广西太阳纸业有限公司

Guangxi Sun Paper Co., Ltd.

350 万吨林浆纸一体化项目

3.5 Million Tons Forest-Pulp-and-Paper Integration Project

环境影响报告书

Environmental Impact Report

（公示稿）

(Public)

建设单位：广西太阳纸业有限公司

Employer: Guangxi Sun Paper Co., Ltd.

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概述

Overview

一、项目由来

I. Origin of the Project

山东太阳控股集团始创于 1982 年，是全球先进的跨国造纸集团和林浆纸一体化集团，总部位于山东省济宁市兖州区。业务涉及投资、造纸、酒店等领域。旗下主要有山东太阳纸业股份有限公司（股票代码：002078）、万国纸业太阳白卡纸有限公司、山东国际纸业太阳纸板有限公司、山东万国太阳食品包装材料有限公司等。截止目前，集团销售收入突破 500 亿元，浆纸产能 838 万吨，拥有资产总额 338 亿元，员工一万四千余人，位列中国企业 500 强，是中国造纸行业领军企业，位列世界造纸前 20 强。

Founded in 1982, Shandong Sun Holdings Group is a leading cross-national paper-making group integrating forestry, pulp and paper-making and headquartered in Yanzhou District, Jining of Shandong Province. The Group engages in such business areas as investment, paper-making and hotel, and has the following subsidiaries: Shandong Sun Paper Industry Joint Stock (stock code: 002078), International Paper & Sun Cartonboard Co., Ltd, Shandong International Paper and Sun Coated Paperboard Co., Ltd., and Shandong International & Sun Food Packaging Material. Up to now, the Group has sales revenue of over RMB 50 billion, pulp and paper production capacity of 8.38 million tons, total assets of RMB 33.8 billion, and total employees of more than 14,000, ranking among the top 500 enterprises of China. It is a leader in Chinese paper-making industry and a top 50 paper-making company in the world.

为实现太阳纸业的可持续发展，适应产业转型升级的必然趋势，公司把“林浆纸一体化”项目建设作为太阳纸业永续经营的重要举措。当前，公司正积极对接国家“一带一路”倡议，沿着“一带一路”开展重点项目布局和建设。公司在老挝实施的“林浆纸一体化”项目已初具规模，配套原料林基地可稳定供应制浆原料，显现出特殊优势。广西北海市是“一带一路”重要节点城市，为了与老挝“林浆纸一体化”项目相互融合、相互补充，利于公司打造完备的原料供应体系和实现企业转型升级，提高公司市场竞争力，提升公司的可持续发展能力。山东太阳纸业股份有限公司经研究在广西北海市铁山港区全资成立广西太阳纸业有限公司。

To realize the sustainable development of Sun Paper and adapt to the inevitable industrial transformation and upgrading, the Company regards the construction of the "forest-pulp-and-paper integration" projects as an important measure for the sustainable operation of Sun Paper. The Company now is actively catching up with the "the Belt and Road Initiative" and carrying out the layout and construction of key projects along "the Belt and Road". The "forest-pulp-and-paper integration" project implemented by the Company in Laos has begun to take shape, and the supporting raw material forest base can stably supply pulping raw materials, showing special advantages. Beihai City in Guangxi is an important node city of "the Belt and Road Initiative". To integrate and supplement with the "forest-pulp-and-paper integration" project in Laos, it is beneficial for the Company to build a complete raw material supply system and realize the transformation and upgrading of the enterprise, improve the Company's market competitiveness and enhance the Company's sustainable development capability. Aafter researches, Shandong Sun Paper Industry Joint Stock Co., Ltd. has established Guangxi Sun Paper Co., Ltd. in Tieshangang District, Beihai City, Guangxi.

北海市比邻东南亚，东南亚气候适宜林木生长，印尼、马来西亚、越南、缅甸等木材资源丰富，可从这些国家进口木片，北海市海运条件得天独厚，运输成本较内地其他地方优势明显。同时广西是我国人工林、速丰林种植面积最大的省份，森林年生长量、年木材产量、森林蓄积年净增量都居全国第一，全区森林覆盖率为 62.28%。广西丰富的木材资源为造纸业创造了得天独厚的条件。

Beihai City is adjacent to Southeast Asia. The climate in Southeast Asia is suitable for forest growth; Indonesia, Malaysia, Vietnam, Myanmar and other countries there have rich wood resources from which wood chips can be imported. Beihai City has unique maritime shipping conditions and obvious advantages over other places in the mainland regarding transportation costs. Further, Guangxi is the province with the largest planting area of man-made forests and fast-growing forests in China; its annual forest growth, annual timber output and annual net increase of forest stock volume all rank first in China, with a forest coverage rate of 62.28% in the whole region. Rich timber resources in Guangxi create unique conditions for the paper industry.

太阳纸业公司将在充分考察、调研、科学规划的基础上，决定在广西北海市铁山港区建设广西太阳纸业有限公司 350 万吨林浆纸一体化项目，将太阳纸业的资金、技术优势同广西丰富的林木资源、北海市铁山港区的物流优势相结合，拟按照“林浆纸一体化”模式走绿色、低碳、可循环发展的路子。在国家发展战略转型升级、倡导“绿色 GDP”

大背景下，公司将就造纸业加快向绿色产业发展进行有益的探索，实现产业转型升级，同时积极应用数字化、智能化、集约化等新兴技术，把拟建项目建设成生态节能、低碳环保、科技智能的世界一流项目。

Based full investigation, survey and scientific planning, Sun Paper decides to build a 3.5 Million Tons Forest-Pulp-and-Paper Integration Project of Guangxi Sun Paper Co., Ltd. in Tieshangang District, Beihai City, Guangxi; combining the capital and technological advantages of Sun Paper with rich forest resources in Guangxi and logistics advantages of Tieshangang District in Beihai City, it plans to follow the "forest-pulp-paper integration" mode for green, low-carbon and recyclable development. Under the background of the transformation and upgrading of national development strategies and the promotion of "green GDP", the Company will make beneficial explorations on accelerating the development of paper industry into a green industry to realize the transformation and upgrading of the industry. Meanwhile, the Company will actively apply emerging technologies such as digitalization, intellectualization and intensification to build the proposed project into a world-class project of an ecological and energy saving, low-carbon and environmentally-friendly, and scientific and intelligent nature.

二、建设项目特点

II. Characteristics of Construction Project

广西太阳纸业有限公司 350 万吨林浆纸一体化项目位于北海市铁山港（临海）工业区内，总占地面积约 3693 亩（含生产区用地 3433 亩、配套一般工业固体废物填埋场 260 亩），项目生产区用地类型为三类工业用地，总投资约 226 亿元；项目已取得铁山港工业区管理委员会建设项目备案证明，项目代码 2019-450512-22- 03-024589。

3.5 Million Tons Forest-Pulp-and-Paper Integration Project of Guangxi Sun Paper Co., Ltd. is located in Tieshangang (Linhai) Industrial Park in Beihai City, with a total area of 3,693 mu (including 3,433 mu of land in the production area and 260mu of supporting landfill site for general industrial solid wastes). Land in the production area of the Project falls under Class III industrial land with a total investment of RMB 22.6 billion. The Project has obtained the record-keeping certification of construction project from Beihai Tieshangang Industrial Park Management Committee, and the project code is 2019-450512-22-03-024589.

项目以海外林基地供应及外购桉木片、桉木原木为原料，采用硫酸盐法连续蒸煮工艺、无元素氯漂白工艺制备化学浆，采用温和盘磨化学预处理碱性过氧化氢机械磨浆法生产化机浆；同时外购部分漂白针叶浆补充进行造纸生产。项目主要建设原料场及备料

车间、制浆车间、造纸车间、碱回收车间、二氧化氯车间、污水处理站、热电站、空压站、制氧站、净水站等，配套建设废气、噪声、固废临时贮存、环境风险等环保设施。

The Project uses eucalyptus chips and eucalyptus logs supplied and purchased from overseas forest bases as raw materials, adopts Kraft cooking process and ECF bleaching process to prepare chemical pulp, and adopts mild disc grinding chemical pretreatment alkaline hydrogen peroxide mechanical refining process to produce chemical mechanical pulp. The Project mainly constructs raw material yard and material preparation workshop, pulping workshop, paper making workshop, alkali recovery workshop, chlorine dioxide workshop, sewage treatment plant, thermal power station, air compression station, oxygen generation station, water purification station, etc., with the supporting construction of environmental protection facilities such as temporary storage of waste gas, noise, of solid waste, and environmental risks.

项目拟分两期建设，第一期拟建年产80万吨漂白化学阔叶浆、20万吨化机浆、55万吨文化用纸、50万吨特种纸生产线；第二期建设年产40万吨化机浆、90万吨白卡纸、年产15万吨生活用纸生产线，建成后总浆纸产能达到350万吨/年。

The Project is to be constructed in two phases. Of which Phase I is to build production lines of 800,000t/a bleached chemical broadleaf pulp, 200,000t/a chemi-mechanical pulp, 550,000t/a cultural paper and 500,000t specialty paper; Phase II is to build production lines of 400,000t/a chemi-mechanical pulp, 900,000t/a white cardboard and 150,000t/a household paper. Upon completion, the total pulp and paper production capacity will reach 3.5 million t/a.

拟建项目采用目前世界上最先进的工艺、技术和设备，最大限度地循环和回收利用整个生产系统所使用的水和各种化学物料，将水的用量和排放量降到最低，使水污染物的产生量大幅减少。采用封闭系统，能够节能并消除恶臭气体逸散；采用中浓系统，多段逆流黑液提取、洗筛、漂白，可以做到节约用水、节能；采用当前最先进的硫酸盐法深度脱木素连续蒸煮工艺，改善纸浆质量、减少浆渣，降低纸浆卡伯值，提高黑液固形物含量，减少漂白产生的COD、BOD和AOX 量；采用氧脱木素技术，可减少漂白工段 COD、BOD排放负荷，减少AOX 排放量，同时减少漂白工段化学品用量；采用无元素氯漂白，降低了漂白损失，减少了 COD、BOD 产生负荷，基本不再产生二噁英，并减少 AOX 的产生量；采用更高效的洗涤设备，黑液提取率≥98%；采用带汽提系统的降膜蒸发器组，提高送碱回收炉黑液固形物浓度，提高产汽量，极大的减少含硫气体的排放量，同时增加回用水量、减少废水排放量；采用封闭系统，臭气全部收集后经处

理送碱炉做燃料或二次风，避免恶臭气体的排放；苛化工段产生的白泥经石灰窑煅烧后循环利用。

The proposed project adopts the most advanced process, technology and equipment in the world today to recycle and reuse the water and various chemical materials used in the whole production system to the maximum extent, so as to minimize the amount and discharge of water and thus greatly reduce the amount of water pollutants generated. The closed system adopted can save energy and eliminate the emission of malodorous gas. Medium concentration system is adopted for extraction, sieving and bleaching of multi-stage countercurrent black liquor, which can save water and energy. The most advanced Kraft deep delignification continuous cooking process is adopted to improve pulp quality, reduce pulp slag, lower kappa number of pulp, increase the solid content of black liquor, and cut down COD, BOD and AOX generated by bleaching. Oxygen delignification technology adopted can reduce COD and BOD emission load, AOX emission and chemical consumption in bleaching section. ECF bleaching adopted reduces bleaching loss, lowers COD and BOD generation load (dioxin is almost no longer generated), and reduces AOX production. More efficient washing equipment is adopted, bringing forth an extraction rate of black liquor ≥ 98%. Falling-film evaporator set with stripping system is adopted to increase the solid concentration of black liquor sent to the alkali recovery furnace and promote the steam production, which greatly reduced the discharge of sulfur-containing gas; also it increases the volume of reused water and reduce the discharge of wastewater. A closed system is adopted, and all odors is collected and then treated and sent to an alkali furnace as fuel or secondary air, to avoid the emission of odors. White clay produced in causticization plant is recycled after calcination in a lime kiln.

碱回收车间采用先进、成熟、可靠的工艺流程，制浆车间来的黑液经蒸发浓缩、燃烧、苛化后，回收碱送制浆回用，碱炉产生高压过热蒸汽与固废综合利用锅炉产生的蒸汽送汽轮发电机组发电，低压蒸汽和背压汽则送生产系统各使用点。化机浆配套 MVR 蒸发器蒸发，采用碱回收炉燃烧方式处理，回收碱和热能、蒸发水回用生产线，可以实现节约用水、化机浆车间废水排放大幅下降，降低污水处理站负荷。

Alkali recovery workshop adopts advanced, mature and reliable process flow. After the black liquor from the pulping workshop is evaporated, concentrated, burned and causticized, the recovered alkali are sent to the pulping workshop for reuse. The high-pressure superheated steam generated by the alkali furnace and the steam generated by the solid waste comprehensive utilization boiler are sent to the steam turbine generator unit for power generation, while the low-pressure steam and the back-pressure steam are sent to each use point of production system. Chemi-mechanical pulp is equipped with MVR evaporator for evaporation, and is treated by alkali recovery furnace combustion mode. Alkali and heat energy are recovered, and evaporated water is recycled into the production line, which can save water, greatly reduce wastewater discharge from chemi-mechanical pulp workshop, and reduce the load of sewage treatment plant.

项目造纸采用自制的漂白阔叶木浆加外购部分针叶木浆，按照一定的配浆比例，添加造纸填料，抄造各类纸产品，造纸机的选型均采用世界上最先进的纸机，以求达到高效、节能、环保要求。

Paper making of the Project adopts self-made bleached hardwood Kraft pulp and a certain amount of purchased softwood pulp. According to a certain pulp proportion, paper fillers are added to manufacture various paper products. For the section of paper machines, the world's most advanced paper machines are chosen to satisfy the high efficiency, energy saving and environmental protection.

三、评价工作过程

III. Process of Assessment

依据《中华人民共和国环境保护法》、《中华人民共和国环境影响评价法》和《建设项目环境影响评价分类管理名录》的有关要求，广西太阳纸业有限公司350万吨林浆纸一体化项目应进行环境影响评价，编制环境影响报告书，为此，建设单位委托我公司承担该项目的环境影响评价工作。我公司接受委托后立即组织有关专业技术人员开展环境状况调查和收集相关资料，进行环境影响因素识别与评价因子筛选，明确了评价重点与环境保护目标，确定工作等级、评价范围和评价标准，制定了工作方案。本评价通过对项目周围的自然环境进行调查评价以及项目的工程情况进行详细的调查分析，并在此基础上预测和分析项目对周围环境的影响程度、范围，分析和论证项目采取的环境保护措施在技术上的可行性，从环境保护的角度论证项目的合理性。整合上述工作成果，编制完成环境影响评价文件。

According to the relevant requirements of the Environmental Protection Law of the People's Republic of China, Law of the People's Republic of China on Environmental Impact Assessment and the Catalogue for the Classified Administration of Environmental Impact Assessments for Construction Projects, Guangxi Sun Paper Co., Ltd. shall carry out environmental impact assessment and prepare environmental impact report for its 3.5 Million Tons Forest-Pulp-and-Paper Integration Project. Therefore, the employer entrusts our company to undertake the environmental impact assessment of the Project. After accepting the entrustment, our company immediately organized relevant professional technicians to investigate environmental status and collect relevant data to identify environmental impact factors and screen assessment factors, thus defining assessment priorities and environmental protection objectives, clarifying work grades, assessment scope and evaluation standards, and formulating work plans. After investigations and assessments of the natural environment around the Project, detailed investigation and analysis of the engineering of the Project, and prediction and analysis of impact degree and scope of the Project on the surrounding environment made on the above basis, the technical feasibility of environmental protection measures adopted in the Project is analyzed and demonstrated, and the rationality of the Project is demonstrated from the perspective of environmental protection. Integrating the above working achievements, environmental impact assessment document is prepared.

四、分析判定相关情况

IV. Analysis and Determination of Relevant Conditions

1、产业政策相符性分析

1. Analysis of compliance with industrial policies

项目建设内容包括一条年产 80 万吨漂白化学木浆生产线，一条年产 20 万吨化机浆生产线和一条年产 40 万吨化机浆生产线，配套相应规模的文化用纸、特种纸、白卡纸、生活用纸和纸板生产线，漂白采用无元素氯漂白工艺，属于《产业结构调整指导目录（2019 年本）》中鼓励类，符合国家产业政策；项目建设符合《造纸产业发展政策》、《中国造纸协会关于造纸工业"十三五"发展的意见》、《广西工业高质量发展行动计划》、《广西造纸与木材加工业发展"十三五"规划》等政策和规划。北海市工业和信息化局北工信函〔2018〕430 号文明确项目符合区域产业发展规划（附件 6）；北海市发展和改革委员会北发改函〔2019〕1033 号）文说明项目供热设施建设符合北海市热电联产规划及国家有关政策要求（附件 15）。

The Project includes an 800,000t/a bleached chemical wood pulp production line, a 200,000t/a chemi-mechanical pulp production line and a 400,000t/a chemi-mechanical pulp production line, matched with corresponding scale of production lines for cultural paper, specialty paper, white cardboard, household paper and paperboard. Since bleaching adopts elemental chlorine-free bleaching process, the Project falls under the category of encouraged projects as stipulated in the Catalog for Guiding Industry Restructuring (2019 Edition) and thereby conforms to the national industrial policies. Construction of the Project conforms to multiple policies and plans such as Policies on Development of Paper-making Industry, Opinions of the China Paper Association on the Development of Paper Industry during the 11th Five-year Plan, Action Plan of Guangxi Industrial High Quality Development, and Development of Guangxi Paper and Wood Processing Industry during 13th Five-year Plan. BGXH [2018] No. 430 issued by Beihai Municipal Bureau of Industry and Information Technology clearly states that the Project conforms to the regional industrial development plan (Annex 6); BFGH [2019] No. 1033 issued by Beihai Development and Reform Commission states that the construction of heating facilities for the Project conforms to Beihai Cogeneration Plan and relevant national policies (Annex 15).

2、与规划、规划环评相符性分析

2. Analysis of compliance with planning and planning EIA

本项目北海市和铁山港（临海）工业区，用地属于三类工业用地，符合园区用地规划，林浆纸业属于园区定位重点发展的产业，符合园区产业定位。用地位于林浆纸业产业组团符合园区产业布局规划。项目达到国内先进生产工艺水平，符合国家规定的环保要求，不属于北海市各产业园区产业准入负面清单（北政发〔2017〕15 号）中北海市铁山港（临海）工业区禁止类的产业，根据北海市发展改革委员会认定，项目符合北海市铁山港（临海）工业区产业准入要求（附件 14）。符合《广西北部湾经济区北海市铁山港工业区规划环境影响报告书》及审查意见（桂环管函〔2009〕268 号）的相关环保要求。符合《广西北部湾经济区北海市铁山港工业区规划环境影响跟踪评价报告书》及审查意见的相关环保要求。

The Project is located in Beihai City and Tieshangang (Linhai) Industrial Park, the land falls under the Class III industrial land, which is in line with the land use planning of the Park. Forest-pulp-and-paper industry is classified as the key development industry in the park positioning, and is in line with the industrial positioning of the Park. The land is located in the forest-pulp-and-paper industry cluster, which conforms to the industrial layout plan of the Park. The Project has reached the domestic advanced production technology level, conforms to the environmental protection requirements stipulated by the State and does not fall under the category of prohibited industries in Beihai Tieshangang (Linhai) Industrial Zone in the Negative List of Industrial Access to Beihai Industrial Parks (BZF [2017] No. 15). According to the confirmation of Beihai Development and Reform Commission, the Project conforms to industrial access requirements of Beihai Tieshangang (Linhai) Industrial Park (Annex 14), relevant environmental protection requirements of the Environmental Impact Report of Beihai

Tieshangang Industrial Park Planning in Beibu Gulf Economic Zone of Guangxi and the review opinions (GHGH [2009] No. 268), relevant environmental protection requirements of Tracking Report on Planning Environmental Impact Assessment of Beihai Tieshangang Industrial Park in Beibu Gulf Economic Zone of Guangxi and the review opinions.

本项目满足《广西环境保护和生态建设“十三五”规划》、《北海市环境保护和生态建设“十三五”规划》要求。

The Project conforms to the Guangxi Environmental Protection and Ecological Construction during the 13th Five-year Plan and Beihai's Environmental Protection and Ecological Construction during the 13th Five-year Plan.

3、“三线一单”符合性分析

3. Analysis of compliance with "three lines and one list (ecological red line, bottom line of environmental quality, upper limit of resources utilization, and negative list of environmental access)”

①生态保护红线

① Ecological red line

项目位于北海市铁山港（临海）工业区，陆域周边无自然保护区、饮用水源保护区、风景名胜区等生态保护目标；项目废水最终排放的海域为铁山港西岸排污区 1（GX012D Ⅳ），属四类海水环境功能区，不属于《广西海洋生态红线划定方案》（桂政函〔2017〕233 号）划定的禁止类红线区和限制类红线区，根据项目海洋环境影响预测结果，项目排污对纳污海域周边广西合浦儒艮国家级自然保护区、广西山口红树林生态自然保护区的影响不大，不会造成其海洋环境功能降级，满足广西海洋生态红线管控要求。故本项目建设排污满足区域生态红线要求。

The Project is located in Tieshangang (Linhai) Industrial Park in Beihai City, and there are no ecological protection targets around the land area, such as nature reserves, drinking water source protection areas and scenic spots. The sea area where the project wastewater is finally discharged is sewage discharge area 1 (GX012D IV) on the west bank of Tieshan Harbor, and falls under the Class-IV seawater environment functional zones, rather than the prohibited red line area and restricted red line area designated by the Regulations on Delineation of Guangxi Marine Ecological Red Line (GZH [2017] No. 233). According to the prediction results of the Project's marine environmental impact, the Project's sewage discharge has little impact on Guangxi Hepu Dugong National Nature Reserve and Guangxi Shankou Mangrove Ecological Nature Reserve around the polluted sea area, which will not lead to the degradation of marine environmental function and is in line with Guangxi marine ecological red line control. Therefore, construction of the Project conforms to the regional ecological red line.

②环境质量底线

Environmental quality baseline

项目所在区域的环境质量底线为：环境空气质量满足《环境空气质量标准》（GB3095-2012）二级标准；地下水质达到《地下水质量标准》（GB/T14848-2017）III类标准；海水水质、海洋沉积物质量满足相应海洋环境功能的要求；声环境质量达到3类标准或声环境功能区要求；土壤环境质量达到《土壤环境质量 农用地土壤污染风险管控标准（试行）》（GB 15618-2018）和《土壤环境质量 建设用地土壤污染风险管控标准（试行）》（GB36600-2018）要求。

Environmental quality baseline in the area where the Project is located is as follows: the ambient air quality meets the Class II standard of Ambient Air Quality Standards (GB3095-2012); underground water quality meets the Class III standard of Standard for Groundwater Quality (GB/T14848-2017); seawater quality and marine sediment quality meet the requirements of corresponding marine environmental functions; sound environment quality meets the requirements of Class III standard or sound environment functional zones; soil environmental quality conforms to the Soil Environmental Quality - Risk Control Standard for Soil Contamination of Agricultural Land (Trial) (GB 15618-2018) and Soil Environmental Quality - Risk Control Standard for Soil Contamination of Development Land (Trial) (GB36600-2018).

本项目大气环境、地下水环境、海水水质环境、土壤环境质量均能够满足相应的标准要求。本项目废水、废气和噪声经污染防治措施处理后均能达标排放，固废可做到无害化处置。采取本项目提出的相关整改防治措施后，本项目排放的污染物不会降低区域环境质量，不会加剧环境的恶化，不触及环境质量底线。

Atmospheric environment, groundwater environment, seawater quality environment and soil environment quality of the Project can all meet the corresponding standard requirements. Wastewater, waste gas and noise of the Project can realize up-to-standard discharge after treated by pollution prevention measures, and the solid waste can be disposed of harmlessly. After relevant rectification and prevention measures proposed by the Project are adopted, the pollutants discharged by the Project will not reduce the regional environmental quality, aggravate the environmental deterioration, or hit the environmental quality baseline.

③资源利用上线

③ Upper limit of resource utilization

本项目用水由供水公司设专管供应原水，项目用水量在供水公司设计供水能力范围内，同时也在园区水资源规划直接向企业提供原水量范围内，未超出园区水资源利用上线（附件 8）。项目建成运行后通过内部管理、设备选择、原辅材料的选用和管理、废物回收利用、污染治理等多方面采取合理可行的防治措施，以"节约、降耗、减污"为目标，有效地控制污染。项目的用水、用电等资源利用不会突破区域的资源利用上线。

Water supply company will set up a special pipeline to supply raw water for the Project; water consumption of the Project is within the scope of both the designed water supply capacity of the water supply company, and the raw water volume directly supplied to the Company as stipulated in the park water resource planning, which does not exceed the upper limit of water resource utilization of the park (Annex 8). After completion and operation of the Project, reasonable and feasible prevention and control measures shall be taken through internal management, equipment selection, selection and management of raw and auxiliary materials, waste recycling, pollution control and other aspects, to effectively control pollution with the goals of "energy saving, consumption reduction and pollution decreasing". Utilization of water, electricity and other resources for the Project will not break through the upper limit of resource utilization in the region.

④环境准入负面清单

④ Environmental access negative list

项目选址符合园区规划要求，不在园区规划环评、跟踪环评提出的负面清单内，满足北海市铁山港工业区规划环评和审查意见各项要求。此外，项目达到国内先进生产工艺水平，符合国家规定的环保要求，不属于《北海市各产业园区产业准入负面清单》（北政发〔2017〕15 号）中北海市铁山港（临海）工业区禁止类产业，根据北海市发展改革委员会认定，项目符合北海市铁山港（临海）工业区产业准入要求（附件 14）。

Siting of the Project meets the park planning requirements and is not presented in the negative list put forward by the park planning EIA and tracking EIA; so it meets the requirements of the planning EIA and review opinions of Beihai Tieshangang Industrial Park. Additionally, the Project has reached the domestic advanced production technology level, conforms to the environmental protection requirements stipulated by the State and does not fall under the category of prohibited industries in Beihai Tieshangang (Linhai) Industrial Zone in the Negative List of Industrial Access to Beihai Industrial Parks (BZF [2017] No.15).

According to the confirmation of Beihai Development and Reform Commission, the Project conforms to industrial access requirements of Beihai Tieshangang (Linhai) Industrial Park (Annex 14),

综上，项目与区域“三线一单”要求相符。

To sum up, the Project conforms to "three lines and one list" in the region.

4、选址符合性分析

4. Analysis of siting compliance

项目位于北海铁山港（临海）工业区，用地为三类工业用地，项目周边无自然保护区、风景名胜区、饮用水源保护区等生态环境敏感目标，距离北海市区和重要旅游景区距离较远，属于整个工业区的下风向区域，下风向无密集的居民区。项目区域大气环境质量现状总体较好，有一定的大气环境容量，项目环境防护距离范围内无居民区、医院等敏感目标分布。项目废水拟经配套污水处理站处理达标后，在B3排污口深海排放，排污区域环境容量相对充足，能满足本项目废水排放需求。项目厂区地下水流向侧下游有部分村民自打井取用地下水，要通过做好分区防渗措施和地下水跟踪监测计划，避免项目生产运行对周边村屯饮用水安全的影响。

The Project is located in Tieshangang (Linhai) Industrial Park in Beihai, with project land falling under Class III industrial land; and there are no ecological environment sensitive targets such as nature reserves, scenic spots and drinking water source protection areas around the Project. Far away from Beihai City and important tourist attractions, the Project is situated in downwind area of the whole industrial park without any dense residential areas. Air environment quality in the project area is generally good at present, with a certain atmospheric capacity, and there are no sensitive targets such as residential areas and hospitals within the environmental protection distance of the Project. Project wastewater is to be up-to-standard discharged into the deep sea of sewage outlet B3 after treated by the supporting sewage treatment plant. The environmental capacity of sewage discharge area is relatively sufficient, which can meet the wastewater discharge demand of the Project. Some villagers in the downstream of the groundwater flow direction of the project plant area dig wells to take groundwater; so it is necessary to take zoning anti-seepage measures and groundwater tracking and monitoring plans to avoid the impact of t project production and operation on the drinking water safety of surrounding villages.

综上所述，本项目选址基本合理。

To sum up, siting of the Project is basically reasonable.

五、关注的主要环境问题及环境影响

V. Major Environmental Issues and Environmental Impact

本评价关注的主要环境问题有：

Major environmental issues in the current assessment include:

（1）运营过程中的大气、水、固体废物等污染物产生排放情况，及生产排放对周边环境的影响。

(1) Discharge of air, water, solid waste and other pollutants during operation, and the impact of production discharge on the surrounding environment.

（2）项目废水深海排放对铁山港海域海水水质和生态环境的影响程度，重点关注对广西合浦儒艮国家级自然保护区、广西山口红树林生态自然保护区的影响情况。

(2) Degree of impact of deep-sea wastewater discharge from the Project on seawater quality and ecological environment in sea areas of Tieshan Harbor, with emphasis on the impact on Guangxi Hepu Dugong National Nature Reserve and Guangxi Shankou Mangrove Ecological Nature Reserve.

（3）项目采取的废水、废气污染防治措施是否能稳定达标、经济技术可行。重点关注臭气控制措施和污水处理设施。

(3) Whether the pollution control measures for wastewater and waste gas adopted in the Project can reach the standard stably and are economically and technically feasible, with the emphasis on stink control measures and sewage treatment facilities.

（4）项目运行过程的环境风险及风险防范措施。

(4) Environmental risks and risk prevention measures during project operation.

六、报告书主要结论

VI. Main Conclusions of the Report

本项目符合国家和地方相关产业政策，符合各项环保规划和园区规划。项目拟采取的污染防治措施技术成熟、可靠，能确保各类污染物稳定达标排放。虽然项目的建设和运营过程中不可避免会带来一些环境负面影响，但在采取各种污染防治措施情况下，不会导致区域环境质量降级，满足环境功能区划要求，环境风险影响属于可以接受水平。项目建设运行能满足生态保护红线、环境质量底线、资源利用上线的要求，不属于区域环境准入负面清单禁止和限制的产业。因此，只要建设单位认真落实本环评报告中提出的各项污染防治措施、环境风险防范措施以及环境管理措施等，严格执行环保“三同时”制度，从环境保护角度分析，项目建设可行。

The Project conforms to relevant national and local industrial policies, various environmental protection plans and park plans. Pollution control measures to be adopted in the Project are mature and reliable in technology, which can ensure the stable up-to-standard discharge of all kinds of pollutants. Though some negative environmental impacts are inevitable during the construction and operation of the Project, the regional environmental quality will not be degraded if various pollution control measures are adopted. This meets the requirements of environmental function zoning, and the environmental risk impact is acceptable. Construction and operation of the Project are compliant regarding the ecological red line, environmental quality baseline and the up limit of resource utilization, the Project does not fall under the industries prohibited and restricted by the negative list of regional environmental access. Therefore, the project construction is feasible from the perspective of environmental protection, provided that the employer earnestly implements various pollution control measures, environmental risk prevention measures and environmental management measures proposed herein, and strictly follows the "Three Simultaneities" system for environmental protection.

目录

Table of Contents

1 总则

1 General Rules

1.1 编制依据

1.1 Basis of compilation

1.1.1 国家的法律法规和管理办法

1.1.1 National laws and regulations and administrative measures

（1）《中华人民共和国环境保护法》（2015年1月1日起施行）；

(1) Environmental Protection Law of the People’s Republic of China (implemented since January 1, 2015);

（2）《中华人民共和国环境影响评价法》（2018年12月修订）；

(2) Law of the People’s Republic of China on Environmental Impact Assessment (revised in December 2018);

（3）《中华人民共和国大气污染防治法》（2018年10月修正，2018年10月26日起施行）；

(3) Law of the People’s Republic of China on the Prevention and Control of Atmospheric Pollution (revised in October 2018 and implemented since October 26, 2018);

（4）《中华人民共和国水污染防治法》（2017年6月修订，2018年1月1日起施行）；

(4) Law of the People's Republic of China on the Prevention and Control of Water Pollution (revised in June 2017 and implemented since January 1, 2018);

（5）《中华人民共和国环境噪声污染防治法》（2018 年 12 月修订）；

(5) Law of the People's Republic of China on the Prevention and Control of Pollution from Environmental Noise (revised in December 2018);

（6）《中华人民共和国固体废物污染环境防治法》（2016 年 11 月修订）；

(6) Law of the People's Republic of China on the Prevention and Control of Environment Pollution by Solid Wastes (Revised in November 2016);

（7）《中华人民共和国海洋环境保护法》（第三次修正，2017 年 11 月 5 日起施行）；

(7) Marine Environment Protection Law of the People's Republic of China (third amendment, implemented since November 5, 2017);

（8）《中华人民共和国土壤污染防治法》（2018 年 8 月修订，2019 年 1 月 1 日起施行）；

(8) Soil Pollution Prevention and Control Law of the People's Republic of China (revised in August 2018 and implemented since January 1, 2019);

（9）《中华人民共和国清洁生产促进法》（2012 年 2 月修订）；

(9) Cleaner Production Promotion Law of the People's Republic of China (revised in February 2012);

（10）《中华人民共和国节约能源法》（2016 年 7 月修订）；

(10) Law of the People’s Republic of China on Conserving Energy (revised in July 2016);

（11）《中华人民共和国可再生能源法》（2009 年 12 月修订）；

(11) Renewable Energy Law of the People's Republic of China (revised in December 2009);

（12）《中华人民共和国土地管理法》（2004 年 8 月修订）；

(12) Land Administration Law of the People's Republic of China (revised in August 2004);

（13）《中华人民共和国城乡规划法》（2015 年 4 月修订）；

(13) Urban and Rural Planning Law of the People' s Republic of China (revised in April 2015);

（14）《中华人民共和国渔业法》（2013 年 12 月修正）；

(14) Fisheries Law of the People’s Republic of China (Revised in December 2013);

（15）《中华人民共和国环境保护税法》（2018 年 1 月 1 日起施行）；

(15) Environmental Protection Tax Law of the People's Republic of China (implemented since January 1, 2018);

（16）《建设项目环境保护管理条例》（国务院令第 682 号，2017 年 10 月实施）；

(16) Regulations on the Administration of Construction Project Environmental Protection (No. 682 Order of the State Council, implemented since October 2017);

（17）《关于落实科学发展观加强环境保护的决定》（国发〔2005〕39 号，2005 年 12 月实施）；

(17) Decision of the State Council on Implementing Scientific Viewpoint of Development and Strengthening Environmental Protection (GF [2005] No. 39, implemented since December 2005)

（18）《国务院关于加强环境保护重点工作的意见》（国发〔2011〕35号）；

(18) Opinions of the State Council on Strengthening Major Environmental Protection Work (GF [2011] No. 35);

（19）《建设项目环境影响评价分类管理名录》修改单（生态环境部令 第1号）；

(19) Amendments to the Catalog of Classified Management of Environmental Impact Assessment of Construction Projects, No. 1 Decree of Ministry of Enology and Environment;

（20）《排污许可管理办法（试行）》（环境保护部令 第48号，2018年1月10日实施）

(20) Measures for Pollutant Discharge Permitting Administration (Trail) (No. 48 Decree of Ministry of Enology and Environment, implemented since January 10, 2018);

（21）《中华人民共和国防治海岸工程建设项目污染损害海洋环境管理条例》（2017年3月修订）；

(21) Regulations on the Prevention and Control of Pollution Damage to Marine Environment by Coastal Construction Projects in People's Republic of China (revised in March 2017);

（22）《中华人民共和国自然保护区条例》（2017年10月修订）；

(22) Regulations of the People's Republic of China on Nature Reserves (revised in October 2017);

（23）《工矿用地土壤环境管理办法（试行）》（生态环境部令 第3号）；

(23) Administrative Measures for Soil Environment of Land for Industrial and Mining Use (Trail) (No. 3 Decree of Ministry of Enology and Environment);

（24）《产业结构调整指导目录（2019年本）》；

(24) Catalog for Guiding Industry Restructuring (2019 Edition);

（25）《关于加强西部地区环境影响评价工作的通知》（环发〔2011〕150号）；

(25) Notice on Strengthening Environmental Impact Assessment in Western China (HF [2011] No. 150);

（26）《关于进一步加强环境影响评价管理防范环境风险的通知》（环发〔2012〕77号）；

(26) Notice on Further Strengthening the Management of Environmental Impact Assessment to Prevent Environmental Risks (HF [2012] No. 77);

（27）《关于切实加强风险防范严格环境影响评价管理的通知》（环发〔2012〕98号）；

(27) Notice on Substantial Enhancement of Risk Prevention and Strict Management of Environmental Impact Assessment (HF [2012] No. 98);

（28）《企业事业单位突发环境事件应急预案备案管理办法（试行）》（环发〔2015〕4 号）；

(28) Measures for the Administration of Filing Emergency Plans for Environmental Emergencies in Enterprises and Institutions (Trial) (HF [2015] No. 4);

（29）《关于切实加强环境影响评价监督管理工作的通知》（环办〔2013〕104 号）；

(29) Notice on Substantial Enhancement of Supervision and Administration of Environmental Impact Assessment (HB [2013] No. 104);

（30）《关于落实大气污染防治行动计划严格环境影响评价准入的通知》（环办〔2014〕30 号）；

(30) Notice on the Implementation of Strict Environmental Impact Assessment Access to the Action Plan for Preventing and Controlling Air Pollution (HB [2014] No. 30);

（31）《国务院关于印发大气污染防治行动计划的通知》（国发〔2013〕37 号）；

(31) Notice of the State Council on Issuing the Action Plan for Prevention and Control of Air Pollution (GF [2013] No. 37);

（31）《国务院关于印发水污染防治行动计划的通知水污染防治行动计划》（国发〔2015〕17 号）；

(31) Notice of the State Council on Issuing the Action Plan for Prevention and Control of Water Pollution (GF [2015] No. 17) ;

（32）《国务院关于印发土壤污染防治行动计划的通知》（国发〔2016〕31 号）；

(32) Notice of the State Council on Issuing the Action Plan for Prevention and Control of Soil Pollution (GF [2016] No. 31);

（33）《环境影响评价公众参与办法》（环境保护部令第 4 号，2019 年 1 月 1 日起实施）；

(33) Measures for Public Participation in Environmental Impact Assessment (No. 4 Decree of Ministry of Enology and Environment, implemented since January 1, 2019);

（34）《关于印发<制浆造纸企业环境守法导则>的通知》（环办函〔2015〕882 号）；

(34) Notice on Issuing the Guidelines for Environmental Compliance of Pulping and Paper-making Enterprises (HBH [2015] No. 882);

（35）《关于做好环境影响评价制度与排污许可制衔接相关工作的通知》（环办环评〔2017〕84 号）；

(35) Notice on Promoting Integration between Environmental Impact Assessment System and Pollutant Discharge Permit System (HBHP [2017] No. 84);

（36)《关于强化建设项目环境影响评价事中事后监管的实施意见》(环环评〔2018〕11 号）；

(36) Implementation Opinions on Strengthening Supervision during and after Environmental Impact Assessment of Construction Projects (HHP [2018] No. 11);

（37）《国务院关于印发打赢蓝天保卫战三年行动计划的通知》（国发〔2018〕22 号）；

(37) Circular of the State Council on Issuing the Three-year Action Plan for Winning the Battle for a Blue Sky (GF [2018] No. 22);

（38）《造纸产业发展政策》（国家发改委公告〔2007〕第 71 号）；

(38) Policies on Development of Paper-making Industry, [2007] No. 71 Circular of NDRC;

（39）《制浆造纸建设项目环境影响评价文件审批原则（试行）》（环办〔2015〕112 号）；

(39) Approval Principles of Environmental Impact Assessment Documents for Pulping and Papermaking Construction Projects (Trial) (HB [2015] No. 112);

（40）《工业炉窑大气污染综合治理方案》（环大气〔2019〕56 号）。

(40) Comprehensive Control Plan for Air Pollution of Industrial Furnaces and Kilns (HDQ (2019) No. 56).

1.1.2 地方性法规及规范性文件

1.1.2 Local regulations and normative documents

（1）《广西壮族自治区环境保护条例（2016 年 5 月 25 日修订）》，自 2016 年 9 月 1 日实施；

（1）Regulations on Environmental Protection of Guangxi Zhuang Autonomous Region (revised on May 25, 2016), implemented since September 1, 2016;

（2）《广西壮族自治区主体功能区规划》（桂政发〔2012〕89 号）；

（2）Main Functional Area Planning for Guangxi Zhuang Autonomous Region (GZF (2012) No. 89);

（3）《广西壮族自治区生态环境厅关于印发〈广西壮族自治区建设项目环境影响评价文件分级审批管理办法〉（2019 年修订版）的通知》（桂环规范〔2019〕8 号）；

（3）Notice of Guangxi Zhuang Autonomous Region Ecological Environment Department on Issuing Measures for the Administration of Graded Approval of Environmental Impact Assessment Documents for Construction Projects in Guangxi Zhuang Autonomous Region (2019 Revision) (GHGF [2019] No. 8);

（4）《广西壮族自治区人民政府办公厅关于印发广西壮族自治区建设项目环境准入管理办法的通知》（桂政办发〔2012〕103 号）；

（4）Notice of the General Office under the People's Government of Guangxi Zhuang Autonomous Region on Issuing Measures for the Administration of Environmental Access to Construction Projects in Guangxi Zhuang Autonomous Region (GZBF [2012] No. 103);

（5）《广西壮族自治区人民政府办公厅关于印发大气污染防治行动工作方案的通知》（桂政办发〔2014〕9 号）；

（5）Notice of the General Office under the People's Government of Guangxi Zhuang Autonomous Region on Issuing the Air Pollution Prevention and Control Action Plan (GZBF [2014] No. 9);

（6）《广西壮族自治区人民政府办公厅关于印发广西水污染防治行动计划工作方案的通知》（桂政办发〔2015〕131 号）；

（6）Notice of the General Office under the People's Government of Guangxi Zhuang Autonomous Region on Issuing the Work Plan of Guangxi Water Pollution Prevention Action Plan (GZBF [2015] No. 131);

（7）《广西壮族自治区人民政府办公厅关于印发广西土壤污染防治行动工作方案的通知》（桂政办发〔2016〕167 号）；

（7）Notice of the General Office under the People's Government of Guangxi Zhuang Autonomous Region on Issuing Action Plan for Guangxi Soil Pollution Prevention and Control (GZBF [2016] No. 167);

（8）《广西壮族自治区环境保护厅关于贯彻落实国务院取消建设项目试生产行政审批事项决定的通知》（桂环函〔2015〕1601 号）；

（8）Notice of Guangxi Zhuang Autonomous Region Environmental Protection Department on Implementing the Decision of the State Council to Cancel the Administrative Examination and Approval for Trial Production of Construction Projects (GHH [2015] No. 1601);

（9）《广西壮族自治区环境保护厅关于贯彻执行<建设项目环境影响评价技术导则

总纲>的通知》（桂环函〔2016〕2146 号）；

（9）Notice of Guangxi Zhuang Autonomous Region Environmental Protection Department on Implementing the Technical Guideline for Environmental Impact Assessment of Construction Project General Programme (GHH [2016] No. 2146);

（10）《广西壮族自治区海洋环境保护条例》（2014 年 2 月实施）；

（10）Regulations of Guangxi Zhuang Autonomous Region on Marine Environmental Protection (implemented since February 2014);

（11）《广西大气污染防治攻坚三年作战方案（2018-2020 年）》（桂政办发〔2018〕80 号）；

（11）Guangxi's Three-year Plan for Air Pollution Prevention and Control (2018-2020) (GZBF [2018] No. 80);

（12）《广西水污染防治攻坚三年作战方案 （2018-2020 年）的通知 （桂政办发〔2018〕81 号）》

（12）Notice on Guangxi's Three-year Plan for Water Pollution Prevention and Control (2018-2020) (GZBF [2018] No. 81);

（13）《广西土壤污染防治攻坚三年作战方案（2018-2020 年）》（桂政办发〔2018〕82 号）；

（13）Guangxi's Three-year Plan for Soil Pollution Prevention and Control (2018-2020) (GZBF [2018] No. 82);

（14）《广西生态环境保护基础设施建设三年作战方案 （2018-2020 年）》（桂政办发〔2018〕83 号）；

（14）Three-year Plan for Infrastructure Construction of Guangxi Ecological Environment Protection (2018-2020) (GZBF [2018] No. 83);

（15）《广西海洋生态红线划定方案》（桂政函〔2017〕233 号）；

（15）Regulations on Delineation of Guangxi Marine Ecological Red Line (GZH [2017] No. 233);

（16）《广西生态保护红线管理办法（试行）》（桂政办发〔2016〕152 号）；

（16）Measures on Administration of Guangxi Ecological Red Line (Trial) (GZBF [2016] No. 152);

（17）《北海市水污染防治行动计划工作方案》（北政办〔2016〕14 号）；

（17）Work Program for Beihai Water Pollution Prevention and Control Action Plan

(BZB [2016] No. 14);

（18）《北海市大气污染防治行动实施方案》（北政办〔2014〕74 号）；

（18）Implementation Plan for Beihai Air Pollution Prevention and Control Action (BZB [2014] No. 74);

（19）《北海市各产业园区产业准入负面清单》（北政发〔2017〕15 号）；

（19）Negative List of Industrial Access to Beihai Industrial Parks (BZF [2017] No. 15);

（20）《北海市大气污染防治攻坚三年作战方案（2018-2020 年）》（北政办〔2018〕156 号）。

（20）Beihai's Three-year Plan for Air Pollution Prevention and Control (2018-2020) (BZB [2018] No. 156);

1.1.3 规划依据

1.1.3 Planning basis

（1）《中华人民共和国国民经济和社会发展第十三个五年规划纲要》（2016 年 3 月 16 日）；

（1）Outline of the 13th Five-year Plan for the National Economic and Social Development of the People's Republic of China (March 16 2016);

（2）《广西北部湾经济区发展规划（2014 年修订）》；

（2）Guangxi Beibu Gulf Economic Zone Development Scheme (Revised in 2014);

（3）《“十三五”生态环境保护规划》（国发〔2016〕65 号）；

（3）Ecological Environment Protection Planning During the 13th Five-year Plan Period (GF [2016] No. 65);

（4）《广西壮族自治区国民经济和社会发展第十三个五年规划纲要》（2016 年 3 月 21 日）；

（4）Outline of the 13th Five-year Plan for the National Economic and Social Development of the Guangxi Zhuang Autonomous Region (March 21, 2016);

（5）《广西壮族自治区环境保护和生态建设“十三五”规划》（桂政办发〔2016〕125 号）；

（5）Planning for Environmental Protection and Ecological Construction in Guangxi Zhuang Autonomous Region During the 13th Five-year Plan (GZBF [2016] No. 125);

（6）《广西壮族自治区水功能区划》（2016 修订）；

（6）Water Function Zoning of Guangxi Zhuang Autonomous Region (Revised in 2016);

（7）《广西壮族自治区生态功能区划》（桂政办发（2008）8 号）；

（7）ecological function zoning of Guangxi Zhuang Autonomous Region" (GZBF [2008] No. 8);

（8）《广西壮族自治区主体功能区规划》（2012 年）；

（8）Main Functional Area Planning of Guangxi Zhuang Autonomous Region (2012);

（9）《广西壮族自治区近岸海域环境功能区划调整方案的通知》（2011 年）；

（9）Notice on Adjustment Plan of Environmental Function Zoning in Coastal Waters of Guangxi Zhuang Autonomous Region (2011);

（10）《广西壮族自治区海洋功能区划》（2011-2020 年）；

（10）Marine Functional Zoning of Guangxi Zhuang Autonomous Region (2011-2020);

（11）《广西壮族自治区海洋主体功能区规划》（桂政发〔2018〕23 号）；

（11）Main Marine Functional Area Planning of Guangxi Zhuang Autonomous Region (GZF [2018] No. 23);

（12）《广西壮族自治区重金属污染防治“十三五”规划》（桂环发〔2017〕3 号）；

（12）Prevention and Control of Heavy Metal Pollution in Guangxi Zhuang Autonomous Region during the "13th Five-year Plan (GHF [2017] No.3);

（13）《北海市国民经济和社会发展第十三个五年规划纲要》；

（13）The 13th Five-year Plan for Economic and Social Development of Beihai;

（14）《北海市城市总体规划（2013-2030）》（2015 年修编）；

（14）Urban Overall Plan of Beihai (2013-2030)" (revised in 2015);

（15）《北海市土地利用总体规划》（2006-2020 年）；

（15）Beihai Overall Plan for Land Utilization (2006-2020);

（16）《北海市环境保护和生态建设“十三五”规划》（2016 年）；

（16）Environmental Protection and Ecological Construction in Beihai City During the 13th Five-year Plan (2016);

（17）《北海市海洋环境保护规划 2010-2020》（北政发〔2012〕13 号）；

（17）Beihai Marine Environmental Protection Plan 2010-2020 (BZF [2012] No. 13);

（18）《北海市铁山港区分区规划》（2004-2020 年）；

（18）Zoning Plan for Beihai Tieshangang District (2004-2020);

（19）《关于广西北部湾经济区北海市铁山港工业区规划环境影响报告书的审查意见》（桂环管函〔2009〕268 号）及环评报告书；

（19）Review Opinions on Environmental Impact Report of Beihai Tieshangang Industrial Park Planning in Beibu Gulf Economic Zone of Guangxi (GHGH [2009] No. 268), and Environmental Impact Report;

（20）《广西造纸与木材加工业发展“十三五”规划》（桂工信轻纺〔2017〕211 号）；

（20）Development of Guangxi Paper-making and Wood-processing Industry during the "13th Five-year Plan" (GGXQF [2017] No. 211);

（21）《中国造纸协会关于造纸工业“十三五”发展的意见》（中纸协〔2017〕11 号）；

（21）Opinions of the China Paper Association on the Development of Paper Industry during the 13th Five-year Plan (ZZX [2017] No. 11);

（22）《广西北部湾港总体规划修编》（桂政函〔2018〕74 号）；

（22）Revision of Overall Planning on Guangxi Beibu Gulf Port (GZH [2018] No. 74);

（23）《广西北部湾经济区北海市铁山港工业区规划环境影响跟踪评价报告书》（2019 年）及专家意见。

（23）Tracking Report on Planning Environmental Impact Assessment of Beihai Tieshangang Industrial Park in Beibu Gulf Economic Zone of Guangxi (2019) and expert opinions.

1.1.4 技术导则与规范

1.1.4 Technical guidelines and specifications

（1）《建设项目环境影响评价技术导则　总纲》（HJ2.1-2016）；

（1）Technical Guideline for Environmental Impact Assessment of Construction Project - General Programme (HJ2.1-2016);

（2）《环境影响评价技术导则　大气环境》（HJ2.2-2018）；

（2）Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018);

（3）《环境影响评价技术导则　地面水环境》（HJ2.3-2018）；

（3）Technical Guidelines for Environmental Impact Assessment - Surfacewater Environment (HJ/HJ2.3-2018);

（4）《环境影响评价技术导则　地下水环境》（HJ610-2016）；

（4）Technical Guidelines for Environmental Impact Assessment - Groundwater Environment (HJ610-2016);

（5）《环境影响评价技术导则　声环境》（HJ2.4-2009）；

（5）Technical Guidelines for Noise Impact Assessment (HJ2.4-2009);

（6）《环境影响评价技术导则 土壤环境（试行）》（HJ964-2018）

（6）Technical Guidelines for Environmental Impact Assessment - Soil Environment (Trail) (HJ964-2018);

（7）《环境影响评价技术导则　生态影响》（HJ19-2011）；

（7）Technical Guideline for Environmental Impact Assessment Ecological Impact (HJ19-2011);

（8）《建设项目环境风险评价技术导则》（HJ169-2018）；

（8）Technical Guidelines for Environmental Risk Assessment on Projects (HJ169-2018);

（9）《大气污染物无组织排放监测技术导则》（HJ/T55-2000）；

（9）Technical Guidelines for Fugitive Emission Monitoring of Air Pollutants (HJ/T55 -2000);

（10）《环境空气质量手工监测技术规范》（HJ/T194-2017）；

（10）Technical Specifications on Manual Methods for Ambient Air Quality Monitoring (HJ/T194-2017);

（11）《地表水和污水监测技术规范》（HJ/T91-2002）；

（11）Technical Specifications Requirements for Monitoring of Surface Water and Waste Water (HJ/T91-2002);

（12）《水污染物排放总量监测技术规范》（HJ/T 92-2002）；

（12）Technical Requirements for Monitoring of Total Amount of Pollutants in Waste Water (HJ/T 92-2002);

（13）《地下水环境监测技术规范》（HJ/T164-2004）；

（13）Technical Specifications for Environmental Monitoring of Groundwater (HJ/T164-2004);

（14）国家环保总局等编《水和废水监测分析方法》（第四版）；

（14）Water and Wastewater Monitoring and Analysis Method (Fourth Edition), State Environmental Protection Administration;

（15）国家环保总局等编《空气和废气监测分析方法》（第四版）；

（15）Air and Wastewater Monitoring and Analysis Method (Fourth Edition), State Environmental Protection Administration;

（16）《海洋生物质量监测技术规程》（HY/T 078-2005）；

（16）Technical Specification of Marine Biological Quality Monitoring (HY/T 078-2005);

（17）《海洋监测规范》（GB17378-2007）；

（17）The Specification for Marine Monitoring (GB17378-2007);

（18）《海洋调查规范》（GB12763-2007）；

（18）Specification for Oceanographic Survey (GB12763-2007);

（19）《近岸海域环境监测规范》（HJ442-2008）及《近岸海域环境监测点位布设技术规范》（HJ 730-2014）；

（19）Specification for Offshore Environmental Monitoring (HJ442-2008), and Specifications on Spot Location of Monitoring Sites Related to Coastal Area Environment (HJ 730-2014);

（20）《建设项目对海洋生物资源影响评价技术规程》（SC/T9410-2007）；

（20）Technical Regulations for Impact Assessment of Construction Projects on Marine Living Resources (SC/T9410-2007);

（21）《重点行业二噁英污染防治技术政策》（环境保护部公告 2015 年第 90 号）；

（21）Technical Policy for Prevention and Control of Dioxin Pollution in Key Industries (Announcement No. 90 of 2015 of the Ministry of Ecology and Environment);

（22）《造纸工业污染防治技术对策》（环境保护部公告 2017 年第 35 号）；

（22）Technical Countermeasures for Pollution Prevention and Control in Paper Industry (Announcement No. 35 of 2017 of the Ministry of Ecology and Environment);

（23）《制浆造纸工业污染防治可行性技术指南》（HJ 2302-2018）；

（23）Guideline for Available Techniques of Pollution Prevention and Control for Pulp and Paper Industry (HJ 2302-2018);

（24）《污染源强核算技术指南 制浆造纸》（HJ887-2018）；

（24）Technical Guidelines of Accounting Method for Pollution Source Intensity - Pulp and Paper Industry (HJ887-2018);

（25）《污染源强核算技术指南 火电》（HJ888-2018）；

（25）Technical Guidelines of Accounting Method for Pollution Source Intensity - Thermal Power Industry (HJ888-2018);

（26）《污染源源强核算技术指南 锅炉》（HJ991-2018）；

（26）Technical Guidelines of Accounting Method for Pollution Source Intensity - Thermal Power Boiler (HJ991-2018);

（27）《排污单位自行监测技术指南 总则》（HJ819-2017）；

（27）Self-monitoring Technology Guidelines for Pollution Sources - General Rule (HJ819-2017);

（28）《排污单位自行监测技术指南 造纸工业》（HJ821-2017）；

（28）Self-monitoring Technology Guidelines for Pollution Sources - Paper industry (HJ821-2017);

（29）《造纸行业排污许可证申请与核发技术规范》、《火电行业排污许可证申请与核发技术规范》（环水体〔2016〕189 号）；

（29）Technical Specification for Application and Issuance of Pollution Discharge Permit in Paper Industry, and Technical Specification for Application and Issuance of Pollution Discharge Permit for Thermal Power Industry (HST [2016] No. 189);

（30）《火电厂污染防治可行技术指南》（HJ2301-2017）。

（30）Guideline on Available Technologies of Pollution Prevention and Control for Thermal Power Plant (HJ2301-2017);

1.1.5 其他依据

1.1.5 Other basis

（1）项目委托书；

(1) Project power of attorney;

（2）项目可行性研究报告；

(2) Project feasibility study report;

（3）项目备案；

(3) Project filing;

（4）建设单位提供的其他资料；

(4) Other materials provided by the employer;

（5）《铁山港工业区一般工业固废处置场项目环境影响报告书》及其环评批复（北环审〔2016〕78 号）；

(5) Environmental Impact Report of the General Industrial Solid Waste Disposal Site Project in Beihai Tieshangang Industrial Park and its environmental assessment approval (BHS [2016] No. 78)

（6）《北海市铁山港区污水处理厂尾水排海管工程项目海洋环境影响报告书》及其核准意见（桂海函〔2017〕26 号）。

(6) Marine Environmental Impact Report on the Tail Water Seaward Discharge Pipeline Project of Beihai Tieshangang District Sewage Treatment Plant and its approval opinion (GHH [2017] No. 26).

1.2 环境功能区划

1_Toc328924299.2 Environmental function zoning

本项目所在区域为工业区，根据《关于同意北海市城市环境功能区划分修编方案的批复》（北政办函〔2012〕93号）和北海市铁山港工业区环境功能区划方案，评价区域空气环境属二类功能区；声环境为3类声环境功能区。项目周边地下水功能为农业用水和分散式生活饮用水，水质类别为III类

The area where the Project is located is an industrial park. According to the Reply on Approving the Revision Plan for Beihai Urban Environment Functional Zoning (BZBH [2012] No. 93) and the Environmental Function Zoning Plan for Beihai Tieshangang Industrial Park, air environment in the assessment area is Class II functional zone, and the acoustic environment is Class III acoustic environment functional zones. Groundwater around the Project is used for agriculture and decentralized domestic drinking water, and the water quality category is Class III.

项目废水经处理后最终经铁山港深海排放管网在B3排污口深海排放，根据《广西近岸海域环境功能区划调整方案》（桂政办发〔2011〕74号），排污口位于铁山港西岸排污区1（GX012DⅣ），属四类海水环境功能区。

After treatment, wastewater from the Project is finally discharged into the deep sea of sewage outlet B3 through the deep-sea discharge pipe network of Tieshan Harbor. According to the Adjustment Plan for Environmental Function Zoning of Guangxi Coastal Waters (GZBF [2011] No. 74), the sewage outlet is located in the Sewage Discharge Zone 1 (GX012D IV) on the west bank of Tieshan Harbor and falls under the Class IV seawater environment functional zone.

项目选址于北海市铁山港，属于广西北部湾经济区，《广西壮族自治区主体功能区

规划》，项目位于国家层面重点开发区域；根据《生态广西省（区）建设规划纲要》，项目位于重点开发区；根据《广西壮族自治区生态功能区划》(桂政办发（2008）8号)，项目不位于重要生态功能区范围；根据《广西海洋生态红线划定方案》，项目不涉及海洋生态禁止类红线和限制类红线区。

The project site is located in Tieshan Harbor, Beihai City, which belongs to Guangxi Beibu Gulf Economic Zone, and according to the Main Functional Area Planning of Guangxi Zhuang Autonomous Region, the Project is located in a key development area at the national level. According to the Outline of Ecological Guangxi Province (District) Construction Plan, the Project is located in key development areas. According to the Ecological Function Zoning of Guangxi Zhuang Autonomous Region (GZBF [2008] No. 8), the Project is not within the scope of important ecological function zones. According to the Regulations on Delineation of Guangxi Marine Ecological Red Line, the Project does not involve prohibited red lines and restricted red lines of marine ecology.

评价区环境功能属性汇总见表 1.2-1。评价海域环境功能区划详见表 1.2-2 和附图 1.2-1~1.2-4。

See Table 1.2-1 for the summary of environmental function attributes of assessment area. See Table 1.2-2 and Figures 1.2-1-1.2-4 for environmental function zoning of the assessed sea area.

表 1.2-1 项目所在地环境功能属性汇总表

Table 1.2-1 Summary of Environmental Function Attributes of the Project Location

序号 S.N.	项目 Item	类别 Category
1	海水环境功能区 Seawater environment functional zone	排污区属四类海水环境功能区 Sewage discharge area e falls under to the Class IV seawater environment functional zone.
2	地下水环境功能区 Groundwater environmental functional zone	III 类地下水功能区 Class III groundwater functional zone
3	环境空气质量功能区 Ambient air quality functional zone	2 类环境空气功能区。 Class II ambient air functional zone
4	声环境功能区 Acoustic environment functional zone	项目用地为 3 类声环境功能区，周边居住区为 2 类声环境功能区 Land used for the Project is Class III acoustic environment functional zone, and the surrounding residential area is Class II acoustic environment functional zone.
5	是否涉及自然保护区 Dose it involve any nature reserves?	陆域不涉及，排污海域涉及广西合浦儒艮国家级自然保护区、广西山口红树林生态自然保护区 No reserves are involved in land area, but the blow-down sea area involves

序号 S.N.	项目 **Item**	类别 **Category**
		the Guangxi Hepu Dugong National Nature Reserve, and Guangxi Shankou Mangrove Ecological Nature Reserve.
6	是否涉及水源保护区 Dose it involve any water source protection areas?	不涉及 No
7	是否涉及基本农田保护区 Dose it involve any basic farmland preservation area ?	不涉及 No
8	是否涉及风景名胜区 Dose it involve any scenic spots?	不涉及 No
9	是否涉及重要生态功能区 Dose it involve any important ecological function zone?	不涉及 No
10	是否重点文物保护单位 Is it the key cultural relic protection unit?	不涉及 No
11	是否水库库区 Is it the reservoir area?	不涉及 No
12	是否有其它重点保护目标 Are there other key protection objectives?	不涉及 No
13	是否污水处理厂集水范围 Is it within catchment area of the municipal sewage treatment plant?	项目办公生活区在生产厂区外另行选址建设，生活污水排入铁山港区污水处理厂。生产废水由项目配套的污水处理厂处理达标后深海排放。 Office and living area of the Project will be sited and constructed separately outside the production plant area, and domestic sewage will be discharged into the Tieshangang District Sewage Treatment Plant. The production wastewater is discharged into deep sea after being treated by the supporting sewage treatment plant of the Project and reaching the standard.

表 1.2-2 评价海域近岸海域环境功能区划
Table 1.2-2 Environmental Function Zoning of Assessed Coastal Sea Area

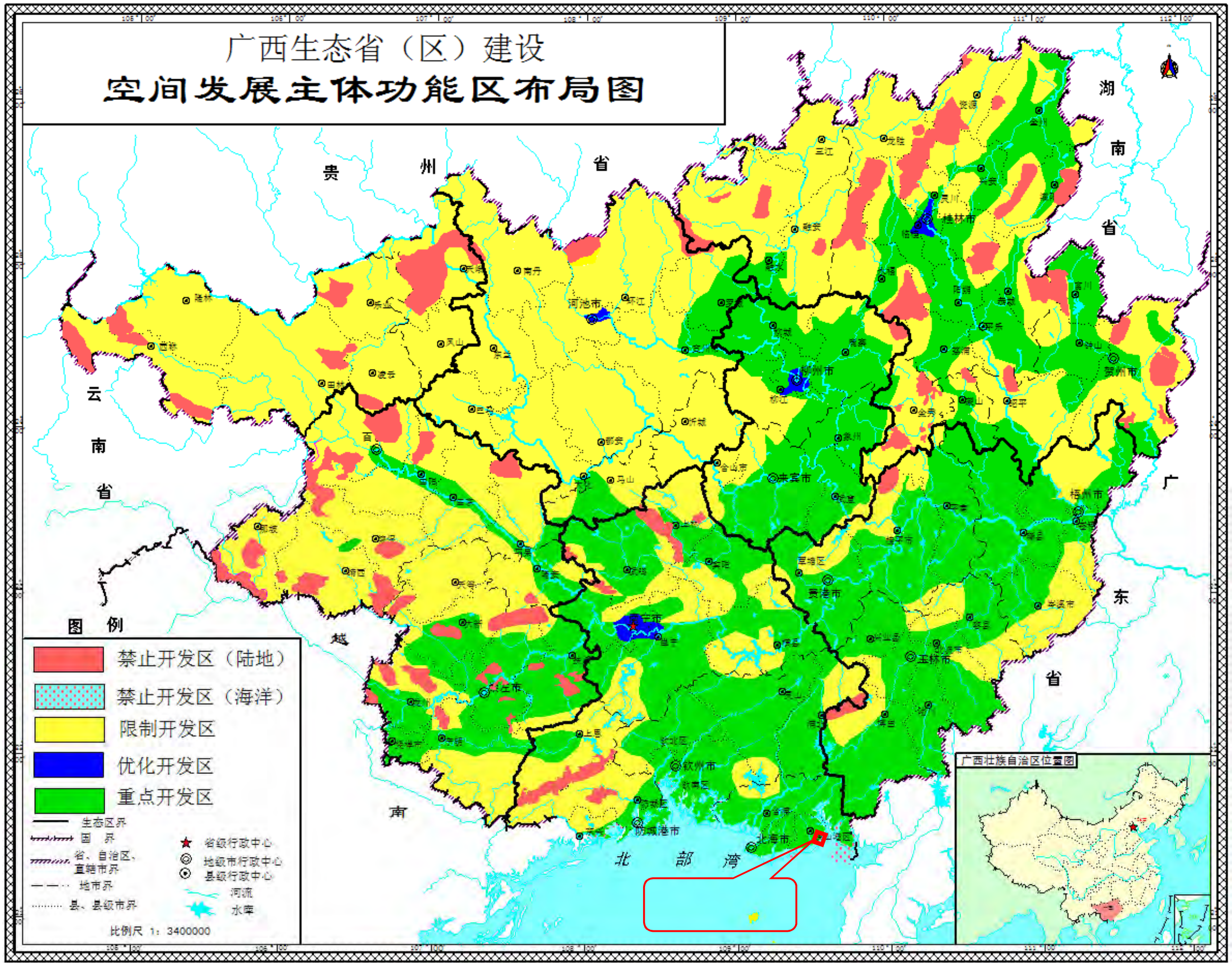
序号 S.N.	环境功能区 Environment functional zone		环境功能区名称 Name of environment functional zone	环境功能区位置 Location of environment functional zone	面积（km^2） Area (km2)	主导使用功能 Dominant function	水质目标类型 Type of water quality goals	备注 Remarks
	代码 Code	类别 Category						
1	GX001AⅠ	一 I	广西合浦儒艮国家级自然保护区 Guangxi Hepu Dugong National Nature Reserve	东起合浦县山口镇英罗港，西至沙田镇，岸线长 43km，位置是 E109°38′30.0″、N21°30′00.0″，E109°46′30.0″、N21°30′00.0″，E109°44′00.0″、N21°18′00.0″，E109°34′30.0″、N21°18′00.0″围成的海域，总面积 350km^2，其中核心区面积 132km^2，缓冲区面积 110km^2，实验区面积 108km^2。 Stretching from Yingluo Port, Shankou Town, Hepu County in the east, to Shatian Town in the west, the Reserve has a shoreline of 43km. The locations are E109°38'30.0", N21°30'00.0", E109°46'30.0", N21°30'00.0", E109°44'00.0", N21°18'00.0", E109°34'30.0" and N21°18'00.0", which forms a sea area with a total area of 350km2, of which the core area is 132km2, the buffer area is 110km2, and the experimental area is 108km2.	350	保护以儒艮和中华白海豚为主的珍稀海洋生物及其栖息环境 Protect the rare marine life and its habitat mainly dugongs and Chinese white dolphins	一 I	
2	GX002AⅠ	一 I	广西山口红树林生态自然保护区 Guangxi Shankou Mangrove Ecological Nature Reserve.	合浦县丹兜海和英罗港湾内，海岸线总长 50km，陆域面积 40km^2，海域面积为 40km^2，核心区位于 E109°43′00.0″、N21°28′00.0″附近海域。 In Dandou Sea and Yingluo Harbor of Hepu County, the total length of coastline is 50km, the land area is 40km 2, and the sea area is 40km 2. The core area is located in the sea area near E109°43"00.0" and N21°28'00.0".	80（陆域 40、海域 40） 80 (40 for land area, 40 for sea area)	保护红树林生态系统 Protect mangrove ecosystems	一 I	

序号 S.N.	环境功能区 Environment functional zone		环境功能区名称 Name of environment functional zone	环境功能区位置 Location of environment functional zone	面积（km^2） Area (km2)	主导使用功能 Dominant function	水质目标类型 Type of water quality goals	备注 Remarks
	代码 Code	类别 Category						
3	GX005BⅡ	二 II	英罗港养殖区 Yingluogang Breeding Area	沙田镇至英罗港海域（除广西山口红树林生态自然保护区、广西合浦儒艮国家级自然保护区、港口区、航道区、工业用海区、排污区外），岸线长约 15km。 Coastline from Shatian Town to Yingluo Port (except Guangxi Shankou Mangrove Ecological Nature Reserve, Guangxi Hepu Dugong National Nature Reserve, port area, waterway area, industrial sea area and sewage discharge area) is about 15km long.	45	方格星虫等海产品养殖用海 Sea area for seafood breeding such as sipunculus nudus	二 II	
4	GX006CⅢ	三 III	榄子根工业用海区 Industrial sea area in Lanzigen	铁山港湾东岸，榄子根村以北至朱屋村岸线，岸线向海 1 km 的海域。 The east coast of Tieshan Bay, the coastline from the north of Lanzigen Village to Zhuwu Village, and the sea area with coastline 1km to the sea.	6	工业建设用海 Sea for industrial construction	三 III	
5	GX008DⅣ	四 IV	沙田港港口区 Port Area of Sahtian Port	沙田镇北面 E109°39′32.0″、N21°31′26.0″起，围绕沙田半岛至E109°39′33.0″、N21°30′51.0″的沙田港规划岸线，长 2km，岸线向海 1km 的海域，周围设 0.5km 水质过渡带。 Panned coastline of Shatian Port surrounding Shatian Peninsula from E109°39'32.0" and N21°31'26.0" at the north of sea area Town to E109°39'33.0" and N21°30'51.0", with a length of 2km. The shoreline is 1km to the sea surrounded by a 0.5km water quality transition zone.	2	港口、工业用海 Port and industrial sea	四 IV	
6	GX009DⅣ	四 IV	铁山港东岸排污区	铁山港航道东侧，位置是 E109°35′10.5″、N21°36′01.2″，E109°36′03.0″、N21°36′09.0″，E109°36′39.1″、N21°34′04.0″，	3	港口、工业、生活排污用海	四 IV	

序号 S.N.	环境功能区 Environment functional zone		环境功能区名称 Name of environment functional zone	环境功能区位置 Location of environment functional zone	面积（km²）Area (km2)	主导使用功能 Dominant function	水质目标类型 Type of water quality goals	备注 Remarks
	代码 Code	类别 Category						
			Tieshangang East Coast Sewage Discharge Area	E109°36′36.2″、N21°33′53.8″围成的海域，面积 3km^2。 It is the sea area surrounded by E109°35'10.5", N21°36'01.2", E109°36'03.0", N21°36'09.0", E109°36'39.1", N21°34'04.0", E109°36'36.2" and N21°33'53.8" on the east side of Tieshan Harbor Channel, with an area of 3km2.		Sea for port, industrial and domestic sewage discharge		
7	GX010DⅣ	四 IV	铁山港东岸港口工业区 Tieshangang East Coast Port Industrial Park	东南面为沙尾村（与广西山口红树林生态自然保护区丹兜海片区岸线距离 2km），西北面至冲美村岸线，岸线长约 9km，岸线向海 1km 的海域，周围设 0.5km 水质过渡带。 In the southeast is Shawei Village (2km away from the coastline of Dandou Sea Area of Guangxi Shankou Mangrove Ecological Nature Reserve), and in the northwest is the coastline of Chongmei Village. The coastline has a length of about 9km and is 1km to the sea, surrounded by a 0.5km water quality transition zone.	9	港口、工业用海 Port and industrial sea	四 IV	
8	GX011DⅣ	四 IV	北海港铁山港作业区 Tieshangang operation area, Beihai Port	铁山港湾西岸，从规划的白沙头港边界向南至玉塘村（E109°28′00″，N21°28′00″）的规划岸线，长约 25km，岸线向海 1km 的海域，周围设 1km 水质过渡带。 It is the sea area located in the planned coastline on the west bank of Tieshan Harbor from the planned boundary of Baishatou Port to Yutang Village (E109°28'00", N21°28'00") at the south. The coastline has a length of about 25km and is 1km to the sea, surrounded by a 1km water quality transition zone.	25	港口、工业用海 Port and industrial sea	四 IV	
9	GX012 DⅣ	四	铁山港西岸排	铁山港湾口，位置为 E109°33′42.0″，N21°29′30.0″；E109°33′42.0″，	15	港口、工业、生活	四	项目排污

序号 S.N.	环境功能区 Environment functional zone		环境功能区名称 Name of environment functional zone	环境功能区位置 Location of environment functional zone	面积（km^2） Area (km2)	主导使用功能 Dominant function	水质目标类型 Type of water quality goals	备注 Remarks
	代码 Code	类别 Category						
		IV	污区 1 Tieshangang west bank pollution discharge area 1	N21°31′15.0″； E109°36′15.0″， N21°31′15.0″； E109°36′15.0″， N21°29′30.0″围成的海域，周围设 1km 水质过渡带 It is sea area located in the bay mouth of Tieshan Harbor and formed by E109°33'42.0", N21°29'30.0"; E109°33'42.0", N21°31'15.0"; E109°36'15.0", N21°31'15.0"; E109°36'15.0", N21°29'30.0", surrounded by a 1km water quality transition zone.		排污用海 Sea for port, industrial and domestic sewage discharge	IV	口所处功能区 Functional zone where the project sewage outlet is located
10	GX013DⅣ	四 IV	铁山港西岸排污区 2 Tieshangang west bank pollution discharge area 2	铁山港湾口，位置是以 E109°33′00.0″、N21°27′00.0″为中心，向东南西北各延伸 1km 的海域，面积 $4km^2$，周围设 1km 水质过渡带。 It is the sea area around E109°33'00.0" and N21°27'00.0" at the mouth of Tieshan Harbor, extending 1km to the southeast and northwest, with an area of 4km 2 and surrounded by 1km water quality transition zone.	4	港口、工业、生活排污用海 Sea for port, industrial and domestic sewage discharge	四 IV	
11	GX014BⅡ	二 II	铁山港水产养殖区 Tieshangang aquaculture area	沙田、白沙、山口、闸口、兴港镇附近海域。 It is the sea areas near Shatian, Baisha, Shankou, Zhakou and Xinggang Towns.		对虾、鱼、蟹等海产品养殖用海 Sea for breeding shrimp, fish, crab and other seafood	二 II	
12	GX015DIII	四	沙田港航道区	沙田镇西南海域，长 6km，宽 0.3km	1.8	船舶通航用海	三	

序号 S.N.	环境功能区 Environment functional zone		环境功能区名称 Name of environment functional zone	环境功能区位置 Location of environment functional zone	面积（km^2） Area (km2)	主导使用功能 Dominant function	水质目标类型 Type of water quality goals	备注 Remarks
	代码 Code	类别 Category						
		IV	Waterway area of Shatian Harbor	It is the sea area at the southwest of Shatian Town, 6km long and 0.3km wide		Sea for ship navigation	III	
13	GX016DIII	四 IV	铁山港航道区 Tieshangang waterway area	铁山港中、南部海域（东西两条航道），东航道长 40km，宽 0.5km；西航道长 5km，宽 0.5km。 It is the sea area in the central and south of Tieshan Harbor (east and west waterways), the east channel is 40km long and 0.5km wide and west waterway is 5km long and 0.5km wide.	22.5	船舶通航用海 Sea for ship navigation	三 III	
14	GX017DIII	四 IV	铁山港 5 万吨级锚地区 50,000t anchorage area in Tieshan Harbor	铁山港湾口，位置是 E109°34′08.0″、N21°22′52.0″，E109°37′08.0″、N21°20′10.0″，E109°36′51.1″、N21°20′10.0″，E109°36′51.0″、N21°22′52.0″围成的海域，周围设 0.2km 水质过渡带。 It is located at the mouth of Tieshan Harbor and a sea area formed by E109°34'08.0", N21°22'52.0", E109°37'08.0", N21°20'10.0", E109°36'51.1", N21°20'10.0", E109°36'51.0" and N21°22'52.0", surrounded by a 0.2km water quality transition zone.	10	船舶停泊、引航、检疫用海 Sea for ship berthing, pilotage and quarantine	三 III	
15	GX024BII	二 II	营盘海水养殖区 Yingpan Marine Culture Area	从营盘渔港西侧至西村港东岸-5m 等深线以内的海域。 It is the sea area from the west side of Yingpan Fishing Port to the -5m isobath of the east bank of Xicun Port.	105	珍珠等海产品养殖用海 Sea for the cultivation of pearls and other seafood	二 II	
16	GX025BII	二 II	营盘海产品增殖区 Yingpan Seafood proliferation area	从营盘渔港西侧至西村港东岸-5m 至-10m 等深线的海域 Sea area from the west of Yingpan Fishing Port to the isobath of-5m to-10m on east bank of Xicun Port	600	海产品增殖、海洋渔业用海 Sea for seafood multiplication and marine fisheries	二 II	


广西生态省（区）建设
空间发展主体功能区布局图
贵
州
省
湖
南
省
云
南
省
广
东
省
越
南
北
部
湾
图 例
禁止开发区（陆地）
禁止开发区（海洋）
限制开发区
优化开发区
重点开发区
生态区界
国 界
省、自治区、直辖市界
地市界
县、县级市界
省级行政中心
地级市行政中心
县级行政中心
河流
水库
比例尺 1：3400000
广西壮族自治区位置图

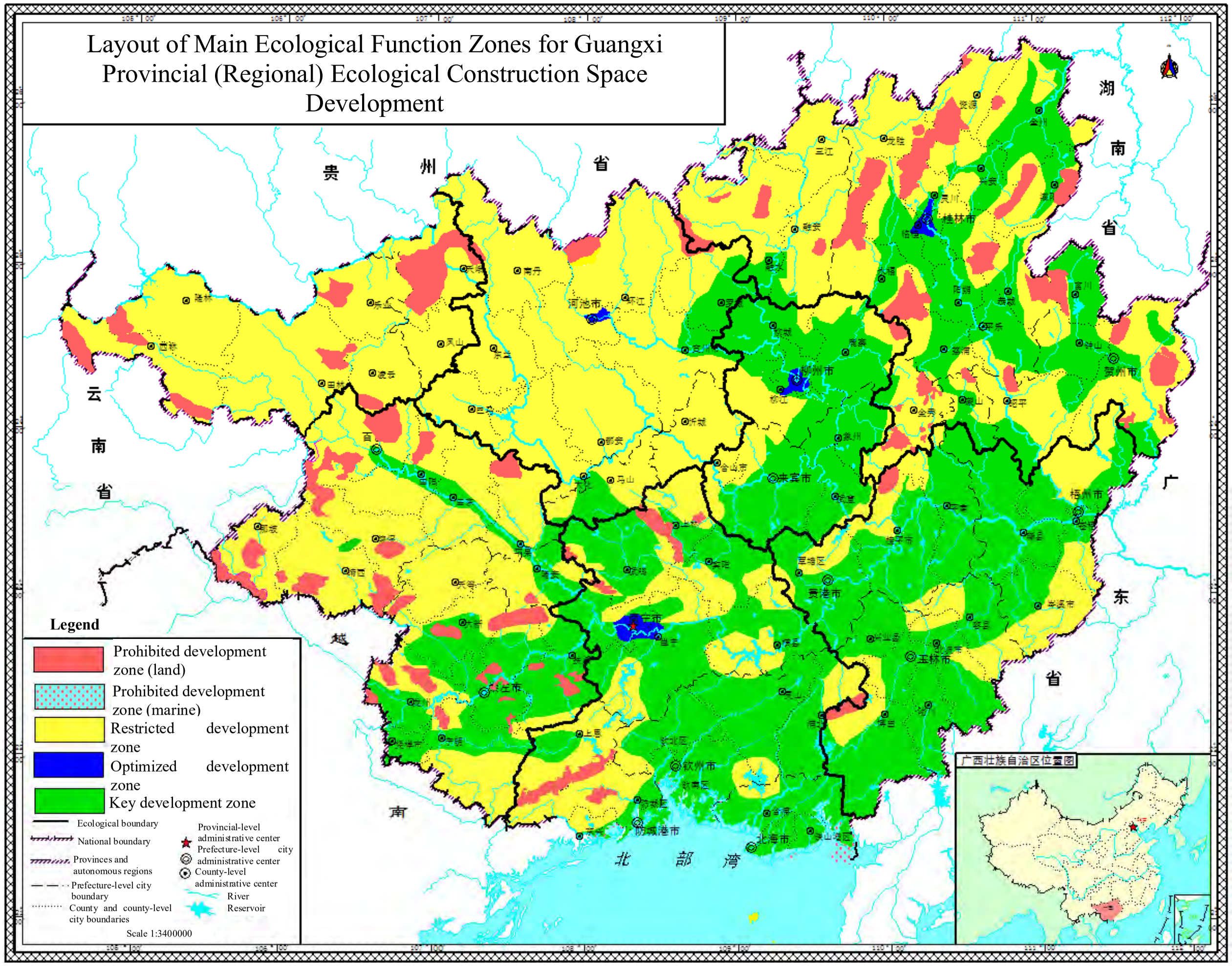
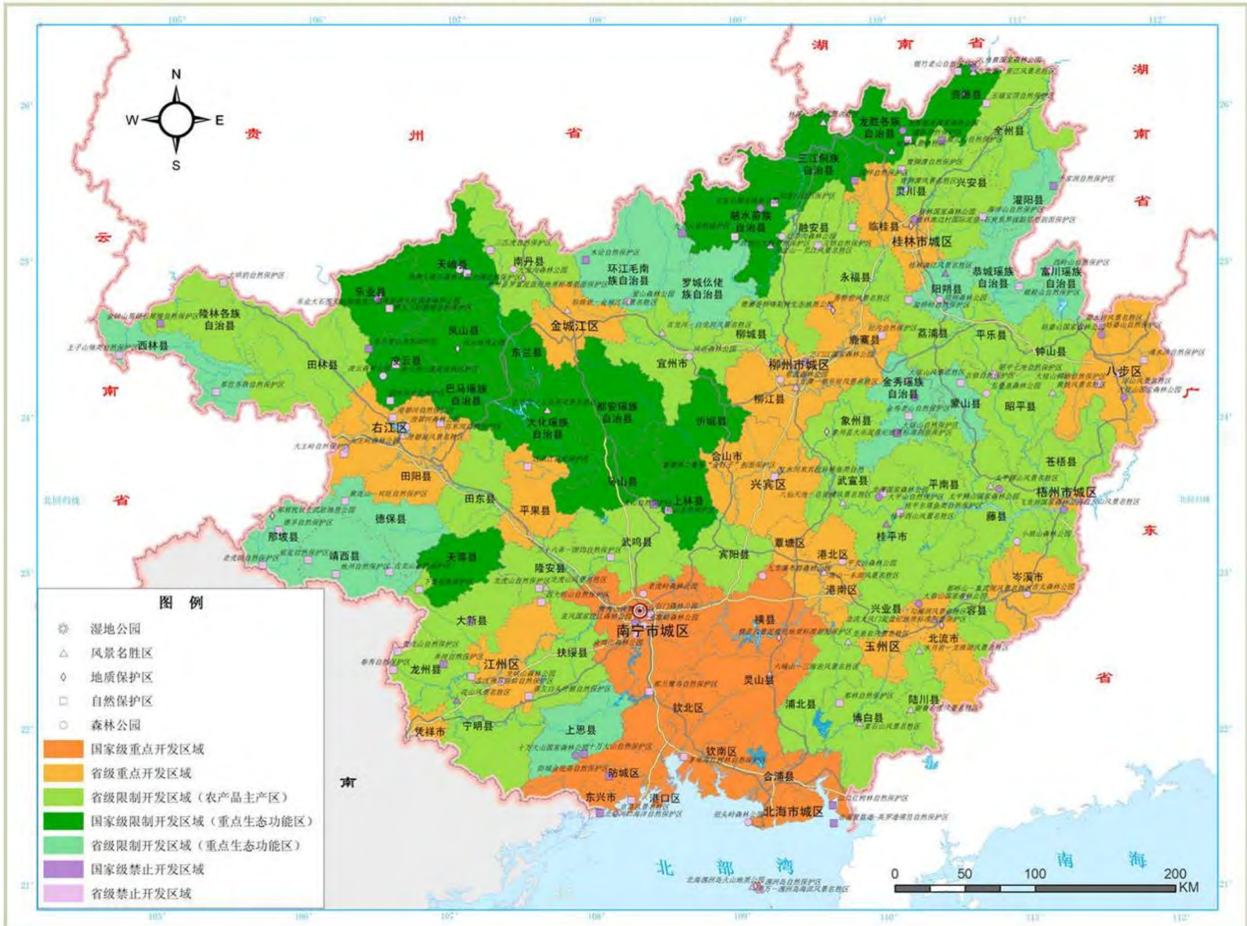


图 1.2-1 项目在广西生态区建设空间发展主体功能区布局中的位置示意

Figure 1.2-1 Diagram for the Project Positioning in the Layout of Main Functional Zones of Guangxi Ecotope Construction Space Development

广西壮族自治区主体功能区划分总图



General layout of Main Functional Zones of Guangxi Zhuang Autonomous Region

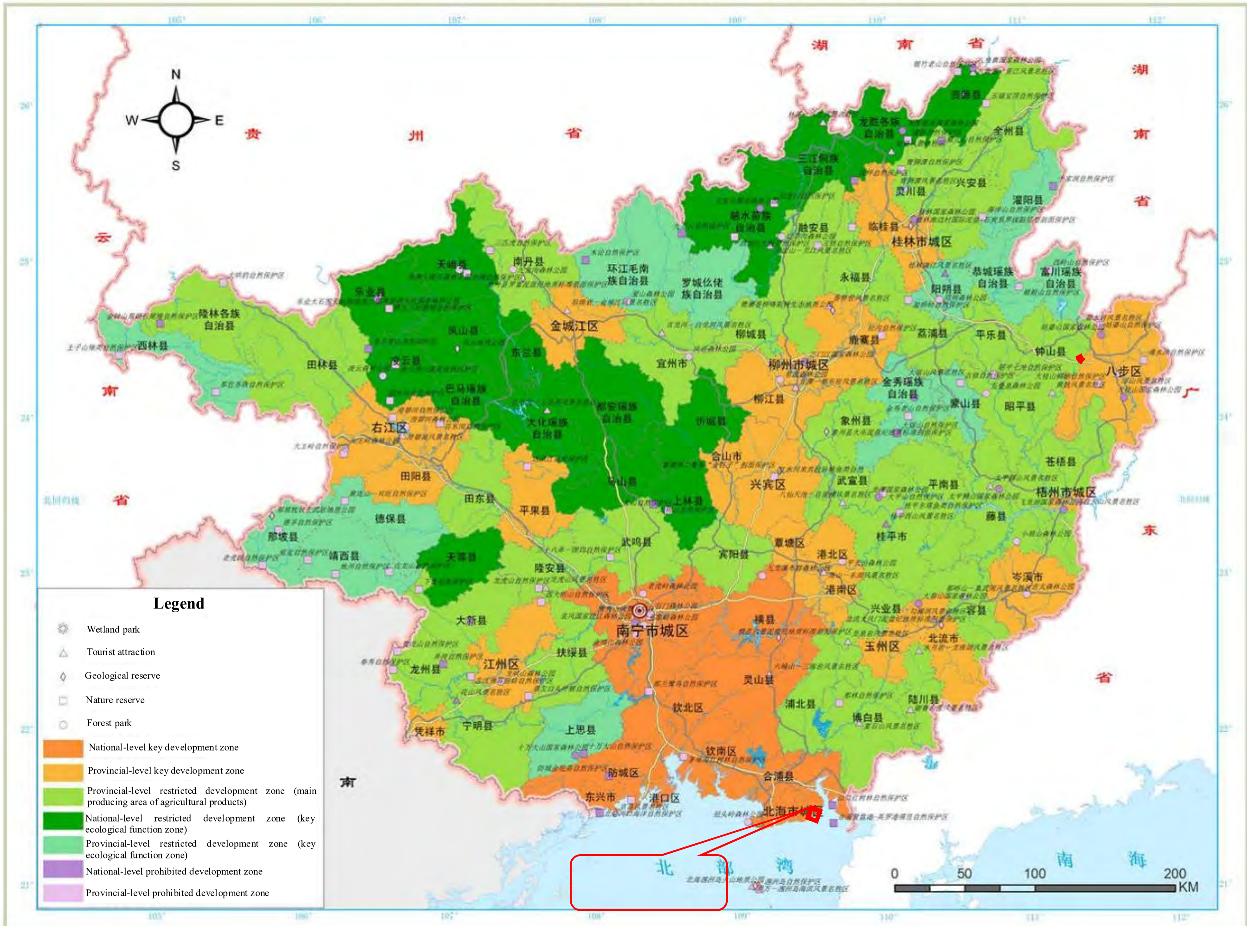
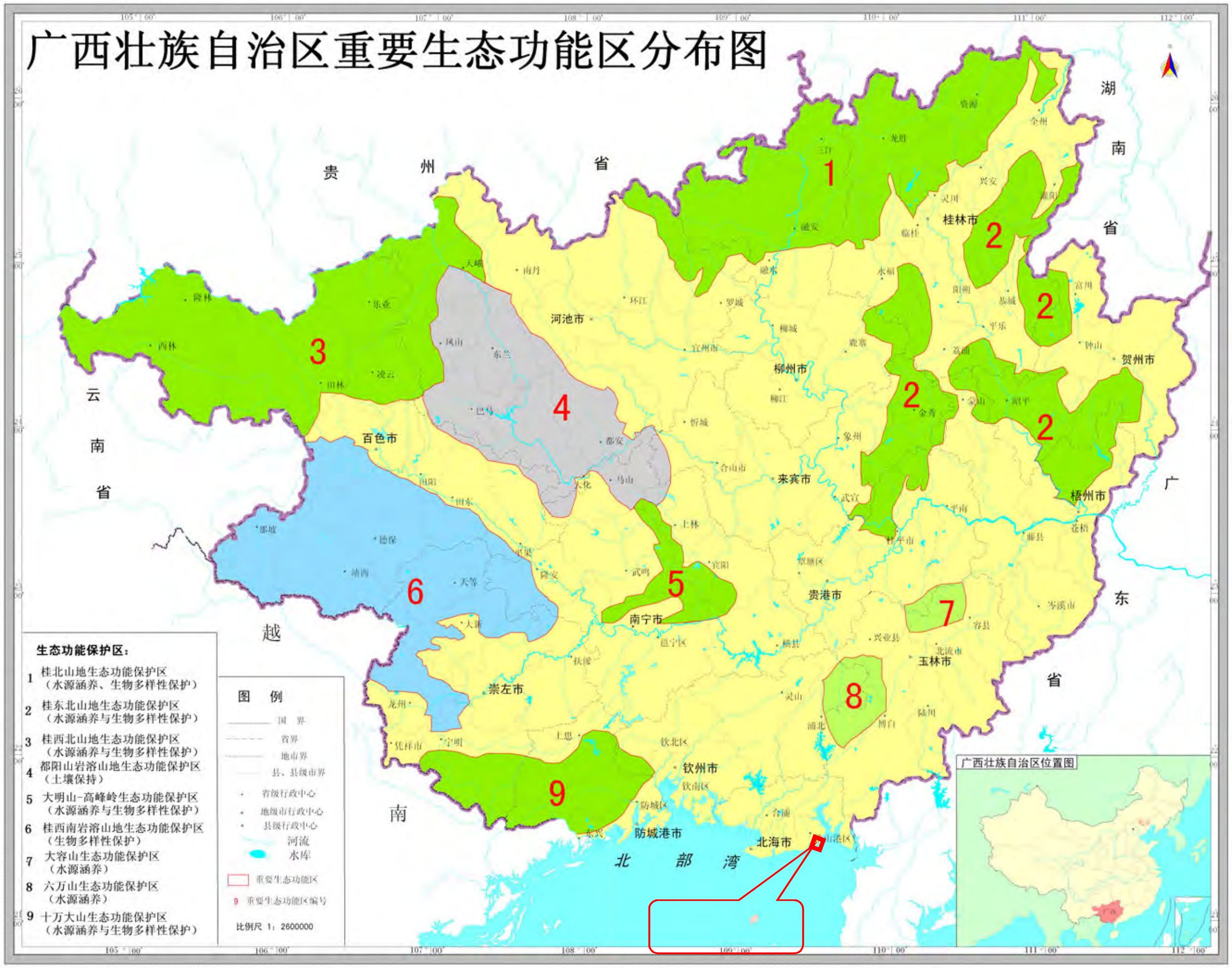


图 1.2-2 项目在广西壮族自治区主体功能区划中的位置示意

Figure 1.2-2 Diagram for the Project Positioning in the Division of Main Function Zones of Guangxi Zhuang Autonomous Region



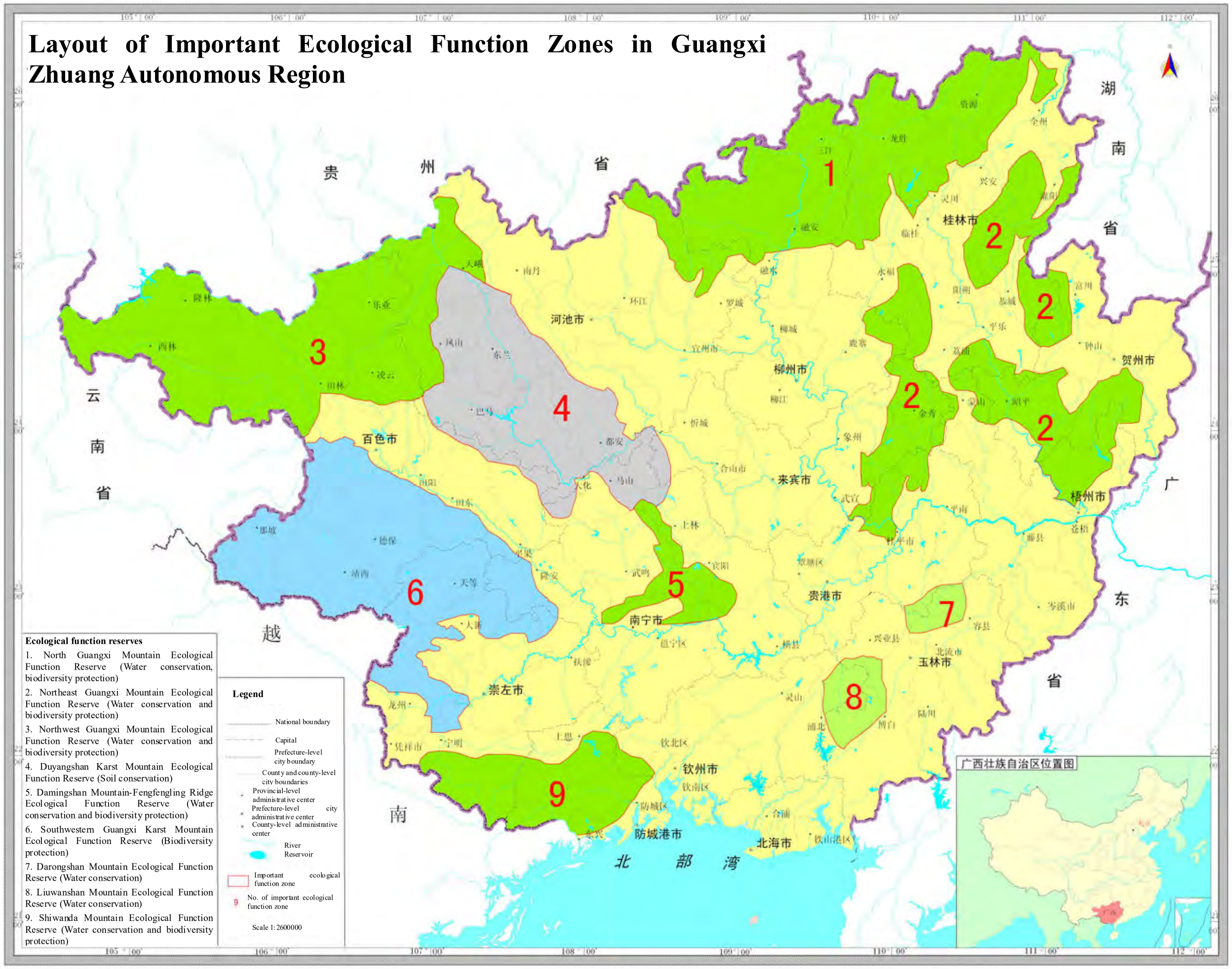
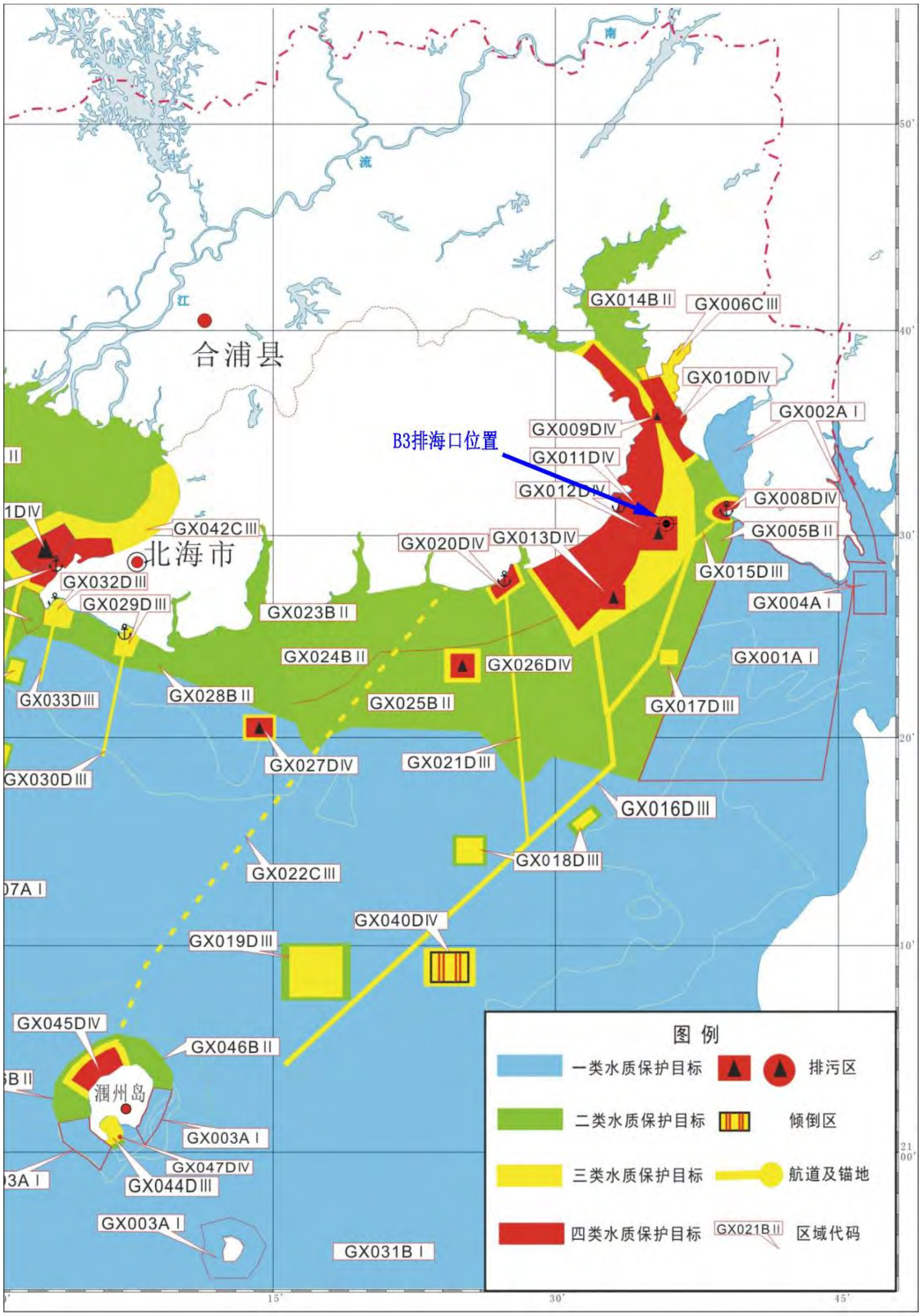


图 1.2-3 项目在广西壮族自治区重要生态功能区中的位置示意

Figure 1.2-3 Diagram for the Project Positioning in the Important Ecological Function Zones of Guangxi Zhuang Autonomous Region


合浦县
北海市
涠州岛
B3排海口位置
GX014BⅡ
GX006CⅢ
GX010DⅣ
GX002AⅠ
GX009DⅣ
GX011DⅣ
GX012DⅣ
GX008DⅣ
GX005BⅡ
GX020DⅣ
GX013DⅣ
GX015DⅢ
GX004AⅠ
GX042CⅢ
GX032DⅢ
GX029DⅢ
GX023BⅡ
GX024BⅡ
GX026DⅣ
GX001AⅠ
GX033DⅢ
GX028BⅡ
GX025BⅡ
GX017DⅢ
GX027DⅣ
GX021DⅢ
GX030DⅢ
GX016DⅢ
GX018DⅢ
GX022CⅢ
GX040DⅣ
GX019DⅢ
GX045DⅣ
GX046BⅡ
GX003AⅠ
GX047DⅣ
GX044DⅢ
GX031BⅠ
图 例
一类水质保护目标
排污区
二类水质保护目标
倾倒区
三类水质保护目标
航道及锚地
四类水质保护目标
GX021BⅡ
区域代码

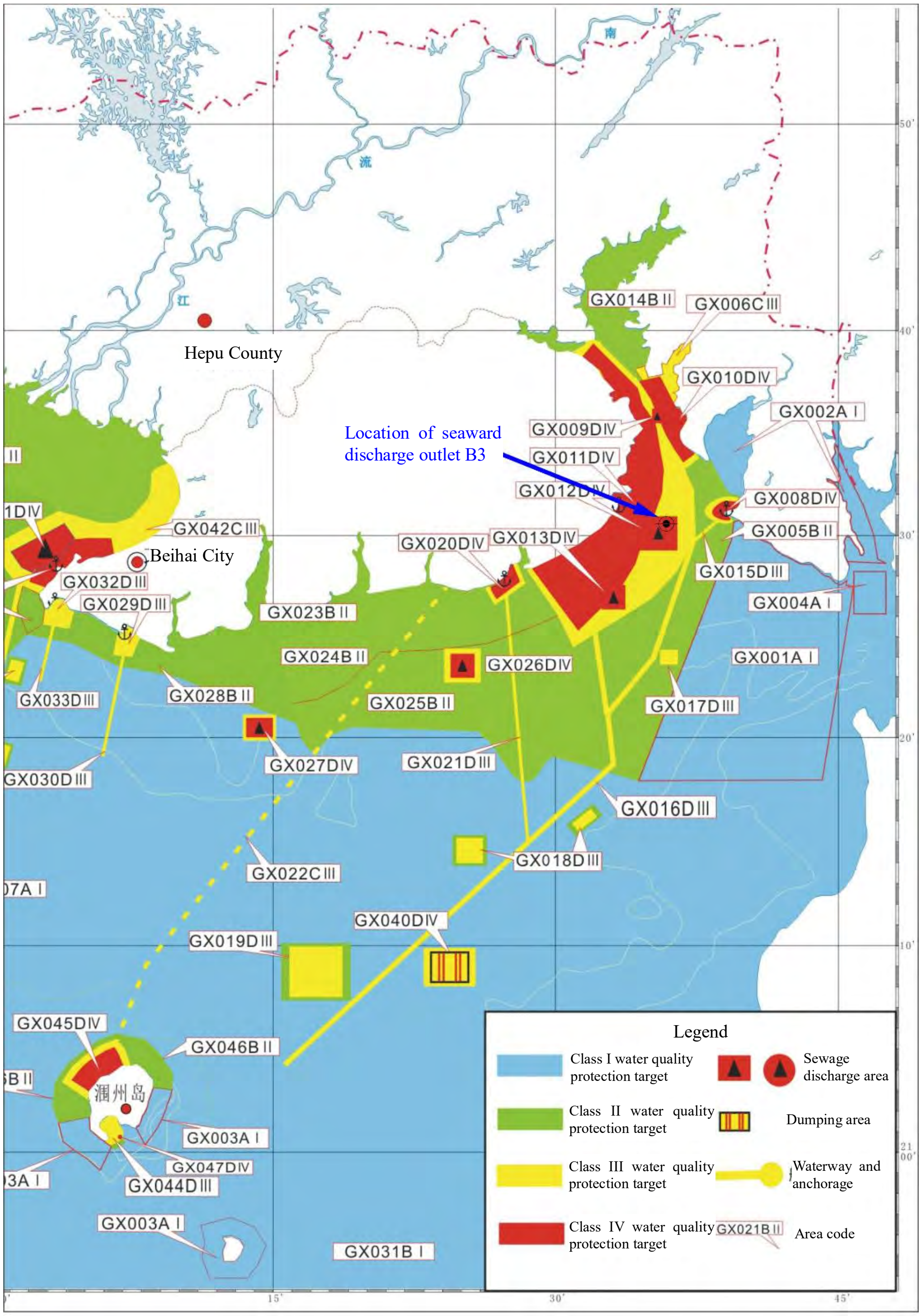


图 1.2-4 项目排污口与广西近岸海域环境功能区划位置关系示意图

Figure 1.2-4 Diagram for the Relationship between the Project Sewage Outlet and the Environmental Function Zoning in the Sea Area of Guangxi

1.3 评价因子与评价标准

1.3 Assessment factors and assessment standards

1.3.1 环境影响识别

1.3.1 Environmental impact identification

根据本项目的工程特征及拟建地区的环境特征，对本项目建设可能产生的环境问题进行了筛选识别，结果列于表 1.3-1。

According to the engineering characteristics of the Project and the environmental characteristics of the proposed construction area, possible environmental problems caused by the construction of the Project are screened and identified, with results listed in Table 1.3-1.

表1.3-1 环境影响识别结果

Table 1.3-1 Results of Environmental Impact Identification

序号 S.N.	阶段 Stage	开发行为 Development	对环境影响 Environmental impact	影响程度 Impact degree									
				有利 Positive	不利 Negative	长期 Long-term	短期 Short-term	可逆 Reversible	不可逆 Irreversible	直接 Direct	间接 Indirect	累积 Cumulative	非累积 Non-cumulative
1	设计阶段 Design stage	行业选择 Industry selection	产业规划及政策 Industrial planning and policy	√		√							
2		项目选址 Project siting	土地利用 Land use	√		√							
3	施工阶段 Construction stage	各种施工活动 Construction activities	声环境 Acoustic environment		√		√			√			√
4			环境空气 Ambient air		√		√		√	√			√
5			施工废物 Construction waste		√		√		√		√		√
6	运营阶段 Operation stage	废气排放 Waste gas emission	环境空气、生态环境 Ambient air, ecological environment		√	√			√	√		√	
7		废水排放 Wastewater	受纳海域 Receiving sea		√	√			√	√		√	

序号 S.N.	阶段 Stage	开发行为 Development	对环境影响 Environmental impact	影响程度 Impact degree									
				有利 Positive	不利 Negative	长期 Long-term	短期 Short-term	可逆 Reversible	不可逆 Irreversible	直接 Direct	间接 Indirect	累积 Cumulative	非累积 Non-cumulative
		discharge	area										
8		生产过程，废水收集、处理，固废暂存及原料储存 Production process, wastewater collection and treatment, temporary storage of solid waste and raw material storage	地下水环境 Groundwater environment		√	√			√		√	√	
9		固体废物 Solid waste	贮存和处置的二次污染 Secondary pollution by storage and disposal		√	√			√		√		√
10		噪声 Noise	厂界声环境质量 Acoustic environment quality at plant boundary		√	√			√	√			√
11		环境风险 Environmental risk	危化品、碱等污染土壤和地下水 Hazardous chemicals, alkali and others that contaminate soil and groundwater		√	√			√		√		√
12		各类污染物排放总量 Total emissions of the pollutants	区域总量控制要求 Regional total quantity control requirements	√		√					√		√
13		建设意义 Construction significance	社会、经济、环境协调统一 Social, economic and environmental	√		√			√		√		

序号 S.N.	阶段 Stage	开发行为 Development	对环境影响 Environmental impact	影响程度 Impact degree									
				有利 Positive	不利 Negative	长期 Long-term	短期 Short-term	可逆 Reversible	不可逆 Irreversible	直接 Direct	间接 Indirect	累积 Cumulative	非累积 Non-cumulative
			coordination and unification										
14		环境管理与监测 Environmental management and monitoring	地区环境管理及环境质量监控 Regional environmental management and environmental quality monitoring	√		√			√		√		

1.3.2 评价因子筛选

1.3.2 Screening of assessment factors

根据项目产排污特点、环境状况特征和环境影响识别，项目评价因子筛选结果见表1.3-2。

According to the characteristics of project pollutant production and discharge, environmental conditions and environmental impact identification, the screening results of project assessment factors are shown in Table 1.3-2.

表1.3-2　　项目主要评价因子一览表

Table 1.3-2 List of Main Assessment Factors of the Project

工程阶段 Stage of project	环境要素 Environmental elements	现状评价因子 Status assessment factor	影响预测因子 Impact prediction factor
施工期 Construction period	大气环境 Atmospheric environment	TSP	/
	水环境 Water environment	COD、SS COD and SS	/
	声环境 Acoustic environment	等效连续 A 声级 Equivalent continuous A sound level	/
	生态环境 Ecological	水土流失 Water and soil loss	/

工程阶段 **Stage of project**	环境要素 **Environmental elements**	现状评价因子 **Status assessment factor**	影响预测因子 **Impact prediction factor**
	environmental		
营运期 Operation period	大气环境 Atmospheric environment	PM_{10}、$PM_{2.5}$、TSP、SO_2、NOx、氨、硫化氢、氯气、氯化氢、臭气浓度、非甲烷总烃、Cr^{6+}、Pb、As、Hg、Cd、二噁英 PM_{10}, $PM_{2.5}$, TSP, SO_2, NOx, ammonia, hydrogen sulfide, chlorine, hydrogen chloride, odor concentration, non-methane hydrocarbon, Cr6 +, Pb, As, Hg, Cd, dioxin	SO_2、NO_2、PM_{10}、$PM_{2.5}$、HCl、H_2S、NH_3、As、Hg、Cd、TSP SO_2, NO_2, PM_{10}, $PM_{2.5}$, HCl, H_2S, NH_3, As, Hg, Cd, TSP
	海水水质 Seawater quality	水温、盐度、pH、悬浮物、溶解氧、COD_{Mn}、无机氮（硝酸盐氮、亚硝酸盐氮、氨氮）、重金属（As、Hg、Cu、Pb、Zn、Cd、Cr）活性磷酸盐、石油类、色度、总磷、总氮、BOD_5 Water temperature, salinity, pH, suspended solids, dissolved oxygen, CODMn, inorganic nitrogen (nitrate nitrogen, nitrite nitrogen, NH3-N), heavy metal (As, Hg, Cu, Pb, Zn, Cd, Cr) reactive phosphate, petroleum, chromaticity, total phosphorus, total nitrogen, BOD_5	COD_{Mn}、无机氮、活性磷酸盐、SS、AOX COD_{Mn}, inorganic nitrogen, reactive phosphate, SS, AOX
	海洋沉积物 Marine sediment	有机碳、硫化物、铜、铅、镉、锌、砷、油类、汞 Organic carbon, sulfide, Cu, Pb, Cd Zn, As, oils, Hg	/
	海洋生物 Marine life	浮游生物、大型底栖生物、潮间带生物、鱼卵仔鱼、渔业资源、海洋生物质量 Plankton, macrobenthos, intertidal benthos, fish roes and prelarva, fishery resources, marine life quality	海洋生物 Marine life
	地下水环境 Groundwater environment	pH 值、色度、总硬度、耗氧量（COD_{Mn}）、溶解性总固体、硫化物、氨氮、氯化物、硫酸盐、挥发性酚类、阴离子合成洗涤剂、硝酸盐、亚硝酸盐、K^++Na^+、Ca^{2+}、Mg^{2+}、CO_3^{2-}、HCO_3^- PH value, chromaticity, total hardness, oxygen consumption (CODMn), total dissolved solids, sulfide, NH3-N, chloride, sulfate, volatile phenols, anion synthetic detergent, nitrate, nitrite, K++Na+, Ca2+, Mg2+, CO32-, HCO3-	耗氧量、氨氮 Oxygen consumption, NH3-N
	声环境 Acoustic environment	等效连续 A 声级 Equivalent continuous A sound level	等效连续 A 声级 Equivalent continuous A sound level
	土壤环境 Soil environment	pH 值、砷、镉、铜、铅、锌、汞、镍、二噁英、铬（六价）、四氯化碳、氯仿、氯甲烷、1,1-二氯乙烷、1,2-二氯乙烷、1,1-二氯乙烯、顺-1,2-二氯乙烯、反-1,2-二氯乙烯、二氯甲烷、1,2-二氯丙烷、1,1,1,2-四氯乙烷、1,1,2,2-四氯乙烷、四氯乙烯、1,1,1-三氯乙烷、1,1,2-三氯乙烷、三氯乙烯、1,2,3-三氯丙烷、氯乙烯、苯、氯苯、1,2-二氯苯、1,4-二氯苯、乙苯、苯乙烯、甲苯、间二甲苯+对二甲苯、硝基苯、苯胺、2-氯酚、苯并[a]蒽、苯并[a]芘、苯并[b]荧蒽、苯并[k]荧蒽、䓛、二苯并[a,h]蒽、茚并[1,2,3-cd]芘、萘、氰化物	铅、汞、砷、二噁英 Lead, mercury, arsenic, dioxin

工程阶段 **Stage of project**	环境要素 **Environmental elements**	现状评价因子 **Status assessment factor**	影响预测因子 **Impact prediction factor**
		pH, arsenic, cadmium, copper, lead, nickel, mercury, dioxin, hexavalent chromium, carbon tetrachloride, chloroform, chloromethane, 1,1-dichloroethane, 1,2-dichloroethane, 1,1-dichloroethylene, cis-1,2-dichloroethylene, trans-1,2-dichloroethylene, dichloromethane, 1,2-dichloroethane, 1,1,1,2-tetrachloroethane, 1,1,2,2-tetrachloroethane, tetrachloroethylene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloroethylene, 1,2,3-trichloropropane, vinyl chloride, benzene, chlorobenzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, ethylbenzene, styrene, toluene, MX+PX, o-xylene, nitrobenzene, aniline, 2-chlorophenol, benzo [a] anthracene, benzo [a] pyrene, benzo [b] fluoranthene, benzo [k] fluoranthene, dibenzo [a,h] anthracene, indo [1,2,3-cd] pyrene, naphthalene, petroleum hydrocarbon, etc.	
	生态环境 Ecological environmental	动植物、水土流失 Loss of animals, plants, water and soil	/

1.3.3 评价标准

1.3.3 Assessment standard

1.3.3.1 环境质量标准

1.3.3.1 Environmental quality standards

（1）环境空气质量标准

(1) Ambient air quality standard

项目选址所在区域为环境空气质量二类功能区，SO_2、NO_2、TSP、PM_{10}、$PM_{2.5}$、CO、O_3、Pb（年均值）、Cd（年均值）、Hg（年均值）、As（年均值）、六价铬（年均值）执行《环境空气质量标准》（GB3095-2012）二级标准，硫化氢、氨、氯化氢、氯执行参照《环境影响评价技术导则 大气环境》（HJ 2.2-2018）附录 D 其他污染物空气质量浓度参考限值；Pb（日均值）、Hg（日均值）、As（日均值）、六价铬（一次值）参照执行《工业企业设计卫生标准》（TJ36-79）居民区有害物质最高允许浓度要求；非甲烷总烃参照执行《大气污染物综合排放标准详解》推荐值；二噁英按环发〔2008〕82 号文要求参照执行日本标准。臭气浓度留作背景，不做评价。具体取值见表 1.3-3。

For area where the Project is located, the ambient air quality falls under Class II functional zones. SO_2, NO_2, TSP, PM10, $PM_{2.5}$, CO, O_3, Pb (annual average), Cd (annual average), Hg (annual average), As (annual average) and CrVl (annual average) shall be subject to the Class II standard as stipulated in Ambient Air Quality Standards (GB3095-2012). H2S, NH3, HCl and Cl shall be subject to the air quality concentration reference limits of other pollutants in Appendix D of Technical Guidelines for Environmental Impact Assessment - Atmospheric Environment (HJ 2.2-2018). Pb (daily average), Hg (daily average), As (daily average) and CrVl (primary value) shall be subject to the maximum allowable concentration of harmful substances in residential areas as stipulated in the Hygienic Standards for the Design of Industrial Enterprises (TJ36-79). Non-methane hydrocarbon shall be subject to the recommended values of as stipulated in the Notes to Integrated Emission Standard of Air Pollutants. Dioxin is subject to Japanese standards as required in the Circular [2008] No. 82. Stink concentration is taken as a background and not assessment herein. Refer to Table 1.3-3.

表 1.3-3 环境空气质量执行标准一览表（摘录）

Table 1.3-3 Executive Standards of Ambient Air Quality (Excerpts)

污染物 **Pollutant**	取值时间 **Selecting time**	浓度限值 **Concentration limit**		
		单位 **Unit**	数值 **Value**	来源 **Source**
二氧化硫 Sulfur dioxide （SO_2） (SO_2)	年平均 Annual average	μg/m^3	60	《环境空气质量标准》 （GB3095-2012）二级标准 Class II standard in Ambient Air Quality Standard (GB3095-2012);
	24 小时平均 24h average		150	
	1 小时平均 1 hour average		500	
二氧化氮 Nitrogen dioxide （NO_2） (NO_2)	年平均 Annual average	μg/m^3	40	
	24 小时平均 24 hour average		80	
	1 小时平均 1 hour average	μg/m^3	200	
颗料物（PM_{10}） Particulate matter (PM_{10})	年平均 Annual average	μg/m^3	70	
	24 小时平均 24 hour average	μg/m^3	150	
颗料物（$PM_{2.5}$） Particulate matter ($PM_{2.5}$)	年平均 Annual average	μg/m^3	35	

污染物 Pollutant	取值时间 Selecting time	浓度限值 Concentration limit		
		单位 Unit	数值 Value	来源 Source
	24 小时平均 24 hour average	μg/m³	75	
总悬浮颗粒物（TSP） Total suspended particulates (TSP)	年平均 Annual average	μg/m³	200	
	24 小时平均 24 hour average	μg/m³	300	
CO	24 小时平均 24 hour average	mg/m³	4	
	1 小时平均 1 hour average	mg/m³	10	
铅 Lead	年平均 Annual average	μg/m³	0.5	
氟化物（F） Fluoride (F)	24 小时平均 24 hour average	μg/m³	7	
	1 小时平均 1 hour average	μg/m³	20	
镉（Cd） Cadmium (Cd)	年平均 Annual average	μg/m³	0.005	
汞（Hg） Mercury (Hg)	年平均 Annual average	μg/m³	0.05	
砷（As） Arsenic (As)	年平均 Annual average	μg/m³	0.006	
氯化氢 Hydrogen chloride	1 小时平均 1 hour average	mg/m³	0.05	《环境影响评价技术导则 大气环境》（HJ 2.2-2018）附录 D 其他污染物空气质量浓度参考限值 Air quality concentration reference limits of other pollutants in Appendix D of Technical Guidelines for Environmental Impact Assessment - Atmospheric Environment (HJ 2.2-2018).
	日平均 Daily average	mg/m³	0.015	
氯 Chlorine	1 小时平均 1 hour average	mg/m³	0.1	
	日平均 Average daily	mg/m³	0.03	
硫化氢 Hydrogen sulfide	1 小时平均 1 hour average	mg/m³	0.01	
氨 Ammonia	1 小时平均 1 hour average	mg/m³	0.20	
非甲烷总烃 Non-methane hydrocarbon	一次 Primary value	mg/m³	2	参照《大气污染物综合排放标准详解》推荐值 Refer to the recommended values of as stipulated in the Notes to Integrated Emission Standard of Air Pollutants.
汞	日平均	mg/m³	0.0003	《工业企业设计卫生标准》

污染物 **Pollutant**	取值时间 **Selecting time**	浓度限值 **Concentration limit**		
		单位 **Unit**	数值 **Value**	来源 **Source**
Mercury	Average daily			（TJ36-79） Sanitary Standards of Industry Enterprise Design (TJ36-79)
铅 Lead	日平均 Average daily	mg/m^3	0.0007	
砷 Arsenic	日平均 Average daily	mg/m^3	0.003	
铬（六价） Hexavalent chromium	一次 Primary value	mg/m^3	0.0015	
二噁英 Dioxin	年平均 Annual average	TEQpg/m^3	0.6	参照日本标准 Refer to Japanese standards

（2）海洋环境质量标准

(2) Marine environment quality standards

项目评价海域海水水质按所属水环境功能区执行相应的《海水水质标准》（GB3097-1997），具体标准限值见表 1.3-4。

Seawater quality of the sea area assessed in the Project shall be subject to the corresponding Seawater Quality Standard (GB3097-1997) according to the water environment functional zone to which it belongs. See Table 1.3-4 for specific standard limits.

表 1.3-4 《海水水质标准》（摘录）
Table 1.3-4 Seawater Quality Standard (Excerpts)

单位：mg/L（pH 值及标注者除外）
Unit: mg/L (except pH value and items labeled)

序号 **S.N.**	项目 **Item**	评价标准 **Assessment standard**			
		第一类 **Class I**	第二类 **Class II**	第三类 **Class III**	第四类 **Class IV**
1	pH 值 pH value	7.8～8.5 7.8~8.5 同时不超出该海域正常变动范围 0.2 pH 单位 Additionally, it shall not exceed the normal fluctuation range of the sea area by 0.2 pH		6.8～8.8 6.8~8.8 同时不超出该海域正常变动范围 0.5 pH 单位 Additionally, it shall not exceed the normal fluctuation range of the sea area by 0.5 pH	
2	悬浮物 Suspended matter	人为增加的量≤10 Man-made increment ≤10		人为增加的量≤100 Man-made increment ≤100	人为增加的量≤150 Man-made increment ≤150
3	溶解氧 Dissolved oxygen	>6	>5	>4	>3
4	化学需氧量 Chemical oxygen demand	≤2	≤3	≤4	≤5
5	无机氮（以 N 计） Inorganic nitrogen (expressed as N)	≤0.20	≤0.30	≤0.40	≤0.50
6	活性磷酸盐（以 p 计）	≤0.015	≤0.030	≤0.030	≤0.045

序号 S.N.	项目 Item	评价标准 Assessment standard			
		第一类 Class I	第二类 Class II	第三类 Class III	第四类 Class IV
	Reactive phosphate (expressed as P)				
7	非离子氨（以 N 计） Non-ionic ammonia (expressed as N)	≤0.020	≤0.020	≤0.020	≤0.020
8	石油类 Petroleum	≤0.05	≤0.05	≤0.30	≤0.50
9	挥发性酚 Volatile phenol	≤0.005	≤0.005	≤0.010	≤0.050
10	硫化物（以 S 计） Sulfide (expressed as S)	≤0.02	≤0.05	≤0.10	≤0.25
11	BOD_5	≤1	≤3	≤4	≤5
12	汞 Mercury	≤0.00005	≤0.0002	≤0.0002	≤0.0005
13	铅 Lead	≤0.001	≤0.005	≤0.010	≤0.050
14	镉 Cadmium	≤0.001	≤0.005	≤0.010	≤0.010
15	砷 Arsenic	≤0.020	≤0.030	≤0.050	≤0.050
16	六价铬 Hexavalent chromium	≤0.005	≤0.010	≤0.020	≤0.050
17	镍 Nickel	≤0.005	≤0.010	≤0.020	≤0.050
18	铜 Copper	≤0.005	≤0.01	≤0.05	≤0.05
19	锌 Zinc	≤0.02	≤0.05	≤0.1	≤0.5

（3）地下水环境质量标准

(3) Groundwater environmental quality standards

项目区域地下水执行《地下水质量标准》（GB14848-2017）III类标准，具体标准限值见表 1.3-5。

Groundwater in the project area shall be subject to Class III standard as stipulated in Standard for Groundwater Quality (Groundwater Quality). See Table 1.3-5 for specific standard limits.

表1.3-5 《地下水质量标准》（摘录）

Table 1.3-5 Groundwater Quality Standard (Excerpts)

（pH值单位无量纲；其余指标单位为mg/L）

pH is dimensionless; all other units are mg/L

序号 S.N.	项目 Item	III类标准 Class III standard
1	pH值 pH value	6.5～8.5

序号 **S.N.**	项目 **Item**	Ⅲ类标准 **Class III standard**
2	色度 Chromaticity	≤15
3	耗氧量（COD_{Mn}法，以O_2计） Oxygen consumption (CODMn method, expressed as O_2)	≤3.0
4	硝酸盐（以N计） Nitrate (expressed as N)	≤20
5	亚硝酸盐（以N计） Nitrite (expressed as N)	≤1.0
6	氨氮（以N计） NH3-N (expressed as N)	≤0.5
7	总硬度（以$CaCO_3$计） Total hardness (expressed as $CaCO_3$)	≤450
8	硫酸盐 Sulfate	≤250
9	氯化物 Chloride	≤250
10	硫化物 Sulfide	≤0.02
11	硫酸盐 Sulfate	≤250
12	挥发性酚类 Volatile phenols	≤0.002
13	阴离子表面活性剂 Anionic surfactant	≤0.3

（4）声环境质量标准

(4) Acoustic environment quality standards

项目厂界声环境执行《声环境质量标准》（GB3096-2008）中 3 类标准，临交通干线一侧执行 4a类标准，周边居民点执行 2 类标准，具体见表 1.3-6。

Acoustic environment at the factory boundary of the Project shall be subject to Class III standard as stipulated in the Environmental Quality Standard for Noise (GB3096-2008), acoustic environment on the side adjacent to the traffic trunk line shall be subject to Class 4a standard, and acoustic environment in surrounding residential areas shall be subject to Class II standards, as shown in Table 1.3-6.

表1.3-6 《声环境质量标准》（摘录）

Table 1.3-6 Acoustic Environmental Quality Standard (Excerpts)

Leq：dB(A)

Leq: dB(A)

声环境功能区类别 **Category of acoustic environment functional zones**	昼间 **Daytime**	夜间 **Nighttime**
3类 Category 3	65	55

2类 Category 2	60	50
4a	70	55

（5）土壤环境质量标准

(5) Soil environment quality standards

项目周边农用地土壤执行《土壤环境质量 农用地土壤污染风险管控标准（试行）》（GB 15618-2018），厂区内土壤执行《土壤环境质量 建设用地土壤污染风险管控标准（试行）》（GB36600-2018），具体见表 1.3-7。

Agricultural land soil around the Project shall be subject to the Soil Environmental Quality - Risk Control Standard for Soil Contamination of Agricultural Land (Trial) (GB 15618-2018), and the soil in plant area shall be subject to the Soil Environmental Quality - Risk Control Standard for Soil Contamination of Development Land (Trial) (GB36600-2018), as shown in Table 1.3-7.

表1.3-7 《土壤环境质量标准》（摘录）

Table 1.3-7 Soil Environmental Quality Standard (Excerpts)

单位：mg/kg

Unit: mg/kg

序号 **S.N.**	污染物项目 **Pollutant item**	《土壤环境质量 农用地土壤污染风险管控标准（试行）》 **Soil Environmental Quality - Risk Control Standard for Soil Contamination of Agricultural Land (Trial)** **（GB 15618-2018）风险筛选值** **(GB 15618-2018) Risk screening value**			
		pH≤5.5	5.5＜pH≤6.5	6.5＜pH≤7.5	pH＞7.5
1	镍≤ Nickel≤	60	70	100	190
2	锌≤ Zinc≤	200	200	250	300
3	铬 其他≤ Chromium Other ≤	150	150	200	250
4	砷 其他≤ Arsenic Other ≤	40	40	30	25
5	铜 其他≤ Copper Other ≤	50	50	100	100
6	铅 其他≤ Lead Other ≤	70	90	120	170
7	镉 其他≤ Cadmium Other ≤	0.3	0.3	0.3	0.6
8	汞 其他≤ Mercury Other ≤	1.3	1.8	2.4	3.4

续表1.3-7 建设用地土壤污染风险筛选值和管制值 单位：mg/kg

Table 1.3-7 Screening Value and Control Value of Soil Pollution Risk for Construction Land (Contd)

Unit: mg/kg

序号 S.N.	污染物项目 Pollutant item	CAS 编号 CAS No.	筛选值 Screening value	
			第一类用地 Class I land	第二类用地 Class II land
重金属和无机物 Heavy metals and inorganic substances				
1	砷 Arsenic	7440-38-2	20① 20	60① 60
2	镉 Cadmium	7440-43-9	20	65
3	铬（六价） Hexavalent chromium	18540-29-9	3.0	5.7
4	铜 Copper	7440-50-8	2000	18000
5	铅 Lead	7439-92-1	400	800
6	汞 Mercury	7439-97-6	8	38
7	镍 Nickel	7440-02-0	150	900
挥发性有机物 Volatile organic compound				
8	四氯化碳 Carbon tetrachloride	56-23-5	0.9	2.8
9	氯仿 Chloroform	67-66-3	0.3	0.9
10	氯甲烷 Chloromethane	74-87-3	12	37
11	1,1-二氯乙烷 1,1-Dichloroethane	75-34-3	3	9
12	1,2-二氯乙烷 1,2-dichloroethane	107-06-2	0.52	5
13	1,1-二氯乙烯 1,1-Dichloroethylene	75-35-4	12	66
14	顺-1,2-二氯乙烯 Cis-1,2-dichloroethylene	156-59-2	66	596
15	反-1,2-二氯乙烯 Trans-1,2-Dichloroethylene	156-60-5	10	54
16	二氯甲烷 Dichloromethane	75-09-2	94	616
17	1,2-二氯丙烷 1,2-Dichloropropane	78-87-5	1	5
18	1,1,1,2-四氯乙烷 1,1,1,2-Tetrachloroethane	630-20-6	2.6	10
19	1,1,2,2-四氯乙烷 1,1,2,2-Tetrachloroethane	79-34-5	1.6	6.8
20	四氯乙烯 Tetrachloroethylene	127-18-4	11	53
21	1,1,1-三氯乙烷 1,1,1-Trichloroethane	71-55-6	701	840

序号 S.N.	污染物项目 Pollutant item	CAS 编号 CAS No.	筛选值 Screening value	
			第一类用地 Class I land	第二类用地 Class II land
22	1,1,2-三氯乙烷 1,1,2-Trichloroethane	79-00-5	0.6	2.8
23	三氯乙烯 Trichloroethylene	79-01-6	0.7	2.8
24	1,2,3-三氯丙烷 1,2,3-Trichloropropane	96-18-4	0.05	0.5
25	氯乙烯 Vinyl chloride	75-01-4	0.12	0.43
26	苯 Benzene	71-43-2	1	4
27	氯苯 Chlorobenzene	108-90-7	68	270
28	1,2-二氯苯 1,2-Dichlorobenzene	95-50-1	560	560
29	1,4-二氯苯 1, 4-Dichlorobenzene	106-46-7	5.6	20
30	乙苯 Ethylbenzene	100-41-4	7.2	28
31	苯乙烯 Styrene	100-42-5	1290	1290
32	甲苯 Toluene	108-88-3	1200	1200
33	间二甲苯+对二甲苯 MX+PX	108-38-3, 106-42-3	163	570
34	邻二甲苯 O-xylene	95-47-6	222	640
半挥发性有机物 Semi-volatile organic compound				
35	硝基苯 Nitrobenzene	98-95-3	34	76
36	苯胺 Aniline	62-53-3	92	260
37	2-氯酚 2-Chlorophenol	95-57-8	250	2256
38	苯并[a]蒽 Benzo [a] anthracene	56-55-3	5.5	15
39	苯并[a]芘 Benzo [a] pyrene	50-32-8	0.55	1.5
40	苯并[b]荧蒽 Benzo[b]fluorathene	205-99-2	5.5	15
41	苯并[k]荧蒽 Benzo[k]fluoranthene	207-08-9	55	151
42	䓛 Chrysene	218-01-9	490	1293
43	二苯并[a, h]蒽 Dibenz[a,h]anthracene	53-70-3	0.55	1.5
44	茚并[1,2,3-cd]芘 Indeno[1,2,3-cd]Pyrene	193-39-5	5.5	15
45	萘	91-20-3	25	70

序号 **S.N.**	污染物项目 **Pollutant item**	**CAS 编号 CAS No.**	筛选值 **Screening value**	
			第一类用地 **Class I land**	第二类用地 **Class II land**
	Naphthalene			
其他项目 Other items				
47	钴 Cobalt	7440-48-4	20①	70①
48	二噁英类（总毒性当量） Dioxins (total toxic equivalent)	-	1×10^{-5}	4×10^{-5}
注：①具体地块土壤中污染物检测含量超过筛选值，但等于或者低于土壤环境背景值（见 3.6）水平的，不纳入污染地块管理。土壤环境背景值可参见附录A。 Note: ① If the detected content of pollutants in the soil of a specific plot exceeds the screening value, but is equal to or lower than the level of soil environmental background value (see 3.6), it will not be included in the management of contaminated plots. The background values of soil environment may be found in Appendix A.				

（6）海洋沉积物质量标准

(6) Marine sediment quality standards

项目评价海域海洋沉积物质量按所属环境功能区执行相应的《海洋沉积物质量》（GBl8668-2002），具体标准限值见表 1.3-8。

Marine sediment quality in the sea area assessed in the Project shall be subject to the corresponding Marine Sediment Quality (GBl8668-2002) according to the environment functional zone to which it belongs, and the specific standard limits are shown in Table 1.3-8.

表1.3-8 《海洋沉积物质量》（GBl8668-2002）（摘录）

Table 1.3-8 Marine Sediment Quality (GBl8668-2002) (Excerpts)

项目 **Item**	第一类 **Class I**	第二类 **Class II**	第三类 **Class III**
有机碳（$\times10^{-2}$）≤ Organic carbon ($\times 10^{-2}$) ≤	2.0	3.0	4.0
石油类（$\times10^{-6}$）≤ Petroleum ($\times 10^{-6}$) ≤	500.0	1000.0	1500.0
硫化物（$\times10^{-6}$）≤ Sulfide ($\times 10^{-6}$) ≤	300.0	500.0	600.0
砷（$\times10^{-6}$）≤ As ($\times 10^{-6}$) ≤	20.0	65.0	93.0
铜（$\times10^{-6}$）≤ Cu ($\times 10^{-6}$) ≤	35.0	100.0	200.0
铅（$\times10^{-6}$）≤ Pb ($\times 10^{-6}$) ≤	60.0	130.0	250.0
镉（$\times10^{-6}$）≤ Cd ($\times 10^{-6}$) ≤	0.50	1.50	5.00
汞（$\times10^{-6}$）≤ Hg ($\times 10^{-6}$) ≤	0.20	0.50	1.00
锌（$\times10^{-6}$）≤ Zn ($\times 10^{-6}$) ≤	150.0	350.0	600.0

项目 **Item**	第一类 **Class I**	第二类 **Class II**	第三类 **Class III**
铬（$\times10^{-6}$）≤ Cr ($\times$ 10^{-6}) ≤	80.0	150.0	270.0

（7）海洋生物质量标准

(7) Marine biological quality standards

项目排污海域海洋生物质量标准采用 GB18421-2001《海洋生物质量》中相应标准，具体数值见表 1.3-9。

Marine biological quality standards in the sewage discharge sea area of the Project adopts the corresponding standard in GB18421-2001 Marine Biological Quality, and the specific values may be found in Table 1.3-9.

表1.3-9 《海洋生物质量》GB18421-2001

Table 1.3-9 Marine Biological Quality (GB18421-2001-2002) (Excerpts)

（鲜重，$\times10^{-6}$）

(Fresh weight, $\times10^{-6}$)

生物类别 Biological category	总汞 Total mercury	铜 Copper	铅 Lead	镉 Cadmium	锌 Zinc	石油烃 Petroleum hydrocarbon
贝类（第一类标准） Shellfish (Class I standard)	0.05	10	0.1	0.2	20	15
贝类（第二类标准） Shellfish (Class II standard)	0.1	25	2.0	2.0	50	50
贝类（第三类标准） Shellfish (Class III standard)	0.3	50	6.0	5.0	100	80
软体类* Mollusc *	0.3	100	10	5.5	250	20*
甲壳类* Crustaceans *	0.2	100	2.0	2.0	150	20*
鱼类* Fishes *	0.3	20	2.0	0.6	40	20*

注：*参考《全国海岸和海湾资源综合检测简明规程》，其中石油烃执行《第二次全国海洋污染基线监测技术规程》（第二分册）。

Note: * Refer to the Concise Regulations for Comprehensive Detection of National Coastal and Gulf Resources, of which petroleum hydrocarbons are subject to the Technical Regulations for the Second National Marine Pollution Baseline Monitoring (Book II).

1.3.3.2 污染物排放标准

1.3.3.2 Pollutant discharge standard

（1）废气

(1) Waste gas

项目涉及废气排放源较多，碱回收锅炉、220t/h固废综合利用锅炉、2×280t/h燃煤锅炉、850t/d石灰窑废气、臭气焚烧器废气分别设废气处置设施处理后经同一根高 150 米多管式集束烟囱排放，各排放源对应执行的废气污染物排放标准见表 1.3-10，污染物无组织排放标准限值见表 1.3-11。

The project involves multiple exhaust emission sources, waste gas from alkali recovery boiler, 220t/h solid waste comprehensive utilization boiler, 2 × 280t/h coal-fired boiler, and 850t/d lime kiln and waste gas from odor incinerator are respectively equipped with waste gas disposal facilities and then discharged through the same 150-meter-high multi-flue sleeve-type chimney. See Table 1.3-10 for the emission standards of waste gas pollutants corresponding to each emission source, and Table 1.3-11 for fugitive emission standard limits of pollutants.

表1.3-10　项目各大气污染物执行标准情况表

Table 1.3-10 Executive Standards for Air Pollutants of the Project

序号 S.N.	污染源 Source of pollution	污染物 Pollutant	排放高度 Emission height（m） (m)	排放浓度（mg/m^3） emission concentration (mg/m3)	排放速率（kg/h） Emission rate (kg/h)	排放限值 Emission limit
1	4600tds/d 碱回收炉烟囱废气 Waste gas from 4600tds/d alkali recovery boiler chimney	烟尘 Smoke dust	150	30	-	《火电厂大气污染物排放标准》（GB 13223-2011）中现有循环流化床火力发电锅炉排放控制要求 Requirements for emission control for existing circulating fluidized bed thermal power boilers as specified in Emission Standard of Air Pollutants for Thermal Power Plants (GB 13223-2011)
		二氧化硫 Sulfur dioxide		200	-	
		氮氧化物 Oxynitride		200	-	
		硫化氢 Hydrogen sulfide		-	21	《恶臭污染物排放标准》 Discharge standard of odor pollutants （GB 14554-93） (GB 14554-93)
2	850t/d 石灰窑废气 850t/d lime kiln waste gas	烟尘 Smoke dust	150	200	-	《工业炉窑大气污染物排放标准》（GB 9078-1996） Emission Standard of Air Pollutants for Industrial Kiln and Furnace (GB 9078-1996)
		二氧化硫 Sulfur dioxide		850	-	
		硫化氢 Hydrogen sulfide		-	21	《恶臭污染物排放标准》 Discharge standard of odor pollutants

序号 S.N.	污染源 Source of pollution	污染物 Pollutant	排放高度 Emission height （m） (m)	排放浓度（mg/m^3） emission concentration (mg/m3)	排放速率（kg/h） Emission rate (kg/h)	排放限值 Emission limit
						（GB 14554-93） (GB 14554-93)
3	220t/h 固废综合利用锅炉废气+2×280t/h 燃煤供热锅炉废气 Waste gas from 220t/h solid waste comprehensive utilization boiler + waste gas from 2 × 280t/h coal-fired heating boiler	颗粒物 PM	150	10	-	参照《全面实施燃煤电厂超低排放和节能改造工作方案》（环发〔2015〕164 号）中锅炉废气超低排放标准限值 Refer to the ultra-low emission standard limit for boiler waste gas as stipulated in the Work Plan on Fully Implementing Ultra-low Emission and Energy Saving Transformation of Coal-fired Power Plants (HF[2015] No.164).
		二氧化硫 Sulfur dioxide		35	-	
		氮氧化物 Oxynitride		50	-	
		汞及其化合物 Mercury and its compounds		0.03	-	《火电厂大气污染物排放标准》（GB 13223-2011） Emission Standard of Air Pollutants for Thermal Power Plants (GB 13223-2011)
		氯化氢 Hydrogen chloride		50	-	《生活垃圾焚烧污染控制标准》（GB18485-2014） Standard for Pollution Control on the Municipal Solid Waste Incineration (GB18485-2014)
		一氧化碳 Carbon monoxide		100	-	
		镉、铊及其化合物 Cadmium, thallium and their compounds		0.1	-	
		锑、砷、铅、铬、钴、铜锰、镍及其化合物 Antimony, arsenic, lead, chromium, cobalt, copper manganese, nickel and		1.0	-	

序号 **S.N.**	污染源 **Source of pollution**		污染物 **Pollutant**	排放高度 Emission height（m）(m)	排放浓度（mg/m^3）emission concentration (mg/m3)	排放速率（kg/h）Emission rate (kg/h)	排放限值 **Emission limit**
			compounds thereof				
			二噁英 Dioxin		0.1（ng TEG/m^3）	-	
4	化学品制备工段 Chemical preparation section	过量氢气排空尾气 Excess hydrogen evacuates tail gas	氯气 Chlorine	25	8	-	《无机化学工业污染物排放标准》（GB31573-2015） *Emission Standard of Pollutants for Synthetic Resin Industry* (GB31573-2015)
5	化学品制备工段 Chemical preparation section	盐酸合成尾气 Tail gas from hydrochloric acid synthesis	氯化氢 Hydrogen chloride	42	20	-	《无机化学工业污染物排放标准》（GB31573-2015） *Emission Standard of Pollutants for Synthetic Resin Industry* (GB31573-2015)
6	化学品制备工段 Chemical preparation section	二氧化氯车间尾气 Tail gas from chlorine dioxide workshop	氯化氢 Hydrogen chloride	30	20	-	《无机化学工业污染物排放标准》（GB31573-2015） *Emission Standard of Pollutants for Synthetic Resin Industry* (GB31573-2015)
7	纸浆车间漂白尾气 Bleaching tail gas from pulp workshop		氯气 Chlorine	150	65	52.7	《大气污染物综合排放标准》（GB16297-1996） Comprehensive Emission Standards for Air Pollutants (GB16297-1996)
8	臭气焚烧器尾气 Stink incinerator tail gas		臭气 Stink	150	-	6000（无量纲） 6000 (non-dimensional)	《恶臭污染物排放标准》 Discharge standard of odor pollutants （GB 14554-93） (GB 14554-93)
8	臭气焚烧器尾气 Stink incinerator tail gas		H_2S	150	-	21	《恶臭污染物排放标准》 Discharge standard of odor pollutants （GB 14554-93） (GB 14554-93)

注：①参照《造纸行业排污许可证申请与核发技术规范》、《火电行业排污许可证申请与核发技术规范》、《全面实施燃煤电厂超低排放和节能改造工作方案》（环发〔2015〕164 号），碱回收炉参照执行《火电厂大气污染物排放标准》（GB13223-2011）排放控制要求；供热燃煤锅炉执行《火电厂大气污染物排放标准》（GB 13223-2011）新建燃煤锅炉排放控制要求，同时参照《全面实施燃煤电厂超低排放和节能改造工作方案》（环发〔2015〕164 号）中锅炉废气超低排放标准限值进行控制；石灰窑炉废气执行《工业炉窑大气污染物排放标准》（GB9078-1996）排放浓度限值按照。固废综合利用锅炉焚烧木屑、污泥、浆渣等一般固废，掺烧不超过 20%的原煤，参照《生活垃圾焚烧污染控制标准》

序号 S.N.	污染源 Source of pollution	污染物 Pollutant	排放高度 Emission height （m） (m)	排放浓度 （mg/m^3） emission concentration (mg/m3)	排放速率 （kg/h） Emission rate (kg/h)	排放限值 Emission limit
（GB18485-2014）和《全面实施燃煤电厂超低排放和节能改造工作方案》（环发〔2015〕164 号）中锅炉废气超低排放标准限值。						

表1.3-11 污染物无组织排放标准限值

Table 1.3-11 Standard Limits for Fugitive Emission of Pollutants

污染物 Pollutant	企业厂界排放监控浓度 （mg/m^3） Monitored Concentration of Emissions at Plant Boundary (mg/m3)	备注 Remarks
颗粒物 PM	1.0	《大气污染物综合排放标准》（GB16297-1996） Comprehensive Emission Standards for Air Pollutants (GB16297-1996)
氯化氢 Hydrogen chloride	0.05	《无机化学工业污染物排放标准》（GB31573-2015） *Emission Standard of Pollutants for Synthetic Resin Industry* (GB31573-2015)
氯气 Chlorine	0.1	
硫化氢 Hydrogen sulfide	0.06	《恶臭污染物排放标准》（GB14554-93） Emission Standards for Odor Pollutants (GB14554-93)
氨 Ammonia	1.5	
臭气浓度 Stink concentration	20（无量纲） 20 (non-dimensional)	

（2）废水

(2) Wastewater

项目各类废水经自建污水处理厂处理后，经专用排污管接入铁山港区污水处理厂尾水排海管，在铁山港 B3 排污口深海排放，项目污水处理站出水执行《制浆造纸工业水污染物排放标准》（GB3544-2008）表 2 新建制浆和造纸联合生产企业水污染物排放浓度限值及单位产品基准排水量；由于铁山港海域无机氮环境容量较小，项目氨氮和总氮排放执行表 3 水污染物特别排放限值。同时废水排放浓度需满足《北海市铁山港区污水处理厂尾水排海管工程项目海洋环境影响报告书》排放污水浓度控制值。各标准排放限值详见表 1.3-12。

After being treated by the self-built sewage treatment plant, all kinds of wastewater from the Project are connected to the tail water seaward discharge pipeline of Tieshangang District Sewage Treatment Plant through special sewage pipes and discharged into the deep sea at sewage outlet B3 of Tieshan Harbor. Effluent from the sewage treatment plant of the Project shall be subject to the emission concentration limit of water pollutants and the benchmark displacement per unit product of newly-built pulp and paper joint production enterprises as stipulated in Table 2 of the Discharge Standard of Water Pollutants for Pulp and Paper Industry (GB3544-2008). Due to the low environmental capacity of inorganic nitrogen in sea areas of Tieshan Harbor, the emission of ammonia nitrogen and total nitrogen in the Project shall be subject to the special emission limits of water pollutants in Table 3. Further, the wastewater discharge concentration shall meet the control value of wastewater discharge concentration as stipulated in the Marine Environmental Impact Report on the Tail Water Seaward Discharge Pipeline Project of Beihai Tieshangang District Sewage Treatment Plant. See Table 1.3-12 for each standard emission limit.

表1.3-12 本项目废水排放标准 单位：除pH值外，其余为mg/L

Table 1.3-12 Wastewater Discharge Standard of the Project: Unit: mg/L except pH value

排放标准 Discharge standard / 指标 Indicator		《制浆造纸工业水污染物排放标准》（GB3544-2008）**Discharge Standards for Water Pollutants of Pulp- and Papermaking Industry (GB3544-2008)**	《北海市铁山港区污水处理厂尾水排海管工程项目海洋环境影响报告书》排放污水浓度控制值 **Control value of wastewater discharge concentration as stipulated in the Marine Environmental Impact Report on the Tail Water Seaward Discharge Pipeline Project of Beihai Tieshangang District Sewage Treatment Plant.**	本项目尾水排放控制限值 **Control Limit of Tail Water Discharge for the Project**	污染物排放监控位置 **Pollutant discharge monitoring position**
1	pH 值 pH value	6~9	6~9	6~9	企业废水总排放口 Wastewater main drain
2	色度（稀释倍数） Chroma (dilution times)	50	—	50	
3	SS（mg/L） SS (mg/L)	30	30	30	
4	BOD_5（mg/L） BOD_5 (mg/L)	20	20	20	
5	CODcr（mg/L） CODcr (mg/L)	90	74	74	
6	氨氮（mg/L） Ammonia nitrogen (mg/L)	5	12	5	
7	总氮（mg/L） Total nitrogen	10	16	10	

排放标准 Discharge standard / 指标 Indicator		《制浆造纸工业水污染物排放标准》（GB3544-2008）**Discharge Standards for Water Pollutants of Pulp- and Papermaking Industry (GB3544-2008)**	《北海市铁山港区污水处理厂尾水排海管工程项目海洋环境影响报告书》排放污水浓度控制值 **Control value of wastewater discharge concentration as stipulated in the Marine Environmental Impact Report on the Tail Water Seaward Discharge Pipeline Project of Beihai Tieshangang District Sewage Treatment Plant.**	本项目尾水排放控制限值 **Control Limit of Tail Water Discharge for the Project**	污染物排放监控位置 **Pollutant discharge monitoring position**
	(mg/L)				
8	总磷（mg/L）Total phosphorus (mg/L)	0.8	1	0.8	
9	AOX（mg/L）AOX (mg/L)	12	—	12	车间或生产设施废水排放口 Wastewater discharge outlet of workshop or production facility
10	二噁英（PgTEQ/L）Dioxin (PgTEQ/L)	30	—	30	
11	单位产品基准排水量，吨/吨（浆）Benchmark displacement per unit product, t/t (slurry)	40	—	40	排水量计量位置与污染物排放监控位置一致 Displacement measuring position is consistent with the pollutant discharge monitoring position.

（3）噪声

(3) Noise

项目施工期噪声排放执行《建筑施工场界环境噪声排放标准》（GB12523-2011），见表 1.3-13。

Noise during the construction period shall be subject to the Emission Standard of Environment Noise for Boundary of Construction Site (GB12523-2011), as shown in Table 1.3-13.

表1.3-13 建筑施工场界环境噪声排放限值 单位：dB

Table 1.3-13 Noise Emission Limits at Boundary of Construction Site Unit: dB

昼间 **Daytime**	夜间 **Night**

70	55

项目厂界噪声排放执行《工业企业厂界环境噪声排放标准》（GB12348-2008）中 3 类声环境功能区排放限值；具体标准限值见表 1.3-14。

Noise at the plant boundary shall be subject to the noise emission limit standards of Class III acoustic environment functional zone as stipulated in Emission Standard for Industrial Enterprises Noise at Boundary (GB12348-2008), see Table 1.3-14 for specific standard value.

表1.3-14 《工业企业厂界环境噪声排放标准》（摘录） Leq：dB(A)

Table 1.3-14 Emission Standard for Industrial Enterprises Noise at Boundary (Excerpts) Leq: dB (A)

厂界外声环境功能区类别 **Classification of functional zones for plant boundary and acoustic environment**	昼间 **Daytime**	夜间 **Night**
3类 Category 3	65	55

（4）固体废物

(4) Solid waste

项目产生的一般工业固废贮存执行《一般工业固体废物贮存、处置场污染控制标准》（GB18599-2001）及其修改单标准要求；危险废物贮存执行《危险废物贮存污染控制标准》（GB18597-2001）及其修改单标准要求。

General industrial solid waste from the Project shall be subject to the Standard for Pollution Control on the Storage and Disposal Site for General Industrial Solid Wastes (GB18599-2001) and its amendments. Storage of hazardous wastes shall be subject to the Standard for Pollution Control on Hazardous Waste Storage (GB18597-2001) and its amendments.

1.4 评价工作等级和评价范围

1.4Assessment level and range

1.4.1 评价工作等级

1.4.1 Assessment level

1.4.1.1 大气环境评价工作等级

1.4.1.1 Atmospheric environment impact assessment levels

根据《环境影响评价技术导则大气环境》（HJ2.2-2018），选择推荐模式中的估算

模型（AERSCREEN）用于本项目评价等级判定。

According to the Technical Guidelines for Environmental Impact Assessment - Atmospheric Environment (HJ2.2-2018), the estimation model (AERSCREEN) in recommended models is selected for the assessment level determination of the Project.

根据项目的初步工程分析结果，分别计算项目排放主要污染物（SO_2、NO_2、PM_{10}、$PM_{2.5}$、HCl、H_2S、NH_3、As、Hg、TSP）的最大地面空气质量浓度占标率 P_i（第 i 个污染物，简称“最大浓度占标率”）及第 i 个污染物的地面空气质量浓度达到标准值的 10%时所对应的最远距离 $D_{10\%}$。其中 P_i 定义为：

According to the preliminary engineering analysis results of the Project, the ratio of the maximum ground air mass concentration Pi (the ith pollutant, referred to as "maximum concentration Pi") of main pollutants (SO_2, NO_2, PM_{10}, $PM_{2.5}$, HCl, H_2S, NH_3 As, Hg, TSP) emitted by the Project and the corresponding longest distance $D_{10\%}$ when the ground air mass concentration of the ith pollutant reaches 10% of the standard value are calculated respectively. P_i is defined as follows:

$$P_i = C_i / C_{Oi} \times 100\%$$

式中：P_i——第 i 个污染物的最大地面浓度占标率，%；

Where: Pi - the ratio of the maximum ground concentration of the ith pollutant to the standard value (%);

C_i——采用估算模式计算出的第 i 个污染物的最大 1h 地面空气质量浓度，μg/m^3；

Ci - the maximum 1h ground air mass concentration of the ith pollutant figured out with the estimation model (μg/m^3);

C_{0i}——第 i 个污染物的环境空气质量标准，μg/m^3。对仅有 8h 平均质量浓度限值、日平均质量浓度限值或年平均质量浓度限值的，可分别按 2 倍、3 倍、6 倍折算为 1h 平均质量浓度限值。

C0i - the standard ambient air mass of the ith pollutant (μg/m3). For those with only 8h average mass concentration limit, daily average mass concentration limit or annual average mass concentration limit, the said limits can be converted into 1h average mass concentration limit by 2 times, 3 times and 6 times respectively.

NO_2 按 NO_X 排放量的 1 小时浓度采用内定的比例值上限 0.9，本次估算模式点源和面源参数见表 4.2-5。

Upper limit of the specified proportion value for NO_2 is 0.9 according to the NO_X 1h emission concentration. See Table 4.2-5 for the point source and area source parameters of this estimation mode.

评价工作等级按表 1.4-1 的分级判据进行划分。

Assessment level can be classified according to the levels indicated in Table 1.4-1 below.

表 1.4-1 大气评价工作等级
Table 1.4-1 Atmospheric Environment Impact Assessment Levels

评价工作等级 Levels of Assessment	评价工作等级分级判据 Basis for levels of assessment
一级 Level I	P_{max}≥10%
二级 Level II	1%＜P_{max}＜10%
三级 Level III	P_{max}＜10%

表 1.4-2 估算模型参数表

Table 1.4-2 Parameters of Estimation Model

参数 Parameters		取值 Values
城市/农村选项 Urban/rural areas	城市/农村 Urban/rural areas	城市 Urban area
	人口数（城市选项时） Population (urban area)	174
最高环境温度/ºC Maximum ambient temperature (℃)		36.1
最低环境温度/ºC Minimum ambient temperature (℃)		2.0
土地利用类型 Land use type		城市 Urban
区域湿度条件 Region humidity conditions		潮湿气候 Humid climate
是否考虑地形 Whether the terrain is taken into account	考虑地形 The terrain is taken into account	■是 □否 ■Yes □No
	地形数据分辨率/m Terrain data resolution/m	90m
是否考虑岸线熏烟 Whether shoreline fume is taken into account	考虑岸线熏烟 The shoreline fume is taken into account	■是 □否 ■Yes □No
	岸线距离/km Shoreline distance/km /	项目东侧 2km 为海域 Sea area is 2km east of the Project
	岸线方向/° Shoreline direction/°	45°

（3）污染物占标率计算结果

(3) Calculation results of pollutant Pi

根据估算模式计算各污染源中污染物的最大地面质量浓度占标率 Pi（第 i 个污染物），估算结果见图 1.4-1。

According to the estimation model, the maximum ground mass concentration Pi (the ith pollutant) of pollutants in each pollution source is calculated, and the estimation results are shown in Figure 1.4-1.

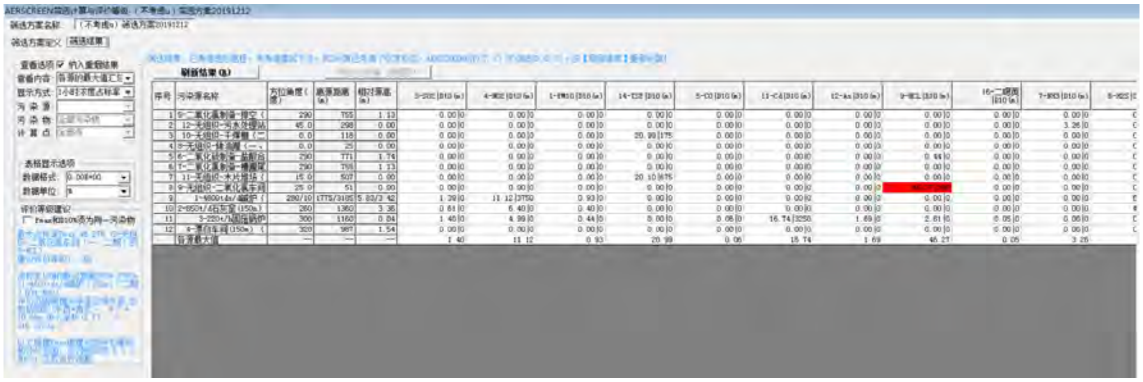


图 1.4-1 估算结果

Table 1.4-1 Estimation Results

（4）评价等级的确定

(4) Determination of assessment level

项目所有筛选的大气污染物最大地面浓度占标率 Pmax=P_{HCl}（二氧化氯车间无组织废气）=46.27%＞10%，地面浓度达标准限值 10%所对应的最远距离 $D_{10\%}$=3762m，因此确定本项目大气影响评价工作等级为一级。

The maximum ground concentration Pi of all screened air pollutants in the Project Pmax=PHCl (fugitive waste gas from chlorine dioxide workshop) = 46.27% > 10%, and the maximum distance $D_{10\%}$ corresponding to the standard limit value of 10% reaches 3762m. Therefore, the air impact assessment level of the Project is rated Level I.

1.4.1.2 地表水评价等级

1.4.1.2 Surface water assessment level

厂区排水系统分为污水系统（生活污水、生产污水）和雨水系统，实行雨污分流、清浊分流制。项目废水经处理达到《制浆造纸工业污染物排放标准》（GB3544-2008）表 2 新建企业水污染物排放限值标准后，经专用排污管接入铁山港区深海排放管网系统，在铁山港 B3 排污口深海排放。

Drainage system in the plant area is divided into sewage system (domestic sewage and production sewage) and rainwater system, with rainwater-sewage diversion and segregation of high and low concentration wastewater implemented. After treated and reaching the discharge limit standard for water pollutants from new enterprises in Table 2 of Discharge Standard of Water Pollutants for Pulp and Paper Industry (GB3544-2008), the project wastewater will be discharged to the deep-sea discharge pipe network system in Tieshangang District through a special sewage pipe and discharged in the deep sea at the sewage outlet B3 of Tieshan Harbor

根据工程分析核算，项目废水排放量为 95023m^3/d≥20000 m^3/d，排放方式为直接排放，项目属于水污染影响型建设项目，依据《环境影响评价技术导则 地表水环境》（HJ 2.3-2018）表 1（见表 1.4-3），本项目地表水环境评价等级定为一级。

According to engineering analysis and accounting, the wastewater discharge of the Project is 95023 m3/d ≥ 20,000m3/d, with the direct discharge as the discharge method. The Project is a construction project with water pollution impact, so the surface water environment assessment level of the Project is Level I according to Table 1 (see Table 1.4-3) of the Technical Guidelines for Environmental Impact Assessment - Surface Water Environment (HJ 2.3-2018).

表 1.4-3 水污染影响型建设项目地表示评价等级划分表

Table 1.4-3 Classification of Assessment Levels of Land for Construction Projects with Water Pollution Impact

评价等级	判定依据	
	排放方式	废水排放量 Q /（m^3/d）；水污染物当量数 W /（量纲一）
一级	直接排放	Q≥20 000 或 W≥600 000
二级	直接排放	其他
三级 A	直接排放	Q＜200 且 W＜6 000
三级 B	间接排放	—

Assessment level	Basis of determination	
	Discharge method	Wastewater discharges (m^3/d) Water pollution discharges W/(dimension I)
Level I	Direct discharge	Q≥20000 or W≥600000
Level II	Direct discharge	Others
Level III A	Direct discharge	Q＜200 and W＜6000
Level III B	Indirect discharge	—

1.4.1.3 地下水评价等级

1.4.1.3 Groundwater assessment level

根据《环境影响评价技术导则 地下水环境》（HJ610-2016）附录，本项目为轻工

行业纸浆和造纸项目，属 II 类项目；项目周边无地方水源地保护区及特殊地下水保护区，场地侧下游分布有川江、坡尾底等村屯，村民主要通过各自打井抽取地下水作为饮用水源，属于分散式饮用水源水源地，地下水环境敏感特征为“较敏感”。对照《环境影响评价技术导则　地下水环境》（HJ610-2016）表 2（见表 1.4-4），本次地下水环境影响评价工作等级为二级。

According to the Appendix of Technical Guidelines for Environmental Impact Assessment- Groundwater Environment (HJ610-2016), the Project is a pulp and paper making project in light industry and a Category II project. There are no local water source protection areas and special groundwater protection areas around the Project, but several villages such as Chuanjiang Village and Poweidi Village in the lower reaches of the site. Villagers mainly pump groundwater as drinking water sources through own wells, which is a distributed drinking water source, and groundwater environment sensitivity is characterized by "relatively sensitive". According to Table 2 (see Table 1.4-4) of Technical Guidelines for Environmental Impact Assessment- Groundwater Environment (HJ610-2016), the groundwater environmental impact assessment is rated Level II.

表 1.4-4　　地下水评价等级划分表

Table 1.4-4 Classification of Groundwater Assessment Levels

项目类别 **Project category** / 环境敏感程度 **Environmental sensitivity**	Ⅰ类项目 **Category I project**	Ⅱ类项目 **Category II project**	Ⅲ类项目 **Category III project**
敏感 **Sensitive**	一 **I**	一 **I**	二 **II**
较敏感 **Relatively sensitive**	一 **I**	二 **II**	三 **III**
不敏感 **Not sensitive**	二 **II**	三 **III**	三 **III**

1.4.1.4 声环境评价等级

1.4.1.4 Acoustic environment assessment level

本项目位于铁山港（临港）工业区内，属于《声环境质量标准》（GB3096-2008）规定的 3 类区，依据《环境影响评价技术导则　声环境》（HJ2.4-2009）对评价级别的规定（见表 1.4-5），建设前后评价范围内敏感目标川江、坡尾底噪声级增高量在 3dB(A)以下，且受影响人口数量变化不大，本工程噪声环境影响评价工作等级为三级。

The Project is located in the Tieshangang (Lingang) Industrial Park that falls under Class

III areas specified in the Environmental Quality Standard for Noise (GB3096-2008). According to the provisions on assessment levels in the Technical Guidelines for Noise Impact Assessment (HJ2.4-2009) (see Table 1.4-5), noise level increase of sensitive targets Chuanjiang Village and Powei Village within the assessment range before and after construction is below 3dB (A), and the number of affected population changes little; so the noise environment impact assessment of the Project is rated Level 3.

表 1.4-5 声环境评价等级判定表

Table 1.4-5 Determination of Acoustic Environment Assessment Level

评价等级 **Assessment level**		声环境功能区类别 **Category of acoustic environment functional zones**	敏感点噪声值变化情况 **Changes in noise value at sensitive points**	受影响人口数量 **Number of affected population**
导则判据 Guideline criteria	一级 Level I	0类 Category 0	>5dB(A)	显著增多 Significantly increased
	二级 Level II	1、2类 Category I and II	≥3dB(A)，且≤5dB(A) ≥3dB(A), and ≤5dB(A)	增加较多 Relatively increased
	三级 Class III	3、4类 Category 3 and 4	<3dB(A)	变化不大 Changed little

1.4.1.5 土壤环境评价等级

1.4.1.5 Soil environment assessment level

根据《环境影响评价技术导则 土壤环境》（HJ610-2018）附录 A，本项目属于污染影响型，造纸和纸制品-造纸（含制浆工艺）项目，属 II 类项目。项目位于工业区，敏感程度为不敏感；项目占地面积为 235.93hm^2，占地规模为大型（≥50hm^2），根据表 1.4-6，本项目土壤评价等级为二级。

According to Appendix A of the Technical Guidelines for Environmental Impact Assessment - Soil Environment (HJ610-2018), the Project is a project with pollution impact, a paper making and paper products-paper making (including pulping process) project, and a Category II project. The Project is located in an industrial area and is insensitive. Land area of the Project is 235.93hm^2, with a large scale (≥50hm^2). According to Table 1.4-6, the soil assessment of the Project is rated Level II.

表 1.4-6 污染影响型评价工作等级划分表

Table 1.4-6 Classification of Pollution Impact Type Assessment Levels

占地规模 评价工作等级 敏感程度	I类			II类			III类		
	大	中	小	大	中	小	大	中	小
敏感	一级	一级	一级	二级	二级	二级	三级	三级	三级
较敏感	一级	一级	二级	二级	二级	三级	三级	三级	-
不敏感	一级	二级	二级	二级	三级	三级	三级	-	-
注："-"表示可不开展土壤环境影响评价工作。									

Sensitivity, assessment level, area of site	Class I			Class II			Class III		
	Large	Moderate	Small	Large	Moderate	Small	Large	Moderate	Small
Sensitive	Level I	Level I	Level I	Level II	Level II	Level II	Level III	Level III	Level III
Relatively sensitive	Level I	Level I	Level II	Level II	Level II	Level III	Level III	Level III	—
Insensitive	Level I	Level II	Level II	Level II	Level III	Level III	Level III	—	—
Note: "—" indicates that soil EIA is unavailable									

1.4.1.6 生态环境评价等级

1.4.1.6 Ecological environment assessment level

根据《环境影响评价技术导则　生态影响》（HJ19-2011）中评价工作等级的划分，本项目占地面积 2.36km^2＞2km^2，项目位于铁山港（临港）工业区内，生态环境较简单，不属于HJ19-2011 规定的特殊生态敏感区、重要生态敏感区，属于一般区域，故生态环境影响评价工作等级定为三级，具体见表 1.4-7。

According to the classification of assessment level in Technical Guideline for Environmental Impact Assessment - Ecological Impact (HJ19-2011), the Project covers an area of 2.36km2 > 2km2, and is located in Tieshangang (Lingang) Industrial Park, with a relatively simple ecological environment. So the Project falls under the general area, instead of special ecologically sensitive area and important ecological sensitive area specified in HJ19-2011; and the ecological environment impact assessment is rated Level II, as shown in Table 1.4-7.

表 1.4-7 生态环境评价工作级别划分表

Table 1.4-7 Classification of Ecological Environment Assessment Levels

影响区域 **Affected area** 生态敏感性 **Ecological sensitivity**	工程占地（水域）范围 **Scope of the project site area (water area)**		
	面积≥20km^2 **Area ≥20km2**	面积 2～20 km^2 **Area 2-20km2**	面积≤2km^2 **Area≤2km2**

	或长度≥100km **Or length ≥100km**	或长度 50～100km **Or length 50-100km**	或长度≤50km **Or length ≤50km**
特殊生态敏感区 Special ecologically sensitive area	一级 Level I	一级 Level I	一级 Level I
重要生态敏感区 Important ecologically sensitive area	一级 Level I	二级 Level II	三级 Class III
一般区域 General area	二级 Level II	三级 Class III	三级 Class III

1.4.1.7 环境风险评价等级

1.4.1.7 Environmental risk assessment level

根据《建设项目环境风险评价技术导则》（HJ169-2018）附录 B 及附录 C，本项目危险物质与工艺系统危害性（P）的等级为 P1；根据《建设项目环境风险评价技术导则》（HJ169－2018）附录 D，项目大气环境敏感程度为 E1，地表水和地下水环境敏感程度均为 E2；

According to Appendices B and C of Technical Guidelines for Environmental Risk Assessment on Projects (HJ169-2018), the perniciousness (P) of hazardous substances and process systems in the Project is rated P1; according to Appendix D of Technical Guidelines for Environmental Risk Assessment on Projects (HJ169-2018), the atmospheric environment sensitivity of the Project is rated E1, and the environmental sensitivity of surface water and groundwater is rated E2.

根据《建设项目环境风险评价技术导则》（HJ169-2018）表 2，本项目大气环境风险潜势为Ⅳ$^{+}$、地表水环境和地下水环境风险潜势均为Ⅳ，风险潜势划分见表 1.4-8。

According to Table 2 of Technical Guidelines for Environmental Risk Assessment on Projects (HJ169-2018), the atmospheric environment risk potential of the Project is rated IV+, and the surface water environment and groundwater environment risk potential are both rated IV. See Table 1.4-8 for the classification of risk potential.

表 1.4-8 建设项目环境风险潜势划分

Table 1.4-8 Classification of Environmental Risk Potential of Construction Projects

环境敏感度（E） **Environmental sensitivity (E)**	危险物质及工艺系统危害性（P） **Perniciousness (P) of hazardous substances and process system**			
	极度危害（P1） **Extremely pernicious (P1)**	高度危害（P2） **Highly pernicious (P2)**	中度危害（P3） **Moderately pernicious (P3)**	轻度危害（P4） **Slightly pernicious (P4)**
环境高度敏感区（E1） Area higher sensitive to environment (E1)	Ⅳ$^{+}$	Ⅳ	III	III
环境中度敏感区（E2）	Ⅳ	III	III	II

Area moderate sensitive to environment (E2)				
环境低度敏感区（E3） Area lower sensitive to environment (E3)	III	III	II	I
注：IV⁺为极高环境风险 Note: IV indicates extremely high environmental risk				

《建设项目环境风险评价技术导则》（HJ169-2018）给出的评价工作等级确定原则见表 1.4-9。

See Table 1.4-9 for the principles for determining the assessment level given in the Technical Guidelines for Environmental Risk Assessment on Projects (HJ169-2018).

表 1.4-9　风险评价工作级别划分

Table 1.4-9 Classification of Risk Assessment Levels

环境风险潜势 Environmental risk potentiality	Ⅳ⁺、Ⅳ Ⅳ+, Ⅳ	Ⅲ	II **II**	I **I**
评价工作等级 Levels of Assessment	一 I	二 II	三 III	简单分析 [a] Simple analysis [a]
a 是相对于详细评价工作内容而言，在描述危险物质、环境影响途径、环境危害后果、风险防范措施等方面给出定性说明。见附录 A。 a is to give a qualitative description for hazardous substances, environmental impact method, environmental hazard consequences, risk prevention measures, etc. relative to the detailed assessment work description. See Appendix A.				

根据 HJ/T169-2018 中评价工作级别划分原则，确定本项目风险评价等级为一级。

According to the classification principle of assessment level in HJ/T169-2018, the risk assessment level of the Project is rated Level 1.

1.4.1.8 评价等级汇总

1.4.1.8 Summary of assessment levels

项目评价等级划分汇总见表 1.4-10。

Classification of project assessment levels is as shown in Table 1.4-10.

表 1.4-10　　项目评价工作等级划分表

Table 1.4-10 Classification of Project Assessment Levels

评价内容 Assessment content	工作等级 Level	判定依据 Basis of judgment	建设项目情况 Basic situation of the Project
空气环境 Air environm	一级 Level I	根据 HJ/2.2-2018，Pmax≥10%，大气评价等级为一级。 According to HJ/2. 2-2018, Pmax is	项目废气最大占标率 Pmax=P_{HCl}（二氧化氯车间无组织废气）=46.27%。 The maximum Pi of project waste gas

评价内容 Assessment content	工作等级 Level	判定依据 Basis of judgment	建设项目情况 Basic situation of the Project
ent		≥10%, and the atmospheric assessment level is rated Level I.	Pmax=P_{HCl} (fugitive waste gas from chlorine dioxide workshop) = 46.27%.
地表水环境 Surface water environment	一级 Level I	根据《环境影响评价技术导则—地面水环境》（HJ2.3-2018），项目废水直接排放，废水排放量为＞20000m^3/d。According to the Technical Guidelines for Environmental Impact Assessment - Surfacewater Environment (HJ2.3-2018), the project wastewater is directly discharged, and the wastewater discharge volume is >200,00m^3/d.	项目生产废水处理达标后汇入直接排放，排放量为 95023 m^3/d。Production wastewater of the Project will be directly discharged after reaching the standard, and the discharge volume is 95023m^3/d.
地下水环境 Groundwater environment	二级 Level II	根据《环境影响评价技术导则 地下水环境》（HJ610-2016），建设项目类别为 II 类，项目地下水较敏感。According to the Technical Guidelines for Environmental Impact Assessment- Groundwater Environment (HJ610-2016), the construction project category is Class II, and the project groundwater is relatively sensitive.	本项目行业类别为 II 类，场地周边村屯采用自打井抽取地下水，地下水环境敏感特征为较敏感。Industry category of the Project is Class II, villages around the site use self-drilled wells to take groundwater, and the environmental sensitivity of groundwater is relatively sensitive.
声环境 Acoustic environment	三级 Class III	《环境影响评价技术导则（声环境）》（HJ2.4-2009），项目用地类型为三类用地。According to the Technical Guidelines for Noise Impact Assessment (HJ2.4-2009), the types of land used for the Project falls under Class III.	工程建设前后评价范围内噪声等价增高量达 3dB（A）以下。The equivalent increase in noise within the assessment range before and after the project construction is below 3dB(A).
土壤 Soil	二级 Level II	根据 HJ964-2018，建设项目 II 类，占地规模大型，敏感程度为不敏感，判定为二级评价。According to HJ964-2018, the construction project is Class II, which covers a large area and is insensitive, and the assessment is rated Level II.	项目属于 II 类项目，位于工业园区，敏感程度为不敏感；本项目占地面积为 235.86hm^2≥50 hm^2。The Project, falling under Class II projects, is located in an industrial park and degree is insensitive. The project covers an area of 235.86hm^2≥50hm^2.
生态环境 Ecological environmental	三级 Class III	依据 HJ19-2011，工程影响范围＞2km^2，所在区域为一般区域。According to HJ19-2011, the project impact range is >2km^2, and the project area is a general area.	项目占地约 2.36km^2，总占地小于 2km^2，为生态一般区域 The Project covers an area of about 2.36km^2, with a total area of less than 2km^2, which is a general ecological area.
环境风险 Environmental risk	一级 Level I	根据 HJ/T169-2018，危险物质与工艺系统危害性（P）的等级为 P1，风险潜势为Ⅳ$^+$，评价等级为一级。According to HJ/T169-2018, the perniciousness (P) of hazardous substances and process systems is rated P1, the risk potential is rated IV	项目危险物质与工艺系统危害性（P）的等级为 P1，大气风险潜势为Ⅳ$^+$，地表水、地下水风险潜势为Ⅳ。The perniciousness (P) of hazardous substances and process systems in the Project is rated P1, the atmospheric risk potential is rated IV +, and the risk

评价内容 Assessment content	工作等级 Level	判定依据 Basis of judgment	建设项目情况 Basic situation of the Project
		+, and assessment is rated Level I.	potential of surface water and groundwater is both rated Level IV.

1.4.2 评价范围

1.4.2 Assessment range

根据评价项目的特征和《环境影响评价技术导则》的要求，确定本评价的范围，各环境要素评价范围见表 1.4-11，评价范围见图 5。

The assessment range is determined according to the characteristics of assessed project and the requirements of the Technical Guidelines for Environmental Impact Assessment. See Table 1.4-11 for the assessment range of each environmental factor and Figure 5 for the assessment range.

表 1.4-11　环境要素评价范围
Table 1.4-11 Assessment Range of Environmental Elements

序号 S.N.	项目 Item		评价范围 Assessment range
1	环境空气 Ambient air		以项目厂址为中心，边长 9×10km（东西×南北）的矩形区域。 A rectangular area with 9×10km (east-west × north-south) side length centered on the project site.
2	地表水 Surface water		主要为铁山港湾海域，地理坐标范围在 21°21.2′~21°44.3′N，109°28′~109°45.5′E 内，覆盖海域面积约 170km^2。 It is mainly distributed in the sea area of Tieshan Harbor, with geographical coordinates ranging from 21°21.2'-21°44.3'N and 109°28'~109°45.5'E , and an area of about 170km2.
3	地下水 Underground water		本项目位于南康盆地水文地质单元大江口次级单元，本次评价以项目所处水文单元，北至那格堂村一带；南至海岸线；西到地下水边界；东至川江村一带，面积约为 30km^2 的范围。 The Project is located in Dajiangkou Sub-unit of Hydrogeological Unit in Nankang Basins. This assessment takes the hydrological unit where the Project is located, with Nagetang Village in the north, the coastline in the south, groundwater boundary in the west, and Chuanjiang Village in the east.
4	声环境 Acoustic environment		项目建设地厂界外 200m 周边范围内。 Within 200m around the boundary of the project construction site., 0.2 km within the scope of the plant site and outside the boundary of the plant.
5	土壤 Soil		厂址范围内及厂界边界外 0.2km。 Within the factory site and 0.2km outside the boundary of the plant.
6	生态环境 Ecological environmental	陆域 Land area	与环境空气评价范围一致。 Consistent with the assessment range of ambient air.
		海域 Sea area	与地表水评价范围一致。 Consistent with the assessment range of surface water.
7	环境	大气 Atmosphere	距项目厂界 5km 范围内的区域。 Area within 5km from the project boundary.

序号 S.N.	项目 Item		评价范围 Assessment range
	风险 Environmental risk	地表水 Surface water	与本项目地表水评价范围一致 Consistent with the assessment range of surface water under the Project
	风险 Environmental risk	地下水 Groundwater	与本项目地下水评价范围一致 Consistent with the groundwater assessment range under the Project

1.5 环境保护目标和环境敏感目标

1.5 Environmental protection targets and environmental sensitive targets

项目位于北海铁山港（临港）工业区，陆域评价范围内无风景名胜区、自然保护区、饮用水源地保护区、集中式饮用取水口等敏感保护目标，也无珍稀动、植物物种，不属于重要生态功能区范围和重要生物多样性维护区。项目评价范围内主要环境敏感目标为居住区，距离项目最近的敏感点为项目厂界南面的川江和坡尾底（30m）。项目排污海域敏感目标还包括山口国家级红树林自然保护区、广西合浦儒艮国家级自然保护区、营盘附近农渔业区等。

The Project is located in the Tieshangang (Lingang) Industrial Zone of Beihai. There are no scenic spots, nature reserves, drinking water source protection zone, centralized drinking water intakes and other sensitive protection targets within the assessment range of land area, and there are also no rare plant and animal species. So the area is not an important ecological function zone and important biodiversity maintenance zone. The main environmental sensitive target is the residential area, and the sensitive point closest (30m) to the Project is Chuanjiang Village and Poweidi Village to the south of the project boundary. Sensitive targets of the Project's sewage discharge sea area further include Shankou National Mangrove Nature Reserve, Guangxi Hepu Dugong National Nature Reserve, and agricultural and fishery areas near Yingpan.

项目周边环境敏感目标分布情况见表 1.5-1、2 及附图 2。

See Table 1.5-1, 2 and Figure 2 for the distribution of environmental sensitive targets around the project.

表1.5-1 项目周围敏感保护目标

Table 1.5-1 Sensitive Protection Targets around the Project

序号 S/N	敏感点 Sensitive points	相对厂区方位 Relative location to plant area	与项目用地边界最近距离(m) Shortest distance to the project land boundary (m)	与项目制浆车间距离(m) Distance to project pulping workshop (m)	人口规模（人） Population (person)	饮用水情况 Drinking water	影响因素 Impact factors	保护目标 Protection target	备注 Remarks
1	川江 Chuanjiang	南 South	30	1000	400	井水 Well water	空气、风险、地下水、噪声 Air, risk, groundwater, noise	①《环境空气质量标准》（GB3095-2012）二级标准②《地下水质量标准》（GB14848-2017）III类标准 ③《声环境质量标准》（GB3096-2008）3 类标准 ① Class-II standard specified in Ambient Air Quality Standards (GB3095-2012) ② Class-III standard specified in Standard for Groundwater Quality (GB14848-2017)	部分位于项目用地范围内，属于用地搬迁范围，统计为未搬迁部分 Some targets are located in the project land, which falls under the scope of land acquisition and relocation, and only those relocated are counted.
2	坡尾底 Poweidi	南 South	30	900	200	井水 Well water	空气、风险、地下水、噪声 Air, risk, groundwater, noise		
3	岸泽 Anze	/	/	/	0	井水 Well water	空气、风险、地下水、噪声 Air, risk, groundwater, noise		位于项目用地范围内，属于用地搬迁范围全部搬迁 Located in project land and within the scope of land acquisition and relocation, the whole village has
4	北暮 Beimu	/	/	/	0	井水 Well water	空气、风险、地下水、噪声 Air, risk, groundwater, noise		

序号 S/N	敏感点 Sensitive points	相对厂区方位 Relative location to plant area	与项目用地边界最近距离(m) Shortest distance to the project land boundary (m)	与项目制浆车间距离(m) Distance to project pulping workshop (m)	人口规模（人） Population (person)	饮用水情况 Drinking water	影响因素 Impact factors	保护目标 Protection target	备注 Remarks
								③ Class III standard specified in the Environmental Quality Standard for Noise (GB3096-2008)	been completely relocated.
5	老妗垌 Laojindong	西 West	650	1550	1019	井水 Well water	空气、风险 Air, risk	《环境空气质量标准》(GB3095-2012）二级标准 Ambient Air Quality Standard (GB3095-2012) Class II standard	
6	邓屋（川江村） Dengwu (Chuanjiang Village)	西 West	310	1340	142	井水 Well water	风险 Risk		
7	山心 Shanxin	西 West	920	1970	280	井水 Well water	空气、风险 Air, risk		
8	南乐 Nanyue	西 West	740	1630	420	井水 Well water	空气、风险 Air, risk		
9	新铺 Xinpu	北 North	460	1530	816	井水 Well water	空气、风险 Air, risk		
10	竹儿根 Zhuergen	西 West	1080	2180	158	井水 Well water	空气、风险 Air, risk		
11	对面垌 Duimiandong	西 West	1070	1850	338	井水 Well water	空气、风险 Air, risk		
12	新岭	西	1300	2200	209	井水	空气、风险		

序号 S/N	敏感点 Sensitive points	相对厂区方位 Relative location to plant area	与项目用地边界最近距离(m) Shortest distance to the project land boundary (m)	与项目制浆车间距离(m) Distance to project pulping workshop (m)	人口规模（人） Population (person)	饮用水情况 Drinking water	影响因素 Impact factors	保护目标 Protection target	备注 Remarks
	Xinling	West				Well water	Air, risk		
13	猪血塘 Zhuxuetang	西 West	1600	2400	500	井水 Well water	空气、风险 Air, risk		
14	谢家村 Xiejiacun Village	北 North	1130	2230	360	井水 Well water	空气、风险 Air, risk		
15	彬嵩 Binsong	西 West	1400	2500	159	井水 Well water	空气、风险 Air, risk		
16	亚细村 Yaxi Village	北 North	1430	2530	755	井水 Well water	空气、风险 Air, risk		
17	华南北苑 Huanan Beiyuan	西 West	1740	2600	215	自来水 Tap water	空气、风险 Air, risk		
18	那格塘（陂头） Nagetang (Pitou)	西北 Northwest	1700	2650	212	井水 Well water	空气、风险 Air, risk		
19	海山排 Haishanpai	北 North	1400	2500	420	井水 Well water	空气、风险 Air, risk		
20	百班村 Baiban Village	西 West	1370	2210	48	人饮工程水塔 Water tower for drinking water project	空气、风险 Air, risk		
21	彬定（新） Binding (New village)	西南 Southwest	1650	2630	1019	井水 Well water	空气、风险 Air, risk	《环境空气质量标准》（GB3095-2012）二级标准	
22	邓九垌	北	1450	2600	100	井水	空气、风险		

序号 S/N	敏感点 Sensitive points	相对厂区方位 Relative location to plant area	与项目用地边界最近距离(m) Shortest distance to the project land boundary (m)	与项目制浆车间距离(m) Distance to project pulping workshop (m)	人口规模（人） Population (person)	饮用水情况 Drinking water	影响因素 Impact factors	保护目标 Protection target	备注 Remarks
	Dengjiudong	North				Well water	Air, risk	Ambient Air Quality Standard (GB3095-2012) Class II standard	
23	贵余坛村 Guiyutan Village	北 North	1970	3170	1100	井水 Well water	空气、风险 Air, risk		
24	南乐社区 Nanyue Community	北 North	2050	3170	280	井水 Well water	空气、风险 Air, risk		
25	中石化倒班宿舍（阳关海岸） Sinopec shift dormitory (Yangguan Haian)	西南 Southwest	2180	2950	572	自来水 Tap water	空气、风险 Air, risk		
26	东方海岸大酒店 Oriental Coast Hotel	南 South	2180	2800	100	自来水 Tap water	空气、风险 Air, risk		
27	油麻山村 Youmashan Village	北 North	2450	3620	120	井水 Well water	空气、风险 Air, risk		
28	东岸场村 Donganchang Village	东北 Northeast	2550	3500	370	井水 Well water	空气、风险 Air, risk		
29	山芦村 Shanlu Village	东北 Northeast	3000	4000	410	井水 Well water	空气、风险 Air, risk		

序号 S/N	敏感点 Sensitive points	相对厂区方位 Relative location to plant area	与项目用地边界最近距离(m) Shortest distance to the project land boundary (m)	与项目制浆车间距离(m) Distance to project pulping workshop (m)	人口规模（人） Population (person)	饮用水情况 Drinking water	影响因素 Impact factors	保护目标 Protection target	备注 Remarks
30	大炮岭村 Dapaoling Village	东北 Northeast	3500	4620	280	井水 Well water	空气、风险 Air, risk		
31	旦场村 Danchang Village	东北 Northeast	4000	4900	170	井水 Well water	空气、风险 Air, risk		
32	只郎村 Zhilang Village	西北 Northwest	3250	4220	140	井水 Well water	空气、风险 Air, risk		
33	浸谷塘村 Jingutang Village	西北 Northwest	4100	5200	160	井水 Well water	空气、风险 Air, risk		
34	港务集团宿舍区 Port Group dormitory	西南 Southwest	2600	3600	500	自来水 Tap water	空气、风险 Air, risk		
35	屋背山 Wubeishan	西 West	3200	4000	48	井水 Well water	空气、风险 Air, risk		
36	冲头村 Chongtou Village	西 West	3330	4280	338	井水 Well water	空气、风险 Air, risk		
37	大田 Datian	西 West	2200	3160	212	井水 Well water	空气、风险 Air, risk		
38	北塘村 Beitang Village	西 West	4050	4150	158	井水 Well water	空气、风险 Air, risk		
39	下底村	西	4000	4800	142	井水	空气、风险		

序号 S/N	敏感点 Sensitive points	相对厂区方位 Relative location to plant area	与项目用地边界最近距离(m) Shortest distance to the project land boundary (m)	与项目制浆车间距离(m) Distance to project pulping workshop (m)	人口规模（人） Population (person)	饮用水情况 Drinking water	影响因素 Impact factors	保护目标 Protection target	备注 Remarks
	Xiadi Village	West				Well water	Air, risk		
40	黄稍村 Huangshao Village	西 West	4200	5000	159	井水 Well water	空气、风险 Air, risk		
41	兴港镇彬定小学 Xinggang Town Binding Primary School	北 North	2500	3600	约 500 人 About 500 persons	井水 Well water	空气、风险 Air, risk		
42	红花根 Honghuangen	北 North	2600	3700	450	井水 Well water	空气、风险 Air, risk		
43	山梓 Shanzi	西北 Northwest	4700	5700	480	井水 Well water	空气、风险 Air, risk		
44	彬池村 Binchi Village	北 North	3000	4130	1000	井水 Well water	空气、风险 Air, risk		
45	下低垌村 Xiadidong Village	西北 Northwest	2600	3600	335	井水 Well water	空气、风险 Air, risk		
46	上高垌 Shanggaodong	西北 Northwest	3450	4450	150	井水 Well water	空气、风险 Air, risk		
47	上陂头 Shangpitou	西北 Northwest	3400	4400	310	井水 Well water	空气、风险 Air, risk		

序号 S/N	敏感点 Sensitive points	相对厂区方位 Relative location to plant area	与项目用地边界最近距离(m) Shortest distance to the project land boundary (m)	与项目制浆车间距离(m) Distance to project pulping workshop (m)	人口规模（人） Population (person)	饮用水情况 Drinking water	影响因素 Impact factors	保护目标 Protection target	备注 Remarks
48	下陂头 Xiapitou	西北 Northwest	3600	4640	300	井水 Well water	空气、风险 Air, risk		
49	南冲 Nanchong	西北 Northwest	4500	5500	350	井水 Well water	风险 Risk		
50	地罗 Diluo	西北 Northwest	4200	5250	209	井水 Well water	风险 Risk		
51	兴港镇 Xinggang Town	北 North	4750	5950	1200	井水 Well water	风险 Risk		
52	大竹园 Dazhuyuan	西南 Southwest	2400	3270	235	人饮工程水塔 Water tower for drinking water project	空气、风险 Air, risk		部分为北海炼化项目搬迁范围，范围内基本搬迁完毕 Some are located in the relocation scope of Beihai Refining and Chemical Project, and relocation within the scope has been basically completed.
53	槟榔根 Binlanggen	西南 Southw	2340	3280	10	井水 Well water	空气、风险 Air, risk		北海炼化项目搬迁范围，基本搬迁

序号 S/N	敏感点 Sensitive points	相对厂区方位 Relative location to plant area	与项目用地边界最近距离(m) Shortest distance to the project land boundary (m)	与项目制浆车间距离(m) Distance to project pulping workshop (m)	人口规模（人） Population (person)	饮用水情况 Drinking water	影响因素 Impact factors	保护目标 Protection target	备注 Remarks
		est							It is located in the relocation scope of Beihai Refining and Chemical Project, and relocation has been basically completed.

表 1.5-2 项目废水排放海域环境保护目标

Table 1.5-2 Environmental Protection Target of the Project Wastewater Discharge Sea Area

序号 S.N.	敏感目标名称 Name of sensitive target	敏感目标基本情况 Basic information of sensitive objectives	主要保护对象 Major protection target	水质保护目标 Water quality protection target	与 B3 排污口的相对位置与距离 Relative position to and distance from the sewage outlet B3	备注 Remarks
1	山口国家级红树林自然保护区（GX002AⅠ） Shankou National Mangrove Forest Nature Reserve (GX002AⅠ)	1990 年 9 月经国务院批准建立的我国首批(5 个)国家级海洋类型保护区之一，位于广西合浦县沙田半岛东西两侧，东侧英罗港，西侧丹兜港，经纬度为 E109°43′～10°46′，N21°28′～21°36′，英罗港为核心区，丹兜港主要为过渡区、缓冲区和小片的核心区。保护区总面积为 8000 hm^2（海域 4000 hm^2，陆域 4000 hm^2）。 It is one of the first five national marine reserves established in September 1990 upon approval by the State Council, and is located on the east and west sides of Shatian Peninsula in Hepu County, Guangxi, with Yingluo Port in the east and Dandou Port in the west. Its longitude and latitude are E109°43'~ 10°46' and N21°28'~21°36'. Yingluo Port is the core area, while Dandou Port is mainly used as a transition area, buffer area and small-range core area. The Reserve has a total area of is 8000hm2 (4000hm^2 for sea area and 4000hm^2 for land area).	红树林生态系统 Mangrove ecosystem	一类 Class I	东北，核心区 6km，试验区 3km Northeast, core area 6km, pilot area 3km	
2	广西合浦儒艮国家级自然保护区（GX001AⅠ） Guangxi Hepu Dugong National Nature Reserve (GX001AⅠ)	1992 年 10 月，被列为国家级自然保护区，保护区范围东起合浦县山口镇英罗港，西至沙田镇，岸线长 43km，位置是 E109°38′30.0″、N21°30′00.0″，E109°46′30.0″、N21°30′00.0″，E 109°44′00.0″、N21°18′00.0″，E109°34′30.0″、N21°18′00.0″围成的海域，其中核心区面积 132km^2，缓冲区面积 110km^2，实验区面积 108km^2。 In October 1992, the reserve was listed as a national nature reserve, and stretches from Yingluo Port, Shankou Town, Hepu County in the east, to Shatian Town in the west, the Reserve has a shoreline of 43km. The locations are E109°38'30.0", N21°30'00.0",	保护以儒艮和中华白海豚为主的珍稀海洋生物及其栖息环境 Protect the rare marine life and its habitat mainly dugongs and Chinese white dolphins	一类 Class I	东，5km East, 5km	

		E109°46'30.0", N21°30'00.0", E109°44'00.0", N21°18'00.0", E109°34'30.0" and N21°18'00.0", which forms a sea area with core area of 132km2, the buffer area of 110km2, and the experimental area of 108km2.				
3	北部湾二长棘鲷长毛对虾国家级种质资源保护区 Beibu Gulf Parargyrops Edita and Penaeus Penicillatus National Germplasm Resource Nature Reserve	总面积 1142158.03 公顷，其中核心区面积 808771.36 公顷，实验区面积 333386.67 公顷。保护区位于北部湾东北部沿岸区域，由北纬 21°31′线、五个拐点连线及广西自治区防城港市、北海市海岸线组成主要保护对象为二长棘鲷和长毛对虾，其他保护物种包括金线鱼、蓝圆鲹、黄带鲱鲤、马氏珠母贝、方格星虫等。 The total area is 1142,158.03 hectares, including 808,771.36 hectares for the core area and 333,386.67 hectares for the experimental area. The Reserve is located in the northeastern coastal area of Beibu Gulf and consists of the N21°31', the line connecting five inflection points and the coastlines of Fangchenggang City and Beihai City in Guangxi Autonomous Region. Main protection targets include parargyrops edita and penaeus penicillatus; and other protected species include nemipterus virgatus, decapterus maruadsi, upeneussulphureus, pinctada martensii, Sipunculus nudus, etc.,	二长棘鲷和长毛对虾 Parargyrops edita and penaeus penicillatus	二类 Category II	西南，16km Southwest, 16km	
4	海草床 Sea grass bed	广西合浦海草床由淀洲沙沙背、淀洲沙下龙尾、英罗、九合井底、榕根山共 5 个海草床组成，为广西海草的主要分布区以及过去儒艮的主要进食区。海草种类包括卵叶喜盐草(Halophila ovalis)、日本鳗草(Zostera japonica)、单脉二药草(Haloduie uninervis)、贝克喜盐草(Halophila beccarii)，优势种为卵叶喜盐草、贝克喜盐草和日本鳗草。 Sea grass beds in Hepu, Guangxi, consists of Dianzhousha shabei, Dianzhousha Xialongwei Yingluo, Jiuhe Jingdi and Ronggenshan, which are the main distribution areas of sea grass in Guangxi and the previous main feeding areas for Dugong. Sea grass species include Halophila ovalis, Zostera japonica, Haloduie uninervis and Halophila beccarii. The dominant species are Halophila ovalis, Halophila beccarii and Zostera japonica.	海草床 Sea grass bed	与所处环境功能区相同 Matched with the environmental function zone	距离东北侧淀洲沙沙背和下龙尾海草区较近，最近距离约 3km It is nearby Dianzhousha shabei and Xialongwei sea grass areas, with the shortest distance of only about 3km.	

《广西海洋生态红线划定方案》（桂政函〔2017〕233 号）将广西海洋生态红线区分为禁止类红线区和限制类红线区，具体划分了 2 类禁止类红线区和 8 类限制类红线区共 54 个，其中禁止类红线区 5 个，限制类红线区 49 个。

Regulations on Delineation of Guangxi Marine Ecological Red Line (GZH[2017] No.233) divides marine ecological red line in Guangxi into 2 types of prohibited red line areas and 8 types of restricted red line areas, specifically 54 types of red line areas including 5 prohibited red line areas and 49 restricted red line areas.

其中，广西合浦儒良保护区禁止类红线区（45-Ja02）属于海洋自然保护区，四至位置为 109°35'24"、109°43'45"、21°20'41"、21° 28'36"，红线面积 131.51km^2，生态目标为海草生态系统及其生境、中华白海豚、中国鲎、海马等；管控要求在海洋自然保护区的核心区和缓冲区，禁止开展任何形式的开发建设活动。管控措施：按照《中华人民共和国自然保护区条例》（2017 年修订）和《海洋自然保护区管理办法》（1995 年 5 月 11 日）进行管理。除进行必要的调查、科研和管理活动外，禁止进行其他活动。环境保护要求：维持海草床及邻近海域自然生态系统，保护生态保护目标及其生境。海水水质、海洋沉积物质量和海洋生物质量均不劣于一类标准。广西合浦儒良保护区限制类红线区（45-Xa02）属于海洋自然保护区，四至位置为 109°38'02"、109°45'59"、21°22'47"、21°30'00"，红线面积 56.52km^2，岸线长度 3.23km 生态目标为海草生态系统及其生境、中华白海豚、中国鲎、海马等；管控要求基本管控要求：1、禁止围填海。2、禁止采挖海砂。3、不得新增入海陆源工业直排口。4、严格控制河流入海污染物排放，海洋生态红线区陆源入海直排口污染物排放达标率达 100%。5 、控制养殖规模，鼓励生态化养殖。6、对已遭受破坏的海洋生态红线区，实施可行的整治修复措施，恢复原有生态功能。7 、实行海洋垃圾巡查清理制度，有效清理海洋垃圾。管控措施：按照《中华人民共和国自然保护区条例》（2017 年修订）和《海洋自然保护区管理办法》（1995 年）进行管理。在不影响保护前提下，可适度进行旅游开发等用海活动。环境保护要求：维持、恢复、改善海洋生态环境和海草床生态系统的生物多样性，减少或避免保护区周边海域环境污染。海水水质、海洋沉积物质量和海洋生物质量均不劣于一类标准。

Among them, the prohibited red line area (45-Ja02) of Guangxi Hepu Dugong National Nature Reserve is a marine nature reserve, with four directions of 109°35'24", 109°43'45", 21°20'41" and 21°28'36", and a red line area of 131.51km2. Ecological targets are sea grass ecosystem and its habitat, Chinese white dolphins, tachypleus tridentatus leach, seahorse, etc. According to control requirements, any form of development and construction activities are prohibited in the core area and buffer area of the marine nature reserve. Control measures: Management shall be carried out in accordance with the Regulations of the People's Republic of China on Nature Reserves (2017 amendment) and the Measures for the Administration of Marine Nature Reserves (May 11, 1995). Activities are prohibited except for necessary investigations, scientific researches and management activities. Environmental protection requirements: maintain the natural ecosystem of sea grass beds and adjacent sea areas, and protect ecological protection targets and their habitats. Seawater quality, marine sediment quality and marine biological quality are not inferior to Class I standards. The restricted red line area (45-Xa02) of Guangxi Hepu Dugong National Nature Reserve is a marine nature reserve, with four directions of 109°38'02", 109°45'59", 21°22'47" and 21°30'00", a red line area of 56.52km2, and a coastline of 3.23km long. Ecological targets are sea grass ecosystem and its habitat, Chinese white dolphins, tachypleus tridentatus leach, seahorse, etc. Control Requirements: Basic control requirements: 1. Reclamation is prohibited. 2. Exploiting sea sand is prohibited. 3. It is prohibited to add any new direct discharge outlet for industrial wastes from land and sea sources. 4. Strictly control the discharge of pollutants from rivers into the sea, and the up-to-standard discharge rate of pollutants from land sources into the sea in the marine ecological red line area shall be 100%. 5. Control the breeding scale and encourage ecological breeding. 6. For the damaged marine ecological red line areas, feasible remediation and restoration measures shall be taken to restore the original ecological functions. 7. Patrol inspection and cleaning system shall be implemented over marine litters for effective cleaning. Control measures: Management shall be carried out in accordance with the Regulations of the People's Republic of China on Nature Reserves (2017 amendment) and the Measures for the Administration of Marine Nature Reserves (May 1995). Tourism development and other marine activities can be appropriately carried out without affecting the protection. Environmental protection requirements: maintain, restore and improve the biodiversity of marine ecological environment and sea grass bed ecosystem, and reduce or avoid environmental pollution in the sea areas around protection areas. Seawater quality, marine sediment quality and marine biological quality are not inferior to Class I standards.

广西山口红树林保护区禁止类红线区（45-Ja03）属于海洋自然保护区，四至位置为 109°37'29"、109°46'59"、21°28'21"、21°36'44"，红线面积 36.73km^2，岸线长度 14.18km；

生态目标为红树林及其生境、中国鲎、海马、珍稀鸟类等。管控要求：在海洋自然保护区的核心区和缓冲区，禁止开展任何形式的开发建设活动。管控措施：按照《中华人民共和国自然保护区条例》（2017 年修订）和《海洋自然保护区管理办法》（1995 年 5 月 11 日）进行管理。除进行必要的调查、科研和管理活动外，禁止进行其他活动。环境保护要求：维持红树林及邻近海域自然生态系统，保护生态保护目标及其生境。海水水质、海洋沉积物质量和海洋生物质量均不劣于一类标准。广西山口红树林保护区限制类红线区（45-Xa03）四至位置为 109°37'22"、109°46'19"、21°28'21"、21°36'44"，红线面积 10.76km^2，岸线长度 4.44km；生态目标为红树林及其生境、中国鲎、海马、珍稀鸟类等。管控要求基本管控要求：1、禁止围填海。2、禁止采挖海砂。3、不得新增入海陆源工业直排口。4、严格控制河流入海污染物排放，海洋生态红线区陆源入海直排口污染物排放达标率达 100%。5、控制养殖规模，鼓励生态化养殖。6、对已遭受破坏的海洋生态红线区，实施可行的整治修复措施，恢复原有生态功能。7、实行海洋垃圾巡查清理制度，有效清理海洋垃圾。管控措施：按照《中华人民共和国自然保护区条例》（2017 年修订）和《海洋自然保护区管理办法》（1995 年）进行管理。在不影响保护前提下，可适度进行旅游开发等用海活动。环境保护要求：维持、恢复、改善海洋生态环境和海草床生态系统的生物多样性，减少或避免保护区周边海域环境污染。海水水质、海洋沉积物质量和海洋生物质量均不劣于一类标准。

Prohibited red line area (45-Ja03) of Shankou Mangrove Reserve in Guangxi is a marine nature reserve, with four directions of 109 ° 37'29", 109°46'59", 21°28'21" and 21°36'44". The red line area is 36.73km2 and the coastline length is 14.18 km. Ecological targets are mangroves and their habitats, tachypleus tridentatus leach, seahorse, rare birds, etc. According to control requirements, any form of development and construction activities are prohibited in the core area and buffer area of the marine nature reserve. Control measures: Management shall be carried out in accordance with the Regulations of the People's Republic of China on Nature Reserves (2017 amendment) and the Measures for the Administration of Marine Nature Reserves (May 11, 1995). Activities are prohibited except for necessary investigations, scientific researches and management activities. Environmental protection requirements: maintain the natural ecosystem of mangroves and adjacent sea areas, and protect ecological protection targets and their habitats. Seawater quality, marine sediment quality and marine biological quality are not inferior to Class I standards. Restricted red line area (45-Xa03) of

Shankou Mangrove Reserve in Guangxi has four directions of 109 ° 37'22", 109°46'19", 21°28'21" and 21°36'44". The red line area is 10.76km2 and the coastline length is 4.44 km. Ecological targets are mangroves and their habitats, tachypleus tridentatus leach, seahorse, rare birds, etc. Control Requirements: Basic control requirements: 1. Reclamation is prohibited. 2. Exploiting sea sand is prohibited. 3. It is prohibited to add any new direct discharge outlet for industrial wastes from land and sea sources. 4. Strictly control the discharge of pollutants from rivers into the sea, and the up-to-standard discharge rate of pollutants from land sources into the sea in the marine ecological red line area shall be 100%. 5. Control the breeding scale and encourage ecological breeding. 6. For the damaged marine ecological red line areas, feasible remediation and restoration measures shall be taken to restore the original ecological functions. 7. Patrol inspection and cleaning system shall be implemented over marine litters for effective cleaning. Control measures: Management shall be carried out in accordance with the Regulations of the People's Republic of China on Nature Reserves (2017 amendment) and the Measures for the Administration of Marine Nature Reserves (May 1995). Tourism development and other marine activities can be appropriately carried out without affecting the protection. Environmental protection requirements: maintain, restore and improve the biodiversity of marine ecological environment and sea grass bed ecosystem, and reduce or avoid environmental pollution in the sea areas around protection areas. Seawater quality, marine sediment quality and marine biological quality are not inferior to Class I standards.

项目未占用上述海洋生态禁止类红线区和限制类红线区，项目排污口与生态红线关系见图1.5-1。

The Project does not occupy the above-mentioned marine ecological prohibited red line area and restricted red line area. See Figure 1.5-1 for the relationship between the sewage outlet of the Project and the ecological red line.

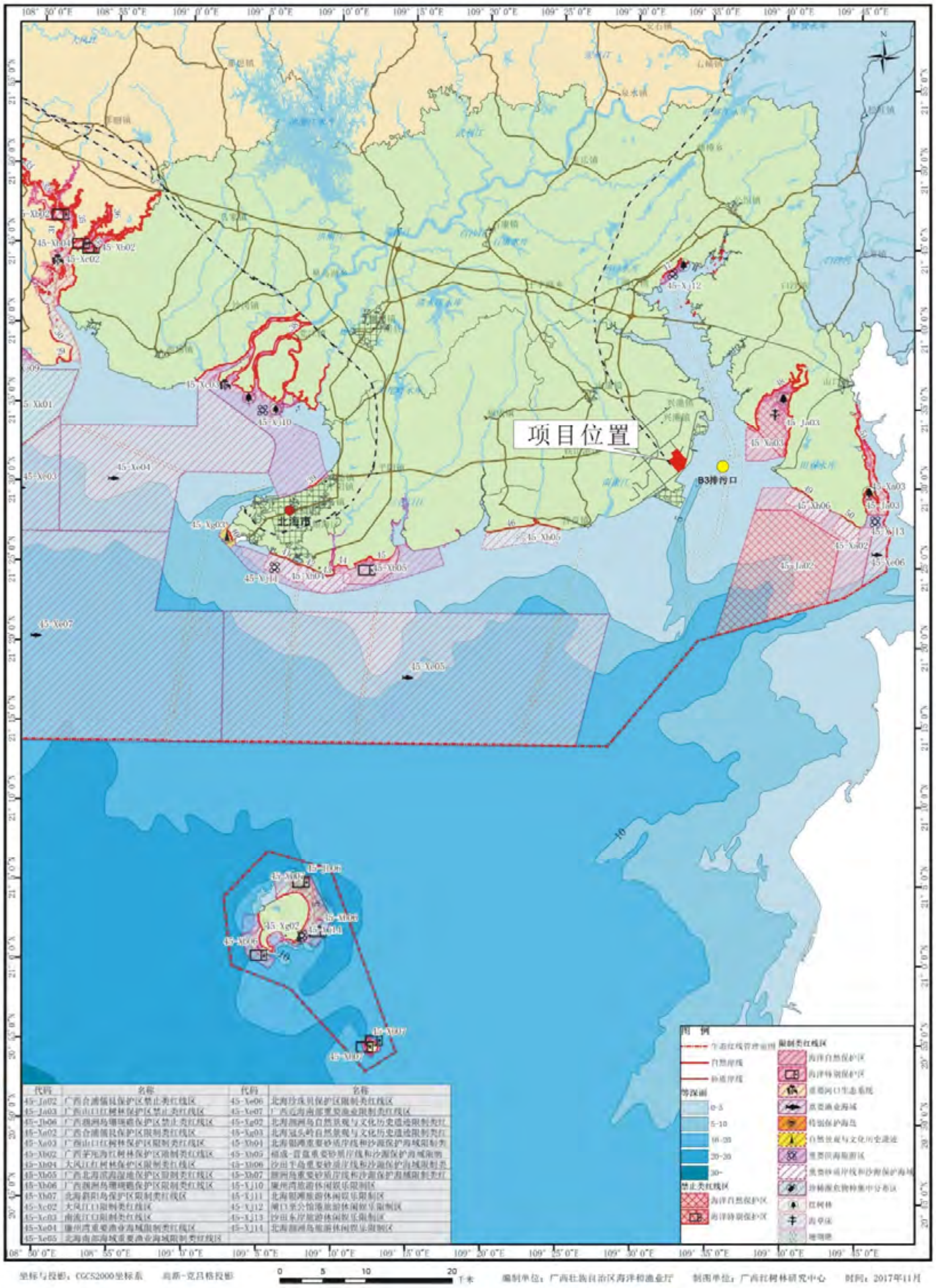


图 1.5-1 项目排污口与广西海洋生态红线关系示意图

Figure 1.5-1 Schematic Diagram of Relationship between Project Sewage Outlet and Guangxi Marine Ecological Red Line

1.6 相关政策、规范相符性分析

1.6 Analysis of compliance with relevant policies and norms

1.6.1 项目与相关产业政策符合性分析

1.6.1 Analysis of compliance of the Project with relevant industrial policies

（1）与《产业结构调整指导目录》符合性分析

(1) Analysis of compliance with Catalog for Guiding Industry Restructuring

根据《产业结构调整指导目录（2019 年本）》鼓励类，十九轻工包括："1、单条化学木浆 30 万吨/年及以上、化学机械木浆 10 万吨/年及以上、化学竹浆 10 万吨/年及以上的林纸一体化生产线及相应配套的纸及纸板生产线（新闻纸、铜版纸除外）建设；采用清洁生产工艺、以非木纤维为原料、单条 10 万吨/年及以上的纸浆生产线建设。3、无元素氯（ECF）和全无氯（TCF）化学纸浆漂白工艺开发及应用。"

According to the category of encouraged projects stipulated in the Catalog for Guiding Industry Restructuring (2019 Edition), Category IX light industries include: "1. Construction of single forest-paper integration production lines for chemical wood pulp of 300,000t/a or more, chemi-mechanical pulp of 100,000t/a or more, chemical bamboo pulp of 100,000t/a or more, and corresponding supporting paper and cardboard production lines (except newsprint and coated paper); construction of single pulp production lines of 100,000t/a or more using clean production technology and non-wood fiber as raw materials. 3. Development and application of element-free chlorine (ECF) and totally chlorine-free (TCF) chemical pulp bleaching processes."

项目建设内容包括一条年产 80 万吨漂白化学木浆生产线，一条年产 20 万吨化机浆生产线和一条年产 40 万吨化机浆生产线，配套相应规模的文化用纸、特种纸、白卡纸、生活用纸和纸板生产线；制浆采用无元素氯（ECF）化学纸浆漂白工艺。项目生产线规模和采用的工艺均符合《产业结构调整指导目录（2019 年本）》鼓励类要求。

Construction of the Project includes a production line of 800,000t/a bleached chemical wood pulp, a production line of 200,000t/a chemi-mechanical pulp and a production line of 400,000t/a chemi-mechanical pulp, matched with corresponding scale of production lines for cultural paper, specialty paper, white cardboard, household paper and paperboard. Elemental chlorine-free (ECF) chemical pulp bleaching process is adopted for pulping. Scale of the project production line and the process adopted meet the requirements of encouraged projects as stipulated in Catalog for Guiding Industry Restructuring (2019 Edition).

（2）与《造纸产业发展政策》符合性分析

(2) Analysis of compliance with the Policies on Development of Paper-making Industry

《造纸产业发展政策》由国家发改委于 2007 年发布，本项目与《造纸产业发展政策》的相符性分析见表 1.6-1。

The Policies on Development of Paper-making Industry were issued by the National Development and Reform Commission in 2007. See Table 1.6-1 for the analysis of project compliance with the polices.

表 1.6-1 与《造纸产业发展政策》符合性分析
Table 1.6-1 Package list of project compliance analysis with Policies on Development of Paper-making Industry

《造纸产业发展政策》 **Policies on Development of Paper-making Industry**		项目情况 **Project information**	符合性 **Compliance**
产业布局 Industry layout	西南地区要合理利用木、竹资源，变资源优势为经济优势，坚持木浆、竹浆并举； In the southwest region, the Project shall make rational use of wood and bamboo resources, transform resource advantages into economic advantages, and adhere to the simultaneous development of wood pulp and bamboo pulp.	广西区位上属西南地区，有丰富的速生林资源，本项目原料采用本地丰富的桉木生产漂白化学木浆 Guangxi is located in the southwest region and has abundant fast-growing forest resources, and the raw materials of the Project are rich local eucalyptus wood to produce bleached chemical wood pulp.	符合 Compliance
	重点环境保护地区、严重缺水地区、大城市市区，不再布局制浆造纸项目 No extra pulp- and paper-making project should be deployed in the key areas of environmental protection and serious shortage of water or the downtown areas of big cities.	本项目位于北海铁山港（临海）工业区，不属于重点环境保护地区、严重缺水地区、大城市市区 The Project is located in Tieshangang (Linhai) Industrial Park in Beihai, and is not a key environmental protection area, severe water-shortage area or metropolitan area.	符合 Compliance
纤维原料 Fiber raw material	加快推进林纸一体化工程建设，大力发展木浆，鼓励利用木材采伐剩余物、木材加工剩余物、进口木材和木片等生产木浆，合理进口国外木浆。 Accelerate the construction of forest-paper integration projects, vigorously develop wood pulp, encourage the use of wood harvesting residues, wood processing residues, imported wood and wood chips to produce wood pulp, and rationally import foreign wood pulp.	本项目为林浆纸一体化项目，木材原料来自太阳纸业老挝林浆纸一体化原料林基地供给、广西本地采购桉木以及海外采购，生产木浆及纸制品。 The Project is a forest-pulp-and-paper integration project. The wood raw materials are supplied from Sun Paper (Laos) forest-pulp-and-paper integration raw material forest base, the eucalyptus purchased in Guangxi and materials purchased overseas to	符合 Compliance

《造纸产业发展政策》 Policies on Development of Paper-making Industry		项目情况 Project information	符合性 Compliance
		produce wood pulp and paper products.	
技术与设备 Technology and equipment	造纸产业技术应向高水平、低消耗、少污染的方向发展。鼓励发展应用高得率制浆技术，生物技术，低污染制浆技术，中浓技术，无元素氯或全无氯漂白技术，低能耗机械制浆技术，高效废纸脱墨技术等以及相应的装备。优先发展应用低定量、高填料造纸技术，涂布加工技术，中性造纸技术，水封闭循环技术，化学品应用技术以及宽幅、高速造纸技术，高效废水处理和固体废物回收处理技术。 Paper-making technology shall develop towards high level, low consumption and less pollution. Encourage the development and application of high-yield pulping technology, biotechnology, low-pollution pulping technology, medium-concentration technology, elemental chlorine-free or chlorine-free bleaching technology, low-energy consumption mechanical pulping technology, high efficiency waste paper deinking technology and the corresponding equipment. Give priority to develop and apply light-weight, highly-loaded paper-making technology, coating processing technology, neutral paper-making technology, water closed circulation technology, chemicals application technology, wide breadth and high-speed paper-making technology, efficient wastewater treatment and solid waste recycling technology.	本项目采取高得率制浆技术、低污染制浆技术、无元素氯漂白技术等先进的制浆造纸技术，单位产品产排污、能耗均较小。无淘汰和禁止使用的设备。 The Project adopts advanced pulping and paper-making technologies such as high yield pulping technology, low pollution pulping technology and elemental chlorine-free bleaching technology, with less pollutant production & discharge and energy consumption per unit product. No outdated or prohibited equipment is used.	符合 Compliance
行业准入 Industry access	“造纸产业发展要实现规模经济，突出起始规模。新建、扩建制浆项目单条生产线起始规模要求达到：化学木浆年产 30 万吨、化学机械木浆年产 10 万吨、化学竹浆年产 10 万吨、非木浆年产 5 万吨；新建、扩建造纸项目单条生产线起始规模要求达到：新闻纸年产 30 万吨、文化用纸年产 10 万吨、箱纸板和白纸板年产 30 万吨、其他纸板项目年产 10 万吨。薄页纸、特种纸及纸板项目以及现有生产线的改造不受规模	单条化学木浆生产线年产 80 万吨，单条化机浆年产 20 万吨和 40 万吨，文化用纸年产 55 万吨，特种纸年产 50 万吨、白卡纸年产 90 万吨、生活用纸年产 15 万吨。 Single 800,000t/a chemical wood pulp production line, single 200,000t/a and 400,000t/a chemi-mechanical pulp production line, single 550,000t/a cultural paper production line, single 500,000t/a specialty paper production line, single 900,000t/a	符合 Compliance

《造纸产业发展政策》 Policies on Development of Paper-making Industry		项目情况 Project information	符合性 Compliance
	准入条件限制。" The development of paper-making industry shall realize scale economy and highlight the initial scale. The initial scale of a single production line for the newly-built and expanded pulping project shall reach 300,000t/a chemical wood pulp, 100,000t/a chemi-mechanical pulp, 100,000t/a chemical bamboo pulp and 50,000t/a non-wood pulp. The initial scale of a single production line for newly-built and expanded paper-making projects shall each 300,000t/a newsprint, 100,000t/a cultural paper, 300,000t/a case board and white cardboard, and 100,000t/a other paperboard projects. Tissue paper, specialty paper and cardboard projects, as well as the transformation of existing production lines are not limited by the scale access conditions."	white cardboard production line, and single 150,000t/a household paper production line.	
	新建项目吨产品在 COD 排放量、取水量和综合能耗（标煤）等方面要达到先进水平。其中漂白化学木浆为 10 千克、45 立方米和 500 千克；化学机械木浆为 9 千克、30 立方米和 1100 千克。 Ton products of the newly-built project shall reach the advanced level in terms of COD emission, water intake and comprehensive energy consumption (standard coal), that is, 10kg, 45m3 and 500kg respectively for bleached chemical wood pulp, and 9kg, 30m3 and 1100kg respectively for chemi-mechanical pulp.	根据工程数据核算，本项目漂白化学木浆吨产品的 COD 排放量、取水量分别约为 1.323 千克、29.5 立方米、综合能耗（标煤）141.7 千克。化学机械木浆吨产品的 COD 排放量、取水量分别为 0.92 千克、11.4 立方米、综合能耗（标煤）221.4 千克。 According to the engineering data, the COD emission and water intake of bleached chemical wood pulp per ton of products in the Project are about 1.323kg and 29.5m3 respectively, and the comprehensive energy consumption (standard coal) is 141.7kg. The COD emission and water intake of chemi-mechanical pulp per ton of products ton products are 0.92kg and 11.4m3 respectively, and the comprehensive energy consumption (standard coal) is 221.4kg.	符合 Compliance

（3）与造纸工业"十三五"发展意见的符合性分析

(3) Analysis of compliance with the opinions on development of paper industry during the 13th Five-year Plan

项目与《中国造纸协会关于造纸工业"十三五"发展的意见》（中纸协〔2017〕11 号）

的符合性见表 1.6-2。

Conformance of the Project with Opinions of the China Paper Association on the Development of Paper Industry during the 13th Five-year Plan (ZZX [2017] No. 11) is shown in Table 1.6-2.

表 1.6-2　与《中国造纸协会关于造纸工业"十三五"发展的意见》符合性分析
Table 1.6-2 Analysis of Compliance with Opinions of the China Paper Association on the Development of Paper Industry during the 13th Five-year Plan

《中国造纸协会关于造纸工业"十三五"发展的意见》 **Opinions of the China Paper Association on the Development of Paper Industry during the 13th Five-year Plan**	项目情况 **Project information**	符合性 **Compliance**
5.3 产品结构。增强新产品开发能力和品牌创建能力，重点调整提升和优化未涂布印刷用纸、生活用纸、包装用纸及纸板、特种纸及纸板的产品质量和品种结构，以适应多元化消费市场需求，形成高、精、特、差异化的纸及纸板产品结构。 5.3 Product structure. We will enhance our ability to develop new products and create brands, and focus on adjusting, improving and optimizing the product quality and variety structure of uncoated printing paper, household paper, packaging paper & cardboard, and specialty paper and cardboard, to satisfy the diversified consumer market demands and form a high, fine, special and differentiated paper and cardboard product structure.	本项目配套造纸生产包括文化纸、特种纸、白卡纸、生活用纸等多种品种。 The supporting paper production of the Project includes cultural paper, specialty paper, white cardboard, household paper and other varieties of paper.	符合 Compliance
6.1 调整产业区域结构，推进产业协调发展。西南地区：要以木竹资源开发为重点，加大林区道路等基础设施建设，合理规划布局。可适当发展一定规模的木浆和竹浆，并充分利用区域内废纸资源，变资源优势为经济优势。 6.1 Adjust the regional industry structure and promote coordinated industry development Southwest China: priority shall be given to exploiting wood and bamboo resources, strengthening infrastructure construction such as forest roads, and rationally planning the layout. Wood pulp and bamboo pulp of a certain scale can be properly developed, and waste paper resources in the region can be fully utilized to transform resource advantages into economic advantages.	广西区位上属西南地区，有丰富的速生林资源，本项目部分原料采用本地丰富的桉木生产漂白化学木浆 Guangxi is located in the southwest region and has abundant fast-growing forest resources, and Some raw materials of the Project are rich local eucalyptus wood to produce bleached chemical wood pulp.	符合 Compliance
6.2 提高产业集中度。调整企业规模结构，改变企业数量多、规模小、布局分散的局面，大宗品种以规模化先进产能替代落后产能。"十三五"期间制浆造纸项目的建设要贯彻适度经济规模的要求，发挥规模效益。 6.2 Increase industrial concentration. We will adjust the scale and structure of enterprises, change the situation of large number, small scale and scattered distribution of enterprises, and replace outdated capacity with large-scale advanced production capacity for bulk commodities. Construction of pulping and paper-making projects during the 13th Five-year Plan shall implement the requirements of moderate economic scale and give full play to scale benefits.	本项目制浆造纸综合产能达到 350 万吨/年，通过规模化综合性生产，实现经济效益和环境效益的双丰收。 Comprehensive production capacity of pulping and paper-making in the Project has reached 3.5 million t/a; economic and environmental benefits may be both realized by virtue of large-scale comprehensive production.	符合 Compliance
6.2 新建和技术改造项目起始规模。新建化学木浆单条	单条化学木浆生产线年产 80	符合

《中国造纸协会关于造纸工业"十三五"发展的意见》 **Opinions of the China Paper Association on the Development of Paper Industry during the 13th Five-year Plan**	项目情况 **Project information**	符合性 **Compliance**
生产线30万吨/年及以上；新建化学机械木浆单条生产线 10 万吨/年及以上；新闻纸限制新建，铜版纸限制新建，白纸板限制新建，薄页纸、特种纸及纸板起始规模不作规定 6.2 Initial scale of newly-built projects and technological transformation projects. Newly-built single chemical wood pulp production line of 300,000t/a or more; newly-built single chemi-mechanical pulp production line of 100,000t/a or more; newly-built newsprint project, newly-built coated paper project and newly-built white cardboard project are all limited; but the initial scale of tissue paper, specialty paper and cardboard projects is not specified	万吨，单条化机浆年产20万吨和40万吨，文化用纸年产55万吨，特种纸年产50万吨、白卡纸年产90万吨、生活用纸年产15万吨。 Single 800,000t/a chemical wood pulp production line, single 200,000t/a and 400,000t/a chemi-mechanical pulp production line, single 550,000t/a cultural paper production line, single 500,000t/a specialty paper production line, single 900,000t/a white cardboard production line, and single 150,000t/a household paper production line.	Compliance
6.3 提高木纤维比重。木材原料供应要充分利用国内、国外两种资源，支持企业提升原料自给能力。……鼓励进口原木、木片、木浆，鼓励国内企业到境外进行森林资源建设，或投资建设大型造纸原料林基地。鼓励境内企业使用进口木片原料，在国内适宜地区建设大型商品纸浆及造纸项目，或改造提升现有木浆生产线规模。 6.3 Increase the proportion of wood fiber. The supply of wood raw materials should make full use of domestic and foreign resources to support the Company to enhance own self-sufficiency in raw materials. The import of logs, wood chips and wood pulp is encouraged; and domestic enterprises are encourage to carry out forest resource construction overseas, or invest in the construction of large paper-making raw material forest bases. Domestic enterprises are also encouraged to use imported wood chip as raw materials, to build large-scale commercial pulp and paper making projects in suitable areas in China, or upgrade the scale of existing wood pulp production lines.	本项目木材原料来自太阳纸业老挝林浆纸一体化原料林基地供给、广西本地采购桉木以及海外采购。 Wood raw materials for the Project are supplied from Sun Paper (Laos) Forest-pulp-and-paper Integration Raw Material Forest Base, the eucalyptus purchased in Guangxi and materials purchased overseas. 本项目选址位于北海市具备较好的建设大型商品纸浆及造纸项目条件。 The Project is located in Beihai City and is conditioned for the construction of large-scale commercial pulp and paper-making projects.	符合 Compliance
6.4 提高资源综合利用水平。充分利用好黑液、废渣、污泥、生物质气体等典型生物质能源，提高热电联产水平，对生产环节产生的余压、余热等能源，以及废气（沼气及其他废气）、废液（纸浆黑液及其他废水）及其他废弃物进行回收利用，最大限度实现资源化。 6.4 Improve comprehensive utilization of resources. Typical biomass energies such as black liquor, waste residue, sludge and biomass gas shall be fully utilized, improve the cogeneration level shall be improved, and energy sources such as residual pressure and waste heat generated in the production process, as well as waste gas (biogas and other waste gases), waste liquid (pulp black liquor and other wastewater) and other wastes shall be	碱回收炉焚烧黑液产生大量的高温高压蒸汽可以驱动汽轮机发电机供热，同时充分利用木屑、废渣、污泥等配套建一台固体综合利用污泥锅炉，提高热电联产水平。对生产环节产生的余压、余热、废弃物等充分回收利用，，最大限度实现资源化，减少化石燃料用量。 A large amount of high-temperature	符合 Compliance

《中国造纸协会关于造纸工业"十三五"发展的意见》 **Opinions of the China Paper Association on the Development of Paper Industry during the 13th Five-year Plan**	项目情况 **Project information**	符合性 **Compliance**
recycled, thus maximizing the recycling.	high-pressure steam generated by burning black liquor in the alkali recovery furnace can drive the steam turbine generator to supply heat; and a comprehensive solid sludge utilization boiler is built by making full use of sawdust, waste residue, sludge, etc. to improve the cogeneration level. Residual pressure, waste heat, wastes and the like generated in the production process are fully recycled to maximize the recycling and reduce the consumption of fossil fuels.	

（4）与广西工业高质量发展行动计划的符合性分析

(4) Analysis of compliance with Action Plan of Guangxi Industrial High Quality Development

为贯彻《中共广西壮族自治区委员会 广西壮族自治区人民政府关于推动工业高质量发展的决定》（桂发〔2018〕11 号）精神，落实工业高质量发展的目标任务，广西壮族自治区人民政府印发了《广西工业高质量发展行动计划（2018—2020 年）》（桂政发〔2018〕30 号）。广西壮族自治区工业和信息化委员会印发了《广西木材加工和造纸产业集群及产业链发展方案》（以下简称"发展方案"）。"发展方案"中关于造纸产业相关内容为：

To implement the spirit of the Decision of the Guangxi Zhuang Autonomous Region Committee of the Communist Party of China and the Guangxi Zhuang Autonomous Region People's Government on Promoting High-quality Industrial Development" (GF [2018] No.11) and perform the target tasks of high-quality industrial development, the People's Government of Guangxi Zhuang Autonomous Region issued the Action Plan of Guangxi Industrial High Quality Development (2018-2020) (GZF [2018] No.30). Industry and Information Technology Committee of Guangxi Zhuang Autonomous Region issued the Plan for the Development of Guangxi Wood Processing and paper-making industry Cluster and Industrial Chain (the "Development Plan"). Relevant contents of the Development Plan on paper-making industry are as follows:

"三、重点任务 （一）推动集聚发展，加快构建产业集群"：

"III. Key Tasks (a) Promote the development of agglomeration and accelerate the establishment of industrial clusters":

北部湾造纸产业群。把握北部湾经济区开发和国家“一带一路”战略的重大机遇，充分发挥资源优势、政策优势及区位优势，以广西金桂、斯道拉恩索（广西）、重组防城港宏源、龙州南华纸业、横县东糖纸业、横县江南纸业、广西天力丰生态材料、南宁市佳达纸业等为龙头企业，大力发展造纸产业。推进并完善纸浆模塑制品产业链、包装纸和纸板产业链、生活用纸产业链发展，引进配套企业，加强品牌建设，带动产业集群发展。新建 1～2 个化学木浆项目，更好地利用该地区木材资源，丰富纸浆种类。发挥龙头企业、科研院所、高等院校的优势，加快产学研转化，提高产业创新能力。重点发展桉木浆、蔗渣浆、白卡纸、食品级液体包装纸、高档生活用纸、纸浆模塑制品等重点产品。

Beibu Gulf Paper-making Industry Cluster. Seize the great opportunity of developing Beibu Gulf Economic Zone and the national strategy "the Belt and Road Initiative", give full play to the advantages of resources, policies and locations, and vigorously develop the paper-making industry led by Guangxi Jingui, Stora Enso (Guangxi), reorganized Fangchenggang Hongyuan, Longzhou Nanhua Paper, Hengxian Dongtang Paper, Hengxian Jiangnan Paper, Guangxi Tianlifeng Ecological Materials, Nanning Jiada Paper, etc. Promote and improve the development of industrial chain of pulp molded products, wrapping paper and cardboard, and household paper, introduce supporting enterprises and strengthen brand building to boost the development of industrial clusters. Built 1-2 new chemical wood pulp projects to make better use of wood resources in this area and enrich pulp types. Give full play to the advantages of leading enterprises, scientific research institutes and institutions of higher learning, accelerate the industry-university-research transformation, and improve the industrial innovation capability. Focus on the development of eucalyptus pulp, bagasse pulp, white cardboard, food-grade liquid packaging paper, high-grade household paper, molded pulp products and other key products.

“四、保障措施（二）稳定资源优势，保障产业可持续发展”：

"IV. Safeguard Measures (2) Stabilize resource advantages to safeguard sustainable industrial development":

继续推进林板一体化、林浆纸一体化、糖纸一体化发展。重点在钦州、北海、玉林、贵港、梧州等适宜种植桉树、马尾松的地区，发展短轮伐期工业原料林，培育木材加工和造纸原料林基地。采用先进营林技术发展速生丰产工业原料林，重点推广无节材、大

径材培育技术，提高单产，营造优质高效用材林。制糖企业加强管理，合理利用蔗渣副产品，提高蔗渣打包率。

Continuously promote the forest-pulp-and-paper integration, and sugar-paper integration. Focus on Qinzhou, Beihai, Yulin, Guigang, Wuzhou and other areas suitable for planting eucalyptus and masson pine, develop industrial raw material forests with short felling cycle, and cultivate wood processing and paper-making raw material forest bases. Select advanced forest culture and management technology to develop fast-growing high-yield industrial raw material forests. Focus on the promotion of knot-free timber and large-diameter timber cultivation technologies to increase unit yield and create high-quality and efficient timber forests. Sugar enterprises shall strengthen management, rationally utilize bagasse by-products, and improve bagasse packaging rate.

《广西木材加工和造纸产业集群及产业链发展方案》明确重点任务为构建“北部湾造纸产业群”，利用该地区木材资源，新建 1~2 个化学木浆项目；保障措施方面，在上述地区发展短轮伐期工业原料林培育木材加工和造纸原料林基地。

The Plan for the Development of Guangxi Wood Processing and paper-making industry Cluster and Industrial Chain clearly specifies the construction of "Beibu Gulf Paper-making Industry Cluster" as the key task, and 1-2 new chemical wood pulp projects may be constructed using the wood resources in the region. In terms of safeguard measures, industrial raw material forests short felling cycle will be developed in the above areas to cultivate wood processing and paper-making raw material forest bases.

本项目选址于北海建设，建成后年产生产化学木浆 80 万吨，年产化机浆年产 60 万吨，文化用纸 55 万吨，特种纸 50 万吨、白卡纸 90 万吨、生活用纸 15 万吨。符合《广西工业高质量发展行动计划（2018-2020 年）》要求，可以促进我区木材加工和造纸产业结构调整和优化升级，完善产业链条，建设产业集群，推动产业高质量发展。

The Project is located in Beihai for construction. Upon completion, it will produce 800,000t/a chemical wood pulp, 600,000t/a chemi-mechanical pulp, 550,000t/a cultural paper, 500,000t/a specialty paper, 900,000t/a white cardboard and 150,000t/a household paper. The Project is in line with Action Plan of Guangxi Industrial High Quality Development (2018-2020), so it can promote the structural adjustment, optimization and upgrading of wood processing and paper-making industry in our region, perfect the industrial chain, build industrial clusters and promote high-quality industrial development.

（5）与广西造纸与木材加工业发展“十三五”规划符合性分析

(5) Analysis of compliance with the Development of Guangxi Paper-making and Wood-processing Industry during the "13th Five-year Plan

2016 年 12 月自治区工信委发布的《广西造纸与木材加工业发展“十三五”规划》中提到：

As mentioned in the Development of Guangxi Paper-making and Wood-processing Industry during the "13th Five-year Plan issued by Industry and Information Technology Committee of Guangxi Zhuang Autonomous Region in December 2016:

第三章 四、发展目标，“十三五”期间，造纸工业实现工业产值 350 亿元。到 2020 年，纸浆年产量达 470 万吨，其中：蔗渣浆 130 万吨/年，木浆 250 万吨/年，废纸浆 70 万吨/年，竹浆 20 万吨/年。纸和纸板年产量 580 万吨，其中：生活用纸 180 万吨/年，食品包装用纸 250 万吨/年，工业包装用纸 80 万吨/年，特种纸 40 万吨/年，文化用纸 30 万吨/年。

Chapter III: IV. Development Goals. During the 13th Five-year Plan period, the paper-making industry realized an industrial output value of RMB 35 billion. By 2020, the annual output of pulp will reach 4.7 million tons, including 1.3 million t/a bagasse pulp, 2.5 million t/a wood pulp, 700,000 t/a waste paper pulp and 200,000t/a bamboo pulp. The annual output of paper and cardboard is 5.8 million tons, including 1.8 million t/a household paper, 2.5 million t/a food packaging paper, 800,000t/a industrial packaging paper, 400,000t/a specialty paper, and 300,000t/a cultural paper.

第四章 产业发展与布局综合考虑资源和区位优势，建设以北部湾、桂东南、桂北和桂西造纸产业群。逐步引导制浆造纸企业进入园区，引导企业向专业化、规模化发展，创造自己品牌提高知名度，提高市场竞争力。（一）北部湾造纸产业群 ：南宁、北海、钦州、防城港、玉林、崇左等，包括沿海沿边区域，区位优势明显，战略地位重要，交通便利。……

Chapter IV Industrial Development and Layout: Considering the advantages of resources and location, a paper-making industry cluster formed by Beibu Gulf, Southeast Guangxi, North Guangxi and West Guangxi is recommended, after which pulping and paper-making enterprises shall be gradually attracted to settle in the park, and guided to be specialized and large-scale, to create own brands, improve popularity and strengthen market competitiveness. (1) Beibu Gulf Paper-making Industry Cluster: It covers Nanning, Beihai, Qinzhou, Fangchenggang, Yulin, Chongzuo, etc., including coastal and border areas, with obvious location advantages, important strategic position and convenient transportation.

第五章 产业优化升级 二、做大做强做优骨干企业，大力培育自主知名品牌 （一）有效利用林业资源，推动林浆纸和林板家具一体化发展“充分利用我区林业优势，支持建设造纸原料基地，推动林浆纸一体化、林板家具一体化发展，打造高档液体包装用纸及人造板大品牌。……”。

Chapter V Industrial Optimization and Upgrading: II. Strive to be a bigger, stronger and more excellent backbone enterprise and vigorously create independent well-known brands: (1) Effectively utilize forestry resources and promote the integrated development of forest-pulp-and-paper and wood-based furniture. "Make full use of the advantages of forestry in our region, support the construction of paper-making raw material bases, promote the forest-pulp-and-paper integration and wood-based furniture integration, and create large brands of high-grade liquid packaging paper and wood-based panels.......".

广西目前建设有 2 家大型浆纸公司，分别为广西金桂浆纸业有限公司、斯道拉恩索（广西）浆纸有限公司，其中广西金桂浆纸业有限公司已建成年产 180 万吨高档纸板项目和年产 75 万吨化机浆项目，斯道拉恩索（广西）浆纸有限公司目前获批的建设规模为年产 90 万吨化学浆、20 万吨化机浆和 90 高档包装卡纸板，从 2008 年获批至今实际建成的规模仅为 20 万吨化机浆和 45 万吨高档包装卡纸板，远未达到规划的建设规模。

At present, there are two large pulp and paper companies in Guangxi: Guangxi Jingui Pulp and Paper Co., Ltd. and Stora Enso (Guangxi) Pulp And Paper Co., Ltd., Among them, Guangxi Jingui Pulp and Paper Co., Ltd. has completed the 1.8 million t/a high-grade cardboard project and 750,000t/a chemi-mechanical pulp project. Stora Enso (Guangxi) Pulp and Paper Co., Ltd. currently has an approved construction scale of 900,000t/a chemical pulp, 200,000t/a chemi-mechanical pulp and 900,000t/a high-grade packaging cardboard. But the actual construction scale is only 200,000 tons of chemical mechanical pulp and 450,000 tons of high-grade packaging cardboard after approved in 2008, far from reaching the planned construction scale.

今年已近“十三五”末，斯道拉恩索（广西）浆纸有限公司年产 90 万吨化学浆项目的推进暂未提上日程，导致广西木浆规划建设规模从 95.5 万吨/年扩大至 250 万吨/年的目标，仍有较大的差距；纸和纸板年产量也距离 580 万吨的规划目标相差甚远。此外，受国外原料浆市场的冲击，广西区内的中小型浆厂的生存环境受到较大的挑战，市场竞争力欠缺，难以形成品牌知名度。广西造纸产业专业化、规模化发展仍是壮大广西造纸产业的重要途径。

This year is approaching the end of the 13th Five-year Plan, and the promotion of

900,000t/a chemical pulp of Stora Enso (Guangxi) Pulp and Paper Co., Ltd. has not yet been put on the agenda, resulting in the planned construction scale of Guangxi wood pulp expanding from 955,000t/a to 2.5 million t/a, which is still far from the target. The annual output of paper and cardboard is also far from the planned target of 5.8 million tons. In addition, under the impact of foreign raw pulp market, the living environment of small and medium-sized pulp plants in Guangxi is greatly challenged, the market competitiveness is deficient, and it is difficult to form brand awareness. Specialization and scale development of Guangxi paper-making industry are still important ways to expand Guangxi paper industry.

本项目布局于北部湾造纸产业群，建成投产后总浆纸产能达到 350 万吨/年，将成为华南、西南一带规模最大的林浆纸一体化项目之一，同时规划的浆纸生产品类丰富，建成后可构建出完整的林浆纸产业网络，带动上下游及相关产业的发展，有机会成为广西造纸产业的新龙头；依托太阳纸业集团现有丰富的销售关系网，有利于提高品牌知名度和市场竞争力，带动广西制浆造纸产业的升级。根据北海市工信局出具的《广西太阳纸业有限公司 350 万吨林浆纸一体化项目新增浆纸规模符合区域产业发展规划的复函》(附件 6）：“经研究，太阳纸业项目的建设投产符合市委市政府做强做大北海市林纸产业的要求，是‘北海市产业树全景图-林纸与木材加工产业’中提出希望重点引进的化学制浆及造纸行业龙头企业，项目符合北海市区域产业发展规划，纳入了 2019 年广西“双百双新”产业项目中重点推进。”本项目新增浆纸规模将纳入广西造纸与木材加工业“十四五”和相关区域性产业规划管理。

The Project is located in Beibu Gulf Paper-making Industry Cluster, and will have a total pulp and paper production capacity of 3.5 million tons/year after completed and put into operation. Then the Project will become one of the largest forest-pulp-and-paper integration projects in South and Southwest China. Additionally, the planned pulp and paper production categories are rich; upon completion, a complete forest-pulp-and-paper industry network can be formed, which will drive the development of upstream and downstream industries and related industries and the Project will perhaps become the new leader of Guangxi paper-making industry. Relying on the existing rich sales network of Sun Paper Group is conducive to improving brand awareness and market competitiveness and promoting the upgrading of pulping and paper-making industry in Guangxi. According to the Reply on the Compliance of New Pulping and Papermaking Scale to 3.5 Million Tons Forest-Pulp-and-Paper Integration Project of Guangxi Sun Paper Co., Ltd. with the Regional Industrial Development Plan issued by Beihai Municipal Bureau of Industry and Information (Annex 6): "After research, the construction and commissioning of Sun Paper Project meets the requirements of the Municipal Party Committee and the

Municipal Government to strengthen and expand the forest paper industry in Beihai, the Company is a leading enterprise in the chemical pulping and paper-making industry that is to be introduced as proposed in the Panorama of Beihai Industrial Tree-Forest-Paper and Wood Processing Industry, and the Project conforms to Beihai regional industrial development plan and is included in Guangxi's "Double-Hundred and Double-New" industrial projects in 2019 for focused promotion." The newly-added scale of pulp and paper in the Project will be incorporated into Guangxi's paper-making and wood processing industry during the "14th Five-year Plan" and the planning and management of related regional industries.

本项目位于北部湾造纸产业群，总体符合《广西造纸与木材加工业发展“十三五”规划》要求。

The Project is located in Beibu Gulf Paper-making Industry Cluster and generally conforms to the Development of Guangxi Paper-making and Wood-processing Industry during the "13th Five-year Plan.

（6）与北海市热电联产规划及国家有关热电产业政策符合性分析

(6) Analysis of compliance with Beihai Cogeneration Planning and relevant national policies on thermal power industry

根据《北海市热电联产规划（2016-2030）》：“铁山港（临海）工业区规划建设北海电厂二期和神华国华广投北海能源基地两个集中供热热源点，其中北海电厂二期扩建项目规划建设 2 台 660MW 的抽凝供热机组和 11 台 50MW 级的抽汽背压机组，神华国华广投北海能源基地一期工程拟建设 2×1000MW 超超临界二次再热纯凝机组。”根据国家发改委联合下发的《热电联产管理办法》（发改能源〔2016〕617 号）第八条规定：“有（热）电厂的供热范围内，且已有（热）电厂可满足或改造后可满足工业项目热力需求，原则上不再重复规划建设热电联产项目（含企业自备电厂）。除经充分评估论证后确有必要外，限制规划建设仅为单一企业服务的自备热电联产项目”。

According to Beihai Cogeneration Planning (2016-2030), two heat supply plants, namely Phase II of Beihai Power Plant and Shenhua Guohua Guangtou Beihai Energy Base are planned to be built in Tieshangang (Linhai) Industrial Park, where Phase II of Beihai Power Plant plans to install two 660MW extraction condensation heating units and 11 sets of 50MW steam extraction back pressure units, and Phase I of Guohua Guangtou Beihai Energy Base plans to build 2×1000MW Ultra Supercritical Double Reheat Straight Condensing Unit. According to Article 8 of *Combined Heat and Power Management Methods* (FGNY (2016) No. 617) issued by National Development and Reform Commission “within the heating range of (thermal) power plants, or the existing or transformed (thermal) power plants can meet the thermal demand of industrial projects, repeat planning and construction of combined heat and power projects (including enterprise-owned power plants) will not be performed in principle. Unless it is really necessary after full assessment and demonstration, the planning and construction of self-provided cogeneration projects are limited to only serve a single enterprise."

建设单位就本项目依托园区热力供应可行性进行了全面的论证：

The employer has made a comprehensive demonstration on the feasibility of relying on heat power supply of the park for the Project:

1、项目用热需求情况

1. Project heat demand

根据项目设计单位中国中轻国际工程有限公司提供的项目用热核算说明，项目建成后一期生产需热负荷 831.26t/h，二期建成后全厂热负荷约 1031.87t/h，需要的三种蒸汽压力等级为 0.6MPa/180℃、1.4MPa/215℃、2.9MPa/350℃。

According to the project heat demand calculations provided by the project designer China Light Industry International Engineering Co., Ltd., the heating load required for the production of Phase I Project is 831.26t/h after the project completion, and the heating load of the whole plant is about 1031.87t/h after the completion of Phase II Project. Three types of steam pressure required are rated 0.6MPa/180℃, 1.4MPa/215℃ and 2.9MPa/350℃.

表 1.6-3 项目用汽参数及用量统计表
Table 1.6-3 Statistics of Steam Consumption Parameters and Consumption of the Project

序号 S.N.	压力等级,MPa Pressure grade (Mpa)	温度,℃ Temperature (℃)	用汽量（t/h） Steam consumption (t/h)
1	2.9	350	136.42
2	1.4	215	250.1
3	0.6	180	645.35
合计 Total			1031.87

2、铁山港（临海）工业区集中供热点供热情况

2. Heat supply at centralized heating points in Tieshangang (Linhai) Industrial Park

目前铁山港（临海）工业区集中供热点为北海电厂一期，北海电厂现有 2×320MW 纯凝汽机组供热改造后的供热能力最大供热工况为 400 吨/小时，已建蒸汽管道供热参数为蒸气最大流量 120 吨/小时、最高压力 1.5Mpa、最高温度 310℃，目前为园区企业供热平均流量 23 吨/小时。

At present, the centralized heating points in Tieshangang (Linhai) Industrial Park are

Phase I of Beihai Power Plant. The maximum heating capacity of the existing 2×320 MW condensing units in Beihai Power Plant after retrofit for heat delivery is 400t/h. The heating parameters of built steam pipeline are 120t/h of maximum steam flow, 1.5Mpa of maximum pressure and 310℃ of maximum temperature. At present, the average heating flow for enterprises in the park is 23t/h.

经与北海市发改委咨询，《北海市热电联产规划（2016-2030）》规划的两个热源点中北海电厂二期目前未纳入国家热电十三五规划建设项目，十四五建设计划也未明确；神华国华广投北海电厂项目也在 2017 年由国家能源局下文停建，故上述两个热源点的建设暂未计划，无法确定投产时间。

After consulting with Beihai Municipal Development and Reform Commission, Phase II of Beihai Power Plant as one of two heat source points planned in Beihai Cogeneration Planning (2016-2030) has not been included in national planned thermal power construction projects during the "13th Five-year Plan", and it is not clear whether it will be included in the 14th Five-year Plan. Shenhua Guohua Guangtou Beihai Power Plant Project was also suspended by the State Energy Administration in 2017. Therefore, the construction of the above two heat source points has not been planned yet and the production time cannot be determined.

3、现有热源点供热存在问题

3. Heat supply problems at existing heat source points

①蒸汽供应量无法满足项目需求

① Steam supply cannot meet the project demand

目前北海电厂一期最大供热工况为 400 吨/小时，已建蒸汽管道供热参数为蒸气最大流量 120 吨/小时，现有供汽能力远远无法满足本项目蒸汽所需 1031.87 吨/小时流量的需求。

Currently, the maximum heating condition of Beihai Power Plant Phase I is 400t/h, and the heating parameter of built steam pipeline is 120t/h. The existing steam supply capacity is far from satisfying 1031.87t/h steam required by the Project.

③热源点距离项目较远，热源损失严重，管道投资大

③ The heat source point is far away from the project, resulting in the serious heat source loss and large pipeline investment.

北海电厂距离本项目厂址直线距离约 7 公里，管线长度约（含空间膨胀）12km；沿程管线长度估算约 12km，按照工业蒸汽流速在 25～30m/s（低流速）状态下，蒸汽压降

一般为 30～200Pa/m，蒸汽每公里温降为 5℃～8℃（按 5℃取值计算），则三种压力等级的蒸汽对应损失值为：

Beihai Power Plant is has a straight-line distance of about 7km to the project site, and the pipeline length (including space expansion) is about 12km. Length of the pipeline along the project is about 12km as estimated. According to the industrial steam flow rate of 25-30m/s (low flow rate), the steam pressure drop is generally 30-200Pa/m, and the steam temperature drop per kilometer is 5℃-8℃ (calculated by 5℃), then the corresponding steam loss values of the three pressure grades are:

a.0.6MPa/180℃蒸汽：压降=61Pa/m×12km=0.73MPa，温降=5℃/km×12km=60℃，汽源供应参数最低应为 1.33MPa(a)/240℃。3 根 DN800 蒸汽管道，流速 23.4m/s。

a. 0.6MPa/180℃ steam: pressure drop = 61Pa/m×12km = 0.73MPa, temperature drop = 5 ℃ /km×12km=60 ℃ , the minimum steam source supply parameter should be 1.33MPa(a)/240℃. Three pieces of DN800 steam pipes have a flow rate of 23.4m/s.

蒸汽理论焓降=2900.68 kJ/kg-2798.18 kJ/kg=101.82kJ/kg

Theoretical enthalpy drop of steam = 2900.68kJ/kg-2798.18 kJ/kg = 101.82kJ/kg

年运行时间按照 8160h 计算，则每年的热能量损失为：

If the annual operation time is calculated by 8160h, the annual heat energy loss is:

645.35t/h×8160h×101.82kJ/kg/1000=536189.82GJ

折算损失 0.6MPa/180℃蒸汽=191496.36 吨，每吨蒸汽按照 170 元/t 核算，则年损失金额 3255.44 万元。

Converted loss is 0.6 MPa/180℃, and steam is 191496.36t. If each ton of steam is calculated by RMB 170/t, the annual loss is RMB 32.5544 million.

b.1.4MPa/215℃蒸汽：压降=87Pa/m×12km=1.04MPa，温降=5℃/km×12km=60℃，汽源供应参数最低应为 2.44MPa/275℃。1 根 DN700 蒸汽管道，流速 19.2m/s。

b. 1.4MPa/215℃ steam: pressure drop = 87Pa/m×12km = 1.04MPa, temperature drop = 5℃/km×12km=60℃, the minimum steam source parameter should be 2.44MPa/275℃. one piece of DN700 steam pipes have a flow rate of 19.2m/s.

蒸汽理论焓降=2943.42 kJ/kg-2834.57 kJ/kg=108.85kJ/kg

Theoretical enthalpy drop of steam = 2943.42 kJ/kg-2834.57 kJ/kg = 108.85kJ/kg

年运行时间按照 8160h 计算，则每年的热能量损失为：

If the annual operation time is calculated by 8160h, the annual heat energy loss is:

250.1t/h×8160h×108.85kJ/kg/1000=222142.82GJ

折算损失 1.4MPa/215℃蒸汽=78369.14 吨，每吨蒸汽按照 170 元/t 核算，则年损失金额 1332.28 万元。

Converted loss is 1.4 MPa/215℃, and steam is 78369.14t. If each ton of steam is calculated by RMB 170/t, the annual loss is RMB 13,322,800.

c.2.9MPa/350℃蒸汽：压降=170Pa/m×12km=2.0MPa，温降=5℃/km×12km=60℃，汽源供应参数最低应为 4.9MPa/410℃。1 根 DN350 蒸汽管道，流速 14.2m/s。

c. 2.9MPa/350℃ steam: pressure drop = 170Pa/m×12km = 2.0MPa, temperature drop = 5℃/km×12km=60℃, the minimum steam source parameter should be 4.9MPa/410℃. one piece of DN350 steam pipes have a flow rate of 14.2m/s.

蒸汽理论焓降=3245.21 kJ/kg-3116.58 kJ/kg=128.63kJ/kg

Theoretical enthalpy drop of steam = 3245.21 kJ/kg-3116.58 kJ/kg = 128.63kJ/kg

年运行时间按照 8160h 计算，则每年的热能量损失为：

If the annual operation time is calculated by 8160h, the annual heat energy loss is:

80.4t/h×8160h×128.63kJ/kg/1000=143189.27GJ

折算损失 2.9MPa/350℃蒸汽=45944.36 吨，每吨蒸汽按照 170 元/t 核算，则年损失金额 781.05 万元。

Converted loss is 2.9 MPa/350℃, and steam is 45944.36t. If each ton of steam is calculated by RMB 170/t, the annual loss is RMB 7,810,500.

三种参数蒸汽计算热量损失合计为 90.52 万 GJ，折算蒸汽为 31.94 万吨（折算标煤 3.10 万吨），若吨汽单价均按照 170 元计算，则年损失金额 5368.77 万元。

Total heat loss calculated by the three types of steam parameters is 905,200GJ, and the converted steam is 319,400t (converted standard coal is 31,000t). If the unit price per ton of steam is calculated by RMB 170, the annual loss is RMB 53.6877 million.

d.输送管线投资预算

d. Transmission pipeline investment budget

根据蒸汽用量，经计算需管道：

According to the steam consumption and after calculations, pipelines shall meet the following requirements:

0.6MPa/180℃蒸汽管道：3 根ϕ820×13；

0.6MPa/180℃ steam pipeline: 3ϕ820×13;

1.5MPa/210℃蒸汽管道：1 根Ȼ720×22；

1.5MPa/210℃ steam pipeline: 1Ȼ720×22;

2.9MPa/350℃蒸汽管道：1 根Ȼ377×16；

2.9MPa/350℃ steam pipeline: 1Ȼ377×16;

管道、附件及安装：1.8 万吨，材料费约 2.3 亿元；管廊、土建基础设施费约为 0.9 亿元；以上总投资费用约 3.2 亿元

Pipelines, accessories and installation: 18,000t, material cost about RMB 230 million; cost of pipe gallery and civil infrastructure is about RMB 90 million. The above total investment cost is about RMB 320 million.

③供应蒸汽压力无法满足项目需求

③ The supply steam pressure cannot satisfy the project

根据上文计算，在经过远距离输送到达热用户后，末端蒸汽参数理论计算为：压力约 0.4MPa、温度约 240℃，故从蒸汽压力参数而言，北海电厂汽源也无法满足本项目所需的 2.9MPa、1.4MPa、0.6MPa 蒸汽参数需要。

According to the above calculations, after the steam reaches heat users through long-distance transmission, the theoretical calculation of terminal steam parameters is as follows: the pressure is about 0.4MPa and the temperature is about 240℃, so steam source of Beihai Power Plant cannot meet the requirements of steam parameters (2.9MPa, 1.4MPa and 0.6MPa) required by the Project in terms of steam pressure parameters.

④管道距离较长，蒸汽传输过程存在安全隐患

④ The pipeline distance is long, and there are potential safety hazards in steam transmission process.

高温蒸汽的长距离、大口径输送，存在安全隐患。蒸汽的温降、压降会产生大量冷凝水，容易产生疏水不畅，进而引起水锤，对管道造成冲击力损伤，直接威胁到周边沿线的行人、车辆和设施。

Long-distance and large-diameter transportation of high-temperature steam has potential safety hazards. The temperature drop and pressure drop of steam will produce a large amount of condensed water, which can easily cause poor hydrophobic flow and further generate water hammer, causing impact damage to pipelines and directly threatening pedestrians, vehicles and facilities along the surrounding route.

4、蒸汽稳定供应对安全生产的影响

4. Impact of stable steam supply on production safety

①根据造纸行业特点，浆纸生产开停频繁，并且生产过程中随着浆的种类及产量不同需及时调整蒸汽的流量和压力，如果蒸汽是长距离输送，所有操作具有滞后性，热源生产调度方面无法及时满足生产需要，将存在巨大的安全隐患。

① According to the characteristics of the paper-making industry, the startup and shutdown will be performed frequently, and the flow and pressure of steam shall be timely adjusted based on the type and output of pulp during production; if the steam is transported over a long distance, all operations will be lagging, and the production scheduling of heat source cannot meet the production demand in time, thus resulting in a huge safety hazard.

②纸浆厂生产过程中产生含有有机硫化物的高浓臭气，爆炸限度约 3.9~45%之间，根据严格的输送要求，需要用蒸汽喷射器，同时在燃烧不正常的紧急开停机情况下也需要及时用蒸汽吹扫，否则会有爆炸的危险，因此外送蒸汽必须保证连续供给。由于正常生产高浓臭气在碱回收炉中燃烧，也危机到碱炉的安全生产。

② High-concentration stink containing organic sulfide is generated in the production process of pulp mill, and the explosivity limits is about 3.9-45%. According to strict transmission requirements, steam ejector is required, and steam purging also is required in time under the condition of emergency start-up and shutdown due to abnormal combustion; otherwise, there will be danger of explosion. Therefore, continuous supply of steam must be guaranteed. As high-concentration stink generated from normal productions burns in the alkali recovery furnace, the safe production of alkali furnace is also endangered.

③纸浆厂制浆废液回收采用碱回收炉燃烧废液中有机硫化物，回收碱液。由于碱回收炉燃烧过程中烟气里含有碱灰，所以需要连续使用蒸汽吹灰，保持受热面的清洁，因碱灰发粘，非常容易在受热面上粘结，如不及时吹灰，粘结成块，易掉入炉膛，将内部水冷屏管砸坏破裂漏水，会引起炉内爆炸的危险，因此吹灰蒸汽要连续使用，这是碱炉安全生产的要求。

③ For recovery of pulping waste liquid in pulp mill, alkali recovery furnace is adopted to burn organic sulfide in waste liquid and recover alkali liquor. As that flue gas contain alkali ash in the combustion process of alkali recovery furnace, the continuous steam blowing is necessary to keep the heating surface clean. Because alkali ash is sticky, it can be easily bonded on the heating surface. If soot is not blown in time, it will be bonded into pieces and easily fall into the furnace, and the internal water-cooling screen tube will be smashed, cracked and leaked, which will cause the danger of explosion in the furnace. Therefore, the steam for soot blowing should be used continuously, which is the requirement for safe production of alkali furnace.

5、国内同类林浆纸一体化项目热电配套情况

5. Thermal power supporting facilities of similar forest-pulp-and-paper integration projects in China

经调查，国内大型林浆纸一体化项目包括湛江晨鸣、斯道拉恩索（广西）、山东晨鸣（寿光美伦）、亚太森博（山东）、海南金海、广西金桂等企业均设置热电站（详见§2.2.9 表 2.2.9-2），利用碱回收炉焚烧制浆黑液产生大量高温高压蒸汽，利用固废综合利用锅炉焚烧生产过程产生的树皮、木屑、浆渣、好氧污泥等废料，产生的高温高压蒸汽。高温高压蒸汽可以驱动汽轮发电机发电并供热，热电站向各项目提供生产需用的蒸汽和电力。蒸汽不足部分配套燃煤锅炉为各项目供汽。

After investigation, domestic large-scale forest-pulp-and-paper integration projects include Zhanjiang Chenming, Stora Enso (Guangxi), Shandong Chenming (Shouguang Meilun), Asia Symbol (Shandong), Hainan Jinhai, Guangxi Jingui and other enterprises, all have set up thermal power stations (see Table 2.2.9-2 of §2.2.9). A large amount of high-temperature high-pressure steam cam be generated by incineration of pulping black liquor in an alkali recovery furnace, and high-temperature high-pressure steam can be generated by incineration of waste materials in solid waste comprehensive utilization boiler such as bark, sawdust, pulp slag, aerobic sludge and the like generated in production process. The high-temperature and high-pressure steam can drive the steam turbine generator to generate electricity and provide heat; the thermal power plant will provide steam and electricity for each project. Coal-fired boilers shall be provided to supply steam for each project in case of insufficient steam.

6、本项目供热配套方案

6. Supporting heat supply plan of the Project

项目利用制浆产生的黑液，经碱回收系统配套的碱回收炉（4600tds/d）燃烧后最多可产生约 670t/h 蒸汽，蒸汽压力为 10.5Mpa(g)，温度 515℃； 同时项目利用生产过程产生的固体废弃物（树皮、木屑、污泥等）设置一台固废综合利用锅炉（220t/h 循环流化床锅炉）燃烧利用，最大产汽 165t/h，蒸汽压力为 10.5Mpa(g)，温度 515℃。蒸汽不足部分，分别在一期和二期各配套一台燃煤供热锅炉（280t/h 循环流化床锅炉）。

The Project uses the black liquor generated by pulping to generate up to 670t/h steam after combustion in the supporting alkali recovery furnace (4600tds/d) of alkali recovery system, with a steam pressure of 10.5Mpa (g) and a temperature of 515℃. Additionally, the Project uses the solid wastes (bark, sawdust, sludge, etc.) generated in the production process to set up a solid waste comprehensive utilization boiler (220t/h circulating fluidized bed boiler) for combustion and utilization, with a maximum steam output of 165t/h, a steam pressure of 10.5Mpa (g) and a temperature of 515℃. In case of insufficient steam, one coal-fired heating boiler (280t/h circulating fluidized bed boiler) will be equipped in Phase I and Phase II respectively.

本项目供热配套依据以热定电的原则，一期工程碱回收炉和固废综合利用锅炉配置 2 台双抽冷凝机组，冷凝量为满足机组正常运行的最小冷凝量。配置 1 台 40MW 抽背式汽轮发电机组，配套 1 台 280t/h 循环流化床锅炉用于满足生产用汽需求。二期工程根据新增热负荷及以热定电的原则，配置 1 台 50MW 抽背式汽轮发电机组，配套 1 台 280t/h 循环流化床锅炉。

Heat supply supporting system of the Project is based on the principle of heat-load-based CHP. The alkali recovery furnace and solid waste comprehensive utilization boiler in Phase I are equipped with two double-extraction condensing units, and the condensing amount is the minimum condensing amount that satisfy the normal operation of units. One 40MW bleeding back-pressure steam turbine generator unit and one 280t/h circulating fluidized bed boiler shall be equipped to meet the steam demand for production. According to the newly-added heat load and the principle of heat-load-based CHP, Phase II will be equipped with one 50MW bleeding back-pressure steam turbine generator unit and one 280t/h circulating fluidized bed boiler.

制浆造纸工业由于工艺环节复杂，生产过程热负荷很不稳定、生产负荷波动大，如果只配置背压或片抽汽背压机组，在热电机组启动、停机以及生产工艺降负荷时（例如纸机、浆板机断头，蒸发站清洗等情况出现后，或工艺系统局部出现问题停止用汽时)，由于锅炉、特别是碱炉负荷周整的迟缓性较大，不能即刻同步匹配工艺负荷变化，不仅导致背压排汽频繁排空，造成热能损失、产生噪音污染扰民。还会影响锅炉特别是碱炉的安全运行。因此，通常情况下背压或者抽汽背压机组不能单独投入运行。根据制浆造纸行业的供热特点，为保证热电机组的安全稳定可靠的运行，同时很据《战略性新兴产业贡点产品和服务指导目录（2016）版》，“以农林剩余物、畜禽粪便、城镇生活垃圾、工业有机废液（包括造纸黑液、印染废液、酿造废液、皮革废液等）、污水处理污泥等生物质资源为主要原料，根据当地市场需求灵活配置发电、供热”，本项目为碱回收炉

和生物质炉配置抽凝式汽轮发电机组，用于调节生产热负荷的波动，避免背压机组参与负荷调节导致热能损失和噪音污染，确保电站设备的安全稳定运行。

In the pulp and paper industry, heat load in the production process is very unstable and the production load fluctuates greatly due the complex processes. If only back-pressure or bleeding back-pressure steam turbines are configured, when the thermoelectric unit is started, shut down and the production process is load down (e.g. breakage of paper machine and pulp machine, after the evaporation station cleaning and other conditions occur, or when the steam consumption is stopped due to local problems in the process system), due to the large delay in the load cycle of boilers, especially alkali furnaces, the process load changes cannot be matched synchronously and immediately. This will not only lead to frequent evacuation of back-pressure exhaust steam, resulting in heat energy loss and noise pollution nuisance to the public, but also affect the safe operation of boilers, especially alkali furnaces. Therefore, back-pressure or bleeding back-pressure steam turbines generally cannot be put into operation alone. Referring to the heat supply characteristics of pulping and paper-making, to ensure the safe, stable and reliable operation of the thermoelectric unit and according to the Guiding Catalogue for Key Products and Services of Strategic Emerging Industries (2016) that "biomass resources such as agricultural and forestry residues, livestock and poultry manure, urban domestic waste, industrial organic waste liquid (including paper-making black liquor, printing and dyeing waste liquid, brewing waste liquid and leather waste liquid) and sludge from sewage treatment are used as main raw materials to flexibly allocate power generation and heat supply according to local market demand", the alkali recovery furnace and biomass furnace are equipped with condensing steam turbine generator units in the Project, which are used to adjust the fluctuation of production heat load, avoid heat energy loss and noise pollution caused by back-pressure unit participating in load adjustment, and ensure the safe and stable operation of power station equipment.

经充分评估论证和研究，北海市发展和改革委员对本项目供热设施建设意见进行了回函（北发改函〔2019〕1033 号）（附件 15）：“鉴于《北海市热电联产规划（2016-2030 年）》规划的两个热源项目没能按规划实施，无法满足太阳纸业 2021 年投产的生产需要，北海市发展和改革委员会意见为：广西太阳纸业 350 万吨林浆纸一体化项目建设供热及附属配套设施确有必要，不应限制规划建设，符合北海市热电联产规划及国家有关政策要求。”

After full assessment, demonstration and research, Beihai Development and Reform Commission issued a reply to the opinions on the construction of heating facilities for the

Project (BFGH [2019] No.1033) (Annex 15), remarking that: "Given that the two heat source projects planned in Beihai Cogeneration Planning (2016-2030) have not been implemented as scheduled, they cannot satisfy the production of Sun Paper launched in 2021. Beihai Development and Reform Commission believes that it is really necessary to build heating and ancillary facilities for 3.5 Million Tons Forest-Pulp-and-Paper Integration Project of Guangxi Sun Paper, and the planning and construction should not be restricted, which conforms to Beihai cogeneration planning and relevant national policies."

1.6.2 项目与相关环保规划符合性分析

1.6.2 Analysis of compliance with relevant environmental protection plans

（1）与制浆造纸建设项目环境影响评价文件审批原则的符合性分析

(1) Analysis of compliance with the approval principles of environmental impact assessment documents for pulping and paper-making construction projects

为进一步规范建设项目环境影响评价文件审批，2015 年 12 月，原国家环保部以环办〔2015〕112 号文发布了《关于规范火电等七个行业建设项目环境影响评价文件审批的通知》，在该通知中对制浆造纸建设项目环境影响评价文件审批原则进行了相应的规定，本项目与其符合性分析见表 1.6-4。

To further standardize the approval of environmental impact assessment documents for construction projects, the former Ministry of Environmental Protection issued the Notice on Regulating the Approval of Environmental Impact Assessment Documents for Construction Projects in Seven Industries including Thermal Power (HB [2015] No. 112) in December 2015, which accordingly provides for the approval principles of environmental impact assessment documents for pulping and paper-making construction projects. See Table 1.6-4 for the analysis of compliance with the notice.

表 1.6-4 与《制浆造纸建设项目环境影响评价文件审批原则》符合性分析
Table 1.6-4 Analysis of Compliance with the Approval Principles of Environmental Impact Assessment Documents for Pulping and Papermaking Construction Projects

序号 S.N.	《制浆造纸建设项目环境影响评价文件审批原则》 **Approval Principles of Environmental Impact Assessment Documents for Pulping and Papermaking Construction Projects**	项目情况 **Project information**	符合性 **Compliance**
1	项目符合国家环境保护相关法律法规和政策要求，符合造纸行业相关产业结构调整、落后产能淘汰要求 The project complies with the relevant national laws, regulations and policies of environmental protection, and complies with the requirements	根据前文分析，项目符合国家法律法规政策要求，符合造纸政策。 Based on the above analysis, the Project complies with the national laws, regulations and policies	符合 Compliance

序号 S.N.	《制浆造纸建设项目环境影响评价文件审批原则》 Approval Principles of Environmental Impact Assessment Documents for Pulping and Papermaking Construction Projects	项目情况 Project information	符合性 Compliance
	of paper-making industry on industry restructuring and phase-out of backward production capacity.	especially the paper-making policies.	
2	项目选址符合主体功能区规划、环境保护规划、造纸发展规划、城市总体规划、土地利用规划、环境功能区划及其他相关规划要求，涉海项目符合近岸海域环境功能区划及海洋功能区划要求。 The project siting complies with the requirements of planning of main function areas, environmental protection planning, paper-making development planning, overall city planning, land use planning, planning of environmental function zones and other relevant planning. The ocean-related part of project complies with the requirements on division of offshore ocean environmental function areas and ocean function areas.	项目位于北海市铁山港(临海)工业区，属于广西主体功能区划中的国家级重点开发区，符合相关环保规划和造纸发展规划。土地利用和产业布局符合北海市铁山港(临海)工业区分区规划要求。项目废水排海口位于近岸海域环境功能区划的排污区，废水排放不会影响周边海域环境功能区降级，符合近岸海域环境功能区划及海洋功能区划要求。 The Project is located in Beihai Tieshangang (Linhai) Industrial Park, which is a national key development zone in Guangxi's main functional zoning and conforms to relevant environmental protection planning and paper-making development planning. Land use and industrial layout conform to Beihai TieshanGang (Linhai) Industrial Park Zoning Planning. The Project's wastewater seaward discharge outlet is located in the sewage discharge area of the coastal sea area environment functional zone. The wastewater discharge will not affect the degradation of surrounding sea area environment function alzone, which meets the requirements of the coastal area environment functional zone and marine function zone.	符合 Compliance
3	新建、扩建项目应位于产业园区，并符合园区规划及规划环境影响评价要求；原则上避开居民集中区、医院、学校等环境敏感区。不予批准位于自然保护区、风景名胜区、饮用水水源保护区、永久基本农田等环境敏感区的项目和严重缺水地区、城市建成区内的新建、扩建项目。 The newly-built and expanded projects should be located in the industry parks and comply with the requirements on park planning and environmental impact assessment of planning; the environmental sensitive zones like	项目选址位于工业园区，符合园区规划及规划环境影响评价要求，周边未分布居民集中区、医院、学校等环境敏感区。不涉及自然保护区、风景名胜区、饮用水水源保护区、永久基本农田等环境敏感区的项目和北海不说是属于严重缺水地区。 The Project is located in the industry parks and comply with the requirements on park planning and environmental impact	符合 Compliance

序号 S.N.	《制浆造纸建设项目环境影响评价文件审批原则》 Approval Principles of Environmental Impact Assessment Documents for Pulping and Papermaking Construction Projects	项目情况 Project information	符合性 Compliance
	concentrated residential areas, hospitals, schools, etc. should on principle be avoided. Any project in the environmental sensitive zones like natural reserves, scenic resorts and historic sites, protected areas of drinking water sources, permanent and fundamental farmlands, etc. as well as the newly-built or expanded project in the areas of serious water shortage and built-up areas of cities should not be approved.	assessment of planning; no environmental sensitive zones like concentrated residential areas, hospitals, schools, etc. are distributed around. It dose not involves any projects in environmental sensitive areas such as nature reserves, scenic spots, drinking water source protection areas, permanent basic farmland, and Beihai is not an area with severe water shortage.	
4	采用先进适用的技术、工艺和装备，清洁生产水平达到国内同行业清洁生产先进水平。 The advanced and appropriate technology, technique and equipment are applied and the clean production reaches the advanced level of the industry in China.	项目采用先进适用的技术、工艺和装备，清洁生产水平达到同行业国际清洁生产先进水平。 The advanced and appropriate technology, technique and equipment are applied and the clean production reaches the international advanced level of the industry.	符合 Compliance
5	自备热电站锅炉、碱回收炉、石灰窑炉、硫酸制备装置采取合理的脱硫、脱硝和除尘措施，漂白、二氧化氯制备等环节采取有效的废气治理措施；优化蒸煮、洗涤、蒸发、碱回收等的设备选型，具有恶臭、VOCs 等无组织气体排放的环节(如污水处理和污泥处置等)密闭收集废气并采取先进技术妥善处理，减少恶臭和 VOCs 等无组织废气排放。热电站锅炉满足《火电厂大气污染物排放标准》(GB 13223)要求，65 蒸吨/小时以上碱回收炉参照《火电厂大气污染物排放标准》(G B13223)要求，65 蒸吨/小时及以下碱回收炉参照《锅炉大气污染物排放标准》(GB13271)中生物质成型燃料锅炉的排放控制要求执行，其他常规和特征污染物排放满足《大气污染物综合排放标准》(G B16297 工《工业炉窑大气污染物排放标准》(GB9078)《恶臭污染物排放标准》(GB14554)等要求。国家和地方另有严格要求的按其规定执行。京津冀、长三角、珠三角等区域新建项目不得配套建设自备燃煤电站。 Reasonable desulfurization, denitration and dust removal measures shall be taken over self-provided thermal power station boilers, alkali recovery furnaces, lime kilns and sulfuric acid preparation units. Bleaching, chlorine dioxide preparation and other links is be subject to effective waste gas treatment measures; selection of equipment used for cooking,	本项目自备热电站锅炉、碱回收炉、石灰窑炉均采取合理高效的脱硫、脱硝和除尘措施，漂白、二氧化氯制备等环节采取废气净化措施；对蒸煮、洗涤、蒸发、碱回收等阶段产生的废气进行有效收集处理，减少恶臭和 VOCs 等无组织废气排放。本项目执行的污染物排放标准执行上述要求或严于上述要求。本项目燃煤供热锅炉经北海市发改委认定属于确有必要建设的供热设施（附件 15）。 Reasonable and efficient desulfurization, denitration and dust removal measures shall be taken over self-provided thermal power station boilers, alkali recovery furnaces and lime kilns of the Project. waste gas generated in cooking, washing, evaporation, alkali recovery and other stages is effectively collected and treated to reduce the fugitive emission of waste gas such as malodor and VOCs. Pollutant emission standards implemented in the Project shall be subject to or stricter than the	符合 Compliance

序号 S.N.	《制浆造纸建设项目环境影响评价文件审批原则》 Approval Principles of Environmental Impact Assessment Documents for Pulping and Papermaking Construction Projects	项目情况 Project information	符合性 Compliance
	washing, evaporation and alkali recovery shall be optimized. Links with fugitive emission of waste gas such as malodor and VOCs (including sewage treatment and sludge disposal) shall collect waste gas in a closed manner and adopt advanced technologies for proper treatment to reduce the fugitive emission of waste gas such as malodor and VOCs. Thermal power station boilers shall conform to the Emission Standard of Air Pollutants for Thermal Power Plants (GB13223). Alkali recovery boilers with a steam capacity of more than 65t/h shall refer to the Emission Standard of Air Pollutants for Thermal Power Plants (GB13223); alkali recovery boilers with a steam capacity of 65t/h or less shall be subject to the emission control requirements of biomass briquette boilers as stipulated in the Emission Standard of Air Pollutants for Boiler (GB13271). Emission of other conventional and characteristic pollutants shall follow the Integrated Emission Standards of Air Pollutants (GB16297), Emission Standard of Air Pollutants for Industrial Kiln and Furnace (GB9078) and Emission Standards for Odor Pollutants (GB14554). The other national and local regulations shall prevail if necessary. Newly-established projects located in Beijing-Tianjin-Hebei Region, Yangtze River Delta, Pearl River Delta, etc. shall not be equipped with and construct own coal-fired power plant.	above requirements. Coal-fired heating boilers in the Project have been recognized by Beihai Municipal Development and Reform Commission as a heating facility really necessary to be built (Appendix 15).	
6	合理设置环境防护距离，环境防护距离内已有居民区、学校、医院等环境敏感目标的，应提出可行的处置方案。 The environmental protection distance is set reasonably, and the feasible disposal scheme shall be proposed if there are residential areas, schools, hospitals and other environment-sensitive targets in the environmental protection distance.	项目环境防护距离范围内无居民区、学校、医院等环境敏感目标分布 There are no environmental sensitive targets such as residential areas, schools and hospitals distributed within the environmental protection distance of the Project.	符合 Compliance
7	强化节水措施，减少新鲜水用量。取用地表水不得挤占生态用水、生活用水、农业用水等。废水分类收集、分质处理、优先回用。 Strengthen water saving measures and reduce consumption of fresh water The intake of ground surface water should not occupy the water for ecology, life, agriculture, etc. Classified wastewater collection, treatment by different quality, priority of reuse.	本项目强化节水措施，减少新鲜水用量，取用地表水未挤占生态用水、生活用水、农业用水等。 In the Project, water-saving measures are strengthened to reduce the consumption of fresh water, and surface water is used without any ecological water, domestic water, agricultural water, etc. taken.	符合 Compliance
	制浆工艺采取低污染制浆技术，碱法制浆设置	项目采取低污染制浆技术，采用	符合

序号 S.N.	《制浆造纸建设项目环境影响评价文件审批原则》 Approval Principles of Environmental Impact Assessment Documents for Pulping and Papermaking Construction Projects	项目情况 Project information	符合性 Compliance
	碱回收系统，按法制浆设置木质素提取系统。 For pulping process, low-pollution pulping technology is adopted. Alkali recovery system is set up for alkali pulping, and lignine extraction system is set up for ammonium sulfite pulping. 漂白工艺不得采用元素氯漂白工艺。外排废水满足《制浆造纸工业水污染物排放标准》(GB3544)要求。采取分区防渗等措施，有效防范对地下水环境的不利影响。 Elemental chlorine bleaching process shall not be used as the bleaching process. Wastewater discharged conforms to the Discharge Standard of Water Pollutants for Pulp and Paper Industry (GB3544). The measures like divisional penetration proof are adopted to effectively prevent the negative impact on the underground water environment.	无元素氯漂白工艺，外排废水到达《制浆造纸工业水污染物排放标准》(GB3544)要求。采取了分区防渗等措施，对地下水环境影响进行控制。 In the Project, low-pollution pulping technology and elemental chlorine-free bleaching process are adopted; and wastewater discharged conforms to the Discharge Standard of Water Pollutants for Pulp and Paper Industry (GB3544). The measures like divisional penetration proof are adopted to control the negative impact on the underground water environment.	Compliance
8	按照"减量化、资源化、无害化"的原则，对固体废物进行处理处置。固体废物贮存和处置满足相关污染控制技术规范和标准要求。 The solid wastes are disposed as per the "reduced, recycled and hazardless" principles. The storage and disposal of solid wastes comply with the relevant technical specifications and standards of pollution control.	充分利用项目产生的木屑、废渣、污泥等固体废物配套建一台固体综合利用污泥锅炉，回收利用资源。白泥部分回用于脱硫，剩余部分制成石灰，其他固体废物均得妥善的处理处置。 Sawdust, waste residue, sludge and other solid wastes generated by the Project shall be fully utilized, to build a solid comprehensive sludge utilization boiler for resource recycling. Part of the white mud is reused for desulfurization, the rest is made into lime, and other solid wastes are properly treated and disposed of.	符合 Compliance
9	厂区内重大危险源布局合理，提出有效的环境风险防范和应急措施。事故废水有效收集和妥善处理，不道接进人外环境。针对项目可能产生的环境风险制定有效的风险防范和应急措施，建立项目及区域环境风险防范与应急管理体系，提出运行期环境风险应急预案编制要求。 The project has reasonable layout of major hazard sources and proposes effective environmental risk prevention and contingency measures. The accidental wastewater is effectively collected and properly treated instead of directly discharged into outside environment. The effective risk prevention and contingency measures should be developed against possible environmental risks of the project. A project and	项目采取有效的风险防范和应急措施，建立环境风险应急管理体系。 In the Project, effective risk prevention and emergency measures shall be adopted to establish an environmental risk emergency management system.	符合 Compliance

序号 S.N.	《制浆造纸建设项目环境影响评价文件审批原则》 Approval Principles of Environmental Impact Assessment Documents for Pulping and Papermaking Construction Projects	项目情况 Project information	符合性 Compliance
	regional environmental risk prevention and contingency management system should be established together with the requirements on development of contingency plan of environmental risks during the operation period.		
10	环境质量现状满足环境功能区要求的区域，项目实施后环境质量仍满足功能区要求；环境质量现状不能满足环境功能区要求的区域，进一步强化项目污染防治措施，并提出有效的区域削减措施，改善区域环境质量。 In the region where the environmental quality status satisfies the requirements of environmental function areas, such environmental quality should remain compliant after project implementation; in the region where the environmental quality status fails to satisfy the requirements of environmental function areas, the Project should further enhance the pollution prevention and control measures and propose effective regional reduction measures to improve the regional environmental quality.	项目评价区域环境环境质量现状满足环境功能区要求，项目实施后未造成环境功能降级 Environmental quality status in assessment areas of the Project conforms to environmental functional zone, and the environmental function has not been degraded after the Project is implemented.	符合 Compliance
11	明确项目实施后的环境管理要求和环境监测计划。制定完善的环境质量、常规和特征污染物排放、生态等的监测计划。按照国家规定，提出污染物排放自动监控要求并与环保部门联网。 The environment management requirements and environment monitoring plan after project implementation should be clarified. A perfect monitoring plan covering environmental quality, discharge of regular and particular pollutants, ecology, etc. should be developed. In accordance with relevant national regulations, the project should propose the automatic monitoring of pollutant discharge and be connected with the network of environmental protection authorities.	本项目按相关管理要求制定详尽的环境管理要求和环境监测计划。 The Project formulates detailed environmental management requirements and environmental monitoring plans in accordance with relevant management requirements.	符合 Compliance

（2）与广西大气污染防治攻坚三年作战方案（2018-2020 年）符合性的符合性

(2) Compliance with Guangxi's Three-year Plan for Air Pollution Prevention and Control (2018-2020)

拟建项目与《广西大气污染防治攻坚三年作战方案（2018-2020 年）》的符合性分析见表 1.6.5。

Analysis of compliance of proposed projects with Guangxi's Three-year Plan for Air Pollution Prevention and Control (2018-2020) is shown in Table 1.6.5.

表 1.6-5　与《广西大气污染防治攻坚三年作战方案（2018-2020 年）》符合性分析

Table 1.6-5 Analysis of Compliance with Guangxi's Three-year Plan for Air Pollution Prevention and Control (2018-2020)

序号 S.N.	广西大气污染防治攻坚三年作战方案（2018-2020 年） Guangxi's Three-year Plan for Air Pollution Prevention and Control (2018-2020)	项目情况 Project information	符合性 Compliance
1	推进重点行业污染治理升级改造。 Promote the upgrading and transformation of pollution control in key industries. 到 2020 年，具备改造条件的燃煤电厂全部完成超低排放改造。推动钢铁行业超低排放改造，新（改、扩）建钢铁企业同步建设烟气超低排放治理设施，达到超低排放限值要求。推动糖厂锅炉烟气治理。 By 2020, all coal-fired power plants that have the conditions for transformation will have completed ultra-low emission transformation. Promote the ultra-low emission transformation in the iron and steel industry, and newly-established (reconstructed and expanded) iron and steel enterprises will simultaneously build ultra-low emission control facilities for flue gas to meet the requirements of ultra-low emission limits. Promote the treatment of boiler flue gas in sugar refineries.	本项目燃煤锅炉率先实行超低排放。 Implement ultra-low emissions firstly to coal-fired boilers in the Project.	符合 Compliance
2	加大燃煤小锅炉淘汰力度。全区县级及以上城市建成区基本淘汰每小时 10 蒸吨及以下燃煤锅炉及茶水炉、经营性炉灶、储量烘干设备等燃煤设施，原则上不再新建每小时 35 蒸吨以下的燃煤锅炉，其他地区原则上不再新建每小时 10 蒸吨以下的燃煤锅炉。加大对纯凝机组和热电联产机组技术改造，提高供热能力，淘汰管网覆盖范围内的燃煤锅炉和散煤。在不具备热电联产集中供热条件的地区，现有多台燃煤小锅炉的可按照煤炭等量替代原则建设为大容量燃煤锅炉。加强工业燃料的监管，工业用煤含硫量不得高于 1.5%，工业用燃油含硫量不得高于 0.8%。 Intensify the elimination of small coal-fired boilers. Urban built-up areas at or above the county level in the whole region have basically eliminated coal-fired boilers of 10t/h or less and coal-fired facilities such as tea stoves, operating stoves and reserve drying equipment. In principle, no new coal-fired boilers of 35t/h or less will be built, and in other regions, no new coal-fired boilers of 10 t/h or less will be built. Technological transformation of condensing units and cogeneration units shall be strengthened, to improve the heat supply capacity, and eliminate coal-fired boilers and scattered coal within the coverage of the pipe network. In areas that do not have the conditions for centralized heating of cogeneration, the existing multiple small coal-fired boilers can be built into large-capacity	本项目燃煤供热锅炉经北海市发改委认定属于确有必要建设的供热设施（附件 15）。 Coal-fired heating boilers in the Project have been recognized by Beihai Municipal Development and Reform Commission as a heating facility really necessary to be built (Appendix 15). 新建燃煤供热锅炉为 280t/h，采用低灰低硫优质煤含硫率小于 1.0%，并实行超低排放，进一步减少大气污染物排放。 Newly-built coal-fired heating boiler is 280t/h, and the sulfur content of low-ash low-sulfur high-quality coal with sulfur content of less than 1.0% is adopted, and ultra-low emission is implemented to further reduce the emission of air pollutants.	符合 Compliance

序号 S.N.	广西大气污染防治攻坚三年作战方案（2018-2020 年） Guangxi's Three-year Plan for Air Pollution Prevention and Control (2018-2020)	项目情况 Project information	符合性 Compliance
	coal-fired boilers according to the principle of equivalent coal substitute. Strengthen the supervision of industrial fuels. The sulfur content of industrial coal shall not be higher than 1.5%, and the sulfur content of industrial fuel oil shall not be higher than 0.8%.		
3	排气口高度超过 45 米的高架源，以及石化、化工、包装印刷、工业涂装等 VOCs 排放重点源，纳入重点排污单位名录，督促企业安装烟气排放自动监控设施。 Elevated sources with an exhaust port height of more than 45m, as well as key VOC emission sources such as petrochemical, chemical, packaging and printing, industrial painting, etc., are included in the list of key pollutant discharging units; and those enterprises are urged to install automatic monitoring facilities for flue gas emissions.	本项目纳入重点排污单位名录，安装烟气排放自动监控设施。 The Project is included in the list of key pollutant discharging units and shall be provided with automatic flue gas emission monitoring facilities.	符合 Compliance

（4）与广西水污染防治攻坚三年作战方案（2018-2020 年）符合性的符合性

(4) Compliance with Guangxi's Three-year Plan for Water Pollution Prevention and Control (2018-2020)

拟建项目与《广西水污染防治攻坚三年作战方案（2018-2020 年）》的符合性分析见表 1.6-6。

Analysis of compliance of proposed projects with Guangxi's Three-year Plan for Water Pollution Prevention and Control (2018-2020) is shown in Table 1.6-6.

表 1.6-6　与《广西水污染防治攻坚三年作战方案（2018-2020 年）》符合性分析
Table 1.6-6 Analysis of Compliance with Guangxi's Three-year Plan for Water Pollution Prevention and Control (2018-2020)

序号 S.N.	北海市环境保护和生态建设“十三五”规划 Environmental Protection and Ecological Construction in Beihai City during the 13th Five-year Plan	项目情况 Project information	符合性 Compliance
1	实施广西北部湾沿海城市环境综合治理工程。严格落实广西北部湾经济区和城市群发展规划，严把规划环评和项目环评关，全面落实重大项目审批制度，制定并严守广西北部湾经济区负面清单要求，严格控制高耗能、高排放产业进入，推动临港工业绿色化升级改造，大力培育壮大新兴产业，改造提升传统产业，全面调整产业、能源、交通运输结构。 Implement comprehensive environmental	本项目符合园区规划环评，全面充分开展项目环评工作，不属于广西北部湾经济区产业负面清单禁止的产业；项目通过规模化多元化经营，提升广西传统造纸产业发展水平。 The Project conforms to the park planning EIA, with project EIA fully carried out; so the Project does not belong to the industry	符合 Compliance

序号 S.N.	北海市环境保护和生态建设"十三五"规划 **Environmental Protection and Ecological Construction in Beihai City during the 13th Five-year Plan**	项目情况 **Project information**	符合性 **Compliance**
	management project for coastal cities in Guangxi Beibu Gulf. Strictly implement the development plan of Guangxi Beibu Gulf Economic Zone and Urban Agglomeration, strictly control the planning environmental impact assessment and the project environmental impact assessment, fully implement the approval system for major projects, formulate and strictly follow the negative list of Guangxi Beibu Gulf Economic Zone, strictly control the entry of energy-intensive and high-emission industries, promote the green upgrading and transformation of harbor-based industries, vigorously cultivate and expand emerging industries, transform and upgrade traditional industries, and comprehensively adjust the industry, energy and transportation structures.	prohibited by the negative list of industries in Guangxi Beibu Gulf Economic Zone. The Project will improve the development level of traditional paper-making industry in Guangxi through large-scale diversified operation.	
2	全面整治入海污染源，规范入海排污口设置，加强不达标排污口的清理、整治工作，全部清理非法排污口。 Comprehensively rectify pollution sources to the sea, standardize the setting of sewage outlets to the sea, strengthen the cleaning and remediation of substandard sewage outlets, and completely eliminate illegal sewage outlets. 严格执行广西海洋主体功能区规划和海洋生态红线划定方案，加大红树林、海草床等滨海湿地、河口和海湾典型生态系统保护力度，完善山口国家级红树林保护区、合浦儒艮国家级自然保护区、北仑河口国家级红树林保护区、茅尾海自治区级红树林保护区等保护区建设。 Strictly implement Guangxi's Main Marine Functional Area Planning and Regulations on Delineation of Guangxi Marine Ecological Red Line, strengthen the protection of typical ecosystems in coastal wetlands (such as mangroves and seagrass beds), estuaries and bays, and improve the construction of protected areas such as Shankou National Mangrove Reserve, Hepu Dugong National Nature Reserve, Beilun Estuary National Mangrove Reserve and Maoweihai Autonomous Region Mangrove Reserve.	项目废水在铁山港排污区 B3 排污口是深海排放，属于合法设施的深海排放口，未处于广西海洋生态红线区内。 Project wastewater is discharged into the deep sea at the sewage outlet B3 in Tieshan Harbor sewage discharge area, which is the deep-sea discharge outlet of legal facilities and is not located in Guangxi marine ecological red line area. 项目废水执行更严格的排放标准，减少废水污染物的排放；其中 COD 排放浓低于行业排放标准，氨氮、总氮排放浓度执行行业特别排放标准，单位产品废水排放量达到国际先进水平。 The project wastewater shall be subject to stricter discharge standards to reduce the discharge of wastewater pollutants; among them, COD emission concentration is lower than the industry emission standard, emission concentration of ammonia nitrogen and total nitrogen are subject to the special industrial emission standard, and wastewater discharge per unit product reaches the international advanced level. 根据项目废水排放海洋环境影响预测结果，项目废水深海排放不会造成周边山口国家级红树林保	符合 Compliance

序号 S.N.	北海市环境保护和生态建设"十三五"规划 Environmental Protection and Ecological Construction in Beihai City during the 13th Five-year Plan	项目情况 Project information	符合性 Compliance
		护区、合浦儒艮国家级自然保护区环境功能降级，未对海域生态环境造成大的影响。 According to the prediction results about marine environment impact of the project wastewater discharge, the deep-sea wastewater discharge of the project will not cause the environmental function degradation of the surrounding National Mangrove Reserve and Hepu Dugong National Nature Reserve at mountain pass, and has not caused any great impact on the marine ecological environment.	
3	钢铁、火电、水泥、煤炭、造纸、印染、污水处理、垃圾焚烧、制糖、酒精、有色金属、化 With close attention paid to steel, thermal power, cement, coal, paper making, printing and dyeing, sewage treatment, waste incineration, sugar production, alcohol, non-ferrous metals, chemical industry, 工、铁合金、氮肥、农副食品加工、原料药制造、制革、农药、电镀、印刷、垃圾填埋等行业为重点，全面推进行业达标排放改造。 ferroalloy, nitrogen fertilizer, agricultural and subsidiary food processing, bulk drug manufacturing, leather making, pesticides, electroplating, printing, refuse landfill and other industries, the up-to-standard discharge transformation of the industry is comprehensively promoted.	本项目废水经过配套污水处理站处理能达到《制浆造纸工业水污染物排放标准》（GB3544-2008）。 Wastewater of the Project can satisfy the Discharge Standard of Water Pollutants for Pulp and Paper Industry (GB3544-2008) after being treated by the supporting sewage treatment plant.	符合 Compliance

（4）与北海市环境保护和生态建设"十三五"规划符合性的符合性

(4) Analysis of conformance with Environmental Protection and Ecological Construction in Beihai City during the 13th Five-year Plan

拟建项目与《北海市环境保护和生态建设"十三五"规划》的符合性分析见表 1.6-7。

Analysis of compliance of proposed projects with Environmental Protection and Ecological Construction in Beihai City during the 13th Five-year Plan is shown in Table 1.6-7.

表 1.6-7 与《北海市环境保护和生态建设"十三五"规划》符合性分析
Table 1.6-7 Analysis of compliance with Environmental Protection and Ecological Construction in Beihai City during the 13th Five-year Plan

序号 S.N.	北海市环境保护和生态建设"十三五"规划 Environmental Protection and Ecological Construction in Beihai City during the 13th Five-year Plan	项目情况 Project information	符合性 Compliance
1	加强近岸海域环境保护。全面清理非法或设置不合理的入海排污口，优化入海排污口布局，实施集中深、远海排放。提高涉海项目准入门槛，实施总氮排放总量控制。 Strengthen environmental protection in offshore areas Comprehensively clean up illegal or unreasonable sewage outlets into the sea, optimize the layout of sewage outlets into the sea, and implement centralized deep- and open-sea discharge. Raise the access threshold for sea-related projects and implement total nitrogen emission control.	项目废水在铁山港排污区 B3 排污口是深海排放，属于合法设施的深海排放口，未处于广西海洋生态红线区内。项目废水执行更严格的排放标准，减少废水污染物的排放；其中 COD 排放浓度低于行业排放标准，氨氮、总氮排放浓度执行行业特别排放标准，单位产品废水排放量达到国际先进水平。 Project wastewater is discharged into the deep sea at the sewage outlet B3 in Tieshan Harbor sewage discharge area, which is the deep-sea discharge outlet of legal facilities and is not located in Guangxi marine ecological red line area. The project wastewater shall be subject to stricter discharge standards to reduce the discharge of wastewater pollutants; among them, COD emission concentration is lower than the industry emission standard, emission concentration of ammonia nitrogen and total nitrogen are subject to the special industrial emission standard, and wastewater discharge per unit product reaches the international advanced level. 项目总氮排放未超过铁山港西岸排污区 1 的环境容量。根据项目废水排放海洋环境影响预测结果，项目废水深海排放不会造成周边山口国家级红树林保护区、合浦儒艮国家级自然保护区环境功能降级，未对海域生态环境造成大的影响。 The total nitrogen emission of the Project does not surpass the environmental capacity of the sewage discharge area 1 on the west bank of Tieshan Harbor. According to the prediction results about marine environment impact of the project wastewater discharge, the deep-sea wastewater discharge of the project will not cause the environmental function	符合 Compliance

序号 S.N.	北海市环境保护和生态建设"十三五"规划 **Environmental Protection and Ecological Construction in Beihai City during the 13th Five-year Plan**	项目情况 **Project information**	符合性 **Compliance**
		degradation of the surrounding National Mangrove Reserve and Hepu Dugong National Nature Reserve at mountain pass, and has not caused any great impact on the marine ecological environment.	
2	进一步压缩工业用煤，完成燃煤锅炉清洁能源替代，全面取消分散燃煤，强化煤质监控管理，煤锅炉使用低灰分低硫燃料（灰分<16%、硫分<1%）。 The consumption of industrial coal is further reduced, to complete the replacement of clean energy for coal-fired boilers, completely abolish scattered coal burning, and strengthen coal quality monitoring and management. Coal-fired heating boilers of the Project will use the low-ash low-sulfur high-quality coals (ash <16%, sulfur <1%).	本项目燃煤供热锅炉采用低灰低硫优质煤，灰分<16%、含硫率小于 1.0%。本项目燃煤供热锅炉实行超低排放，进一步减少大气污染物排放。同时还建设一台固废利用锅炉，以项目生产过程产生的固体废物为燃料，减少燃煤的使用。 Coal-fired heating boilers of the Project will use the low-ash low-sulfur high-quality coals with ash content <16% and sulfur content <1.0%. Coal-fired heating boilers of the Project will be subject to ultra-low emissions to further reduce the emissions of air pollutants. Additionally, a solid waste utilization boiler shall be built to consume the solid waste generated in the production process of the Project as fuel to reduce the use of coal.	符合 Compliance
3	深化火电行业污染治理，对燃煤机组全面实施超低排放和节能改造，使所有现役电厂每千瓦时平均煤耗低于 310 克、新建电厂平均煤耗低于 300 克。 Deepen pollution control in the thermal power industry, and fully implement ultra-low emission and energy-saving transformation for coal-fired units, so that the average coal consumption per kilowatt-hour of all active power plants is less than 310g, and the average coal consumption of newly-built power plants is less than 300g.	本项目率先执行超低排放。 The Project takes the lead in following ultra-low emissions.	符合 Compliance
4	加快工业固废综合利用与处置体系建设。加强固体废物源头控制和全过程监控管理，逐步建立综合利用与安全处置相结合的固体废物处理处置体系。促进各类废物在企业内部、生态工业园区内的循环使用和综合利用。建设可再生废旧物资回收系统，推进再生资源回收利用，提高废物综合利用率。建立物资和废物交换中心，促进企业物资的交换和副产品与废物的处置。建设工业固体废物处置中心，对无法 Accelerate the construction of comprehensive	本项目生产产生的废木屑、浆渣、污泥，配套一台固废综合利用锅炉回收利用热能，白泥部分作为脱硫剂，剩余生产石灰，绿泥、污泥等送一般固体废物处置中心填埋处置，工业固体废物综合处置利用率为 100%。 The waste sawdust, slurry and sludge produced in the production of the Project are provided with a solid waste comprehensive	符合 Compliance

序号 S.N.	北海市环境保护和生态建设"十三五"规划 **Environmental Protection and Ecological Construction in Beihai City during the 13th Five-year Plan**	项目情况 **Project information**	符合性 **Compliance**
	utilization and disposal system of industrial solid waste. Strengthen the source control and whole-process monitoring & management of solid wastes, to gradually establish a solid waste treatment and disposal system combining comprehensive utilization and safe disposal. Promote the recycling and comprehensive utilization of all kinds of wastes within enterprises and in eco-industrial parks. Establish a recycling system for renewable waste materials to promote the recycling of renewable resources, and improve the comprehensive utilization rate of waste. Establish a material and waste exchange center to promote the exchange of enterprise materials and the disposal of by-products and wastes. Construct an industrial solid waste disposal center for 综合利用的工业固体废物进行最终处置。到 2020 年，工业固体废物综合处置利用率为 100%。 the final disposal of industrial solid waste that cannot be comprehensively utilized. By 2020, the comprehensive disposal and utilization rate of industrial solid waste will be 100%.	utilization boiler to recycle and utilize heat energy. The part of white mud is used as desulfurization agent, and the remaining is used to produce lime, but green mud and sludge are transported to the general solid waste disposal center for landfill disposal. So the comprehensive disposal utilization rate of industrial solid waste is 100%.	
5	加快产业布局和结构调整。根据《北海市人民政府关于印发北海市主体功能区产业结构调整指导意见的通知》，将北海市主体功能区划分为优化开发区、重点开发区、限制开发区、禁止开发区四类。在四类功能区中确定重点产业发展类型、限制性、禁止类产业发展类型及用能品种。 Accelerate industrial layout and structural adjustment. According to the Notice of Beihai Municipal People's Government on Issuing Guiding Opinions on Industrial Restructuring in Beihai's Main Functional Zones, Beihai's main functional zones are divided into four categories: optimized development zones, key development zones, restricted development zones and prohibited development zones. The development types of key industries, as well as the development types and energy-using varieties of restricted and prohibited industries, shall be determined in the four categories.	铁山港区兴港镇，属于重点开发区，不属于禁止或淘汰类产业，原煤不属于禁止使用的能源品种 Xinggang Town, Tieshangang District, is a key development zone, rather than the category of prohibited or eliminated industries; and raw coal is the prohibited energy varieties.	符合 Compliance
6	优化发展第二产业。着重发展壮大电子信息、石油化工、临港新材料"三大千亿元产业"，加快发展林浆纸一体化、新能源、生物医药、环保产业和光电等节能型产业。形成以北海组团和铁山港（龙潭）组团为两核，北海工业园区、北海出口加工区、北海高新技术产业园区、铁山港（临海）工业区（韩铁山港东岸）、合浦	项目属于北海市加快发展的产业，选址位于七大重点园区之内，现实符合北海工业发展布局。 The Project, an industry under accelerated development in Beihai, is located in the said seven	符合 Compliance

序号 S.N.	北海市环境保护和生态建设“十三五”规划 **Environmental Protection and Ecological Construction in Beihai City during the 13th Five-year Plan**	项目情况 **Project information**	符合性 **Compliance**
	工业园、龙港新城（香港产业园）、北海国家（海洋）农业科技园区暨北海海洋产业科技 Optimized development of the secondary industry. Close attention shall be paid to develop and expand the "three industries at scale of RMB 100 billion" (electronic information, petrochemical industry and port-surrounding new materials), and to accelerate the development of energy-saving industries such as forest-pulp-and-paper integration, new energy, biological medicine, environmental protection industry and photoelectricity industry. Beihai Cluster and Tieshan Harbor (Longtan) Cluster are formed as two cores, withseven parks (Beihai Industrial Park, Beihai Export Processing Zone, Beihai High-tech Industrial Park, Tieshangang (Linhai) Industrial Park (East Coast of Hantieshan Port), Hepu Industrial Park, Longgang New Town (Hong Kong Industrial Park), Beihai National (Marine) Agricultural Technology Park and Beihai Marine Industry Technology Park) as key areas, and 园区七大园区为重点，325 国道北海段沿线地带为补充的“两核七园一带”工业发展新格局。 the region along the Beihai Section of National Highway 325 as the supplementary area to new pattern of industrial development in the "Two Cores, Seven Parks and One Region".	key parks, and its actual situations are in line with Beihai's industrial development layout.	
7	根据产业结构调整目录，结合土地集约化利用和环评、能评管理，落实环境准入协同管理。在重点生态功能区严格限制“两高一资”产业布局，在水源涵养区禁止钢铁、造纸等高耗水产业的布局，在重要生物多样性维护区禁止大规模水电开发和林浆纸一体化产业发展，严格限制破坏生态的项目布局。 According to the Catalogue of Industrial Restructuring, the coordinated management of environmental access will be implemented combined with intensive land use, EIA and energy assessment management. In key ecological function zones, the "two-high and one-resource" industrial layout shall be strictly restricted. In the water conservation areas, the layout of high-water-consumption industries such as steel and paper-making shall be prohibited, in important biodiversity conservation areas, large-scale hydropower development and the development of forest-pulp-and-paper integration industries shall be prohibited, and the layout of ecologically damaging projects is strictly restricted.	项目位于工业园区，不属于重要生态功能区范围和重要生物多样性维护区。项目配套林基地在海外设置，不在国内配套建设林基地。 The Project is located in an industrial park and but out of the scope of important ecological function zones and important biodiversity maintenance zones. Supporting forest bases for the Project are set up overseas, instead of in China.	符合 Compliance
8	北海市铁山港（临海）工业区侧重布局资本和	本项目通过环境影响评价，充分	符合

序号 S.N.	北海市环境保护和生态建设“十三五”规划 Environmental Protection and Ecological Construction in Beihai City during the 13th Five-year Plan	项目情况 Project information	符合性 Compliance
9	技术密集型的重化工项目，主要发展石油、化工、金属冶炼等项目，环境风险程度高，要严格控制其对儒艮自然保护区、山口红树林自然保护区的生态安全影响，对产能过剩、高耗水、高污染等不符合国家产业政策的企业，一律不得批准建设，提高石油、化工、造纸、电镀等临港工业及配套产业入园风险管理要求。 Beihai Tieshangang (Linhai) Industrial Park focuses on capital-intensive and technology-intensive heavy chemical projects, which mainly develops petroleum, chemical industry, metal smelting and other projects. Due the high environmental risk, the impact on the ecological security of Dugong Nature Reserve and Shankou Mangrove Nature Reserve shall be strictly controlled. Enterprises with overcapacity, high water consumption and high pollution that do not conform to the national industrial policies shall not be approved for construction, to improve the risk management requirements for harbor-based industries and supporting industry settlement, such as petroleum, chemical industry, paper-making and electroplating.	分析项目建设运行对儒艮自然保护区、山口红树林自然保护区的生态安全影响；提出入园风险管理要求。项目建设符合国家产业政策及相关环保政策要求。 Through EIA, ecological security impact of the project construction and operation on Dugong Nature Reserve and Shankou Mangrove Nature Reserve are fully analyzed in the Project, with requirements for admission risk management proposed. The project construction conform to national industrial policies and relevant environmental protection policies.	Compliance
9	加强企业环境应急预案备案管理，推动企业加强环境安全隐患排查治理。企业应积极配合当地政府建设和完善项目所在园区（港区、资源开采区）环境风险预警体系、环境风险防控工程、环境应急保障体系。企业突发环境事件应急预案应与当地政府和相关部门以及周边企业、园区（港区、资源开采区）的应急预案相衔接，加强区域应急物资调配管理，构建区域环境风险联控机制。 Filing management of environmental emergency plans shall be strengthened for enterprises, to promote enterprises to strengthen the investigation and management of potential environmental safety hazards. So enterprises shall actively cooperate with the local governments to build and improve the environmental risk pre-warning system, environmental risk prevention and control project, and environmental emergency protection system in the park (harbor area and resource exploitation area) where the project is located. Emergency plan for environmental emergencies of enterprises shall be linked with the emergency plans of local governments and relevant departments as well as the those of surrounding enterprises and parks (harbor areas and resource exploitation areas), the allocation and management of regional emergency materials	项目环评对项目建设环境风险进行全面的评价，提出企业、园区、区域三级风险防控措施的建议和要求。 The project EIA makes a comprehensive assessment for the environmental risks of the project construction, and provides recommendations and requirements for risk prevention and control measures at the three levels of enterprises, parks and regions.	符合 Compliance

序号 S.N.	北海市环境保护和生态建设"十三五"规划 Environmental Protection and Ecological Construction in Beihai City during the 13th Five-year Plan	项目情况 Project information	符合性 Compliance
	shall be strengthened, and a joint control mechanism for regional environmental risks shall be created.		

1.6.3 项目与区域规划、规划环评符合性分析

1.6.3 Analysis of compliance with Regional Planning and Planning EIA

（1）与铁山港（临海）工业区分区规划符合性分析的符合性

(1) Analysis of compliance with the zoning planning of Tieshangang (Linhai) Industrial Park

拟建项目与《铁山港（临海）工业区分区规划（2009~2025）》的符合性分析见表 1.6-8。

See Table 1.6-8 for the analysis of compliance of proposed projects with the Zoning Planning of Tieshangang (Linhai) Industrial Park (2009-2025).

表 1.6-8 与《铁山港（临海）工业区分区规划》符合性分析
Table 1.6-8 Analysis of Compliance with the Zoning Planning of Tieshangang (Linhai) Industrial Park

序号 S.N.	《铁山港（临海）工业区分区规划（2009~2025）》 Zoning Planning of Tieshangang (Linhai) Industrial Park (2009-2025)		项目情况 Project information	符合性 Compliance
1	产业定位 Industrial positioning	以石油化工产业为主体，重点发展林浆纸业、船舶修造及现代物流业，协调发展出口加工、资源加工、新材料加工、能源电力和先进制造业等综合产业 With the petrochemical industry as the main body, close attention is paid to the development of forest-pulp-and-paper industry, ship building and repairing, modern logistics industry, while coordinating the development of comprehensive industries such as export processing, resource processing, new material processing, energy & electricity, and advanced manufacturing industry.	林浆纸业，属于园区定位重点发展的产业，符合园区产业定位 The forest-pulp-and-paper industry is a key industry in the park positioning and conforms to the industrial positioning of the park.	符合 Compliance
2	用地规划 Land use planning	三类工业用地面积为 4325.28 公顷，主要沿海岸线布置，利用深水岸线形成大规模临海工业，主要包括石油化工、造纸、资源加工、新材料加工、能源电力、	用地为三类工业用地，符合园区用地规划 The land is of Class III industrial land, which conforms to the land use planning of the park, with	符合 Compliance

序号 S.N.	《铁山港（临海）工业区分区规划（2009~2025）》 Zoning Planning of Tieshangang (Linhai) Industrial Park (2009-2025)		项目情况 Project information	符合性 Compliance
		船舶修造等。 Class III industrial land, with an area of 4325.28 ha., is mainly arranged along the coastline. Deep-water coastlines are used to form large-scale coastal industries, including petrochemical engineering, paper making, resource processing, new material processing, energy and power, ship building, etc.		
3	产业布局 Industry layout	布局石油化、林浆纸业、现代物流、船舶修造、综合产业 5 个产业组团 layout of five industrial clusters (petrochemical, forest-pulp-and-paper industry, modern logistics, ship building and repairing, comprehensive industry).	项目用地位于林浆纸业产业组团符合园区产业布局规划 Land used in the Project is located in the forest-pulp-and-paper industry cluster, which conforms to the industrial layout plan of the Park.	符合 Compliance

综上所述，本项目符合北海市和铁山港（临海）工业区的相关规划要求。

To sum up, the Project meets the relevant planning requirements of Tieshangang (Linhai) Industrial Park.

（2）与北海市铁山港工业区规划环评符合性分析

(2) Analysis of compliance with the EIA of Beihai Tieshangang Industrial Park Planning

项目与《关于广西北部湾经济区北海市铁山港工业区规划环境影响报告书》及审查意见（桂环管函〔2009〕268 号）的相符性分析见表 1.6-9。

See Table 1.6-9 for the analysis of conformance with the Environmental Impact Report of Beihai Tieshangang Industrial Park Planning in Beibu Gulf Economic Zone of Guangxi and its Review Opinions (GHGH [2009] No. 268).

表 1.6-9 与规划环评及其审查意见符合性分析
Table 1.6-9 Analysis of compliance with Planning EIA and Its Review Opinions

序号 S.N.	规划环评及审查意见主要要求 Main requirements of planning EIA and review opinions	符合性 Compliance
1	在规划实施过程中，应注意采取措施保护合浦沙田儒艮自然保护区、山口红树林生态海洋自然保护区的生态环境。 In the process of planning implementation, attention shall be paid to taking measures to protect the ecological environment of Hepu Shatian Dugong	项目废水在铁山港西岸排污区 1（GX012 DⅣ）B3 排污口排放，根据海洋环境影响预测结果，对合浦沙田儒艮自然保护区、山口红树林生态海洋自然保护区影响较小，符合要求。 Project wastewater is discharged at

序号 S.N.	规划环评及审查意见主要要求 Main requirements of planning EIA and review opinions	符合性 Compliance
	Nature Reserve and Shankou Mangrove Ecological Marine Nature Reserve.	the sewage outlet B3 in the sewage discharge area 1 (GX012 D IV) on the west bank of Tieshan Harbor. According to the marine environment impact prediction results, it has little impact on Hepu Shatian Dugong Nature Reserve and Shankou Mangrove Ecological Marine Nature Reserve; so it meets the requirements.
2	在开发建设的过程中须加强对引进项目的管理，对进入工业区的项目实行高标准，严要求，将二氧化硫排放量控制在 16.8 万吨以内，以确保区域环境容量能满足工业区开发的需要。 In the process of development and construction, it is necessary to strengthen the management of introduced projects, implement high standards and strict requirements for projects settling into the industrial parks, and control the emission of sulfur dioxide within 168,000t, so as to ensure that the regional environmental capacity can satisfy the industrial park development.	本项目按高标准、严要求建设，配套完善的环保设施确保稳定达标排放。根据园区跟踪环评测算，园区已批复项目二氧化硫排放量为 6230.88t/a，实际建成投产项目排放量为 1995.08 t/a。本项目二氧化硫采取严格的净化处理措施，排放量为 749.66 t/a，本项目投产后园区二氧化硫批复排放总量为 6980.54t/a，占控制排放量的 4.16%，占标率较小，符合要求。 The Project is constructed according to high standards and strict requirements, and is provided with complete supporting environmental protection facilities to ensure stable up-to-standard discharge. According to the calculation of park tracking EIA, the sulfur dioxide emission of approved projects in the park is 6230.88t/a, and the emission of projects that have been actually completed and put into operation is 1995.08t/a. Strict purification measures are adopted for sulfur dioxide in the Project with an emission of 749.66t/a. After the Project is put into operation, the approved total emissions of sulfur dioxide in the park is 6980.54t/a, accounting for 4.16% of the controlled emissions, and having a lower Pi. So the Project is conforming.
3	调整远期污水处理厂规模：污水处理二厂规模 36 万立方米/天调整为满足 B3 排污区氨氮排放环境容量规模，包括林浆纸 11 万立方米/天的污水处理规模，并保留已批准的 4 万立方米/天污水处理规模，在满足氨氮排放环境容量的情况下，可适当增加规模。 Adjust the scale of long-term sewage treatment plants: the scale of 360,000m³/day for the Sewage Treatment Plant II is adjusted to the scale meeting the environmental capacity of ammonia nitrogen discharge in sewage discharge area B3, including the sewage treatment scale of 110,000m³/day for forest-pulp-and-paper project; but the approved sewage treatment scale of 40,000m³/day remains	本项目氨氮和无机氮排放执行《制浆造纸工业水污染物排放标准》（GB3544 -2008）表 3 水污染物特别排放限值，严于《城镇污水处理厂污染物排放标准》（GB18918-2002）一级 A 标准对氨氮和总氮的要求。 Emission of ammonia nitrogen and inorganic nitrogen in the Project shall be subject to the special emission limit for water pollutants as stipulated in Table 3 of Discharge Standard of Water Pollutants for Pulp and Paper Industry (GB3544-2008), which is stricter than the requirements for ammonia nitrogen and

序号 S.N.	规划环评及审查意见主要要求 **Main requirements of planning EIA and review opinions**	符合性 **Compliance**
	unchanged. Under the condition of meeting the environmental capacity of ammonia nitrogen discharge, the scale can be appropriately increased.	total nitrogen in Grade A Standard of the Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant (GB18918-2002). 项目海洋环境影响预测结果无机氮排放浓度能达到相应海洋功能区的要求，满足氨氮排放环境容量的要求。 Marine environment impact prediction results in the Project show that the inorganic nitrogen emission concentration can meet the requirements for corresponding marine functional zones and meet the environmental capacity requirements of ammonia nitrogen emission. 园区跟踪环评已根据环境容量变化情况对园区排污方案进行调整，见下文跟踪环评符合性分析。 The park tracking EIA has adjusted the park sewage disposal plan according to the changes in environmental capacity. See the following tracking EIA compliance analysis.
4	增加远期提高氨氮排放控制标准要求，远期 A1 排污口氨氮需执行一级 A 标准排放控制标准。B3 排污口氨氮排放标准根据污水排放规模和环境容量确定。 Intensify the requirements for long-term improvement of ammonia nitrogen emission control standards, and the ammonia nitrogen at long-term sewage outlet A1 shall be subject to Class 1A emission control standards. The ammonia nitrogen emission standard for sewage outlet B3 is determined according to the sewage discharge scale and environmental capacity.	
5	强化水资源利用，提高水的重复利用率；生产排水实行清、污分流，以提高新鲜水的重复利用率，有条件的企业要强化污水深度处理回用，减少污水排放量 Strengthen the utilization of water resources and improve the reuse rate of water; production drainage shall be subject to the clean water-sewage division, to improve the recycle rate of fresh water. If the conditions permit, enterprises shall strengthen advanced treatment and reuse of sewage to reduce sewage discharge.	项目生产排水实行清、污分流，提高水的重复利用率，符合要求。 Production drainage of the Project shall be subject to the clean water-sewage division to improve the reuse rate of water, which meets the requirements.
6	实行污水排放总量控制，B3 排污口环境容量为：COD 13687.5t/a；NH_3-N 350.4t/a；石油类 116.8t/a。 The total quantity control shall be implemented for total sewage discharge, and the environmental capacity of sewage outlet B3 is 13687.5t/a for COD, 350.4t/a for NH3-N, and 116.8t/a for petroleum.	由于园区规划环评于 2007 年完成以来，已超过 10 年，铁山港沿海岸线及海域环境功能区划也发生了较大变化，园区跟踪环评（2019 年）依据最新的铁山港现状岸线和规划岸线，结合近年海域海水水质本底情况，对排污口环境容量进行重新数模测算分析，测算结果为废水排放 B3 排污口近期环境容量化学需氧量、无机氮、活性磷酸盐分别为 10918t/a 1002t/a 和 54t/a，远期分别为 15434t/a 和 1336t/a、68 t/a（见附件 4）。环境容量变化主要受排污区环境功能类别由三类调整为四类，铁山港海域海水水质本底值变化，周边红树林保护区范围调整等多方面边界条件变化影响。 Given that the EIA has been completed

序号 S.N.	规划环评及审查意见主要要求 **Main requirements of planning EIA and review opinions**	符合性 **Compliance**
		for more than 10 years since 2007, great changes have also taken place in the environmental function zoning along the coastline and sea area of Tieshan Harbor. According to the latest situations of Tieshan Harbor existing and planned coastline, and based on the background situation of seawater quality in recent years, the environmental capacity of sewage outlet is calculated and analyzed with mathematical model again in park tracking EIA (2019). The calculation results show that, in wastewater discharge, the short-term environmental capacity of sewage outlet B3 is 10918t/a, 1002t/a and 54t/a respectively for chemical oxygen demand, inorganic nitrogen and active phosphate, and the long-term environmental capacity is 15434t/a, 1336t/a and 68 t/a respectively for the same (see Annex 4). The change of environmental capacity is mainly caused by the change of boundary conditions such as the adjustment of environmental function categories from Category III to Category IV in the sewage discharge area, the change of seawater quality background value in the sea area of Tieshan Harbor, and the adjustment of the scope of surrounding mangrove protection areas. 本项目建成后 B3 排污口化学需氧量、无机氮、活性磷酸盐排放量分别为 6236t/a、607t/a 和 27.7t/a，均未超出园区跟踪环评重新测算的 B3 排污口环境容量，在 B3 排污口排放符合要求。 After the Project is completed, the chemical oxygen demand, inorganic nitrogen and active phosphate emissions of sewage outlet B3 are 6236t/a, 607t/a and 27.7t/a respectively, which do not exceed the environmental capacity of sewage outlet B3 recalculated in the park tracking EIA; so the emissions at sewage outlet B3 meet the requirements.
7	限制入区的工业项目：⑴ 列入国家经贸委第 6 号令、第 16 号令、第 32 号令《淘汰落后生产能力、工艺和产品的目录》（第一、第二、第三批）的项目。⑵ 列入国家经贸委第 14 号令《工商投资领域制止重复建设目录》（第一批）的项目。(3)《产业结构调整指导目录(2005 年本)》中规定的限制类项目。 Industrial projects restricted from being settled	本项目符合国家产业政策，不属于限制、禁止入园的产业和项目类别，符合要求。 The Project conforms to the national industrial policy, rather than the industries and project categories that is restricted or prohibited to be settled into the park; so it meets the requirements.

序号 S.N.	规划环评及审查意见主要要求 **Main requirements of planning EIA and review opinions**	符合性 **Compliance**
	into the park: (1) projects listed in the Catalogue of Eliminating Backward Production Capacity, Technology and Products (Batches I, II and III), Decree No. 6, Decree No. 16 and Decree No. 32 of the State Economic and Trade Commission. (2) Projects listed in the Catalogue of Stopping Repeated Construction in the Field of Industrial and Commercial Investment (Batch I), Decree No. 14 of the State Economic and Trade Commission. (3) Restricted projects stipulated in the Catalog for Guiding Industry Restructuring (2005 Edition). 禁止入区的工业项目：⑴ 列入国家计委、国家经贸委和外经贸部第 21 号令发布的《外商投资产业指导目录（禁止类）》的项目。⑵ 列入国家规定的“十五小”的项目。(3)《产业结构调整指导目录(2005 年本)》中规定的禁止类项目。 Industrial projects prohibited from being settled into park: (1) projects listed in the Catalogue for the Guidance of Foreign Investment Industries (Prohibited Categories), Decree No. 21 of the State Development Planning Commission, the State Economic and Trade Commission, and the Ministry of Foreign Trade and Economic Cooperation. (2) Projects listed in the national "Fifteen Categories of Small-sized Enterprises" (3) Prohibited projects stipulated in the Catalog for Guiding Industry Restructuring (2005 Edition). 国家明令淘汰、禁止建设的、不符合国家产业政策规定的项目，以及列入国务院清理整顿范围，不符合国家政策规定的钢铁、电解铝、水泥、电石、铁合金、焦炭、平板玻璃、13.5 万千瓦及以下火电机组等项目严禁引入工业区。 Projects that are explicitly eliminated or prohibited from construction and do not conform to national industrial policies, as well as projects such as steel, electrolytic aluminum, cement, calcium carbide, ferroalloy, coke, flat glass and thermal power units of 135,000 kilowatts or less that are included in the rectification by the State Council and do not conform to national policies, are strictly prohibited from being introduced into industrial parks.	
8	新建项目红线： New Project Red Line: 铁山港工业区概念规划实施后，会加大区域内资源和环境压力，所以必须对新上项目有严格的要求，这些要求至少不低于目前国内对建设项目的相关要求，具体要求如下： After the conceptual planning of Beihai Tieshangang Industrial Park is implemented, the pressure on resources and environment in the region will be increased. Therefore, strict requirements must be imposed on the new projects, and these	项目建设符合国家和地方产业政策和环保政策，清洁生产达到国内先进水平，符合要求。 The project construction conforms to the national and local industrial policies and environmental protection policies, and cleaner production reaches the domestic advanced level; so the project meets the requirements.

序号 S.N.	规划环评及审查意见主要要求 Main requirements of planning EIA and review opinions	符合性 Compliance
	requirements are at least not lower than the current domestic requirements for construction projects, specifically as follows: （1）不符合国家和地方产业政策及环保政策的项目，一律禁止上马； (1) Projects that do not conform to national and local industrial policies and environmental protection policies are prohibited from being launched. （2）新上项目至少达到国家清洁生产二级水平以上。 (2) New project shall at least reach the Level 2 or above in terms of cleaner production as stipulated in national regulations.	
9	加强对大气污染源控制与管理： Strengthen the control and management of air pollution sources: 在工业区商贸居住区附近区域和商贸居住区上风向区域（北部区域）的工业区不宜建设大气污染较为严重的工业项目，在上述范围 600 米之内，不宜设置超过 50 米高度的燃煤锅炉，锅炉设置宜以燃油为主。在工业区商贸居住区下风向区域的工业区，可建设冶金、钢铁、电力等大气污染较为明显的工业项目。为了避免工业项目的烟囱设置过于密集而形成局部环境浓度的超标，工业项目选址布局时不宜过于密集。 Industrial projects with serious air pollution shall not be built in the areas near commercial and residential areas of the industrial park, or in industrial parks in the windward direction (northern areas) of the commercial and residential areas. Within 600 meters around the above range, coal-fired boilers with a height of more than 50 meters shall not be set up, and the boiler shall be oil-fired mainly. Industrial projects with obvious air pollution, such as metallurgy, steel and electricity, can be built in industrial areas in the downwind direction of commercial & residential areas in industrial park. To prevent the chimneys of industrial projects from being too dense and causing the local environmental concentration to exceed the standard, the site selection and layout of industrial projects should not be too dense.	项目选址位于工业区南部区域，属于规划区的下风向，且远离规划的商贸居住区； The project site is located in the southern area of the industrial park, which is in the downwind direction of the planned area and is far away from the planned commercial & residential area. 项目合理布置厂房和排气筒，严格废气排放管理，确保污染物排放和区域环境质量双达标。 In the Project, the factory building and exhaust pipe are reasonably arranged, to strictly manage the exhaust gas emission, and ensure that the pollutant emission and regional environmental quality meet the standards. 符合要求。 So the Project meets the requirements.

综上所述，本项目基本符合《关于广西北部湾经济区北海市铁山港工业区规划环境影响报告书》及审查意见（桂环管函〔2009〕268 号）的相关环保要求。

To sum up, the Project basically meets the Environmental Impact Report of Beihai Tieshangang Industrial Park Planning in Beibu Gulf Economic Zone of Guangxi and its Review Opinions (GHGH [2009] No. 268).

（3）与北海市铁山港工业区跟踪环评符合性分析

(3) Analysis of compliance with the tracking EIA of Beihai Tieshangang Industrial Park

园区于 2018 年开展了跟踪环评工作，项目与《广西北部湾经济区北海市铁山港工业区规划环境影响跟踪评价报告书》及专家审查意见的相符性分析见表 1.6-10。

The tracking EIA was made for the park in 2018, and the conformance of the Project with the Report on Tracking Environmental Impact Assessment of Beihai Tieshangang Industrial Park Planning in Beibu Gulf Economic Zone of Guangxi, and export review is shown in Table 1.6-10.

表 1.6-10　与园区跟踪环评及其审查意见符合性分析
Table 1.6-10 Analysis of Compliance with the Park Tracking EIA and Its Review Opinions

序号 S.N.	园区跟踪环评及审查意见主要要求 Main requirements for the park tracking EIA and review opinions	符合性 Compliance
1	园区后续发展环境准入负面清单： Negative list of environmental access for subsequent development of the park: 禁止：①不符合北海市生态保护红线的排放污染物的建设项目；②列入国家计委、国家经贸委和外经贸部第 21 号令发布的《外商投资产业指导目录（禁止类）》的项目；③列入国家规定的“十五小”及“新五小”的项目；④《产业结构调整指导目录(2013 年本)》中规定的禁止类项目；⑤列入《禁止用地项目目录（2012 年本）》中的项目；⑥国家明令淘汰、禁止建设的、不符合国家产业政策规定的项目，以及列入国务院清理整顿范围，不符合国家政策规定的钢铁、电解铝、水泥、电石、铁合金、焦炭、平板玻璃、13.5 万千瓦及以下火电机组等项目严禁引入工业区。 Prohibited projects: ① Construction projects that do not comply with the ecological red line of Beihai City and discharge pollutants; ② Projects listed in the Catalogue for the Guidance of Foreign Investment Industries (Prohibited Categories), Decree No. 21 of the State Development Planning Commission, the State Economic and Trade Commission, and the Ministry of Foreign Trade and Economic Cooperation; ③ Projects listed in the "Fifteen Categories of Small-sized Enterprises" and "New Five Categories of Small-sized Enterprises" in China; ④ Prohibited projects stipulated in the Catalog for Guiding Industry Restructuring (2013 Edition); ⑤ Projects listed in the Catalogue of Prohibited Land Projects (2012 Edition); ⑥ Projects that are explicitly eliminated or prohibited from construction and do not conform to national industrial policies, as well as projects such as steel, electrolytic aluminum, cement, calcium carbide, ferroalloy, coke, flat glass and thermal power units of 135,000 kilowatts or less that are included in the rectification	本项目不属于所属的禁止、限制类项目，符合要求。项目达到国内先进生产工艺水平，符合国家规定的环保要求。 The Project does not fall under the category of the prohibited or restricted projects, so it meets the requirements. The Project has reached the domestic advanced production technology level, conforms to the rational environmental protection requirements stipulated.

序号 S.N.	园区跟踪环评及审查意见主要要求 Main requirements for the park tracking EIA and review opinions	符合性 Compliance
2	by the State Council and do not conform to national policies, are strictly prohibited from being introduced into industrial parks. 限制：① 列入国家经贸委第 6 号令、第 16 号令、第 32 号令《淘汰落后生产能力、工艺和产品的目录》（第一、第二、第三批）的项目。②列入国家经贸委第 14 号令《工商投资领域制止重复建设目录》（第一批）的项目。③ 《产业结构调整指导目录(2013 年本)》中规定的限制类项目。 Projects restricted ① projects listed in the Catalogue of Eliminating Backward Production Capacity, Technology and Products (Batches I, II and III), Decree No. 6, Decree No. 16 and Decree No. 32 of the State Economic and Trade Commission. ② Projects listed in the Catalogue of Stopping Repeated Construction in the Field of Industrial and Commercial Investment (Batch I), Decree No. 14 of the State Economic and Trade Commission. ③ Restricted projects stipulated in the Catalog for Guiding Industry Restructuring (2013 Edition).	
2	引进项目时仍然需要严格控制 TSP 、SO_2 、NO_2 、VOC 排放量，引进低污染的企业和无污染的企业，采用清洁能源，实施清洁生产，最大限度地减少污染物排放量，加大尾气除尘、脱硫、脱销处理，加强 VOC 治理，合理布局各有污染源的企业，要充分考虑环境容量的充分和合理利用，尤其是工业区的布局，中高架源尽可能考虑布置在区域的边缘，以便充分利用相邻区域的中高空环境容量，污染物排放量大的采用高烟囱排放，以减少区域内的环境压力。 The emissions of TSP, SO2, NO2 and VOC shall be strictly controlled when som eprojects are not the indtroduced projects. As a result, low-pollution and pollution-free enterprises shall be introduced, clean energy shall be adopted, and cleaner production shall be implemented to minimize pollutant emissions. Dust removal, desulfurization and denitrification of tail gas shall be intensified; and VOC control shall be strengthened, Enterprises with pollution sources shall be reasonably layout, and full and reasonable utilization of environmental capacity shall be fully considered, especially the layout of industrial parks. Medium- and high-chimney discharge should be arranged at the edge of the area as much as possible, to make full use of the medium- and high-altitude environmental capacity of adjacent areas. High chimneys shall be used for areas with high pollutant emissions to relieve environmental protection load in the area.	本项目按高标准、严要求建设，配套完善的环保设施确保稳定达标排放，其中燃煤供热锅炉和固废综合利用锅炉执行超低排放，进一步减少颗粒物、SO_2 、NO_2 的排放，本项目设置高 150 米的多管集束烟囱，将各主要我污染源废气处理达标后高空排放，项目排放的污染物总量满足环境容量的要求。 The Project is constructed by following high standards and strict requirements, and is provided with complete supporting environmental protection facilities to ensure stable up-to-standard discharge. Among them, coal-fired heating boilers and solid waste comprehensive utilization boilers are subject to ultra-low emissions to further reduce the emissions of particulate matter, SO2 and NO2. A 150-meter-high multi-tube chimney-group is set in the Project for up-to-standard discharge of waste gas from major pollution sources at high altitude. The total amount of pollutants discharged in the Project meets the requirements of environmental capacity.
3	对于新建的工业项目，必须严格执行治理“三废”措施与主体工程同时设计、同时施工、同时投	本项目污水处理站采用“初沉池+厌氧反应器+生物选择池+卡鲁塞尔氧化沟+

序号 S.N.	园区跟踪环评及审查意见主要要求 **Main requirements for the park tracking EIA and review opinions**	符合性 **Compliance**
	产的"三同时"规定。水污染防治技术尽可能选择国内外先进的工艺技术，以提高工业区内项目水污染控制水平，减少废水中污染物的排放。对于污染比较严重，治理措施又达不到环保要求的项目，建议不要安排在工业区内。 For newly-built industrial projects, the "Three Simultaneities" regulation which provides for the simultaneous design, simultaneous construction and simultaneous operation between "Three Wastes" control measures and main works must be strictly implemented. For water pollution prevention and control technology, the advanced technology at home and abroad shall be chosen as much as possible to improve the water pollution control level of projects in the industrial park and reduce the discharge of pollutants in wastewater. Projects with serious pollution and treatment measures that cannot address environmental protection are not recommended in industrial parks.	高级氧化池"工艺，废水处理达标后排入铁山港区深海排放管网，在铁山港 B3 排污口深海排放。污水处理工艺为国内外造纸废水处理最先进的工艺，能确保废水稳定达标排放。符合要求。 Sewage treatment plant of the Project adopts the process of "primary settling tank + anaerobic reactor + biological selector + Carrousel oxidation ditch + advanced oxidation tank". The wastewater is discharged into the deep-sea discharge pipe network of Tieshangang District after reaching the standard and then discharged into the deep sea at the sewage outlet B3 of Tieshan Harbor. Sewage treatment process is the most advanced process for paper-making wastewater treatment at home and abroad, which can ensure stable up-to-standard discharge. So the Project meets the requirements.
4	铁山港工业区在后期的发展中构建循环经济产业链，通过引入"补链"和"延链"项目，构建循环经济主导产业链和辅助产业链，实现生产装置互联、上中下游产品互供、产业环环相扣，从而促进原料投入和废物排放的减量化、再利用和资源化，以及危险废物的资源化和无害化处理。 In the later development of Beihai Tieshangang Industrial Park, industry chain of circular economy is established. Through the introduction of "chain supplement" and "chain extension" projects, the leading and auxiliary industrial chain of circular economy will be constructed to realize the interconnection of production devices, the mutual supply of products among the upper, middle and lower reaches, and the interlocking of industries, thus promoting the minimization, reuse and recycling of raw material input and waste emissions, as well as the recycling and harmless treatment of hazardous wastes.	本项目产生的废弃物大部分在厂内进行减量化和资源化利用，白泥送石灰窑处理，木屑、浆渣、污泥送固废综合利用锅炉回收热能。符合要求。 Most of the wastes generated in the Project are minimized and recycled in the factory. White mud is delivered to lime kiln for treatment, and sawdust, slurry and sludge are delivered to solid waste comprehensive utilization boiler to recover heat energy. So the Project meets the requirements.
5	大力推进节能降耗，实现资源的高效利用： Energy conservation and consumption reduction shall be vigorously promoted for efficient utilization of resources: （1）采用节约资源、能源和土地的技术工艺与装备及相应的保障措施，实现生产过程中的减量化。（2）推进企业在生产过程中使用串联用水系统和循环用水系统。（3）对生产过程中产生的废气（余压、余热）、废渣、废液进行综合利用处理，最大限度地实现资源化。 (1) Technologies and equipment that save resources, energy and land shall be adopted, and corresponding safeguard measures shall be taken, to	项目生产排水实行清、污分流，提高水的重复利用率，单位产品用水、排水量等指标达到清洁生产国际先进水平。大部分在厂内进行减量化和资源化利用。符合要求。 Production drainage of the Project shall be subject to clean water-sewage division to improve the reuse rate of water. Water consumption & drainage per unit product and other indexes will reach the international advanced level in terms of cleaner production. Most of them are minimized and recycled in the factory. So

序号 S.N.	园区跟踪环评及审查意见主要要求 Main requirements for the park tracking EIA and review opinions	符合性 Compliance
6	realize minimization in the production process. (2) Enterprises shall be promoted to adopt series water system and circulating water system in the production process. (3) Comprehensive utilization and treatment shall be made to the waste gas (residual pressure, residual heat), waste residue and waste liquid generated in the production process to maximize resource utilization.	the Project meets the requirements.
6	严格保护广西合浦儒艮国家级自然保护区、广西山口国家级红树林生态自然保护区、北部湾二长棘鲷长毛对虾国家级水产种质资源保护区的环境质量。 The environmental quality of Guangxi Hepu Dugong National Nature Reserve, Guangxi Shankou National Mangrove Ecological Nature Reserve, and Beibu Gulf National Fisheries Genetic Resources Reserve for Parargyrops Edita and Penaeus Penicillatus shall be strictly protected.	根据海洋环境影响预测结果，对合浦沙田儒艮自然保护区、山口红树林生态海洋自然保护区、北部湾二长棘鲷长毛对虾国家级水产种质资源保护区，影响较小，均不会造成保护区功能降级，符合要求。 According to the prediction results of marine environmental impact, it has little impact on Hepu Shatian Dugong Nature Reserve, Shankou Mangrove Ecological Marine Nature Reserve and Beibu Gulf National Fisheries Genetic Resources Reserve for Parargyrops Edita and Penaeus Penicillatus, which will not cause the degraded reserve function and meets the requirements.
7	对于入区企业，所有符合监管条件的企业在污染物排放口需设置在线监控装置。 For enterprises settled, all enterprises that meet the regulatory conditions shall be equipped with on-line monitoring devices at the pollutant discharge ports.	本评价已对企业重点监管排污口要求设置在线监控。符合要求。 This assessment has set up on-line monitoring requirements for key sewage outlets under the supervision of enterprises. So the Project meets the requirements.
8	建议工业区近期废水在满足 B3 排污口环境容量的基础上优先考虑在 B3 排污口深海排放，B3 排污口环境容量不足时，启动新排污区的论证和建设工作。 It is suggested that the wastewater of the industrial park in the short term shall be discharged into the deep sea of sewage outlet B3 on the basis of meeting the environmental capacity of sewage outlet B3. When the environmental capacity of sewage outlet B3 is insufficient, the demonstration and construction of the new sewage discharge area shall be started.	根据跟踪环评测算，B3 排污口化学需氧量、无机氮、活性磷酸盐排放量近期控制在 10918t/a 1002t/a 和 54t/a，远期控制在 15434t/a 和 1336t/a、68 t/a，本项目建成后 B3 排污口化学需氧量、无机氮、活性磷酸盐排放量分别为 6236t/a、607t/a 和 27.7t/a，均未超出 B3 排污口环境容量，在 B3 排污口排放符合要求。 According to the estimation and calculation of tracking EIA calculation, the discharge amount of chemical oxygen demand, inorganic nitrogen and active phosphate at sewage outlet B3 is limited to 10918t/a, 1002t/a and 54t/a in the short term and 15434t/a, 1336t/a and 68 t/a in the long term. After the Project is completed, the discharge amount of chemical oxygen demand, inorganic nitrogen and active phosphate at sewage outlet B3 is 6236t/a, 607t/a and 27.7 t/a respectively, which do not exceed the
9	园区后续发展废水主要污染物允许排放量控制建议：废水排放 B3 排污口新增化学需氧量、无机氮、活性磷酸盐排放量近期控制在 10918t/a 1002t/a 和 54t/a，远期控制在 15434t/a 和 1336t/a、68 t/a。 Suggestions on the allowable discharge control of major pollutants in wastewater for the follow-up park development: the discharge of newly-added chemical oxygen demand, inorganic nitrogen and active phosphate at sewage outlet B3 for wastewater discharge shall be limited to 10918t/a, 1002t/a and	

序号 S.N.	园区跟踪环评及审查意见主要要求 **Main requirements for the park tracking EIA and review opinions**	符合性 **Compliance**
	54t/a in the short term, and 15434t/a, 1336t/a and 68 t/a in the long term.	environmental capacity of sewage outlet B3 and thus meet the requirements.

综上所述，本项目总体符合《广西北部湾经济区北海市铁山港工业区规划环境影响跟踪评价报告书》及专家意见的相关环保要求。

To sum up, the Project generally conforms to the Tracking Report on Planning Environmental Impact Assessment of Beihai Tieshangang Industrial Park in Beibu Gulf Economic Zone of Guangxi and expert opinions.

（4）与《北海市各产业园区产业准入负面清单》的符合性

(4) Conformance with Negative List of Industrial Access to Beihai Industrial Parks

北海市人民政府 2017 年 4 月印发的《北海市各产业园区产业准入负面清单》（北政发〔2017〕15 号）中北海市铁山港（临海）工业区市场准入负面清单对“22 造纸和纸制品业 2211 木竹浆制造”列为限制类产业，管控要求为要求达到国内先进生产工艺水平，符合国家规定的环保要求。

In the Negative List of Industrial Access to Beihai Industrial Parks (BZF [2017] No. 15) issued by Beihai Municipal People's Government in April 2017, the Negative List of Market Access in Tieshangang (Linhai) Industrial Park listed "22 Paper-making and Paper Products Industry 2211 Wood and Bamboo Pulp Manufacturing" as a restricted industry. The control requirements are to reach the domestic advanced production technology level and meet the national environmental protection requirements.

根据§2.2.8 和§2.2.9 分析，本项目生产工艺、清洁生产、污染物排放等均达到国内同行业先进水平以上，且均符合国家各项环保法律法规要求。根据《北海市发展和改革委员会关于对广西太阳纸业有限公司 350 万吨林浆纸一体化项目入园意见的复函》（北发改函〔2019〕1021 号）：认为项目符合国家产业政策，符合铁山港（临海）工业区产业准入要求。

According to the analysis of §2.2.8 and §2.2.9, the production process, cleaner production and pollutant emission of the Project have reached the advanced level of the same industry in China and all conform to various national environmental protection laws and regulations. According to the Reply of Beihai Development and Reform Commission on the Opinions on the Admission of 3.5 Million Tons Forest-Pulp-and-Paper Integration Project of Guangxi Sun Paper Co., Ltd. (BFGH [2019] No. 1021), it is believed that the Project conforms to the national industrial policy and meets the industrial access requirements of Tieshangang (Linhai) Industrial Park.

2 项目工程概况及工程分析

2. Project engineering overview and engineering analysis

2.1 项目工程概况

2.1. Project engineering overview

2.1.1 基本概况

2.1.1 Basic overview

（1）项目名称：广西太阳纸业有限公司350万吨林浆纸一体化项目

(1) Project name: 3.5 Million Tons Forest-Pulp-Paper Integration Project of Guangxi Sun Paper Co., Ltd.

（2）项目性质：新建

(2) Project nature: New-built

（3）建设地点：北海市铁山港（临海）工业区兴港路、8号路、新2路、滨海大道之间，项目中心地理坐标为东经109°32’52.48”，北纬21°31’36.46”，具体地理位置见附图1。

(3) Construction location: Among Xinggang Road, No. 8 Road, New 2 Road and Binhai Avenue of Tieshangang (Linhai) Industrial Park, Beihai City, the Project Center’s geographical coordinates: East longitude 109°32’52.48”, northern latitude: 21°31’36.46”, and the specific geographic location is shown in the Attached Map 1.

（4）建设单位：广西太阳纸业有限公司

(4) Construction unit: Guangxi Sun Paper Co., Ltd.

（5）占地面积：总占地面积约3693亩（其中，生产区用地3433亩，项目配套的一般工业固体废物填埋场260亩另行选址）。

(5) Floor area: total floor area is about 3693 mu (including 3433 mu of production area, and the site of the supported general industrial solid waste landfill (260 mu) will be selected additionally).

（6）主要建设内容及规模：

(6) Main construction content and scale:

一期建设一条 80 万 t/a 化学木浆生产线和一条 20 万 t/a 化机浆生产线，均以桉木片、阔叶木木片等为原料，其中化学木浆生产线采用硫酸盐法制浆，化机浆采用 APMP 制浆；并以自制漂白阔叶浆，配一定量的外购长纤浆，生产文化用纸和特种纸，设计规模分别为 55 万 t/a 和 50 万 t/a，余下的自制漂白木浆抄成浆板外卖，设计规模为 45 万 t/a。

Phase I: Construct a 800,000 t/a chemical wood pulp production line and a 200,000 t/a APMP production line, both of which take eucalyptus wood chips and hardwood wood chips as the raw materials, where the chemical wood pulp production line adopts the pulping by the sulfate process, and APMP production line adopts APMP pulping; they can also produce cultural paper and special paper with self-made BHKP assorted with a certain amount of purchased long-fiber pulp. The design scale is 550,000 t/a and 500,000 t/a, respectively; the remaining self-made bleach pulp will be made into pulp boards for sales, with the design scale of 450,000 t/a.

二期新增一条 40 万 t/a 化机浆生产线，以桉木片、阔叶木木片等为原料，采用 APMP 制浆工艺，并以自制化机浆、漂白阔叶浆，配一定量的外购长纤浆，生产生活用纸和白卡纸，设计规模分别为 15 万 t/a 和 90 万 t/a。

Phase II: Newly add a 400,000 t/a chemical wood pulp production line, which takes eucalyptus wood chips and hardwood wood chips as the raw materials, and adopts the APMP pulping; it is used to produce life paper and ivory board with self-made APMP and BHKP, as well as a certain amount of purchased long-fiber pulp. The design scale is 150,000 t/a and 900,000 t/a, respectively.

（7）项目总投资：2259145 万元，其中环保投资 301726，占总投资的 13.36%。

(7) Total investment of the Project: RMB 22,591,450,000, of which environmental protection investment is RMB 3,017,260,000, accounting for 13.36% of the total investment.

（8）项目建设周期：项目一期工程待环评批复后开工建设，建设工期 2 年~2.5 年，80 万吨化学浆项目和 55 万吨文化纸项目计划于 2021 年 10 月投产；20 万吨化机浆和 50 万吨特种纸项目计划于 2022 年 5 投产。

(8) Construction period: Phase I of the Project will be constructed after obtaining EIA approval, with the construction period of 2~2.5 years; the 800,000 tons chemical pulp project

and 550,000 tons cultural paper project are planned to be put into operation in October 2021; the 200,000 tons APMP and 500,000 tons special paper projects are planned to be put into operation in May 2022.

项目二期工程计划于 2022 年 10 月启动，2024 年 10 月全部投产运行。

Phase II of the Project will be started in October 2022, and put into operation in October 2024.

（9）劳动定员及生产制度：本项目劳动定员 3200 人，其中一期 2440 人，二期 760 人。全年工作天数为 340 天，生产车间为四班三运转工作制。

(9) Labor capacity and production system: There are 3,200 employees in the Project, where 2,440 in Phase I and 760 in Phase II. The project adopts 340 working days per year, and a four-team three-shift system in the workshop.

（10）本报告只针对项目生产区进行评价，配套一般工业固体废物填埋场另行开展环评工作。项目涉及的输变电工程环境影响评价内容另行开展环评工作。

(10) This report only evaluates the production area, and the environmental impact assessment on general industrial solid waste landfill will be separately carried out. In the case that the project involves the environmental impact assessment of the transmission and transformation project, the environmental impact assessment will be carried out separately.

2.1.2 产品方案及产品质量标准

2.1.2 Product scheme and product quality standard

项目产品方案见.2-1，产品质量执行企业自定标准。

The product scheme of the Project is shown in 2-1, and the product quality executes the self-made standard of the Company.

表 2.1.2-1　产品方案及质量标准
Table 2.1.2-1 Product scheme and quality standard

序号 S.N.	时段 Period	产品名称 Product name	单位 Unit	规模 Scale	产品执行标准 Product implementation standards
1	一期产品方案 Phase I product scheme	漂白阔叶木浆板 Bleached hardwood kraft pulp board	万 t/a 10,000t/a	45	QB/T1678-2008
2		文化用纸 Cultural paper	万 t/a 10,000t/a	55	Q/0882STZ001-2017 Q/0882STZ002-2017

3		特种纸 Special paper	万 t/a 10,000t/a	50	Q/0882STZ003-2017 Q/0882STZ004-2017 Q/0882STZ005-2017 Q/0882STZ009-2017 Q/0882STZ0010-2017
4	二期产品方案 Phase II product scheme	生活用纸 Life paper	万 t/a 10,000t/a	15	Q/0882STS001-2017 Q/0882STS002-2017
5		白卡纸 Ivory board	万 t/a 10,000t/a	90	Q/0882SWS001-2019 Q/0882SGZ001-2017 Q/0882WTZ001-2017 Q/0882WTZ002-2017 Q/0882WTZ005-2018 Q/0882WTZ006-2018 Q/0882TYZ001-2017 Q/0882STZ007-2018
6	二期建成后，全厂产品方案 Product scheme of the whole manufacturer after the completion of Phase II	漂白阔叶木浆板 Bleached hardwood kraft pulp board	万 t/a 10,000t/a	18	QB/T1678-2008
7		文化用纸 Cultural paper	万 t/a 10,000t/a	55	Q/0882STZ001-2017 Q/0882STZ002-2017
8		特种纸 Special paper	万 t/a 10,000t/a	50	Q/0882STZ003-2017 Q/0882STZ004-2017 Q/0882STZ005-2017 Q/0882STZ009-2017 Q/0882STZ0010-2017
9		生活用纸 Life paper	万 t/a 10,000t/a	15	Q/0882STS001-2017 Q/0882STS002-2017
10		白卡纸 Ivory board	万 t/a 10,000t/a	90	Q/0882SWS001-2019 Q/0882SGZ001-2017 Q/0882WTZ001-2017 Q/0882WTZ002-2017 Q/0882WTZ005-2018 Q/0882WTZ006-2018 Q/0882TYZ001-2017 Q/0882STZ007-2018

2.1.3 项目组成

2.1.3 Project composition

本项目分两期进行。一期项目组成包括木片堆场、化学浆车间、化机浆车间、浆板车间、碱回收车间、文化纸车间、特种纸车间、热电站、污水处理站以及相应的辅助工程、公用工程等组成。二期项目组成包括化机浆车间、生活用纸车间、白卡纸车间、成品仓库等。

The Project is constructed in two phases. Phase I consists of the wood chip stockyard, chemical pulp workshop, APMP workshop, pulp board workshop, alkali recovery workshop, cultural paper workshop, special paper workshop, thermal power plant, sewage treatment plant and the corresponding auxiliary works and utilities. Phase II consists of the APMP workshop, life paper workshop, ivory board workshop, and finished goods warehouse.

表 2.1.3-1 项目组成一览表
Table 2.1.3-1 List of project composition

类别 Category	工程名称 Project name		主要建设内容及规模 Main construction contents and scale	备注 Remarks
一、一期工程 I. Phase I project				
主体工程 Main work	制浆 Pulping	备料工段 Preparation section	木材削片筛选：占地面积 1404m²，局部 2 层，框架结构。包括削片、筛选、储存和皮带输送系统。 Wood slicing and screening: Floor area: 1,404m², 2 storeys locally, frame structure. Including chipping, screening, storage and belt conveyor systems.	
			木片筛房：占地面积 864m²，2 层，框架结构。 Wood chip screening room: Floor area: 864m², 2 storeys locally, frame structure.	
		化学浆车间 Chemical pulp workshop	占地面积 15120m²，局部 3 层，框架结构。 Floor area: 15,120m², 3 storeys locally, frame structure. 建设 1 条 80 万 t/a 漂白硫酸盐木浆生产线，设计能力 2360adt/d。 Construct one 800,000 t/a bleached sulfate pulp production line, with the design capability of 2,360 adt/d.	
		20 万吨化机浆车间 200,000 tons chemimechanical pulp workshop	占地面积 3645m²，4 层，框架结构。 Floor area: 3,645m², 4 storeys, frame structure. 建设 1 条 20 万 t/a 化机浆生产线，设计能力 606adt/d。 Construct one 200,000 t/a APMP production line, with the design capability of 606 adt/d.	
			MVR 蒸发工段：占地面积 2250m²，1 层，轻钢结构。 MVR evaporation section: Floor area: 2,250 m², 1 storey, light steel structure.	
	造纸 Paper making	55 万吨文化用纸 550,000 tons cultural paper	碎解间：占地面积 8640m²，1 层，轻钢结构。 Repulping room: Floor area: 8,640 m², 1 storey, light steel structure.	
			造纸车间：占地面积 22032m²，2 层，框架结构。 Paper making workshop: Floor area: 22,032 m², 2 storeys, frame structure.	
			纸加工车间：占地面积 20672m²，1 层，局部 2 层，框架结构。 Paper processing workshop: Floor area: 20,672 m², 1 storey, 2 storeys locally, frame structure.	
			文化纸平板库（一）：占地面积 5586m²，1 层，轻钢结构。 Cultural Paper Board Storage (1): Floor area: 5,586 m², 1 storey, light steel structure.	
			文化纸平板库（二）占地面积 7644m²，1 层，轻钢结构。 Cultural Paper Board Storage (2): Floor area: 7,644 m², 1 storey, light steel structure.	
			文化纸平板库（三）占地面积 11520m²，1 层，轻钢结构。 Cultural Paper Board Storage (3): Floor area: 11,520 m², 1 storey, light steel structure.	
		50 万吨特种纸 500,000 tons special paper	特种纸车间（一）：占地面积 15960m²，2 层，框架结构。年产特种纸 5 万吨，纸种主要为食品级离型原纸。 Special paper workshop (1): Floor area: 15,960 m², 2 storeys, frame structure. The annual output of special paper reaches 50,000 tons, mainly involving the food-grade release paper.	
			特种纸车间（二）：占地面积 21840m²，2 层，框架结构。年	

类别 **Category**	工程名称 **Project name**		主要建设内容及规模 **Main construction contents and scale**	备注 **Remarks**
			产特种纸 45 万吨，纸种主要包括：淋淋膜原纸/淋膜纸、标签纸、烟包用纸、艺术纸、广告用纸、彩色喷墨打印纸/相册纸、数码打印纸等。 Special paper workshop (2): Floor area: 21,840 m^2, 2 storeys, frame structure. The annual output of special paper reaches 450,000 tons, mainly involving the coated base paper/coated paper, label paper, cigarette package paper, art paper, advertising paper, color inkjet printing paper/photo album paper, and digital printing paper, etc.	
			特种纸成品库：占地面积 25200m^2，1 层，框架结构。 Special paper finished goods warehouse: Floor area: 25,200 m^2, 1 storey, frame structure.	
	浆板车间 Pulp board workshop		占地面积 9500m^2，2 层，框架结构。设计能力 1324t/d Floor area: 9500m^2, 2 storeys, frame structure. Design capability: 1,324 t/d	
	化学品制备 Chemical preparation	二氧化氯制备车间 Chlorine dioxide preparation workshop	占地面积 4464m^2，4 层，框架结构。设计能力 50t/d，采用综合法制备二氧化氯溶液。 Floor area: 4464m^2, 4 storeys, frame structure. Design capability: 50t/d,the comprehensive method is adopted to prepare carbon dioxide solution.	
	碱回收车间 Alkaline recovery workshop		蒸发工段（含蒸发配电室）：占地面积 9525m^2，2 层，框架结构，蒸发水量 898t/h，最大为 1100t/h。 Evaporation section (including an evaporation distribution room): Floor area: 9,525 m^2, 2 storeys, frame structure, evaporation amount: 898 t/h, maximum amount: 1,100 t/h.	
			燃烧工段：占地面积 7488m^2，局部 4 层，框架结构。设 1 台 4600tds/d 碱炉，焚烧生产过程中产生的黑液，参数为 10.5MPa（g）、515℃，装设 1 台 CC80-10/1.4/0.6 双抽冷凝机组，回收利用热能供热发电，预留脱硫脱硝脱白设施用地。 Combustion section: Floor area: 7,488 m^2, 4 storeys locally, frame structure. The Project is equipped with an alkali furnace of 4,600 tds/d, to incinerate the black liquor produced during production; its parameters are 10.5MPa (g) , 515℃; it is equipped with a CC80-10/1.4/0.6 dual pumping condensing unit, to recover the heat energy for heat supply and power generation; the land for placing desulfurization, denitrification and whitening facilities will be reserved.	
			苛化工段（含石灰库）：占地面积 22792m^2，2 层，局部 3 层，框架结构。白液处理能力 10500m^3/d，石灰窑处理能力为 850t/d。 Causticization section (including the lime storage): Floor area: 22,792 m^2, 2 storeys, 3 storeys locally, frame structure. Treatment capacity of white liquor: 10,500 m^3/d, treatment capacity of lime kiln: 850t/d.	
			绿泥白泥板框车间：占地面积 4485m^2，2 层，框架结构。 Green & white mud board frame workshop: Floor area: 4,485 m^2, 2 storeys, frame structure.	
储运	外来木片堆场 Outsourcing wood		占地面积 215828m^2。 Floor area: 215,828 m^2.	

类别 Category	工程名称 Project name	主要建设内容及规模 Main construction contents and scale	备注 Remarks
工程 Storage and transportation engineering	chip stockyard		
	木片堆场 Wood chip stockyard	占地面积 272625m^2。 Floor area: 272625m^2.	
	外来原木堆场 Outsourcing log stockyard	占地面积 8979m^2。 Floor area: 8979m^2.	
	木片散堆场 Wood chip bulk yard	占地面积 51627m^2。 Floor area: 51627m^2.	
	木屑仓 Wood chippings bin	占地面积 1050m^2，3 层，框架结构。 Floor area: 1050m^2, 3 storeys, frame structure.	
	浆板库 Pulp board storage	占地面积 4800m^2，1 层，轻钢结构。 Floor area: 4,800 m^2, 1 storey, light steel structure.	
	化工库（一） Chemical Engineering Storage (I)	占地面积 1710m^2，1 层，轻钢结构。 Floor area: 1710m^2, 1 storey, light steel structure.	
	化工库（二） Chemical Engineering Storage (II)	占地面积 2340m^2，1 层，轻钢结构。 Floor area: 2340m^2, 1 storey, light steel structure.	
	机修车间 Mechanical Repair Workshop	占地面积 10710m^2，1 层，轻钢结构。 Floor area: 10710m^2, 1 storey, light steel structure.	
	五金仓库 Hardware Workshop	占地面积 10710m^2，1 层，轻钢结构。 Floor area: 10710m^2, 1 storey, light steel structure.	
	综合仓库（一） Comprehensive Warehouse (I)	占地面积 12936m^2，1 层，轻钢结构。 Floor area: 12936m^2, 1 storey, light steel structure.	
	综合仓库（二） Comprehensive Warehouse (II)	占地面积 11880m^2，1 层，轻钢结构。 Floor area: 11880m^2, 1 storey, light steel structure.	
	综合仓库（三） Comprehensive Warehouse (III)	占地面积 12210m^2，1 层，轻钢结构。 Floor area: 12210m^2, 1 storey, light steel structure.	
	干煤棚 Dry coal shed	占地面积 31020m^2，235×132m，1 层，轻钢结构。全封闭结构，兼做固废锅炉燃料临时存放。 Floor area: 31,020 m^2, 235×132m, 1 storey, light steel structure. Fully enclosed structure, and it can also be used for temporary storage of fuel of solid waste boiler.	
	灰渣仓库 Ash slag warehouse	项目设 3 台渣仓，每台渣仓容积为 400m^3，渣仓可贮存锅炉约 234h 的排渣量。除灰系统设灰库 3 座，灰库容积各 1000m^3。可贮存锅炉设计工况下约 318 小时的排灰量。 The Project is set with 3 slag bins, each of which has the capacity of 400 m^3, and can be used to store about 234h of ash slag discharged from the boiler. The ash disposal system is set with 3 storages, each of which has a volume of 1,000 m^3. It can store about 318 hours of ash discharged from the boiler under design conditions.	
辅助工程	空压站制氧站 Oxygen generation station of the air	占地面积 4000m^2，1 层，轻钢结构。 Floor area: 4000m^2, 1 storey, light steel structure.	

类别 **Category**	工程名称 **Project name**	主要建设内容及规模 **Main construction contents and scale**	备注 **Remarks**
Ancillary works	compression station		
	地磅房 Loadometer Room	占地面积 504m²。 Floor area: 504m².	
	办公生活区 Office and living quarter	生产技术中心：占地面积 3570m²，4 层，框架结构。 Production Technology Center: Floor area: 3,570 m², 4 storeys, frame structure.	
		内部加油站：占地面积 1056m²，1 层，轻钢结构。采用地下油罐形式，设两个 50m³ 柴油贮油罐，年用柴油量约 2000 吨，设一个 20m³ 汽油贮油罐，年用汽油量约 300 吨。 Internal petrol station: Floor area: 1,056 m², 1 storey, light steel structure. The underground oil tanks are arranged: there are two 50 m³ diesel storage tanks, which can provide about 2,000 tons of diesel each year, and there is one 20m³ gasoline storage tank, which can provide about 300 tons of gasoline each year.	
		门卫：3 个，占地面积 108m²，1 层，轻钢结构。 Guard: 3, floor area: 108 m², 1 storey, light steel structure.	
		营销中心：占地面积 1440m²，6 层，框架结构。 Marketing Center: Floor area: 1,440 m², 6 storeys, frame structure.	位于生产区外另行选址 The site will be separately selected out of the production area
		食堂礼堂：占地面积 4200m²，3 层，框架结构。 Canteen hall: Floor area: 4,200 m², 3 storeys, frame structure.	
		高管宿舍：占地面积 1920m²，6 层，框架结构。 Executives' dormitory: Floor area: 1,920 m², 6 storeys, frame structure.	
		倒班宿舍（一）：占地面积 1920m²，6 层，框架结构。 Shift dormitory (I): Floor area: 1,920 m², 6 storeys, frame structure.	
		倒班宿舍（二）：占地面积 1920m²，6 层，框架结构。 Shift dormitory (II): Floor area: 1,920 m², 6 storeys, frame structure.	
公用工程 Utilities	供水系统 Water supply system	给水净化站：占地面积 10080 m²，取水水源来自合浦水库群的东岭水库，给水净化站采用一体化自动反冲洗净水器，设计规模 6650m³/h，包含化学水处理系统。 Water supply purification station: Floor area: 10,080 m²; water source: Dongling Reservoir of Hepu Reservoir Group. The station adopts an integrated automatic backwash water purifier, with the design scale of 6,650 m³/h, including a chemical water treatment system.	
		软化水车间：占地面积 7140 m²，化学水处理系统设计规模 1130t/h，除盐采用反渗透+混床工艺处理工艺。 Softened water workshop: Floor area: 7,140 m², design scale of chemical water treatment system: 1,130t/h; desalting is realized by the reverse osmosis + mixed bed process.	
		工艺循环水站占地面积 7315m²，设热电站和造纸工艺两个循环水站。其中热电站循环水站设冷却水池一座，尺寸为 110m×22m×3m，上部设六台冷却塔，单塔处理水量 4000m³/h，配套循环泵房一座。造纸工艺循环水站设热水池一座，尺寸为 20m×10m×3m；冷却水池一座，尺寸为 65m×20m×3m，上部设四台冷却塔，每台处理水量 3000m³/h，配循环泵房一座。	

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		Floor area of the process circulating water station: 7,315 m^2; two circulating water stations are set for the thermal power plant and paper making process. Where the circulating water station of the thermal power plant is set with a cooling pool, with the size of 110m×22m×3m; at the upper part, there are 6 cooling towers, each of which has the treatment capacity of 4,000 m^3/h, and it is also assorted with a circulating pump room. The circulating water station for paper making is set with a hot water pool, with the size of 20m×10m×3m; a cooling pool, with the size of 65m×20m×3m; at the upper part, there are 4 cooling towers, each of which has the treatment capacity of 3,000 m^3/h, and it is also assorted with a circulating pump room.	
	热电站 Thermal power plant	1 台 220t/h 固废综合利用锅炉：占地面积 1280m^2，局部 4 层，框架结构。额定参数为 10.5MPa（g）、515℃的循环流化床锅炉，利用项目生产过程产生的树皮、木屑、污泥等废渣，燃烧回收利用热能，装设 1 台 CC80-10/1.4/0.6 双抽冷凝机组。 One 220t/h solid waste comprehensive utilization boiler: Floor area: 1,280 m^2, 4 storeys locally, frame structure. The circulating fluidized bed boiler with the rated parameters of 10.5MPa (g) and 515℃ can burn the bark, wood chips, sludge and other slags to recovery the heat; one set of CC80-10/1.4/0.6 dual pumping condensing unit.	
		1 台 280t/h 锅炉：占地面积 1280m^2，局部 4 层，框架结构。额定参数为 10.5MPa（g）、515℃的循环流化床锅炉，燃料为燃煤，配 1 台 CB40-10/2.8/0.6 抽汽背压式机组。 One 280 t/h boiler: Floor area: 1,280 m^2, 4 storeys locally, frame structure. The circulating fluidized bed boiler with the rated parameters of 10.5MPa (g) and 515℃ is coal-fired, and equipped with a set of CB40-10/2.8/0.6 steam extraction back pressure unit.	
		汽机间：占地面积 1881m^2，2 层，框架结构。 Steam turbine room: Floor area: 1,881 m^2, 2 storeys, frame structure.	
		除尘装置：占地面积 3600m^2，1 层，轻钢结构。 Dust removal equipment: Floor area: 3,600 m^2, 1 storey, light steel structure.	
		除氧煤仓：占地面积 900m^2，5 层，框架结构。 Deoxidized coal bunker: Floor area: 900 m^2, 5 storeys, frame structure.	
	供电系统 Power supply system	厂区内建一座预热利用电站外，还在厂区内建一座 220kV 或 110kV 中央变电站和若干座 35/10.5kV 区域变电站来满足生产用电的需求。变电站：占地面积 2500m^2，1 层，轻钢结构。 In addition to the preheating power station, the plant area also builds a 220kV or 110kV central substation and several 35/10.5kV regional substations, to meet the demand of power for production. Substation: Floor area: 2,500 m^2, 1 storey, light steel structure.	
环保工程 Environmental	废气治理 Exhaust gas control	4600tds/d 碱炉烟气：三列四电场静电除尘器除+150mH×Φ5.2m 烟囱。 Flue gas of a 4,600 tds/d alkali furnace: Three-row four-field electrostatic precipitator+150mH×Φ5.2m chimney.	
		850t/d 石灰窑废气：一列四电场静电除尘器除尘，	

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protection works		+150mH×Φ2.6m 烟囱。 850t/d lime kiln waste gas: One-row four-field electrostatic precipitator +150mH×Φ2.6m chimney.	
		220t/h 固废锅炉烟气：SNCR/SCR 联合脱硝+布袋除尘器+活性炭吸附+炉外石灰石/石膏湿法脱硫+高效除雾器（脱硫塔复合配套，下同），通过 150mH × Φ4.8m 烟囱排放。 Flue gas from 220t/h solid waste boiler: SNCR/SCR combined denitration+bag-type dust collector +activated carbon adsorption+limestone outside the boiler/gypsum wet desulfurization +high efficiency demister (assorted with a desulfurization tower, the same below); the flue gas is emitted through a 150mH × Φ4.8m chimney.	
		280t/h 燃煤锅炉烟气：SNCR/SCR 联合脱硝+电袋除尘器+炉外石灰石/石膏湿法脱硫+高效除雾器，通过 150mH× Φ4.8m 烟囱排放。 Flue gas from 280t/h coal-fired boiler: SNCR/SCR combined denitration+electrostatic-bag type dust collector +limestone outside the boiler/gypsum wet desulfurization +high efficiency demister; the flue gas is emitted through a 150mH × Φ4.8m chimney.	
		漂白塔尾气：经碱液洗涤后通过 150mH×Φ1.0m 排气筒排放。 Bleaching tower tail gas: Discharged through the 150mH×Φ1.0m exhaust funnel after alkali cleaning.	
		二氧化氯车间尾气：二氧化氯车间氯酸钠电解槽过量氢气排空尾气经碱液洗涤后通过 25mH×Φ0.2m 排气筒排放；盐酸合成尾气经软化水洗涤后通过 42mH×0.25m 排气筒排放；二氧化氯罐槽尾气经海波塔洗涤后通过 30mH×Φ0.3m 排气筒排放。 Chlorine dioxide workshop tail gas: The tail gas generated from hydrogen at the sodium chlorate electrolytic cell in the chlorine dioxide workshop is discharged through the 25mH×Φ0.2m exhaust funnel after alkali cleaning; the tail gas from hydrochloric acid synthesis is discharged through the 2mH×0.25m exhaust funnel after softened water cleaning; the tail gas from chlorine dioxide tank is discharged through the 30mH×Φ0.3m exhaust funnel after cleaning by the Hypo tower.	
		臭气收集处理系统：高浓恶臭气体经收集后送碱回收炉燃烧，低浓臭气经收集处理后作为碱炉二次风入炉燃烧，事故状态下启用备用臭气焚烧器。 Odor collection and treatment system: The high-consistency odor will be collected and sent to an alkali recovery furnace for incineration. The low-consistency odor will be collected and treated as the secondary gas, and then sent to the furnace for incineration. In case of any accident, the standby incinerator will be activated. 焚烧器：占地面积 1309.5m^2，局部 2 层，框架结构，事故状态下的臭气燃烧器，备用。臭气焚烧器烟囱高 150m，内径 1.5m。 Incinerator: Floor area: 1,309.5 m^2, 2 storeys locally, frame structure; incinerator in case of an accident, standby. The chimney of the incinerator is 150m in hight, with an inner diameter of 1.5m.	
		污水处理站臭气：项目对污水处理站产生臭气的构筑物进行加盖密封，并配置一套碱洗除臭系统，臭气经抽风管送至除臭系	

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		统，经喷淋洗涤后，送至生产区碱炉内燃烧分解后，经过碱炉烟囱排放。 Odor from the sewage treatment plant: The Project covers and seals the structures producing odor of the sewage treatment plant, and arranges an alkaline washing deodorant system, which can send the odor to the deodorant system through the exhaust tube; the odor, after spray washing, will be sent to the alkali furnace in the production area for combustion and decomposition, and then discharged through the chimney.	
		集束烟囱设置：4600tds/d 碱炉烟气、850t/d 石灰窑废气、220t/h 固废综合利用锅炉烟气、280t/h 锅炉烟气、漂白塔尾气以及臭气焚烧器烟气的烟囱以集束烟囱形式建设，高 150m，内径 12.9m，包括楼梯、吊物孔、工业电梯井等。 Cluster chimney: The chimneys and cluster chimneys for 4,600 tds/d alkali furnace flue gas, 850t/d lime kiln waste gas, 220t/h solid waste comprehensive utilization boiler flue gas, 280t/h boiler flue gas, bleaching tower tail gas and odor incinerator flue gas shall be 150m high with the inner diameter of 12.9m, including the stairs, hanging holes, and industrial elevator shafts.	
	废水治理 Wastewater control	采用雨污分流制，拟建设总处理规模为 100000m^3/d 的污水处理系统，工艺采用“初沉池+厌氧反应器+生物选择池+卡鲁塞尔氧化沟+高级氧化池”，废水处理达标后排入铁山港区深海排放管网，在铁山港 B3 排污口深海排放。 The rainwater-sewage diversion system is adopted, and it is planned to build a sewage treatment system with the total treatment scale of 100,000 m^3/d, which adopts the process of “Primary sedimentation tank+anaerobic reactor+biological selection pool+Carrousel oxidation ditch+advanced oxidation pool”; the up-to-standard wastewater after treatment is discharged to the deep-sea discharge pipe network of Tieshangang District, specifically the B3 sewage draining exit of Tieshangang District.	
	固体废物 Solid waste	①木屑、浆渣、污泥送至固废锅炉做燃料； ①Wood chips, pulp slag, and sludge are sent to the solid waste boiler as fuel; ②白泥一部分作为锅炉烟气脱硫剂，剩余部分送石灰窑处置回用； ②A part of white mud is taken as the desulfurizer of the boiler flue gas, and the remaining will be sent to the lime kiln for disposal and reuse; ③绿泥、石灰渣、不宜焚烧的化学污泥送一般工业固体废物集中处置场填埋； ③The green mud, lime sludge, and other chemical sludges that are unsuitable for burning will be sent to the centralized disposal site of general industrial solid waste for landfill; ④制浆黑液全部送碱回收系统回收碱。 ④The black liquor will be sent to the alkali recovery system for recycling. ⑤锅炉飞灰、炉渣外售水泥厂、砖厂综合利用。（固废锅炉飞灰需定期对固废锅炉的飞灰进行浸出毒性检测，如检测具有危险特性需委托有资质的单位进行处置。） ⑤Fly ash and furnace slag will be sold to cement plants and brick	

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			plants for comprehensive utilization. (The leaching toxicity of the solid waste fly ash shall be regularly detected, and if there is any hazardous property, a qualified unit should be entrusted for disposal.) ⑥废分子筛由厂家回收利用；锅炉灰渣外售制砖和铺路； ⑥ The waste molecular sieve will be recycled by the manufacturer; and boiler ash will be sold for making bricks and paving; ⑦脱硫石膏外售水泥厂作为水泥的缓凝剂或者建材厂制成石膏板、石膏砌块等建材材料； ⑦ Desulfurized gypsum will be sold to cement plants as the retarder of cement or to building material plants for producing gypsum boards, gypsum blocks and other building materials; ⑧废离子交换树脂、储油罐残渣、隔油池污泥、废活性炭、废催化剂、废机油为危险废物，由供货厂家回收综合利用或委托有资质单位处置；项目在热电站北面设一个危险废物暂存库，占地面积96平方米。 ⑧Waste ion exchange resin, oil storage tank residue, grease trap sludge, waste activated carbon, waste catalyst, and waste machine oil are hazardous wastes, which shall be recycled by the supplier for comprehensive utilization or disposed by a qualified unit; a temporary storage of hazardous waste is set in the north of the thermal power plant, with an area of 96 m^2. ⑨生活垃圾由环卫部门统一清运处置。 ⑨Domestic wastes will be cleared and transported uniformly by the environmental protection authority.	
	风险应急 Emergency control		初期雨水池5200m^3，位于项目污水处理站。 Initial rainwater tank (5,200 m^3) is located in the sewage treatment plant.	
			在污水处理站设置一座容积为40000 m^3的废水事故池，可满足生产区废水事故排放，同时在污水处理发生故障时接纳项目6小时生产废水的非正常排放。 The sewage treatment plant is set with a wastewater emergency tank of 40,000 m^3, which can collect emergency discharge of wastewater from the production area, and can also collect 6-hour abnormal discharge of production wastewater.	
			化学品罐围堰、有毒有害气体在线监测报警及喷淋装置、雨水废水排口闸阀。 Chemical tank cofferdam, toxic and harmful gas online monitoring alarm and spray device, rainwater and wastewater discharge outlet valve.	
二、二期工程 II. Phase II project				
主体工程 Main work	制浆 Pulping	备料工段 Preparation section	包括木片筛选、储存和皮带输送系统。 Including wood chip screening, storage and belt conveyor systems.	
		40万吨化机浆车间 400,000 tons chemimechanical pulp	占地面积10150m^2，4层，框架结构。 Floor area: 10150m^2, 4 storeys, frame structure. 建设1条40万t/a化机浆生产线，设计能力1212adt/d。 Construct one 400,000 t/a APMP production line, with the design capability of 1212 adt/d.	

类别 Category	工程名称 Project name		主要建设内容及规模 Main construction contents and scale	备注 Remarks
		workshop		
	造纸 Paper making	15 万吨生活用纸 150,000 tons of life paper	碎解+浆板库（1）：占地面积 3200m^2，1 层，轻钢结构。 Cracking+pulp board warehouse (I): Floor area: 3,200 m^2, 1 storey, light steel structure.	
			碎解+浆板库（2）：占地面积 5840m^2，1 层，轻钢结构。 Cracking+pulp board warehouse (II): Floor area: 5840m^2, 1 storey, light steel structure.	
			生活用纸车间（一）：占地面积 9280m^2，2 层，框架结构。 Life paper workshop (I): Floor area: 9,280m^2, 2 storeys, frame structure.	
			生活用纸车间（二）：占地面积 16936m^2，2 层，框架结构。 life paper workshop (II): Floor area: 16,936m^2, 2 storeys, frame structure.	
			后加工车间（一）：占地面积 4080m^2，1 层，轻钢结构。 Post-processing workshop (I): Floor area: 4,080 m^2, 1 storey, light steel structure.	
			后加工车间（一）：占地面积 7446m^2，1 层，轻钢结构。 Post-processing workshop (I): Floor area: 7446m^2, 1 storey, light steel structure.	
		90 万吨白卡纸 900,000 tons ivory board	造纸车间：占地面积 38808m^2，2 层，框架结构。 Paper making workshop: Floor area: 38808m^2, 2 storeys, frame structure.	
储运工程 Storage and transportation engineering	浆板库 Pulp board storage		占地面积 13132m^2，1 层，轻钢结构。 Floor area: 13132m^2, 1 storey, light steel structure.	
	成品库（一） Finished goods warehouse (I)		占地面积 8400m^2，1 层，轻钢结构。 Floor area: 8400m^2, 1 storey, light steel structure.	
	成品库（二） Finished goods warehouse (II)		占地面积 15330m^2，1 层，轻钢结构。 Floor area: 15330m^2, 1 storey, light steel structure.	
	平板纸成品库（一） Sheet paper finished goods warehouse (I)		占地面积 12060m^2，1 层，轻钢结构。 Floor area: 12060m^2, 1 storey, light steel structure.	
	平板纸成品库（二） Sheet paper finished goods warehouse (II)		占地面积 12395m^2，1 层，轻钢结构。 Floor area: 12395m^2, 1 storey, light steel structure.	
公用工程 Utilities	供水系统 Water supply system		依托一期工程。 Based on Phase I project.	
	热电站 Thermal power plant		二期新增一台额定蒸发量为 280t/h，蒸汽参数为 10.5MPa（g）、515℃的循环流化床锅炉，燃料为燃煤。配套建设 1 台 CB50-10/1.4/0.6 抽汽背压式机组。 Phase II adds a coal-fired circulating fluidized bed boiler with the rated evaporation of 280t/h, and steam parameter of 10.5MPa (g) and 515℃. It is assorted with a set of CB50-10/1.4/0.6 steam extraction back pressure unit.	
			1 台 280t/h 锅炉：占地面积 1280m^2，局部 4 层，框架结构。 One 280 t/h boiler: Floor area: 1,280 m^2, 4 storeys locally, frame structure.	

类别 Category	工程名称 Project name	主要建设内容及规模 Main construction contents and scale	备注 Remarks
		汽机间：占地面积 1026m²，2 层，框架结构。 Steam turbine room: Floor area: 1026m², 2 storeys, frame structure.	
		除尘装置：占地面积 7200m²，1 层，轻钢结构。 Dust removal equipment: Floor area: 7200m², 1 storey, light steel structure.	
		除氧煤仓：占地面积 1890m²，5 层，框架结构。 Deoxidized coal bunker: Floor area: 1890m², 5 storeys, frame structure.	
	供电系统 Power supply system	依托一期工程。 Based on Phase I project.	
环保工程 Environmental protection works	废气治理 Exhaust gas control	280t/h 燃煤锅炉烟气：SNCR/SCR 联合脱硝+电袋除尘器+炉外石灰石/石膏湿法脱硫+高效除雾器+150mH×Φ4.8m，通过 150mH× Φ4.8m 烟囱排放。 Flue gas from 280t/h coal-fired boiler: SNCR/SCR combined denitration+electrostatic-bag type dust collector +limestone outside the boiler/gypsum wet desulfurization +high efficiency demister+150mH×Φ4.8m; the flue gas is emitted through a 150mH × Φ4.8m chimney.	
	固废治理 Solid waste treatment	依托一期工程。 Based on Phase I project.	
	废水治理 Wastewater control	依托一期工程。 Based on Phase I project.	
依托工程 Basis projects			
铁山港区深海排放管网工程 Tieshangang District Deep-Sea Discharge Pipe Network Project		铁山港区深海排放管网工程已建成 DN2000 排放管于岸线外 4km 处 B3 排污口深海排放，管网设计污水流量为 23.2 万 m³/d。处理达标的废水经陆上排水管网至营闸路、新二路交汇口附近汇入深海排放井后，进入铁山港区深海排放管网（海域段）。 Tieshangang District Deep-Sea Discharge Pipe Network Project has constructed a DN2000 discharge pipe, which discharges at B3 sewage draining exit 4 km away from the coastline, with the design flow of 232,000 m³/d. The up-to-standard wastewater is discharged to the deep-sea discharge well located at the intersection of Yingzha Road and Xiner Road through the land drainage pipe network, and then to the Tieshangang District Deep-Sea Discharge Pipe Network (sea section).	已建成运行 Has been constructed and put into operation
铁山港工业区一般工业固体废物集中处置场 Tieshangang Industrial Park General Industrial Solid Waste Centralized Disposal Site		铁山港工业区一般工业固体废物集中处置场位于北海市铁山港工业区中石化配套道路以南，中石化火炬区以东，项目总占地面积 150 亩，服务范围为铁山港工业区及北海市工业企业产生的第 II 类一般工业固体废物，填埋区库容为 45.08 万立方米，设计服务年限 15 年。项目目前正在建设，计划于 2020 年底建成投入使用。 Tieshangang Industrial Park General Industrial Solid Waste Centralized Disposal Site is located in the south of Sinopec supporting road and east of Huoju District in Tieshangang Industrial Park, Beihai City; the project covers an area of 150 mu,	目前正在建设 Under construction

类别 Category	工程名称 Project name	主要建设内容及规模 Main construction contents and scale	备注 Remarks
		which is mainly used to dispose Class II general industrial solid waste produced by Tieshangang Industrial Park and industrial enterprises in Beihai; the landfill capacity is 450,800 m^3, with the service life of 15 years. The project is being constructed, and it is planned to be completed and put into operation at the end of 2020. 本项目配套一般固体废物填埋场目前正在进行选址及前期工作，计划于 2022 年底建成投入运行，项目一期生产线计划于 2021 年 8 月建成投入生产，在本项目配套一般固体废物填埋场运行前，计划依托铁山港区一般固体废物集中处置场使用 5~12 个月。 The site of the supporting general solid waste landfill is being selected at present, and the preliminary work is being carried out; it is planned to be completed and put into operation at the end of 2022. The Phase I production line is planned to be completed and put into operation in August 2021. Prior to the operation of the supporting general solid waste landfill, the General Solid Waste Disposal Site of Tieshangang District is planned to be used for 5~12 months.	
	天然气工程 Natural gas engineering	铁山港工业区天然气工程位于铁山港工业区内，站区西侧紧邻六路，南侧紧邻七号路。天然气工程气源来自于铁山港中石化 LNG 接收码头 BOG 气化天然气，备用气源为中石化长输管道天然气，气源产地为澳大利亚 LNG 工厂。经调压设备，将上游气源气体压力 0.8MPa-1.6MPa 调压为 0.35MPa 供应给下游用户。铁山港工业区天然气工程已建设，经项目用地的高压管道在本项目建成运行前报装建设。 Tieshangang Industrial Park Natural Gas Project is located in Tieshangang Industrial Park, and it is next to Road No. 6 in the west, and Road No. 7 in the south. The gas source of the natural gas project is BOG gasified natural gas from Sinopec LNG terminal in Tieshangang District, and the stand-by gas is from Australian LNG plant through Sinopec long-distance pipeline. Adjust the upstream gas source gas pressure from 0.8MPa-1.6MPa to 0.35MPa with the pressure regulating equipment, and then supplied to the downstream users. Tieshangang Industrial Park Natural Gas Project has been constructed, and the high-pressure pipelines has been laid prior to the operation of the Project.	已建成运行 Has been constructed and put into operation

2.1.4 总平面布置

2.1.4 General layout

根据本项目的工程内容、可用地范围、厂区与外部公路的联接等具体情况，充分考虑功能分区、工艺物料流向、洁净区域与非洁净区域的划分进行总平面布置，该方案按功能分成原料堆存区、制浆及碱回收车间区、热电站动力区、一期造纸车间区、二期造纸车间区、生产辅助车间区、污水处理厂区、办公及生活服务区、物流仓储区等区域进行布置。

According to the specific contents, available area, and connection between the plant area and external roads of the Project, and fully considering the functional zoning, process material flow, and division of clean area and non-clean area, the general layout is determined, which is divided into the raw material storage area, pulping and alkali recovery workshop, thermal power plant power area, Phase I paper making workshop, Phase II paper making workshop, production auxiliary workshop, sewage treatment plant, office and living service area, and logistics storage area.

原料堆存区：包括内容有圆形木片堆场，单个堆场堆存量为 31.5 万立方米、木片输送栈桥（包括连接至南面 2 公里处的铁山港货运码头）、外购木片上料翻板、木片筛房、木片剥皮削片筛选、木片仓、木片散堆场、外来原木堆场及外来木片堆场等。该区域占地大，储存的木片量大，防火等级要求高，将该区域布置在厂区用地范围的西面及北面，便于货运码头商品木片原料进厂，以及消防安全的统一管理。

Raw material storage area: including the round wood chip stockyard, with the single yard capacity of 315,000 m^3, wood chip conveyor trestle (including Tieshangang Cargo Terminal connected to the site 2 km away), loading board of outsourcing wood chips, wood chip screening room, wood chip peeling and chipping screen, wood chip yard, outsourcing log yard, and outsourcing wood chip stockyard. It covers a large area, can store a large amount of wood chips, and has a high fire rating requirement, so it is arranged on the west and north of the plant area, so as to facilitate the transport of wood chips from the cargo terminal, thus ensuring unified management of fire safety.

制浆及碱回收车间区：包括内容有一期 80 万吨化学浆制浆车间及碎解站、一期 20 万吨化机浆和二期 40 万吨化机浆生产线、二期 MVR 蒸发工段、制浆车间二氧化氯工段、碱回收车间蒸发工段、燃烧工段、苛化石灰窑工段、浆板车间及浆板库、以及与生产工艺相配套的循环冷却水站、加油站、空压制氧站等。该制浆核心区域布置于全厂用地范围的最中心位置。使其他与之相关联的生产车间、辅助车间及后续下游产业的造纸车间等都能紧密联系。

Pulping and alkali recovery workshop: including Phase I 800,000 tons chemical pulping workshop and repulping station, Phase I 200,000t APMP and Phase II 400,000t APMP production lines, Phase II MVR evaporation section, pulping workshop chlorine dioxide section, alkali recovery workshop evaporation section, combustion section, causticization lime kiln section, pulp board workshop and pulp board storage, as well as the circulating cooling water station, petrol station, and air compression oxygen station matched with the production process. The pulping area is located at the center of the plant. This can make the pulping area closely linked to other associated production workshops, auxiliary workshops and subsequent downstream paper-making workshops.

热电站动力区：主要内容有碱回收燃烧工段、电站及臭气焚烧器、热电站主厂房（包括锅炉间、汽机间）、软化水车间、给水净化一体化设施、烟囱、变电站、热力及工艺循环冷却水站。该区域与核心制浆车间区及造纸区域等用电负荷大的区域联系密切，可使到达各个用电负荷大的车间电缆长度敷设长度最短，将该区域布置于厂区用地范围的东面中部区域，其西面紧邻制浆核心区域，使碱回收燃烧工段工段及蒸发工段能够与制浆核心区域的制浆车间更贴近，使碱回收工艺管线距离更省。

Thermal power plant power area: including the alkali recovery combustion section, power station and odor incinerator, main plants of the thermal power plant (including the boiler room and steam turbine room), softened water workshop, integrated water purification facility, chimney, substation, thermal and process circulating cooling water station. This area is closely associated with the areas being high in electrical load, such as the core pulping workshop and paper-making area, which can minimize the length of cable to heavy-load workshops; this area is located in central east of the plant area, with the west part next to the core pulping area, which can make the alkali recovery combustion section section and evaporation section closer to the pulping workshop at the center, thus reducing the distance of the alkali recovery process pipeline.

一期造纸车间区：包括内容有文化用纸造纸车间及其纸加工车间、文化纸平板库及化工库、特种纸车间及其成品库、生活用纸车间及后加工车间、成品库等。该区域文化用纸车间、特种纸车间及生活用纸车间一字型依次平行布置于 80 万吨化学浆制浆车间南面，有利于企业的逐步建设发展。

Phase I paper-making workshop: including the cultural paper making workshop and processing workshop, cultural paper board and chemical warehouse, special paper workshop and finished goods warehouse, life paper workshop and post processing workshop, and finished goods warehouse. The cultural paper workshop, special paper workshop and life paper workshop are arranged in parallel in the south of the 800,000 tons chemical pulping workshop, which is conducive to the gradual construction and development of the enterprise.

二期造纸车间区：包括内容有 90 万吨白卡纸造纸车间及浆板库、平板纸成品仓库及综合仓库。该区域布置于厂区用地范围的北面，紧邻南面为制浆车间核心区及热电站动力区。靠近制浆车间区及热电站动力区，有利于浆管、蒸汽管、动力电缆等管线的联系，节省投资。由于二期原料及成品运输量骤增，在二期造纸车间区东侧开设二期原料及成品出入口，利于外购浆板、原料及成品的运输。

Phase II paper-making workshop: including the 900,000 tons ivory board paper-making workshop and pulp board storage, sheet paper finished goods warehouse and comprehensive warehouse. This area is located in the north of the plant area, which is next to the core area of pulping workshop in the south and the thermal power plant power area. It location next to the pulping workshop and thermal power plant power area is conducive to the connection of pulp pipes, steam pipes, power cables and other pipelines, thus saving the investment. Due to the sudden increase in transportation of raw materials and finished products in Phase II, an opening is arranged at the east side of the Phase II paper-making workshop for transferring raw materials and finished products, which is conducive to the transportation of outsourcing pulp boards, raw materials and finished products.

生产辅助车间区：包括内容有生产技术中心、机修车间、五金仓库。该区域布置于厂区用地范围的东南角，通过机修车间和五金仓库隔离生产办公楼与厂区内其他生产工段对其的不良影响。并在南面开设单独的人流出入口，有效的分离了人流及生产运输的车流，同时便于员工上班。

Production auxiliary workshop: including the production technology center, machine repair workshop, and hardware warehouse. This area is located in the southeast corner of the plant area, so its adverse effect on the office building and other production sections can be isolated by the machine repair workshop and the hardware warehouse. A separate passageway for people is set in the south, which can effectively separate the flow of people and that of production and transportation vehicles; at the same time, it can also facilitate employees to go to work.

污水处理厂区：该区域设置于厂区用地范围北面现有园区八号路的北测与项目用地隔路相望，将来考虑另行独立管理运营。该区域占地规模约 297 亩。

Sewage treatment plant: It is located at the north side of the existing Road No. 8 in the north of the plant area, which is on the other side of the project side, so it is considered for independent management and operation in the future. This area covers an area of about 297 mu.

物流仓储区：该区域占地约 518 亩，位于项目生产用地范围最南侧的边角区域。作为将来配合企业做大做强后的仓储物流配套建设使用。厂区共设置 3 个出入口：一期设 2 个物流出入口，位于铁山港(临海)工业区规划营闸路，二期设 1 个物流出入口，位于铁山港(临海)工业区现有新二路。

Logistics and storage area: It covers an area of about 518 mu, and is located at the south corner of the production area. It will be used for constructing logistics and storage facilities in the future. The plant area has 3 passages: Phase I Project is set with 2 logistics passages, which are located at Yingzha Road in Tieshangang (Linhai) Industrial Park, and Phase II Project is set with 1 logistics passage, which is located at the existing Xin’er Road in Tieshangang (Linhai) Industrial Park.

2.1.5 主要原辅材料及能源消耗

2.1.5 Consumption of main and auxiliary materials and energy

项目原辅材料、能源消耗见表 2.1.5-1。

Consumption of main and auxiliary materials and energy is shown in Table 2.1.5-1.

表 2.1.5-1　项目原辅材料、能源消耗表
Table 2.1.5-1 Consumption of main and auxiliary materials and energy

（1）木材资源

(1) Wood resources

本项目主要是以桉木片、桉木原木等阔叶木为原料。原料来源有以下几种方式：

The Project mainly takes eucalyptus wood chips, eucalyptus log and other hardwoods as the raw materials. The sources of raw materials include:

本项目年需木片量为 232.8 万吨（绝干），根据目前已签订的原料供应协议，项目从太阳老挝林基地和海外采购的木片原料比例超过 90%，广西区内及周边采购木片原料比例不足 10%，只作为周转补充。太阳老挝林基地全部建成后，可满足本项目全部原料需求。通过以上几种渠道，利用国内外两种资源，建设林浆纸一体化项目，项目原料来源有保障。

The Project required 2,328,000 tons wood chips (absolute dry) each year, and according to the currently signed raw material supply agreement, the Project purchases more than 90% of raw materials from the forest bases in Laos and other overseas regions, and only less than 10% of raw materials are purchased from Guangxi and surrounding regions, which are only used for turnover. After the construction of forest bases in Laos, the supply can satisfy the demand of the Project. The above channels can help to construct the forest-pulp-and-paper integration project with domestic and foreign resources, thus ensuring the sources of raw materials.

（2）化工原料

(2) Chemical raw materials

本项目所需的化工原料如氢氧化钠、硫代硫酸钠、过氧化氢、液氯、盐酸、芒硝、石灰石、消泡剂、碳酸钙（造纸填料用）、滑石粉、淀粉等，均可以在区内外市场上采购。厂址所处地理位置海运、铁路、公路等交通运输便利。

The chemical raw materials required by the Project, such as sodium hydroxide, sodium thiosulfate, hydrogen peroxide, liquid chlorine, hydrochloric acid, mirabilite, limestone, defoaming agent, calcium carbonate (for paper-making filler), talcum powder, and starch, can be purchased from the markets in and out of Guangxi. The plant site has convenient shipping, railway, and road transportation.

（3）燃料

(3) Fuel

燃煤等燃料，可在区内外采购；燃煤可从越南、印尼等地进口，海上运输港口条件便利；天然气从铁山港工业区内管道敷设至厂区。

The fuel such as coal can be purchased from the markets in and out of Guangxi; the coal can be imported from Vietnam and Indonesia through convenient ports; natural gas is transported to the plant area through the pipeline in Tieshangang Industrial Park.

2.1.6 公用工程

2.1.6 Utility works

（1）给水工程

(1) Water supply works

①给水水源

①Water supply source

根据项目各生产单元用水量测算，项目一期新鲜水用水量为平均 4561m^3/h，最大 5472m^3/h，全天 109438m^3/d。二期新鲜水用量为平均 5625m^3/h，最大 6750m^3/h，全天 134995m^3/d。循环水量为平均 27400m^3/h，最大 34630 m^3/h，全天 657600m^3/d。

As calculated the water consumption of each production unit, the fresh water consumption of Phase I is about 4,561 m^3/h, the maximum consumption is 5,472 m^3/h, and the daily consumption is 109,438 m^3/d. The fresh water consumption of Phase Phase II is about 5,625 m^3/h, the maximum consumption is 6,750 m^3/h, and the daily consumption is 134,995 m^3/d. The circulating water amount is about 27,400 m^3/h, the maximum amount is 34,630 m^3/h, and the daily amount is 657,600 m^3/d.

根据园区水资源论证报告分析，园区远期规划用水量分别为 37 万和 76.75 万 m^3/d，其中远期规划铁山港水厂供水规模 18.59 万 m^3/d，中石化水厂 12.5 万 m^3/d，海水淡化厂 2.5 万 m^3/d，中水回用水厂 5.4 万 m^3/d，直接向企业提供原水 37.76 万 m^3/d。规划取水规模 68.85 万 m^3/d。水源从合浦水库群的东岭水库引水，取水口位于合浦水库群输水走廊湖海运河的东岭水库，合浦水库群水资源非常丰富，兴利库容达 6.36 亿 m^3，水质清澈良好，是工业区的良好水源，合浦水库属多年调节水库，枯水年份当取水量不足时，从南流江抽水进入旺盛江水库，利用合浦水库群的多年调节库容进行取水。南流江水量丰富，利用量较小，规划从南流江抽水量仅为 6.0m^3/s，仅占多年平均流量的 3.3%，比例很小，不会挤占用生态流量。

As analyzed on the basis of the water resource demonstration report, the planned long-term water consumption is 370,000 and 767,500 m^3/d, where long-term water supply of Tieshangang Water Plant is 185,900 m^3/d, that of Sinopec Water Plant is 125,000 m^3/d, that of the Seawater Desalination Plant is 25,000 m^3/d, that of the Reclaimed Water Reuse Plant is 54,000 m^3/d, and the raw water directly supplied to the enterprise is 377,600 m^3/d. The planned water intaking scale is 688,500 m^3/d. The water is taken from Dongling Reservoir of the Hepu Reservoir Group, with the water intake at Dongling Reservoir connected with the water delivery corridor. Hepu Reservoir Group is rich in water resources, with the utilizable capacity of 636 million m^3; the clear water is a good source of the industrial park. Hepu Reservoir is a multi-year regulating reservoir; in dry years when there is no sufficient water intake, the water of Nanliu River will be pumped to Wangshengjiang Reservoir, and then the multi-year storage capacity of Hepu Reservoir Group can be used. Nanliu River is rich in water, but its amount of utilization is small; the planned pumping amount is only 6.0 m^3/s, accounting for 3.3% of the average flow for many years, which will not occupy the ecological flow.

目前，园区已建成水厂一座、加压泵站一座，已建成 4 条直径 1.2 米、长 26.4km 合浦水库群东岭水库至铁山港供水管道，供水能力为 44.7 万 m^3/d，可满足园区近期用水的需要，供水覆盖范围 123 平方公里。已经铺设完成 DN100 至 DN1800 配套管网共 57.85km。根据负责园区供水的广西北海市湖海水利供水有限公司《北海市铁山港供水及太阳纸业项目周边供水情况说明》（附件 8）： 目前铁山港工业区内原水总供水量约 5 万 m^3/d（其中净水约 1.2 万 m^3/d，原水约 3.8 万 m^3/d），仍有足够的供水能力满足本项目用水需求。

At present, the park has built a water plant, a booster pump station, and 4 pipelines (diameter: 1.2 m, length: 26.4 km) from Dongling Reservoir to Tieshangang, whose water supply capacity is 447,000 m^3/d, so it can meet the water demand of the park, and cover an area of 123 km^2. A total of 57.85km of DN100-DN1800 pipeline has been laid. According to *Statement of Water Supply in Tieshangang and Surrounding Areas of Sun Paper Project* (Appendix 8) issued by Guangxi Beihai Huhai Water Conservancy and Supply Co., Ltd supplying water to the Park: At present, the total supply of raw water to Tieshangang Industrial Park is about 50,000 m^3/d (including about 12,000 m^3/d of clean water and about 38,000 m^3/d of raw water), and there is enough water supply capacity to meet the water demand of the Project.

本项目计划敷设 2 根 DN1000 的螺旋缝焊接钢管的原水输水管到厂区红线边。项目一二期建成后用水量占园区规划向企业提供原水量的 36%，满足园区水资源利用规划的要求。

The Project plans to lay two DN1000 raw water pipe of spiral welded steel pipe along the red line in the plant area. After construction of Phase I and Phase II, the water consumption will account for 36% of the raw water planned to be supplied to enterprises, and it can meet the demand of the water utilization plan.

②给水净化站

②Water purification station

厂区给水净化装置采用一体化自动反冲洗净水器，并对排泥水进行处理，每套净水器产水量 350m^3/h，共设 19 套，设计规模 6650m^3/h。可满足一期、二期生产需求。给水净化站设四座 4000m^3 清水池，配泵房、加药系统、排泥水处理系统等设施。

The water purification device of the plant adopts the integrated automatic backwash water purifier, which can treat the sludge water; each purifier can produce water of 350 m^3/h, and there are 19 sets of purifiers, with the design capacity of 6,650 m^3/h. They can meet the production demand of Phase I and Phase II. The water purification station is set with four 4,000 m^3 clear water pools, and equipped with the pump houses, feed system, and sludge water treatment system.

③给水管网系统

③ Water supply pipe network system

厂区内共设 4 套给水管网，分别为生产给水及室外消防给水管网、室内消防给水管网、消防炮给水管网和生活给水管网；其中生产给水及室外消防给水管网、室内消防给水管网和消防炮给水管网均采用单独环状管网供水。生活给水管网由园区自来水管网接入采用单独支状管网供水。

The plant area is set with four water supply pipe networks, namely the production water supply and outdoor fire water supply pipe network, indoor fire water supply pipe network, fire monitor water supply pipe network and domestic water supply pipe network; where production water supply and outdoor fire water supply pipe network, indoor fire water supply pipe network and fire monitor water supply pipe network are supplied by separate ring pipe network. Domestic water supply pipe network is connected to tap water of the park, and water is supplied through a separate branch pipe network.

④化学水系统

④ Chemical water system

软化水主要用于锅炉、碱回收炉补水，采用反渗透+混床工艺处理工艺，设计规模 1130t/h。

Softened water is mainly used for supplementing water to boilers and alkali recovery furnace; this system adopts the reverse osmosis + mixed bed treatment process, with the design capacity of 1,130 t/h.

⑤循环水系统

⑤ Circulating water system

循环冷却水主要用于热电站和造纸工艺等，热电站循环水量平均时为 8000m^3/h，最大时为 22630m^3/h；造纸工艺循环水量平均时为 10000m^3/h，最大时为 12000m^3/h。其中热电站循环水站设冷却水池一座，尺寸为 110m×22m×3m，上部设六台冷却塔，单塔处理水量 4000m^3/h，配套循环泵房一座。造纸工艺循环水站设热水池一座，尺寸为 20m×10m×3m；冷却水池一座，尺寸为 65m×20m×3m，上部设四台冷却塔，每台处理水量 3000m^3/h，配循环泵房一座。

Circulating cooling water is mainly used for thermal power plant and paper-making process; the average circulating water of the thermal power plant is 8,000 m^3/h, and 22,630 m^3/h at the maximum; the circulating water for paper-making is 10,000 m^3/h, and 12,000 m^3/h at the maximum. Where the circulating water station of the thermal power plant is set with a cooling pool, with the size of 110m×22m×3m; at the upper part, there are 6 cooling towers, each of which has the treatment capacity of 4,000 m^3/h, and it is also assorted with a circulating pump room. The circulating water station for paper making is set with a hot water pool, with the size of 20m×10m×3m; a cooling pool, with the size of 65m×20m×3m; at the upper part, there are 4 cooling towers, each of which has the treatment capacity of 3,000 m^3/h, and it is also assorted with a circulating pump room.

⑥消防水源及供水能力，贮存量及贮存方式

⑥Fire water source and supply capacity, storage volume and method

根据《消防给水及消火栓系统技术规程》（GB50974-2014），由于厂区面积大于100ha，火灾同时发生次数按两次考虑，厂区生产车间和堆场按需水量最大的建筑和堆场各 1 次。本工程消防用水量计算按火灾危险性丙类、建筑物耐火等级按二级进行设计，其中车间消防用水量为 130L/S（室外消防用水量为 45L/S，室内消防用水为 25L/S，消防炮用水量 60L/S），车间室内外火灾延续时间为 3h，车间消防炮火灾延续时间为 1h；堆场消防用水量为 110L/S，火灾延续时间为 6h，一次火灾总需消防水量 3348m^3，存于给水净化站的清水池中。室外消防给水与生产用水管网合并，采用环状管网，室外消防水与生产水共用水泵；室内消防给水管网，采用环状管网，由变频气压供水装置及专用室内消防水泵供给；消防炮给水管网，采用环状管网，由变频气压供水装置及专用消防炮给水泵供给。车间内设置室内消火栓及干粉灭火器，车间外设置室外消火栓。

According to the *Technical Code for Fire Protection Water Supply and Hydrant System* (GB50974-2014), and considering the fact that the plant area is greater than 100 ha, two fire accidents shall be assumed simultaneously, and it shall meet the demand of the production workshop and stockyard with the largest demand. The fire water consumption shall be calculated based on category C of fire hazard, and the fire resistance rating of buildings shall be designed to be Class 2; the fire water consumption of workshop is 130L/S (outdoor fire water consumption: 45L/S, indoor fire water consumption: 25L/S, and fire monitor fire water consumption: 60L/S), for fire lasting for 3h in and out of the workshop, and for fire lasting for 1h in the workshop treated by fire monitor; the fire water consumption for each yard is 110L/S, for fire lasting for 6h, total amount of fire water needed by a fire is 3,348 m^3, and the water is kept in the clean-water reservoir of the water purification station. The outdoor fire water supply network is combined with the production water pipe network, which adopts the ring-shaped pipe network, and the outdoor fire water and production water share the same pump; the indoor fire water supply pipe network adopts the ring-shaped pipe network, and the water is supplied by the variable frequency air pressure water supply device and special indoor firefighting water pump; the fire monitor water supply pipe network adopts the ring-shaped pipe network, and the water is supplied by variable frequency air pressure water supply device and special fire monitor firefighting water pump. The workshop is set with indoor fire hydrants and dry powder fire extinguishers, and the region out of the workshop is set with outdoor fire hydrants.

项目各生产单元用水量估算见表 2.1.6-1。

Water consumption of each production unit is shown in Table 2.1.6-1.

（2）排水工程

(2) Drainage works

根据估算，项目一期生产废水排放量为 72130m^3/d，二期建成后全厂生产废水排放量为 95003 m^3/d，生活污水排放量为 324 m^3/d。项目采取雨污分流，拟建设总处理规模为 100000m^3/d 的污水处理系统，工艺采用厌氧反应器+生物选择池+卡鲁塞尔氧化沟+高级氧化池，废水处理达标后排入铁山港区深海排放管网系统，在铁山港 B3 排污口深海排放。项目各生产单元用水量估算见表 2.1.6-2。

As estimated, the production wastewater of Phase I will be 72,130 m^3/d, and that of the entire plant after completion of Phase II will be 95,003 m^3/d, and the domestic sewage discharge will be 324 m^3/d. The rainwater-sewage diversion system is adopted, and it is planned to build a sewage treatment system with the total treatment scale of 100,000 m^3/d, which adopts the process of “Anaerobic reactor+biological selection pool+Carrousel oxidation ditch+advanced oxidation pool”; the up-to-standard wastewater after treatment is discharged to the deep-sea discharge pipe network of Tieshangang District, specifically the sewage draining exit B3 of Tieshangang District. Water consumption of each production unit is shown in Table 2.1.6-2.

（3）初期雨水

(3) Initial rainwater

根据《关于印发<制浆造纸企业环境守法导则>的通知》（环办函〔2015〕882 号），初期雨水应经过收集入池，企业应当及时处理雨水收集水池内污水，并确保收集池雨天有足够的收集容量。

According to the *Notice on Issuing the Guidelines for Environmental Compliance of*

Pulping and Paper-Making Enterprises (HBH (2015) No. 882), the initial rainwater shall be collected into the pool, and the enterprise shall promptly dispose the sewage in the collection pool, to ensure that the collection pool has enough capacity on rainy days.

本项目原料堆场木片堆垛中带有的少量砂石及木屑在降雨时会冲出，木片在被水浸泡一段时间后会有一些污染物析出溶解在水中，因此初期雨水具有较高的污染物负荷，需要收集并进行处理。初期雨水计算公式采用北海市暴雨强度公式：

There is a small amount of sand and wood chips in the stockyard of raw materials, which will be washed out during rainfall; some pollutants will be precipitated from the wood chips after being soaked in water for a period of time and dissolved in water, so initial rainwater will contain a high amount of pollutants, and it shall be collected and disposed. The initial rainwater calculation formula adopts the rainstorm intensity formula of Beihai City:

$$q = \frac{1625(1+0.437P)}{(t+4)^{0.57}}$$

式中：

Where:

q——暴雨强度（升/秒•公顷）；

q - Rainstorm intensity (L/s • ha) ;

P——重现期，P取2；

P - Recurrence interval, P=2;

t——降雨历时（min），取 60min。

t - Duration (min), t=60 min.

经计算，暴雨强度为 171.79L/s·ha。

As calculated, the rainstorm intensity is 171.79L/s·ha.

初期雨水设计流量的计算公式为：

The calculation formula of initial rainwater design flow is:

$Q=qF\psi T$

式中：

Where:

Q——初期雨水排放量；

Q - Initial rainwater discharge;

F——汇水面积，两期全部建成后原料及木片堆场面积约 55hm^2；

F - Water catchment area, and the area of the stockyard for raw materials and wood chips after completion of Phase I and Phase II will be about 55hm^2;

Ψ——为径流系数（0.4-0.9，取 0.6）；

Ψ - runoff coefficient (0.4-0.9,Ψ=0.6);

T——为收水时间，取 15min。

T - water collection time, T=15min.

经计算，厂区需收集的初期雨水量约为 5102m^3，项目拟建 5200m^3 的初期雨水收集池。初期雨水应经雨水沟闸板阀截留后进入初期雨水收集池暂存，收集后的初期雨水分批进入污水处理站处理达标后排放，15 分钟后的雨水通过厂区雨水管网外排。

As calculated, the initial rainwater to be collected is about 5,102m^3, and it is planned to build an initial rainwater collection pool of 5,200 m^3. The initial rainwater shall be intercepted by the rainwater ditch gate valve and temporarily stored in the initial rainwater pool, which shall then be discharged into the sewage treatment plant, and only the up-to-standard water can be discharged; the rainwater 15 minutes later can be discharged through the rainwater pipe network of the plant.

（4）供电

(4) Power supply

外部电源：铁山变（电压等级 220kV，终期 3×150MVA，本期 2×150MVA，现负荷约 200MW），距厂区约 8km；盐田变（电压等级 220kV，终期 3×180MVA，本期 1×180MVA，现负荷约 10MW），余量充足。据厂区约 4km。

External power supply: Tieshan Substation (voltage: 220kV, final: 3×150MVA, current: 2×150MVA, current load: 200MW), which is about 8km from the plant area; Yantian Substation (voltage: 220kV, final: 3×180MVA, current: 1×180MVA, current load: 10MW), with sufficient margin. It is about 4km from the plant area.

内部电源：一期工程碱回收炉及固废综合利用锅炉配 2 台 CC80-10/1.4/0.6 双抽冷凝

机组进行供热发电；一台 280t/h 动力锅炉配 1 台 CB40-10/2.8/0.6 抽汽背压式机组进行供热，经热力专业汽电综合平衡计算，正常时，热电站自发电总量为 171000kW，一期工程用电负荷为 179751kW，尚需外购电量 8751kW。二期工程配套建设 1 台 CB50-10/1.4/0.6 抽汽背压式机组，发电机电压为 10.5kV，二期新增用电量为 107152kW，总用电量为 286903kW，一二期总发电量为 171000+40057= 211057kW，尚需外电 75846KW。

Internal power supply: In Phase I, the alkali recovery furnace and solid waste comprehensive utilization boiler are equipped with two CC80-10/1.4/0.6 dual pumping condensing units for heating and power generation; and one 280t/h power boiler is equipped with one CB40-10/2.8/0.6 steam extraction back pressure unit for heating; based on the comprehensive balance calculation of steam and electricity, the output of the thermal power plant under normal conditions is 171,000kW, and the engineering load of Phase I is 179,751kW, so 8,751 kW shall be bought. In Phase II, it is assorted with a set of CB50-10/1.4/0.6 steam extraction back pressure unit, the generator voltage is 10.5kV, the newly-increased power consumption in Phase II is 107,152kW, the total power consumption is 286,903kW, and the total power generation of Phase I and Phase II is 171,000+40,057= 211,057kW, so 75,846KW shall be purchased.

本工程在厂区内建一座 220kV 或 110kV 中央变电站和若干座 35/10.5kV 区域变电站来满足生产用电的需求。

The Project also builds a 220kV or 110kV central substation and several 35/10.5kV regional substations, to meet the demand of power for production.

（5）供汽

(5) Steam supply

本项目位于铁山港（临海）工业区，目前园区集中供热点为北海电厂一期，供热参数为蒸汽最大流量 120t/h，最高压力为 1.5MPa、最高温度为 310℃，目前园区企业供热平均流量为 23t/h，远不能满足本项目蒸汽需求。铁山港(临海)工业区规划建设北海电厂二期和神华国华广投北海能源基地两个集中供热热源点，其中北海电厂二期扩建项目规划建设 2 台 660MW 的抽凝供热机组和 11 台 50MW 级的抽汽背压机组，神华国华广投北海能源基地一期工程拟建设 2×1000MW 超超临界二次再热纯疑机组。目前北海电厂

二期和神华电厂尚未核准或建设，无法确定投产时间。根据造纸行业特点，浆纸生产开停频繁，并且生产过程中随着浆的种类及产量不同需及时调整蒸汽的流量和压力，如果蒸汽是长距离输送，所有操作具有滞后性，热源生产调度方面无法及时满足生产需要，将存在巨大的安全隐患。

The Project is located in Tieshangang (Linhai) Industrial Park, and its the centralized heating is provided by Phase I of Beihai Power Plant. Heating parameters: maximum steam flow rate: 120t/h, maximum pressure: 1.5MPa, maximum temperature: 310℃. At present, the average flow rate of heating for enterprises in the Park is 23t/h, which cannot meet the demand of the Project for steam. Two heat supply plants, namely Phase II of Beihai Power Plant and Shenhua Guohua Guangtou Beihai Energy Base are planned to be built in Tieshangang (Linhai) Industrial Park, where Phase II of Beihai Power Plant plans to install two 660MW extraction condensation heating units and 11 sets of 50MW steam extraction back pressure units, and Phase I of Guohua Guangtou Beihai Energy Base plans to build 2×1,000MW Ultra Supercritical Double Reheat Straight Condensing Unit. At present, Phase II of Beihai Power Plant and Shenhua Power Plant have not been approved or constructed, so the time for production cannot be determined. According to the characteristics of the paper-making industry, the startup and shutdown will be performed frequently, and the flow and pressure of steam shall be timely adjusted based on the type and output of pulp during production; if the steam is transported over a long distance, all operations will be lagging, and the production scheduling of heat source cannot meet the production demand in time, thus resulting in a huge safety hazard.

根据国家发改委联合下发的《热电联产管理办法》(发改能源〔2016〕617 号)第八条规定:“有(热)电厂的供热范围内，且已有(热)电厂可满足或改造后可满足工业项目热力需求，原则上不再重复规划建设热电联产项目(含企业自备电厂)。除经充分评估论证后确有必要外，限制规划建设仅为单一企业服务的自备热电联产项目”，鉴于《北海市热电联产规划(2016-2030)年》规划的两个热源项目没能按规划实施，无法满足项目 2021 年投产的生产需要，因此项目拟建设热电站为生产提供服务。项目于 2019 年 11 月 20 日获得北海市发展和改革委员会《关于广西太阳纸业 350 万吨林浆纸一体化项目建设供

热设施意见的函》（北发改函〔2019〕1033 号），项目建设供热及附属配套设施，符合北海市热电联产规划及国家有关政策要求。

According to Article 8 of *Combined Heat and Power Management Methods* (FGNY (2016) No. 617) issued by National Development and Reform Commission “within the heating range of (thermal) power plants, or the existing or transformed (thermal) power plants can meet the thermal demand of industrial projects, repeat planning and construction of combined heat and power projects (including enterprise-owned power plants) will not be performed in principle. Except as deemed indeed necessary after thorough evaluation and demonstration, it can only plan and build self-owned CHP projects serving individual enterprises”; in view of the fact that the two heat source projects planned in *Beihai Combined Heat and Power Plan* (2016-2030) have not been implemented as planned, and cannot meet the production demand put into operation in 2021, so the Project plans to build a thermal power plant to provide services for production. The Project obtained the *Letter on Opinions on Construction of Heating Facilities for 3.5 Million Tons Forest-Pulp-and-Paper Integration Project of Guangxi Sun Paper* (BFGH (2019) No. 1033) issued by Beihai City Development and Reform Commission on November 20, 2019, and then constructed the heat supply and ancillary facilities, which met the requirements of Beihai CHP Plan and the relevant national policies.

本项目一期工程平均用汽量：2.8MPa(g)，375℃：136.42t/h，1.3MPa(g)，215℃：173.50 t/h，0.5MPa(g)，180℃：521.27 t/h，总用汽量为 831.26 t/h，最大用汽量 926.62t/h。一二期工程工程投产后平均用汽量：2.8MPa(g)，350℃：136.42t/h，1.3MPa(g)，215℃：250.1t/h，0.5MPa(g)，180℃：645.35t/h，总用汽量为 1031.87t/h，最大用汽量 1180.5t/h。

The average steam consumption of Phase I of the Project: 2.8MPa(g), 375℃: 136.42t/h, 1.3MPa(g), 215℃: 173.50 t/h, 0.5MPa(g), 180℃: 521.27 t/h; overall steam consumption: 831.26 t/h; maximum steam consumption: 26.62t/h. The average steam consumption after the putting into operation of Phase I and Phase II: 2.8MPa(g), 350℃: 136.42t/h, 1.3MPa(g), 215℃: 250.1t/h, 0.5MPa(g), 180℃: 645.35t/h; overall steam consumption: 1,031.87t/h; maximum steam consumption: 1,180.5t/h.

本项目设热电站，利用碱回收炉焚烧制浆黑液产生大量高温高压蒸汽，利用固废综合利用锅炉焚烧生产过程产生的树皮、木屑、浆渣、好氧污泥等废料，产生的高温高压蒸汽。高温高压蒸汽可以驱动汽轮发电机发电并供热，热电站向生产部门提供生产需用的蒸汽和电力。本项目配套建设一台碱回收炉，焚烧生产过程中产生的黑液，碱回收炉额定处理黑液能力为4600tds/d。一期工程碱回收炉平衡固形物量：4200tds/d（含20万吨化机浆固形物100tds/d），平均产汽量为644t/h，二期产生的黑液经过MVR蒸发工段处理后送至4600tds/d碱炉处理，新增固形物处理量为200tds/d，新增产汽量为26t/h，达到670 t/h。碱回收炉高温高压蒸汽参数为10.5MPa（g）、515℃。项目设一台220t/h固废综合利用锅炉（循环流化床锅炉），额定参数为10.5MPa（g）、515℃，燃烧项目生产过程产生的树皮、木屑、浆渣、好氧污泥等固废回收利用热能，为保证锅炉稳定运行，正常运行时掺烧不超过20%的原煤。固废综合利用锅炉可产汽量为165t/h。碱回收炉和固废综合利用锅炉配2台CC80-10/1.4/0.6双抽冷凝机组进行供热发电。

The Project is set with a thermal power plant, which will produce a large amount of high-temperature and high-pressure steam through burning black liquor with the alkali recovery furnace, and also produce high-temperature and high-pressure steam through burning the bark, wood chips, pulp slags and aerobic sludge produced by the solid waste comprehensive utilization boiler. The high-temperature and high-pressure steam can drive the steam turbine generator to generate electricity and provide heat; the thermal power plant will provide steam and electricity for the production department. The Project is equipped with an alkali recovery furnace, incinerate the black liquor produced during production, and the rated capacity of the alkali recovery furnace is 4,600 tds/d. The balance solid content of alkali recovery furnace in Phase I: 4,200tds/d (including 200,000 tons APMP solid matters, 100tds/d), the average steam production is 644t/h; the black liquor produced in Phase II will be sent to the 4,600tds/d alkali furnace after treating by the MVR evaporation section; the newly added solid processing capacity is 200tds/d, the newly added steam output is 26t/h, reaching 670 t/h. The high-temperature and high-pressure steam parameters of the alkali recovery furnace: 10.5MPa(g), 515℃. The Project is installed with a 220t/h solid waste comprehensive utilization boiler (circulating fluidized bed boiler), with the rated parameters of 10.5MPa(g), 515℃; it will burn solid wastes produced in the production process such as bark, wood chips, pulp slag, and aerobiotic sludge, to recycle thermal energy; in order to ensure the stable operation of the boiler, no more 20% of coal may be mixed during normal operation. The solid waste comprehensive utilization boiler can produce the steam of 165t/h. The alkali recovery furnace and solid waste comprehensive utilization boiler is equipped with two CC80-10/1.4/0.6 dual pumping condensing units for heating and power generation.

项目一期工程配套建设一台额定蒸发量为 280t/h，蒸汽参数为 10.5MPa（g）、515℃的循环流化床锅炉，配 1 台 CB40-10/2.8/0.6 抽汽背压式机组进行供热。

Phase I is equipped with a circulating fluidized bed boiler with the rated evaporation of 280t/h, and steam parameters of 10.5MPa(g) and 515℃, and also a CB40-10/2.8/0.6 steam extraction back pressure unit for heating.

二期增加一台额定蒸发量为 280t/h，蒸汽参数为 10.5MPa（g）、515℃的循环流化床锅炉，配 1 台 CB50-10/1.4/0.6 抽汽背压式机组进行供热。

Phase II is added with a circulating fluidized bed boiler with the rated evaporation of 280t/h, and steam parameters of 10.5MPa(g) and 515℃, and also a CB50-10/1.4/0.6 steam extraction back pressure unit for heating.

项目热平衡见表 2.1.6-3 及表 2.1.6-4，图 2.1.6-1 及 2.1.6-2。

The heat balance of the project is shown in Table 2.1.6-3 and Table 2.1.6-4, Fig. 2.1.6-1 and 2.1.6-2.

2.1.7 依托工程

2.1.7 Basis projects

（1）铁山港区深海排放管网工程

(1) Tieshangang District Deep-Sea Discharge Pipe Network Project

项目生产废水在厂内处理达标后依托铁山港区深海排放管网工程在 B3 排污口深海排放。排海管沿园区三号明渠布设，与三号明渠深海排放井处接入海域管段排入海里。

The sewage of the Project is discharged into the deep-sea discharge pipe network system of Tieshangang District after being processed by the plant at sewage draining exit B3. The discharge pipe is laid along the No. 3 open channel in the park, which is connected to the sea section at the deep-sea discharge well, for discharging sewage to the sea.

北海市铁山港区污水处理厂尾水排海管工程于 2013 年获北海市发展和改革委员会批复建设（北发改投资〔2013〕77 号），工程海洋环境影响报告书于 2017 年 1 月获广西壮族自治区海洋局核准（桂海函〔2017〕26 号）；项目由北海市路港建设投资开发有限公司建设运行，已于 2017 年建成投入使用，管道排放能力为 23.2 万立方/天，排海口位于铁山港西岸排污区 1（GX012DⅣ）B3 排污口（E109°35′48″，N21°30′54″）。

The Tailwater Discharge Pipe Project of Beihai Tieshangang District Sewage Treatment Plant was approved for construction by Beihai City Development and Reform Commission in 2013 (BFGTZ (2013) No. 77); the marine environmental impact report was approved by Ocean Bureau of Guangxi Zhuang Autonomous Region in January 2017 (GHH (2017) No. 26); the project was constructed and operated by Beihai Lugang Construction Investment Development Co., Ltd., and was put into operation in 2017; it has the discharge capacity of 232,000 m3/d, and its outlet is located at sewage draining exit B3 (E109°35′48″, N21°30′54″) of West Drainage Area 1 (GX012DⅣ).

排海管长 4350m（含开挖段长度 741m，管径 1500mm；顶管段长度 3176m，管径 2000mm；扩散段长度 400m，管径 1500~300mm），其间还包含 2 座人工岛及工作井。排水采用间歇排放，扩散段放流管初始管径为 1500mm，无水流时，轴线处稀释度为 68，初始稀释度为 61。为保证扩散器内流速大于清淤流速 0.6m/s，扩散器长度 320m，扩散器管径从 1500mm 逐渐缩至 300mm。扩散管管径为 300mm，设 40 条扩散管，扩散管间距 8 米。在扩散管顶部对称开 4 个孔，孔径 80mm，并在各孔处接 DN80mm 鸭嘴阀，

防止泥沙倒灌。在扩散器末端设翻板闸阀，平时关闭，进行管道冲洗时打开。扩散管喷口流速约3.5m/s，佛汝德数为3.98，大于1。

The length of the sea discharge pipe is 4,350m (including the excavation section of 741m, with the pipe diameter of 1,500 mm; the pipe jacking section of 3,176m, with the pipe diameter of 2,000mm; and the diffusion section of 400m, with the pipe diameter of 1,500~300mm); there are also 2 artificial islands and working wells. The sewage is discharged intermittently; the initial diameter of outlet pipe at the diffusion section is 1,500mm; under conditions that there is no water flow, the dilution at the axis is 68, and the initial dilution is 61. In order to ensure that the flow rate in the diffuser is greater than the dredging rate of 0.6m/s, the length of the diffuser is set as 320m, with the diameter gradually reducing from 1,500mm to 300mm. There are 40 diffusion pipes of 300mm in diameter, with the interval of 8 m. There are 4 symmetrical openings on the top of the diffuser, with the diameter of 80mm, and each of which is installed with a DN80mm duckbill valve, to prevent the backflow of sediment. A flap gate valve is installed at the end of the diffuser, which is normally closed, and only opened during pipe flushing. The velocity at the diffuser nozzle is about 3.5m/s, with the Froude number of 3.98, which is greater than 1.

目前已获得项目环评批复，经尾水排海管工程排放的项目排放量共计约13.544万立方/天（包括铁山港区污水处理厂40000立方/天、中石化北海炼油异地改造石油化工项目2340立方/天、斯道拉恩索林浆纸项目90352立方/天、北部湾表面处理中心项目2750立方/天），管道剩余排放能力约为9.656万立方/天。实际建成运行项目的尾水排放量约为2.315万立方/天，仅占设计管道排水能力的11%，尾水排海管仍有较大的接纳空间。深海排放工作井共设置有4个接口，目前已使用3个，分别为铁山港区污水处理厂、中石化北海炼化项目、斯道拉恩索林浆纸项目使用。铁山港（临海）工业区管理委员会《关于北海市铁山港区污水处理厂尾水排海管工程使用情况的说明》（附件13）："近期保留已获得环评批复的项目排水量共计约13.55万立方/天，剩余接纳能力9.65万立方/天，优先保障近期入驻的广西太阳纸业有限公司350万吨林浆纸一体化项目排水。"

At present, the project has been approved through environmental impact assessment, and the total discharge of the tailwater discharge pipeline is about 135,440 m3/d (Tieshangang District Sewage Treatment Plant: 40,000 m3/d, Sinopec Beihai Oil Refining Off-site Reconstruction Petrochemical Project: 2,340 m3/d, Stora Ensorin Pulp and Paper Project: 90,352 m3/d, Beibu Gulf Surface Treatment Center Project: 2,750 m3/d); and the remaining discharge capacity of the pipeline is about 96,560 m3/d. The tail water discharge of the completed project is about 23,150 m3/d, which only accounts for 11% of the designed drainage capacity, the tail water discharge pipe has greater acceptance space. There are 4 interfaces in the deep-sea discharge working well, 3 of which have been put into operation for Tieshangang District Sewage Treatment Plant, Sinopec Beihai Refining & Chemical Project, and Stora Ensorin Pulp and Paper Project. In the Description of the Use of Tailwater Discharge Pipe of Tieshangang District Sewage Treatment Plant(Appendix 13) issued by Tieshangang (Linhai) Industrial Park Management Committee, it is stated that "The discharge of the project with EIA approval reserved recently is about 135,500 m3/d, and the remaining capacity is 96,500 m3/d, so the priority is given to ensuring the drainage of 3.5 Million Tons Forest-Pulp-and-Paper Integration Project of Guangxi Sun Paper Co., Ltd."

本项目建成投产后，铁山港区污水处理厂尾水排海管排放能力已接近满负荷，为妥善解决今后进引进企业污水排放问题，为铁山港（临海）工业区后续发展提供排污空间，经北海市政府同意，园区已启动新深海排污区论证及排污管道的建设工作。

After construction and operation of the Project, the capacity of the tail water discharge pipe of Tieshangang District Sewage Treatment Plant will be close to full load, so in order to properly ensure the sewage discharge from introduced enterprises in the future, and provide discharge space for subsequent development of Tieshangang (Linhai) Industrial Park, the Park, with the approval of Beihai Municipal Government, has started the demonstration of a new deep-sea sewage discharge area and the construction of discharge pipes.

铁山港区深海排放管网工程目前已投入使用，剩余接纳能力能满足本项目废水排放需求，依托可行。

Tieshangang District Deep-Sea Discharge Pipe Network Project has been put into operation, and its remaining capacity can meet the wastewater discharge requirements of the Project.

（2）铁山港工业区一般工业固体废物集中处置场

(2) Tieshangang Industrial Park General Industrial Solid Waste Centralized Disposal Site

铁山港工业区一般工业固体废物集中处置场位于北海市铁山港工业区中石化配套道路以南，中石化火炬区以东，服务范围为铁山港工业区及北海市工业企业产生的第II类一般工业固体废物。填埋区库容45.08万m^3，设计服务年限15年，年运营天数为365

天，可容纳填埋废物总量为40.07万m^3，处置场的废物处置主要处置绿泥、石灰渣、脱硫废渣等第II类一般工业废物，综合各处置废物性质，平均填埋废物量为36329.68t/a。

Tieshangang Industrial Park General Industrial Solid Waste Centralized Disposal Site is located in the south of Sinopec supporting road and east of Huoju District in Tieshangang Industrial Park, Beihai City, which is mainly used to dispose Class II general industrial solid waste produced by Tieshangang Industrial Park and industrial enterprises in Beihai. The capacity of the landfill area is 450,800 m^3, with the design service period of 15 years, annual operation days of 365, and the total amount of landfill waste of 400,700 m^3; it is mainly used to treat Class II general industrial waste, such as green mud, lime slag, and desulfurization slag; considering the nature of wastes to be treated, the average landfill volume is 36,329.68t/a.

铁山港工业区一般工业固体废物集中处置场建设内容主要包括填埋区建设工程、防渗系统、渗滤液导排系统、地下水导排系统、填埋气体导排系统、污泥预处理系统、渗滤液处理系统及生活办公设施等。其中填埋区由西南向东北划分为四个填埋区，中间建设三条分区坝，分区坝宽3m，坝高3m。围绕每个填埋整个填埋库区修筑约5.5米高垃圾坝，坝底黄海基准标高9.3m，坝顶黄海基准标高16.0m，垃圾坝内围成区域向下开挖1~2米形成具备一定库容的填埋库区，垃圾坝设计内侧坡度不大于1：2.0(垂直：水平)，外侧坡度不大于1：2.0。

Tieshangang Industrial Park General Industrial Solid Waste Centralized Disposal Site mainly consists of the landfill area, anti-seepage system, leachate guide and drainage system, underground water guide and drainage system, landfill gas guide and drainage system, sludge pretreatment system, leachate treatment system and living and office facilities. Where the landfill area is divided into four regions arranged from southwest to northeast, and there are three zoning dams (width: 3m, height: 3m). The Project constructs a garbage dam of about 5.5m in height around each landfill region, with the yellow sea datum elevation of 9.3m at the bottom and 16.0m at the top; within the dam, the ground is excavated 1 to 2 m downward, to form a landfill region with certain capacity; the internal slope is designed to be smaller than

1:2.0 (vertical: horizontal), and the external slope is designed to be smaller than 1:2.0.

本项目配套一般固体废物填埋场目前正在进行选址及前期工作，铁山港（临海）工业区管理委员会计划于 2020 年 6 月前完成选址（见附件 10），建设单位承诺于 2021 年底建成投入运行，本项目一期生产线计划于 2021 年 8 月建成投入试生产，在本项目配套一般固体废物填埋场正常运行前，计划依托铁山港区一般固体废物集中处置场过渡使用 5~12 个月。

The site of the supporting general solid waste landfill is being selected at present, and the preliminary work is being carried out; Tieshangang (Linhai) Industrial Park Management Committee plans to complete the site selection before June 2020 (see Appendix10). The construction unit promises to complete and put it into operation at the end of 2021. The Phase I production line is planned to be completed and put into trial operation in August 2021. Prior to the operation of the supporting general solid waste landfill, the General Solid Waste Disposal Site of Tieshangang District is planned to be used for 5~12 months as transition.

铁山港工业区一般工业固体废物集中处置场于目前正在建设，计划于 2020 年 12 月建成（见附件 10），能在本项目建成运行前投入使用。

Tieshangang Industrial Park General Industrial Solid Waste Centralized Disposal Site is currently under construction, and it is planned to be completed in December 2020 (See Appendix 10), and put into operation prior to the completion of the Project.

（3）铁山港工业区天然气工程

(3) Tieshangang Industrial Park Natural Gas Project

铁山港工业区天然气工程位于铁山港工业区内，站区西侧紧邻六路，南侧紧邻七号路。天然气工程包括门站部分、LNG 储存气化站部分以及加气站部分，其中门站部分一期供气能力 50 万 m^3/d，二期供气能力为 100 万 m^3/d，主要为铁山港工业区居民用户、工业用户及商业用户提供天然气；LNG 储存气化站部分高峰气化能力为 2.4 万 Nm^3/d，主要是在长输管道未敷设至本站前，作为铁山港工业区天然气主要气源；加气站部分 LNG 设计加气能力 2 万 Nm^3/d，CNG 设计加气能力 2 万 Nm^3/d，主要为各类汽车永华提供天然气燃料。天然气工程气源来自于铁山港中石化 LNG 接收码头 BOG 气化天然气，

备用气源为中石化长输管道天然气，气源产地为澳大利亚 LNG 工厂。经调压设备，将上游气源气体压力 0.8MPa-1.6MPa 调压为 0.35MPa 供应给下游用户。

Tieshangang Industrial Park Natural Gas Project is located in Tieshangang Industrial Park, and it is next to Road No. 6 in the west, and Road No. 7 in the south. The Natural Gas Project consists of the gate station, LNG storage gasification station and gas filling station, where Phase I of the gate station has the gas supply capacity of 500,000 m^3/d, and Phase II has the gas supply capacity of 1 million m^3/d, which mainly supplies natural gas to residential users, industrial users and commercial users in Tieshangang Industrial Park; LNG storage gasification station has the peak gasification capacity of 24,000 Nm^3/d, which is the main source of gas in Tieshangang Industrial Park before the laying of long-distance pipeline; as for the gas filling station, the designed LNG filling capacity is 20,000 Nm^3/d, and the designed CNG filling capacity is 20,000 Nm^3/d for supplying natural gas to various types of vehicles. The gas source of the natural gas project is BOG gasified natural gas from Sinopec LNG terminal in Tieshangang District, and the stand-by gas is from Australian LNG plant through Sinopec long-distance pipeline. Adjust the upstream gas source gas pressure from 0.8MPa-1.6MPa to 0.35MPa with the pressure regulating equipment, and then supplied to the downstream users.

铁山港工业区天然气工程已建成，天然气供气管道由企业报建，由负责运行的天然气公司建管网接入，能在本项目建成运行前投入使用，依托可行。铁山港工业区天然气工程及管道示意图见图 2.1.7-3。

Tieshangang Industrial Park Natural Gas Project has been completed, the natural gas supply pipelines have been applied for laying by the enterprise and connecting to the pipeline network of the natural gas company, and it can be put into operation prior to the completion of the Project. The Diagram of Tieshangang Industrial Park Natural Gas Project and Pipelines is shown in Fig. 2.1.7-3.


广西北部湾新奥燃气发展有限公司
铁山港(临海)工业园区燃气管道规划图
向海大道
项目位置
林浆纸业
东方海岸
北海电厂
信义玻璃厂
中石化LNG接收站
图 例
已建中压管道
已建次高压管道
已建高压管道
待建次高压管道
项目位置

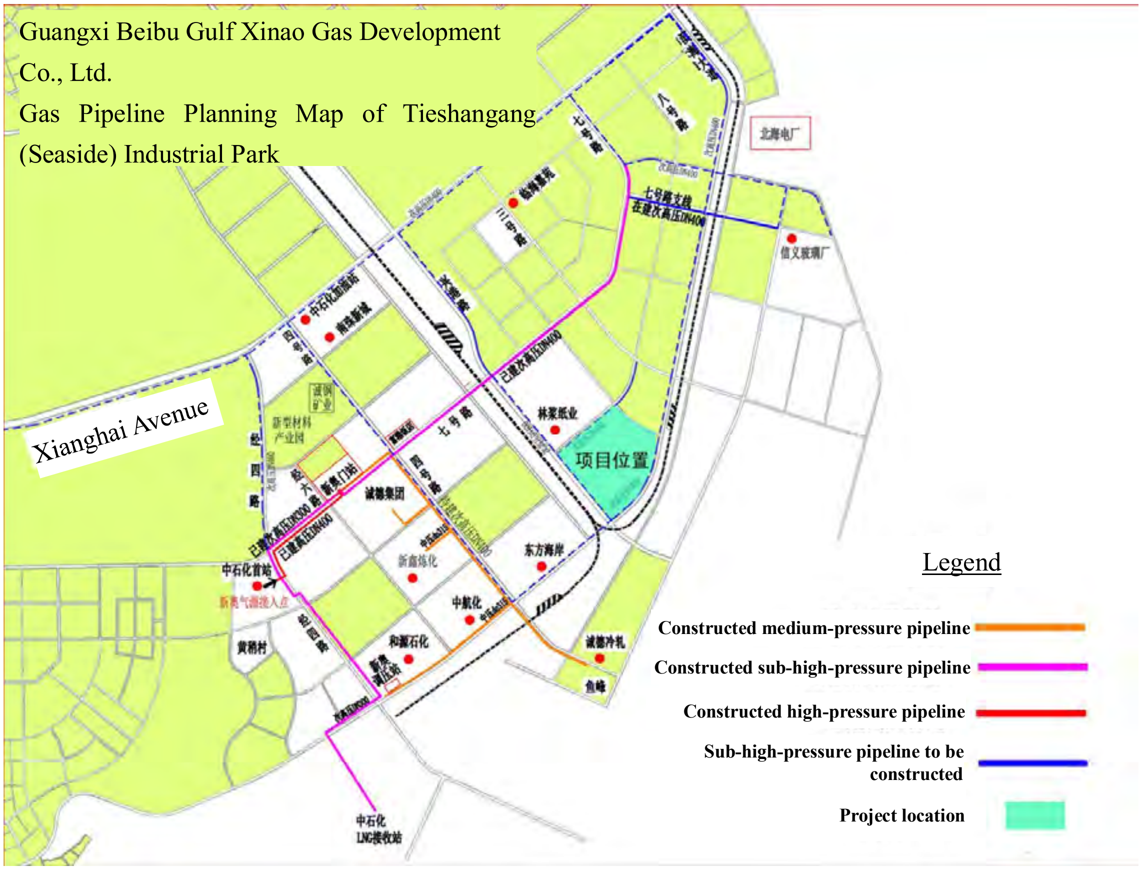


图 2.1.7-1　铁山港工业区天然气工程及管网示意图

Fig. 2.1.7-1 Diagram of Tieshangang Industrial Park Natural Gas Project and Pipelines

2.2 项目影响因素分析

2.2 Analysis of project influencing factors

2.2.1 工艺流程、设备、物料消耗及产排污节点分析

2.2.1 Analysis of process flow, equipment, material consumption and sewage production and emission nodes

2.2.1.1 原料堆场及备料车间

2.2.1.1 Raw material stockyard and preparation workshop

（1）工艺流程及产污环节

(1) Process flow and pollutant generation process

年产80万吨漂白阔叶木浆约需168万吨（绝干）原料，年产60万吨化机浆约需64.8万吨（绝干）木片。原料堆场根据原材料的组织方式和当地的运输状况设置一定的储量，以满足连续生产的需要。根据广西本地桉木供应情况和条件，本项目原料主要以木片为主，原料堆场主要考虑木片堆场，同时也需要考虑原木收购情况，布置一定面积的原木堆场。原木运进厂后，直接剥皮、切片，然后以木片堆存，原木不考虑长时间堆放。

The annual output of 800,000 tons of bleached hardwood kraft pulp needs about 1,680,000 tons of (absolute dry) raw materials, and the annual output of 600,000 tons of APMP needs about 648,000 tons of (absolute dry) wood chips. Raw material stockyard is set with certain reserves according to the organization of raw materials and local transportation conditions, so as to meet the requirement of continuous production. According to the supply situation and conditions of Eucalyptus wood in Guangxi, the raw materials are mainly wood chips, so the raw material stockyard is mainly used to store wood chips, and a log stockyard of a certain area shall be arranged considering the purchasing of logs. After being transported into the plant, the logs shall be directly peeled and sliced, and then stocked as wood chips; the logs shall not be stacked for a long time.

本项目采用先筛后堆方式，木片堆存时间按1个月考虑，需堆存19.4万吨绝干木片，按照木片堆虚积150kg/m^{3}计，需要堆存约130万m^3。

The Project will stack wood chips after screening; if the staking time is set as 1 month, 194,000 tons absolute dry sheets shall be stacked; as calculated based on the virtual volume of 150kg/m^3, about 1.3 million m^3 shall be stacked.

一期外来木片汽车运进，汽车在液压翻板机卸料，木片卸到链板输送机送至皮带输送机，通过盘筛筛选，除去大块杂质，然后进入木片摇摆筛，摇摆筛大块木片再碎，碎屑则通过皮带输送机送至木屑仓，通过皮带输送机送至固废综合利用锅炉燃烧。合格木片送木片堆场堆存，生产时，通过皮带输送机栈桥送至化学浆车间蒸煮工段。

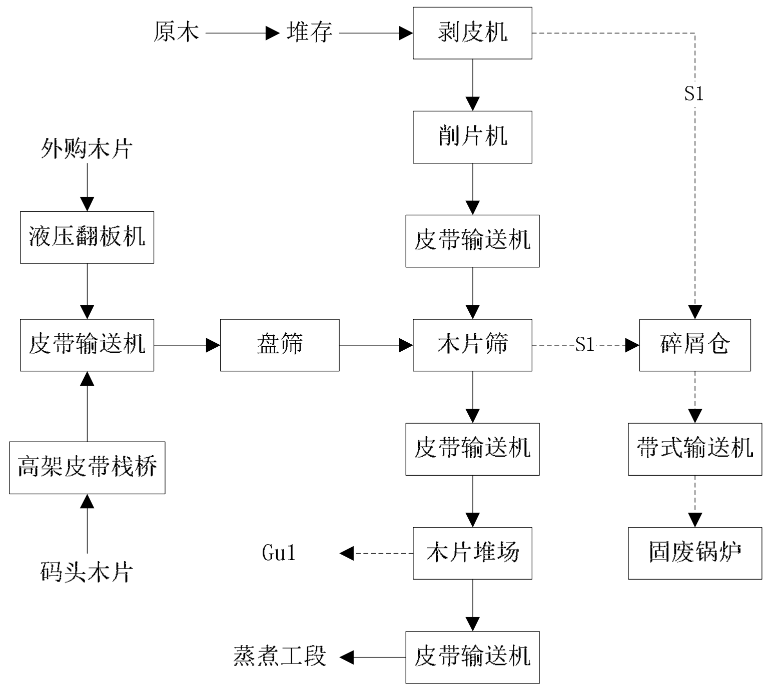
In Phase I, outsourcing wood chips are transported by vehicles, which unload by the hydraulic flip machine on the chain plate conveyor, and the wood chips are sent to the belt conveyor and then to the disc screen for removing large impurities; later, they are sent to the swinging screen, to crush large chips, and the scraps are sent to the Wood chippings Bin through the belt conveyor, and finally sent to solid waste comprehensive utilization boiler by the belt conveyor. Qualified wood chips are sent to the stockyard, which will then be sent to the cooking section of the chemical pulp workshop through the belt conveyor trestle.

由于本项目原木进料量较少，考虑采用辊式剥皮机进行剥皮。原木削片后，木片在暂存区暂存，用装载机送进皮带输送机与外来木片线会合进入盘筛至摇摆筛。

Due to the small amount of logs, they can be peeled by the roller peeling machine. After slicing, the wood chips are stored at the temporary storage warehouse, and then loaded to the belt conveyor with the loader, and then to the disk screen and swinging screen with outsourcing sheets.

本项目东南面即为铁山港码头，距离 10#泊位码头仅约 3 公里。当项目需要进口木片，或者木片海运过来时，则经码头转运。在码头上设皮带输送机装料系统，通过高架栈桥沿场地边沿送至本项目木片堆场，经过转运直接送木片筛选系统后送堆存。

Tieshangang Port is located at the southeast of the Project, which is only about 3 km from the 10# berth. When imported wood chips are required, or the wood chips are transported by sea, they shall be transferred through the terminal. A belt conveyor loading system shall be arranged at the terminal, which can deliver the materials to the stockyard of the Project through the elevated trestle along the edge; then the materials can be stacked after screening by the wood chip screening system.



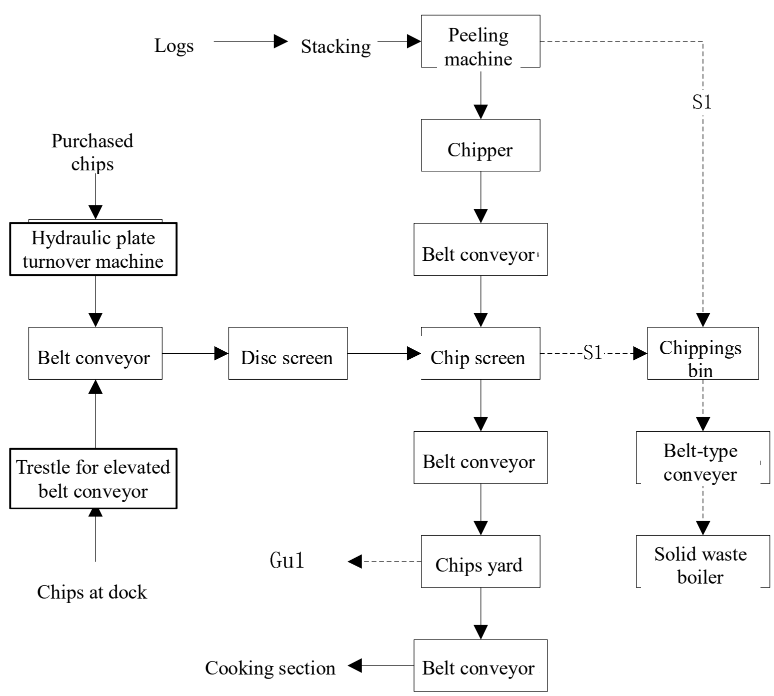


图 2.2.1-1 一期工程原料备料工艺流程及产污节点图

Fig. 2.2.1-1 Phase I raw material preparation process and pollutant generation nodes

二期外购木片通过自卸汽车运到厂，秤重后送木片堆场。用装载机将木片推至地坑螺旋输送机输送机送到木片筛筛选，合格的木片经皮带输送机送到木片仓。筛选出的过

大木片经再碎机再切处理后送回木片筛。木屑送化学浆配套的碎屑仓贮存，后送固废综合利用锅炉燃烧。

In Phase II, outsourcing wood chips are transported to the plant by dump trucks, and then to the wood chip stockyard after weighing. Load the wood chips on the spiral conveyer with a loader, and transfer to the screen; the qualified ones will be transferred to the wood chip bin through the belt conveyor. The screened oversized wood chips are sliced by the rechipper and sent back to the the screen. The chippings will be transferred to the chippings bin of the chemical pulp section for stocking, and then to the solid waste comprehensive utilization boiler for burning.

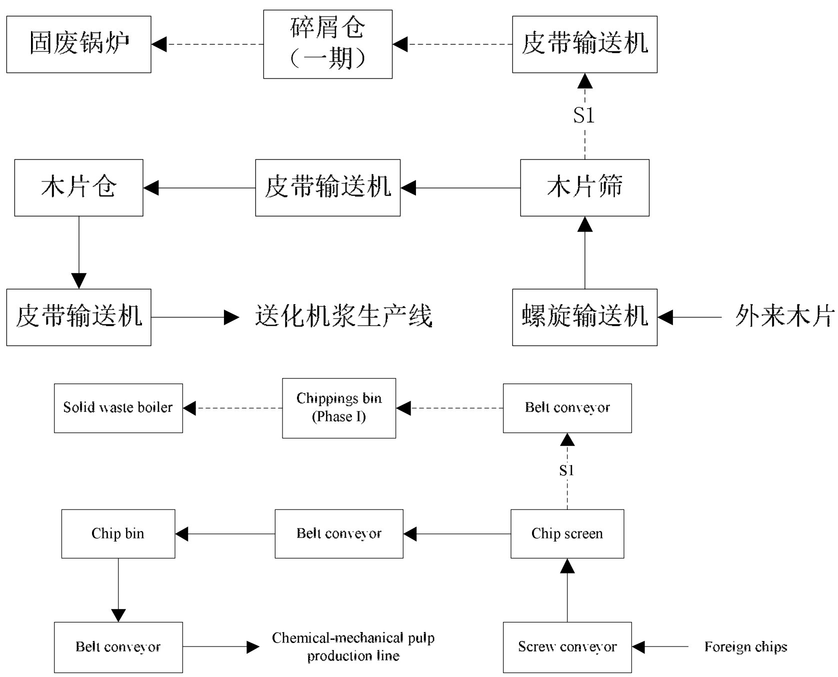


图 2.2.1-2 二期原料备料工艺流程及产污节点图
Fig. 2.2.1-2 Phase II raw material preparation process and pollutant generation nodes

项目原料堆场及备料车间产污环节见表2.2.1-1。

pollutant generation steps of raw material stockyard and preparation workshop are shown in Table 2.2.1-1.

表 2.2.1-1 项目原料堆场及备料车间产污环节汇总表
Table 2.2.1-1 Summary of pollutant generation steps of the raw material stockyard and preparation workshop

类别 Category	污染源 Source of pollution	污染物类型 Type of pollutants	治理措施 Control measures	排放去向 Discharge destination	污染源编号 Pollution source no.
废气 Exhaust gas	木片堆场 Wood chip stockyard	颗粒物 Particulate Matters (PM)	木片堆场的粉尘主要产生于木片圆堆成堆过程，由于木片含水量大，并采用先筛后存储工艺，不易起尘，木片堆场粉尘基本不会对大气环境带来不利影响。 The dust in the wood chip stockyard is mainly produced by stacking the chips; due to the large water content of the wood chips, the screening before stacking can reduce dust, so the dust of the wood chip stockyard will not adversely affect the atmosphere basically.	以无组织形式排入大气环境。 Discharge to atmosphere in a fugitive form.	Gu1
	备料车间 Material workshop	颗粒物 Particulate Matters (PM)	主要产生于木片筛，木片筛位于封闭车间内，产生的扬尘量很小，且基本不会飘散至室外，不会对项目区大气环境带来不利影响。 They are mainly produced by the wood chip screen located in the closed workshop, and due to the small amount of dust and the fact that it will not spread outside, they will not adversely affect the atmospheric environment in the project area.		
废水 Wastewater	本工段无废水产生。 No wastewater produced in this section.				
固废 Solid waste	剥皮机 Peeler	木屑 Wood chippings	送至固废综合利用锅炉焚烧。 Transferred to solid waste comprehensive utilization boiler for incineration.	焚烧处置。 Incineration.	S1
	木片筛 Wood chip screen				

（2）主要工艺技术参数

(2) Main process technical parameters

原料堆场及备料车间主要工艺技术参数见表 2.2.1-2。

Main process technical parameters of raw material stockyard and preparation workshop are shown in Table 2.2.1-2.

（3）项目木片消耗量及备料车间能源消耗指标

(3) Wood chip consumption and preparation workshop energy consumption

indicators

项目木片消耗量及备料车间能源消耗情况见表2.2.1-3。

Wood chip consumption and preparation workshop energy consumption indicators are shown in Table 2.2.1-3.

（4）主要设备

（4）Main equipment

备料车间主要设备清单见表2.2.1-4。

The list of main equipment of preparation workshop is shown in Table 2.2.1-4.

2.2.1.2 化学浆车间

2.2.1.2 Chemical pulp workshop

（1）制浆工艺选择

(1) Selection of pulping process

化学浆车间由蒸煮工段、洗选及氧脱木素工段、漂白工段、ClO_2制备工段和化学品制备工段组成。

The chemical pulp workshop consists of the cooking section, washing and oxygen delignification section, bleaching section, ClO_2 preparation section and chemical preparation section.

①蒸煮工艺

①Cooking process

制浆工业生产上常用碱法制浆及亚硫酸盐法制浆两大类，其中碱法制浆又包括烧碱法和硫酸盐法等，硫酸盐法具有蒸煮得率高，纸浆强度好，碱回收工艺成熟等优点，在以木材为原料的制浆生产中应用最广泛。硫酸盐法蒸煮工艺包括：连续蒸煮、低能耗间歇蒸煮等工艺。

The pulping industry mainly adopts the alkali-based pulping and sulfite pulping, where alkali-based pulping is divided into caustic soda method and sulfate method, where the sulfate method has high cooking yield, nice pulp strength and mature alkali recovery process; so it is widely used in pulping with wood as raw materials. The sulfate cooking process contains continuous cooking, and low-energy intermittent cooking.

连续蒸煮就是将原料和药液以稳定的速度连续送入蒸煮器的顶部，原料向下移动并经蒸煮成浆连续从底部排出，中间抽出药液通过热交换器加热后送回蒸煮区，以提供蒸煮所需的热量。目前世界上具有代表性的连续蒸煮为维美德的紧凑蒸煮（Compact Cooking TM G2）和安德里茨的低固形物连续蒸煮技术（Downflow Lo-Solids Cooking），具有生产效率高，产品质量稳定，得率高，纸浆脱水性能好，操作条件得到改善，用汽无高峰负荷，容易实现自动化等优点。加之采用冷喷放，既能回收喷放余热，又能使蒸煮过程中无废汽外泄，消除废气对环境的污染，减少蒸汽消耗，而且浆料不发生高温裂解反应，对纤维损伤少，从而提高了纤维强度。

Continuous cooking refers to the process that the raw materials and liquor are continuously fed into the top of the cooking machine at a stable speed; the raw materials move downwards and continuously discharge from the bottom after cooking; the liquor extracted in the process is sent back to the cooking area after heating by the heat exchanger, to provide the heat required for cooking. The world's representative continuous cooking techniques are Compact Cooking TM G2 and Downflow Lo-Solids Cooking, which have the advantages of high production efficiency, stable product quality, high yield, nice pulp dewatering performance, improved operating conditions, no peak load of steam consumption, and easy achievement of automation. Cold blow is adopted, which can recover the waste heat of blow, and also prevent spent steam leakage during cooking, thus eliminating the pollution of the spent steam to the environment, and reducing steam consumption; in addition, the pulp will have no high-temperature cracking reaction, and create less damage to the fiber, thus increasing the fiber strength.

低能耗蒸煮技术是传统间歇蒸煮的发展和改进，主要代表有维美德的超级间蒸(Super Batch)、G&LV 的 DUAL CTM Cooking 和 CPL 的 DDS 蒸煮技术，它们的工艺基本相同，主要以减少能耗、提高浆质量为目的。在间歇蒸煮中，原料在单个蒸煮器中依次进行装锅、蒸煮和喷放。在蒸煮初期，先将温、热黑液依次置换装入锅内，使锅内达

到较高的温度，然后直接加热蒸煮。放锅时，又将温、稀黑液依次置换出锅中的热黑液和温黑液，使锅内温度降至100℃以下，然后再泵送到喷放锅贮存。间歇蒸煮的优点是操作上有较大的灵活性，便于更换浆种，开停机方便，浆的得率高；缺点是需要个数较多的蒸煮器，控制系统比较复杂，用汽量有波动，且设备占地面积比较大。

Low-energy cooking is a technique developed and improved on the basis of the traditional intermittent cooking, mainly including Valmet's Super Batch, G&LV's DUAL CTM Cooking and CPL's DDS cooking, which are basically the same in process, with the aim of reducing energy consumption and improving pulp quality. During intermittent cooking, the raw materials are filled, cooked and blown in individual cooking machines. At the early stage of cooking, first put the warm and hot black liquor into the kettle, to reach a higher temperature, and then start cooking directly. After placing the kettle, replace the hot and warm black liquor in the kettle, to reduce the temperature below 100℃, and then pumped to the blow kettle for storage. The advantages of intermittent cooking include higher flexibility in operation, convenience for changing the type of pulp, convenience for starting and stopping, and high pulp yield; the disadvantages include a large number of cooking machines, relatively complicated control system, fluctuation in steam consumption, and large floor area of equipment.

本项目从节能、环保、工艺稳定性等多角度考虑，拟采用连续蒸煮工艺。

The Project plans to adopt continuous cooking from the perspectives of energy conservation, environmental protection and process stability.

②洗选及氧脱木素工艺

② Washing and oxygen delignification process

对于未漂浆的洗涤有以下两个作用：除去蒸煮过程中溶解在浆料中的固形物并为浆料后续的氧脱木素阶段做准备。使用洗浆机既有置换洗涤的作用又有浓缩浆料的作用。这样保证了在较低的稀释因子下高效的COD洗涤效率，也为后续的氧脱木素阶段提供了一个最适宜的浆料浓度。多段逆流洗涤、全封闭热筛选系统是目前普遍采用的制浆洗选工艺。全封闭热筛选系统是将筛浆和洗浆连为一体，整体筛浆作业过程不与外界空气

接触，筛浆所需的稀释水可在系统内循环且筛浆浓度较高（2%～3%）。封闭筛选系统封闭筛选(压力筛选)系统是最新的筛选理念，国际大型纸浆厂目前均采用此项技术，其优点是纸浆的质量好，节水、节电，流程紧凑，占地面积小，纤维的流失小，对筛选工艺进行改革，采用封闭系统进行浆料筛选，具有杂质剔除率高，设备组合灵活，浆料滞留时间短和低水耗、低能耗等优点，在国际造纸产业中占有很大的地位。

The washing of unbleached pulp can remove the solids dissolved in the pulp during cooking, and prepare for subsequent oxygen delignification of the pulp. The washer can realize displacement washing and concentrate the pulp. It can ensure the high-efficiency COD washing at a lower dilution factor, and can also provide an optimal consistency for subsequent oxygen delignification. The multi-stage counter-current washing and fully enclosed thermal screening system is currently the most popular washing process. The fully enclosed thermal screening system combines pulp sieving and washing; the pulp sieving process does not contact with external air, and the dilution water can be circulated in the system, and the pulp consistency can be high (2%～3%) . Closed screening system The closed screening (pressurized screening) system is the latest concept of screening, which is adopted by large international pulp mills, for it can produce high-quality pulp, with the advantages of water and electricity saving, compact process, small floor area, and small fiber loss; the reform of the screening process, and the use of a closed system for pulp screening can effectively remove impurities, flexibly set the equipment, shorten the residence time of pulp, and lower water and and energy consumption; it can play a great role in the international paper industry.

氧脱木素是降低漂白中段废水污染的关键，氧脱木素（O 段）废液可直接逆流回用至洗涤系统，进入碱回收。两段氧脱木素脱木素率可达 60%，并使纸浆的卡伯值进一步减低，达到环保型漂白工艺的要求，从而降低漂白段化学品的消耗，减轻污水污染负荷。氧脱木素还具有纸浆得率和粘度较高、白度稳定、脱水性能好等优点，是现代化漂白硫酸盐纸浆厂不可缺或的一个工艺系统。

Oxygen delignification is the key to reducing of wastewater pollution at the middle stage of bleaching; during oxygen delignification (O section), the waste liquor can directly return to the washing system for alkali recovery. In the two sections, the oxygen delignification rate can reach 60%, and further reduce the Kappa value of the pulp, to make the process meet the requirements of environmentally friendly bleaching, thus reducing the consumption of chemicals for bleaching and the pollution load of sewage. Oxygen delignification, with the advantages of higher pulp yield and viscosity, stable whiteness, and good dewatering performance, is an indispensable process system in modern bleaching sulfate pulp mills.

③漂白工艺

③ **Bleaching process**

随着含氯元素漂白工艺的淘汰，目前国内外制浆行业推荐的清洁漂白工艺为无元素氯漂白工艺（ECF）和全无氯漂白工艺（TCF）。以 ClO_2 为核心的 ECF 漂白技术是目前欧洲和北美许多工厂采用的主流漂白方法之一，ECF 漂白技术典型的流程为 D_0-EOP-D_1，世界上约有 75%的化学浆是采用 ECF 漂白方法制得的。TCF 漂白是不采用任何含氯漂剂，利用 O_2、H_2O_2、臭氧及过醋酸等含氧化学药品进行漂白。超过 40 万吨规模的漂白化学浆（目标白度 88%ISO），使用 TCF 漂白方式几乎未有。国内几家大型浆厂采用的漂白工艺均为以二氧化氯为主的漂白工艺：

With the abandon of chlorine-containing bleaching process, the domestic and foreign pulp industries currently recommend the element chlorine free (ECF) and total chlorine free (TCF) bleaching. ECF bleaching based on ClO_2 is currently one of the mainstream bleaching methods adopted by factories in Europe and North America. The typical process of ECF bleaching is D_0-EOP-D_1, and about 75% of chemical pulp in the world is prepared by ECF bleaching. TCF bleaching refers to the bleaching with O_2, H_2O_2, ozone and peracetic acid and other oxygen-containing chemicals, rather than chlorine-containing bleaching agent. The bleached chemical pulp of over 400,000 tons (target whiteness: 88%ISO) has almost never been bleached by TCF bleaching. Several large pulp mills in China adopt the bleaching processes based on chlorine dioxide:

湛江晨鸣：A-D_0-EOP-D_1

Zhanjiang Chenming: A-D_0-EOP-D_1

海南金海：Dht-E-D_1-D_2

Hainan Jinhai: Dht-E-D_1-D_2

日照森博：Dht-E-D_1-D_2

Rizhao Senbo: Dht-E-D_1-D_2

寿光晨鸣：A-Z-D-EOP-D_1, Z 段效果有限，仍以二氧化氯为主。近年来，海外投产最大的 OKI 项目（2016 年开机），260 万吨产能，也使用了无元素氯 Dht-EOP-D_1 漂白，未使用臭氧漂。

Shouguang Chenming: A-Z-D-EOP-D_1, Section Z has limited effect, and chlorine dioxide is mainly used. In recent years, the largest OKI project overseas (started in 2016), with the capacity of 2.6 million tons, also adopts the ECF bleaching (Dht-EOP-D_1) bleaching, rather than ozone bleaching.

ECF 纸浆市场占有率远远高于 TCF，而且 ECF 的发展远比 TCF 迅速得多。欧洲和美国环境权威部门均承认 ECF 和 TCF 都是制浆造纸工业的最佳实用技术。曾有大量的研究对 ECF 和 TCF 漂白废水进行比较, 总的结论是它们的毒性都主要来自木材的天然成分, 在毒性上并无明显区别, 没有科学证据认为 TCF 漂白废水对环境的影响比 ECF 漂白废水小。

The market share of ECF pulp is much higher than that of TCF pulp, and the development of ECF is much faster than that of TCF. European and American environmental authorities recognize that ECF and TCF are the best practical technologies in pulp and paper industry. A large number of studies have compared the wastewater of ECF and TCF bleaching, and concluded that their toxicity mainly comes from the natural ingredients of wood, there is no obvious difference in toxicity, and no scientific evidence shoes that TCF bleaching wastewater has less environmental impact than ECF bleaching wastewater.

以上工艺技术，均为国际领先且成熟可靠的技术，本项目拟采用 ECF 漂白工艺，在原成熟工艺的基础上，备料工段通过增加大量的设备，强化了木片筛选系统，提高了进入系统木片的质量。通过使用最为先进的洗涤设备，并在主流洗涤工艺基础上增加洗涤设备，提高了浆料的洗净程度，提高了氧脱木素效率，在保证得率的前提下降低了未

漂浆的卡伯值及 COD 携带量，有效降低了漂白段化学品的使用量，降低了中段废水的排放量及 COD，达到世界领先水平。

The above process technologies are internationally leading, mature and reliable, and the Project plans to adopt the ECF bleaching process; based on the original mature process, the preparation section strengthens the wood chip screening system through adding a large number of equipment, thus increasing the quality of wood chips. The use of the most advanced washing equipment, and the adding of washing equipment based on the mainstream washing process, improve the washing degree of pulp, and increase the efficiency of oxygen delignification; while ensuring the yield, it reduces the Kappa value and COD carrying amount of unbleached pulp, effectively reduces the amount of chemicals used in the bleaching section, and reduces the discharge of wastewater and COD at the middle stage, thus reaching the world's leading level.

（2）化学浆车间生产工艺流程及产污环节

(2) Production process and pollutant generation steps of the chemical pulp workshop

①蒸煮工艺

① Cooking process

蒸煮工段采用连续蒸煮工艺，蒸煮过程在整个蒸煮塔内进行，蒸煮塔内分为浸渍区、蒸煮区和逆向蒸煮热洗区。

The cooking section adopts continuous cooking, which is completed in the cooking tower; the cooking tower is divided into the dipping area, cooking area and reverse cooking hot washing area.

备料车间来的合格木片，经气锁螺旋喂料器进入木片仓。木片在木片仓停留，用二次蒸汽发生器产生的清洁蒸汽加热到 100℃，预汽蒸后的木片通过变频控制的双螺旋输送机从木片仓均匀卸料和计量，然后经多台木片泵串联输送入蒸煮器顶部。

Qualified wood chips prepared at the preparation workshop are sent to the wood chip bin by the air lock scroll feeder. In the wood chip bin, the wood chips are heated to 100 °C with the clean steam generated by the secondary steam generator; the wood chips are evenly discharged and metered from the bin with the frequency-controlled two-scroll conveyor, and then sent to the top of the cooking machine by several wood chip pumps.

木片经反向的顶部分离器进入蒸煮塔的预浸区，在蒸煮塔顶部加入中压蒸汽，在预浸之前将木片加热到大约120℃，木片在蒸煮塔顶部停留时间为30分钟，以确保木片在蒸煮开始之前在蒸煮液中足够的预浸。木片通过预浸区后进入上部蒸煮循环区，在这里，预浸液从蒸煮塔上部的篦子抽出，温度大约为132℃，然后木片接触到蒸煮循环中向上流的热蒸煮液（蒸煮塔第二组篦子），该液体加热木片到需要的蒸煮温度，大约155-162℃。

The wood chips are put into the pre-soaking area of the cooking tower by the reverse top separator, the medium pressure steam is then added at the top of the cooking tower; prior to pre-soaking, the wood chips are heated to about 120℃, and such wood chips are maintained at the top of the cooking tower for 30 min., to ensure that the wood chips are sufficiently pre-soaked in the cooking liquor prior to cooking. The wood chips are transferred to the upper cooking cycle area after pre-soaking, where the pre-soaking liquor is drawn from the strainer at the upper part of the cooking tower; the temperature is about 132℃; then the wood chips come into contact with the hot cooking liquor that flows upwards (the second strainer of the cooking tower); heat the wood chips to the required cooking temperature (about 155-162 °C) with the liquor.

蒸煮塔的下一个区为顺流蒸煮区，余下的液体在蒸煮塔下部的抽吸篦子被抽出。

The next area of the cooking tower is downstream cooking area, and the remaining liquor is drawn out from the suction strainer at the lower part of the cooking tower.

在蒸煮塔底部的洗涤区，洗涤液逆流通过浆料完成在蒸煮塔中的洗涤。冷喷放液泵将洗涤液加入蒸煮塔底部，滤液加入蒸煮塔之前在冷喷放冷却器里冷却，在洗涤循环中心管加入一部分冷喷放滤液进一步对浆料进行洗涤，滤液在蒸煮区末端置换浆料中的黑液。

In the washing area at the bottom of the cooking tower, the washing liquor reversely flows through the pulp, thus completing the washing in the cooking tower. The cold blow pump adds washing liquor into the bottom of the cooking tower; the filtrate shall be cooled in the cooler before adding into the cooking tower. Add a part of filtrate into the central tube of the washing cycle for further washing the pulp, and replace the black liquor in the pulp with filtrate at the end of the cooking area.

蒸煮白液由白液泵送入蒸煮塔顶部及各个加热循环部分。在最后的洗涤区洗涤液是逆向流动，在这部分仍然起缓和的蒸煮脱木素作用。

The white liquor of cooking is sent to the top of the cooking tower and each heating circulation part with the white liquor pump. In the final washing area, the washing liquor flows in a reverse direction, and it can still play a mild role of cooking delignification.

木片汽蒸，用的是干净的二次蒸汽汽蒸，预浸用白液进行。整个蒸煮工段没有臭气逸出。汽蒸出来的低浓废气送蒸发工段臭气收集系统，分离臭气和回收松节油。

Wood chips are steamed with secondary steam, and pre-soaked with white liquor. No odor escapes from the cooking section. The low-consistency exhaust gas produced by steaming is sent to the evaporation section odor collection system, to separate odor and recover turpentine.

蒸煮后的成浆，通过塔底部的卸料器和喷放阀，进入喷放锅。

The cooked pulp is transferred to the blow tank through the unloader and blow valve at the bottom of the tower.

②洗选、氧脱工段

②Washing and oxygen delignification process

粗浆经过联合筛除节筛选、两台双辊洗浆机洗涤后，进入中浓氧漂系统，浓度为 10%的浆料直接落入中浓浆泵前的立管，在立管处同时加入低压蒸汽、NaOH 溶液（用氧化白液代替），然后用中浓泵泵送到中浓混合器，在混合器前加入氧气和中压蒸汽，浆料与蒸汽和氧气充分混合后从一段氧脱木素反应塔的底部进入升流塔内进行氧脱木素反应，氧脱木素后的浆料经塔顶部的卸料器排放到二段氧脱木素反应塔中浓浆泵前的立管，同样经过二段氧脱木素反应后浆料排放到喷放浆槽。从喷放浆槽出来的浆料用浆泵送到两台双辊洗浆机进行充分的洗涤，洗净后的浆用中浓泵送入未漂浆中浓贮浆塔贮存。

After being screened by the joint screen and washed by two twin-roll pulp washers, the coarse pulp is transferred to the medium-consistency oxygen bleaching system, where the pulp with a consistency of 10% falls directly into the riser into the medium-consistency pulp pump; the low-pressure steam and NaOH solution (replaced with oxidized white liquor) are added in the riser, and then transferred to the medium consistency mixer with the medium consistency pump; oxygen and medium-pressure steam are added in front of the mixer, and after fully mixing the pulp with steam and oxygen, the mixture is sent to the upward flow tower from the bottom of oxygen delignification reaction tower of section 1 for oxygen delignification reaction, and the treated pulp is discharged through the discharger at the top of the tower to the riser in front of the underflow pump in the oxygen delignification reaction tower of section 2, and the treated pulp is discharged to the blow trough after oxygen delignification reaction. The pulp from the blow trough is transferred to two twin-roll washers with a pulp pump, and the washed pulp is sent to the unbleached medium-consistency storage tower with a medium-consistency pump.

本工段设白液氧化系统，用空气和碱回收白液中的 Na_2S 反应，将 Na_2S 转化为对纤维没有损害的 Na_2SO_3 和 Na_2SO_4。氧脱木素阶段使用氧化白液可以保持工厂的碱硫化学平衡，同时氧化反应是在高温高压下进行，氧化反应的热量可以回收。

This section is equipped with a white liquor oxidation system, which can transfer Na_2S into Na_2SO_3 and Na_2SO_4 that do not damage the fiber through the reaction between air and Na_2S in alkali recovery white liquor. In the process of oxygen delignification, the oxidized white liquor can maintain the chemical balance of alkali and sulfur in the plant, the oxidation reaction is carried out under high temperature and pressure, and the heat of the oxidation reaction can be recovered.

碱回收车间来的白液泵送进白液氧化反应器，与空气一起在反应器进行反应。氧化后的白液直接送氧脱木素系统使用。

The white liquor from the alkali recovery workshop is pumped to the white liquor oxidation reactor for reacting with the air. The oxidized white liquor is directly sent to the oxygen delignification system for use.

③漂白工段

③Bleaching section

A.D0 段

A.D0 section

氧脱木素后的未漂浆用中浓泵送往二氧化氯混合机后进入升流式二氧化氯漂白塔（D0 塔）。反应时间约为 15 分钟，反应温度 70～75℃。D0 塔出来的浆料直接进入 D0

段洗浆机，洗浆前段用来自D1段的滤液、后段用EOP段的滤液洗浆，洗后浆送入中浓泵。

The unbleached pulp after oxygen delignification is pumped to the chlorine dioxide mixer with a medium-consistency pump, and then to the up-flow chlorine dioxide bleaching tower (D0 tower). The reaction time is about 15 minutes, and the reaction temperature is 70～75℃. The pulp flowing from the D0 tower is directly transferred to the washer of D0 section, filtrate from the D1 section is used at the front end and filtrate from the EOP section is used at the back end of pulp washing process; the washed pulp is sent to the medium-consistency pump.

B.EOP段

B.EOP section

在洗浆机出料螺旋和中浓泵的立管中加入NaOH和H_2O_2溶液，然后把浆送到Eop压力反应塔，浆进入反应塔之前，加入氧气和蒸汽，并用混合器进行混合。在升流反应塔内的反应时间为75分钟，塔顶压力为4bar，反应温度约85℃，与常压Eop段反应塔相比，压力反应塔能降低卡伯值。在反应塔里会发生缓慢的脱木素反应，生产出初级漂白浆，浆通过塔顶卸料器排放到Eop段洗浆机。Eop段洗浆机利用来自D1段的滤液洗涤。

NaOH and H_2O_2 solution are added into the discharge spiral tube of the pulp washer and riser of the medium-consistency pump; then the pulp is sent to the Eop pressure reaction tower. Before entering into the reaction tower, oxygen and steam are added and mixed with a mixer. The reaction time in the up-flow reaction tower is 75 min, the top pressure is 4 bar, and the reaction temperature is about 85℃; compared with the reaction tower of the atmospheric pressure Eop section, the pressure reaction tower can reduce the Kappa value. A slow delignification reaction may occur in the reaction tower, and then the primary bleaching pulp will be produced; later, the pulp will be transferred to the washer of the Eop section through the discharger at the top of the tower. The pulp washer of the Eop section washes pulp with the filtrate from D1 section.

C.D1段

C.D1 section

Eop段洗后浆落入中浓泵立管，通过中浓泵送至二氧化氯混合器，加入ClO_2水溶液

混合后送至 D1 段的升流式漂白塔。D1 段反应时间为 120 分钟，反应温度 75℃。漂白塔塔顶卸料器排放的浆料自流到 D1 段洗浆机，用来自浆板机的白水洗浆。

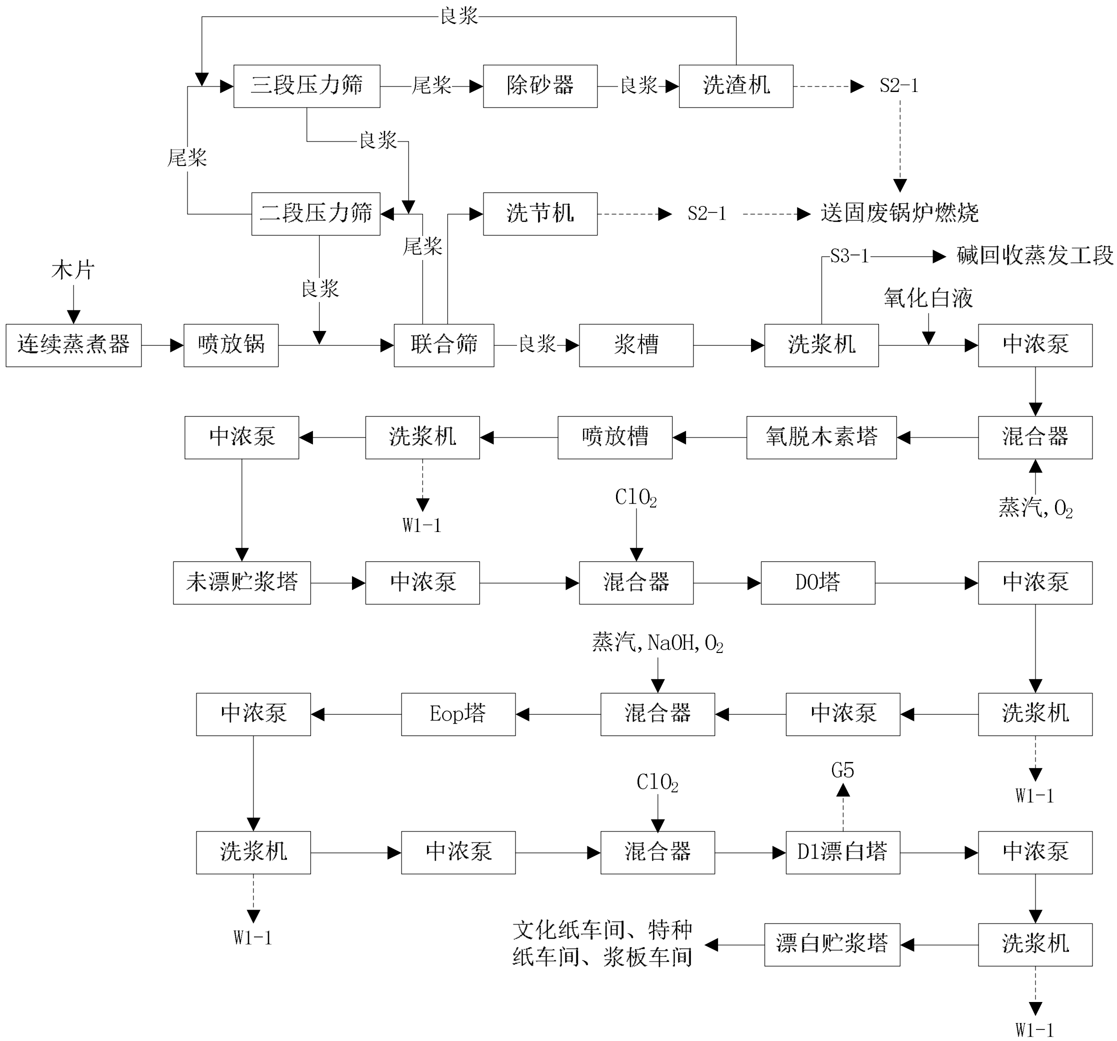
The pulp washed in the Eop section is transferred into the riser of the medium-consistency pump, which then pumps the pulp to the chlorine dioxide mixer and sends it to the up-flow bleaching tower of D1 section after mixing with ClO_2 aqueous solution. The reaction time of D1 section is about 120 minutes, and the reaction temperature is 75℃. The pulp discharged from the discharger at the top of the bleaching tower flows automatically to the pulp washer of D1 section, and washed with the white water from the pulp machine.

D.PO 段（预留）

D.PO section (reserved)

在 D1 段洗浆机中浓泵的立管中加入 NaOH、H_2O_2溶液，通过中浓泵把浆送到 PO 段混合器混合均匀，混合器之前有蒸汽加热装置加入氧气和蒸汽，混合好的浆料进入升流式 PO 漂白塔。PO 段的反应时间为 90 分钟，塔顶压力 4bar，温度 85~90℃。漂白浆通过塔顶卸料器排放到 PO 段洗浆机洗涤。为充分循环利用生产废水，降低水耗，PO 段使用抄浆白水洗浆。洗后浆通过中浓泵送至浆板车间的两个漂后浆塔贮存。

NaOH and H_2O_2 solution are added into the riser of the medium-consistency pump in the pump washer of D1 section; then the pulp is sent to the the mixer of the PO section through the medium-consistency pump. Before entering into the mixer, oxygen and steam are added and mixed, and then the mixture is sent to the up-flow PO bleaching tower. The reaction time of the PO section is 90 minutes, the top pressure of the tower is 4 bar, and the temperature is 85~90℃. The bleached pulp is discharged from the discharger at the top of the bleaching tower to pulp washer of PO section for washing. In order to fully recycle the production wastewater and reduce water consumption, the pulping white water is used for washing the pulp in the PO section. The washed pulp is sent to the two bleached pulp towers of the pulp board workshop for storage through the medium-consistency pump.


良浆
三段压力筛
尾浆
除砂器
良浆
洗渣机
S2-1
良浆
尾浆
二段压力筛
洗节机
S2-1
送固废锅炉燃烧
尾浆
S3-1
碱回收蒸发工段
木片
良浆
氧化白液
连续蒸煮器
喷放锅
联合筛
良浆
浆槽
洗浆机
中浓泵
中浓泵
洗浆机
喷放槽
氧脱木素塔
混合器
W1-1
ClO_2
蒸汽, O_2
未漂贮浆塔
中浓泵
混合器
D0塔
中浓泵
蒸汽, NaOH, O_2
中浓泵
Eop塔
混合器
中浓泵
洗浆机
W1-1
ClO_2
G5
洗浆机
中浓泵
混合器
D1漂白塔
中浓泵
W1-1
文化纸车间、特种纸车间、浆板车间
漂白贮浆塔
洗浆机
W1-1

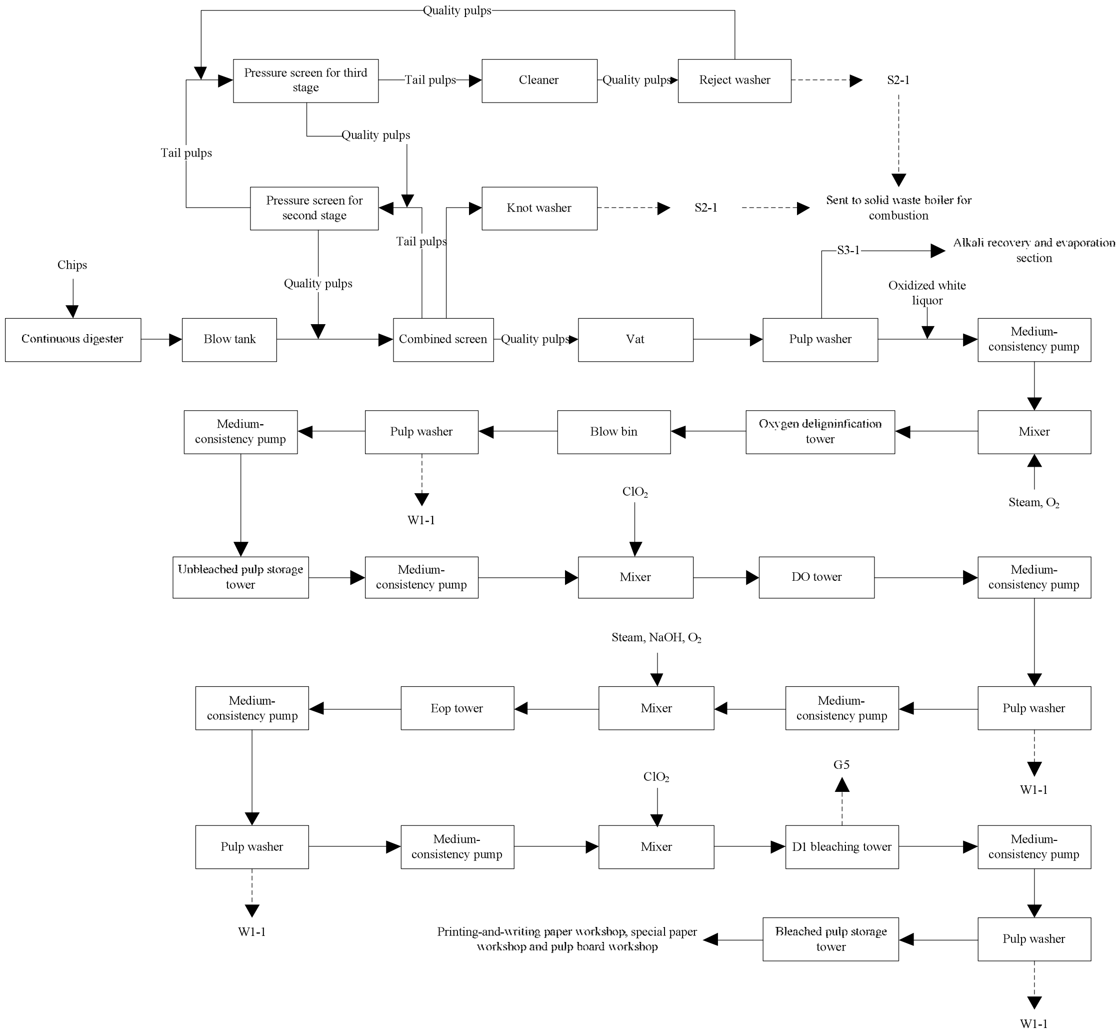


图 2.2.1-3 一期工程制浆工艺流程及产污节点图
Fig. 2.2.1-3 Phase I pulping process and pollutant generation nodes

项目化学浆车间产污环节见表2.2.1-5。

The pollutant generation steps of the chemical pulp workshop are shown in Table 2.2.1-5.

表 2.2.1-5 项目化学浆车间产污环节汇总表
Table 2.2.1-5 Summary of pollutant generation steps of the chemical pulp workshop

类别 Category	污染源 Source of pollution	污染物类型 Type of pollutants	治理措施 Control measures	排放去向 Discharge destination	污染源编号 Pollution source no.
废气 Exha	漂白工段漂白尾气	Cl_2	漂白尾气进入碱洗涤塔洗涤，洗涤尾水送漂	经 150mH×Φ1.0m 排气筒排入大气环境。	G5

类别 Category	污染源 Source of pollution	污染物类型 Type of pollutants	治理措施 Control measures	排放去向 Discharge destination	污染源编号 Pollution source no.
ust gas	Bleaching tail gas of the bleaching section		白工段回用。 The bleaching tail gas is sent to the alkali washing tower for washing, and the tail water is sent to the bleaching section for reuse.	The tail gas is emitted into the atmosphere through a 150mH×Φ1.0m exhaust funnel.	
	蒸煮器、蒸煮喷放锅、洗浆机、洗浆机黑液槽等 The cooking machine, cooking and blowing kettle, pulp washer, pulp washer black liquor trough, etc.	H_2S	高浓臭气和汽提气经处理后直接送到碱回收炉燃烧，低浓臭气经碱液洗涤后送碱回收炉作二次送风 The high-concentration odor and stripping gas are directly sent to the alkali recovery furnace for combustion after treatment, and low-concentration odor is sent to the alkali recovery furnace for secondary air supply after washing with alkali liquor	经1根150mH×Φ5.2m烟囱排放至大气环境 It is discharged to the atmosphere through a 150mH×Φ5.2m chimney	G1
		H_2S	碱炉事故状态下启用臭气燃烧器焚烧制浆过程产生的臭气 Odor produced in the pulping process is incinerated by the odor incinerator under the accident state of alkali furnace.	经1根150mH×Φ1.5m烟囱排放至大气环境 It is discharged to the atmosphere through a 150mH×Φ1.5m chimney	G9
废水 Waste water	漂白洗选中段废水 Wastewater at the middle stage of bleaching and	COD、SS、氨氮等 COD, SS, ammonia nitrogen, etc.	进入污水处理站。 Enter the sewage treatment plant.	废水处理达标后排入铁山港区深海排放管网系统，在铁山港B3排污口深海排放。 The sewage is	W1-1

类别 Category	污染源 Source of pollution	污染物类型 Type of pollutants	治理措施 Control measures	排放去向 Discharge destination	污染源编号 Pollution source no.
	washing			discharged into the deep-sea discharge pipe network system of Tieshangang District after being processed, and then discharged into the deep sea at the sewage outlet B3 of Tieshangang.	
固废 Solid waste	洗渣机、洗节机 Slag washer, and knot washer	浆渣、节子 Pulp slag, knot	送至固废综合利用锅炉焚烧。 Transferred to solid waste comprehensive utilization boiler for incineration.	焚烧处置。 Incineration.	S2-1
	初步洗浆废液 Waste liquor of preliminary washing	黑液 Black liquor	送碱回收车间回收碱 It is sent to the alkali recovery workshop for recovering alkali		S3-1

（2）主要工艺技术参数

(2) Main process technical parameters

化学浆车间主要工艺技术指标见表2.2.1-6。

Main process technical parameters of the chemical pulp workshop are shown in Table 2.2.1-6.

（3）主要物料消耗指标

(3) Main material consumption indicators

化学浆车间物料消耗情况见表2.2.1-7。

Material consumption conditions of the chemical pulp workshop are shown in Table 2.2.1-7.

（4）主要设备

（4）Main equipment

化学浆车间主要设备清单见表2.2.1-8。

The list of main equipment of the chemical pulp workshop is shown in Table 2.2.1-8.

2.2.1.3 文化用纸车间

2.2.1.3 Cultural paper workshop

（1）文化纸车间生产工艺流程及产污环节

(1) Production process and pollutant generation steps of the cultural paper workshop

文化纸车间包括浆料处理工段、辅料工段、抄纸工段和完成工段。

The cultural paper workshop includes the pulp treatment section, auxiliary material section, forming & pressing section and completion section.

（1）浆料处理工段

(1) Pulp treatment section

浆料处理工段将自产的漂白阔叶木浆及市场采购的商品漂白硫酸盐针叶木浆（NBKP）进行碎解、磨浆和净化，以特定比例进入混合浆池进行配浆。

In the pulp treatment section, the self-made bleached hardwood kraft pulp and the purchased NBKP are crushed, refined and purified, and put into the mixing pool at a specific ratio for mixing.

自制漂白阔叶木浆按照配比范围：50%~80%最大值配备设备生产能力，按日处理浆量 1106.5adt/d 设计；

The production capacity of self-made bleached hardwood kraft pulp is set within the proportion of 50%~80% at the maximum, and designed based on the daily treatment pulp of 1,106.5 adt/d;

外购漂白针叶木浆按配比范围 10%~30%最大值配备设备生产能力，按日处理浆量 369adt/d 设计。

The production capacity of purchased NBKP is set within the proportion of 10%~30% at the maximum, and designed based on the daily treatment pulp of 369 adt/d;

自制化机浆按配比范围 10%~30%最大值配备设备生产能力，按日处理浆量 369adt/d 设计。

The production capacity of self-made APMP is set within the proportion of 10%~30% at the maximum, and designed based on the daily treatment pulp of 369 adt/d;

本项目采用53％自制漂白阔叶木浆配以22％商品漂白针叶木浆和25%自制化机浆抄造高档文化用纸；年生产规模为55万吨。

The Project produces high-end cultural paper with 53％ self-made bleached hardwood kraft pulp, 22％ purchased NBKP and 25% self-made APMP, with the annual production scale of 550,000 tons.

为了保证打浆后浆料满足抄造高档文化用纸的各种特性，采用双圆盘磨浆机串联打浆，打浆方式采取半游离半粘状打浆。打浆处理后的浆料按比例配浆，供造纸机抄造用。浆料处理工段的损纸经打浆处理送到配浆系统按比例回用。

In order to ensure that the pulp conforms to various characteristics of high-end cultural paper, the double-disc fiberizer is used for beating in a semi-free and semi-viscous manner. The pulp after beating is mixed in proportion, and supplied to the paper-making machine. The broke of the pulp treatment section is sent to the mixing system after beating for recycle in proportion.

自制漂白阔叶木浆至贮浆槽贮存，然后送磨浆机串联打浆，在叩后浆槽贮存；外购漂白针叶木浆板则在水力碎浆机碎解后，经双圆盘磨浆机打浆处理，进入叩后池；打好的浆料再与抄纸工段来的损纸浆及辅料一起按一定的配比连续配浆后送成浆池，在抄造浆池加入填料、助剂后送抄纸工段调浆箱。

The self-made bleached hardwood kraft pulp is stored in the storage tank, then transferred to the fiberizer for beating, and stored in the post-beating storage tank; the purchased NBKP boards are crushed by a hydrapulper and beat by a double-disc fiberizer, and then transferred into the post-beating pool; the processed pulp is mixed with the broke pulp and auxiliary materials from the forming & pressing section at a certain ratio, and sent to the forming pool; after adding the filler and additives, the mixture is sent to the pulp mixing tank of the forming & pressing section.

（2）辅料工段

(2) Auxiliary material section

本工段主要设置填料、中性内部施胶剂、表面施胶胶料、涂料以及其它助剂的制备。

This section mainly involves the preparation of filler, neutral internal sizing agent, surface sizing material, coating and other auxiliary agents.

（3）抄纸工段

(3) Forming & pressing section

由浆料处理工段成浆池泵送过来的浆料送至纸机浆池，经过冲浆、一级六段低浓除砂、一级二段压力筛选，进入流浆箱上网，浆料上网后，经立式夹网成形器、靴型压榨、干燥、表面施胶、干燥、软压光机处理后，进行卷纸。卷纸机下来的纸卷，送完成工段。纸机各部分的湿损纸和干损纸分别在各自的损纸池和水力碎浆机中碎解后，经泵送至浆料处理工段的损纸处理系统。

The pulp formed in the pulp treatment section is pumped to the pulp pool of the paper machine; after flushing, one-grade six-stage low-concentration sand removal, one-grade two-stage pressurized screening, it is transferred to the flow box for meshing, forming by the vertical former, boot pressing, drying, surface sizing, drying, and soft calendering, and then the paper can be rolled. The rolled paper is sent to the completion section. The wet broke and dry broke at each part of the paper machine are respectively crushed in the respective pool and hydrapulper, and then pumped to the broke treatment system of the pulp treatment section.

造纸机：采用10500mm/1800m/min长网多缸文化纸机（带表面施胶）。

Paper machine: The 10,500mm/1,800m/min long-net multi-cylinder cultural paper machine (with surface sizing) is used.

（4）完成工段

(4) Completion section

为了适应市场需要，本工段考虑平板纸和卷筒纸两个系统。生产卷筒纸时经复卷机复卷、称重、包装和封头后入库。生产平板纸时则先经切纸、选纸，然后打包入库。成品库设置在完成工段后。

In order to meet the market demand, this section considers two systems for sheet paper and web. The web is rolled by a re-reeling machine, then weighed, packaged and sealed, and finally stored in the storehouse. The production of sheet paper follows the procedure of cutting, selecting, packaging and warehousing. The finished goods warehouse is set after the completion section.

另外抄纸工段还配有表面施胶制备系统、真空系统、蒸汽冷凝水系统、压缩空气系统、清水系统、白水系统等辅助系统。

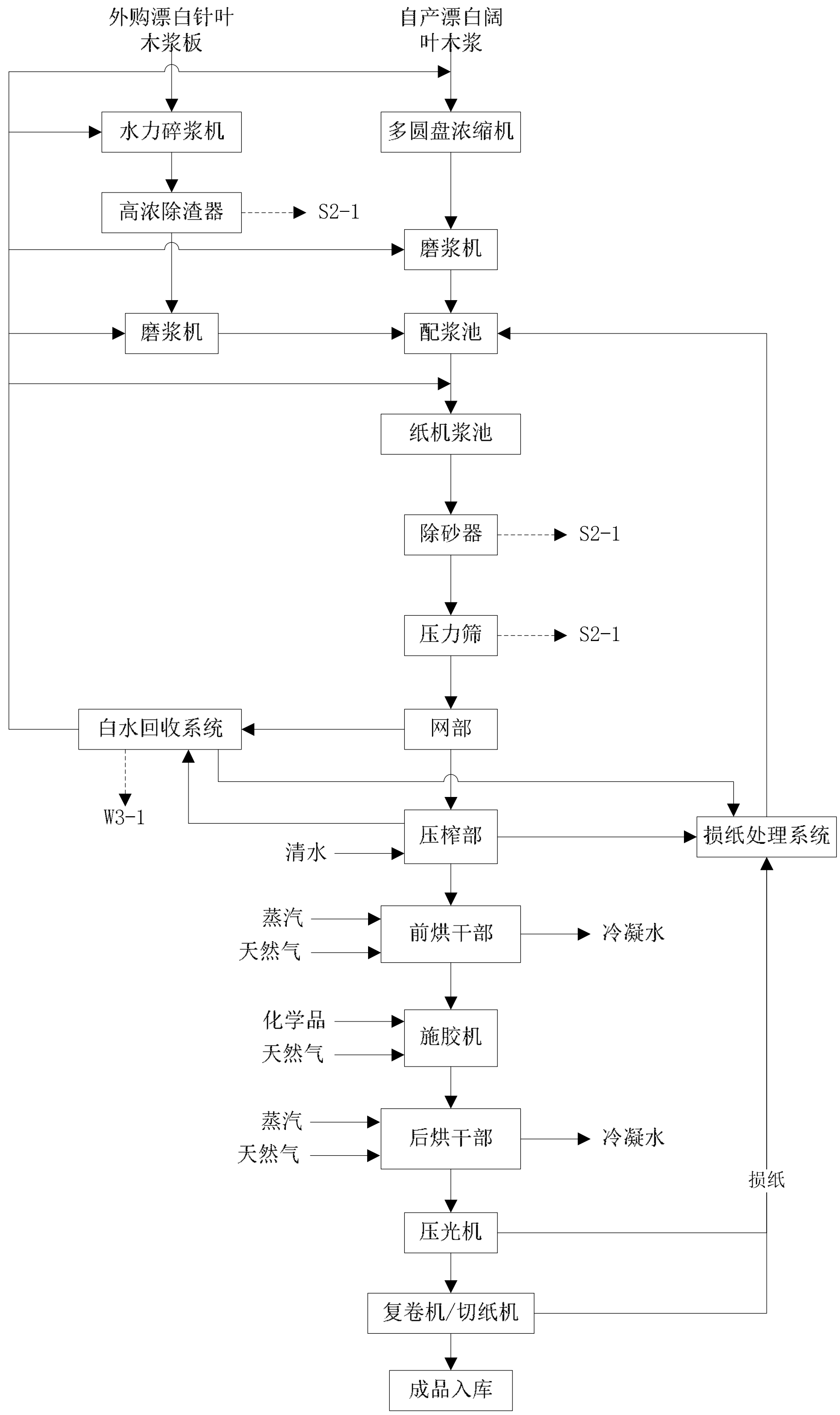
In addition, the forming & pressing section is also equipped with several auxiliary systems, including surface sizing preparation system, vacuum system, steam condensate system, compressed air system, clean water system, and white water system.

（5）白水回收间

(5) White water reclaiming room

白水回收采用多盘式纤维回收机分离回收白水中的固形物，净化清水回用。

For white water reclaiming, the multi-disc fiber recycling machine is used to separate and recover the solids in white water, and purify the water for reuse.


外购漂白针叶木浆板
自产漂白阔叶木浆
水力碎浆机
多圆盘浓缩机
高浓除渣器
S2-1
磨浆机
磨浆机
配浆池
纸机浆池
除砂器
S2-1
压力筛
S2-1
白水回收系统
网部
W3-1
压榨部
清水
损纸处理系统
蒸汽
天然气
前烘干部
冷凝水
化学品
天然气
施胶机
蒸汽
天然气
后烘干部
冷凝水
损纸
压光机
复卷机/切纸机
成品入库

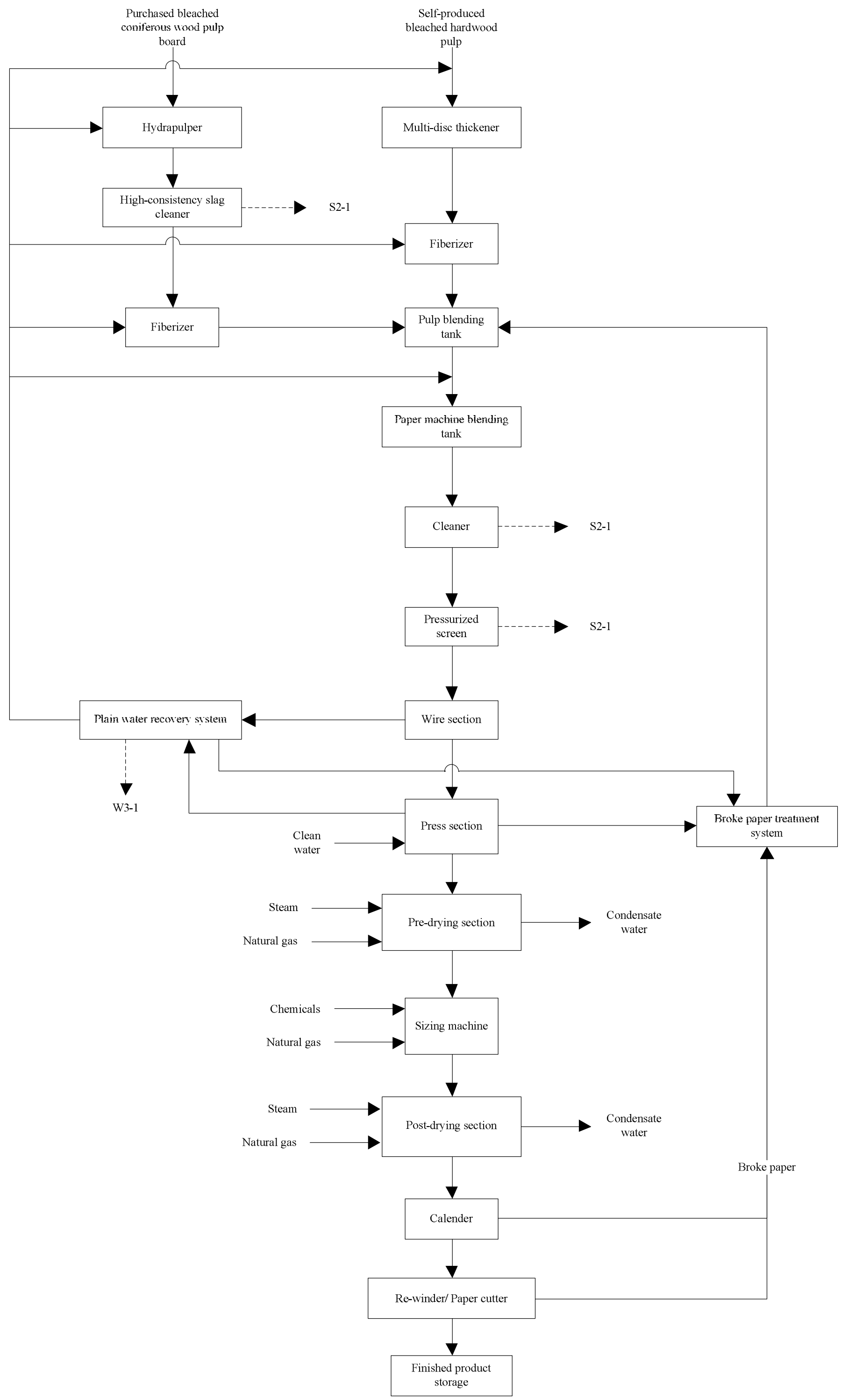


图 2.2.1-4 一期文化纸工艺流程及产污节点图

Fig. 2.2.1-4 Phase I cultural paper process and pollutant generation nodes

项目文化纸车间产污环节见表2.2.1-9。

The pollutant generation steps of the cultural paper workshop are shown in Table 2.2.1-9.

表 2.2.1-9 项目文化纸车间产污环节汇总表
Table 2.2.1-9 Summary of pollutant generation step of the cultural paper workshop

类别 Category	污染源 Source of pollution	污染物类型 Type of pollutants	治理措施 Control measures	排放去向 Discharge destination	污染源编号 Pollution source no.
废气 Exhaust gas	本工段无废气产生。 No waste gas produced in this section.				
废水 Waste water	白水回收系统 White water recovery system	COD、SS、氨氮等 COD, SS, ammonia nitrogen, etc.	进入污水处理站。 Enter the sewage treatment plant.	废水处理达标后排入铁山港区深海排放管网系统，在铁山港B3排污口深海排放。 The sewage is discharged into the deep-sea discharge pipe network system of Tieshangang District after being processed, and then discharged into the deep sea at the sewage outlet B3 of Tieshangang.	W3-1
固废 Solid waste	除渣器、除砂器、压力筛 Slag remover, sand remover, pressurized screen	浆渣 Slag residue	送至固废综合利用锅炉焚烧。 Transferred to solid waste comprehensive utilization boiler for incineration.	焚烧处置。 Incineration.	S2-1

（2）主要工艺技术参数

(2) Main process technical parameters

文化纸车间主要工艺技术参数见表2.2.1-10。

Main process technical parameters of the cultural paper workshop are shown in Table 2.2.1-10.

（3）主要物料消耗指标

(3) Main material consumption indicators

文化纸车间物料消耗情况见表2.2.1-11。

Material consumption conditions of the cultural paper workshop are shown in Table 2.2.1-11.

（4）主要设备

(4) Main equipment

文化纸车间主要设备清单见表2.2.1-12。

The list of main equipment of the cultural paper workshop is shown in Table 2.2.1-12.

2.2.1.4 浆板车间

2.2.1.4 Pulp board workshop

（1）浆板车间设计规模的确定

(1) Determination of design scale of the pulp board workshop

按照55万吨/年文化用纸项目和50万吨特种纸项目的用浆情况，计算浆板车间的设计产能，计算见表2.2.1-13。

The design capacity of the pulp board workshop is calculated based on the demand of pulp of the 550,000 tons/year cultural paper project and 500,000 tons special paper project, and the results are shown in Table 2.2.1-13.

由上表可以看出，本项目一期工程年产80万吨漂白阔叶木浆，用于年产55万吨文化用纸项目和年产50万吨特种纸项目后，仍有440301吨需要抄造成浆板外卖，浆板车间设计规模按年产45万吨设计。

As shown in the above table, Phase I of the Project can produce 800,000 tons bleached hardwood kraft pulp each year, and after supplying to the 550,000 tons cultural paper project and 500,000 tons special paper project, 440,301 tons are remained, and shall be made into pulp boards for selling; the design capacity of the pulp board workshop is 450,000 tons.

（2）浆板车间生产工艺及产污环节

(2) Production process and pollutant generation steps of the pulp board workshop

浆板车间由精选工段、抄浆工段、完成工段和成品库组成。浆板车间流程简述如下：化学浆车间管道送来的漂白纸浆，经三段压力筛+二段除砂筛选，一段压力筛良浆送抄造浆槽后经冲浆以 1.2～1.7%浓度送浆板机流浆箱。浆料经夹网部脱水形成湿纸幅、再

经压榨部压榨后，进入干燥部；干燥后的浆板经切纸机分切成 600×800mm 浆板，经自动接纸台连续码垛，浆包自动计量为每包 200 或 250kg，然后进入液压打包机打包并由捆扎机制成成品浆包，再经大包打包机打 2×4 的大包，送入成品库。抄浆白水在本车间内作为浆料稀释水用，多余白水送化学浆车间 D1 段洗浆。

The pulp board workshop consists of the selection section, pulping section, completion section and finished goods warehouse. The process adopted in the pulp board workshop is: Process the bleached pulp transferred by the pipeline of the chemical pulp workshop through screening with the pressurized screen at the tertiary + sand removal screen at the second stage; then screen with the pressurized screen at the first stage; transfer the pulp to the paper-making trough for flushing; and finally transfer it to the flow box of the pulp machine at the concentration of 1.2-1.7%. The pulp is dehydrated in the mesh section to form the wet paper web, which is then sent to the drying section after being pressed in the press section; the dried pulp boards are cut into 600×800mm pieces, and then stacked by the automatic paper receiving table; the pulp bale is automatically weighed at 200 or 250 kg; then they are sent to the hydraulic baler for packing and strapping machine for making finished bags, which are packed into 2×4 bags by a big baler, and sent to the finished goods warehouse. The white water for pulping is used as dilution water in this workshop, and the excess white water will be sent to D1 section of the chemical pulp workshop for pulp washing.

①精选工段

①Selection section

精选工段采用 3 段压力筛+2 段除砂器组合成的筛选/净化流程，采用压力筛。漂白浆在高浓浆塔的底部稀释后，泵送到混合浆池与损纸浆混合，然后进入筛选/净化系统的一段筛去除杂质。

The selection section adopts a combined screening/purification process by the pressurized screen at the tertiary + sand remover at the second stage, and the pressurized screen is adopted. When the bleached pulp is diluted at the bottom of the high-concentration pulp tower, it is pumped to the mixing tank for mixing with the broke pulp, and then transferred to the screen at the first stage of the screening/purification system to remove impurities.

一段筛的良浆被送到浆板机前的成浆池，尾浆渣进入后续的筛选/净化流程。各段筛的缝宽均为 0.2mm。第 4、5 段除砂器筒体为耐磨不锈钢耐磨制。系统进浆浓度约 2.7%，

到5段除砂器时降到约0.4 %浓度，有利于安全操作，并保证低的纤维损失。

The fine pulp through the screen at the first stage is transferred to the pulp tank before the pulp machine, and the tail pulp slags are sent to the subsequent screening/purification process. The slit width of the screen is 0.2mm. The bodies of the fourth and fifth sand removers are made of wear-resistant stainless steel. The pulp feed concentration of the system is about 2.7%, which will be reduced to about 0.4% in the sand remover at the fifth stage; this is conducive to safe operation, and can ensure low fiber loss.

②抄浆工段

②Pulp section

A.浆板机

A.Pulp machine

筛选净化后的浆料经冲浆泵与浆板机白水池的白水混合后，进入流浆箱。

The screened and purified pulp is pumped to the flow box by the slushing pump after being mixed with the white water in the white water pool of the pulp machine.

流浆箱采用水力式流浆箱，有稀释水系统用于稳定浆板的横幅定量。

The hydraulic flow box is adopted, which has a dilution water system that can be used to stabilize the cross direction ration of pulp boards.

网部由底网和顶网组成，浆料可以通过顶网和底网进行脱水，脱水距离最短。这种方法也避免了长网脱水出现的成纸两面差，即细小纤维集中在浆料和网面的接触面，使浆幅的脱水性能降低。双网成形可以提供最柔和、最有效的脱水，同时浆幅的成形和强度最好，产能最高。安装在网部的蒸汽箱能把浆幅温度提高大约15℃，以提高进入压榨部的干度和运行性能，干度约为24%的浆幅在带毛毯的预压辊作进一步的脱水，吸移毛毯配有一个真空吸水箱，以便在进入真空脱水辊的第一个压区前将滤液吸出。

The mesh is composed of the bottom mesh and top mesh. The pulp can be dewatered by the bottom mesh and top mesh, with the shortest dewatering distance. This can also avoid the difference between the two sides of the paper after dewatering by the long mesh, namely, the fine fibers are concentrated on the contact surface of the pulp and mesh, which can reduce the dewatering performance of the pulp web. The forming by two meshes can provide the softest and most effective dewatering, the best forming and strength of the pulp web, and the highest productivity. The steam box installed in the mesh section can increase the temperature of the pulp web by about 15 ℃, to improve the dryness and operational performance of the press section; the pulp web with the dryness of about 24% is further dewatered by the pre-loading roller with felt, which is equipped with a vacuum suction box, to suck the filtrate out before entering into the first pressing area of the vacuum dewatering roller.

压榨部的设计是为了使浆幅脱水以达到最大可能的干度。压榨部由一个3辊复合压榨和一个双毛布靴式压榨组成。

Press section is designed to dewater the pulp web and reach the maximum possible dryness. Press section consists of a 3-roller compound press device and a double-wool boot press device.

B.气垫干燥机

B.Air cushion dryer

干燥部采用气垫干燥器，干燥机采用加热后的空气来干燥和支撑浆幅。浆幅进入干燥机的上部平台，悬在气垫上，顺着干燥机全长进行多次水平方向的来回运动，最后从浆板机出口出来。浆幅和干燥平台之间始终稳定保持着一定的距离，且浆幅张紧度较低。较低的浆幅张紧度使浆板机能够处理低强度的浆幅。这样可以保证更为稳定的运行，减少停机时间。

Drying section adopts a air cushion dryer, which can dry and support the pulp web with heated air. After being transferred to the upper platform of the dryer, the pulp web may hang above the air cushion, and move back and forth for several times in the horizontal direction along the full length of the dryer, and finally get out of the pulp machine. The pulp web keeps a certain distance from the drying platform, and the tension of the pulp web is low. The low tension can enable the pulp machine to process the low-strength pulp web. This can ensure more stable operation and reduce the downtime.

干燥机的气垫系统是在两个面之间的气流可以产生一种力量，使两个面之间保持一定的距离。

The air cushion system of the dryer can generate a force by the air flow on two surfaces, thus ensuring a certain distance between the two surfaces.

气垫系统将浆幅完全托起，使其与干燥平台保持一定的距离，且无浆幅摆动。浆幅在此系统被风干，可以保证其完全平整无摆动，横向无张紧力，纵向张紧力达到最小。干燥室是由若干单独的中间隔室组成的，配有蒸汽盘管以加热空气，风机将热风分配到吹风箱。

The air cushion system can fully lift the pulp web, and keep a certain distance from the drying platform, without swinging of the pulp web. The pulp web is air-dried in this system, and can ensure that it is completely flat without swinging, without lateral direction and minimum longitudinal tension. The drying room consists of several separate compartments, which is equipped with steam coils to heat the air; the heated air can be sent to the blow box by a blower.

除了位于设备两端的旋转辊，将浆幅从一个气垫层面送到下一个气垫层面，干燥室内部没有转动设备。所有的轴承都位于干燥室外部，易于维护。

Except for the rotating rollers at both ends of the equipment that can transfer the pulp web from one air cushion to another, there is no other rotating equipment in the drying room. All bearings are located outside the drying room, so they can be easily maintained.

所有的加热盘管和循环风机也置于干燥室的外侧，易于维护。一旦某一台风机或风机电机发生故障，整个组件可以单独从干燥机拆除。

All heating coils and circulating fans are placed outside the drying room, so they can also be easily maintained. Once a fan or its motor fails, the entire assembly can be separately removed from the dryer.

干燥机的真空清洁系统包括干燥机两侧的总管/联箱，便捷的定位连接使得清洁加热盘管之前致密的网筛和干燥机内部更为容易。清洁工作可在干燥机正常运行时进行。

The vacuum cleaning system of the dryer consists of the main pipes/headers at both sides of the dryer; the convenient positioning connection can make it easier to clean the dense mesh screen before the heating coil and the inner part of the dryer. The cleaning can be performed under normal operation of the dryer.

底部的吹风箱提供稳定的冲击式气源。顶部的吹风箱喷出的冲击气体只用以提高热传导率，

The blow box at the bottom can provide stable impact air source. The impact gas ejected from the blow box at the top can only be used to improve the thermal conductivity,

干燥机的速度是由齿轮电机通过链条驱动入口转辊和出口转辊的速度进行调节。为保证合适的浆幅张紧度，干燥机在浆板幅入口转辊设有张力感应，张力传感器定位于辊子轴承处，其输出信号用于速度的调节。

The speed of the dryer is adjusted by a geared motor through driving the inlet and outlet rollers by a chain. In order to ensure the proper tension of the pulp web, a tension sensor is set at the inlet roller of the pulp web; located at the bearing of the roller, the tension sensor's output signal can be used for speed adjustment.

在正常运行时，干燥机转辊的驱动与链传动是脱开的，只有出口浆板幅速度需要控制时，出口转辊驱动带上链传动。引纸装置在引纸时，由单独的齿轮电机驱动，自动完成从入口到出口的引纸动作。

During normal operation, the roller driving is separated from chain drive, and only when the speed of the outlet pulp web shall be controlled, can the outlet roller drives by chain. During guiding the paper, the guiding device is driven by a separate geared motor, to automatically complete the guiding process from the inlet to the outlet.

冷却区利用厂房空气冷却和支撑幅面，幅面自动的从干燥区送入冷却区的气垫层。

The cooling area cools and supports the web with air in the workshop, and the web is automatically sent to the air cushion level in the cooling area from the drying area.

下部的冷却区与干燥区的气垫层在机理上是一致的。

The lower cooling area has the same mechanism as the air cushion level of the drying area.

冷却区与干燥区，通过干燥机的送风气室和绝热底板来隔离。

The cooling area and drying area are isolated by the air supply chamber and thermal insulation floor of the dryer.

热回收系统通过利用干燥机排出气体的热量预热送入的气体来降低干燥机运行费用。排、送风机用以维持干燥机内的湿度在一个最佳水平。

The heat recovery system can reduce the operating cost of the dryer by pre-heating the supplied gas with the heat of the exhaust gas of the dryer. The exhaust and supply fan can maintain the optimal humidity in the dryer.

热回收第一步是加热送入的空气，采用直接加热式热交换器换热。由送风机送入干燥机的空气在风机塔内的蒸汽盘管处进一步加热。

The first step of heat recovery is to heat the supplied air, and realize heat transfer with a direct heating-type heat exchanger. The air sent by the supply fan to the dryer can be further heated at the steam coil of the fan tower.

回收的热量还用于加热工艺用水或加热用于通风系统的水源。

The recovered heat can also be used to heat the process water or the water source used in the ventilation system.

③完成工段

③Completion section

打包线是一条完整的打包线。在平面布置时考虑预留第二条打包线的位置，浆包在压包前的贮存区有约 30 分钟的贮存时间，包装用浆板贮存区可贮存 24 小时。

The packing line is a complete line. During plane layout, the location for a second packing line shall be reserved, the pulp bales would be stored in the storage area for 30 min prior to pressing, and the pulp boards would be stored in the storage area for 24 hours.

从切纸机堆码机下来的浆包落到主平台输送机上，主平台将浆包卸到摆动输送机上，浆包经过几条输送机运送，然后分开并单个送至称重输送机上自动称重。

The pulp bales from the stacker of the cutter may fall on the conveyor of the main platform, which will unload the pulp bales to the swing conveyor, and the pulp bales will be individually sent to the weighing conveyor for automatic weighing by several conveyors.

单个浆包的重量将被自动记录，一旦浆包的重量被记录，称重输送机便将称重后的浆包由压包机前的皮带输送机送入压包机。在压包机中，浆包被压缩到合适的高度。然后，浆包进入装在校正输送机上的浆包校正器进行对中校正。浆包对中后将进入封皮机，封皮机会把顶部和底部的封皮纸准确地放到浆包上。

The weight of a single pulp will be automatically recorded, and once the weight is recorded, the weighing conveyor will send the weighed pulp bale to the belt conveyor, which send it to the baler. In the baler, the pulp bale will be compressed to a suitable height. Then, the pulp bale will be sent to the pulp bale corrector installed on the calibration conveyor for centering correction. After centering, the pulp bale will be sent to covering machine, which will accurately cover the top and bottom cover paper on the pulp bale.

封皮机可接收封皮纸，顶部及底部的封皮是通过封皮机的输送装置来实现的。

The covering machine can receive the cover paper, and the top and bottom cover paper can be sent by the conveying device of the covering machine.

当封皮浆板放到浆包上后，浆包进入第一道捆扎机，预定数量的铁丝把浆包捆好，封皮浆板将贴在浆包上。

When the covering pulp board is placed on the pulp bale, the pulp bale will be sent to the first strapper, which will strap the pulp bale with a predetermined number of wires, and place the covering pulp board on the pulp bale.

浆包经过第一道捆扎后，被送入转向平台机构，该机构包括有对中装置、转向平台、及输送机，在此处浆包完成定位、提升、转向 90 度，然后回到输送机上。转向后的浆包被送入端部折边机构，在此处浆包完成折边封头，折边后浆包通过折边护板输送至第二道捆扎机并捆扎上预定数量的铁丝。

After initial strapping, the pulp bale will be sent to the steering platform (consisting of a centering device, steering platform, and conveyor), which can position, lift, and turn the pulp bale 90 degrees, and put it back on the conveyor. The turned pulp bale will be sent to the end folding mechanism, where the edgefold will be completed, and then the pulp bale will be sent to the second strapper by the fender apron, and strapped with a predetermined number of wires.

经过捆扎后的浆包进入喷码输送机进行两侧的喷码标识。

The strapped pulp bale will be sent to the coding conveyor for coding on both sides.

然后浆包进入液压叠包机，叠到预定的四垛高，由叠包贮存输送机送到转向输送机上。

Then the pulp bale will be sent to the hydraulic stacking machine, which will stack the pulp bales to the predetermined four-stack height, and they will be sent to the steering conveyor by the stacking storage conveyor.

从叠包贮存输送机来的两垛浆包在转向输送机上转过 90 度，送往一个平交的滚子平台。

The two stacks of pulp bales from the stacking storage conveyor will turn 90 degrees on the steering conveyor, and will be sent to a leveling roller platform.

在滚子平台上两垛浆包被推向捆扎机并调整到正确的角度。

The two stacks of pulp bales on the roller platform will be pushed to the strapper with the correct angle.

在捆扎机上两垛浆包被一定数量的铁丝打成一个捆，打成捆的浆包通过捆包贮存输送机平交输送到出口台板。这些捆包在出口台板被叉车搬运开之前一直停留在贮存输送机上。

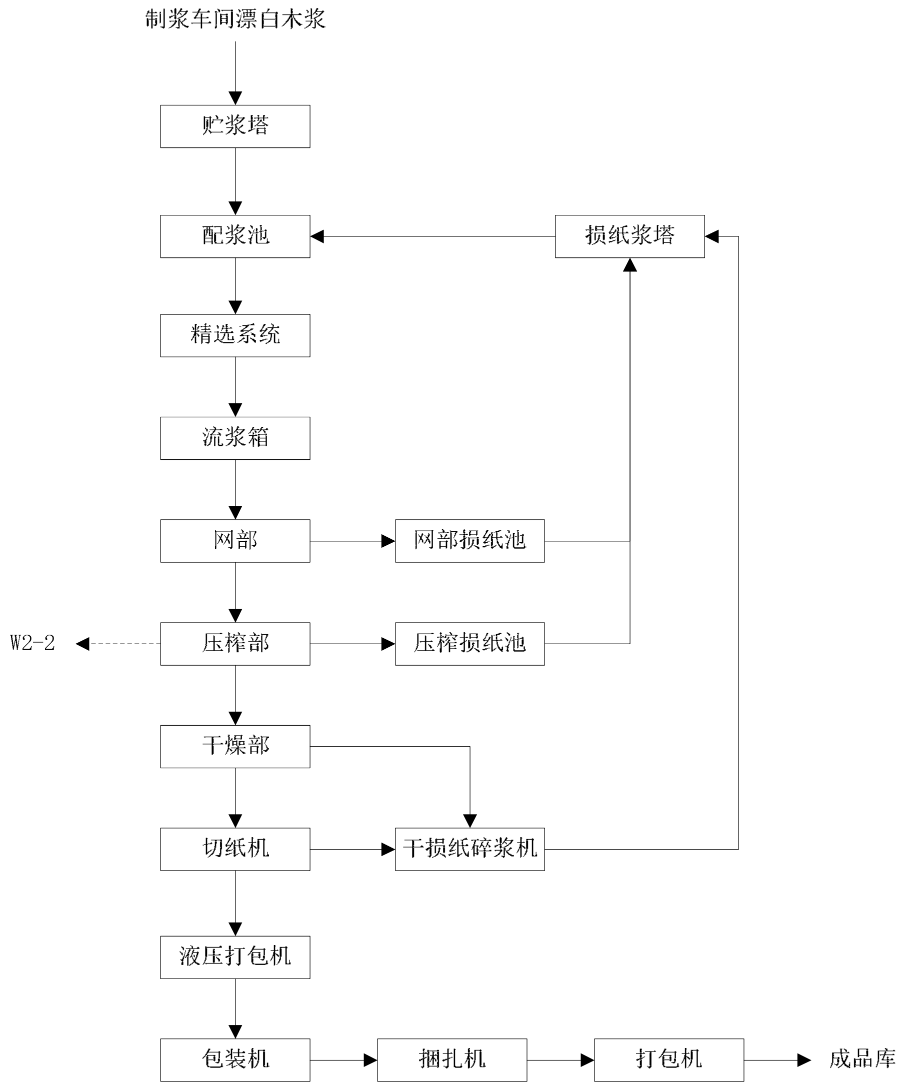
On the strapper, the two stacks of pulp bales will be strapped by a certain amount of wires, and then sent to the outlet platform by the strapping storage conveyor. These bales will be left on the storage conveyor before they are transferred by the forklift at the outlet platform.

在打包线旁边备用大包及小包捆扎机各一台，当在线捆扎机需要检修时可以方便地推出，替换上备用捆扎机，插上电源并运行，此时备用捆扎机将修改其设置参数。

One spare strapper for large bales and one for small bales are prepared beside the packing line, and they shall be easily arranged when the operating strapper needs to be repaired, and it shall run after connecting the power; its setting parameters shall be adjusted.

从切纸机堆码机下来的封皮浆板落到主平台输送机上，主平台将这些浆包转送至包装输送机，转过 90 度后浆包通过移动输送机送到封皮浆板送纸输送机上。这个系统利用一个平交的输送机把封皮浆板输送至封皮机的进料台，封皮浆板将经封皮机的喂料输送机送入封皮机。

The covering pulp boards will fall on the main platform conveyor from the stacker, and the main platform will transfer these pulp bales to the packing conveyor; the pulp bales turned 90 degrees will be sent to the covering pulp board conveyor by a mobile conveyor. This system sends the covering pulp boards to the loading bay of the covering machine with a leveling conveyor, and these pulp boards will be sent to the covering machine by the feeding conveyor.


制浆车间漂白木浆
贮浆塔
配浆池
损纸浆塔
精选系统
流浆箱
网部
网部损纸池
W2-2
压榨部
压榨损纸池
干燥部
切纸机
干损纸碎浆机
液压打包机
包装机
捆扎机
打包机
成品库

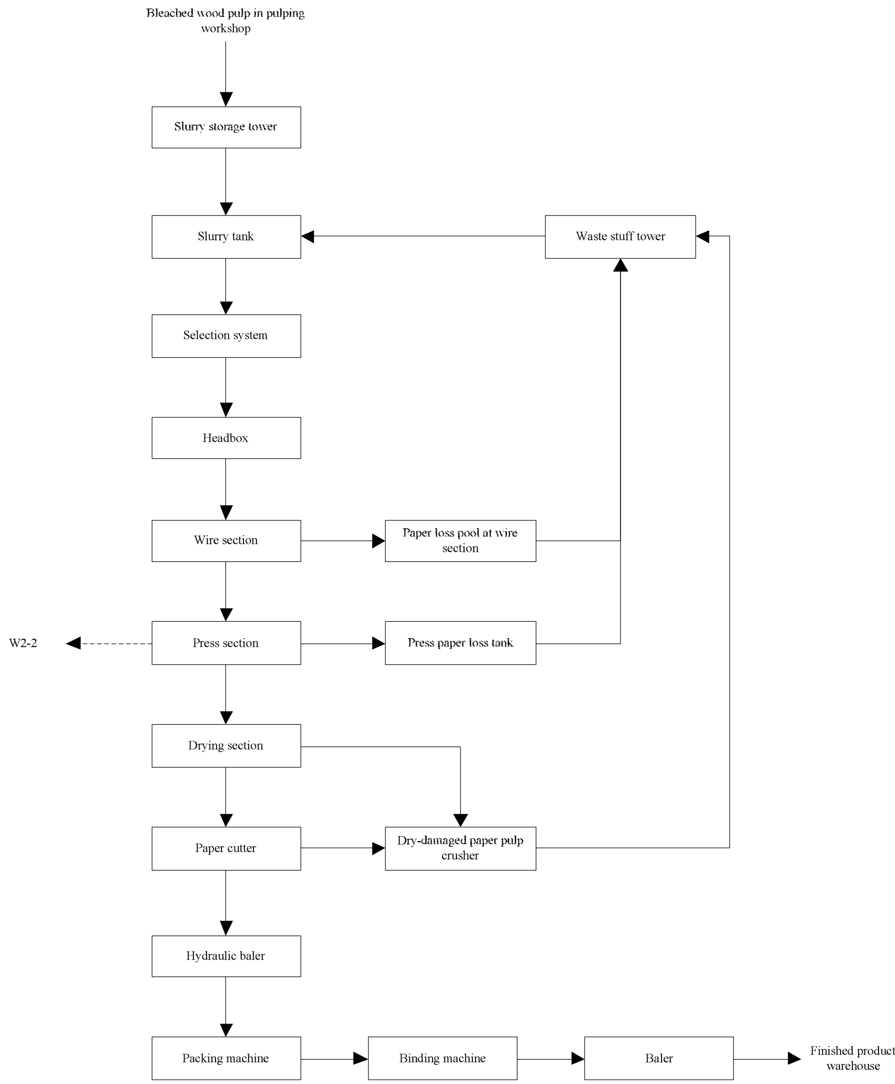


图 2.2.1-5　浆板车间工艺流程图

Fig. 2.2.1-5 Process flow of the pulp board workshop

项目浆板车间产污环节见表2.2.1-14。

The pollutant generation steps of the pulp board workshop are shown in Table 2.2.1-14.

表 2.2.1-14　项目浆板车间产污环节汇总表

Table 2.2.1-14 Summary of pollutant generation steps of the pulp board workshop

类别 Category	污染源 Source of pollution	污染物类型 Type of pollutants	治理措施 Control measures	排放去向 Discharge destination	污染源编号 Pollution source no.
废气 Exhaust	本工段基本无废气产生。 No waste gas produced in this section.				

gas					
废水 Waste water	造纸白水 Paper-making white water	COD、SS、氨氮等 COD, SS, ammonia nitrogen, etc.	进入污水处理站。 Enter the sewage treatment plant.	废水处理达标后排入铁山港区深海排放管网系统，在铁山港 B3 排污口深海排放。 The sewage is discharged into the deep-sea discharge pipe network system of Tieshangang District after being processed, and then discharged into the deep sea at the sewage outlet B3 of Tieshangang.	W2-2
固废 Solid waste	压榨、切纸产生的浆渣、损纸直接回用于生产系统，此工段无固废产生。 The pulp slag and broke produced by pressing and cutting are recycled and directly used by the production system; and no solid waste is generated in this section.				

（**3**）主要工艺技术参数

(3) Main process technical parameters

（**4**）主要物料消耗指标

(4) Main material consumption indicators

浆板车间物料消耗情况见表 2.2.1-16。

Material consumption conditions of the pulp board workshop are shown in Table 2.2.1-16.

（**5**）主要设备

(5) Main equipment

浆板车间主要设备清单见表 2.2.1-17。

The list of main equipment of the pulp board workshop is shown in Table 2.2.1-17.

2.2.1.5 碱回收车间

2.2.1.5 Alkaline recovery workshop

（**1**）碱回收车间生产工艺流程及产污环节

(1) Production process and pollutant generation steps of the alkali recovery workshop

①蒸发工段

① Evaporation section

本工程采用结晶蒸发技术，通过在结晶产生前黑液中混入碱灰控制碳酸钠矾的结晶晶核使Ⅰ效蒸发站能在结晶状态下运行而加热元件不产生结构，从而使得黑液浓度得到大幅度提高，降低浓缩黑液所耗的能源，大大提高碱回收炉的运行效率及热效率，同时采用结晶蒸发技术后去除了蒸发设备及管道的结垢机会，因此也极大地提高了蒸发站的运行效率并降低蒸发站的维护费用。

In the Project, the crystallization evaporation technique is adopted, which can control the crystal nucleus of burkeite through mixing alkali ash in the black liquor before crystallization, and enable the I-effect evaporation station to run under the crystalline state, without generating any structure by the heating element, thus greatly increase the concentration of black liquor, reducing the energy consumption for concentrating black liquor, and greatly improving the operation efficiency and thermal efficiency of the alkali recovery furnace; at the same time, this technique can avoid scaling of the evaporation equipment and pipeline, thus greatly improving the operation efficiency and reducing the maintenance cost of the evaporation station.

采用 7 效板式蒸发站，Ⅰ效为四体效，Ⅱ效为一体两室效，VI、Ⅴ、Ⅳ、Ⅶ效设有黑液闪蒸分离区。蒸发站额定蒸发能力 898t/h，最大蒸发能力为 1100t/h。出站黑液浓度为 80％（不计加灰），出站黑液温度 135℃。

The 7-effect plate evaporation station is adopted, where the I-effect is four-effect, II-effect is a one-body two-compartment effect, and the VI, V, VI, VII-effects are set with black liquor flash separation area. The rated evaporation capacity of the evaporation station is 898t/h, with the maximum evaporation capacity of 1,100 t/h. The concentration of black liquor is 80％ (excluding ash addition), and its temperature is 135℃.

化学浆车间来稀黑液（~15％，120℃）经换热冷却后进入稀黑液槽贮存，再泵送至Ⅳ效闪蒸区闪蒸后再依次到Ⅴ、Ⅵ效闪蒸，在Ⅶ效通过循环开始浓缩，然后逆流到 VI 浓缩后，再逆流到Ⅴ、Ⅳ、Ⅲ、Ⅱ效进行进一步浓缩；Ⅱ效蒸发器为一体两室蒸发器，其中一室可以轮流切换为用稀黑液进行清洗状态；经Ⅱ效浓缩后的浓黑液经 Id、Ⅰ$_C$、Ⅰ$_B$、Ⅰ$_A$继续浓缩，Ⅰ$_A$出来的浓黑液闪蒸后送压力黑液贮存槽贮存，然后送碱回收炉进行燃烧。从Ⅰ$_B$体取出部分浓黑液贮存于黑液槽中而后送碱灰混合槽与碱炉的碱灰进

行混合后作为带晶核的黑液送回 Id 体与从Ⅱ效送来的黑液混合进效促使结晶蒸发顺利进行。

The diluted black liquor from the chemical pulp workshop (~15％, 120℃) is first stored in the black liquor tank after cooling by heat exchanger, and then pumped to the IV-effect flash zone; later, to V and VI-effect flash zones, and concentrated through the circulation in the VII-effect flash zone; next, reversely flows to VI-effect flash zone for concentration, and V, IV, III and II-effect flash zones for further concentration. The II-effect evaporator is a two-compartment station, where one compartment can be switched to the state of cleaning with diluted black liquor; the black liquor after II-effect concentration is further concentrated by Id, I_C, I_B, and I_A, the concentrated black liquor from $Ⅰ_A$ is sent to the pressure black liquor storage tank for storage after flash evaporation, and then sent to the alkali recovery furnace for combustion. Part of the concentrated black liquor is taken from I_B and stored in the black liquor tank, and then sent to the alkali ash mixing tank, and mixed with the ash in the alkali furnace as the black liquor with crystal nuclei, which will be sent to the Id body and mixed with the black liquor fro II-effect zone, to promote the smooth evaporation of crystallization.

污冷凝水经汽提后回用于洗浆和苛化工段。汽提塔出来的高浓臭气送燃烧工段碱炉或臭气焚烧器燃烧。各槽罐收集的低浓臭气也送燃烧工段集中处理，送碱炉或臭气焚烧器燃烧。

After steam stripping, the contaminated condensate can be used for pulp washing and causticization section. The high-concentration odor from the stripping tower is sent to alkali furnace of the combustion section or incinerator for combustion. The low-concentration odor collected by each tank is sent to the combustion section for centralized treatment, and then to the alkali furnace or odor incinerator for combustion.

②燃烧工段

②Combustion section

首先从蒸发站$Ⅰ_B$送来的 70%浓度的浓黑液到碱灰混合槽与碱灰混合，混合碱灰后的黑液再送回蒸发站经 Id→$Ⅰ_C$→$Ⅰ_B$→$Ⅰ_A$进行结晶蒸发，出来的高浓黑液经闪蒸后送压力高浓黑液贮存槽贮存，高浓黑液浓度 81~82%(已经与芒硝和碱灰混合)，温度 135℃。而后用入炉泵经黑液加热器加热至 140℃后送入炉膛燃烧。碱炉上的黑液环管管道设有

黑液浓度检测系统，当送来浓度低于 58%时黑液不许入炉而转送到碱灰混合槽。

First, the concentrated black liquor (70%) sent from I_B of the evaporation station is delivered to the alkali ash mixing tank for mixing with the alkali ash; the mixture is sent back to the evaporation station for crystallization evaporation in the process of Id→ I_C→ I_B→ I_A. The high-concentration black liquor is sent to the storage tank for storage after flash evaporation. Concentration of the high-concentration black liquor is 81~82% (mixed with mirabilite and alkali ash), and its temperature is 135℃. Then it is heated to 140 °C by a black liquor heater and pumped to the furnace for combustion with a furnace pump. The black liquor loop of the alkali furnace is equipped with a concentration detection system, which will prevent the black liquor from entering into the furnace when the concentration is lower than 58%, but transferred to the alkali ash mixing tank.

碱回收炉设有高浓臭气及低浓臭气燃烧装置，高浓臭气由各车间收集后送到燃烧工段进行气液分离，臭气送入二次风附近的高浓臭气燃烧器进行燃烧。高浓臭气采用天然气助烧，同时设有旁通臭气焚烧器，以便在碱炉停炉或臭气燃烧系统发生事故时让臭气旁通进入臭气焚烧器焚烧。

The alkali recovery furnace is equipped with a high-concentration and low-concentration odor combustion device. The high-concentration odor is collected by each workshop and sent to the combustion section for gas-liquor separation, and the odor is sent to the high-concentration odor combustion device near the secondary air system for combustion. The high-concentration odor takes natural gas as the combustion aid, and a bypass odor incinerator is provided, to let the odor in the odor incinerator in the case of the shutdown of alkali furnace and accident of the odor combustion system.

低浓臭气由各车间收集后到燃烧工段进行气液分离，气液分离后的臭气加热到 100℃与加热后的补充空气混合作为三次风入炉燃烧。

The low-concentration odor is collected by each workshop and sent to the combustion section for gas-liquor separation, and the odor is heated to 100℃ and mixed with the heated supplementary air as the tertiary air for combustion in the furnace.

燃烧生成的熔融物经溜槽流入溶解槽，用来自苛化工段的稀白液溶解后所得绿液连续送往苛化工段。熔融物经溜槽设有蒸汽消音装置消音。

The melt produced by combustion will flow to the dissolution tank through the chute, and dissolve in the diluted white liquor from the causticization section; then the obtained green liquor will be sent to the causticization section. The chute of melt is set with a steam silencing device for noise reduction.

碱回收炉生产的蒸汽压力为10.5MPa(表压)，温度515℃送热电站汽机间发电。

The steam pressure produced by the alkali recovery furnace is 10.5MPa (gage pressure), and the temperature is 515℃; then it is sent to the Steam Turbine Room of the thermal power plant for power generation.

碱回收炉的吹灰用汽为2.8 MPa(表压)，350℃，从热电站汽机抽汽送来。

The pressure of the blowing steam used in the alkali recovery furnace is 2.8 MPa (gauge pressure), and the temperature is 350℃; it is sent from the steam turbine of the thermal power plant.

③苛化工段

③Causticization section

燃烧工段来的绿液先到绿液稳定槽充分混合均匀后到绿液澄清器澄清后贮存，然后澄清绿液泵经冷却后与回收石灰一起在石灰消化器消化；绿液澄清器沉下绿泥用板框式过滤机进行洗涤、脱水后送厂外填埋；消化乳液送连续苛化器苛化后泵送压力圆盘过滤机进行过滤，压力圆盘过滤机滤出的浓白液送浓白液贮存槽贮存后泵送化学浆车间使用，白泥则经白泥洗涤槽洗涤，洗涤后的白泥贮存于白泥贮存槽，后送至白泥盘式过滤机过滤脱水至干度约75%后，送白泥回收装置煅烧成石灰后回用。白泥盘式过滤机出来的澄清稀白液贮存于稀白液槽，后泵送燃烧工段溶解槽溶解碱炉出来的熔融物形成绿液。

The green liquor produced in the combustion section is first sent to the green liquor stabilization tank for full mixing, and then stored after clarification in the clarification tank; later, the cooled green liquor is digested in the lime slaker together with the recovered lime; the green mud in the green liquid clarifier is cleaned with a plate and frame filter, and the dewatered mud is sent out of the plant for landfill; the digested emulsion is sent to the continuous causticizer for causticization, and pumped to the pressure disc filter for filtration; the filtered white liquor is then sent to the concentrated white liquor storage tank, and pumped to the chemical pulp workshop for using. The white mud is cleaned by the white mud washing tank, the cleaned white mud is stored in the white mud storage tank, and sent to the white mud disc filter for filtration, then to the disc filter for filtration and dewatering to the dryness of about 75%, and finally sent to the white mud recovery unit and calcined into lime for recycling. The clarified diluted white liquor filtered by the white mud disc filter is stored in the diluted white liquor tank, and then pumped to the combustion section dissolving tank to dissolve the melt of the alkali furnace, thus forming the green liquor.

④石灰回收工段

④Lime recovery section

出苛化工段的白泥干度可达到75%，采用先进的带闪急干燥器短窑。石灰回收工段设计能力为日产石灰850吨。

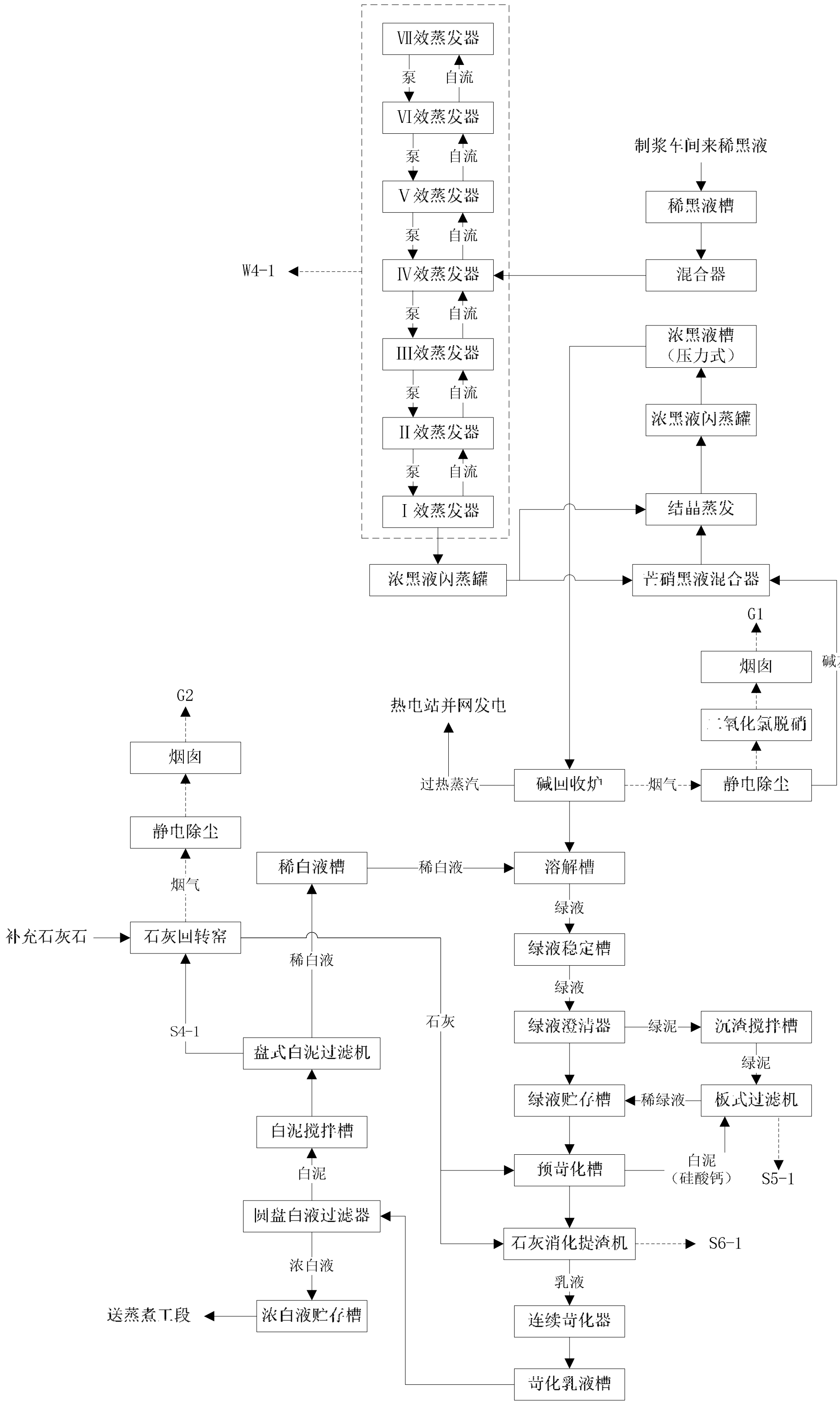
The dryness of white mud after causticization section can reach 75%, and the advanced short kiln with flash dryer is adopted. The design capacity of the lime recovery section is 850 tons of lime per day.

从苛化系统来的白泥经带式输送机送闪急干燥器-旋风分离器，用石灰窑尾气预干燥后经喂料螺旋进入石灰窑喂料端装置，与补充石灰石以及静电除尘器收集的粉尘一齐进入石灰窑。在窑内，物料迎着高温烟气沿倾斜方向向下翻滚，先后经链条干燥区和中间区至煅烧区。成品灰由卸料端排出，至冷却器冷却，大块的成品灰经回收石灰粉碎机粉碎后与出冷却器的粒度约30mm的成品灰一齐经刮板输送机、斗式提升机送入苛化工段的石灰仓供消化使用。

The white mud transferred from the causticization system is sent to the flash dryer - cyclone separator with the belt conveyor, and pre-dried by the lime kiln tail gas, and then fed to the feed end of the lime kiln through the feeding spiral pipe; finally, the white mud is sent to the lime kiln together with the supplementary limestone and dust collected by the electrostatic precipitator. In the kiln, the materials will roll down in the inclined direction against the high-temperature flue gas, and pass through the drying area and intermediate area, and then to the calcination area. The finished ash is discharged from the delivery end to the cooler for cooling. Large pieces of finished ash are first crushed by the pulverizer and sent to the lime bin of the causticization section by the scraper conveyor and bucket elevator together with the finished ash of about 30mm in particle size taken from the cooler, for digestion and usage.

石灰回转窑所用的燃料为天然气。石灰回转窑产生的烟气采用静电除尘器除尘，经引风机送到烟囱排出。

The fuel used in the lime rotary kiln is natural gas. The flue gas generated by the lime rotary kiln is sent to the chimney by a draught fan for discharge after removing the dust with an electrostatic precipitator.


Ⅶ效蒸发器
Ⅵ效蒸发器
Ⅴ效蒸发器
Ⅳ效蒸发器
Ⅲ效蒸发器
Ⅱ效蒸发器
Ⅰ效蒸发器
泵
自流
W4-1
制浆车间来稀黑液
稀黑液槽
混合器
浓黑液槽
（压力式）
浓黑液闪蒸罐
结晶蒸发
浓黑液闪蒸罐
芒硝黑液混合器
G1
烟囱
碱灰
二氧化氯脱硝
静电除尘
热电站并网发电
过热蒸汽
碱回收炉
烟气
G2
烟囱
静电除尘
烟气
稀白液槽
稀白液
溶解槽
绿液
补充石灰石
石灰回转窑
稀白液
绿液稳定槽
绿液
石灰
S4-1
盘式白泥过滤机
绿液澄清器
绿泥
沉渣搅拌槽
绿泥
绿液贮存槽
稀绿液
板式过滤机
白泥搅拌槽
白泥
预苛化槽
白泥
（硅酸钙）
S5-1
圆盘白液过滤器
石灰消化提渣机
S6-1
浓白液
乳液
送蒸煮工段
浓白液贮存槽
连续苛化器
苛化乳液槽

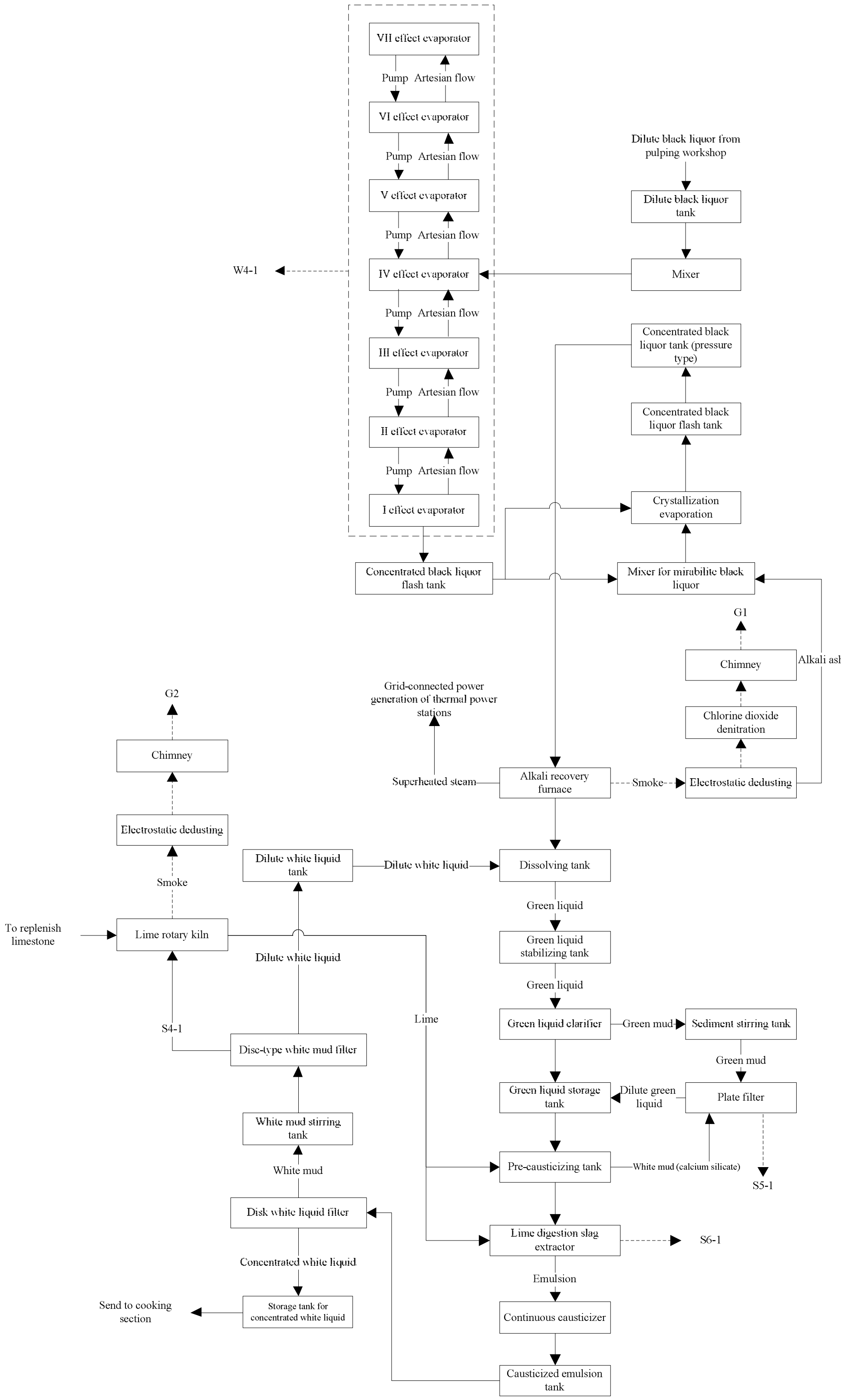


图 2.2.1-6　碱回收工艺流程及产污节点图

Fig. 2.2.1-6 Process flow and pollutant generation nodes of alkali recovery

项目碱回收车间产污环节见表2.2.1-18。

The pollutant generation steps of the alkali recovery workshop are shown in Table 2.2.1-18.

表 2.2.1-18 项目碱回收车间产污环节汇总表
Table 2.2.1-18 Summary of pollutant generation steps of the alkali recovery workshop

类别 Category	污染源 Source of pollution	污染物类型 Type of pollutants	治理措施 Control measures	排放去向 Discharge destination	污染源编号 Pollution source no.
废气 Exhaust gas	碱回收炉烟气 Flue gas of alkali recovery furnace	烟尘、SO_2、NO_x、H_2S Smoke dust, SO_2, NO_x, H_2S	三列四电场的静电除尘器 Three-row four-electric field electrostatic precipitator	经1根150mH×Φ5.2m烟囱排放至大气环境。It is discharged to the atmosphere through a 150mH×Φ5.2m chimney.	G1
	石灰窑烟气 Flue gas of lime kiln	烟尘、SO_2、NO_x、H_2S Smoke dust, SO_2, NO_x, H_2S	一列四电场静电除尘器。One-row four-electric field electrostatic precipitator.	经1根150mH×Φ2.6m烟囱排放至大气环境。It is discharged to the atmosphere through a 150mH×Φ2.6m chimney.	G2
	重污冷凝水槽、黑液槽、冷凝水槽、溶解槽、苛化器等 Heavily polluted condensate tank, black liquor tank, condensate tank, dissolution tank, and causticizer, etc.	H_2S	高浓臭气和汽提气经处理后直接送到碱回收炉燃烧，低浓臭气经碱液洗涤后送碱回收炉作二次送风 The high-concentration odor and stripping gas are directly sent to the alkali recovery furnace for combustion after treatment, and low-concentration odor is sent to the alkali recovery furnace for secondary air supply after washing with alkali liquor	经1根150mH×Φ5.2m烟囱排放至大气环境 It is discharged to the atmosphere through a 150mH×Φ5.2m chimney	G1
		H_2S	碱炉事故状态下启用臭气燃烧器焚烧制浆过程产生的臭气	经1根150mH×Φ1.5m烟囱排放至大气环境 It is discharged to the atmosphere through a	G9

			Odor produced in the pulping process is incinerated by the odor incinerator under the accident state of alkali furnace.	150mH×Φ1.5m chimney	
废水 Waste water	蒸发器轻污冷凝水 Light pollution condensate of the evaporator	COD、BOD_5、SS等 COD, BOD_5, and SS etc.	回用于生产，多余部分进入污水处理站。It can be recycled for production, and the excessive part may be sent to the sewage treatment plant.	废水处理达标后排入铁山港区深海排放管网系统，在铁山港B3排污口深海排放。The sewage is discharged into the deep-sea discharge pipe network system of Tieshangang District after being processed, and then discharged into the deep sea at the sewage outlet B3 of Tieshangang.	W4-1
固废 Solid waste	苛化工段 Causticization section	白泥 White mud	部分用于烟气脱硫，剩余部分送石灰窑回收处置 It is partly used for flue gas desulfurization, and the remaining part is sent to the lime kiln for recycling	回收处置。Recycling.	S4-1
		绿泥 Green mud	送一般工业固体废物填埋处置 It is sent to the general industrial solid waste disposal site for landfill	填埋处置。Landfill.	S5-1
	石灰消化 Lime digestion	石灰渣 Lime slag			S6-1

（2）主要工艺技术参数

(2) Main process technical parameters

碱回收车间主要工艺技术指标见表2.2.1-19。

Main process technical parameters of the alkali recovery workshop are shown in Table 2.2.1-19.

（3）主要物料消耗指标

(3) Main material consumption indicators

碱回收车间物料消耗情况见表2.2.1-20。

Material consumption conditions of the alkali recovery workshop are shown in Table

2.2.1-20.

（5）主要设备

（5）Main equipment

碱回收车间主要设备清单见表2.2.1-21。

The list of main equipment of the alkali recovery workshop is shown in Table 2.2.1-21.

2.2.1.6 二氧化氯制备车间

2.2.1.6 Chlorine dioxide preparation workshop

（1）二氧化氯制备工艺选择

(1) Selection of preparation process of chlorine dioxide

目前，国内外对二氧化氯制备研究主要是从强酸溶液中利用还原剂（SO_2、CH_3OH、HCl、H_2O_2）还原 $NaClO_3$ 和电解食盐水（综合法）两种基本方法上改进，衍生出了多种二氧化氯制备的方法。我国使用二氧化氯纸浆漂白的企业，现场制备二氧化氯的方法主要有R6、R8、R8\R10法和R11法等。上述方法有一定的差异，也各拥有不同的特点和不同的适应性，在我国不同规模和不同地区制浆项目选用的制备工艺也有不同。

At present, the studies on the preparation of chlorine dioxide in China and other foreign countries are mainly carried out based on two basic methods, namely the reduction of $NaClO_3$ from strong acid solution with reducing agents (SO_2, CH_3OH, HCl, H_2O_2) and saline solution electrolysis (comprehensive method), which have derived a variety of methods for preparing chlorine dioxide. In China, the enterprises that use chlorine dioxide for pulp bleaching mainly adopt the methods R6, R8, R8\R10 and R11 for preparing chlorine dioxide at the site. There are certain differences between the above methods, and each of which has its own characteristics and adaptability; so the pulping projects of different sizes in different regions in China usually select different preparation processes.

R6法的整个系统呈封闭循环状态，没有连续性的有害物排放，制得 ClO_2 的浓度较高、综合运行成本比较低和原料单一（只需要外购HCl或 Cl_2 和用电），综合运行成本比较低（可变成本约为R8法的1/2），由于以HCl或 Cl_2、水和电为原料，生产过程中仅需补充部分HCl或 Cl_2 即可保持系统平衡，比其他R法系列技术的原料运输量均要小得多，而且由于不需外购易燃的危险品 $NaClO_3$，安全性比较好，从原料采购和经济运行等方面有特殊的优势。但系统组成及设备构成比较复杂，操作要求严格，一次性投资

大，用电量大。该法适合大规模项目建设和交通不便或资源贫乏的边远地区。该技术在国外已经运行多年，具有工艺成熟、反应效率高、生产能力大、无固体废弃物、运行稳定，维护费用低等特点，受到众多大中型制浆造纸企业的青睐。

As for R6 method, the entire system is in a closed loop, without continuous emission of noxious substances. It can prepare higher-concentration ClO_2 with simple raw materials (HCl or Cl_2 and power), so the comprehensive operating cost is relatively low (the variable cost is about 1/2 of the R8 method). This method takes HCl or Cl_2, water and power as the raw materials, and only HCl or Cl_2 needs to be supplemented to maintain the system balance during production, so the transportation volume of raw materials is much smaller than that of other R method series; in addition, without the use of the flammable dangerous goods $NaClO_3$, it has better safety, and special advantages in fields of raw material procurement and economic operation. But the composition of system and equipment is relatively complex, with strict operation requirements, high one-time investment, and large power consumption. This method is suitable for large-scale projects and remote areas with inconvenient transportation or poor resources. This method has been operating for several years in foreign countries, and due to its characteristics of mature process, high reaction efficiency, large production capacity, no solid waste, stable operation, and low maintenance cost, it is favored by numerous large and medium-sized pulp and paper enterprises.

R8法的最大特点是在集发生一蒸发一结晶3作用为一体的前提下取消了Cl_2吸收塔，具有反应效率高、设备成熟且操作简单，不产生Cl_2副产品，钠盐副产品也大为减少，原料消耗低、转换率高、ClO_2纯度高、产量弹性大、物料停留时间短、运行平稳等特点，也是我国近几年在 ECF 漂白中引进较多的技术。但其不足是需要使用大量的氯酸钠、甲醇和硫酸，均属于危险化工，预计氯酸钠使用量为82吨/天，硫酸使用量为50吨/天，甲醇7.5吨/天，使用量较大，潜在安全风险较大；副产品酸性钠盐在送往碱回收时必须进行中和处理，ClO_2产品中有少量甲醇会增加漂白废水的COD和BOD。

The biggest characteristic of R8 method is that the Cl_2 absorption tower is removed under the premise of integrating reaction, evaporation and crystallization, thus creating the advantages of high reaction efficiency, mature equipment and simple operation, no production of Cl_2 by-products, less sodium salt by-products, low consumption of raw materials, high conversion rate, high purity of ClO_2, high yield elasticity, short storage time of materials, and stable operation. It is a popular ECF bleaching technology introduced in China in recent years.

But there are also several disadvantages, such as the use of a large amount of sodium chlorate, methanol and sulfuric acid, which are all hazardous chemicals. As estimated, it will consume sodium chlorate of 82 tons/day, sulfuric acid of 50 tons/day, and methanol of 7.5 tons/day; the large usage amount would have potential safety risks; the by-product acid sodium salt shall be collected and treated for alkali recovery, and the small amount of methanol in ClO_2 would increase COD and BOD in bleaching wastewater.

R8/R10 法是在 R8 法的基础上，在副产品内部循环利用上义作了进一步改进，在生产 ClO_2 纯度与 R8 法相同的前提卜，结合 R10 法芒硝复分解反应工艺，将酸性芒硝转变为中性芒硝，并将复分解后的酸性母液再循环用于反应。该法虽然在 ClO_2 中的酸性芒硝[$Na_3H(SO_4)_2$]转换分离上增加了设备投资，但也节省了酸性芒硝中和利用的过程和投资，综合投资几乎相同，有效地降低了制备 ClO_2 的新鲜酸液用量，减少了酸的消耗量，提高了 ClO_2 转换率，并减少了送往回收系统用于中和酸性芒硝的苛性碱的用量，使所产生的副产品钠盐不但可以完全利用于硫酸盐制浆碱回收的芒硝补充，也可减少非硫酸盐制浆对副产品消化的难度，综合比较要优于 R8 法。因此，R8/R10 法是目前代替 R8 法的理想技术，在我国近期的几个 ECF 漂白系统就引进应用了该技术。

R8/R10 is a method further improved based on R8 method in terms of internal recycling of by-products. Under the premise that the purity of ClO_2 is the same as that produced by R8 method, the mirabilite double decomposition reaction process of R10 method is combined to transform acid mirabilite to neutral mirabilite, and recycle the acid mother liquor of double decomposition for reaction. Although this method increases investment in equipment for conversion and separation of acid mirabilite [$Na_3H(SO_4)_2$] in ClO_2, its reduces the investment in neutralization and utilization of acid mirabilite, so the comprehensive investment is almost the same. It can effectively reduce the amount of fresh acid for preparing ClO_2, reduce the acid consumption, increase the ClO_2 conversion rate, and reduce the amount of caustic alkali for neutralizing acid acid mirabilite in the recovery system; therefore, the by-product sodium salt can be fully used in supplementation of mirabilite for alkali recovery from sulfate pulping, and can also reduce the difficulty of digesting by-products during non-sulfate pulping. The comprehensive comparison shows that this method is superior to R8 method. Therefore, R8/R10 method is currently an ideal technology to replace R8 method, and it has been introduced in several recent ECF bleaching systems in China.

目前国内大型浆厂均使用综合法制备二氧化氯，如云南云景、日照森博、海南金海，

湛江晨鸣，黄岗晨鸣、寿光晨鸣等。R8 或 R8/R10 法制备二氧化氯目前在国内均为 15t/d 以下的小产能，30t/d 以上的产能鲜有工程化应用。本项目从投资运行成本、原料运输储存的安全性、生产的效率和稳定性等方面综合考虑拟选用 R6 综合法二氧化氯制备工艺，同时从安全环保角度，以盐酸作为综合法工艺的原料，减少氯气使用、暂存的安全和环境风险。

At present, large-scale pulp mills in China prepare chlorine dioxide with the comprehensive method, such as Yunnan Yunjing, Rizhao Senbo, Hainan Jinhai, Zhanjiang Chenming, Huanggang Chenming, and Shouguang Chenming, etc. The production capacity of chlorine dioxide by R8 or R8/R10 method is currently less than 15t/d in China, and the capacity of more than 30t/d has been rarely applied in projects. Through comprehensive consideration of investment operation cost, safety transportation and storage of raw materials, production efficiency and stability, the Project plans to select R6 comprehensive method for preparing chlorine dioxide. In addition, from the perspective of safety and environmental protection, the taking of hydrochloric acid as the raw material can reduce the safety and environmental risks of chlorine use and temporary storage.

（2）二氧化氯制备工艺产污环节

(2) Pollutant generation steps of preparation of chlorine dioxide

漂白需用二氧化氯量约为：17kg/adt，2360adt/dx17kg/adt=40.12t/d。本项目采用综合法制备二氧化氯溶液，二氧化氯制备系统设计能力为 50t/d。

The amount of chlorine dioxide required for bleaching is about: 17kg/adt, 2,360adt/dx17kg/adt=40.12t/d. The Project plans to prepare chlorine dioxide solution by the comprehensive method, with the design capability of 50t/d.

综合法以盐酸作为原料，消耗电能，为一封闭的电化学系统，它包括氯酸钠制备、盐酸合成以及二氧化氯发生三个部分。

The comprehensive method electrically prepares chlorine dioxide by using hydrochloric acid as the raw material in a closed electrochemical system through 3 stages: sodium chlorate preparation, hydrochloric acid synthesis, and chlorine dioxide generation.

在氯酸钠电解系统电解槽内通入直流电，NaCl 溶液被电解，产生 $NaClO_3$、H_2。$NaClO_3$ 溶液泵送到浓 $NaClO_3$ 槽，经冷却、过滤后送 ClO_2 制备系统使用。H_2 通过脱气器分离送到盐酸合成单元，和系统中循环的稀氯气在盐酸合成塔内燃烧后生成 HCl，用

软水吸收，生成盐酸，同时系统补充部分盐酸作为制备二氧化氯的原材料。电解系统产生的过量氢气中含氯，经碱液洗涤后排空，洗涤液回氯酸钠反应器回用。盐酸合成系统的尾气，污染物为 HCl、Cl_2，经碱液洗涤后由排气筒达标排放，洗涤液回盐酸吸收工段。

After connecting direct current to the electrolytic bath of the sodium chlorate electrolysis system, NaCl solution will be electrolyzed, to produce $NaClO_3$ and H_2. $NaClO_3$ solution is pumped to concentrated $NaClO_3$ tank, and sent to ClO_2 preparation system after cooling and filtering. H_2 is separated by a degasser and sent to the hydrochloric acid synthesis unit, and combusted in the hydrochloric acid synthesis tower with diluted chlorine gas circulating in the system to produce HCl, which can then be absorbed with soft water to produce hydrochloric acid; at the same time, the system may supplement hydrochloric acid as the raw material for preparing chlorine dioxide. The excess hydrogen produced by the electrolysis system contains chlorine, which can be removed after washing with alkali liquor, and the washing solution should be sent to the sodium chlorate reactor for reuse. The pollutants in tail gas of the hydrochloric acid synthesis system include HCl, and Cl_2, which can be discharged through the exhaust funnel after washing with alkali liquor and reaching the standard; the washing solution should be sent to the hydrochloric acid absorption section.

在二氧化氯发生器中，$NaClO_3$ 与来自盐酸合成单元的盐酸反应，产生 ClO_2、Cl_2、NaCl。ClO_2、Cl_2 气体经冷却后送至二氧化氯吸收塔，NaCl 溶液被送回氯酸钠电解槽。在二氧化氯吸收塔内，ClO_2 气体被低于 7℃的冷冻水吸收，形成 ClO_2 溶液，溶液浓度一般为 10g/L，贮存在玻璃钢贮槽中，最后泵送漂白工段。Cl_2 经气体分离器分离后回盐酸合成单元。

In the chlorine dioxide generator, $NaClO_3$ may react with hydrochloric acid from the hydrochloric acid synthesis unit, and generate ClO_2, Cl_2, and NaCl. ClO_2 and Cl_2 are sent to the chlorine dioxide absorption tower after cooling, and NaCl solution is sent back to the sodium chlorate electrolytic bath. In the chlorine dioxide absorption tower, ClO_2 would be absorbed by chilled water under 7℃, to form ClO_2 solution, whose concentration is generally 10g/L; it should be stored in FRP tanks, and pumped to the bleaching section. Cl_2 should be sent back to the hydrochloric acid synthesis unit after being separated by the gas separator.

二氧化氯车间各贮槽尾气、事故废气经集成系统收集后去海波塔经碱液洗涤后由排气筒达标排放，洗涤液回氯酸钠反应器回用。生产系统主要消耗电和氯气，基本不需要其它化学品，也无废液废渣产生。生成的二氧化氯浓度为10±0.5g/l，其中含氯量1.7±0.2g/l。

The tail gas and accident exhaust gas of each tank of the chlorine dioxide workshop should be collected by the integrated system, and then sent to the Hypo tower for alkali washing; the up-to-standard gas can be discharged through the exhaust funnel, and the washing solution should be sent to the sodium chlorate reactor for reuse. The production system mainly consumes electricity and chlorine, basically requires no other chemicals, without waste liquid and slag. The concentration of generated chlorine dioxide is 10±0.5g/l, and the chlorine content is1.7±0.2g/l.

各系统反应原理如下：

The reaction principle of each system is:

$NaClO_3$ 电解系统：$NaCl+3H_2O=NaClO_3+3H_2$

$NaClO_3$ electrolysis system: $NaCl+3H_2O=NaClO_3+3H_2$

HCl 合成系统： $H_2+Cl_2=2HCl$

HCl synthesis system: $H_2+Cl_2=2HCl$

ClO_2 发生系统： $NaClO_3+2HCl=ClO_2+1/2Cl_2+NaCl+H_2O$（主反应）

ClO_2 generation system: $NaClO_3+2HCl=ClO_2+1/2Cl_2+NaCl+H_2O$ (main reaction)

本项目电解阴极保护材料使用重铬酸钠，在投产的时候需要在整个系统母液中加入重铬酸钠，让重铬酸钠在电解的阴极形成铬合物的保护膜层，在正常生产和异常跳电的时候启到保护阴极板的作用。重铬酸钠存在于电解槽里，需要排空时是排到放空槽中，恢复生产时又注入到电解槽里，不外排。

In the Project, sodium dichromate is used as the electrolysis cathodic protection material, so when it is put into production, sodium dichromate should be added in the mother liquor of the system, to allow sodium dichromate to form a chromium compound protective film on the cathode, thus protecting the cathode plate during normal production and abnormal trip.

Sodium dichromate is present in the electrolytic bath, and can be discharged into the unloading tank as required; when production is resumed, it can be injected into the electrolytic bath, without discharging outside.

图 2.2.1-7 二氧化氯制备工艺流程及产污节点图

Fig. 2.2.1-7 Preparation process and pollutant generation nodes of chlorine dioxide

项目二氧化氯车间产污环节见表2.2.1-22。

The pollutant generation steps of the chlorine dioxide workshop are shown in Table 2.2.1-22.

表 2.2.1-22 项目二氧化氯车间产污环节汇总表

Table 2.2.1-22 Summary of pollutant generation steps of the chlorine dioxide workshop

类别 Category	污染源 Source of pollution	污染物类型 Type of pollutants	治理措施 Control measures	排放去向 Discharge destination	污染源编号 Pollution source no.
废气 Exhaust gas	过量氢气排空尾气 Excess hydrogen evacuates tail gas	HCl、Cl_2 HCl, Cl_2	碱洗 Alkaline washing	经1根25mH×Φ0.2m排气筒排放至大气环境。 It is discharged to the atmosphere through a 25mH×Φ0.2m exhaust funnel.	G6
	盐酸合成尾气 Tail gas from hydrochloric acid synthesis	H_2、少量Cl_2 H_2, a small amount of Cl_2	软化水洗涤 Washing by softened water	经1根42mH×Φ0.25m排气筒排放至大气环境。 It is discharged to the atmosphere through a 42mH×Φ0.25m exhaust funnel.	G7
	二氧化氯储槽尾气 Tail gas from chlorine dioxide storage tank	Cl_2	海波塔洗涤 Washing by Hypo tower	经1根30mH×Φ0.3m排气筒排放至大气环境。 It is discharged to the atmosphere through a 30mH×Φ0.3m exhaust funnel.	G8
	二氧化氯生产、贮存过程 Production and storage process of chlorine dioxide	Cl_2	以无组织形式排入大气环境。 Discharge to atmosphere in a fugitive form.		Gu2
废水 Waste water	本工段无废水产生。 No wastewater produced in this section.				

固废 Solid waste	本工段无固废产生。 No solid waste produced in this section.

（**2**）主要物料消耗指标

(2) Main material consumption indicators

二氧化氯车间物料消耗情况见表2.2.1-23。

Material consumption conditions of the chlorine dioxide workshop are shown in Table 2.2.1-23.

（**3**）主要设备

(3) Main equipment

二氧化氯车间主要设备清单见表2.2.1-24。

The list of main equipment of the chlorine dioxide workshop is shown in Table 2.2.1-24.

2.2.2.7 化机浆车间

2.2.2.7 APMP workshop

（**1**）化机浆车间生产工艺流程及产污环节

(1) Production process and pollutant generation steps of the APMP workshop

从备料工段送来的合格木片进入木片仓，通过木片仓底的振动卸料器，木片连续地经计量螺旋输送机到达木片洗涤系统，通过搅拌器搅动洗去木片表面的尘土、砂子、塑料及其他杂质，洗净后的木片跌落至木片混合槽，再由木片泵送到脱水螺旋，经脱水后，木片进入预蒸仓。洗涤系统的废水通过弧形筛去除杂质后，澄清水进入洗涤水槽，循环回用于木片洗涤系统。

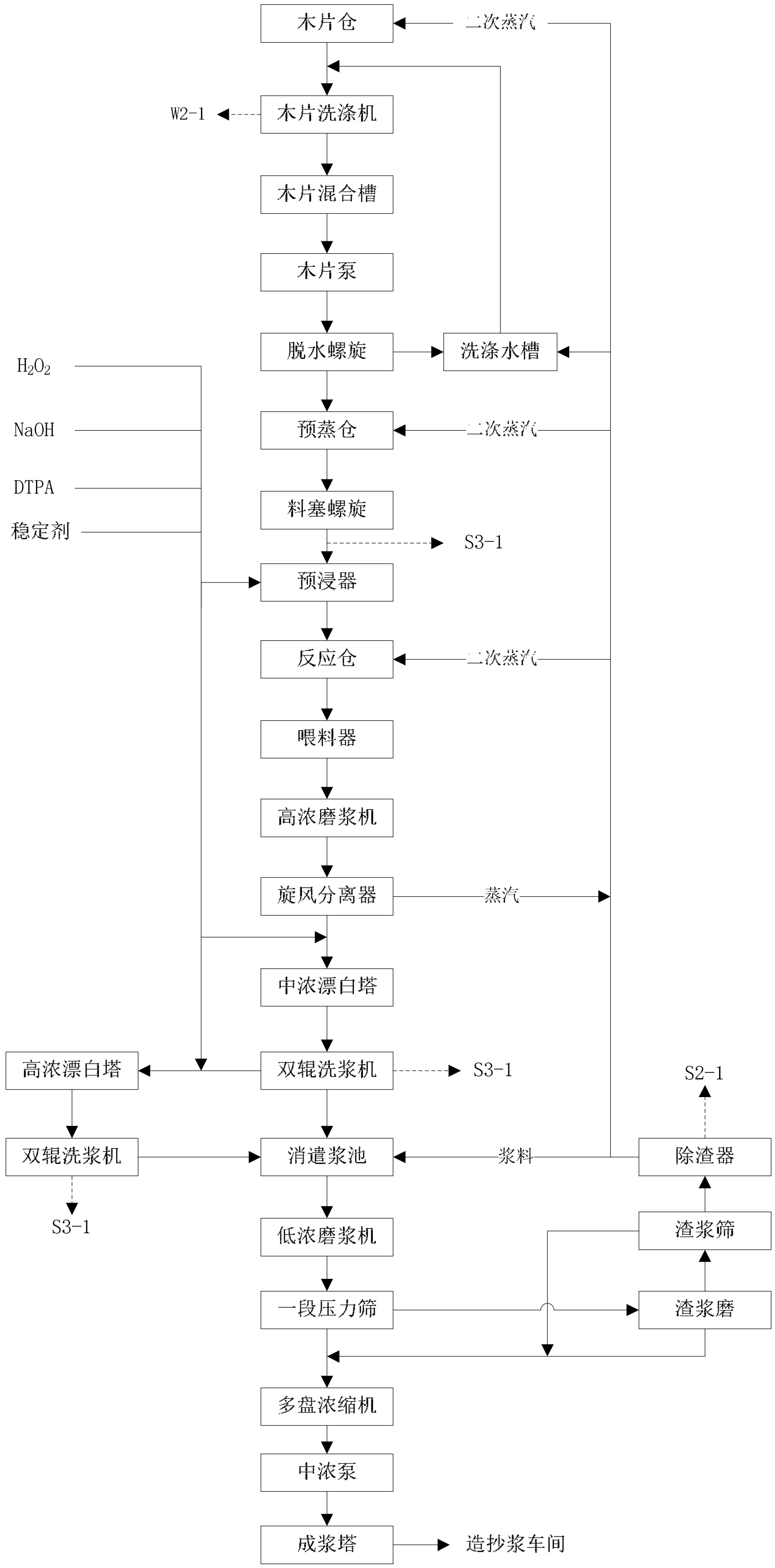
The qualified wood chips sent from the preparation section are stored in the chip bin, and then sent to the washing system through the vibration unloader at the bottom of the bin and the weighing spiral conveyer; later, the stirrer is used to remove the dust, sand, plastic and other impurities on the surfaces of the chips. The cleaned wood chips would fall into the mixing tank, and then sent to the dewatering device by the chip pump, and they are finally sent to the pre-steaming bin. After removing impurities from the wastewater of the washing system by the sieve bend, the clarified water would be sent to the washing sink for being reused by the wood chip washing system.

经料塞螺旋，木片进入预浸器，在此木片受压脱水，由于受挤压而成形的木片料塞随挤压机不停地运转而连续地释压后，木片显膨松状，均匀地撕裂成小木条或粗大纤维，并进入预浸器，此时加入药液，在预浸器内木片充分的吸收药液，然后木片进入反应仓。在反应仓内通入低压蒸汽进行汽相蒸煮，树脂等抽提物被除去。通过反应仓的活底，木片进入计量螺旋，再经过喂料器后进入一段高浓磨浆机磨浆，磨后的浆料经旋风分离器除去多余的蒸汽，然后经过冷却输送螺旋后进入中浓漂白塔，进塔之前加入混合药液，主要起漂白作用的是过氧化氢，氧化浆料中的发色基团，达到提高成浆的白度和质量的目的。从中浓漂白塔出来的浆料经过一段双辊洗浆机洗涤后，进入高浓漂白塔，同样，进塔之前加入混合药液，主要起漂白作用的是过氧化氢，氧化浆料中的发色基团。从高浓漂白塔出来的浆料依次进入二段、三段双辊洗浆机，洗涤后浆料进入消潜浆池中稀释，再进入二段低浓磨浆机，此时浆料浓度为 4%左右，磨后浆料进入压力筛经筛选处理，良浆进入多盘浓缩机浓缩，浓缩后的浆料泵送到贮浆塔贮存后送特种纸车间和白卡纸车间，必要时，文化用纸车间调整浆料配比后，可添加部分化机浆。而压力筛的尾浆送入未磨渣浆槽，经渣浆磨，渣浆筛和三段除渣器等处理。

The wood chips are sent to the pre-sinking device through the material plug, where the wood chips are dewatered under pressure. The wood chip plug formed by extrusion would continuously release under operation of the extruder, the wood chips would be fluffy and evenly torn into small strips or coarse fibers; after placing them into the pre-sinking device, the agent should be added, and after fully absorbing the agent, the wood chips would be sent to the reaction chamber. Low-pressure steam is introduced into the reaction chamber for vapor phase cooking, which can remove the extracts such as resin. The wood chips can fall on the measuring spiral through the drop bottom of the reaction chamber, and then fed to the high-consistency fiberizer by the feeder for defibrination; the excess steam in the processed pulp is removed by the cyclone separator, and the pulp is sent to the medium-consistency bleaching tower through the cooling and conveying spiral; prior to the entering into the tower, bleaching is mainly realized by hydrogen peroxide, to oxidize the chromophoric group in the pulp, thus increasing the whiteness and quality of the pulp. The pulp from the medium-consistency bleaching tower is first washed by the twin-roll pulp washer, and then sent to the high-consistency bleaching tower; similarly, the mixed chemical solution is added before sending to the tower; hydrogen peroxide plays the main role of bleaching, and it can oxidize the chromophoric group in the pulp. The pulp from high-consistency bleaching tower is gradually sent to the twin-roll pulp washer in the second and third sections; the washed pulp is sent to the pulp tank for dilution, and then to the low-consistency fiberizer of the second section. At this time, the pulp concentration is about 4%; the processed pulp is sent to the pressurized screen for screening, and the fine pulp is then sent to multi-disc thickener for concentration; later, the concentrated pulp is pumped to the storage tower, and sent to the special paper workshop and ivory board workshop; if necessary, when the pulp ratio is adjusted at the cultural paper workshop, part of APMP can be added. The tail pulp of the pressurized screen is sent to the unground slag tank, for treatment by the slag mill, slag screen and slag remover of the third section.

从一段双辊洗浆机出来的滤液经圆网浓缩机回收滤液里的浆料后循环使用。

As for the filtrate from the twin-roll pulp washer of the first section, the decker machine is adopted to recover the pulp from the filtrate for recycling.


木片仓
二次蒸汽
木片洗涤机
W2-1
木片混合槽
木片泵
脱水螺旋
洗涤水槽
H_2O_2
NaOH
DTPA
稳定剂
预蒸仓
二次蒸汽
料塞螺旋
S3-1
预浸器
反应仓
二次蒸汽
喂料器
高浓磨浆机
旋风分离器
蒸汽
中浓漂白塔
高浓漂白塔
双辊洗浆机
S3-1
S2-1
双辊洗浆机
消遣浆池
浆料
除渣器
S3-1
低浓磨浆机
渣浆筛
一段压力筛
渣浆磨
多盘浓缩机
中浓泵
成浆塔
造抄浆车间

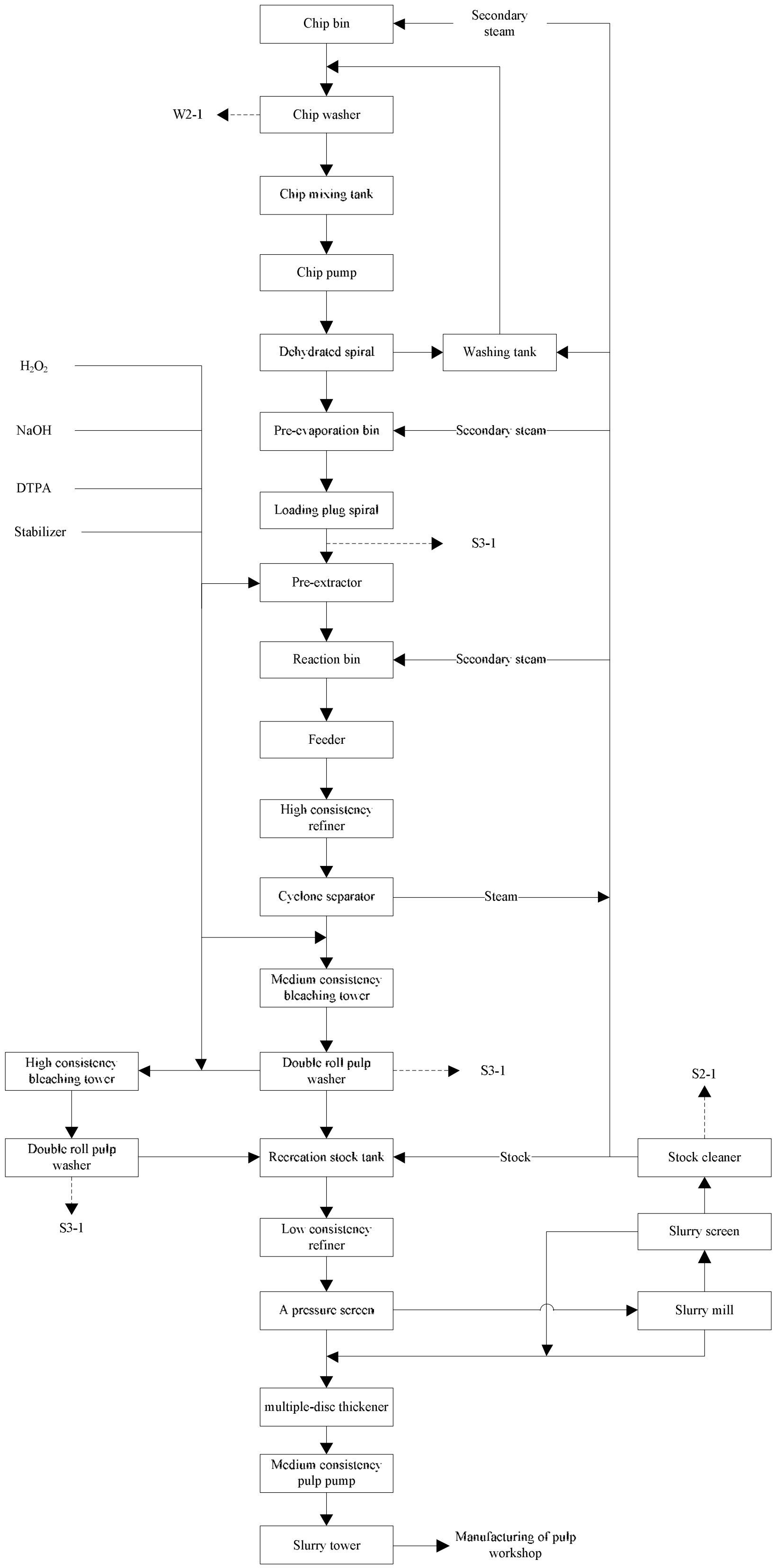

Chip bin
Secondary steam
Chip washer
W2-1
Chip mixing tank
Chip pump
Dehydrated spiral
Washing tank
H_2O_2
NaOH
DTPA
Stabilizer
Pre-evaporation bin
Secondary steam
Loading plug spiral
S3-1
Pre-extractor
Reaction bin
Secondary steam
Feeder
High consistency refiner
Cyclone separator
Steam
Medium consistency bleaching tower
High consistency bleaching tower
Double roll pulp washer
S3-1
S2-1
Double roll pulp washer
Recreation stock tank
Stock
Stock cleaner
S3-1
Low consistency refiner
Slurry screen
A pressure screen
Slurry mill
multiple-disc thickener
Medium consistency pulp pump
Slurry tower
Manufacturing of pulp workshop

图 2.2.1-8 化机浆生产工艺流程及产污节点图

Fig. 2.2.1-8 Production process and pollutant generation nodes of APMP production process

项目化机浆车间产污环节见表2.2.1-25。

The pollutant generation steps of the APMP workshop are shown in Table 2.2.1-25.

表 2.2.1-25 项目化机浆车间产污环节汇总表
Table 2.2.1-25 Summary of pollutant generation steps of the APMP workshop

类别 Category	污染源 Source of pollution	污染物类型 Type of pollutants	治理措施 Control measures	排放去向 Discharge destination	污染源编号 Pollution source no.
废气 Exhaust gas	本工段无废气产生。No waste gas produced in this section.				
废水 Waste water	木片洗涤 Washing of wood chips	COD、SS、氨氮等 COD, SS, ammonia nitrogen, etc.	进入污水处理站。Enter the sewage treatment plant.	废水处理达标后排入铁山港区深海排放管网系统，在铁山港 B3 排污口深海排放。The sewage is discharged into the deep-sea discharge pipe network system of Tieshangang District after being processed, and then discharged into the deep sea at the sewage outlet B3 of Tieshangang.	W1-1
固废 Solid waste	除渣器 Slag remover	浆渣 Slag residue	送至固废综合利用锅炉焚烧。Transferred to solid waste comprehensive utilization boiler for incineration.	焚烧处置。Incineration.	S2-1
	螺旋脱水、洗选废水 Spiral dewatering, washing and screening wastewater	黑液 Black liquor	经 MVR 工段蒸发后送一期碱回收工段 It is sent to Phase I alkali recovery section after evaporation in the MVR section		S3-1

（2）主要工艺技术参数

(2) Main process technical parameters

化机浆车间主要工艺技术指标见表 2.2.1-26。

Main process technical parameters of the APMP workshop are shown in Table 2.2.1-26.

（3）主要物料消耗指标

(3) Main material consumption indicators

化机浆车间物料消耗情况见表 2.2.1-27。

Material consumption conditions of the APMP workshop are shown in Table 2.2.1-27.

（4）主要设备

(4) Main equipment

化机浆车间主要设备清单见表 2.2.1-28。

The list of main equipment of the APMP workshop is shown in Table 2.2.1-28.

2.2.2.8MVR 蒸发工段

2.2.2.8 MVR evaporation section

（1）MVR 蒸发工艺产污环节

(1) Pollutant generation steps of MVR evaporation

本工段拟采用并联运行 6 台 MVR 板式降膜蒸发器和串联 3 台强制循环蒸发器的组合工艺处理化机浆车间送来的黑液。

This section plans to adopt 6 sets of MVR plate falling film evaporator connected in parallel and 3 sets of forced circulation evaporator connected in series are combined to process the black liquor sent from the chemimechanical pulp.

①黑液流程

①Black liquor process

从化机浆车间送来浓度约为 1.5~2.0%的稀黑液储存于稀黑液槽中，由稀黑液泵送入到黑液预热器，与 MVR 蒸发器中产生的轻污冷凝水产生热交换，稀黑液被加热，温度达到设计温度后进入到 MVR 蒸发器内进行浓缩蒸发。经 MVR 蒸发器浓缩到浓度为 20%后由 MVR 出料泵送出，并依次逆流经过Ⅲ、Ⅱ、Ⅰ效强制循环蒸发器进行浓缩蒸发，蒸发至设定浓度 65%后出料，送浓黑液闪蒸罐自然蒸发并降低温度，经由泵送至浓黑液槽，最后泵送至燃烧工段。

The diluted black liquor with a concentration of about 1.5~2.0% from the APMP workshop is stored in the black liquor tank, and pumped to the preheater by the black liquor pump; it exchanges heat with the lightly condensed condensate produced by the MVR evaporator, and the diluted black liquor is heated to the design temperature, and sent to the MVR evaporator for concentration and evaporation. When the black liquor is concentrated to the concentration of 20% by the MVR evaporator, and sent to MVR discharge pump; later, it flows countercurrently through the III, II and I-effect forced circulation evaporator for concentration and evaporation; when the concentration reaches 65% of the set value, it can be discharged to the concentrated black liquor flash tank for natural evaporation and lowering the temperature. It would then be pumped to the concentrated black liquor tank, and finally to the combustion section.

②蒸汽流程

②Seam process

6 台 MVR 蒸发器新鲜蒸汽来自于燃烧工段蒸汽管网，经减压阀减压后作为启动蒸发系统的初始动力，以便将稀黑液加热至沸点并形成蒸发，从而产生大量的二次蒸汽。在蒸发器正常运行时使用自身二次蒸汽，经蒸汽压缩机升温、加压后作为自身蒸发热源，同时根据设定参数补充少量新鲜蒸汽用于补充各种热量损失。

As for the 6 MVR evaporators, fresh steam comes from the steam pipe network of the combustion section, which can be used as the initial motive force for starting the evaporation system after pressure reducing through the reducing valve, so as to heat the diluted black liquor to the boiling point and form evaporation, thus producing a large amount of secondary steam. Under normal operation, the evaporator can can use its own secondary steam as the heat source for evaporation after being heated and pressurized by the steam compressor; at the same time, a small amount of fresh steam should be added according to the set parameters for supplementing various heat losses.

Ⅰ效蒸发器蒸发热源使用燃烧工段所产的新鲜蒸汽，Ⅰ效蒸发器产生的二次蒸汽一部分送汽提塔，一部分进入Ⅱ效，Ⅱ效蒸发器产生的二次蒸汽进入Ⅲ效。Ⅲ效蒸发器加热室分成两个区，其中一个区采用Ⅱ效二次蒸汽作为热源，另一个区可以采用磨浆蒸汽或Ⅱ效二次蒸汽作为热源。

I-effect evaporator takes the fresh steam produced by the combustion section as the heat source for evaporation; a part of the the secondary steam generated by the I-effect evaporator is sent to the stripping column, and the remaining is sent to the II-effect evaporator; the secondary steam generated by the II-effect evaporator is sent to the III-effect evaporator. The heating chamber of the III-effect evaporator is divided into two zones, one of which takes the secondary steam generated by the II-effect evaporator as the heat source, and the other of which takes the pulping steam or the secondary steam generated by the II-effect evaporator as the heat source.

汽提塔使用Ⅰ效蒸发器产生的二次蒸汽作为汽提动力，在汽提塔内消耗少量蒸汽用于加热冷凝水，其余蒸汽及臭气、不凝性气体从塔顶排出，分别进入到三台MVR蒸发器加热元件的汽提区，经换热冷却后形成重污冷凝水，多余的蒸汽进入到表面冷凝器冷却。

The stripping column is driven by the secondary steam generated by the I-effect evaporator; a small amount of steam is consumed to heat the condensate, and the remaining steam, odor, and non-condensable gas are discharged from the top of the column, to the stripping areas of heating elements of the three MVR evaporators; after heat exchange and cooling, heavily polluted condensate would be formed, and the excess steam would be sent to the surface condenser for cooling.

③冷凝水流程

③Condensate process

Ⅰ效蒸发器新鲜蒸汽产生的清洁冷凝水储存于清洁冷凝水槽中，回用于碱炉给水系统。

The clean condensate generated by the fresh steam of the Ⅰ-effect evaporator is stored in the clean condensate tank, and provided for the water supply system of the alkali furnace.

Ⅱ、Ⅲ效蒸发器产生轻污冷凝水，储存于轻污冷凝水槽中。

The lightly polluted condensate generated by the II and III-effect evaporators is stored in the lightly polluted condensate tank.

MVR蒸发器设置自汽提结构，将蒸发所产生的冷凝水分为两种：即轻污冷凝水和重污冷凝水。其中轻污冷凝水经黑液预热器与来自稀黑液槽的稀黑液产生热交换，充分利用其热能后送入到轻污冷凝水槽暂时储存；重污冷凝水暂时储存于重污冷凝水槽中。

MVR evaporator is set with a self stripping structure, which can divide the condensate produced by evaporation into lightly polluted condensate and heavily polluted condensate. The lightly polluted condensate would realize heat exchange by the black liquor preheater with the diluted black liquor from the diluted black liquor tank, and would be sent to the lightly polluted condensate tank for temporary storage after making full use of the heat energy;

the heavily polluted condensate is temporarily stored in the heavily polluted condensate tank.

储存于重污冷凝水槽中的重污冷凝水由重污冷凝水上水泵首先送入到污冷凝水预热器，与汽提后的冷凝水发生热交换而被加热，然后送入到汽提塔做汽提处理，处理后形成轻污冷凝水从塔底排出，送入到轻污冷凝水槽。

The heavily polluted condensate stored in the heavily polluted condensate tank is first pumped to the preheater by the heavily polluted condensate pump, and heated through heat exchange with the stripped condensate; then sent to the stripping column for stripping, and the lightly polluted condensate is discharged from the bottom of the column to the lightly polluted condensate tank.

轻污冷凝水槽出来的轻污冷凝水可送往苛化工段用作白泥洗涤用，或直接排去污水处理站处理。

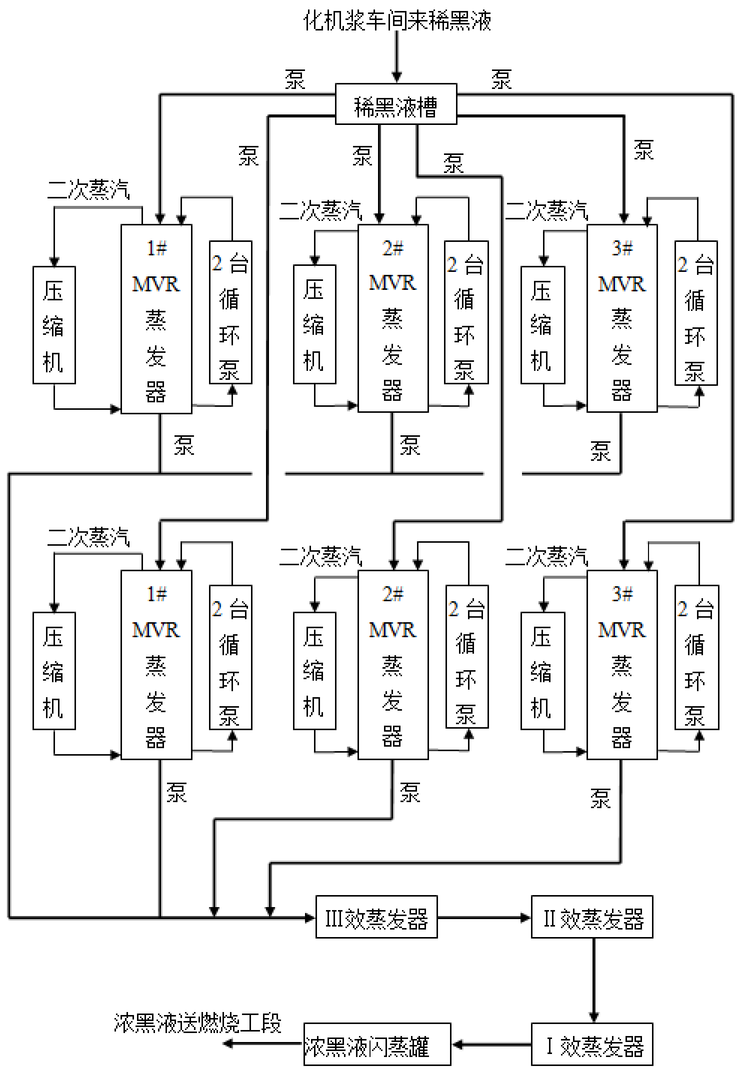
The lightly polluted condensate stored in the lightly polluted condensate tank can be sent to the causticization section for washing the white mud, or directly discharged to the sewage treatment plant for treatment.

④不凝气流程

④Non-condensable gas process

MVR 蒸发器、Ⅱ、Ⅲ效蒸发器的臭气、不凝性气体随部分蒸汽通过不凝气管道进入到表面冷凝器，由循环水泵供水冷却除去蒸汽，臭气由真空泵送往燃烧工段。

The odor and non-condensable gas from the MVR evaporator, II and III-effectevaporator are sent to surface condenser together with partial steam through the non-condensable gas pipe; the steam is removed by cooling with the water supplied by the circulating water pump, and the odor is pumped to the combustion section by the vacuum pump.


化机浆车间来稀黑液
稀黑液槽
泵
二次蒸汽
压缩机
1# MVR 蒸发器
2# MVR 蒸发器
3# MVR 蒸发器
2 台循环泵
III效蒸发器
II 效蒸发器
I 效蒸发器
浓黑液闪蒸罐
浓黑液送燃烧工段

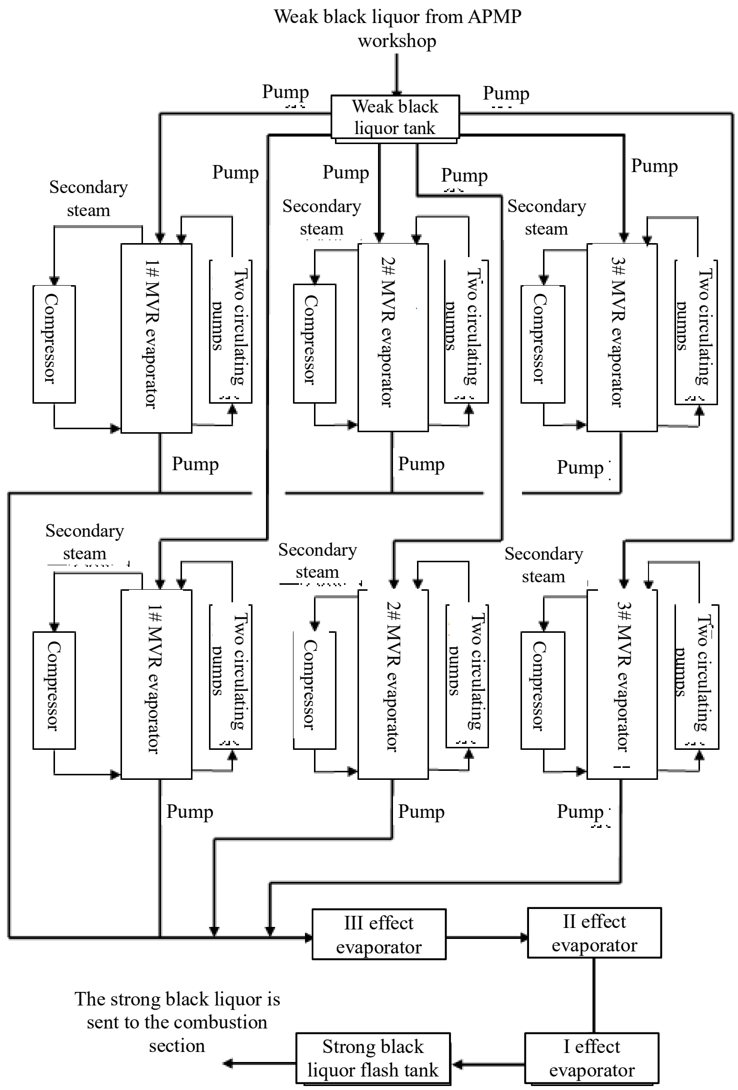


图 2.2.1-9 二期 MVR 蒸发工段工艺流程图
Fig. 2.2.1-9 Process flow of Phase II MVR evaporation section

项目MVR蒸发工段产污环节见表2.2-29。

The pollutant generation steps of the MVR evaporation section are shown in Table 2.2-29.

表 2.2-29 项目碱回收车间产污环节汇总表
Table 2.2-29 Summary of pollutant generation steps of the alkali recovery workshop

类别 Category	污染源 Source of pollution	污染物类型 Type of pollutants	治理措施 Control measures	排放去向 Discharge destination	污染源编号 Pollution source no.
废气 Exha	此工段无废气产生。 No waste gas produced in this section.				

ust gas					
废水 Waste water	蒸发器轻污冷凝水 Light pollution condensate of the evaporator	COD、BOD_5、SS等 COD, BOD_5, and SS etc.	回用于生产，多余部分进入污水处理站。 It can be recycled for production, and the excessive part may be sent to the sewage treatment plant.	废水处理达标后排入铁山港区深海排放管网系统，在铁山港B3排污口深海排放。 The sewage is discharged into the deep-sea discharge pipe network system of Tieshangang District after being processed, and then discharged into the deep sea at the sewage outlet B3 of Tieshangang.	W4-2
固废 Solid waste	此工段无固废产生。 No solid waste produced in this section.				

（2）主要工艺技术参数

(2) Main process technical parameters

（3）主要物料消耗指标

(3) Main material consumption indicators

MVR蒸发工段物料消耗情况见表2.2.1-31。

Material consumption conditions of the MVR evaporation section are shown in Table 2.2.1-31.

（4）主要设备

（4）Main equipment

2.2.2.9 生活用纸车间

2.2.2.9 Life paper workshop

（1）生活用纸车间工艺产污环节

(1) Pollutant generation steps of the life paper workshop

①备浆工段

①Pulp preparation section

外购漂白针叶木浆板运至浆板库贮存，用叉车等设备送至履带输送机，进水力碎浆机碎浆，后送过渡池贮存，然后经双圆盘磨浆机打浆后，进入叩后池；自制漂白阔叶木浆进入叩前浆池贮存，然后泵送到疏解机进行疏解打浆，打好的浆料进入叩后浆池贮存；根据抄纸的工艺要求，按浆料配比加入针叶木浆和阔叶木浆，浆料经过配浆池充分混合后再送双圆盘磨浆机匀整打浆至33～38ºSR后送成浆池贮存。然后送抄纸工段上浆系统。

The purchased NBKP boards are transported to the pulp board storage, and then to the crawler conveyor with a forklift, which would transfer the boards to the hydrapulper for repulping; the pulp would be sent to the transitional pool; later, after beating with a double-disc fiberizer, the pulp would be sent to the post-beating pool. The self-made bleached hardwood kraft pulp is first sent to the pre-beating pool for storage, and then pumped to a deflaker for defibering; the processed pulp would be sent to the post-beating pool. According to the process requirements of forming & pressing, softwood pulp and hardwood pulp at a certain proportion should be added, and after full mixing in the mixing tank, the pulp would be sent to the double-disc fiberizer to process it to 33～38ºSR; finally, the pulp would be sent to the finished pulp pool for storage. Next, the pulp can be sent to the loading system of the forming & pressing section.

生活用纸抄造需要添加的辅料有湿增强剂、起皱粘合剂、柔软剂、剥离剂等辅料，这些辅料均为袋装的粉状或颗粒状化工原料，因此均需在溶解槽搅拌溶解均匀后进入贮槽贮存，然后根据工艺要求进行计量后，在不同位置加入浆料中，以保证抄造的成品纸达到性能参数要求。

The making of life paper should be added with the following auxiliary materials: wet enhancers, wrinkle adhesives, softeners, peeling agents, all of which are powdered or granular chemical raw materials in bags, so they should be evenly dissolved in the dissolution tank before storage; after measuring according to the process requirements, the solution can be added into the pulp at different locations, to ensure that the finished paper can meet the performance parameter requirements.

白水回收采用多盘白水回收机分离回收白水中的固形物，净化清水回用。

For white water reclaiming, the multi-disc white water recycling machine is used to separate and recover the solids in white water, and purify the water for reuse.

②抄纸工段

②Forming & pressing section

本车间设计生产能力年产 15 万吨，选用两台 5600mm/2200m/min 高速卫生纸机，单台产量 6 万吨，共 12 万吨；另外再选用两台国际先进水平的 2850mm/1300m/min 高速卫生纸机，单台年产量 1.5 万吨，共 3 万吨，总产能 15 万吨。

The designed production capacity of this workshop is 150,000 tons; two 5,600mm/2,200m/min high-speed paper machines are adopted, with the output of 60,000 tons each, and 120,000 tons in total; in addition, two internationally advanced 2,850mm/1,300m/min high-speed paper machines are also arranged, with the output of 15,000 tons each, and 30,000 tons in total. All the four machines have the total capacity of 150,000 tons.

从浆料制备车间送来的浆料，经上浆泵至冲浆泵入口，用机外白水塔的浓白水冲浆后，通过压力筛筛选匀整，良浆直接进入流浆箱面，从流浆箱喷出的浆料，经新月型成型器脱水成型，再经真空压辊压榨，进入烘干部，经扬克烘缸、热风气罩干燥后，到卷纸机进行卷取，经过复卷分切后，纸卷打包入库。

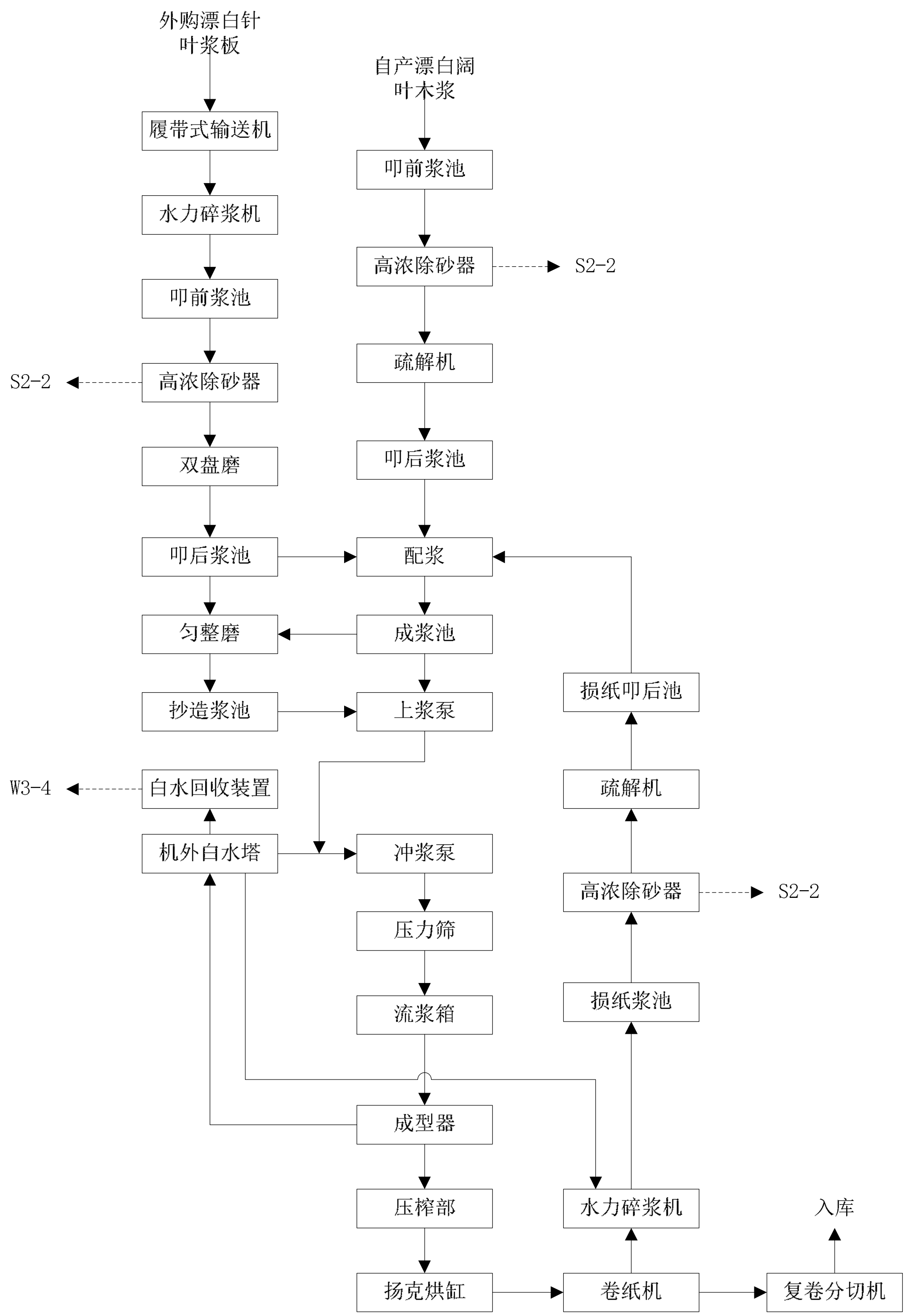
The pulp sent from the pulping workshop is pumped to the inlet of the slushing pump by a loading pulp; after flushing with the concentrated white water from the white water tower, the pulp would be evenly screened by a pressurized screen; the fine pulp would directly flow to the flow box, and the pulp from the flow box would be dewatered by a crescent shaper, pressed by a vacuum pressure roller, and sent to the drying section for drying by Yankee dryer and hot air hood; later, to the paper reeling machine for reeling; packaging & warehousing would be finally performed after reeling and cutting.

成品的定量、水分控制等采用 QCS 质量控制系统。

The QCS quality control system is adopted to control the quantification and water content of the finished paper.

损纸浆生产线：从后加工车间及卷纸机处来的损纸浆，先进入贮浆池贮存，然后经高浓除砂器除砂、疏解机疏解后，经叩后浆池按比例送至配浆，然后送上浆系统。

Broke pulp production line: The broke pulp from post-processing workshop and paper reeling machine is first stored in the pulp storage tank; then sent to the high-consistency grit separator for degritting, and to the deflaker for defibering; later, it would be sent to the lost-beating tank for pulping at a certain proportion; finally, it would be sent to the loading system.


外购漂白针叶浆板
自产漂白阔叶木浆
履带式输送机
水力碎浆机
叩前浆池
高浓除砂器
S2-2
疏解机
双盘磨
叩后浆池
配浆
匀整磨
成浆池
损纸叩后池
抄造浆池
上浆泵
W3-4
白水回收装置
机外白水塔
冲浆泵
压力筛
损纸浆池
流浆箱
成型器
压榨部
水力碎浆机
入库
扬克烘缸
卷纸机
复卷分切机

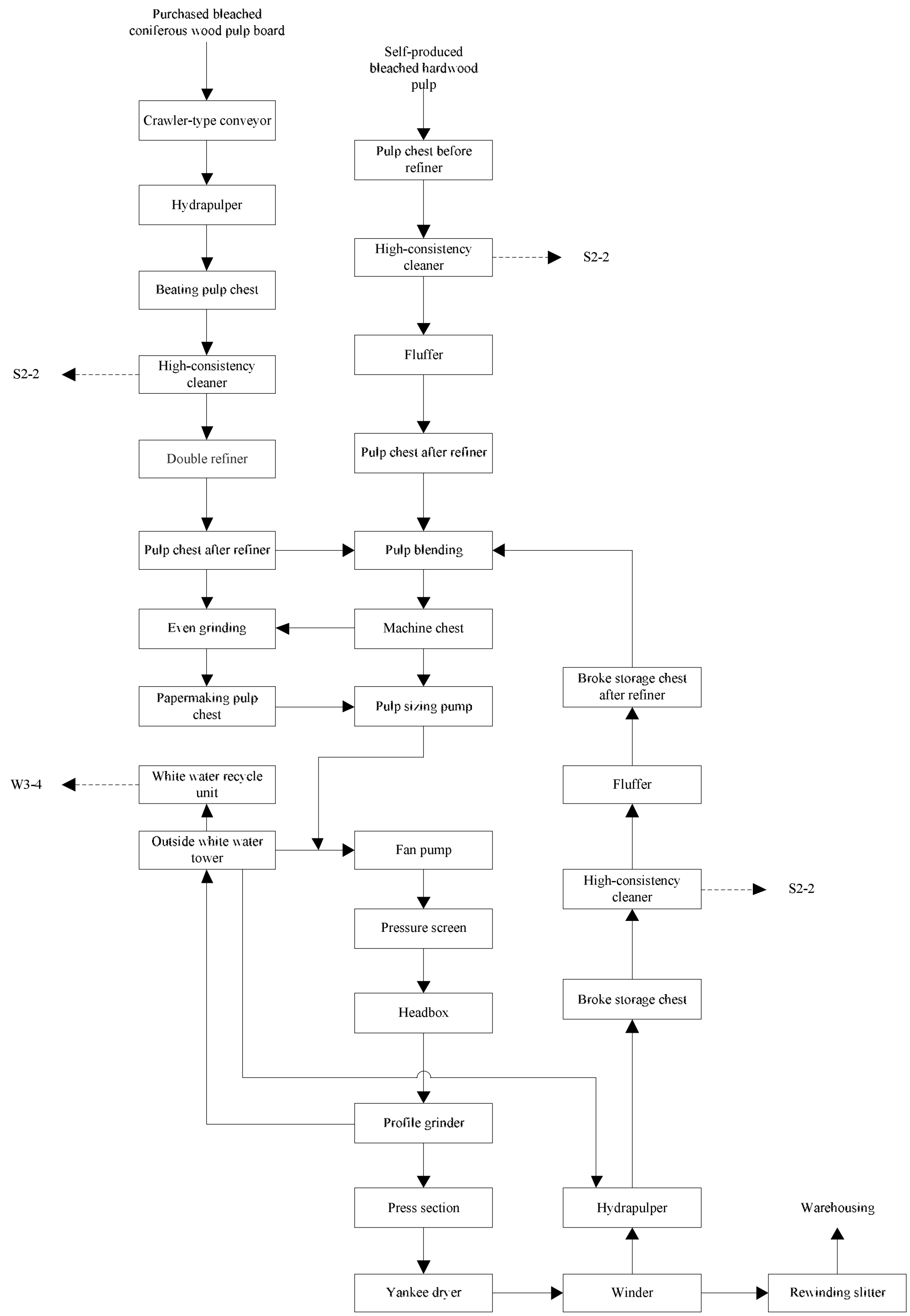


图 2.2.1-10 二期生活用纸生产工艺流程图

Fig. 2.2.1-10 Process flow of Phase II life paper production

项目生活用纸车间产污环节见表2.2.1-33。

The pollutant generation steps of the life paper workshop are shown in Tables 2.2.1-33.

表 2.2.1-33 项目生活用纸车间产污环节汇总表
Table 2.2.1-33 Summary of pollutant generation steps of the life paper workshop

类别 Category	污染源 Source of pollution	污染物类型 Type of pollutants	治理措施 Control measures	排放去向 Discharge destination	污染源编号 Pollution source no.
废气 Exhaust gas	本工段基本无废气产生。No waste gas produced in this section.				
废水 Waste water	白水回收系统 White water recovery system	COD、SS、氨氮等 COD, SS, ammonia nitrogen, etc.	进入污水处理站。Enter the sewage treatment plant.	废水处理达标后排入铁山港区深海排放管网系统，在铁山港B3排污口深海排放。The sewage is discharged into the deep-sea discharge pipe network system of Tieshangang District after being processed, and then discharged into the deep sea at the sewage outlet B3 of Tieshangang.	W3-4
固废 Solid waste	除砂器 Grit separator	浆渣 Slag residue	送至固废综合利用锅炉焚烧。Transferred to solid waste comprehensive utilization boiler for incineration.	焚烧处置。Incineration.	S2-2

（2）主要工艺技术参数

(2) Main process technical parameters

（3）主要物料消耗指标

(3) Main material consumption indicators

（4）主要设备

（4）Main equipment

2.2.2.10 特种纸车间

2.2.2.10 Special paper workshop

本特种纸项目分为两个车间，一个车间生产涂布类特种纸，年产量约为 45 万吨，主要产品为淋膜原纸/淋膜纸、标签纸、烟包用纸、艺术纸、广告用纸、彩色喷墨打印纸

/相册纸、数码打印纸等。另一个特种纸车间为生产食品级离型原纸，年产量5万吨。

This special paper project is divided into two workshops, one of which is used to produce the coating-type special paper, with the annual yield of 450,000 tons, including coated base paper/coated paper, label paper, cigarette package paper, art paper, advertising paper, color inkjet printing paper/photo album paper, and digital printing paper, etc. The other of which mainly produces food-grade release paper, with the annual yield of 50,000 tons.

（1）45万吨特种纸（涂布类）车间

(1) Special paper (coating-type) workshop of 450,000 tons

1）涂布类特种纸简介

1) Introduction of coating-type special paper

主要生产产品为淋膜原纸/淋膜纸、标签纸、烟包用纸、艺术纸、广告用纸等。

Main products include coated base paper/coated paper, label paper, cigarette package paper, art paper, and advertising paper, etc.

①淋膜原纸/淋膜纸："淋膜纸就是将塑料粒子通过流延机涂覆在纸张表面的复合材料，主要特点就是此复合材料可以防油、防水（相对的）、可以热合。 不同的用途取其不同的特点： 当用于包装汉堡时，取其防油特性。麦当劳是80度的食用植物油10分钟不漏油。 当用于铜版纸令包装时，取其防水的特性。 当用于自动包装机包装时，取其可热合的特性。"淋膜原纸/淋膜纸的原料为针叶木浆NBKP（外购商品浆板）、阔叶木浆LBPK（外购商品浆板或自制）、阔叶APMP（商品浆或自制）。

①Coated base paper/coated paper: "Coated paper refers to a composite material coating plastic particles on the surface of the paper with a casting machine, which has the advantages of grease proofing and water proofing (relative); such paper can be heat-sealed. Different uses may make use of different characteristics: When it is used for packaging burgers, its grease proofing characteristic is used. The standard of McDonald's is that the paper leaks no edible vegetable oil at 80 degrees for 10 min. When the coated paper is used, the water proofing characteristic is used. When it is used by an automatic packaging machine, the characteristic of heat seal is used." Raw materials include NBKP (purchased pulp board), LBPK (purchased or self-made pulp board), and APMP (commercial or self-made pulp).

②标签纸：随着市场经济的深入发展，商品从生产到消费全过程的信息管理已经发展成熟，并随着市场竞争的加剧，商家更加注重商品从生产到售后产品信息的追踪，在这一过程中能实现信息传递所依赖的就是标签。标签用纸对纸张强度、定量、厚度均一性、适印性、尺寸稳定性、外观白度、光泽度、平滑度等质量指标要求较高，对设备和技术含量的要求较高。标签用纸的原料为针叶木浆 NBKP（外购商品浆板）、阔叶木浆 LBPK（外购商品浆板或自制）、阔叶 APMP（商品浆或自制）。

②Label paper: With the in-depth development of the market economy, the information management of commodities from production to consumption has been mature. With the intensification of market competition, the merchants have paid more attention to the tracking of product information from production to after-sales. In this process, information transfer relies on label. Label paper has high requirements for quality indicators such as paper strength, quantification, thickness uniformity, printability, dimensional stability, appearance whiteness, glossiness, and smoothness, and also has high requirements for equipment and technical content. Raw materials of label paper include NBKP (purchased pulp board), LBPK (purchased or self-made pulp board), and APMP (commercial or self-made pulp).

③烟包用纸：荧光增白剂是一种荧光染料，是一种复杂的有机化合物，能显著提高纸张的白度，所以被广泛应用于造纸行业中。但近几年人们发现荧光增白剂含有的苯、萘、恶唑、噻吩等基团如果进入人体，对人体健康有很大害处。随着人们环保意识的加强，对用于香烟包装纸提出了更高的环保要求。为满足市场需求，太阳纸业准备开发生产绿色、健康、环保的无荧光铜版纸作为烟包用纸。烟包用纸的原料为针叶木浆 NBKP（外购商品浆板）、阔叶木浆 LBPK（外购商品浆板或自制）。

③Cigarette package paper: Fluorescent brightener is a type of fluorescent dye and a complex organic compound, which can significantly improve the whiteness of paper, so it can be widely used in the paper industry. But in recent years, people have found that the benzene, naphthalene, oxazole, and thiophene contained in flourescent brightener are harmful to human health. With the strengthening of awareness of environmental protection, the public has put forward higher environmental protection requirements for cigarette package paper. In order to meet the market demand, Sun Paper plans to develop and produce green, healthy and environmentally friendly non-fluorescent coated paper as cigarette package paper. Raw materials of cigarette package paper include NBKP (purchased pulp board), and LBPK (purchased or self-made pulp board).

④艺术纸：艺术纸的表面经过微涂处理，具有纤维特有的自然原生纹理，且纹理清雅，品质超群，松厚度高，粗而不糙，印刷效果更加清晰，画面更加亮丽，印刷后表现的色彩层次丰富，立体感增强，视觉柔和不刺眼。符合现今读者视觉上追求的舒适感。因而这种铜版纸可广泛地用来印刷画报、广告、风景画、精美挂历、人物摄影图等。艺术纸最大的特点是纸的表面经过涂布处理,没有印刷的地方显哑色，而印刷的地方显示光亮的色泽；超感纸具有毛绒感觉的自然纹理表面，并且颜色淡雅、自然、立体美感、反射光减少、不刺眼、视觉柔美、舒服；另外超感纸多用于各类高档宣传画册、样本、书籍、风景画、精美挂历、人物摄影图等，故对于纸张强度、定量、厚度均一性、适印性、尺寸稳定性等要求高，所以对设备和技术含量的要求较高。艺术纸的原料为针叶木浆 NBKP（外购商品浆板）、阔叶木浆 LBPK（外购商品浆板或自制）、阔叶 APMP（商品浆或自制）。

④Art paper: The surface of art paper is slightly coated, with natural texture of fiber; it is coarse but not rough, and has the following advantages: elegant texture, high quality, high thickness, better printing effect, brighter picture, rich color layers after printing, enhanced three-dimensional sense, and softness but not dazzling. It can provide the visual comfort that the readers want to have. Therefore, such coated paper can be widely used for printing pictorials, advertisements, landscape paintings, exquisite calendars, and photographs. The biggest characteristic of art paper is that its surface is coated; the unprinted part shows a dull color, and the printed part shows a bright color; the super-sense paper has natural texture with a feeling of plush, and its color is elegant, natural, three-dimensional, reduced reflected light, not dazzling, visually soft and comfortable; in addition, the super-sense paper is mainly used to print various high-end publicity brochures, samples, books, landscape paintings, exquisite calendars, and photographs, so it has high requirements for paper strength, quantification, thickness uniformity, printability, dimensional stability, and also has high requirements for equipment and technical content. Raw materials of art paper include NBKP (purchased pulp board), LBPK (purchased or self-made pulp board), and APMP (commercial or self-made pulp).

⑤广告用纸：广告用纸多指涂布纸。海报最常用涂布纸，印刷效果比较好，大多数画册宣传单都是涂布纸； 还有的就是书写纸，像单色的文字宣传单均可采用。彩页、台历等也大多采用涂布艺术纸。因其印刷效果较好，色彩艳丽，印刷表面光泽度高，表面平滑，色彩细腻。图像更具立体感。广告用纸的原料为针叶木浆 NBKP（外购商品浆板）、阔叶木浆 LBPK（外购商品浆板或自制）、阔叶 APMP（外购商品浆板或自制）

⑤Advertising paper: it refers to coated paper. The posters are usually printed with coated paper, which has better printing effect; most of the brochures are printed with coated paper; in addition, writing paper can be used to print single-color text leaflet. Color pages and desk calendars are also usually printed with coated art paper. Because it has good printing effect, bright color, high glossiness, smooth surface, and exquisite color. The image is more three-dimensional. Raw materials of advertising paper include NBKP (purchased pulp board), LBPK (purchased or self-made pulp board), and APMP (commercial or self-made pulp).

⑥彩色喷墨打印纸/相册纸：相册纸/彩色喷墨打印纸是一种新型记录纸，利用其打印的图像清晰亮丽、色彩鲜艳饱满、层次丰富、光泽好，有良好耐光性和色牢度，有照片一样的光泽，纸的白度极高，有良好的吸墨性，适于色彩鲜明、有照像画面效果的图像输出。有良好耐光性。特别适用于照片影像输出和广告展示版制作。

⑥Color inkjet printing paper/photo album paper: Photo album paper/color inkjet printing paper is a new type of recording paper. The images printed with such paper are clear and light, bright and rich in color, rich in layers, nice in gloss, light resistance and color fastness, photo-like gloss, high whiteness, and nice ink absorption; therefore, it is suitable for printing the images of vivid color and photo-like effect. It has nice light resistance. It is especially suitable for printing photo images and advertisement display.

相册纸/彩色喷墨打印纸与一般纸张有很大区别，这是因为彩色喷墨印刷通常使用水性油墨，而一般纸张接受到水性油墨后会迅速吸收扩散，结果无论从色彩上还是从清晰度上都达不到印刷要求(使用吸水性差的材料又不能吸收油墨)；彩色喷墨打印纸是纸张深加工的产物，它是将普通印刷用纸表面经过特殊涂布处理，使之既能吸收水性油墨又能使墨滴不向周边扩散，从而完整地保持原有的色彩和清晰度。

Photo album paper/color inkjet printing paper is greatly different from ordinary paper, because color inkjet printing mainly adopts water-based ink; if water-based ink is used on ordinary paper, it would be quickly absorbed and diffused, and cannot meet the printing requirements for color and definition (materials with poor water absorption cannot absorb ink); color inkjet printing paper is the product of deep processing, namely special coating treatment on the surface of ordinary printing paper, which can make the paper absorb water-based ink and prevent the ink droplets from spreading, thus completely maintaining the original color and definition.

相册纸/彩色喷墨打印纸是喷墨打印机喷嘴喷出墨水的接受体，在其上面记录图像或文字。它的基本特性是吸墨速度快、墨滴不扩散。具体要求及其特点如下：a.有良好的记录性，吸墨力强、吸墨速度快、墨滴直径小，形状近似圆形；b.记录速度快，即密度高、阶调连续、画面清晰；c.保存性好，画面有一定耐水性、耐光性，在室内或室外有一定的保存性及牢度；d.涂层有一定牢度和强度，涂层不易划伤、无静电，有一定滑度、耐弯曲、耐折抻。

Photo album paper/color inkjet printing paper is the receiver of the ink from ink-jet printer, and can be used to record images or text. Its basic characteristics include fast ink absorption and no diffusion of ink droplets. Specific requirements and characteristics: a.Good recordability, strong ink absorption, fast ink absorption, small ink drop diameter, and approximately circular shape; b. Fast recording, high density, continuous tone, and clear image; c. Good preservation, certain water resistance and light resistance of images, certain preservation and fastness indoors or outdoors; d. Certain fastness and strength of coating, without easy scratching, without static electricity, certain slippery degree, bending resistance and folding resistance.

⑦数码打印纸：数码打印纸用于高速喷墨印刷，由于具有以下优势：没有起印量的限制。周期短、交货快。无需制版，短版成本低。数字控制模式。印料浪费少。自动化程度高，印刷环节简化。满足个性化需求。

⑦Digital printing paper: digital printing paper is mainly used for high speed ink-jet printing, and there is no limit on the amount of printing due to the following advantages: Short cycle, fast delivery. No plate-making, low cost of short plate. Digital control mode. Less waste of printing materials. High degree of automation and simplified printing process. Meet individual requirements.

2） 生产方法及工艺流程选择

2) Selection of production methods and technical processes

涂布类特种纸车间包括浆料处理工段、涂料制备工段、抄纸工段和完成工段。

The coating-type special paper workshop includes the pulp treatment section, coating preparation section, forming & pressing section and completion section.

①浆料处理工段

①Pulp treatment section

浆料处理工段将自产的漂白阔叶木浆自制化机浆，以及市场采购的商品漂白硫酸盐针叶木浆（NBKP）进行碎解、磨浆和净化，以特定比例进入混合浆池进行配浆。

In the pulp treatment section, the self-made bleached hardwood kraft pulp, self-made APMP and the purchased NBKP are crushed, refined and purified, and put into the mixing pool at a specific ratio for mixing.

自制漂白阔叶木浆至贮浆槽贮存，然后送磨浆机串联打浆，在叩后浆槽贮存；自制化机浆至贮浆槽贮存，然后送疏解机疏解，在叩后浆槽贮存；外购漂白针叶木浆板则在水力碎浆机碎解后，经双圆盘磨浆机打浆处理，进入叩后池；打好的浆料再与抄纸工段来的损纸浆及辅料一起按一定的配比连续配浆后送成浆池，在抄造浆池加入填料、助剂后送抄纸工段调浆箱。

The self-made bleached hardwood kraft pulp is stored in the storage tank, then transferred to the fiberizer for beating, and stored in the post-beating storage tank; the self-made APMP is stored in the storage tank, and then sent to the defibering machine for defibering, and stored in the post-beating storage tank; the purchased NBKP boards are crushed by a hydrapulper and beat by a double-disc fiberizer, and then transferred into the post-beating pool; the processed pulp is mixed with the broke pulp and auxiliary materials from the forming & pressing section at a certain ratio, and sent to the forming pool; after adding the filler and additives, the mixture is sent to the pulp mixing tank of the forming & pressing section.

②涂料制备工段

②Coating preparation section

本工段主要制备涂料供抄纸工段涂布使用。

This section mainly prepares coatings for the forming & pressing section.

本项目使用的涂料配方主要成分为颜料，颜料一般是碳酸钙和少量瓷土，以无机物为主，其他为有机助剂。涂布配方如下：

The main components of coatings used in the Project are pigments, including calcium carbonate and a small amount of porcelain clay, mainly inorganic substances, as well as organic additives. The coating formula is:

涂料配制由矿物颜料的分散开始。最常使用的矿物颜料包括瓷土和碳酸钙。颜料的分散过程借助分散剂来完成。被分解的颜料浆料被转移到储藏容器中。

The preparation of coating starts from dispersion of mineral pigments. The most commonly used mineral pigments include porcelain clay and calcium carbonate. Pigment dispersion may be completed with the help of dispersants. The decomposed pigment and pulp are transferred to storage containers.

涂料配制还需要添加剂，如可溶性粘合剂。可溶性粘合剂可以是天然或合成的大分子，如淀粉、羧甲基纤维素、聚乙烯醇。

The preparation of coating requires the addition of additives, such as soluble binders. Soluble binders can be the materials with natural or synthetic macromolecules, such as starch, carboxymethyl cellulose, and polyvinyl alcohol.

涂料配制的重要一步是添加胶乳，如苯乙烯丁二烯共聚物、聚醋酸乙烯胶粘剂和丙烯酸类胶乳。

An important step for the preparation of coating is to add latex, such as styrene-butadiene copolymer, polyvinyl acetate adhesive and acrylic latex.

接下来的步骤就是添加不同的助剂，如用来减少压光机上灰尘的润滑剂，用来提高纸张表面湿强度的湿强剂，抑制涂料气泡的抑泡剂等。涂料的 pH 值和固含量调整到设定的数值后，涂料被转移到储藏容器里。

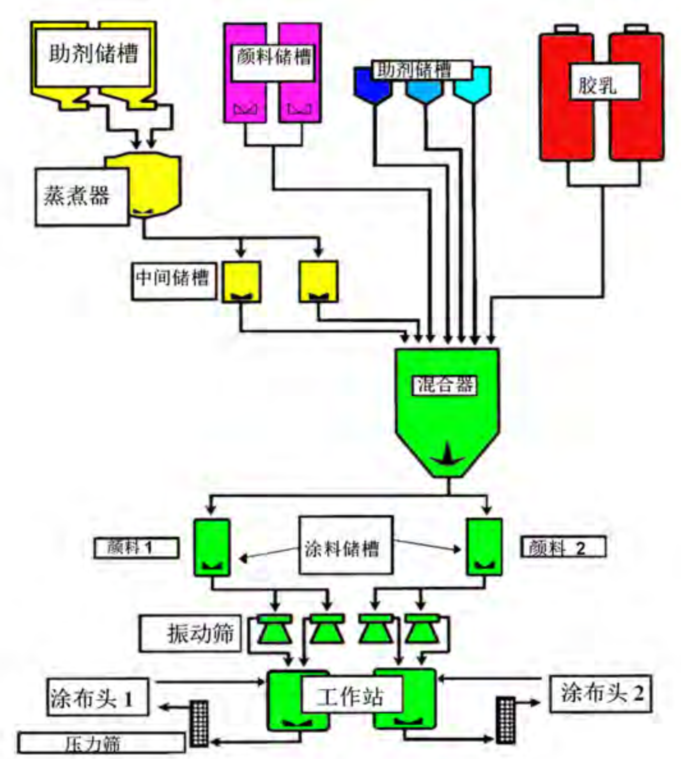
The next step is to add different additives, such as the lubricant for reducing dust on the calender, wet strength agent for improving the wet strength of the paper surface, and foam inhibitor for suppressing paint bubbles. The pH value and solid content are adjusted to the set values, and the coatings are transferred to the storage container.

涂布过程中，涂料的流动过程大体如下：涂料从储存槽转移到涂布机上具有分级控制的小槽中，然后通过气压过滤器过滤其中的大颗粒残余物，然后涂料被泵送至涂布装置，剩余的涂料则被回流至涂布机中。涂料里一般会有2%~10%的量会最终留在纸面上，回流的涂料则被循环利用。

During coating, the flow process is generally as follows: The coating is transferred to the small tanks of the coater under hierarchical control from the coating tank, and the pneumatic filter is used to filter large-particle residues; then the coating is pumped to the coating device; and the remaining coating is transferred back to the coater. Generally, 2%~10% coating would remain on the paper, and the recirculated coating would be recycled.

涂布作业是一个封闭的系统，如流程图所示，生产中涂料在生产线上不断回流，循环利用的，属于零排放系统，基本无污染物排放，涂料主要成分为碳酸钙和瓷土，制备过程需要少量助剂为有机物，产生少量散逸挥发性气体以无组织形式在车间内排放。

Coating operation is a closed system. As shown in the flow chart, the coating is continuously refluxed and recycled during production on the production line, so it is a zero-emission system, and there are basically no pollutants. Main components of the coating include calcium carbonate and porcelain clay; a small amount of additives during preparation are organic substances, and a small amount of volatile gas is emitted in the workshop in a fugitive form.



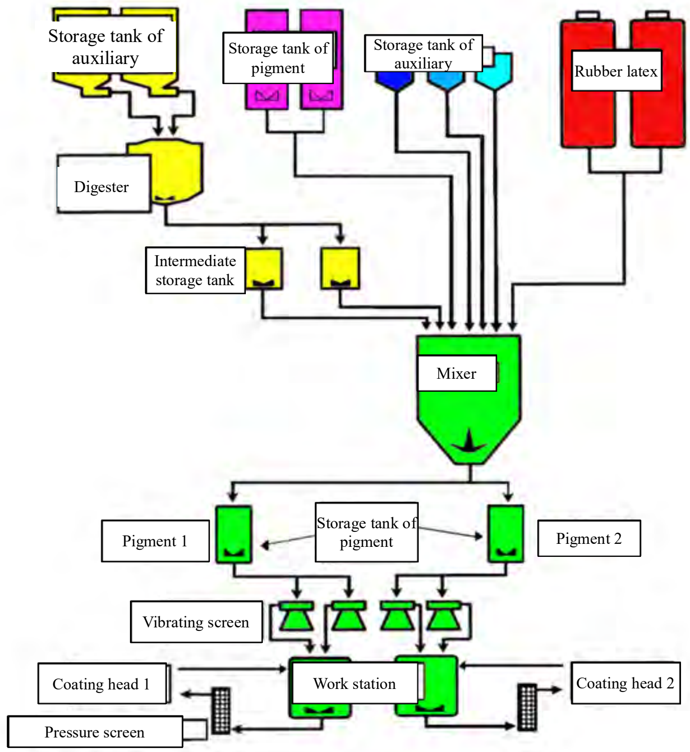


图 2.2.1-11　涂料制备生产工艺流程图
Fig. 2.2.1-11 Process flow of coating preparation

③抄纸工段

③Forming & pressing section

由浆料处理工段成浆池泵送过来的浆料送至纸机浆池，经过冲浆、一级六段低浓除砂、一级二段压力筛选，进入流浆箱上网，浆料上网后，经立式夹网成形器、靴型压榨、干燥、表面施胶、干燥、软压光机处理后，进行卷纸。卷纸机下来的纸卷，送完成工段。纸机各部分的湿损纸和干损纸分别在各自的损纸池和水力碎浆机中碎解后，经泵送至浆料处理工段的损纸处理系统。

The pulp formed in the pulp treatment section is pumped to the pulp pool of the paper machine; after flushing, one-grade six-stage low-concentration sand removal, one-grade two-stage pressurized screening, it is transferred to the flow box for meshing, forming by the vertical former, boot pressing, drying, surface sizing, drying, and soft calendering, and then the paper can be rolled. The rolled paper is sent to the completion section. The wet broke and dry broke at each part of the paper machine are respectively crushed in the respective pool and hydrapulper, and then pumped to the broke treatment system of the pulp treatment section.

造纸机：采用5000mm/1800m/min长网多缸文化纸机，带机内涂布。

Paper machine: The 5000mm/1800m/min long-net multi-cylinder cultural paper machine (with internal coating) is used.

④完成工段

④Completion section

为了适应市场需要，本工段考虑平板纸和卷筒纸两个系统。生产卷筒纸时经复卷机复卷、称重、包装和封头后入库。生产平板纸时则先经切纸、选纸，然后打包入库。成品库设置在完成工段后。

In order to meet the market demand, this section considers two systems for sheet paper and web. The web is rolled by a re-reeling machine, then weighed, packaged and sealed, and finally stored in the storehouse. The production of sheet paper follows the procedure of cutting, selecting, packaging and warehousing. The finished goods warehouse is set after the completion section.

另外抄纸工段还配有表面施胶制备系统、真空系统、蒸汽冷凝水系统、压缩空气系统、清水系统、白水系统等辅助系统。

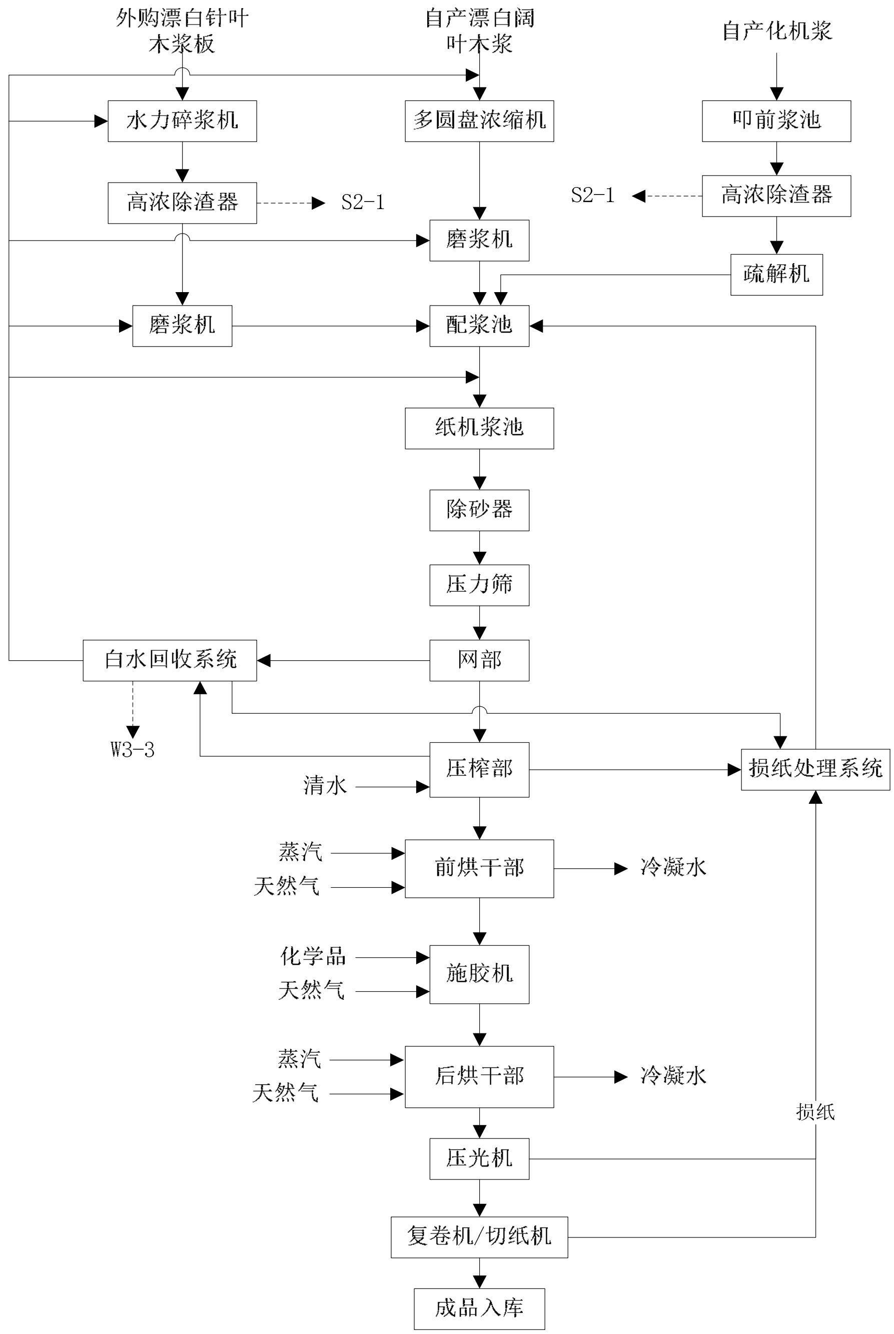
In addition, the forming & pressing section is also equipped with several auxiliary systems, including surface sizing preparation system, vacuum system, steam condensate system, compressed air system, clean water system, and white water system.

⑤白水回收间

⑤White water reclaiming room

白水回收采用多盘式纤维回收机分离回收白水中的固形物，净化清水回用。

For white water reclaiming, the multi-disc fiber recycling machine is used to separate and recover the solids in white water, and purify the water for reuse.


外购漂白针叶木浆板
自产漂白阔叶木浆
自产化机浆
水力碎浆机
多圆盘浓缩机
叩前浆池
高浓除渣器
S2-1
S2-1
高浓除渣器
磨浆机
疏解机
磨浆机
配浆池
纸机浆池
除砂器
压力筛
白水回收系统
网部
W3-3
压榨部
损纸处理系统
清水
蒸汽
天然气
前烘干部
冷凝水
化学品
天然气
施胶机
蒸汽
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成品入库

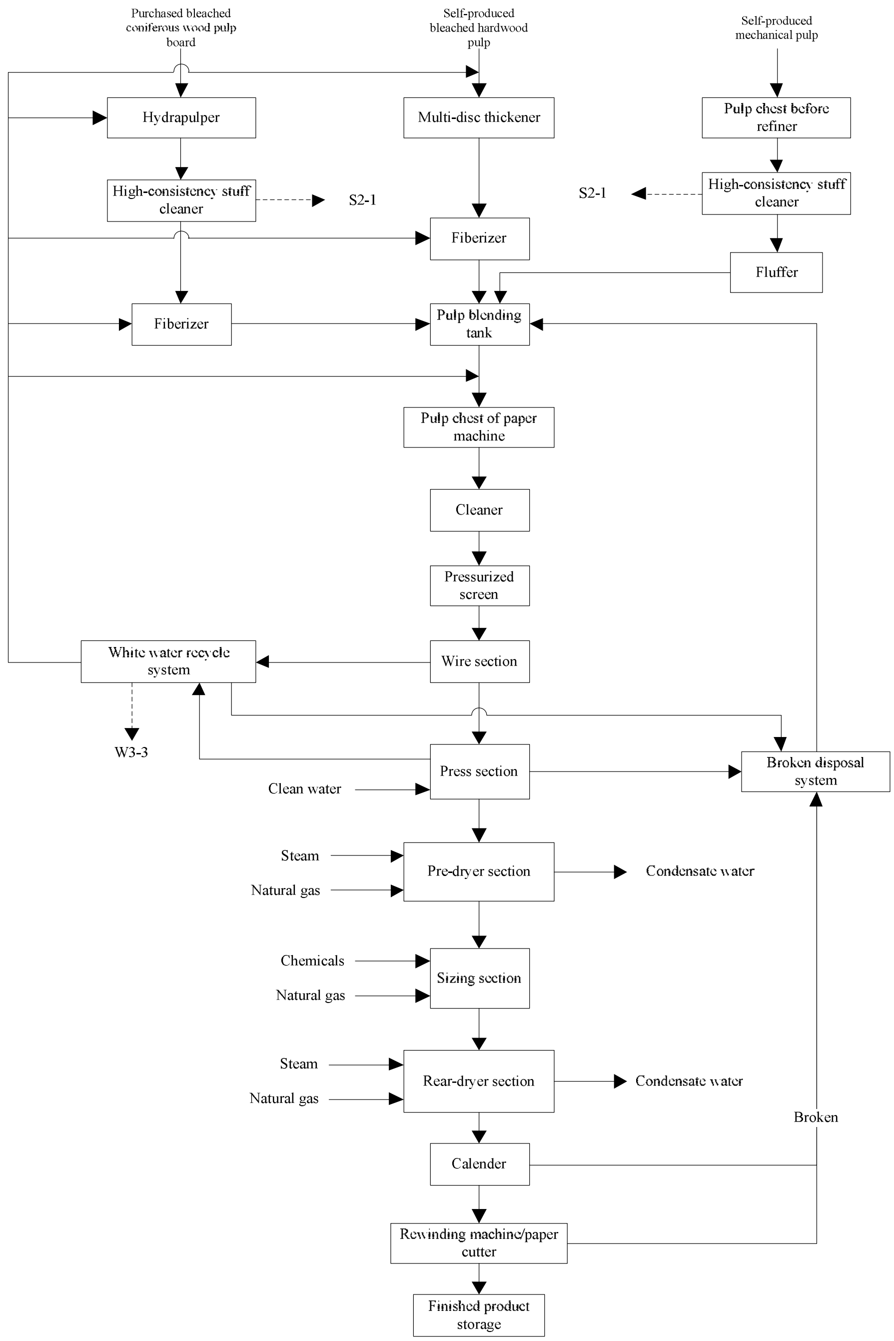


图 2.2.1-11 45 万吨特种纸生产工艺流程图

Fig. 2.2.1-11 450,000 tons special paper process flow

项目特种纸车间产污环节见表2.2.1-38。

The pollutant generation steps of the special paper workshop are shown in Table 2.2.1-38.

表 2.2.1-38 项目特种纸车间产污环节汇总表

Table 2.2.1-38 Summary of pollutant generation steps of the special paper workshop

类别 Category	污染源 Source of pollution	污染物类型 Type of pollutants	治理措施 Control measures	排放去向 Discharge destination	污染源编号 Pollution source no.
废气 Exhaust gas	涂料制备等过程 Coating preparation and other processes	挥发性有机物（VOCs） Volatile organic compound (VOCs)	涂布作业是一个封闭的系统，少量散逸挥发性气体以无组织形式在车间内排放。 Coating operation is a closed system, and a small amount of volatile gas is emitted in the workshop in a fugitive form.	通过车间换气排放。 It is discharged through ventilation of the workshop.	Gu3
废水 Waste water	白水回收系统 White water recovery system	COD、SS、氨氮等 COD, SS, ammonia nitrogen, etc.	进入污水处理站。 Enter the sewage treatment plant.	废水处理达标后排入铁山港区深海排放管网系统，在铁山港B3排污口深海排放。 The sewage is discharged into the deep-sea discharge pipe network system of Tieshangang District after being processed, and then discharged into the deep sea at the sewage outlet B3 of Tieshangang.	W3-3
固废 Solid waste	高浓除渣器 High-consistency slag separator	浆渣 Slag residue	送至固废锅炉车间焚烧。 Transported to solid waste boiler workshop for incineration.	焚烧处置。 Incineration.	S2-1

3）主要工艺技术参数

3) Main process technical parameters

4）主要物料消耗指标

4) Main material consumption indicators

5）主要设备

5) Main equipment

（2）5万吨特种纸（食品级离型原纸）车间

(2) Special paper (food-grade release paper) workshop of 50,000 tons

1）食品级离型原纸简介

1) Introduction of food-grade release paper

离型纸是一种防粘纸，离型纸由离型原纸经淋膜制成。本项目生产食品级林型原纸。

Release paper is a type of separate paper, which is produced by laminating of release base paper. The Project mainly produces food-grade release paper.

原料为针叶木浆NBKP（外购商品浆板）、阔叶木浆LBPK（外购商品浆板或自制）。

Raw materials include NBKP (purchased pulp board), and LBPK (purchased or self-made pulp board).

2） 生产方法及工艺流程选择

2) Selection of production methods and technical processes

涂布类特种纸车间包括浆料处理工段、抄纸完成工段。

The coating-type special paper workshop includes the pulp treatment section, and paper-making completion section.

生产过程的第一步是将外购的商品浆板送入水力碎浆机，在碎浆机内加入适量的白水进行碎解。经过水力碎浆机碎解后纸浆再经过锥型磨浆机进行磨浆，使纸浆的纤维形态适合抄纸机的抄造。磨浆机处理过的原生浆和压力筛处理过的损纸浆经过混合后送到纸机进行抄造。纸机为单层长网纸机，干部为一个扬克缸和四个调态小烘缸，抄造后的成品纸再经复卷机进行复卷分切，分切后的纸卷包装后送到成品库。

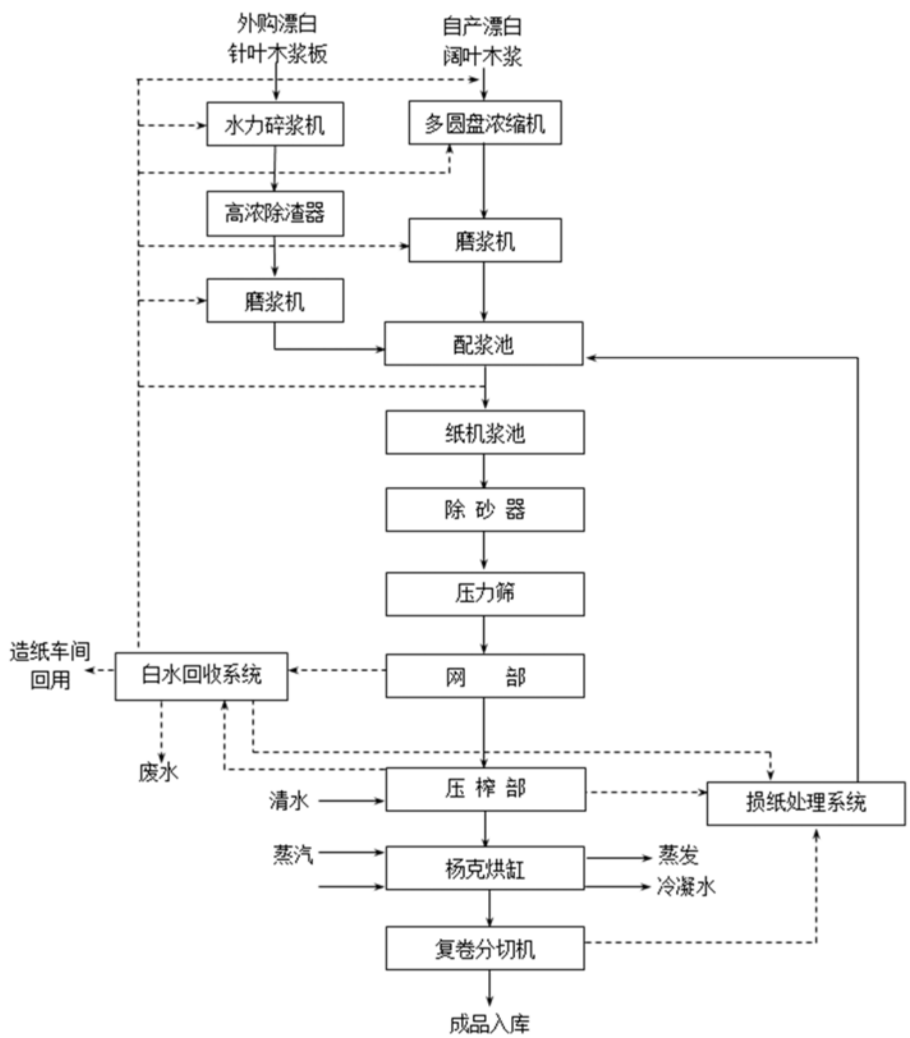
The first step of production is to send the purchased pulp board to the hydrapulper, and add an appropriate amount of white water for crushing. The pulp processed by the hydrapulper is refined by a cone-type fiberizer, to make the fiber shape more suitable for forming & pressing. The raw pulp processed by the fiberizer and broke pulp processed by the pressurized screen are mixed and sent to the paper machine for forming & pressing. The paper machine is a single-layer long-mesh paper machine; the dry part consists of one yankee dryer and four adjustable small dryers; the finished pater after forming & pressing is then rolled and cut by the re-reeling machine, the scrolls are finally packaged and sent to the finished goods warehouse.

造纸机：采用 4800mm/800m/min 单层长网纸机，干部为一个扬克缸和四个调态小烘缸。

Paper machine: A 4,800mm/800m/min single-layer long-mesh paper machine; its dry part consists of one yankee dryer and four adjustable small dryers.

白水回收采用多盘式纤维回收机分离回收白水中的固形物，净化清水回用。该设备操作简单，生产效率高，占地面积少。

For white water reclaiming, the multi-disc fiber recycling machine is used to separate and recover the solids in white water, and purify the water for reuse. The equipment is simple in operation, with high production efficiency and small floor area.



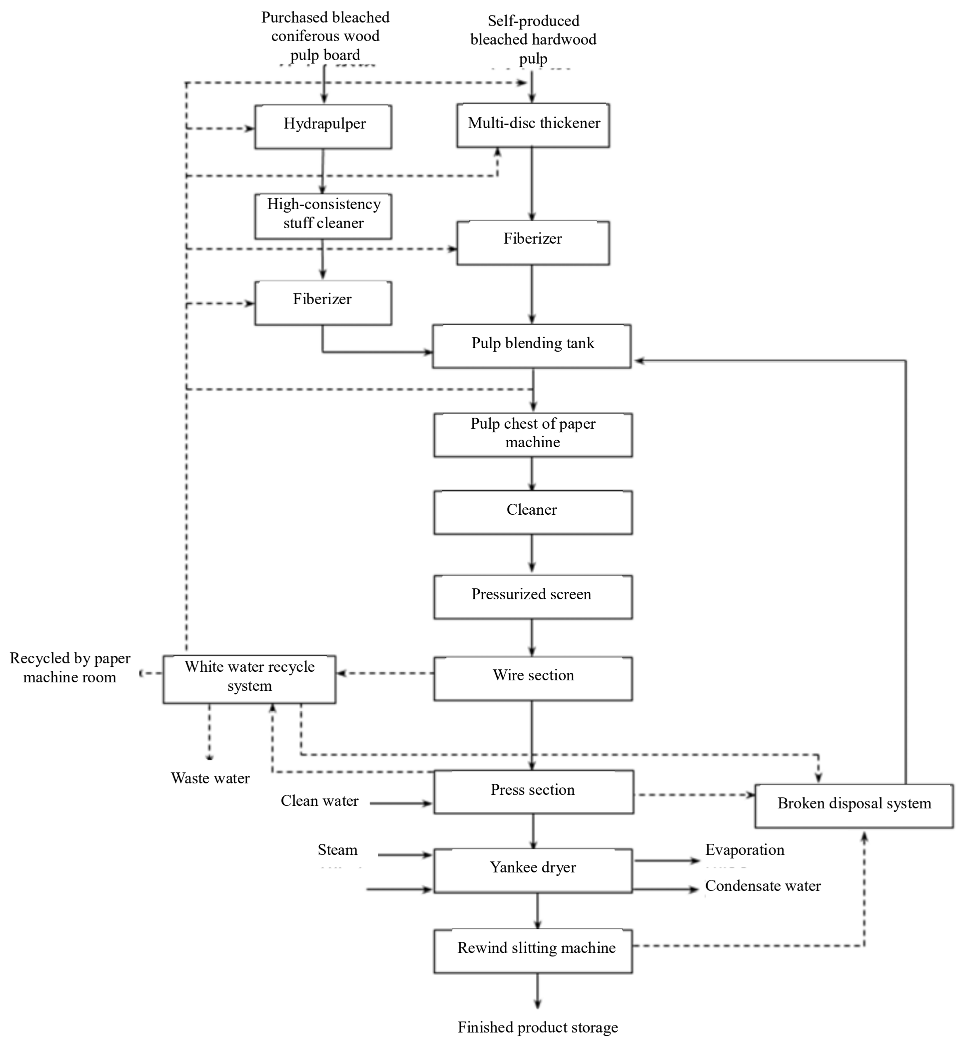


图 2.2.1-11　5 万吨特种纸生产工艺流程图
Fig. 2.2.1-11 50,000 tons special paper process flow

3）主要工艺技术参数

3) Main process technical parameters

特种纸车间主要工艺技术指标见表 2.2.1-42。

Main process technical parameters of the special paper workshop are shown in Table 2.2.1-42.

4）主要物料消耗指标

4) Main material consumption indicators

特种纸车间物料消耗情况见表 2.2.1-43。2.2.2.11 白卡纸车间

Material consumption conditions of the special paper workshop are shown in Table 2.2.1-43. 2.2.2.11 Ivory board workshop

（1）白卡纸车间工艺产污环节

(1) Pollutant generation steps of the ivory board workshop

白卡纸车间包括备浆工段、抄纸工段和 GCC（碳酸钙研磨）工段、CK（涂料制备）工段、湿端化学品工段。

The ivory board workshop consists of pulp preparation section, forming & pressing section and GCC (Ground Calcium Carbonate) section, CK (coating preparation) section, and wet-end chemical section.

①备浆工段

①Pulp preparation section

根据生产规模及产品的原料结构，备浆工段设置一条外购漂白针叶木浆板处理线、一条自制阔叶木浆生产线、一条自制化机浆生产线。各生产线处理能力和处理方法具体见表 2.2.1-44。

According to the production scale and raw material structure of product, the pulp preparation section sets a purchased NBKP board processing line, a self-made hardwood pulp production line, and a self-made APMP production line. The processing capacity and processing method of each production line are shown in Table 2.2.1-44.

外购针叶木浆生产线：漂白商品针叶木浆板经自动解包和除铁丝后用链板机输送至水力碎浆机中碎解，碎解好的浆料由泵送至卸料浆塔，泵入高浓除砂器，良浆进入叩前浆池，再由浆泵送至磨浆机打浆（3 台串联磨浆），合格浆料进入叩后浆池贮存，最后用浆泵送至配浆池进行配浆。

The purchased NBKP production line: The NBKP pulp boards are sent to the hydrapulper by a chain conveyer after automatic unpacking and removal of the wires; the processed pulp is pumped to the unloading tower, and then pumped to the high-consistency grit separator; the fine pulp would be sent to the pre-beating tank, and then pumped to the fiberizer (3 sets in series3); the qualified pulp would be sent to the post-beating tank for storage, and pumped to pulp blending tank for blending.

自制漂白阔叶木浆生产线：自制漂白阔叶木浆管道送至卸料浆塔，泵入高浓除砂器，良浆进入叩前浆池，再用浆泵送至 2 台串联磨浆机（共四组）磨浆，合格浆料进入叩后浆池贮存，最后用浆泵送至配浆池进行配浆。

The self-made bleached hardwood kraft pulp production line: The self-made bleached hardwood kraft pulp is sent to the unloading tower through a pipeline, and then pumped to the high-consistency grit separator; the fine pulp would be sent to the pre-beating tank, and then pumped to two fiberizers in series (4 sets); the qualified pulp would be sent to the post-beating tank for storage, and pumped to pulp blending tank for blending.

自制化机浆生产线：自制化机浆由泵送至卸料浆塔贮存，然后泵入高浓除砂器，送至叩前浆池，再用浆泵送至 6 台并联疏解机进行磨浆，合格浆料进入叩后浆塔贮存，最后用浆泵送至配浆池进行配浆。

The self-made APMP production line: The self-made APMP is pumped to the unloading tower for storage, and pumped to the high-consistency grit separator; the pulp would be sent to the pre-beating tank, and then pumped to 6 deflakers in parallel; the qualified pulp would be sent to the post-beating tank for storage, and pumped to pulp blending tank for blending.

损纸系统：损纸分干损纸和湿损纸二个系统。纸机湿损纸系统：伏辊池损纸先进入损纸浓缩机浓缩至 4.5～5%的浓度后进损纸浆池，泵送入湿损纸浆塔贮存；伏辊和压榨较大量损纸经损纸水力碎浆机处理后直接进损纸贮浆塔贮存，浓度较低时经浓缩机浓缩后泵送备浆车间芯层配浆系统。干部产生的干损纸，经过机下水力碎浆机碎解，然后泵送至中间损纸浆池过渡，再送损纸浆塔贮存。损纸浆塔贮存的浆，泵送至损纸浓缩机浓缩后经中间浆池，再泵送至高浓除砂器除去可能有的砂粒，然后良浆进一级三段压力筛选系统，杂质排地沟；经一段和二段筛选后的损纸良浆直接进入纤维疏解机疏解后进浆池暂存，然后泵送芯层配浆系统；筛选后浆渣经疏解机处理后进入三段筛再筛选，良浆送至前面浓缩后中间浆池，浆渣排入废渣处理系统。

Broke system: The system is divided into the dry broke and wet broke systems. Wet broke system: The broke in the coucher pool is first sent to the broke thickener to process it to the concentration of 4.5-5%, and then sent to the broke pulp tank; then it would be pulped to the wet broke pulp tower for storage. The large amount of broke produced by couching and pressing would be processed by the hydrapulper and directly sent to the pulp storage tower for storage; if the concentration is low, it should first be sent to the thickener for concentration and pumped to the blending system of the pulp preparation workshop. The dry broke produced by the drying section is first processed by the hydrapulper, and then pumped to the intermediate broke pulp tank for transition, and finally sent to the broke pulp tower for storage. The pulp stored in the broke pulp tower is first pumped to the broke thickener for concentration, and stored in the intermediate pulp tank; then it is pumped to the high-consistency grit separator for removing the possible sand particles; later, the fine pulp is sent to the pressurized screening system of the third section at level one, and the impurities are discharged into the trench; the fine broke pulp after screening of the first and second sections is directly sent to the deflaker and then temporarily stored in the pulp tank; later, it is pumped to the core blending system; the pulp slags after screening are processed by the deflaker and sent to the screen of the third section for screening again; the fine pulp is sent to the intermediate pulp tank after concentration, and the pulp slags are discharged into the waste slag treatment system.

配浆系统：从备浆工段送来的浆料按一定比例进入各层配浆池进行配浆；面层浆由25%NBKP 和 75%LBKP 组成，经混合器混合后进入面层配浆池；芯层浆由 10%LBKP 和 70%APMP 浆及 20%损纸浆组成，经混合器混合后进入芯层配浆池；底层浆由 25% NBKP 和 75%LBKP 浆组成，经混合器混合后进入底层配浆池。各层配好后的浆料用浆泵送至各个纸机浆池，再用泵送造纸车间各上浆系统。

Pulp blending system: The pulp sent from the pulp preparation section is pumped to the blending tank at each layer in a certain proportion; the surface pulp is composed of 25% NBKP and 75% LBKP, which would be sent to the surface blending tank after being mixed by a mixer; the core pulp is composed of 10% LBKP, 70% APMP and 20% broke pulp, which would be sent to the core blending tank after being mixed by a mixer; the bottom pulp is composed of 25% NBKP and 75% LBKP, which would be sent to the bottom blending tank after being mixed by a mixer. The prepared pulp of each layer is pumped to each pulp tank, and then to the loading system of the paper-making workshop.

②抄纸工段

②Forming & pressing section

纸板机生产能力为2648t/a，生产技术方案配备见下表。

The production capacity of the board machine is 2,648t/a, and the production technology plan is shown in the table below.

面层上浆系统：由备浆车间配浆池送来的成浆送到纸机浆池，再由浆泵送至机外白水槽中与白水混合后进入1#冲浆泵，然后由泵送到一级三段高效除砂器系统进行除砂，除砂后出来的良浆送面层脱气系统进行脱气，再经2#冲浆泵送一级二段压力筛系统进行筛选，由一段纸机压力筛处理后的良浆送流浆箱上网抄造。

Surface pulp loading system: The finished pulp sent from the blending tank is pumped to the paper machine pulp tank, and then to the white water tank outside the machine for mixing with the white water; later, it is pumped to the 1# slushing pump, and to the high-consistency grit separator of the third section at level one; the processed pulp is sent to the surface degassing system for degassing, and pumped to the pressurized screen of section two at level one by 2# slushing pump; finally, the fine pulp processed by the pressurized screen of the first section is pumped to the flow box for paper making.

芯层上浆系统：主工艺流程与面层相同，不同点在于芯层系统设置有损纸配浆系统和稀释水系统。由备浆车间配浆池送来的成浆送到纸机浆池，再由浆泵送至机外白水槽中与白水混合后进入1#冲浆泵，然后由泵送到一级三段高效除砂器系统进行除砂，除砂后出来的良浆送脱气系统进行脱气，再经冲浆泵送一级三段压力筛系统进行筛选，由一段纸机压力筛出来的良浆送流浆箱上网抄造。同时，部分白水从机外白水槽进入稀释水筛，进入流浆箱，控制芯层上网浓度。

Core pulp loading system: The main technological process is the same as the surface pulp, with the difference that the core pulp system is set with a broke pulp blending system and a diluted water system. The finished pulp sent from the blending tank is pumped to the paper machine pulp tank, and then to the white water tank outside the machine for mixing with the white water; later, it is pumped to the 1# slushing pump, and to the high-consistency grit separator of the third section at level one; the processed pulp is sent to the degassing system for degassing, and pumped to the pressurized screen of the third section at level one by the slushing pump; finally, the fine pulp processed by the pressurized screen of the first section is pumped to the flow box for paper making. At the same time, part of the white water is sent to the diluted water screen from the white water tank outside the machine, and then to the flow box, to control the concentration of pulp of the core layer flowing onto the wire.

底层上浆系统：工艺流程与面层相同。

Bottom pulp loading system: The technological process is the same as that of the surface layer.

纸机抄造系统：由上浆系统面、芯、底层纸机筛来的合格浆料送至各层流浆箱，浆水在流浆箱中混合稀释后各自喷入面、芯、底层网，其中芯层网配有上成型器帮助脱水。经各自网部脱水和三层复合后的纸页，进入压榨部进一步脱水，然后进前干燥部进行干燥；前干燥部出来的纸张进入表面施胶机双面施胶，通过空气转向器和红外干燥后进入后干燥部干燥；干部出来的纸页进入硬压光机处理，然后进入涂布机（4 个涂布站）涂布，再经由红外干燥器、热风干燥箱和烘缸组成的组合式干燥系统干燥；涂布干燥后的纸页进二辊双面软压光机压光处理，再在卷纸机上卷取，经自动输送搁纸架到分切复卷机。

Paper machine making system: The qualified pulp screened by the surface, core and bottom screens of the loading system is sent to the flow box of each layer, where it would be mixed and diluted, and then sprayed to the surface, core and bottom screens; the core screen is equipped with a shaper for dewatering. The paper dewatered by individual sections after three-layer composition is sent to the press section for further dewatering, and the to the front drying section for drying; the processed paper is then sent to the surface sizing machine for double-sided sizing, and then to the rear drying section for drying after being processed by the air diverter and infrared drying; the paper from the drying section is sent to the hard calender for processing, and then to the coating machine (4 coating stations) for coating, and then dried by the combined drying system consisting of the infrared dryer, hot air drying oven and drying cylinder; the coated and dried paper would be sent to the two-roller double-sided soft calender for processing, and then reeled on the reeling machine; finally, the paper would be sent to the cutting and reeling machine by the automatic transport rack.

从卷纸机下来的纸卷经复卷分切后，纸卷输送至自动卷筒纸包装生产线，生产卷筒纸。

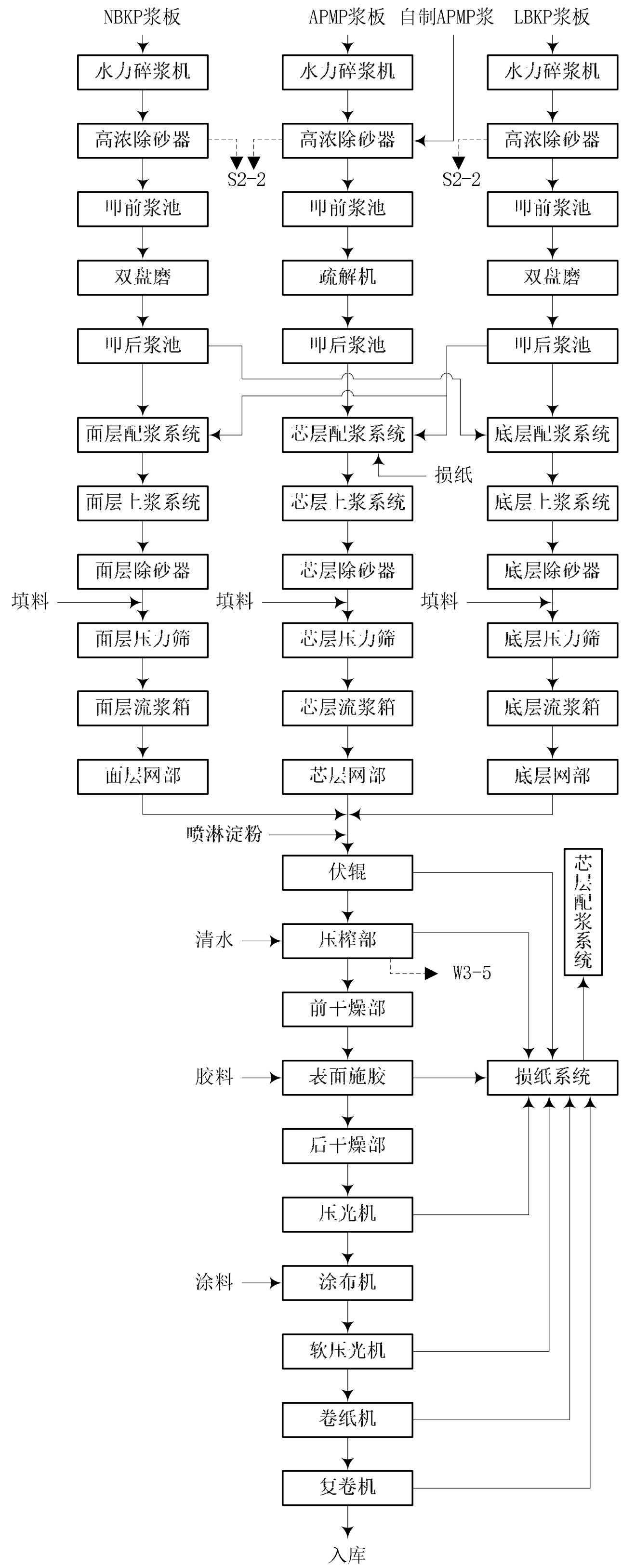
The paper rolls from the paper reeling machine is sent to the automatic roll paper packaging line after reeling and cutting, to produce roll paper.

抄纸工段还配有流送系统、真空系统、清水系统、白水系统、损纸处理系统、蒸汽及冷凝水系统、压缩空气系统等辅助系统。

The forming & pressing section is also equipped with several auxiliary systems, including flowing system, vacuum system, clean water system, white air system, steam condensate system, steam condensate system, and compressed air system.

备浆和造纸车间多数工序涉及白水的收集或回用，车间设置机外白水槽和白水池以及白水塔，白水系统所需清水在白水池进行补充，多余白水在白水塔外排。

Several processes int he pulp preparation and paper-making workshop involve the collection or reuse of white water; the workshop is set with a white water tank outside the machine, as well as a white water pool and white water tower; the clean water required by the white water system is replenished by the white water pool, and the excess white water would be discharged out of the white water tower.


NBKP浆板
APMP浆板
自制APMP浆
LBKP浆板
水力碎浆机
高浓除砂器
S2-2
磨前浆池
双盘磨
疏解机
磨后浆池
面层配浆系统
芯层配浆系统
底层配浆系统
损纸
面层上浆系统
芯层上浆系统
底层上浆系统
面层除砂器
芯层除砂器
底层除砂器
填料
面层压力筛
芯层压力筛
底层压力筛
面层流浆箱
芯层流浆箱
底层流浆箱
面层网部
芯层网部
底层网部
喷淋淀粉
伏辊
清水
压榨部
W3-5
前干燥部
胶料
表面施胶
损纸系统
芯层配浆系统
后干燥部
压光机
涂料
涂布机
软压光机
卷纸机
复卷机
入库

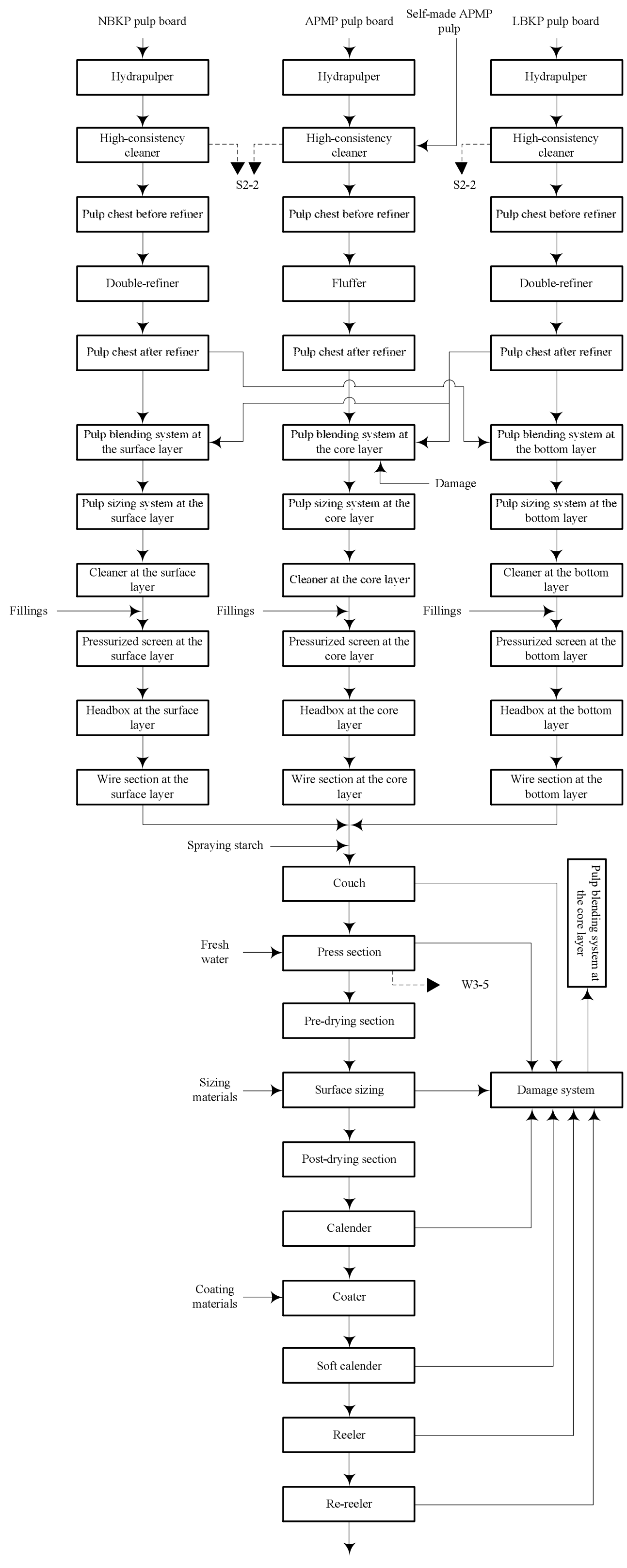

NBKP pulp board
APMP pulp board
Self-made APMP pulp
LBKP pulp board
Hydrapulper
Hydrapulper
Hydrapulper
High-consistency cleaner
High-consistency cleaner
High-consistency cleaner
S2-2
S2-2
Pulp chest before refiner
Pulp chest before refiner
Pulp chest before refiner
Double-refiner
Fluffer
Double-refiner
Pulp chest after refiner
Pulp chest after refiner
Pulp chest after refiner
Pulp blending system at the surface layer
Pulp blending system at the core layer
Pulp blending system at the bottom layer
Damage
Pulp sizing system at the surface layer
Pulp sizing system at the core layer
Pulp sizing system at the bottom layer
Cleaner at the surface layer
Cleaner at the core layer
Cleaner at the bottom layer
Fillings
Fillings
Fillings
Pressurized screen at the surface layer
Pressurized screen at the core layer
Pressurized screen at the bottom layer
Headbox at the surface layer
Headbox at the core layer
Headbox at the bottom layer
Wire section at the surface layer
Wire section at the core layer
Wire section at the bottom layer
Spraying starch
Couch
Pulp blending system at the core layer
Fresh water
Press section
W3-5
Pre-drying section
Sizing materials
Surface sizing
Damage system
Post-drying section
Calender
Coating materials
Coater
Soft calender
Reeler
Re-reeler
Warehousing

图 2.2.1-12 二期白卡纸生产工艺流程图

Fig. 2.2.1-12 Process flow of Phase II ivory board production

③GCC（碳酸钙研磨）工段

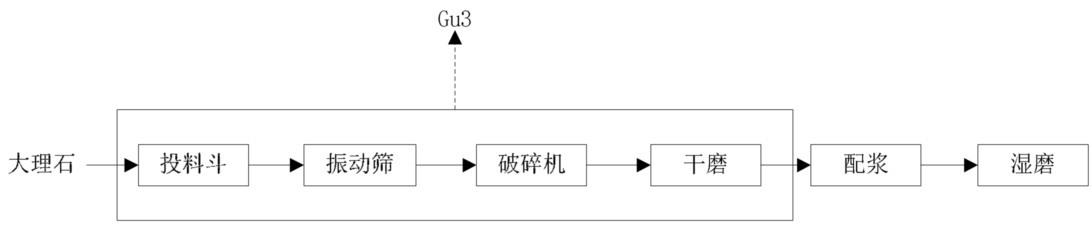
③ Ground Calcium Carbonate (GCC) section

本项目配套一个 GCC 车间，处理能力 700t/d。

The Project is equipped with a GCC workshop, with the processing capacity of 700t/d.

GCC 车间主要工艺流程见图。

Main process flow of the GCC workshop is shown in the figure below.



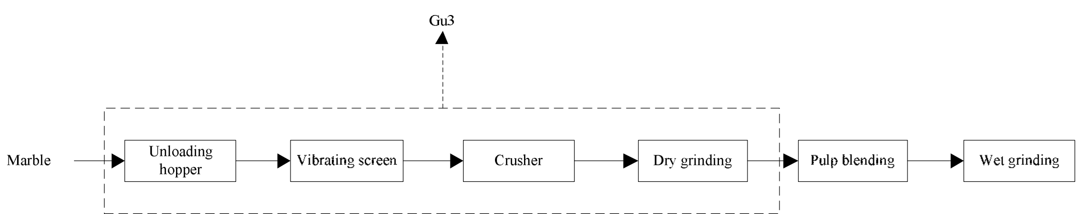


图 2.2.1-13 二期特种纸 GCC（碳酸钙研磨）工段工艺流程图

Fig. 2.2.1-13 Process flow of Phase II special paper GCC (ground calcium carbonate) section

主要工艺描述如下：

Main process is described below:

大理石经投料斗投料，经输送带送至振动筛筛除杂质后进入破碎机，破碎为 3 段破碎，破碎后送至干磨机，经干磨后送至配浆罐，在配浆罐加入水、分散剂、杀菌剂等进行配浆，然后进入湿磨段，经湿磨后形成成品供纸机使用。

The marble is fed through the feeding hopper, and then sent to the the vibrating screen with a conveyor for removing impurities, and then to a crusher for three-stage crushing; later, the crushed material would be sent to the dry mill, and then to the pulp blending tank, where the pulp would be blended with the addition of water, dispersing agent and bactericide; next, the pulp would be sent to the wet milling section, and the finished product would be provided for the paper machine.

④CK（涂料制备）工段

④CK (coating preparation) section

本项目配套一个CK（涂料制备）工段，主要用于制备纸机涂布用涂料。涂布化学品通过加水、NaOH、分散剂等在混合器内混合，然后送纸机涂布段使用。

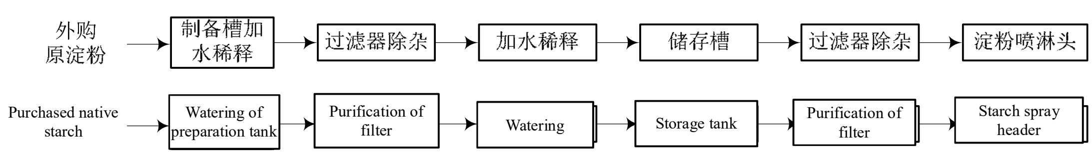
The Project is equipped with a CK section, which is mainly used to prepare the coatings used by the paper machine. The coating chemicals are mixed with water, NaOH, and dispersing agent in the mixer, and then sent to the coating section for application.

⑤湿端化学品车间

⑤Wet-end chemical workshop

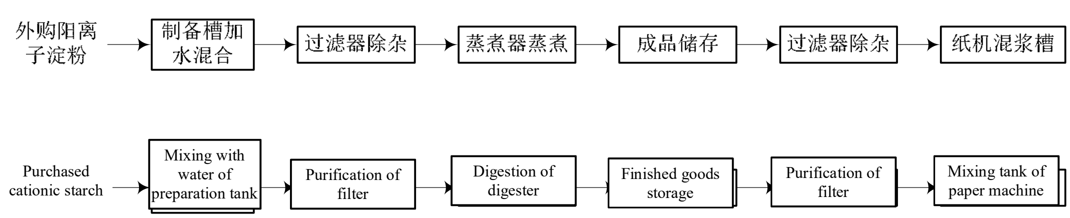
本项目配套一个湿端化学品工段，主要用于制备纸机湿端用化学品，化学品主要为淀粉。根据淀粉的用途，主要分为3个处理工序：喷淋淀粉制备，阳性淀粉制备，自转化淀粉制备。另外，其他化学品主要是在湿端化学品车间进行混合和除杂的过程。

The Project has a wet-end chemical section, which is mainly used to produce chemicals for wet end of the paper machine, and such chemical is mainly the starch. According to the usage of starch, it is mainly divided into 3 treatment procedures: preparation of spraying starch, preparation of positive starch, and preparation of self-transformed starch. In addition, other chemicals are mainly mixed at the wet-end chemical workshop and the contained impurities are removed at the same workshop.



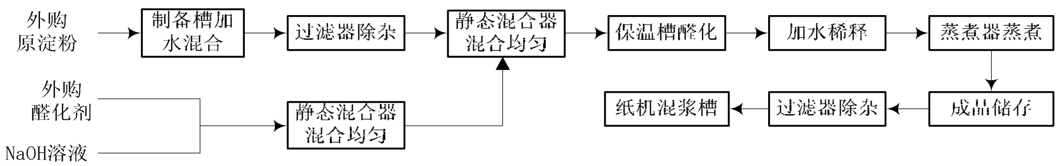
喷淋淀粉工艺流程

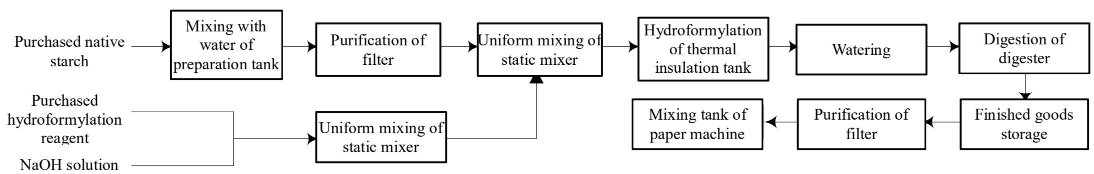
Spraying starch process flow



阳性淀粉工艺流程

Positive starch process flow





自转化淀粉工艺流程

Self-transformed starch process flow

图 2.2.1-14 二期特种纸湿端化学品工段工艺流程图

Fig. 2.2.1-14 Process flow of Phase II special paper wet-end chemical section

项目白卡纸车间产污环节见表2.2.1-46。

The pollutant generation steps of the ivory board workshop are shown in Tables 2.2.1-46.

表 2.2.1-46 项目白卡纸车间产污环节汇总表

Table 2.2.1-46 Summary of pollutant generation steps of the ivory board workshop

类别 Category	污染源 Source of pollution	污染物类型 Type of pollutants	治理措施 Control measures	排放去向 Discharge destination	污染源编号 Pollution source no.
废气 Exhaust gas	GCC 工段 GCC section （碳酸钙研磨） (Ground Calcium Carbonate)	颗粒物 Particulate Matters (PM)	生产车间封闭作业、设备配套收尘装置回收碳酸钙粉尘，仅有少量未收集的粉尘通过车间换气以无组织形式排入大气 The production workshop adopts closed operation, and the dust collecting devices are equipped to collect calcium carbonate dust; only a small amount of uncollected dust is discharged to the atmosphere in a fugitive form in the process of ventilation of the workshop		Gu4
废水 Waste water	造纸白水 Paper-making white water	COD、SS、氨氮等 COD, SS, ammonia nitrogen, etc.	进入污水处理站。 Enter the sewage treatment plant.	废水处理达标后排入铁山港区深海排放管网系统，在铁山港 B3 排污口深海排放。 The sewage is discharged into the deep-sea discharge pipe network system of Tieshangang District after being processed, and then discharged into	W3-5

				the deep sea at the sewage outlet B3 of Tieshangang.	
固废 Solid waste	高浓除砂器 High-consistency grit separator	浆渣 Slag residue	送至固废综合利用锅炉焚烧。Transferred to solid waste comprehensive utilization boiler for incineration.	焚烧处置。Incineration.	S2-2

（2）主要工艺技术参数

(2) Main process technical parameters

（3）主要物料消耗指标

(3) Main material consumption indicators

白卡纸车间物料消耗情况见表2.2.1-49。

Material consumption conditions of the ivory board workshop are shown in Table 2.2.1-49.

（4）主要设备

（4）Main equipment

白卡纸车间主要设备清单见表2.2.1-50~2.2.1-51

The list of main equipment of the ivory board workshop is shown in Table 2.2.1-50~2.2.1-51.

2.2.1.12 热电站

2.2.1.12 Thermal power plant

一期热电站配套一台设计能力4600tds/d的碱回收炉，焚烧生产过程中产生的黑液；一台额定蒸发量为220t/h的循环流化床锅炉，主要燃料为制浆生产过程产生的树皮、木屑、好氧污泥等废渣；一台额定蒸发量为280t/h的循环流化床锅炉，燃料为燃煤。热电站装设2台CC80-10/1.4/0.6双抽冷凝机组和1台CB40-10/2.8/0.6抽汽背压式机组，发电机电压为10.5kV，充分回收利用热能供热发电。

The thermal power plant in Phase I is equipped with an alkali recovery furnace with a design capacity of 4,600 tds/d to burn the black liquor produced during the production process;

a circulating fluidized bed boiler with a rated evaporation capacity of 220t/h, which mainly burns bark, wood chips, aerobic sludge and other waste residues generated in the pulp production process; and a circulating fluidized bed boiler with a rated evaporation capacity of 280t/h, , fueled by coal. The thermal power plant is equipped with two sets of CC80-10/1.4/0.6 dual pumping condensing units and one set of CB40-10/2.8/0.6 steam extraction back pressure unit; the generator voltage is 10.5kV, which can fully recycle and use the heat energy for power generation.

二期新增一台额定蒸发量为 280t/h 的循环流化床锅炉，燃料为燃煤，配套配 1 台 CB50-10/1.4/0.6 抽汽背压式机组进行供热。

Phase II is added with a circulating fluidized bed boiler with the rated evaporation of 280t/h, fueled by coal, and a CB50-10/1.4/0.6 steam extraction back pressure unit for heating.

（1）热电站主要设备

(1) Main equipment of the thermal power plant

热电站主要设备清单见表 2.2.1-52。

The list of main equipment of the thermal power plant is shown in Table 2.2.1-52.

（2）燃料及贮运煤方式

(2) Fuel, and coal storage and transportation method

220t/h 固废综合利用锅炉的燃料为生产过程产生的木屑、浆渣、好氧污泥等废渣，为保证锅炉稳定运行，正常运行时掺烧煤，掺烧比例小于 20%。燃料消耗情况见表 2.2.1-53，燃料分析见表 2.2.1-54。

The 220t/h solid waste comprehensive utilization boiler mainly burns the wood chippings, pulp slag, and aerobiotic sludge produced in the production process; in order to ensure the stable operation of the boiler, no more 20% of coal may be mixed during normal operation. Fuel consumption conditions are shown in Table 2.2.1-53, and fuel analysis is shown in Table 2.2.1-54.

项目原料主要为桉木等阔叶木，根据南京林业大学别星辰等人编制的《桉树木屑型煤燃料特性研究》中对桉木木屑的成分分析，木屑含硫量为 0.17%，根据《燃煤电厂煤

中汞含量对烟气汞排放水平的影响》（俞美香,杨丽,寇晓芳.[J].环境监控与预警，2014.）中对国内多家电厂燃煤成分分析，国内煤中汞含量为 0.055~0.297μg/g，本评价取 0.297μg/g。污泥、浆渣、烟煤其他成分依据建设单位提供资料及同类企业确定，详见表 2.2.1-55。

The raw materials mainly include eucalyptus wood and other broad-leaved wood. According to the analysis on the composition of eucalyptus wood chippings in *Research on Characteristics of Eucalyptus Wood Chipping-Type Coal Fuel* prepared by Bie Xingchen et. al. from Nanjing Forestry University, the sulfur content of wood chippings is 0.17%. According to the analysis on composition of coal used in several power plants in *The Effect of Mercury Content in Coal on the Level of Mercury Emissions from Coal-fired Power Plant flue gas* (YU Mei-xiang, YANG Li, KOU Xiao-fang. [J]. Environmental Monitoring and Forewarning, 2014.), the mercury content in domestic coal is 0.055~0.297μg/g, and in this evaluation, 0.297μg/g is adopted. The components including sludge, pulp slag, bituminous coal are determined by the information provided by the construction unit and similar enterprises, and the details are shown in Table 2.2.1-55.

表 2.2.1-54 燃料成分分析
Table 2.2.1-54 Analysis on fuel composition

表 2.2.1-55 污泥、浆渣、烟煤重金属成分分析
Table 2.2.1-55 Analysis on sludge, pulp slag, and heavy metal in bituminous coal

原煤采用水路和铁路运输，厂内堆存采用全封闭干煤棚，面积约为 235m×100m，按煤堆高度 8m，可贮存煤量约为 12 万吨，并配有封闭式输煤廊道，能有效防止在煤场的堆料、取料、转运环节中以及在大风情况下煤尘对周边环境的污染。燃煤从煤棚经胶带输送机运至锅炉间煤仓。

The raw coal is transported by waterway and railroad, and then stored in a fully enclosed dry coal shed, with an area of 235m×100m; as calculated by coal pile height of 8m, it can store about 120,000 tons of coal; it is also arranged with a closed coal conveying corridor, which can effectively prevent environmental pollution by coal dust generated in the process of stacking, reclaiming and transferring, and under strong wind conditions. The coal is transported from the coal shed to the coal bunker of the boiler room by the belt conveyor.

（3）热电站产污环节

(3) Pollutant generation steps of the thermal power plant

项目热电站产污环节见表2.2.1-56。

The pollutant generation steps of the thermal power plant are shown in Table 2.2.1-56.

表 2.2.1-56 项目热电站产污环节汇总表

Table 2.2.1-56 Summary of pollutant generation steps of the thermal power plant

<table>
<tr><th>类别
Category</th><th>污染源
Source of pollution</th><th>污染物类型
Type of pollutants</th><th>治理措施
Control measures</th><th>排放去向
Discharge destination</th><th>污染源编号
Pollution source no.</th></tr>
<tr><td rowspan="3">废气
Exhaust gas</td><td>220t/h 固废锅炉烟气
Flue gas of 220t/h solid waste boiler</td><td>烟尘、SO_2、NO_x、氯化氢、重金属、二噁英
Smoke dust, SO_2, NO_x, hydrogen chloride, heavy metal, Dioxin</td><td>SNCR/SCR 联合脱硝+布袋除尘器+活性炭吸附+炉外石灰石/石膏湿法脱硫+高效除雾器
SNCR/SCR combined denitration+bag-type dust collector +activated carbon adsorption+limestone outside the boiler/gypsum wet desulfurization +high efficiency demister</td><td rowspan="2">经 1 根 150mH×Φ4.8m 烟囱排放至大气环境。
It is discharged to the atmosphere through a 150mH×Φ4.8m chimney.</td><td>G3</td></tr>
<tr><td>280t/h 锅炉烟气
Flue gas of 280T/h boiler</td><td>烟尘、SO_2、NO_x、汞
Smoke dust, SO_2, NO_X, Hg</td><td>SNCR/SCR 联合脱硝+电袋除尘器+炉外石灰石/石膏湿法脱硫+高效除雾器
SNCR/SCR combined denitration+electrostatic-bag type dust collector+limestone outside the boiler/gypsum wet desulfurization +high efficiency demister</td><td>G4</td></tr>
<tr><td>干煤棚
Dry coal shed</td><td>颗粒物
Particulate Matters (PM)</td><td colspan="2">干煤棚采用半密封结构，除出口外，都建有挡墙，定期洒水降尘，少量扬尘无组织形式排放。
The dry coal shed is a semi-sealed structure, with retaining walls on three sides except for the exit; water is sprayed regularly to reduce dust, and a small amount of dust may be discharged in a fugitive form.</td><td>Gu7</td></tr>
<tr><td>废水
Waste water</td><td>化学水处理系统
Chemical water treatment system</td><td>软化废水
Demineralized wastewater</td><td>进入污水处理站。
Enter the sewage treatment plant.</td><td>废水处理达标后排入铁山港区深海排放管网系统，在铁山港 B3 排污口深海排放。</td><td>W5</td></tr>
</table>

	锅炉排污水 Boiler sewage	COD、BOD_5、SS等 COD, BOD_5, and SS etc.		The sewage is discharged into the deep-sea discharge pipe network system of Tieshangang District after being processed, and then discharged into the deep sea at the sewage outlet B3 of Tieshangang.	W6
固废 Solid waste	锅炉 Boiler	炉渣、飞灰 Furnace slag, fly ash	外售、水泥厂砖厂综合利用 Sold to cement plants and brick plants for comprehensive utilization		S7
	脱硫装置 Desulfurization equipment	脱硫石膏 Desulfurized gypsum	外售水泥厂作为水泥的缓凝剂或者建材厂制成石膏板、石膏砌块等建材材料 Sold to cement plants as the retarder of cement or to building material plants for producing gypsum boards, gypsum blocks and other building materials.		S8
	活性炭吸附装置 Activated carbon adsorption device	废活性炭 Waste activated carbon	供货厂家回收综合利用或委托有资质单位处理 The supplier recycles for comprehensive utilization or entrusts a qualified unit for disposal		S9
	脱硝系统 Denitration system	废催化剂 Waste catalyst			S15

2.2.1.13 加油站

2.2.1.13 Petrol station

（1）柴油加油工艺流程及产污环节

(1) Process flow and pollutant generation process of diesel refueling

项目加油站主要为厂区内装载机、叉车等运输工具加油。加油站主要分为油罐车卸油过程和给过往车辆加油过程，加油站采用地下油罐形式，设两个 50m³ 柴油贮油罐，年用柴油量约 2000 吨。设一个 20m³ 汽油贮油罐，年用汽油量约 300 吨。

The petrol station of the Project mainly provides fuel for loaders, forklifts and other vehicles in the plant area. The petrol station mainly include tank truck unloading process and vehicle refueling process. It adopts the underground oil tanks, including two 50m³ diesel oil storage tanks, which can provide 2,000 tons of diesel each year. There is also a 20m^3 gasoline storage tank, which can provide about 300 tons of gasoline each year.

①卸油

①Oil unloading

油罐车将柴油运至场地内再通过密闭卸油点把柴油卸至埋地卧式油罐。在油罐车卸油过程中，储油车内压力减小，地下储罐内压力增加，地下储罐与油罐车内的压力差，使卸油过程中地下油罐内部上空通过排气管和油罐车上空通过呼吸控制阀挥发油气。

The oil tank truck will transport diesel to the site, and unload it into underground horizontal tanks through closed unloading points. During unloading of the oil tank truck, the pressure in the tank truck will decrease, the pressure in the underground storage tank will increase, the pressure difference between the underground storage tank and the tank truck will make the oil gas volatilize through the exhaust pipe above the underground storage tank and the breathing control valve of the oil tank truck during oil unloading.

②加油

②Refueling

油通过潜污泵从埋地油罐输送至加油机，然后通过加油机配套的加油枪给过往车辆加油。加油过程中通过计量器进行计量，加油车辆油罐随着柴油的注入，车辆油罐内产生的油气逸散至大气中。

The oil is pumped to the refueler from the underground storage tank by a submersible pump, for refueling for vehicles with the assorted oil guns. The refueling is measured by a meter, and with the refueling of diesel, the gas generated in the fuel tank may escape into the atmosphere.

③清罐

③Tank cleaning

加油站大概每 5 年需进行一次油罐清洗作业，保证输出油品质量和防治油罐腐蚀。清罐由有相关资质的专业清理公司定期清理，首先排除罐内存油，然后再用通风排除罐内油气并测定油气浓度到安全范围，接着人员进罐清扫油污、水及其它沉淀物，人工用

290~490kpa 高压水冲洗罐内油污和浮锈，同时尽快排除冲洗污水并用拖布擦净，然后再通风干燥除湿，人工用铜制工具除去局部锈蚀，最后进行质量检查验收。清罐产生的清罐废物属危险废物，由清理公司负责妥善处理。

All tanks of the petrol station shall be cleaned approximately every 5 years, to ensure the quality of oils and prevent the tanks from corrosion. Tank cleaning should be regularly performed by a professional cleaning company with the relevant qualification. First, the remaining fuel in each tank should be removed; then the oil gas should be removed through ventilation, and the oil and gas concentration should be within the safety range; later, the cleaning personnel may enter into the tank to clean the oil fouling, water and other sediments, remove the fouling and rust within each tank with 290~490kpa high-pressure water; at the same time, they should drain the flushing sewage as soon as possible, and wipe with mop; next, the tank should be dried through ventilation, and local corrosion should be manually removed by copper tools; finally, quality inspection and acceptance should be performed. The wastes produced during tank cleaning are hazardous wastes, which should be disposed by a cleaning company in an appropriate manner.

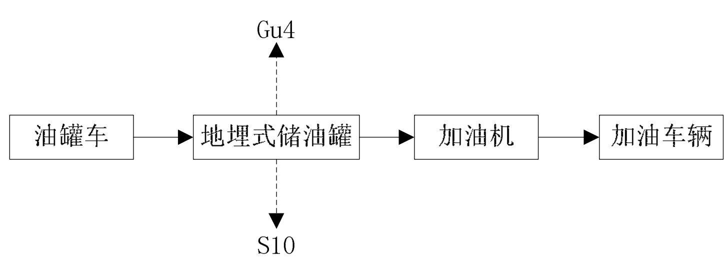


图 **2.2.1-15** 加油站生产工艺流程及产污节点图

Fig. 2.2.1-15 Production process and pollutant generation nodes of the petrol station

项目加油站产污环节见表2.2.1-57。

The pollutant generation steps of the petrol station are shown in Table 2.2.1-57.

表 **2.2.1-57** 项目加油站车间产污环节汇总表

Table 2.2.1-57 Summary of pollutant generation steps of the petrol station workshop

类别	污染源	污染物类型	治理措施	排放去向	污染源

Category	Source of pollution	Type of pollutants	Control measures	Discharge destination	编号 Pollution source no.
废气 Exhaust gas	储油罐、卸油 Oil storage tank, oil unloading	非甲烷总烃 Non-methane hydrocarbon	以无组织形式排入大气环境。 Discharge to atmosphere in a fugitive form.		Gu5
废水 Waste water	本工段无废水产生。 No wastewater produced in this section.				
固废 Solid waste	储油罐残渣 Slag of oil storage tank	清罐废渣和高浓含油废水 Slag and high-concentration oil-containing wastewater produced during tank cleaning	由专业清理公司负责妥善处理，每五年清理一次。 They should be properly disposed by a professional cleaning company, and cleared once every five years.		S10
	隔油池污泥 Sludge in the oil separator	含油污泥 Oily sludge	由有危险废物处置资质的单位进行处理 They should be disposed by a unit with the appropriate hazardous waste disposal qualification		S11

2.2.1.14 臭气收集治理系统

2.2.1.14 Odor collection and treatment system

臭气收集系统包括高浓度不凝气（CNCG）系统、低浓度不凝气（DNCG）系统和汽提气（SOG 甲醇提取）系统三套处理装置，分别将蒸煮、洗浆及碱回收蒸发过程中产生的不凝气全部收集起来，高浓臭气和汽提气经处理后直接送到碱回收炉燃烧，低浓臭气经碱液洗涤后送碱回收炉作二次送风，事故状态下进入备用臭气焚烧器。

The odor treatment system includes three treatment systems consisting of the concentrated non-condensable gas (CNCG) system, diluted non-condensable gas (DNCG) system and stripper off-gas (SOG methanol extraction) system, to collect all the non-condensable gas generated respectively from the cooking, pulp washing and alkali recovery processes. The high-consistency odor and stripper off-gas after treatment is directly led to the alkali recovery furnace for combustion, and the low-consistency odor after being washed in the alkali liquor is conveyed to the alkali recovery furnace as the secondary air supply, and sent to the standby odor incinerator in the event of an accident.

表 2.2.1-58 臭气系统收集点一览表

Table 2.2.1-58 List of the odor system collection points

序号 S.N.	车间名称 Workshop name	CNCG	DNCG
一 I	化学浆车间 Chemical pulp workshop		
1	蒸煮工段 cooking section	/	木片仓 Wood chip screen bin
		/	蒸煮器 Cooking vessel
		/	蒸煮喷放锅 Cooking blow tank
2	洗选工段 Washing section	/	洗渣机 Slag washer
		/	洗节机 Knot washer
		/	洗浆机 Pulp washer
		/	稀释液槽 Diluent tank
		/	洗浆机黑液槽 Black liquor tank of the pulp washer
		/	组合式除节筛 Combined knot removing screen
		/	泡沫收集槽 Foam collection tank
		/	筛选后洗浆机 Post-screening pulp washer
		/	筛选后黑液槽 Post-screening black liquor tank
		/	真空泵 Vacuum pump
3	氧脱木素段 Oxygen delignification section	/	氧脱洗浆机黑液槽 Black liquor tank of the oxygen delignification pulp washer
		/	氧脱喷放锅 Oxygen delignification blow tank
		/	氧脱洗浆机 Oxygen delignification pulp washer
		/	中浓泵配套真空泵 Vacuum pump matching medium-consistency pump
二 II	碱回收车间 Alkaline recovery workshop		
1	蒸发工段 Evaporation section	重污冷凝水槽 Heavy-pollution condensate tank	黑液槽 Black liquor tank
		高浓黑液槽 Concentrated black liquor tank	半浓黑液槽 Semi-concentrated black liquor tank

序号 S.N.	车间名称 Workshop name	CNCG	DNCG
		入炉高浓黑液槽 Tank of concentrated black liquor into the furnace	泄漏液收集槽 Leakage collection tank
		SOG 甲醇提取系统 SOG methanol extraction system	冷凝水槽 Condensate tank
2	燃烧工段 Combustion section	/	溶解槽 Dissolution tank
		/	芒硝碱灰黑液混合槽 Mirabilite-alkali ash-black liquor mixing tank
3	苛化工段 Causticization section	/	绿液稳定槽 Green liquor stabilization tank
		/	绿泥混合槽 Green mud mixing tank
		/	石灰消化提渣机洗涤器 Washer of lime slaker
		/	苛化器 Causticizer
		/	过滤机系统 Filter system
		/	白液贮存槽 White liquor storage tank
		/	稀白液槽 Diluted white liquor tank

（1）高浓度不凝臭气（CNGG）收集处理系统

(1) Concentrated non-condensable gas (CNGG) collection and disposal system

高浓度不凝臭气（CNCG）来自于制浆线的不同区域，主要是重污冷凝水槽、高浓黑液槽、入炉高浓黑液槽、SOG 甲醇提取系统等。由于 CNCG 体积小，收集后经蒸汽喷射器动力输送至碱回收炉专用燃烧器燃烧。

Concentrated non-condensable gas (CNCG)is produced at different parts of the pulping line, mainly the heavy-pollution condensate tank, concentrated black liquor tank, tank of concentrated black liquor into the furnace, and SOG methanol extraction system, etc. Due to the small size of CNCG, it can be sent to the specialized combustor of the alkali recovery furnace for combustion by a steam ejector after collection.

在蒸汽喷射器入口处有压力转换器和控制阀，可以保持收集箱持续真空，同时预防臭气流量低时，空气从压力/真空爆破器进入。喷射器推动流体(蒸汽)输送和压缩 CNCG 以产生动能，当蒸汽经过喷嘴时，在蒸汽入口处产生真空，推动臭气输送。

At the inlet of the steam ejector, there is a pressure converter and a control valve, which can maintain the state of continuous vacuum of the collection tank, and prevent the incoming of air from the pressurized/vacuum blaster when the odor flow rate is low. The ejector can drive the transfer of fluid (steam) and compress CNCG to generate kinetic energy. When steam passes through the nozzle, vacuum can be formed at the inlet of steam, thus promoting the transport of odor.

在蒸汽喷射器后设排污管线及雾沫分离器分离臭气及污冷凝水，分离后臭气送往碱炉燃烧，污冷凝水送往汽提塔。

A drainage pipeline and entrainment separator are set after the steam ejector to separate odor and polluted condensate, the separated odor is sent to the alkali furnace for combustion, and the polluted condensate is sent to the stripping tower.

为防止空气和火焰进入 CNCG 收集系统，避免燃烧的发生，在 CNCG 燃烧点附近设一个阻火器。阻火器能吸收和消散来自其一端火焰的热量，以预防另一端火焰温度升高大于蒸汽燃烧点引起燃烧。同时为预防系统压力在迅速增加的条件下对管线造成损害，在系统中装设爆破盘。

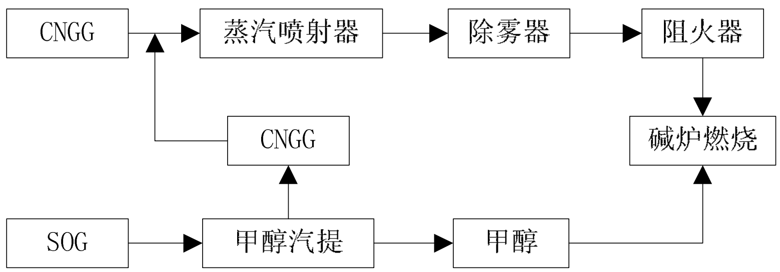
In order to prevent the entering of air and flame into the CNCG collection system, and avoid combustion, a fire arrester is set near the combustion site of CNCG. The fire arrester can absorb and dissipate the heat from one end, to prevent combustion due to the condition that the flame temperature at the other end rises over the steam combustion point. At the same time, in order to prevent the damage to the pipeline caused by rapid increase of the system pressure, a blasting plate is installed in the system.

（2）汽提气（SOG）甲醇提取系统

(2) Stripper off-gas (SOG) methanol extraction system

汽提气（SOG） 来自于碱回收蒸发工段汽提污冷凝水的汽提塔，它含有 50%（质量比）甲醇和 40%（质量比）水蒸汽，其余成分 10%包含 TRS、氮气和氧气，属于高浓臭气。SOG 经过甲醇汽提冷凝提取后，SOG 中的甲醇去碱炉臭气燃烧器助燃，其他不凝气 GNCG 去蒸发水封槽经过蒸汽喷射器，分离后臭气送往碱炉燃烧，冷凝水送往汽提塔。

Stripper off-gas (SOG) is from the stripping tower for stripping polluted condensate from the alkali recovery evaporation section; it contains 50% (mass ratio) methanol and 40% (mass ratio) water vapor, and the rest 10% contains TRS, nitrogen and oxygen, which are high-consistency odors. After methanol stripping and condensation of SOG, the methanol is sent to the odor combustor of the alkali furnace as the combustion-supporting gas; other GNCGs are sent to the de-evaporation water tank for passing through the steam ejector, the separated odor is sent to the alkali furnace for combustion, and condensate is sent to the stripping tower.



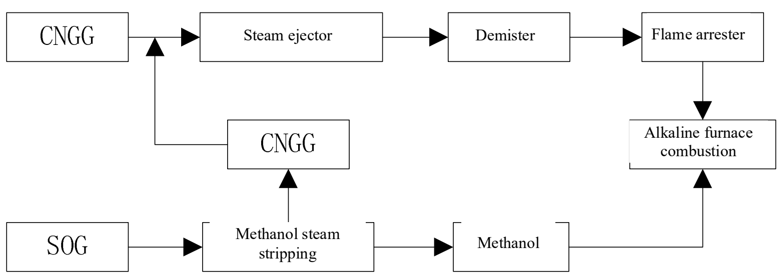


图 2.2.1-16 高浓臭气收集处理流程图

Fig. 2.2.1-16 Collection and disposal process flow of high-consistency odor

（3）低浓度不凝气（DNCG）收集处理系统

(3) Diluted non-condensable gas (DNCG) collection and disposal system

低浓度不凝气（DNCG）主要来源于化学浆车间蒸煮工段的木片仓、喷放锅、中浓浆液贮存槽、过滤机、筛选设备、洗涤器、真空泵和滤液槽，及碱回收车间蒸发工段的稀黑液槽、二次冷凝水槽、中浓黑液槽、碱炉溶解槽、碱灰混合槽、污冷凝水槽，苛化工段的洗涤器、苛化器、绿液稳定槽、绿泥混合槽等槽罐及污水处理站。

Diluted non-condensable gas (DNCG) is mainly produced by the wood chip bin, blow tank, medium-consistency pulp storage tank, filter, screening equipment, washer, vacuum pump and filtrate tank of the cooking section in the chemical pulp workshop; the diluted black liquor tank, secondary condensate tank, medium-consistency black liquor tank, alkali furnace dissolution tank, alkali ash mixing tank, polluted condensate tank of the evaporation section in the alkali recovery workshop; the washer, causticizer, green liquor stabilization tank, and green mud mixing tank of the causticization section; and the sewage treatment plant.

DNCG 系统由离心式风机驱动，其作用就是从各臭气收集点收集臭气并运输到碱炉内燃烧。风机推动各收集点臭气进入 DNCG 臭气冷却器，经过雾沫分离器，然后推动臭气经蒸汽螺旋加热器，进入碱炉二次风系统。DNCG 中大部分是空气，因此可用作碱炉的燃烧空气，这样也减少了由碱炉风机提供的空气量，在燃烧前，DNCG 气体先通过臭气加热器进行臭气预热，这样减少了 DNCG 与空气混合时的冷凝物形成，减轻了臭气向碱炉输送进程中的腐蚀性。

DNCG system is driven by a centrifugal fan, which can collect odor from each odor collection point and send it to the alkali furnace for combustion. The fan will push the odor collected at each collection point into the DNCG odor cooler, and the entrainment separator, and then it can push the odor to the spiral heater for heating, and finally to the secondary air system of the alkali furnace. The most part of DNCG is air, so it can be taken as the combustion air of the alkali furnace, and this can also reduce the amount of air provided by the fan of the alkali furnace. Prior to combustion, DNCG is preheated by the odor heater, which can reduce condensation products generated by the mixing of DNCG and air, thus reducing the corrosiveness of the odor transferred to the alkali furnace.

DNCG 拥有污冷凝水收集装置，收集后污冷凝水送汽提塔汽提。

DNCG has a polluted condensate collection device, and the polluted condensate is sent to the stripping tower.

DNCG → 冷却器 → 风机 → 预加热器 → 碱炉燃烧

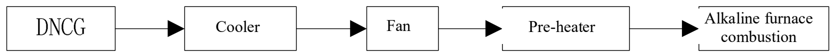


图 2.2.1-17 低浓臭气收集处理流程图

Fig. 2.2.1-17 Collection and disposal process flow of low-consistency odor

（4）臭气治理管理系统

(4) Odor management system

从总体上看，工艺设计将生产过程中产生臭气的点位均进行收集后，分别经 CNCG、SOG（甲醇提取系统）和 DNCG 系统进行处理。在管理方面制定了严格的开停机顺序管理，保证了在开停机过程中不出现臭气溢出事故。

Generally, the odor collected from each collection point during production can be sent to CNCG,SOG (methanol extraction system) and DNCG systems for disposal. In terms of management, a strict startup and shutdown sequence management system is determined, which can prevent odor odor leakage during startup and shutdown.

停机顺序：只要制浆、蒸发等系统开始运行就会有臭气产生和溢出的可能，这时臭气的收集和燃烧系统必须提前开始运行且处于良好的运行状态是保证不发生臭气外溢的前提条件。在停机时先停制浆系统，再停蒸发系统，使系统中的气体被全部收集处理后，再停燃烧臭气的碱回收炉。在停机的同时也要为开机做好充分的准备，在蒸发系统的浓黑液槽中留出足够的浓黑液供碱回收炉开机时燃烧。

Shutdown sequence: The operation of the pulping, evaporation and other systems will produce odor and cause leakage; at this time, the odor collection and combustion system must be started in advance; the fine operating state is the prerequisite for preventing odor leakage. In the case of shutdown, the pulping system should first be turned off, and then the evaporation system to fully collect the gas in the system; finally, the alkali recovery furnace for odor combustion may be turned off. At the time of shutdown, sufficient preparations for starting up should be made; the concentrated black liquor tank of the evaporation system should reserve sufficient concentrated black liquor for combustion upon startup of the alkali recovery furnace.

开机顺序：只有当燃烧臭气的碱回收炉（开机时燃烧停机时留下来的浓黑液，使其运行负荷及参数都达到规定的要求）开启且能正常燃烧臭气时才能开启制浆系统及蒸发系统，这样才能保证在开机时臭气能充分收集燃烧处理而不发生事故。

Startup sequence: Only when the alkali recovery furnace for odor combustion (upon startup, it burns the concentrated black liquor reserved upon shutdown, to make the operating load and parameters meet the specified requirements) is started up, and odor is normally burned, can the pulping system and evaporation system be started, which can ensure full collection and combustion of odor upon start up, without any accident.

项目臭气焚烧器产污环节见表2.2.1-59。

The pollutant generation steps of the odor incinerator are shown in Table 2.2.1-59.

表 2.2.1-59 项目臭气焚烧器产污环节汇总表
Table 2.2.1-59 Summary of pollutant generation steps of the odor incinerator

类别 Category	污染源 Source of pollution	污染物类型 Type of pollutants	治理措施 Control measures	排放去向 Discharge destination	污染源编号 Pollution source no.
废气 Exhaust gas	臭气焚烧器 Odor incinerator	H_2S	焚烧 Incineration	经 1 根 150mH×Φ1.5m 烟囱排放至大气环境。It is discharged to the atmosphere through a 150mH×Φ1.5m chimney.	G9
废水 Waste water	本工段无废水产生。No wastewater produced in this section.				
固废 Solid waste	本工段无固废产生。No solid waste produced in this section.				

2.2.2 主要污染源分析

2.2.2 Analysis of major pollution sources

项目主要污染源分析见表 2.2.2-1。

Analysis of major pollution sources is shown in Table 2.2.2-1.

表 2.2.2-1 项目主要污染源一览表
Table 2.2.2-1 List of main pollution sources

类别 Categ ory	时段 Peri od	污染源 Source of pollution		污染物 Pollutant	治理措施 Control measures	排放去向 Discharge destination		污染源编号 Pollution	排气筒编号 Exhaust
废气 Exhaust gas	一期 Phase I	有组织 Intentional	4600t/d 碱炉废气 4,600T/d alkali furnace waste gas	烟尘、SO_2、NO_x、H_2S Smoke dust, SO_2, NO_x, H_2S	三列四电场的静电除尘器 Three-row four-electric field electrostatic precipitator	经 1 根 150mH×Φ5.2m 烟囱排放至大气环境 It is discharged to the atmosphere through a 150mH×Φ5.2m chimney	集束烟囱 Cluster chimney	G1	1#
			850t/d 石灰窑废气 850t/d lime kiln waste gas	烟尘、SO_2、NO_x、H_2S Smoke dust, SO_2, NO_x, H_2S	一列四电场静电除尘器 One-row four-electric field electrostatic precipitator	经 1 根 150mH×Φ2.6m 烟囱排放至大气环境 It is discharged to the atmosphere through a 150mH×Φ2.6m chimney		G2	2#
			220t/h 固废锅炉废气 220t/h solid waste boiler waste gas	烟尘、SO_2、NO_x、氯化氢、重金属、二噁英 Smoke dust, SO_2, NO_x, hydrogen chloride, heavy metal and Dioxin	SNCR/SCR 联合脱硝+布袋除尘器+活性炭吸附+炉外石灰石/石膏湿法脱硫+高效除雾器 SNCR/SCR combined denitration+bag-type dust collector +activated carbon adsorption+limestone outside the boiler/gypsum wet desulfurization +high efficiency demister	经 1 根 150mH×Φ4.8m 烟囱排放至大气环境 It is discharged to the atmosphere through a 150mH×Φ4.8m chimney		G3	3#

			280t/h 锅炉废气 280T/h boiler waste gas		烟尘、SO_2、NO_x、汞 Smoke dust, SO_2, NO_X, Hg	SNCR/SCR 联合脱硝+电袋除尘器+炉外石灰石/石膏湿法脱硫+高效除雾器 SNCR/SCR combined denitration+electrostatic-bag type dust collector+limestone outside the boiler/gypsum wet desulfurization +high efficiency demister			G4	
			漂白工段废气 Waste gas from bleaching section		Cl_2	碱洗 Alkaline washing	经 1 根 150mH×Φ1.0m 烟囱放至大气环境 It is discharged to the atmosphere through a 150mH×Φ1.0m chimney.		G5	4#
			焚烧器废气 Waste gas from the incinerator		H_2S	碱炉事故状态下启用臭气燃烧器焚烧制浆过程产生的臭气 Odor produced in the pulping process is incinerated by the odor incinerator under the accident state of alkali furnace.	经 1 根 150mH×Φ1.5m 烟囱排放至大气环境 It is discharged to the atmosphere through a 150mH×Φ1.5m chimney		G9	5#
			二氧化氯制备 Preparation of chlorine dioxide	过量氢气排空尾气 Excess hydrogen evacuates tail gas	H_2、少量 Cl_2 H_2, a small amount of Cl_2	碱洗 Alkaline washing	经 1 根 25mH×Φ0.2m 排气筒排放至大气环境 It is discharged to the atmosphere through a 25mH×Φ0.2m exhaust funnel		G6	6#
				盐酸合成尾气 Tail gas from hydrochloric acid synthesis	HCl、Cl_2 HCl, Cl_2	软化水洗涤 Washing by softened water	经 1 根 42mH×Φ0.25m 排气筒排放至大气环境 It is discharged to the atmosphere through a 42mH×Φ0.25m exhaust funnel		G7	7#

				二氧化氯储槽尾气 Tail gas from chlorine dioxide storage tank	Cl_2	海波塔洗涤 Washing by Hypo tower	经 1 根 30mH×Φ0.3m 排气筒排放至大气环境 It is discharged to the atmosphere through a 30mH×Φ0.3m exhaust funnel	G8	8#
		无组织 Fugitive	木片堆场及备料车间 Wood chip stockyard and preparation workshop		颗粒物 Particulate Matters (PM)	堆场采取洒水降尘，水炮喷雾抑尘措施；备料车间木片筛位于封闭车间内，基本不会飘散至室外，少量扬尘以无组织形式排放 The stockyard reduces dust fall by water spraying, and water cannon spraying; the wood chip screen in the material workshop is located in the closed workshop, the dust would basically not float out, and only a small amount of dust is discharged in a fugitive form.		Gu1	/
			二氧化氯制备车间 Chlorine dioxide preparation workshop		HCl、Cl_2 HCl, Cl_2	未被收集 HCl、Cl_2 以无组织形式排放 The uncollected HCl and Cl_2 are discharged in a fugitive form		Gu2	/
			特种纸车间 Special paper		VOCs	涂布作业是一个封闭的系统，少量散逸挥发性气体以无组织形式在车间内排放。 Coating operation is a closed system, and a small amount of volatile gas is emitted in the workshop in a fugitive form.		Gu3	
			GCC 车间 GCC workshop		颗粒物 Particulate Matters (PM)	未被收集颗粒物以无组织形式排放 The uncollected particles are discharged in a fugitive form		Gu4	/
			加油站储油罐 Oil storage tank of the petrol station		非甲烷总烃 Non-methane hydrocarbon	以无组织形式排放 is discharged in a fugitive form		Gu5	/
			污水处理站 Sewage treatment plant		NH_3、H_2S、臭气浓度 Concentration of NH_3, H_2S, and odor	对产生臭气的构筑物进行加盖密封，并配置一套碱洗除臭系统，臭气经抽风管送至除臭系统，经喷淋洗涤后，送至生产区碱炉内燃烧分解，最后经过碱炉烟囱排放。 未被收集臭气以无组织形式排放 The Project covers and seals the structures producing odor of the sewage treatment plant, and arranges an alkaline washing deodorant system, which can send the odor to the deodorant system through the exhaust tube; the odor, after spray washing, will be sent to the alkali furnace in the production area for combustion and decomposition, and finally discharged through the chimney. The uncollected odor is discharged in a fugitive form		Gu6	/

				干煤棚 Dry coal shed	颗粒物 Particulate Matters (PM)	干煤棚采用全封闭的结构，定期洒水降尘，少量扬尘无组织形式排放。 The dry coal shed is a fully enclosed structure, water is sprayed regularly to reduce dust, and a small amount of dust may be discharged in a fugitive form.		Gu7	/
	二期 Phase II	有组织 Intentional		280t/h 锅炉废气 280T/h boiler waste gas	烟尘、SO_2、NO_x Smoke dust, SO_2, NO_x	SNCR/SCR 联合脱硝+电袋除尘器+炉外石灰石/石膏湿法脱硫+高效除雾器 SNCR/SCR combined denitration+electrostatic-bag type dust collector+limestone outside the boiler/gypsum wet desulfurization +high efficiency demister	经集束烟囱的锅炉烟囱排放（150mH×Φ4.8m） They are discharged through a cluster chimney (150mH×Φ4.8m)	G4	3#
废水 Waste water	一期 Phase I	化学浆车间、化机浆车间 Chemical pulp workshop, APMP workshop	洗选漂工段 Washing and bleaching section	中段废水 Middle-section wastewater	COD_{Cr}、BOD_5、SS、NH_3N 等 COD_{Cr}, BOD_5, SS, and NH_3N, etc.	送污水处理站处理 They are sent to the sewage treatment plant	废水处理达标后排入铁山港区深海排放管网系统，在铁山港 B3 排污口深海排放 The sewage is discharged into the deep-sea discharge pipe network system of Tieshangang District after being processed, and then discharged into the deep sea at the sewage outlet B3 of Tieshangang	W1-1	/
		化学浆车间 Chemical pulp workshop	木片洗涤 Washing of wood chips	洗涤废水 Washing wastewater				W2-1	/
		文化用纸车间 Cultural paper		造纸白水 Paper-making white water				W3-1	/
		浆板车间 Pulp board workshop		造纸白水 Paper-making white water				W3-2	
		特种纸车间 Special paper		造纸白水 Paper-making white water				W3-3	

		碱回收车间 Alkaline recovery workshop	污冷凝水 Polluted condensate				W4-1	/
		MVR 蒸发工段 MVR evaporation section	污冷凝水 Polluted condensate				W4-2	
		热电站 Thermal power plant	锅炉排污 Boiler blowdown				W5-1	/
			软化处理废水 Softening wastewater				W6-1	
		其他 Others	地面冲洗废水、堆场淋滤水 Floor washing wastewater, and stockyard leaching water				W7-1	/
		办公生活 Office life	生活污水 Domestic sewage		进园区污水处理厂 Sewage treatment plant of the industrial park		W8-1	/
	二期 Phase II	化机浆车间 Chemi mechanical pulp workshop: 洗选漂工段 Washing and bleaching section	中段废水 Middle-section wastewater	COD_{Cr}、BOD_5、SS、NH_3N 等 COD_{Cr}, BOD_5, SS, and NH_3N, etc.	送污水处理站处理 They are sent to the sewage treatment plant	废水处理达标后排入铁山港区深海排放管网系统，在铁山港 B3 排污口深海排放 The sewage is discharged into the deep-sea discharge pipe network system of Tieshangang District after being processed, and then discharged into the deep sea at the sewage outlet B3 of Tieshangang	W1-2	/
		化机浆车间 Chemi mechanical pulp workshop: 木片洗涤 Washing of wood chips	洗涤废水 Washing wastewater				W2-2	
		生活用纸车间 Life paper	造纸白水 Paper-making white water				W3-4	/
		白卡纸车间 Ivory board	造纸白水 Paper-making white water				W3-5	
		MVR 蒸发工段 MVR evaporation section	污冷凝水 Polluted condensate				W4-3	
		热电站 Thermal power plant	锅炉排污 Boiler blowdown				W5-2	/

			软化处理废水 Softening wastewater			W6-2	
		其他 Others	地面冲洗废水 Floor washing wastewater			W7-2	/
		办公生活 Office life	生活污水 Domestic sewage		进园区污水处理厂 Sewage treatment plant of the industrial park	W8-2	/
固体废物 Solid waste	一期 Phase I	备料工段 Preparation section		废木屑 Waste chippings	作为 220t/h 锅炉燃料 As fuel of 220t/h boiler	S1-1	/
		制浆车间、化机浆车间、文化纸车间、特种纸车间 Pulping workshop, APMP workshop, cultural paper workshop, and special paper workshop		浆渣、节子 Pulp slag, knot	作为 220t/h 锅炉燃料 As fuel of 220t/h boiler	S2-1	/
		制浆车间、化机浆车间 Pulping workshop, and APMP workshop		黑液 Black liquor	送碱回收系统回收碱 It is sent to the alkali recovery system for recovering alkali	S3-1	
		碱回收车间 Alkaline recovery workshop		白泥 White mud	送石灰窑回收处置 It is sent to the lime kiln for recovery	S4-1	/
				绿泥 Green mud	送至填埋场填埋 It is sent to the landfill for treatment	S5-1	/
				石灰渣 Lime slag		S6-1	/
		热电站 Thermal power plant		锅炉灰渣 Boiler ash	外售、水泥厂砖厂综合利用 Sold to cement plants and brick plants for comprehensive utilization	S7-1	/
				脱硫石膏 Desulfurized gypsum	外售水泥厂作为水泥的缓凝剂或者建材厂制成石膏板、石膏砌块等建材材料 Sold to cement plants as the retarder of cement or to building material plants for producing gypsum boards, gypsum blocks and other building materials.	S8-1	/
				废活性炭 Waste activated carbon	供货厂家回收综合利用或委托有资质单位处置 The supplier recycles for comprehensive utilization or entrusts a qualified unit for disposal	S9-1	
				废催化剂 Waste catalyst	供货厂家回收综合利用或委托有资质单位处置 The supplier recycles for comprehensive utilization or entrusts a qualified unit for disposal	S15-1	
		制氧站 Oxygen generation station		废分子筛 Waste molecular sieve	厂家回收处置 It is sent to the manufacturer for recycling	S10-1	/

		软化水车间 Softened water workshop	废离子交换树脂 Waste ion exchange resin	委托有资质的单位处置 Entrusted to a qualified unit for disposal	S11-1	/
		加油站 Gas station	储油罐残渣 Slag of oil storage tank	委托有资质的单位处置 Entrusted to a qualified unit for disposal	S12-1	/
			隔油池污泥 Sludge in the oil separator	委托有资质的单位处置 Entrusted to a qualified unit for disposal	S13-1	/
		污水处理站 Sewage treatment plant	污泥 Sludge	作为 220t/h 锅炉燃料 As fuel of 220t/h boiler	S14-1	/
		机修车间 Mechanical Repair Workshop	废机油 Waste engine oil	委托有资质单位处置 Entrusted to a qualified unit for disposal	S16-1	
		办公生活 Office life	生活垃圾 Domestic waste	环卫部门统一处理 Treated by environmental sanitation department	S17-1	/
	二期 Phase II	备料工段 Preparation section	废木屑 Waste chippings	作为 220t/h 锅炉燃料 As fuel of 220t/h boiler	S1-2	/
		化机浆车间、生活用纸车间、白卡纸车间 APMP workshop, household paper workshop, ivory board workshop	浆渣、节子 Pulp slag, knot	作为 220t/h 锅炉燃料 As fuel of 220t/h boiler	S2-2	/
		化机浆车间 Chemimechanical pulp workshop	黑液 Black liquor	送碱回收系统回收碱 It is sent to the alkali recovery system for recovering alkali	S3-2	
		碱回收车间 Alkaline recovery workshop	白泥 White mud	送石灰窑回收处置 It is sent to the lime kiln for recovery	S4-2	
			绿泥 Green mud	送至填埋场填埋 It is sent to the landfill for treatment	S5-2	
			石灰渣 Lime slag		S6-2	
		热电站 Thermal power plant	锅炉灰渣 Boiler ash	外售、水泥厂砖厂综合利用 Sold to cement plants and brick plants for comprehensive utilization	S7-2	/
			脱硫石膏 Desulfurized gypsum	外售水泥厂作为水泥的缓凝剂或者建材厂制成石膏板、石膏砌块等建材材料 Sold to cement plants as the retarder of cement or to building material plants for producing gypsum boards, gypsum blocks and other building materials.	S8-2	/
			废活性炭 Waste activated carbon	供货厂家回收综合利用或委托有资质单位处置 The supplier recycles for comprehensive utilization or entrusts a qualified unit for disposal	S9-2	/

			废催化剂 Waste catalyst	供货厂家回收综合利用或委托有资质单位处置 The supplier recycles for comprehensive utilization or entrusts a qualified unit for disposal	S15-2	
		制氧站 Oxygen generation station	废分子筛 Waste molecular sieve	厂家回收处置 It is sent to the manufacturer for recycling	S10-2	/
		软化水车间 Softened water workshop	废离子交换树脂 Waste ion exchange resin	委托有资质的单位处置 Entrusted to a qualified unit for disposal	S11-2	/
		加油站 Gas station	储油罐残渣 Slag of oil storage tank	委托有资质的单位处置 Entrusted to a qualified unit for disposal	S12-2	/
			隔油池污泥 Sludge in the oil separator	委托有资质的单位处置 Entrusted to a qualified unit for disposal	S13-2	/
		污水处理站 Sewage treatment plant	污泥 Sludge	作为 220t/h 锅炉燃料 As fuel of 220t/h boiler	S14-2	/
		机修车间 Mechanical Repair Workshop	废机油 Waste engine oil	委托有资质单位处置 Entrusted to a qualified unit for disposal	S16-2	
		办公生活 Office life	生活垃圾 Domestic waste	环卫部门统一处理 Treated by environmental sanitation department	S17-2	/

2.2.3 相关平衡

2.2.3 Related balance

2.2.3.1 物料平衡

2.2.3.1 Material balance

2.2.3.2 水平衡

2.2.3.2 Water balance

2.2.3.3 碱平衡

2.2.3.3 Alkali balance

2.2.3.4 硫平衡

2.2.3.4 Sulfur balance

2.2.3.5 制浆车间浆水平衡

2.2.3.5 Pulp-water balance in the pulping workshop

2.2.3.6 化机浆车间浆水平衡

2.2.3.6 Pulp-water balance in the APMP workshop

2.2.3.8 特种纸车间浆水平衡

2.2.3.8 Pulp-water balance in the special paper workshop

2.2.3.9 生活用纸车间浆水平衡

2.2.3.9 Pulp-water balance in the household paper workshop

2.2.3.10 白卡纸纸车间浆水平衡

2.2.3.10 Pulp-water balance in the ivory board workshop

2.2.3.11 二氧化氯车间氯平衡

2.2.3.11 Chlorine balance in the chlorine dioxide workshop

2.2.4 施工期污染源源强分析

2.2.4 Pollution source intensity analysis during construction

2.2.4.1 施工期大气污染物

2.2.4.1Air pollutants during construction

施工过程中造成大气污染的主要产生源有：新建建（构）筑物施工地基开挖、临时混凝土搅拌站运行、运输车辆、施工机械走行车道所带来的扬尘，施工建筑材料（水泥、石灰、砂石料）的装卸、堆砌过程以及开挖弃土的堆砌、运输过程中造成扬起和洒落；各类施工机械和运输车辆所排放的废气。

Major sources of air pollution in the construction process include: foundation excavation of newly-built buildings (structures), operation of temporary concrete batching plants, dust generated by transportation vehicles and construction machinery travel ways, loading and unloading of construction & building materials (cement, lime, sand and gravel), stockpiling process and stockpiling of excavated spoil, and lifting and spilling during transportation; exhaust gas from various construction machineries and transportation vehicles.

（1）扬尘

(1) Flying dust

施工产生的大气污染物主要为扬尘，来源于场地平整、扰动原地貌等，扬尘污染会造成大气中 TSP 值增高，根据类比资料，施工扬尘的起尘量与许多因素有关。影响起尘量的因素包括：基础开挖起尘量、施工渣土堆场起尘量、进出车辆夹带泥砂量、水泥搬运量、弃土外运装载起尘量以及起尘高度、采取的防护措施、空气湿度、风速等因素有关。类比同类工程，源强处扬尘浓度为 10mg/m^3，距离扬尘点 25m 处扬尘浓度范围在 0.37～1.10mg/m^3，距扬尘点 50m 处扬尘浓度范围在 0.31～0.98mg/m^3。

The atmospheric pollutant produced during construction is mainly flying dust produced by site leveling and disturbance of the original landforms; the dust pollution would increase TSP value in the atmosphere, and according to the analogy data, the construction dust is related to many factors. The factors affecting the dust amount include: dust of foundation excavation, dust of construction muck dump, mud and sand of vehicles, amount of cement handled, dust produced by transport of abandoned soil and height of dust, protection measures adopted, air humidity, and wind speed. Analogous to similar projects, the dust concentration at the source is 10mg/m^3, the range of dust concentration at a distance of 25m from the dust point is 0.37～1.10mg/m^3, and that at a distance of 50m from the dust point is 0.31～0.98mg/m^3.

（2）汽车尾气

(2) Vehicle tail gas

施工过程中需要使用挖掘机、推土机等大型机械设备；建筑材料运输过程中会使用各种大型机动车辆，这些设备和车辆均使用柴油发动机或使用柴油发动机临时供电，因此，这些车辆及设备在运行时会排放一定量的 CO、NO_x 以及未完全燃烧的碳氢化物非甲烷总烃等大气污染物，会对环境产生一定的影响。

During construction, large mechanical equipment such as excavators and bulldozers should be used; and building materials should be transported by various large vehicles. These equipment and vehicles are driven by diesel engines or temporarily powered by diesel engines, so they would discharge a certain amount of CO, NO_x and atmospheric pollutants such as incompletely burned hydrogen carbonide non-methane hydrocarbon, which would have a certain impact on the environment.

2.2.4.2 施工期水污染物

2.2.4.2 Water pollutants during construction

该部分废水主要为施工人员生活污水、施工作业废水。

The wastewater is mainly the domestic wastewater of construction personnel and that from construction working.

（1）施工人员生活污水

(1) Domestic sewage of construction personnel

项目施工高峰期人数约 1000 人，生活污水排放量按 160L/人•d 计，则生活污水排放量为 160m^3/d。施工期生活污水参照低浓度生活污水水质（即悬浮物 220mg/L，BOD_5 250mg/L，COD_{Cr} 350 mg/L，NH_3-N 35 mg/L）计算，得出施工期生活污水的污染负荷，其结果列于表 2.2.4-1。

During the construction peak hours of the Project, population will reach about 1,000, and the domestic sewage discharge will be 160L/person • d, rendering a domestic sewage discharge of 160m^3/d. Domestic sewage during construction should be calculated with reference to the water quality of low-concentration domestic sewage (suspended matter: 220mg/L, BOD_5 250mg/L, COD_{Cr} 350 mg/L, NH_3-N 35 mg/L), to get the pollution load of domestic sewage during construction, and the results are listed in Table 2.2.4-1.

表 2.2.4-1 施工期水污染负荷
Table 2.2.4-1 Water pollution load during construction

污染因子 **Pollution factor**	**SS**	**BOD_5**	**COD_{Cr}**	**NH_3-N**
浓度（mg/L） Concentration (mg/L)	220	250	350	35
污染负荷（kg/d） Pollution load (kg/d)	6	6.8	9.55	0.95

（2）施工作业废水

(2) Construction wastewater

施工配料和对机械设备进行冲洗及维护保养，将产生少量的作业废水（约 100m^3/d），废水中的污染物主要是悬浮物和石油类。排出的施工废水会对周围水体产生暂时性的影响，应设隔油、沉砂池等临时处理设施，处理后用于洒水降尘。

Auxiliary materials and washing and maintenance of mechanical equipment would generate a small amount of operation wastewater (about 100m^3/d), and the pollutants in wastewater are suspended solids and petroleum. The discharged construction wastewater would have a temporary impact on the surrounding water bodies. Therefore, the oil separator, grit basin and other temporary treatment facilities, and the treated water can be used to reduce dust through spraying.

2.2.4.3 施工期声污染源

2.2.4.3 Noise pollution sources during construction

①施工机械噪声

①Construction machinery noise

施工期，项目建设工程噪声主要来源于场地平整、建筑物基础施工噪声。经过有关施工现场调查，结合工程实际情况，场道施工时的主要机械噪声状况见表 2.2.4-2。由表可以看出，对周围环境影响最大的是冲击式打桩机，距离 5m 时噪声级达 109dB (A)。

Noises during the construction period mainly come from site leveling and foundation construction. Through investigation on the construction site, and in combination with the actual situation of the Project, the main mechanical noises during road construction are shown in Table 2.2.4-2. As shown in the table, the impact-type pile driver has the greatest impact on the surrounding environment, and the noise level at the distance of 5m can reach 109dB (A).

表 2.2.4-2 本项目施工噪声污染源
Table 2.2.4-2 Construction noise pollution sources of the Project

设备 Equipment	轮式装载机 Wheel loader	平地机 Grader	推土机 Bulldozer	轮胎式液压挖掘机 Rubber-tyred hydraulic excavator	冲击式钻井机 Impact-type drilling rig
距离(5m) Distance (5m)	90	90	86	84	87
设备 Equipment	冲击式打桩机 Impact-type pile driver	混凝土搅拌机 Concrete mixer	混凝土泵 Concrete pump	混凝土振捣机 Concrete vibrator	气动扳手 Pneumatic wrench
距离(5m) Distance (5m)	109	91	85	84	95

②运输车辆噪声

②Traffic vehicle noise

施工过程中一般使用大型货运卡车及混凝土运输车，其噪声较高，可达85dB(A)左右，自卸卡车在装卸石料等建筑材料时，其噪声可达90dB (A)以上。

Large cargo trucks and concrete trucks are generally used during construction, whose noise would be relatively high and can reach about 85dB(A); when loading and unloading stone and other building materials by the self-discharging truck, the noise can reach over 90dB (A).

2.2.4.4 施工期固体废物

2.2.4.4 Solid waste during construction

（1）建筑垃圾

(1) Construction wastes

施工过程中产生的建筑垃圾主要包括地表开挖的泥土、渣土、施工剩余废物料等。根据《建筑垃圾的产生与循环利用管理》的数据显示，每平方米建筑面积将产生20～50kg的建筑垃圾，项目总建筑面积约185万m^2，本次评价取每平方米建筑面积产生30kg建

筑垃圾计，则施工期共产生建筑垃圾55500t。其主要成分为：废弃的沙土石、水泥、木屑、碎木块、弃砖、水泥袋、纤维、塑料泡沫、碎玻璃、废金属、废瓷砖等，其中废金属、木屑、碎木块。施工废弃建材分类回收，集中收集，及时清运。

Construction wastes produced during construction mainly include the soil of excavation, slag, and residual construction wastes. As shown in the data of *Management of Generation and Recycling of Construction Wastes*, each square meter of construction area would produce 20-50kg construction wastes; the total construction area of the Project is about 1.85 million m^2. In the evaluation, the value 30kg per square meter is adopted, and 55,500t would be produced during the construction period. Construction wastes mainly include: Waste sand, stone, cement, wood chippings, broken wood blocks, abandoned bricks, cement bags, fibers, plastic foam, broken glass, scrap metals, and waste ceramic tiles, where the scrap metals, wood chippings, broken wood blocks. Waste construction materials are recycled by classification, collected in a centralized manner, and promptly cleared and transported.

（2）生活垃圾

(2) Domestic waste

施工人员产生的生活垃圾伴随整个施工期的全过程，其成分是有机物较多。本项目施工高峰期预计进场工人1000人，人均生活垃圾产生量按1kg/人·d计算，施工期垃圾日产生量为1t。施工期产生的生活垃圾每日由专人收集处置，送填埋场处理。

The domestic wastes would be produced by construction personnel throughout the construction period, and such wastes contain more organic matters. It is estimated that there will be 1,000 workers at the construction peak, and as calculated on the per capita domestic waste of 1kg/person·d, the daily waste generation would be 1t. The domestic wastes produced during construction would be collected by designated personnel each day and sent to the landfill for disposal.

2.2.5 运营期污染源源强分析

2.2.5 Analysis of pollution source intensity during operation period

2.2.5.1 同类企业调查情况

2.2.5.1 Survey of similar enterprises

2.2.5.2 废气源强分析

2.2.5.2 Analysis of waste gas source intensity

1.有组织排放

1. Intentional discharge

（1）碱炉废气（G1）

(1) Alkali furnace exhaust gas (G1)

项目配套一台设计能力 4600tds/d 的碱回收炉，一期固形物处理量为 4200tds/d（其中化学浆固形物 4100 tds/d，化机浆固形物 100tds/d），可提供蒸汽 644t/h，二期化机浆生产线新增黑液固形物处理量 200 tds/d，送 4600tds/d 的碱回收炉处理。碱回收炉烟气采用三列四电场静电除尘器除尘，除尘效率以 99.92%计，处理后达标烟气由 150mH×Φ5.2m 烟囱排放，烟气温度为 130℃。

The Project is equipped with an alkali recovery furnace with the design capacity of 4,600tds/d. The solid treatment capacity in Phase I is 4,200tds/d (including chemical pulp solid of 4,100 tds/d, and APMP solid of 100tds/d), and it can provide 644t/h of steam; in Phase II, the black liquor solid treatment capacity of 200 tds/d will be added to the APMP production line, and the products will be sent to the alkali recovery furnace of 4,600tds/d for treatment. The dust of the alkali recovery furnace is removed by the three-column four-electric field electrostatic precipitator, with the dust removal efficiency of 99.92%; the up-to-standard flue gas is emitted through the 150mH×Φ5.2m chimney at the temperature of 130℃.

碱炉烟气中主要污染物为烟尘、氮氧化物、二氧化硫、硫化氢。根据设计资料，一期 4600tds/d 碱炉烟气量为 894710Nm^3/h，二期为 979920Nm^3/h。由于黑液固形物钠、钾、

氯等质量分数数据较难获取，烟尘难以通过物料衡算进行计算，本评价烟尘采用类比法进行源强分析，二氧化硫、硫化氢及氮氧化物源强根据《污染源强核算技术指南 制浆造纸》（HJ887-2018）分别采用物料衡算和设计值确定，根据 HJ887-2018 以及湛江晨鸣项目 4500tds/d 碱炉污染物产生情况，项目碱炉废气污染物产生情况如下：

Main pollutants in the flue gas of the alkali furnace are smoke dust, nitrogen oxides, sulfur dioxide, and hydrogen sulfide. According to the design data, the volume of flue gas of the 4,600tds/d alkali furnace is 894,710Nm^3/h in Phase I, and 979,920Nm^3/h in Phase II. Due to the reason that the mass fraction of the solids in black liquor, such as sodium, potassium and chlorine, cannot be easily obtained, the amount of smoke dust cannot be calculated based on material balance; therefore, an analogy method is adopted in this evaluation to analyze the source intensity of smoke dust. The source intensity data of sulfur dioxide, hydrogen sulfide and nitrogen oxides are determined based on material balance and design value according to the *Technical Guidelines of Accounting Method for Pollution Source Intensity - Pulp and Paper Industry* (HJ887-2018). In accordance with the HJ887-2018 and the pollutant generation situation of the 4,500tds/d alkali furnace of Zhanjiang Chenming, the generation conditions of exhaust gas of the alkali furnace are shown as below:

A.烟尘：类比湛江晨鸣项目碱炉烟尘最大产生浓度 34455mg/m^3，本项目取值 34455mg/m^3。

A. Smoke dust: Referring to the maximum concentration of smoke dust of Zhanjiang Chenming alkali furnace of 34,455mg/m^3, the Project takes the value of 34,455mg/m^3.

B.二氧化硫：根据 HJ887-2018，碱炉烟气中二氧化硫采用下式计算：

B. Sulfur dioxide: According to HJ887-2018, the sulfur dioxide in flue gas of the alkali furnace is calculated by the following formula:

$$d_S=2\left(G'\omega_S+M_S+K_S-R_S-P_S\right)$$

式中：

Where:

d_s——碱回收炉烟气中二氧化硫产生量，t；

d_s - Amount of sulfur dioxide in flue gas of the alkali recovery furnace, t;

G′——进入碱炉燃烧的固形物的量(绝干)，t，根据设计，一期为3280t/d，二期建成后全厂为3520 t/d;

G′ - The amount of solids (absolute dry) taken into the alkali furnace for combustion, t; as designed, the amount in Phase I is 3,280t/d, and that of the entire plant after the completion of Phase II is 3,520 t/d;

——固形物中硫元素的质量分数，%，根据山东省能源利用监测中心栾宏志《造纸黑液成分分析研究》对造纸黑液成分分析，黑液全硫量为3.19%。本项目取3.19%;

 - The mass fraction of sulfur in solids, %; according to the analysis on black liquor carried out by Luan Hongzhi, an expert in Shandong Energy Utilization Monitoring Center, in his paper “Research on composition analysis of black liquor for paper making”, the total sulfur content of black liquor is 3.19%. So 3.19% is adopted in the Project;

M_s——补充芒硝中带入硫的量，t;

M_s - The amount of sulfur brought in by the supplemented thenardite, t;

K_s——臭气带入硫的量(主要包括制浆生产线预浸塔、蒸煮器、闪蒸罐、碱回收蒸发系统产生的高浓臭气，以及制浆生产线洗浆机、碱回收系统槽罐等产生的低浓臭气)，t，根据周军等人对硫酸盐浆纸厂排放恶臭气体的研究，各工段产污系数见表2.2.6-2;

K_s - The amount of sulfur brought in by odor (mainly including the high-consistency odor produced by the prepreg tower, cooker, flash tank, and alkali recovery evaporation system of the pulping production line, as well as low-consistency odor produced by the pulp washer and alkali recovery tank of the pulping production line), t; according to the research on odor discharged by sulfate pulp and paper mills (Zhou Jun et. al.), the pollution production coefficient s of each section are shown in Table 2.2.6-2;

R_s——熔融物带走硫的量，t，根据平衡，一期取125.32t，二期取132.72t/a;

R_s - The amount of sulfur taken out by melts, t; according to the balance, 125.32t is taken for Phase I, and 132.72t/a for Phase II;

P_3——碱灰带走硫的量，t，根据平衡，一期取1.08t，二期取1.28 t。

P_3 - The amount of sulfur taken out by alkali ash, t; according to the balance, 1.08t is taken for Phase I, and 1.28 t/a for Phase II.

经核算，一期二氧化硫产生量为327.76t/a，二期建成后，全厂二氧化硫产生量为365.84t/a。

As calculated, the amount of sulfur dioxide in Phase I is 327.76t/a, and after completion of Phase II, the amount of sulfur dioxide of the entire plant is 365.84t/a.

C.氮氧化物：根据HJ887-2018，氮氧化物采用设计单位根据原料、制浆工艺和碱回收炉参数以及行业碱炉排污水平，在设计文件中确定的氮氧化物排放质量浓度保证值。根据项目设计资料，本项目采用低氮碱炉，排放浓度保证值200mg/m^{3}以下，本项目取值200mg/m^3。

C. Nitrogen oxides: According to HJ887-2018, the guarantee value of emission mass concentration determined by the design unit according to the raw materials, pulping process, alkali recovery furnace parameters,and industry alkali furnace blowdown level is adopted. According to the project design information, the Project adopts a low-nitrogen alkali furnace, with the emission concentration guarantee value of no more than 200mg/m^3, so the Project takes 200mg/m^3.

D.硫化氢：TRS以H_2S的相当量表示，根据物料衡算，一期硫化氢产生量为32.8t/a，二期建成后，全厂硫化氢产生量为36.6t/a。

D. Hydrogen sulfide: TRS is expressed in the equivalent amount of H_2S, and according to material balance, the amount of hydrogen sulfide in Phase I is 32.8t/a, and after completion of Phase II, the output of hydrogen sulfide of the entire plant is 36.6t/a.

一期碱炉废气污染物产排情况见表2.2.5-12，二期建成后，碱炉废气污染物产排情况见表2.2.5-13。

The production and emission of flue gas of Phase I alkali furnace flue gas is shown in Table 2.2.5-12, and after completion of Phase II, the production and emission of flue gas of Phase II alkali furnace flue gas is shown in Table 2.2.5-13.

表2.2.5-12 碱炉污染物产排情况一览表（一期）
Table 2.2.5-12 List of production and emission of pollutants from alkali furnace (Phase I)

污染源 Source of pollution	烟气量 Flue gas volume (Nm^3/h)	污染物 Pollutant	污染物产生情况 Production situation of pollutants		去除率% Removal rate %	污染物排放情况 Discharge of pollutants	
			产生浓度 (mg/m^3)	产生量 Output		排放浓度 (mg/m^3)	排放量 Emission amount

			Generation concentration (mg/m³)	kg/h	t/a		Discharge concentration (mg/m³)	kg/h	t/a
4600tds/d碱炉 4,600tds/d alkali furnace	894710	烟尘 Smoke dust	34455.0	30827.23	251550.22	99.92	27.6	24.66	201.24
		SO_2	44.9	40.17	327.76	0	44.9	40.17	327.76
		NO_x	200.0	178.94	1460.17	0	200.0	178.94	1460.17
		H_2S	4.5	4.02	32.8	0	4.5	4.02	32.8

表 2.2.5-13 碱炉污染物产排情况一览表（一期+二期）

Table 2.2.5-13 List of production and emission of pollutants from alkali furnace (Phase I + Phase II)

污染源 Source of pollution	烟气量 Flue gas volume (Nm³/h)	污染物 Pollutant	污染物产生情况 Production situation of pollutants			去除率% Removal rate %	污染物排放情况 Discharge of pollutants		
			产生浓度 (mg/m³) Generation concentration (mg/m³)	产生量 Output			排放浓度 (mg/m³) Discharge concentration (mg/m³)	排放量 Emission amount	
				kg/h	t/a			kg/h	t/a
4600tds/d碱炉 4,600tds/d alkali furnace	979920	烟尘 Smoke dust	34455.0	33763.14	275507.25	99.92	27.6	27.01	220.41
		SO_2	45.8	44.83	365.84	0	45.8	44.83	365.84
		NO_x	200.0	195.98	1599.23	0	200.0	195.98	1599.23
		H_2S	4.6	4.49	36.6	0	4.6	4.49	36.6

（2）石灰窑废气（G2）

(2) Exhaust gas of lime kiln (G2)

项目碱回收工段配置一座石灰窑进行白泥回收，设计规模为850t/d，石灰窑采用天然气为燃料。烟气采用一列四电场静电除尘器除尘，除尘效率以99%计，处理后达标烟气通过150mH×Φ2.6m烟囱排放，烟气温度为350℃。

The alkali recovery section of the Project is equipped with a lime kiln with the design scale of 850t/d, which can be used to recycle white mud, and the lime kiln takes natural gas as the fuel. The dust in the flue gas is removed by the three-column four-electric field electrostatic precipitator, with the dust removal efficiency of 99%; the up-to-standard flue gas is emitted through the 150mH×Φ2.6m chimney at the temperature of 350℃.

石灰窑烟气中主要污染物为烟尘、氮氧化物、二氧化硫、硫化氢。根据设计资料，850t/d 石灰窑烟气量为 158760Nm³/h。根据《污染源强核算技术指南 制浆造纸》

（HJ887-2018）附录 A，同时类比湛江晨鸣项目 800t/d 石灰窑各污染物产生情况，项目石灰窑废气污染物产生情况如下：

Main pollutants in the flue gas of the lime kiln are smoke dust, nitrogen oxides, sulfur dioxide, and hydrogen sulfide. According to the design data, the volume of flue gas of the lime kiln is 158,760Nm^3/h. According to Appendix A of the *Technical Guidelines of Accounting Method for Pollution Source Intensity - Pulp and Paper Industry* (HJ887-2018), and referring to the production situation of pollutants of the 800t/d lime kiln of Zhanjiang Chenming, the production situation of exhaust gas of the lime kiln is shown below:

A.烟尘：类比湛江晨鸣项目石灰窑烟尘最大产生浓度 5844mg/m^3，本项目取值 5844mg/m^3。

A. Smoke dust: Referring to the maximum concentration of smoke dust of Zhanjiang Chenming lime kiln of 5,844mg/m^3, the Project takes the value of 5,844mg/m^3.

B.二氧化硫：根据硫平衡，石灰窑二氧化硫产生量为 129.2t/a。

B. Sulfur dioxide: According to the sulfur balance, the output of sulfur dioxide of the lime kiln is 129.2t/a.

C.氮氧化物：根据《污染源强核算技术指南 制浆造纸》（HJ887-2018）附录 A，采用天然气为燃料的石灰窑氮氧化物污系数为 0.15~0.85kg/t（风干浆），制浆生产线用碱量为 18%时，石灰窑产污系数取高值，制浆生产线用碱量为 14%，石灰窑产污系数取低值，其余内插取值。本项目用碱量为 17%（以 Na_2O 计），本次通过内插法取 0.4kg/t（风干浆）。

C. Nitrogen oxides: According to Appendix A of the *Technical Guidelines of Accounting Method for Pollution Source Intensity - Pulp and Paper Industry* (HJ887-2018), the pollution factor of nitrogen oxides in lime kiln with natural gas as the fuel is 0.15~0.85kg/t (air dried pulp); when amount of alkali used in the pulp production line is 18%, the pollution production coefficient of the lime kiln takes a high value, and when it is 14%, the pollution production coefficient takes a low value; for other conditions, interpolated values are taken. The amount of alkali used in the Project is 17% (calculated based on Na_2O), 0.4kg/t (air dried pulp) is adopted through interpolation method this time.

D.硫化氢：TRS 以 H_2S 的相当量表示，根据硫平衡，石灰窑硫化氢产生量为 17.5t/a。

D. Hydrogen sulfide: TRS is expressed in the equivalent amount of H_2S, and according to sulfur balance, the output of hydrogen sulfide of the lime kiln is 17.5t/a.

石灰窑烟气污染物产生及排放情况见表 2.2.5-14。

The production and emission of flue gas pollutants from the lime kiln are shown in Table 2.2.5-14.

表 2.2.5-14 石灰窑污染物产排情况一览表
Table 2.2.5-14 List of production and emission of pollutants from lime kiln

污染源 **Source of pollution**	烟气量 **Flue gas volume (Nm^3/h)**	污染物 **Pollutant**	污染物产生情况 **Production situation of pollutants** 产生浓度 **(mg/m^3) Generation concentration (mg/m^3)**	产生量 **Output** **kg/h**	 **t/a**	去除率% Removal rate %	污染物排放情况 **Discharge of pollutants** 排放浓度 **(mg/m^3) Discharge concentration (mg/m^3)**	排放量 **Emission amount** **kg/h**	 **t/a**
850t/d 石灰窑 Lime kiln	158760	烟尘 Smoke dust	5844.0	927.79	7570.79	99	58.4	9.28	75.71
		SO_2	99.7	15.83	129.20	0	99.7	15.83	129.20
		NO_x	419.9	66.67	544.00	0	419.9	66.67	544.00
		H_2S	13.5	2.14	17.5	0	13.5	2.14	17.5

（3）锅炉废气

(3) Flue gas of boiler

① 固废综合利用锅炉（G3）

① Solid waste comprehensive utilization boiler for (G3)

项目设 1 台 220t/h 固废综合利用锅炉为生产供汽，燃料为项目产生的木屑、浆渣和污水处理站污泥，为保证锅炉稳定运行，正常运行时需要参数部分燃煤。其中一期木屑燃烧量为 73100（绝干）t/a，浆渣为 10200（绝干）t/a，污泥为 81600（绝干）t/a，原煤消耗量 41180t/a；二期建成后木屑燃烧量为 85000（绝干）t/a，浆渣为 17000（绝干）t/a，污泥为 108800（绝干）t/a，原煤消耗量 96451t/a。

The Project is set with a 220t/h solid waste comprehensive utilization boiler for providing steam for production, and the following materials are taken as the fuel: wood chippings, pulp slug and sludge of the sewage treatment plant; in order to ensure the stable operation of the boiler, a certain amount of coal should be added during normal operation. Where, the wood chipping combustion amount in Phase I is 73,100 (absolute dry)t/a, the pulp slag is 10,200 (absolute dry)t/a, the sludge is 81,600 (absolute dry)t/a, the raw coal consumption is 41,180t/a; after completion of Phase II, the wood chipping combustion amount will be 85,000 (absolute dry)t/a, pulp slag will be 17,000 (absolute dry)t/a, sludge will be 108,800 (absolute dry)t/a, and raw coal consumption will be 96,451t/a.

固废综合利用锅炉烟气中主要污染物为烟尘、氮氧化物、二氧化硫、重金属、二噁英等。根据设计资料，一期锅炉烟气量为166000Nm^3/h，二期锅炉烟气量为230386Nm^3/h。烟气采用活性炭吸附去除二噁英、重金属，除尘除采用布袋除尘器+湿法脱硫配套高效除雾器协同除尘，脱硫炉外石灰石/石膏湿法脱硫，脱硝循环流化床SNCR+SCR联合脱硝。

The main pollutants in the flue gas from the solid waste comprehensive utilization boiler include smoke dust, nitrogen oxides, sulfur dioxide, heavy metals, and dioxin, etc. According to the design data, the volume of flue gas of the boiler is 166,000Nm^3/h in Phase I, and 230,386Nm^3/h in Phase II. Activated carbon adsorption is adopted to remove dioxin and heavy metals from the flue gas; in addition to bag-type dust collector+wet desulphurization assorted with high-efficiency demister for dust removal, limestone/gypsum wet desulfurization outside the desulfurization furnace, denitration circulating fluidized bed SNCR+SCR combined denitration are adopted.

项目烟尘、二氧化硫、氮氧化物、汞、镉、砷、铅、铬排放量采用物料衡算法进行核算，氯化氢、铊、锑、钴、铜、锰、镍、二噁英类比山东太阳纸业股份有限公司180t/h造纸固废综合利用锅炉各污染物最大排放浓度产生情况，类比污染物浓度取值见表2.2.5-15。

The discharge of smoke dust, sulfur dioxide, nitrogen oxides, mercury, cadmium, arsenic, lead, and chromium is calculated by the material balance method; hydrogen chloride, thallium, antimony, cobalt, copper, manganese, nickel, and dioxin refer to the maximum emission concentration of the 180t/h solid waste comprehensive utilization boiler of Shandong Sun

Paper Industry Joint Stock Co., Ltd., and the concentrations of these pollutants are shown in Table 2.2.5-15.

表 2.2.5-15　项目各污染物浓度取值表
Table 2.2.5-15 Concentrations of pollutants of the Project

序号 S.N.	污染物名称 Name of pollutant	单位 Unit	类比项目 Referring item	本项目取值 Value of the Project
3	氯化氢 Hydrogen chloride	mg/m^3	25	25
4	一氧化碳 Carbon monoxide	mg/m^3	/	100
5	铊 Thallium	mg/m^3	<0.008	0.008
6	锑 Antimony	mg/m^3	0.0011	0.0011
7	钴 Cobalt	mg/m^3	0.00274	0.00274
8	铜 Copper	mg/m^3	0.0104	0.0104
9	锰 Manganese	mg/m^3	0.0489	0.0489
10	镍 Nickel	mg/m^3	0.126	0.126
11	二噁英 Dioxin	TEQng/m^3	0.033	0.033

根据项目入炉固废及烟煤成分分析，通过加权平均计算本项目入炉燃料组分见表 2.2.5-16。

According to the analysis on composition of solid wastes and bituminous coal for the boiler, the composition of fuel is determined through the weighted average method, and the results are shown in Table 2.2.5-16.

表 2.2.5-16　项目入炉燃料组分分析表
Table 2.2.5-16 Analysis on composition of fuel for the boiler of the project

时段 Period	入炉燃料（t/a） Fuel for the boiler (t/a)	处理系统 Treatment system	平均组成 Average composition						
			S （%） (%)	灰分 （%） Ash (%)	汞 (mg/kg) Mercury (mg/kg)	镉 (mg/kg) Cadmium (mg/kg)	铬 (mg/kg) Chromium (mg/kg)	铅 Lead (mg/kg)	砷 Arsenic (mg/kg)
一期 Phase I	210350	固废综合利用锅炉 Solid waste comprehensive utilization boiler	0.26	10.8	0.09	2.03	18.52	16.40	0.49
二期建成后，全厂 After completion of Phase II,	307251		0.33	11.7	0.12	1.83	16.6	14.72	0.44

烟尘、二氧化硫、氮氧化物物料衡算参照《污染源源强核算技术指南 火电》

（HJ888-2018），计算公式如下：

the material balance smoke of dust, sulfur dioxide, nitrogen oxides should refer to *Technical Guidelines of Accounting Method for Pollution Source Intensity* (HJ888-2018), and the calculation formula is as follows:

A.烟尘

A.Smoke dust

$$M_A = B_g \times \left(1 - \frac{\eta_c}{100}\right) \times \left(\frac{A_{ar}}{100} + \frac{q_4 Q_{net,ar}}{100 \times 33\,870}\right) \times \alpha_{fh}$$

式中：

Where:

M_A——核算时段内烟尘排放量，t；

M_A - Emission of smoke dust in the accounting period, t;

B_g——核算时段内锅炉燃料耗量，t；

B_g - Boiler fuel consumption in the accounting period, t;

A_{ar}——收到基灰分的质量分数，%；

A_{ar} - The mass fraction of the basic ash received, %;

q_4——锅炉机械不完全燃烧热损失，%，取 2.5%；

q_4 - Heat loss due to incomplete combustion of the boiler, %, 2.5% is adopted;

$Q_{net,ar}$——收到基低位发热量，kJ/kg；

$Q_{net,ar}$ - The low calorific value received, kJ/kg;

a_{fh}——锅炉烟气带出的飞灰份额，%，一般为 40%~60%，取 60%；

a_{fh} - The share of ash taken away by flue gas of the boiler, %, generally 40%~60%, and 60% is adopted;

η_c——除尘效率，%，当除尘器下游设有湿法脱硫、湿式电除尘器等设备时，应考虑除尘效果。由于一二期入炉燃料组分存在差异，一期取 99.91%，二期取 99.93%。

η_c - Dust removal efficiency, %; when the precipitator is set with wet desulphurization device, and wet electric precipitator, the dust removal efficiency should be considered. Due to the difference in composition of fuel of the boiler, 99.91% is adopted in Phase I, and 99.93% in Phase II.

将参数带入公式，算得一期固废锅炉烟尘排放量为13.5t/a；二期建成后，固废锅炉烟尘排放量为18.56t/a。

Substitute the parameters into the formula, the emission of smoke dust from the solid waste boiler of Phase I is 13.5t/a; after completion of Phase II, the emission will be 18.56t/a.

B.二氧化硫

B.Sulfur dioxide

$$M_{SO_2} = 2B_g \times \left(1-\frac{\eta_{S1}}{100}\right) \times \left(1-\frac{q_4}{100}\right) \times \left(1-\frac{\eta_{S2}}{100}\right) \times \frac{S_{ar}}{100} \times K$$

式中：

Where:

M_{SO_2}——核算时段内二氧化硫排放量，t；

M_{SO_2} - Emission of sulfur dioxide in the accounting period, t;

B_g——核算时段内锅炉燃料耗量，t；

B_g - Boiler fuel consumption in the accounting period, t;

S_{ar}——收到基硫的质量分数，%；

S_{ar} - The mass fraction of the basic sulfur received, %;

q_4——锅炉机械不完全燃烧热损失，%，取2.5%；

q_4 - Heat loss due to incomplete combustion of the boiler, %, 2.5% is adopted;

η_{s1}——除尘器的脱硫效率，%，电除尘、袋式除尘、电袋复合除尘器取0%；

η_{s1} - Desulfurization efficiency of the precipitator, %, which os electrostatic precipitator, bag-type dust collector, and electrostatic fabric filter takes 0%;

η_{s2}——脱硫系统的脱硫效率，%，由于一二期入炉燃料组分存在差异，一期取94.7%，二期取96.1%；

η_{s2} - Desulfurization efficiency of the desulfurization system, %; due to the difference in composition of fuel of the boiler, 94.7% is adopted in Phase I, and 96.1% in Phase II;

K——燃料中的硫燃烧后氧化成二氧化硫的份额，量刚一的量，取0.85。

K - The proportion of sulfur in the fuel oxidized to sulfur dioxide after combustion, and 0.85 is adopted.

将参数带入公式，算得一期固废锅炉二氧化硫排放量为 47.18t/a；二期建成后，固废锅炉二氧化硫排放量为65.29t/a。

Substitute the parameters into the formula, the emission of sulfur dioxide from the solid waste boiler of Phase I is 47.18t/a; after completion of Phase II, the emission will be 65.29t/a.

C.氮氧化物

C.Nitrogen oxide (NOx)

$$E_{NOx} = \rho_{NOx} \times Q \times \left(1 - \frac{\eta_{NOx}}{100}\right) \times 10^{-9}$$

式中：

Where:

E_{SO_2}——核算时段内氮氧化物排放量，t；

E_{SO_2} - Emission of nitrogen oxides in the accounting period, t;

ρ_{NOx}——锅炉炉膛出口氮氧化物质量浓度，mg/m^3，根据 HJ991-2018，取 300 mg/m^3；

ρ_{NOx} - The mass concentration of nitrogen oxides at the outlet of the boiler furnace, mg/m^3; according to HJ991-2018, 300 mg/m^3 is adopted;

Q——核算时段内烟气排放量，m^3；

Q - Emission of flue gas in the accounting period, m^3;

η_{NOx}——脱硝效率，%，取 83.35%。

η_{NOx} - Denitration efficiency, %; 83.35% is taken.

将参数带入公式，算得一期氮氧化物排放量为 67.66t/a；二期建成后，全厂氮氧化物排放量为93.9t/a。

Substitute the parameters into the formula, the emission of nitrogen oxides of Phase I is 67.66t/a; after completion of Phase II, the emission of the plant will be 93.9t/a.

汞、镉、砷、铅、铬产生量根据入炉燃料各组分含量计算，分别算得一期汞产生量为 0.019t/a、镉 0.418t/a、砷 0.100t/a、铅 3.380t/a、铬 3.816t/a，二期建成后，全厂汞为

0.038t/a、镉 0.561t/a、砷 0.134t/a、铅 4.524 t/a、铬 5.100t/a。

The output of mercury, cadmium, arsenic, lead, and chromium is calculated according to content of each component of the fuel, and it is calculated that Phase I produces 0.019t/a of mercury, 0.418t/a of cadmium, 0.100t/a of arsenic, 3.380t/a of lead, and 3.816t/a of chromium; after completion of Phase II, the plant can produce 0.038t/a of mercury, 0.561t/a of cadmium, 0.134t/a of arsenic, 4.524 t/a of lead, and 5.100t/a of chromium.

综上，220t/h 固废综合利用锅炉烟气污染物产生及排放情况见表 2.2.5-17 及表 2.2.5-18。

In summary, the production and emission of flue gas from the 220t/h solid waste comprehensive utilization boiler are shown in Table 2.2.5-17 and Table 2.2.5-18.

表 2.2.5-17 220t/h 固废综合利用锅炉烟气产排一览表（一期）
Table 2.2.5-17 List of production and emission of flue gas from the 220t/h solid waste comprehensive utilization boiler (Phase I)

污染源 Source of pollution	烟气量 Flue gas volume (Nm^3/h)	污染物 Pollutant	污染物产生情况 Production situation of pollutants			去除率% Removal rate %	污染物排放情况 Discharge of pollutants		
			产生浓度 (mg/m^3) Generation concentration (mg/m^3)	产生量 Output kg/h	产生量 Output t/a		排放浓度 (mg/m^3) Discharge concentration (mg/m^3)	排放量 Emission amount kg/h	排放量 Emission amount t/a
220t/h 固废综合利用锅炉 220t/h solid waste comprehensive utilization boiler	166000	烟尘 Smoke dust	10404.4	1727.14	14093.42	99.91	9.88	1.64	13.39
		SO_2	654.7	108.68	886.84	94.7	34.83	5.78	47.18
		NO_x	300.0	49.80	406.37	83.35	49.95	8.29	67.66
		氯化氢 Hydrogen chloride	250.0	41.50	338.64	90	25	4.15	33.86
		一氧化碳 Carbon monoxide	/	/	/	/	100	16.60	135.46
		汞 Mercury	0.0137	0.0023	0.019	40	0.0082	0.00136	0.0111
		镉 Cadmium	0.3087	0.0513	0.418	70	0.0917	0.01522	0.1242
		铊 Thallium	0.0267	0.004	0.036	70	0.008	0.0013	0.0108
		锑 Antimony	0.0037	0.001	0.005	85	0.0011	0.0002	0.0015
		砷 Arsenic	0.0740	0.012	0.100	85	0.0111	0.0018	0.0150
		铅 Lead	2.4955	0.414	3.380	85	0.3743	0.0621	0.5070

污染源 Source of pollution	烟气量 Flue gas volume (Nm³/h)	污染物 Pollutant	污染物产生情况 Production situation of pollutants			去除率% Removal rate %	污染物排放情况 Discharge of pollutants		
			产生浓度 (mg/m³) Generation concentration (mg/m³)	产生量 Output			排放浓度 (mg/m³) Discharge concentration (mg/m³)	排放量 Emission amount	
				kg/h	t/a			kg/h	t/a
		铬 Chromium	2.8169	0.468	3.816	85	0.4225	0.0701	0.5723
		钴 Cobalt	0.0183	0.003	0.025	85	0.00274	0.0005	0.0037
		铜 Copper	0.0693	0.012	0.094	85	0.0104	0.0017	0.0141
		锰 Manganese	0.3260	0.054	0.442	85	0.0489	0.0081	0.0662
		镍 Nickel	0.8400	0.139	1.138	85	0.126	0.0209	0.1707
		镉+铊 Cadmium +thallium	0.3323	0.055	0.450	70	0.0997	0.0165	0.1350
		锑+砷+铅+铬+钴+铜+锰+镍 Antimony +arsenic+lead+chromium +cobalt+copper+manganese+nickel	7.1221	1.182	9.647	85	0.9971	0.1655	1.3506
		二噁英 Dioxin	0.330ng TEG/m³	0.055 mg/h	0.447 mg/a	90	0.0330ng TEG/m³	0.0055 mg/h	0.0447 mg/a

表 2.2.5-18 220t/h 固废综合利用锅炉烟气产排一览表（一期+二期）

Table 2.2.5-18 List of production and emission of flue gas from the 220t/h solid waste comprehensive utilization boiler (Phase I + Phase II)

污染源 Source of pollution	烟气量 Flue gas volume (Nm³/h)	污染物 Pollutant	污染物产生情况 Production situation of pollutants			去除率% Removal rate %	污染物排放情况 Discharge of pollutants		
			产生浓度 (mg/m³) Generation concentration (mg/m³)	产生量 Output			排放浓度 (mg/m³) Discharge concentration (mg/m³)	排放量 Emission amount	
				kg/h	t/a			kg/h	t/a
220t/h 固废综合利用锅炉 220t/h solid waste comprehensive utilization	230386	烟尘 Smoke dust	12197.3	2810.08	22930.24	99.92	9.88	2.28	18.57
		SO_2	883.7	203.59	1661.27	96.1	34.73	8.00	65.29
		NO_x	300.0	69.12	563.98	83.35	49.95	11.51	93.90
		氯化氢 Hydrogen chloride	250.0	57.60	469.99	90	25	5.76	47.00

污染源 Source of pollution	烟气量 Flue gas volume (Nm^3/h)	污染物 Pollutant	污染物产生情况 Production situation of pollutants			去除率% Removal rate %	污染物排放情况 Discharge of pollutants		
			产生浓度 (mg/m^3) Generation concentration (mg/m^3)	产生量 Output kg/h	t/a		排放浓度 (mg/m^3) Discharge concentration (mg/m^3)	排放量 Emission amount kg/h	t/a
boiler		一氧化碳 Carbon monoxide	/	/	/	/	100	23.04	187.99
		汞 Mercury	0.0202	0.0046	0.038	40	0.0121	0.00279	0.0227
		镉 Cadmium	0.2984	0.0688	0.561	70	0.0895	0.02063	0.1683
		铊 Thallium	0.0267	0.006	0.050	70	0.008	0.0018	0.0150
		锑 Antimony	0.0073	0.002	0.014	85	0.0011	0.0003	0.0021
		砷 Arsenic	0.0712	0.016	0.134	85	0.0107	0.0025	0.0201
		铅 Lead	2.4065	0.554	4.524	85	0.3610	0.0832	0.6786
		铬 Chromium	2.7128	0.625	5.100	85	0.4069	0.0938	0.7650
		钴 Cobalt	0.0183	0.004	0.034	85	0.00274	0.0006	0.0052
		铜 Copper	0.0693	0.016	0.130	85	0.0104	0.0024	0.0196
		锰 Manganese	0.3260	0.075	0.613	85	0.0489	0.0113	0.0919
		镍 Nickel	0.8400	0.194	1.579	85	0.126	0.0290	0.2369
		镉+铊 Cadmium +thallium	0.3251	0.075	0.611	70	0.0975	0.0225	0.1833
		锑+砷+铅+铬+钴+铜+锰+镍 Antimony+arsenic+lead+chromium +cobalt+copper+manganese+nickel	6.4515	1.486	12.128	85	0.9677	0.2229	1.8193
		二噁英 Dioxin	0.3300 ng TEG/m^3	0.076 mg/h	0.62 mg/a	90	0.0330 ng TEG/m^3	0.0076 mg/h	0.0620 mg/a

②燃煤锅炉废气（G4）

②Flue gas of the coal-fired boiler (G4)

项目一期设置 1 台 280t/h 循环硫化床锅炉（1#）为生产供汽，运行负荷为 92.5%，二期新增一台 280t/h 循环硫化床锅炉（2#），运行负荷为 87.8%，燃料均为烟煤，其中一期燃煤量为 314225t/a，二期新增燃煤量为 298330t/a，煤质分析见表 2.2-7。

Phase I of the Project is set with a 280t/h circulating fluidized bed boiler (1#), with the operating load of 92.5%, which is used to provide steam for production; Phase II is newly added with a 280t/h circulating fluidized bed boiler (2#), with the operating load of 87.8%, both of which are bituminous coal-fired boilers. The coal combustion in Phase I is 314,225t/a, and 298,330t/a in Phase II; the coal property analysis is shown in Table 2.2-7.

燃煤锅炉烟气中主要污染物为烟尘、氮氧化物、二氧化硫、汞。根据设计资料，一期锅炉烟气量为303089Nm^3/h，二期锅炉烟气量为287764Nm^3/h。烟气除尘采用电袋除尘器+湿法脱硫配套高效除雾器协同除尘除尘，除尘效率以99.93%计，炉外石灰石/石膏湿法脱硫，脱硫效率以97.73%计，循环流化床SNCR+SCR联合脱硝，脱硝效率以83.4%计。

Main pollutants in the flue gas of the coal-fired boiler are smoke dust, nitrogen oxides, sulfur dioxide, mercury. According to the design data, the volume of flue gas of the boiler is 303089Nm^3/h in Phase I, and 287764Nm^3/h in Phase II. Flue gas dust removal adopts electrostatic-bag type dust collector+wet desulphurization assorted by high-efficiency demister, with the efficiency of 99.93%; limestone/gypsum wet desulfurization outside the desulfurization furnace, with the efficiency of 97.73%; circulating fluidized bed SNCR+SCR combined with denitration, with the efficiency of 83.4%.

项目烟尘、二氧化硫、氮氧化物、汞排放量采用《污染源源强核算技术指南 火电》（HJ888-2018）。

The discharge of smoke dust, sulfur dioxide, nitrogen oxides, and mercury of the Project should refer to *Technical Guidelines of Accounting Method for Pollution Source Intensity* (HJ888-2018).

A.烟尘

A. Smoke dust

$$M_A = B_g \times \left(1 - \frac{\eta_c}{100}\right) \times \left(\frac{A_{ar}}{100} + \frac{q_4 Q_{net,ar}}{100 \times 33\,870}\right) \times \alpha_{fh}$$

式中：

Where:

M_A——核算时段内烟尘排放量，t；

M_A - Emission of smoke dust in the accounting period, t;

B_g——核算时段内锅炉燃料耗量，t；

B_g - Boiler fuel consumption in the accounting period, t;

A_{ar}——收到基灰分的质量分数，%；

A_{ar} - The mass fraction of the basic ash received, %;

q_4——锅炉机械不完全燃烧热损失，%，取 2.5%；

q_4 - Heat loss due to incomplete combustion of the boiler, %, 2.5% is adopted;

$Q_{net,ar}$——收到基低位发热量，kJ/kg；

$Q_{net,ar}$ - The low calorific value received, kJ/kg;

a_{fh}——锅炉烟气带出的飞灰份额，%，一般为 40%~60%，取 60%；

a_{fh} - The share of ash taken away by flue gas of the boiler, %, generally 40%~60%, and 60% is adopted;

η_c——除尘效率，%，当除尘器下游设有湿法脱硫、湿式电除尘器等设备时，应考虑除尘效果，取 99.93%。

η_c - Dust removal efficiency, %; when the precipitator is set with wet desulphurization device, and wet electric precipitator, the dust removal efficiency should be considered. 99.93% is adopted.

将参数带入公式，算得一期 280t/h 锅炉烟尘排放量为 24.41t/a；二期 280t/h 锅炉烟尘排放量为 23.18t/a。

Substitute the parameters into the formula, the emission of smoke dust from the 280t/h boiler of Phase I is 24.41t/a; the emission of 280t/h boiler of Phase II will be 23.18t/a.

B.二氧化硫

B. Sulfur dioxide

$$M_{SO_2} = 2B_g \times \left(1 - \frac{\eta_{S1}}{100}\right) \times \left(1 - \frac{q_4}{100}\right) \times \left(1 - \frac{\eta_{S2}}{100}\right) \times \frac{S_{ar}}{100} \times K$$

式中：

Where:

M_{SO_2}——核算时段内二氧化硫排放量，t；

M_{SO_2} - Emission of sulfur dioxide in the accounting period, t;

B_g——核算时段内锅炉燃料耗量，t；

B_g - Boiler fuel consumption in the accounting period, t;

S_{ar}——收到基硫的质量分数，%；

S_{ar} - The mass fraction of the basic sulfur received, %;

q_4——锅炉机械不完全燃烧热损失，%，取2.5%；

q_4 - Heat loss due to incomplete combustion of the boiler, %, 2.5% is adopted;

η_{s1}——除尘器的脱硫效率，%，电除尘、袋式除尘、电袋复合除尘器取0%；

η_{s1} - Desulfurization efficiency of the precipitator, %, which os electrostatic precipitator, bag-type dust collector, and electrostatic fabric filter takes 0%;

η_{s2}——脱硫系统的脱硫效率，%，取97.73%；

η_{s2} - Efficiency of desulfurization system, %; 97.73% is adopted;

K——燃料中的硫燃烧后氧化成二氧化硫的份额，量刚一的量，取0.85。

K - The proportion of sulfur in the fuel oxidized to sulfur dioxide after combustion, and 0.85 is adopted.

将参数带入公式，算得一期280t/h锅炉二氧化硫排放量为86.31t/a；二期280t/h锅炉二氧化硫排放量为81.94t/a。

Substitute the parameters into the formula, the emission of sulfur dioxide from the 280t/h boiler of Phase I is 86.31t/a; the emission of 280t/h boiler of Phase II will be 81.94t/a.

C.氮氧化物

C. Nitrogen oxides

氮氧化物排放量按下式计算：

The emission of nitrogen oxides is calculated as follows:

$$E_{NOx} = \rho_{NOx} \times Q \times \left(1 - \frac{\eta_{NOx}}{100}\right) \times 10^{-9}$$

式中：

Where:

E_{so_2}——核算时段内氮氧化物排放量，t；

E_{so_2} - Emission of nitrogen oxides in the accounting period, t;

ρ_{NOx}——锅炉炉膛出口氮氧化物质量浓度，mg/m^3，根据 HJ991-2018，取 300 mg/m^3；

ρ_{NOx} - The mass concentration of nitrogen oxides at the outlet of the boiler furnace, mg/m^3; according to HJ991-2018, 300 mg/m^3 is adopted;

Q——核算时段内烟气排放量，m^3；

Q - Emission of flue gas in the accounting period, m^3;

η_{NOx}——脱硝效率，%，取 83.4%。

η_{NOx} - Denitration efficiency, %; 83.4% is taken.

将参数带入公式，算得一期锅炉氮氧化物排放量为 123.171t/a；二期锅炉氮氧化物排放量为 116.94t/a。

Substitute the parameters into the formula, the emission of nitrogen oxides of Phase I is 123.171t/a; and the emission of Phase II will be 116.94t/a.

D.汞及其化合物

C. Mercury and its compounds

$$E_{Hg} = R \times m_{Hgar} \times (1 - \frac{\eta_{Hg}}{100}) \times 10^{-6}$$

式中：

Where:

E_{Hg}——核算时段内汞及其化合物排放量（以汞计），t；

E_{Hg} - Discharge of mercury and its compounds in the auditing period (Hg), t;

R——核算时段内锅炉燃料耗量，t；

R - Boiler fuel consumption in the accounting period, t;

m_{Hgar}——收到基汞的含量，μg/g；

m_{Hgar} - Content of basic mercury received, μg/g;

η_{Hg}——汞的协同脱除效率，%，根据 HJ991-2018，取 70%。

η_{Hg} - Collaborative removal efficiency of mercury, %; according to HJ991-2018, 70% is adopted.

根据《燃煤电厂煤中汞含量对烟气汞排放水平的影响》（俞美香,杨丽,寇晓芳.[J].环境监控与预警,2014.）中对国内多家电厂燃煤成分分析，国内煤中汞含量为 0.055~0.297μg/g，本评价取 0.297μg/g。将参数带入公式，一期 280t/h 锅炉算得汞排放量为 0.028t/a；二期 280t/h 锅炉排放量为 0.027t/a。

According to the analysis on composition of coal used in several domestic power plants as stated in “The Effect of Mercury Content in Coal on the Level of Mercury Emissions from Coal-fired Power Plant Flue Gas” (YU Mei-xiang, YANG Li, KOU Xiao-fang. [J]. *Environmental Monitoring and Forewarning*, 2014.), the mercury content in domestic coal is 0.055~0.297μg/g, and 0.297μg/g is adopted in this evaluation. Substitute the parameters into the formula, the emission of mercury from the 280t/h boiler of Phase I is 0.028t/a; the emission of 280t/h boiler of Phase II is 0.027t/a.

综上，项目燃煤锅炉烟气污染物产生及排放情况见表 2.2.5-19 和表 2.2.5-20。

In summary, the production and emission of flue gas from the coal-fired boiler are shown in Table 2.2.5-19 and Table 2.2.5-20.

表 2.2.5-19 280t/h 燃煤锅炉烟气产排一览表（一期）

Table 2.2.5-19 List of production and emission of flue gas from the coal-fired boiler (Phase I)

污染源 Source of pollution	烟气量 Flue gas volume (Nm^3/h)	污染物 Pollutant	污染物产生情况 Production situation of pollutants			去除率% Removal rate %	污染物排放情况 Discharge of pollutants		
			产生浓度 (mg/m^3) Generation concentration (mg/m^3)	产生量 Output			排放浓度 (mg/m^3) Discharge concentration (mg/m^3)	排放量 Emission amount	
				kg/h	t/a			kg/h	t/a
1×280t/h 燃煤锅炉（1#） 1×280t/h coal-fired boiler (1#)	303089	烟尘 Smoke dust	13162.2	3989.32	32552.85	99.93	9.87	2.99	24.41
		SO_2	1537.3	465.94	3802.04	97.73	34.90	10.58	86.31
		NO_x	300	90.93	741.96	83.4	49.80	15.09	123.17
		汞 Mercury	2.0	0.01	0.09	70.0	0.011	0.0034	0.028

表 2.2.5-20 280t/h 燃煤锅炉烟气产排一览表（二期）

Table 2.2.5-20 List of production and emission of flue gas from the 80t/h 280t/h coal-fired boiler (Phase II)

污染源 Source of pollution	烟气量 Flue gas volume (Nm^3/h)	污染物 Pollutant	污染物产生情况 Production situation of pollutants		去除率% Removal	污染物排放情况 Discharge of pollutants	
			产生浓度 (mg/m^3)	产生量 Output		排放浓度 (mg/m^3)	排放量 Emission amount

			Generation concentration (mg/m^3)	kg/h	t/a	rate %	Discharge concentration (mg/m^3)	kg/h	t/a
1×280t/h 燃煤锅炉（2#） 1×280t/h coal-fired boiler (2#)	287764	烟尘 Smoke dust	13161.9	3787.52	30906.17	99.93	9.87	2.84	23.18
		SO_2	1537.3	442.37	3609.72	97.73	34.90	10.04	81.94
		NO_x	300	86.33	704.45	83.4	49.80	14.33	116.94
		汞 Mercury	2.0	0.01	0.09	70.0	0.011	0.0033	0.027

③锅炉烟气混合排放情况

③ Mixed emission of boiler flue gas

项目固废锅炉及燃煤锅炉烟气经烟气处理系统处理后的达标烟气统一通过150mH×Φ4.8m 烟囱排放，烟气温度为 55℃。项目锅炉烟气排放情况见表 2.2.5-21 及2.2.5-22。

The flue gas from the solid waste boiler and coal-fired boiler should be treated by the flue gas treatment system, and the up-to-standard gas can be emitted through a 150mH×Φ4.8m chimney at a temperature of 55℃. Flue gas emission of the boiler is shown in Table 2.2.5-21 and 2.2.5-22.

表 2.2.5-21 锅炉烟气排放情况一览表（一期）
Table 2.2.5-21 List of boiler flue gas emission (Phase I)

污染源 Source of pollution	烟气量 Flue gas volume (Nm^3/h)	污染物 Pollutant	污染物排放情况 Discharge of pollutants		
			排放浓度(mg/m^3) Discharge concentration (mg/m^3)	排放量 Emission amount	
				kg/h	t/a
1×220t/h 固废综合利用锅炉、1×280t/h 燃煤锅炉 1×220t/h solid waste comprehensive utilization boiler, 1×280t/h coal-fired boiler	469089	烟尘 Smoke dust	9.88	4.63	37.80
		SO_2	34.87	16.36	133.49
		NO_x	49.85	23.39	190.83
		氯化氢 Hydrogen chloride	8.85	4.15	33.86
		一氧化碳 Carbon monoxide	35.39	16.60	135.46
		汞 Mercury	0.0102	0.0048	0.0391
		镉 Cadmium	0.0324	0.0152	0.1242
		铊 Thallium	0.0028	0.0013	0.0108

污染源 Source of pollution	烟气量 Flue gas volume (Nm^3/h)	污染物 Pollutant	污染物排放情况 Discharge of pollutants		
			排放浓度(mg/m^3) Discharge concentration (mg/m^3)	排放量 Emission amount kg/h	t/a
		锑 Antimony	0.0004	0.0002	0.0015
		砷 Arsenic	0.0039	0.0018	0.0150
		铅 Lead	0.1325	0.0621	0.5070
		铬 Chromium	0.1495	0.0701	0.5723
		钴 Cobalt	0.0010	0.0005	0.0037
		铜 Copper	0.0037	0.0017	0.0141
		锰 Manganese	0.0173	0.0081	0.0662
		镍 Nickel	0.0446	0.0209	0.1707
		镉+铊 Cadmium +thallium	0.0353	0.0165	0.1350
		锑+砷+铅+铬+钴+铜+锰+镍 Antimony+arsenic +lead+chromium +cobalt+copper+manganese+nickel	0.3528	0.1655	1.3506
		二噁英 Dioxin	0.0117 ng TEG/m^3	0.0055 mg/h	0.0447mg/a

表 2.2.5-22 锅炉烟气排放情况一览表（一期+二期）
Table 2.2.5-22 List of boiler flue gas emission (Phase I +Phase II)

污染源 Source of pollution	烟气量 Flue gas volume (Nm^3/h)	污染物 Pollutant	污染物排放情况 Discharge of pollutants		
			排放浓度(mg/m^3) Discharge concentration (mg/m^3)	排放量 Emission amount kg/h	t/a
1×220t/h 固废综合利用锅炉、2×280t/h 燃煤锅炉 1×220t/h	821239	烟尘 Smoke dust	9.87	8.11	66.17
		SO_2	34.85	28.62	233.53
		NO_x	49.84	40.93	334.01
		氯化氢 Hydrogen chloride	7.01	5.76	47.00

污染源 Source of pollution	烟气量 Flue gas volume (Nm^3/h)	污染物 Pollutant	污染物排放情况 Discharge of pollutants		
			排放浓度(mg/m^3) Discharge concentration (mg/m^3)	排放量 Emission amount	
				kg/h	t/a
solid waste comprehensive utilization boiler, 2×280t/h coal-fired boiler		一氧化碳 Carbon monoxide	28.05	23.04	187.99
		汞 Mercury	0.0115	0.00948	0.0773
		镉 Cadmium	0.0251	0.0206	0.1683
		铊 Thallium	0.0022	0.0018	0.0150
		锑 Antimony	0.0003	0.0003	0.0021
		砷 Arsenic	0.0030	0.0025	0.0201
		铅 Lead	0.1013	0.0832	0.6786
		铬 Chromium	0.1142	0.0938	0.7650
		钴 Cobalt	0.0008	0.0006	0.0052
		铜 Copper	0.0029	0.0024	0.0196
		锰 Manganese	0.0137	0.0113	0.0919
		镍 Nickel	0.0353	0.0290	0.2369
		镉+铊 Cadmium +thallium	0.0274	0.0225	0.1833
		锑+砷+铅+铬+钴+铜+锰+镍 Antimony+arsenic+lead+chromium +cobalt+copper+manganese+nickel	0.2715	0.2229	1.8193
		二噁英 Dioxin	0.0093 ng TEG/m^3	0.0076 mg/h	0.0620 mg/a

（4）化学浆车间漂白工段尾气（G5）

(4) Tail gas from bleaching section of chemical pulp workshop (G5)

化学浆车间漂白工段尾气主要污染物为氯气，经碱洗涤后经通过150mH×Φ1.0m排气筒排放。类比湛江晨鸣项目制浆车间漂白工段尾气氯气最大排放浓度为3.79mg/m^3，本项目取4.0 mg/m^3，项目化学浆车间漂白工段尾气污染物产生及排放情况见表2.2.5-23。

The main pollutant in tail gas from bleaching section of chemical pulp workshop is chlorine, which can be emitted through a 150mH×Φ1.0m exhaust funnel after alkali washing. Referring to the maximum emission concentration of chlorine of 3.79mg/m^3 in bleaching section of pulping workshop of Zhanjiang Chenming, 4.0 mg/m^3 is adopted in the Project; the production and emission of tail gas from bleaching section of chemical pulp workshop are shown in Table 2.2.5-23.

表 2.2.5-23 化学浆车间漂白工段尾气污染物产排一览表
Table 2.2.5-23 List of production and emission of tail gas from bleaching section of chemical pulp workshop

污染源 Source of pollution	废气量 Exhaust gas volume (Nm^3/h)	污染物 Pollutant	污染物产生情况 Production situation of pollutants			去除率% Removal rate %	污染物排放情况 Discharge of pollutants		
			产生浓度 (mg/m^3) Generation concentration (mg/m^3)	产生量 Output			排放浓度 (mg/m^3) Discharge concentration (mg/m^3)	排放量 Emission amount	
				kg/h	t/a			kg/h	t/a
漂白塔尾气 Bleaching tower tail gas	16300	Cl_2	16.0	0.26	2.13	75	4.0	0.065	0.53

（5）二氧化氯制备尾气（G6、G7、G8）

(5) Tail gas of preparation of chlorine dioxide (G6, G7, G8)

二氧化氯车间氯酸钠电解槽过量氢气排空尾气经稀碱液洗涤后通过 25mH×Φ0.2m 排气筒排放，排气量为2000m^3/h；盐酸合成尾气经软化水洗涤后通过42mH×0.25m 排气筒排放，排气量为 2500m^3/h；二氧化氯罐槽尾气经海波塔洗涤后通过 30mH×Φ0.3m 排气筒排放，排气量为4500m^3/h，根据二氧化氯车间氯平衡，项目二氧化氯制备污染物产生及排放情况见表 2.2.5-24。

Excessive hydrogen tail gas in sodium chlorate electrolytic cell of chlorine dioxide workshop can be emitted through a 25mH×Φ0.2m exhaust funnel after washing with diluted alkali liquor, with the exhaust volume of 2,000m^3/h; tail gas from hydrochloric acid synthesis can be emitted through a 42mH×0.25m exhaust funnel after washing with softened water, with the exhaust volume of 2,500m^3/h; tail gas from the chlorine dioxide tank can be emitted through a 30mH×Φ0.3m exhaust funnel after washing by Hypo tower, with the exhaust volume of 4,500m^3/h; according to chlorine balance in the chlorine dioxide workshop, the production and emission of tail gas of preparation of chlorine dioxide are shown in Table 2.2.5-24.

表 2.2.5-24 二氧化氯制备尾气污染物产排一览表
Table 2.2.5-24 List of production and emission of tail gas of preparation of chlorine dioxide

污染源 Source of pollution	废气量 Exhaust gas volume (m^3/h)	污染物 Pollutant	污染物产生情况 Production situation of pollutants			去除率% Removal rate %	污染物排放情况 Discharge of pollutants		
			产生浓度 (mg/m^3) Generation concentration (mg/m^3)	产生量 Output			排放浓度 (mg/m^3) Discharge concentration (mg/m^3)	排放量 Emission amount	
				kg/h	t/a			kg/h	t/a
二氧化氯车间过量氢气排空尾气 Excessive hydrogen tail gas of chlorine dioxide workshop	2000	Cl_2	25.0	0.05	0.408	75	6.3	0.013	0.102
二氧化氯车间盐酸合成尾气 Tail gas from hydrochloric acid synthesis in chlorine dioxide workshop	2500	Cl_2	21.3	0.05	0.44	70	6.4	0.016	0.131
		HCl	50.7	0.13	1.03	70	15.2	0.038	0.310
二氧化氯车间槽罐尾气 Tail gas from tank of chlorine dioxide workshop	4500	Cl_2	29.3	0.13	1.08	75	7.3	0.033	0.269

2.无组织排放

2. Fugitive emission

（1）木片堆场及备料车间无组织排放分析（Gu1）

(1) Analysis on fugitive emission from wood chip stockyard and material preparation

workshop (Gu1)

木片堆场及备料车间的粉尘主要产生于木片堆存、转运、筛分及再碎过程，本次评价将木片堆场及备料车间作为一个面源，面源面积 553385m^2，面源的释放高度选择均值 3m，参照广西金桂浆纸业有限公司年产 40 万吨高档纸板扩建工程木片堆场及备料车间的粉尘产生系数为 5.534×10^{-6}g/s·m^2，本项目计算得 11.02kg/h。

The dust in the wood chip stockyard and material preparation workshop is mainly generated from the process of wood chip storage, transfer, screening and re-crushing. In this evaluation, the wood chip stockyard and preparation workshop are taken as an areal source, with an area of 553,385m^2, and its release height takes 3m on average. Referring to the dust generation coefficient of 5.534×10^{-6}g/s·m^2 of the wood chip stockyard and preparation workshop of 400,000t high-grade cardboard expansion project of Guangxi Jingui Pulp & Paper Co., Ltd., the volume in the Project is calculated as 11.02kg/h.

由于木片含水量较大，不易起尘，木片堆场通过洒水降尘，水炮喷雾抑尘措施后，产生的扬尘量很小；备料车间的扬尘主要产生于木片筛，木片筛位于封闭车间内，基本不会飘散至室外，通过上述措施抑尘效率取 60%，则木片堆场及备料车间无组织排放为 4.41kg/h。

Due to the high water content of wood chips, no dust will be easily raised. And after taking the measures such as water spraying and water gun spraying, there will be only a small amount of flying dust in the wood chip stockyard. The dust in the material preparation workshop is mainly generated by the wood chip screen, which is located in a closed workshop, so the dust will not spread outside. With the above measures and the dust suppression efficiency of 60%, the fugitive emission of the wood chip stockyard and material preparation workshop is 4.41kg/h.

（2）二氧化氯车间无组织排放分析（Gu2）

(2) Analysis on fugitive emission from chlorine dioxide workshop (Gu2)

拟建项目二氧化氯车间氯酸钠电解槽过量氢气排空尾气、盐酸合成尾气、罐槽尾气经洗涤器洗涤后排空，在生产过程中，仍可能产生 Cl_2、HCl 少量的无组织排放，根据平衡，Cl_2、HCl 排放量分别为 0.0563kg/h、0.0563kg/h。

Excessive hydrogen tail gas in sodium chlorate electrolytic cell of chlorine dioxide workshop, tail gas from hydrochloric acid synthesis, and tank tail gas of the proposed project can be emitted after washing with a washer; during production, there will still be fugitive emission of a small amount of Cl_2 and HCl; according to balance, the emission volume of Cl_2 and HCl is 0.0563kg/h and 0.0563kg/h, respectively.

根据海南金海 100 万吨硫酸盐木浆项目，其二氧化氯制备工艺与拟建项目相同，均采用综合法，设计规模为 105t/d。类比海南金海项目化学品制备车间 Cl_2、HCl 无组织排放监测结果，厂界无组织排放监控点 Cl_2 浓度＜0.03mg/m^3，HCl 浓度＜0.05 mg/m^3，均满足《无机化学工业污染物排放标准》（GB31573-2015）表 5 标准限值要求，即 Cl_2 0.1mg/m^3、HCl 0.05mg/m^3。

According to the 1 million ton sulfate wood pulp project of Hainan Jinhai, the preparation process of chlorine dioxide is the same as that of the proposed project, and the comprehensive method is adopted, with the design capacity of 105t/d. Referring to the monitoring results of fugitive emission of Cl2 and HCl of the chemical preparation workshop of Hainan Jinhai Project, the concentration of Cl2 at fugitive emission monitoring points in the plant＜0.03mg/m^3, and the concentration of HCl＜0.05 mg/m^3, which meet the standard limit requirements in Table 5 of *Emission standards of pollutants for inorganic chemical industry* (GB31573-2015), namely, 0.1mg/m^3 for Cl_2 and 0.05mg/m^3 for HCl.

一期工程二氧化氯车间生产能力为 50t/d，小于海南金海 100 万吨硫酸盐木浆项目二氧化氯制备规模，通过类比可知，拟建项目化学品制备车间 Cl_2、HCl 的无组织排放可满足《无机化学工业污染物排放标准》（GB31573-2015）表 5 标准限值要求。

In Phase I, the production capacity of the chlorine dioxide workshop is 50t/d, which is smaller than that of Hainan Jinhai 1 Million Ton Sulfate Wood Pulp Project; it can be seen that the fugitive emissions of Cl2 and HCl in the chemical preparation workshop of the proposed project meet the standard limit requirements in Table 5 of *Emission standards of pollutants for inorganic chemical industry* (GB31573-2015).

（3）特种纸车间无组织排放分析（Gu3）

(3) Analysis on fugitive emission from special paper workshop (Gu3)

特种纸车间涂布作业是一个封闭的系统，生产中涂料在生产线上不断回流，循环利用的，基本无污染物排放，涂料主要成分为碳酸钙和瓷土，制备过程需要少量助剂为有机物，产生少量散逸挥发性气体（VOCs）以无组织形式在车间内排放，对外环境影响较小。

Coating operation in the special paper workshop is a closed system. The coating is continuously refluxed and recycled during production on the production line, and there are basically no pollutants. Main components of the coating include calcium carbonate and porcelain clay; a small amount of additives during preparation are organic substances, and a small amount of VOCs is emitted in the workshop in a fugitive form, which will have a small impact on external environment.

（4）GCC 车间无组织排放分析（Gu4）

(4) Analysis on fugitive emission from GCC workshop (Gu4)

GCC 车间破碎工段和研磨过程工段在密闭车间内进行，破碎、研磨设备配套有除尘装置，少量未收集的粉尘通过车间换气以无组织形式排入大气，对环境影响较小。

The crushing section and grinding section of GCC workshop are operated in a closed workshop, and the crushing and grinding equipment are equipped with dust removal devices, so only a small amount of uncollected dust is discharged into the atmosphere in a fugitive form through ventilation, which will only have a small impact on the environment.

（5）加油站无组织排放分析（Gu5）

(5) Analysis on fugitive emission from the petrol station (Gu5)

①油罐大呼吸

① Tank big breathing

项目油罐大呼吸挥发性有机物产生量参考《石油库设计节能导则》(SH/T3002-2000）中拱顶罐（罐顶为球冠状、罐体为圆柱形的钢制容器）大呼吸蒸发损耗计算公式进行计算：

The emission of big breathing VOCs from the fuel tank of the Project should be calculated by the formula of big breathing evaporation loss of dome roof tank (A steel container with a spherical crown and a cylindrical body) referring to *Guideline for petroleum* *depots energy conservation design* (SH/T3002-2000):

$$L_{DW}=K_T K_1 \frac{P_y}{(690-4\mu_y)} V_1$$

$$P_y=(P_{y1}+P_{y2})$$

式中：

Where:

L_{DW}——拱顶罐大呼吸蒸发损耗量(m^3/a)；

L_{DW} - Dome roof tank big breathing evaporation loss (m^3/a);

V_1——泵送液体入罐量(m^3)，取油罐容积的 0.9 倍系数；

V_1 - The volume of liquid pumped into the tank (m^3), 0.9 times the volume of the oil tank is taken;

K——单位换算常数，K＝51.6；

K - Unit conversion constant, K＝51.6;

K_T——周转系数；

K_T - Turnover coefficient;

K_1——油品系数，柴油取 K_1＝0.8；

K_1 - Oil product coefficient, K_1＝0.8 for diesel;

μ_y——油蒸汽摩尔质量(kg/kmol)；

μ_y - Molar mass of oil vapor (kg/kmol);

P_y——油品平均温度下的蒸汽压(kPa)；

P_y - Vapor pressure (kPa) at the average temperature of oil (kPa);

P_{y1}——油罐内液面最低温度所对应的蒸汽压(kPa)；

P_{y1} - Vapor pressure (kPa) at the minimum temperature of the liquid level in the oil tank;

P_{y2}——油罐内液面最高温度所对应的蒸汽压(kPa)。

P_{y2} - Vapor pressure (kPa) at the maximum temperature of the liquid level in the oil tank.

其中 K_T 与周转次数有关，N＝Q/V，当 N＞36 时，K_T＝(180+N)/6N 当 N≤36 时，K_T＝1 式中，N 为油罐年周转次数，V 为油罐容积（m^3），Q 为油罐车周转量（m^3/a）。

K_T is related to the number of turnovers, N＝Q/V, when N＞36, K_T＝(180+N)/6N; when

N≤36, K_T＝1. Where, N is annual turnover of the oil tank truck, V is the volume of oil tank (m^3), and Q is the turnover of the oil tank truck (m^3/a).

项目加油站设两个 50m^3 地下柴油贮油罐，年用柴油量约 2000t，按照柴油密度 860kg/m^3，则柴油油罐年周转量为 2326 m^3。本项目参数取值情况见表 2.2.5-25。

The petrol station of the Project is set with two 50m^3underground diesel storage tanks; as calculated according to the annual consumption of about 2,000t, and diesel density of 860kg/m^3, the annual turnover of each tank will be 2,326 m^3. Project parameters are shown in Table 2.2.5-25.

表 2.2.5-25 项目柴油罐大呼吸损失参数表
Table 2.2.5-25 Parameters of big breathing loss of the diesel tank

污染源 Source of pollution	V_1	μ_y	P_y	P_{y1}	P_{y2}	K_T	N	V	Q
	m^3	kg/kmol	kPa	kPa	kPa	/	/	/	m^3/a
柴油罐 Diesel tank	45	120	65	58	72	0.95	38	50	2326

②油罐小呼吸

②Tank small breathing

本项目油罐小呼吸挥发性有机物产生量参考《石油库设计节能导则》（SH/T3002-2000）中拱顶罐小呼吸蒸发损耗计算公式进行计算：

The emission of small breathing VOCs from the fuel tank of the Project should be calculated by the formula of big breathing evaporation loss of dome roof tank referring to *Guideline for petroleum depots energy conservation design* (SH/T3002-2000):

$$L_{DS} = 0.024 K_2 K_3 \left(\frac{P}{P_a - P} \right)^{0.68} D^{1.73} H^{0.51} \Delta T^{0.5} F_p C_1$$

式中：

Where:

L_{DS}——拱顶罐年小呼吸损耗量(m/a)

L_{DS} - Dome roof tank annual small breathing evaporation loss (m/a)

P——油罐内油品本体温度下的蒸汽压(kPa)，油品本体温度取自油品计量报表，如果缺乏这类资料，油品本体温度可取大气温度加 2.8℃；

P - Vapor pressure (kPa) in the tank at the oil temperature (kPa), and the oil temperature is taken from the measuring statement; if there is no such data, the oil temperature can be the atmospheric temperature plus 2.8℃;

P_a——当地大气压(kPa(A))；

P_a - Local atmospheric pressure (kPa(A));

H——油罐内气体空间高度(m)，包括油罐罐体部分预留容积的高度和罐顶部分容积的换算高度；

H - The height of the gas in the tank (m), including the height of the reserved volume in the tank and converted height of the volume at the top of the tank;

△T——大气温度的平均日温差(℃)；

△T - The average daily temperature difference of atmospheric temperature (℃);

F_p——涂料系数，查《石油库节能设计导则》中表 A.0.3-1，柴油取 1.46；

F_p - Coating coefficient, according to Table A.0.3-1 of Design guideline for energy conservation of petroleum depots, 1.46 for diesel;

K_2——单位换算系数，取 23；

K_2 - Unit conversion factor, 23;

K_3——油品系数，柴油 K_3＝0.8；

K_3 - Oil product coefficient, K_3＝0.8 for diesel;

D——油罐直径(m)；

D - Diameter of tank (m);

C_1——小直径油罐修正系瞰，查《石油库节能设计导则》中图 A.0.3，柴油取 0.4。

C_1 - Small-diameter tank correction system, according to Fig. A.0.3 of Design guideline for energy conservation of petroleum depots, 0.4 for diesel.

本项目汽油油罐和柴油油罐小呼吸损失计算参数取值见表 2.2.5-26。

The calculation parameters of small breathing loss of gasoline tank and diesel tank are shown in Table 2.2.5-26.

表 2.2.5-26 项目柴油罐小呼吸损失参数表
Table 2.2.5-26 Parameters of small breathing loss of the diesel tank

污染源 Source of	P	P_a	H	△T	F_p	D	C_1
	kPa	kPa(A)	m	℃	/	m	/

pollution							
柴油罐 Diesel tank	68	100	0.2	18	1.46	4	0.4

将参数带入公式后可计算得柴油罐大小呼吸损耗量为18m³/a（0.1t/a），即0.013kg/h。

Substitute the parameters into the formula, the big and small breathing loss is calculated to be $18m^3/a$ (0.1t/a), namely 0.013kg/h.

（6）污水处理站恶臭分析（Gu6）

(6) Analysis on odor of the sewage treatment plant (Gu6)

本评价参照《城市污水处理厂恶臭影响及对策分析》（王喜红.[J].黑龙江环境通报,2011,35(3):82-84.），根据污水处理站设计的构筑物表面积估算污水处理站生恶臭废气产生源强。

This evaluation refers to the Analysis of impact of Odor in Urban Wastewater Treatment Plant and Its Countermeasures (Wang Xihong.[J]. Heilongjiang Environmental Journal, 2011,35(3):82-84.), and estimates the source intensity of order generated by the sewage treatment plant according to the surface area of the structure.

表 2.2.5-27 污水处理主要构筑物臭气产生情况
Table 2.2.5-27 Odor generation of main structures for sewage treatment

构筑物名称 Name of structure	参数（m^2） Parameter (m^2)	NH_3		H_2S	
		单位排放量 Unit emission amount	源强 Source intensity (kg/h)	单位排放量 Unit emission amount	源强 Source intensity (kg/h)
生化池 Biochemical tank	6232	$0.0049mg/(s \cdot m^2)$	0.110	$0.26 \times 10^{-3} mg/(s \cdot m^2)$	0.00583
二沉池 Secondary sedimentation tank	2123	$0.007mg/(s \cdot m^2)$	0.053	$0.029 \times 10^{-3} mg/(s \cdot m^2)$	0.00022
污泥脱水间 Sludge dewatering room	3040	$0.103mg/(s \cdot m^2)$	1.127	$0.03 \times 10^{-3} mg/(s \cdot m^2)$	0.00033
合计 Total		/	1.29	/	0.006

综上所述，污水处理构筑物建成后，NH_3产生量为1.291kg/h，H_2S产生量为0.006kg/h。项目对污水处理站产生臭气的构筑物进行加盖密封，并配置一套碱洗除臭系统，臭气经抽风管送至除臭系统，经喷淋洗涤后，送至生产区碱炉内燃烧分解，最后经过碱炉烟囱排放。臭气收集效率按90%计，则无组织排放的NH_3排放量为0.129kg/h，H_2S排放量

为 0.0006kg/h。

In summary, after construction of the sewage treatment structures, the output of NH_3 will be 1.291kg/h, and that of H_2S will be 0.006kg/h. The Project covers and seals the structures of the producing odor of the sewage treatment plant, and arranges an alkaline washing deodorant system, which can send the odor to the deodorant system through the exhaust tube; the odor, after spray washing, will be sent to the alkali furnace in the production area for combustion and decomposition, and finally discharged through the chimney. If calculated based on the odor collection efficiency of 90%, the output of NH_3 fugitive emission is 0.129kg/h, and the output of H_2S is 0.0006kg/h.

（7）干煤棚粉尘无组织排放分析（Gu7）

(7) Analysis on fugitive emission of dust of the dry coal shed (Gu7)

粉尘主要产生于煤灰及灰渣的运输、装卸和存储煤的干煤棚。干煤棚采用全封闭的结构，燃煤由汽车直接运至封闭煤场进行卸煤，并采取洒水降尘。参考清华大学在霍州电厂现场试验的模式进行估算：

The dust is mainly generated in the transportation, loading and unloading, and storage of coal and slag. The dry coal shed is a fully enclosed structure; the coal is directly transported by vehicles to the closed coal yard for unloading and water is sprayed to reduce dust. Calculated referring to the site test of Huozhou Power Plant carried out by Tsinghua University:

$$Q=11.7U^{2.45}\bullet S^{0.345}\bullet e^{-0.5W}$$

式中：Q 煤堆起尘强度，mg/s；

Where: Q is the coal pile dust raising intensity, mg/s;

U：地面平均风速，取 3.6m/s；

U: Ground average wind speed, 3.6m/s;

S：煤堆面积，一期取 3500m^2，二期取 5000 m^2；

S: Coal pile area, 3,500m^2 in Phase I, and 5,000 m^2 in Phase II;

W：含水率，取 18%。

W: Water content, 18%.

计算出一期干煤棚堆场扬尘起尘量为0.56kg/h，二期0.63 kg/h。

The dust raising amount of the dry coal shed in Phase I is 0.56kg/h, and 0.63 kg/h in Phase II.

3.废气污染源汇总

3. Summary of pollution source intensity of flue gas

项目废气排放汇总见表2.2.5-28。

The summary of flue gas emission is shown in Table 2.2.5-28.

表 2.2.5-28　一期废气污染源强及相关参数一览表（一期）

Table 2.2.5-28 List of pollution source intensity of flue gas and related parameters in Phase I (Phase I)

工序/生产线 Process/ production line	装置 Plant	污染源 Source of pollution	污染物 Pollutant	污染物产生 Pollutant production				治理措施 Control measures			污染物排放 Pollutant discharge			排放时间/h Discharge time/h
				核算方法 Accounting method	废气产生量(m^3/h) Output of flue gas (m^3/h)	产生浓度 (mg/m^3) Generation concentration (mg/m^3)	产生量 (kg/h) Output (kg/h)	工艺 Process	效率% Efficiency %	核算方法 Accounting method	废气排放量 (m^3/h) Emission of flue gas (m^3/h)	排放浓度 (mg/m^3) Discharge concentration (mg/m^3)	排放量 (kg/h) Emission (kg/h)	
碱回收车间 Alkaline recovery workshop	4600tds/d 碱炉 4,600tds/d alkali furnace	1# 排气筒 Exhaust funnel (150m)	烟尘 Smoke dust	类比法 Analogy method	894710	34455	30827.23	三列四电场静电除尘 Three-row four-electric field electrostatic precipitator	99.92	类比法 Analogy method	894710	27.6	24.66	8160
			二氧化硫 Sulfur dioxide	系数法 Factor method		44.9	40.17		0	系数法 Factor method		44.9	40.17	
			氮氧化物 Nitrogen oxide (NOx)	类比法 Analogy method		200	178.94		0	类比法 Analogy method		200.0	178.94	
			硫化氢 Hydrogen sulfide	类比法 Analogy method		4.5	4.02		0	类比法 Analogy method		4.5	4.02	
	850t/d 石灰窑 850t/d lime kiln		烟尘 Smoke dust	类比法 Analogy method	158760	5844	927.79	一列四电场静电除尘 One-row four-electric field electrostatic precipitator	99	类比法 Analogy method	158760	58.4	9.28	8160
			二氧化硫 Sulfur dioxide	系数法 Factor method		99.7	15.83		0	系数法 Factor method		99.7	15.83	
			氮氧化物 Nitrogen oxide (NOx)	类比法 Analogy method		419.9	66.67		0	类比法 Analogy method		419.9	66.67	
			硫化氢 Hydrogen sulfide	类比法 Analogy method		13.5	2.14		0	类比法 Analogy method		13.5	2.14	
热电站 Thermal power	220t/h 固废综合利用锅		烟尘 Smoke dust	物料衡算 Material balance	166000	10404.4	1727.14	SNCR/SCR 联合脱硝+布袋	99.91	物料衡算 Material balance	166000	9.88	1.64	8160

工序/生产线 Process/production line	装置 Plant	污染源 Source of pollution	污染物 Pollutant	污染物产生 Pollutant production				治理措施 Control measures			污染物排放 Pollutant discharge			排放时间/h Discharge time/h
				核算方法 Accounting method	废气产生量(m^3/h) Output of flue gas (m^3/h)	产生浓度 (mg/m^3) Generation concentration (mg/m^3)	产生量 (kg/h) Output (kg/h)	工艺 Process	效率% Efficiency %	核算方法 Accounting method	废气排放量 (m^3/h) Emission of flue gas (m^3/h)	排放浓度 (mg/m^3) Discharge concentration (mg/m^3)	排放量 (kg/h) Emission (kg/h)	
plant	炉 220t/h solid waste comprehensive utilization boiler		二氧化硫 Sulfur dioxide	物料衡算 Material balance		654.7	108.68	除尘器+活性炭吸附+炉外石灰石/石膏湿法脱硫+高效除雾器 SNCR/SCR combined denitration+bag-type dust collector +activated carbon adsorption+limestone outside the boiler/gypsum wet desulfurization +high efficiency demister	94.7	物料衡算 Material balance		34.83	5.78	
			氮氧化物 Nitrogen oxide (NOx)	物料衡算 Material balance		300.0	49.80		83.35	物料衡算 Material balance		49.95	8.29	
			氯化氢 Hydrogen chloride	类比法 Analogy method		250.0	41.50		90	类比法 Analogy method		25	4.15	
			一氧化碳 Carbon monoxide	类比法 Analogy method		/	/		/	类比法 Analogy method		100	16.60	
			汞 Mercury	物料衡算 Material balance		0.0137	0.0023		40	物料衡算 Material balance		0.0082	0.00136	
			镉 Cadmium	物料衡算 Material balance		0.3087	0.0513		70	物料衡算 Material balance		0.0917	0.01522	
			铊 Thallium	类比法 Analogy method		0.0267	0.004		70	类比法 Analogy method		0.008	0.0013	
			锑 Antimony	类比法 Analogy method		0.0037	0.001		85	类比法 Analogy method		0.0011	0.0002	
			砷 Arsenic	物料衡算 Material		0.0740	0.012		85	物料衡算 Material		0.0111	0.0018	

工序/生产线 Process/production line	装置 Plant	污染源 Source of pollution	污染物 Pollutant	污染物产生 Pollutant production				治理措施 Control measures			污染物排放 Pollutant discharge			排放时间/h Discharge time/h
				核算方法 Accounting method	废气产生量(m^3/h) Output of flue gas (m^3/h)	产生浓度(mg/m^3) Generation concentration (mg/m^3)	产生量(kg/h) Output (kg/h)	工艺 Process	效率% Efficiency %	核算方法 Accounting method	废气排放量(m^3/h) Emission of flue gas (m^3/h)	排放浓度(mg/m^3) Discharge concentration (mg/m^3)	排放量(kg/h) Emission (kg/h)	
				balance						balance				
			铅 Lead	物料衡算 Material balance		2.4955	0.414		85	物料衡算 Material balance		0.3743	0.0621	
			铬 Chromium	物料衡算 Material balance		2.8169	0.468		85	物料衡算 Material balance		0.4225	0.0701	
			钴 Cobalt	类比法 Analogy method		0.0183	0.003		85	类比法 Analogy method		0.00274	0.0005	
			铜 Copper	类比法 Analogy method		0.0693	0.012		85	类比法 Analogy method		0.0104	0.0017	
			锰 Manganese	类比法 Analogy method		0.3260	0.054		85	类比法 Analogy method		0.0489	0.0081	
			镍 Nickel	类比法 Analogy method		0.8400	0.139		85	类比法 Analogy method		0.126	0.0209	
			镉+铊 Cadmium +thallium	类比法 Analogy method		0.3323	0.055		70	类比法 Analogy method		0.0997	0.0165	
			锑+砷+铅+铬+钴+铜+锰+镍 Antimony+arsenic+lea	类比法 Analogy method		7.1221	1.182		85	类比法 Analogy method		0.9971	0.1655	

工序/生产线 Process/production line	装置 Plant	污染源 Source of pollution	污染物 Pollutant	污染物产生 Pollutant production				治理措施 Control measures			污染物排放 Pollutant discharge			排放时间/h Discharge time/h
				核算方法 Accounting method	废气产生量(m³/h) Output of flue gas (m³/h)	产生浓度(mg/m³) Generation concentration (mg/m³)	产生量(kg/h) Output (kg/h)	工艺 Process	效率% Efficiency %	核算方法 Accounting method	废气排放量(m³/h) Emission of flue gas (m³/h)	排放浓度(mg/m³) Discharge concentration (mg/m³)	排放量(kg/h) Emission (kg/h)	
			d+chromium +cobalt+copper+manganese+nickel											
			二噁英 Dioxin	类比法 Analogy method		0.3300 ng TEG/m³	0.055 mg/h		90	类比法 Analogy method		0.0330 ng TEG/m³	0.0055 mg/h	
	1×280t/h 燃煤锅炉（1#） 1×280t/h coal-fired boiler (1#)		烟尘 Smoke dust	物料衡算 Material balance	303089	13162.2	3989.32	SNCR/SCR联合脱硝+电袋除尘器+炉外石灰石/石膏湿法脱硫+高效除雾器 SNCR/SCR combined denitration+electrostatic-bag type dust collector+limestone outside the boiler/gypsum wet desulfurization +high efficiency demister	99.93	物料衡算 Material balance	303089	9.87	2.99	8160
			二氧化硫 Sulfur dioxide	物料衡算 Material balance		1537.3	465.94		97.73	物料衡算 Material balance		34.90	10.58	
			氮氧化物 Nitrogen oxide (NOx)	物料衡算 Material balance		300	90.93		83.4	物料衡算 Material balance		49.80	15.09	
			汞及其化合物 Mercury and its compounds	物料衡算 Material balance		2.0	0.01		70	物料衡算 Material balance		0.011	0.0034	
漂白车间 Bleachin	漂白塔 Bleaching tower		氯气 Chlorine	类比法 Analogy method	16300	16.0	0.16	碱洗 Alkaline washing	75	类比法 Analogy method	16300	4	0.065	8160

工序/生产线 Process/production line	装置 Plant	污染源 Source of pollution	污染物 Pollutant	污染物产生 Pollutant production				治理措施 Control measures			污染物排放 Pollutant discharge			排放时间/h Discharge time/h
				核算方法 Accounting method	废气产生量(m^3/h) Output of flue gas (m^3/h)	产生浓度(mg/m^3) Generation concentration (mg/m^3)	产生量(kg/h) Output (kg/h)	工艺 Process	效率% Efficiency %	核算方法 Accounting method	废气排放量(m^3/h) Emission of flue gas (m^3/h)	排放浓度(mg/m^3) Discharge concentration (mg/m^3)	排放量(kg/h) Emission (kg/h)	
g workshop														
二氧化氯制备 Preparation of chlorine dioxide	二氧化氯车间过量氢气排空尾气 Excessive hydrogen tail gas of chlorine dioxide workshop	2#排气筒(25m) Exhaust funnel (25m)	Cl_2	物料衡算 Material balance	2000	25.0	0.05	碱洗 Alkaline washing	75	物料衡算 Material balance	2000	6.3	0.0125	8160
	二氧化氯车间盐酸合成尾气 Tail gas from hydrochloric acid synthesis in chlorine dioxide workshop	3#排气筒(42m) Exhaust funnel (42m)	Cl_2	物料衡算 Material balance	2500	21.3	0.05	软化水洗涤 Washing by softened water	70	物料衡算 Material balance	2500	6.4	0.016	
			HCl	物料衡算 Material balance		50.7	0.13		70	物料衡算 Material balance		15.2	0.038	
	二氧化氯车间槽罐尾气 Tail gas from tank of chlorine dioxide workshop	4#排气筒(30m) Exhaust funnel (30m)	Cl_2	物料衡算 Material balance	4500	29.3	0.13	海波塔洗涤 Washing by Hypo tower	75	物料衡算 Material balance	4500	7.3	0.033	
木片堆	木片堆存、	无组织排	颗粒物	类比法	/	/	11.02	洒水降尘，水	/	类比法	/	/	4.41	8160

工序/生产线 Process/ production line	装置 Plant	污染源 Source of pollution	污染物 Pollutant	污染物产生 Pollutant production				治理措施 Control measures			污染物排放 Pollutant discharge			排放时间/h Discharge time/h
				核算方法 Accounting method	废气产生量(m^3/h) Output of flue gas (m^3/h)	产生浓度(mg/m^3) Generation concentration (mg/m^3)	产生量(kg/h) Output (kg/h)	工艺 Process	效率% Efficiency %	核算方法 Accounting method	废气排放量(m^3/h) Emission of flue gas (m^3/h)	排放浓度(mg/m^3) Discharge concentration (mg/m^3)	排放量(kg/h) Emission (kg/h)	
场及备料车间 Wood chip stockyard and preparation workshop	备料过程 Wood chip stacking, material preparation	放 Non-organized discharge	Particulate Matters (PM)	Analogy method				炮喷雾，封闭车间 Spraying water for dust reduction, spraying with water guns, closed workshop		Analogy method				
二氧化氯车间 Chlorine dioxide workshop	二氧化氯生产、贮存过程 Production and storage process of chlorine dioxide	无组织排放 Non-organized discharge	Cl_2	物料衡算 Material balance	/	/	0.0563	/	/	物料衡算 Material balance	/	/	0.0563	8160
			HCl	物料衡算 Material balance	/	/	0.0563	/	/	物料衡算 Material balance	/	/	0.0563	8160
干煤棚 Dry coal shed	煤堆 Coal pile	无组织 Fugitive	颗粒物 Particulate Matters (PM)	系数法 Factor method	/	/	0.56	/	/	系数法 Factor method	/	/	0.56	8160
污水处理站 Sewage treatment plant	各污水构筑物 Various sewage structures	无组织排放 Non-organized discharge	氨气 Ammonia	系数法 Factor method	/	/	0.129	/	/	系数法 Factor method	/	/	0.129	8160
			硫化氢 Hydrogen sulfide	系数法 Factor method		/	0.0006		/	系数法 Factor method		/	0.0006	
加油站 Gas station	储油罐 Oil storage tank	无组织排放 Non-orga	非甲烷总烃 Non-metha	物料衡算 Material balance	/	/	0.013	/	/	物料衡算 Material balance	/	/	0.013	8160

工序/生产线 Process/production line	装置 Plant	污染源 Source of pollution	污染物 Pollutant	污染物产生 Pollutant production				治理措施 Control measures			污染物排放 Pollutant discharge			排放时间/h Discharge time/h
				核算方法 Accounting method	废气产生量(m^3/h) Output of flue gas (m^3/h)	产生浓度 (mg/m^3) Generation concentration (mg/m^3)	产生量 (kg/h) Output (kg/h)	工艺 Process	效率% Efficiency %	核算方法 Accounting method	废气排放量 (m^3/h) Emission of flue gas (m^3/h)	排放浓度 (mg/m^3) Discharge concentration (mg/m^3)	排放量 (kg/h) Emission (kg/h)	
		nized discharge	ne hydrocarbon											

表 2.2.5-29　二期建成后全厂废气污染源强及相关参数一览表（一期+二期）

Table 2.2.5-29 List of pollution source intensity and related parameters of the plant after completion of Phase II (Phase I + Phase II)

工序/生产线 Process/production line	装置 Plant	污染源 Source of pollution	污染物 Pollutant	污染物产生 Pollutant production				治理措施 Control measures			污染物排放 Pollutant discharge			排放时间/h Discharge time/h
				核算方法 Accounting method	废气产生量 (m^3/h) Output of flue gas (m^3/h)	产生浓度 (mg/m^3) Generation concentration (mg/m^3)	产生量 (kg/h) Output (kg/h)	工艺 Process	效率% Efficiency %	核算方法 Accounting method	废气排放量 (m^3/h) Emission of flue gas (m^3/h)	排放浓度 (mg/m^3) Discharge concentration (mg/m^3)	排放量 (kg/h) Emission (kg/h)	
碱回收车间 Alkaline recovery workshop	4600tds/d 碱炉 4,600tds/d alkali furnace	1#排气筒 Exhaust funnel (150m)	烟尘 Smoke dust	类比法 Analogy method	979920	34455	33763.14	三列四电场静电除尘 Three-row four-electric field electrostatic precipitator	99.92	类比法 Analogy method	979920	27.6	27.01	8160
			二氧化硫 Sulfur dioxide	系数法 Factor method		45.8	44.83		0	系数法 Factor method		45.8	44.83	
			氮氧化物 Nitrogen oxide (NOx)	类比法 Analogy method		200	195.98		0	类比法 Analogy method		200.0	195.98	
			硫化氢 Hydrogen sulfide	类比法 Analogy method		4.6	4.49		0	类比法 Analogy method		4.6	4.49	
	850t/d 石灰窑		烟尘 Smoke dust	类比法 Analogy method	158760	5844	927.79	一列四电场静电除尘	99	类比法 Analogy method	158760	58.4	9.28	8160

工序/生产线 Process/production line	装置 Plant	污染源 Source of pollution	污染物 Pollutant	污染物产生 Pollutant production				治理措施 Control measures			污染物排放 Pollutant discharge			排放时间/h Discharge time/h
				核算方法 Accounting method	废气产生量 (m^3/h) Output of flue gas (m^3/h)	产生浓度 (mg/m^3) Generation concentration (mg/m^3)	产生量 (kg/h) Output (kg/h)	工艺 Process	效率% Efficiency %	核算方法 Accounting method	废气排放量 (m^3/h) Emission of flue gas (m^3/h)	排放浓度 (mg/m^3) Discharge concentration (mg/m^3)	排放量 (kg/h) Emission (kg/h)	
	850t/d lime kiln		二氧化硫 Sulfur dioxide	系数法 Factor method		99.7	15.83	One-row four-electric field electrostatic precipitator	0	系数法 Factor method		99.7	15.83	
			氮氧化物 Nitrogen oxide (NOx)	类比法 Analogy method		419.9	66.67		0	类比法 Analogy method		419.9	66.67	
			硫化氢 Hydrogen sulfide	类比法 Analogy method		13.5	2.14		0	类比法 Analogy method		13.5	2.14	
热电站 Thermal power plant	220t/h 固废综合利用锅炉 220t/h solid waste comprehensive utilization boiler		烟尘 Smoke dust	物料衡算 Material balance	230386	12197.3	2810.08	SNCR/SCR 联合脱硝+活性炭吸附+布袋除尘器+炉外石灰石/石膏湿法脱硫+高效除雾器 SNCR/SCR combined denitration +activated carbon adsorption+bag-type dust collector+wet desulphurization of limestone/gypsum outside the	99.92	物料衡算 Material balance	230386	9.88	2.28	8160
			二氧化硫 Sulfur dioxide	物料衡算 Material balance		883.7	203.59		96.1	物料衡算 Material balance		34.73	8.00	
			氮氧化物 Nitrogen oxide (NOx)	物料衡算 Material balance		300.0	69.12		83.35	物料衡算 Material balance		49.95	11.51	
			氯化氢 Hydrogen chloride	类比法 Analogy method		250.0	57.60		90	类比法 Analogy method		25	5.76	
			一氧化碳 Carbon monoxide	类比法 Analogy method		/	/		/	类比法 Analogy method		100	23.04	
			汞 Mercury	物料衡算 Material balance		0.0202	0.0046		40	物料衡算 Material balance		0.0121	0.00279	

工序/生产线 Process/production line	装置 Plant	污染源 Source of pollution	污染物 Pollutant	污染物产生 Pollutant production				治理措施 Control measures			污染物排放 Pollutant discharge			排放时间/h Discharge time/h
				核算方法 Accounting method	废气产生量 (m^3/h) Output of flue gas (m^3/h)	产生浓度 (mg/m^3) Generation concentration (mg/m^3)	产生量 (kg/h) Output (kg/h)	工艺 Process	效率% Efficiency %	核算方法 Accounting method	废气排放量 (m^3/h) Emission of flue gas (m^3/h)	排放浓度 (mg/m^3) Discharge concentration (mg/m^3)	排放量 (kg/h) Emission (kg/h)	
			镉 Cadmium	物料衡算 Material balance		0.2984	0.0688	furnace+high-efficiency demister	70	物料衡算 Material balance		0.0895	0.02063	
			铊 Thallium	类比法 Analogy method		0.0267	0.006		70	类比法 Analogy method		0.008	0.0018	
			锑 Antimony	类比法 Analogy method		0.0073	0.002		85	类比法 Analogy method		0.0011	0.0003	
			砷 Arsenic	物料衡算 Material balance		0.0712	0.016		85	物料衡算 Material balance		0.0107	0.0025	
			铅 Lead	物料衡算 Material balance		2.4065	0.554		85	物料衡算 Material balance		0.3610	0.0832	
			铬 Chromium	物料衡算 Material balance		2.7128	0.625		85	物料衡算 Material balance		0.4069	0.0938	
			钴 Cobalt	类比法 Analogy method		0.0183	0.004		85	类比法 Analogy method		0.00274	0.0006	
			铜 Copper	类比法 Analogy method		0.0693	0.016		85	类比法 Analogy method		0.0104	0.0024	

工序/生产线 Process/production line	装置 Plant	污染源 Source of pollution	污染物 Pollutant	污染物产生 Pollutant production				治理措施 Control measures			污染物排放 Pollutant discharge			排放时间/h Discharge time/h
				核算方法 Accounting method	废气产生量 (m^3/h) Output of flue gas (m^3/h)	产生浓度 (mg/m^3) Generation concentration (mg/m^3)	产生量 (kg/h) Output (kg/h)	工艺 Process	效率% Efficiency %	核算方法 Accounting method	废气排放量 (m^3/h) Emission of flue gas (m^3/h)	排放浓度 (mg/m^3) Discharge concentration (mg/m^3)	排放量 (kg/h) Emission (kg/h)	
			锰 Manganese	类比法 Analogy method		0.3260	0.075		85	类比法 Analogy method		0.0489	0.0113	
			镍 Nickel	类比法 Analogy method		0.8400	0.194		85	类比法 Analogy method		0.126	0.0290	
			镉+铊 Cadmium+thallium	类比法 Analogy method		0.3251	0.075		70	类比法 Analogy method		0.0975	0.0225	
			锑+砷+铅+铬+钴+铜+锰+镍 Antimony+arsenic+lead+chromium+cobalt+copper+manganese+nickel	类比法 Analogy method		6.4515	1.486		85	类比法 Analogy method		0.9677	0.2229	
			二噁英 Dioxin	类比法 Analogy method		0.3300 ng TEG/m^3	0.076 mg/h		90	类比法 Analogy method		0.0330 ng TEG/m^3	0.0076 mg/h	
	1×280t/h 燃煤锅炉（1#） 1×280t/h coal-fired boiler		烟尘 Smoke dust	物料衡算 Material balance	303089	13162.2	3989.32	SNCR/SCR 联合脱硝+电袋除尘器+炉外石灰石/石膏湿法脱硫+高	99.93	物料衡算 Material balance	303089	9.87	2.99	8160
			二氧化硫 Sulfur dioxide	物料衡算 Material balance		1537.3	465.94		97.73	物料衡算 Material balance		34.90	10.58	

工序/生产线 Process/production line	装置 Plant	污染源 Source of pollution	污染物 Pollutant	污染物产生 Pollutant production				治理措施 Control measures			污染物排放 Pollutant discharge			排放时间/h Discharge time/h
				核算方法 Accounting method	废气产生量 (m^3/h) Output of flue gas (m^3/h)	产生浓度 (mg/m^3) Generation concentration (mg/m^3)	产生量 (kg/h) Output (kg/h)	工艺 Process	效率% Efficiency %	核算方法 Accounting method	废气排放量 (m^3/h) Emission of flue gas (m^3/h)	排放浓度 (mg/m^3) Discharge concentration (mg/m^3)	排放量 (kg/h) Emission (kg/h)	
	(1#)		氮氧化物 Nitrogen oxide (NOx)	物料衡算 Material balance		300	90.93	效除雾器 SNCR/SCR combined denitration+electrostatic-bag type dust collector+lime stone outside the boiler/gypsum wet desulfurization +high efficiency demister	83.4	物料衡算 Material balance		49.80	15.09	
			汞及其化合物 Mercury and its compounds	物料衡算 Material balance		2.0	0.01		70	物料衡算 Material balance		0.011	0.0034	
	1×280t/h 燃煤锅炉（2#） 1×280t/h coal-fired boiler (2#)		烟尘 Smoke dust	物料衡算 Material balance	287764	13161.9	3787.52	SNCR/SCR 联合脱硝+电袋除尘器+炉外石灰石/石膏湿法脱硫+高效除雾器 SNCR/SCR combined denitration+electrostatic-bag type dust collector+lime stone outside the boiler/gypsum wet	99.93	物料衡算 Material balance	287764	9.87	2.84	8160
			二氧化硫 Sulfur dioxide	物料衡算 Material balance		1537.3	442.37		97.73	物料衡算 Material balance		34.90	10.04	
			氮氧化物 Nitrogen oxide (NOx)	物料衡算 Material balance		300	86.33		83.4	物料衡算 Material balance		49.80	14.33	
			汞及其化合物 Mercury and its compounds	物料衡算 Material balance		2.0	0.01		70	物料衡算 Material balance		0.011	0.0033	

工序/生产线 Process/production line	装置 Plant	污染源 Source of pollution	污染物 Pollutant	污染物产生 Pollutant production				治理措施 Control measures			污染物排放 Pollutant discharge			排放时间/h Discharge time/h
				核算方法 Accounting method	废气产生量 (m^3/h) Output of flue gas (m^3/h)	产生浓度 (mg/m^3) Generation concentration (mg/m^3)	产生量 (kg/h) Output (kg/h)	工艺 Process	效率% Efficiency %	核算方法 Accounting method	废气排放量 (m^3/h) Emission of flue gas (m^3/h)	排放浓度 (mg/m^3) Discharge concentration (mg/m^3)	排放量 (kg/h) Emission (kg/h)	
								desulfurization +high efficiency demister						
漂白车间 Bleaching workshop	漂白塔 Bleaching tower		氯气 Chlorine	类比法 Analogy method	16300	16.0	0.26	碱洗 Alkaline washing	75	类比法 Analogy method	16300	4	0.065	8160
二氧化氯制备 Preparation of chlorine dioxide	二氧化氯车间过量氢气排空尾气 Excessive hydrogen tail gas of chlorine dioxide workshop	2#排气筒(25m) Exhaust funnel (25m)	Cl_2	物料衡算 Material balance	2000	25.0	0.05	碱洗 Alkaline washing	75	物料衡算 Material balance	2000	6.3	0.0125	8160
	二氧化氯车间盐酸合成尾气 Tail gas from	3#排气筒(42m) Exhaust funnel (42m)	Cl_2	物料衡算 Material balance	2500	21.3	0.05	软化水洗涤 Washing by softened water	70	物料衡算 Material balance	2500	6.4	0.016	
			HCl	物料衡算 Material balance		50.7	0.13		70	物料衡算 Material balance		15.2	0.038	

工序/生产线 Process/production line	装置 Plant	污染源 Source of pollution	污染物 Pollutant	污染物产生 Pollutant production				治理措施 Control measures			污染物排放 Pollutant discharge			排放时间/h Discharge time/h
				核算方法 Accounting method	废气产生量 (m^3/h) Output of flue gas (m^3/h)	产生浓度 (mg/m^3) Generation concentration (mg/m^3)	产生量 (kg/h) Output (kg/h)	工艺 Process	效率% Efficiency %	核算方法 Accounting method	废气排放量 (m^3/h) Emission of flue gas (m^3/h)	排放浓度 (mg/m^3) Discharge concentration (mg/m^3)	排放量 (kg/h) Emission (kg/h)	
	hydrochloric acid synthesis in chlorine dioxide workshop													
	二氧化氯车间槽罐尾气 Tail gas from tank of chlorine dioxide workshop	4# 排气筒 (30m) Exhaust funnel (30m)	Cl_2	物料衡算 Material balance	4500	29.3	0.13	海波塔洗涤 Washing by Hypo tower	75	物料衡算 Material balance	4500	7.3	0.033	
木片堆场及备料车间 Wood chip stockyard and preparation workshop	木片堆存、备料过程 Wood chip stacking, material preparation	无组织排放 Non-organized discharge	颗粒物 Particulate Matters (PM)	类比法 Analogy method	/	/	11.02	洒水降尘，水炮喷雾，封闭车间 Spraying water for dust reduction, spraying with water guns, closed workshop	/	类比法 Analogy method	/	/	4.41	8160
二氧化	二氧化	无组织	Cl_2	物料衡算	/	/	0.0563	/	/	物料衡算	/	/	0.0563	8160

工序/生产线 Process/production line	装置 Plant	污染源 Source of pollution	污染物 Pollutant	污染物产生 Pollutant production				治理措施 Control measures			污染物排放 Pollutant discharge			排放时间/h Discharge time/h
				核算方法 Accounting method	废气产生量 (m^3/h) Output of flue gas (m^3/h)	产生浓度 (mg/m^3) Generation concentration (mg/m^3)	产生量 (kg/h) Output (kg/h)	工艺 Process	效率% Efficiency %	核算方法 Accounting method	废气排放量 (m^3/h) Emission of flue gas (m^3/h)	排放浓度 (mg/m^3) Discharge concentration (mg/m^3)	排放量 (kg/h) Emission (kg/h)	
氯车间 Chlorine dioxide workshop	氯生产、贮存过程 Production and storage process of chlorine dioxide	排放 Non-organized discharge		Material balance						Material balance				
			HCl	物料衡算 Material balance	/	/	0.0563	/	/	物料衡算 Material balance	/	/	0.0563	8160
干煤棚 Dry coal shed	煤堆 Coal pile	无组织排放 Non-organized discharge	颗粒物 Particulate Matters (PM)	系数法 Factor method	/	/	0.63	/	/	系数法 Factor method	/	/	0.63	8160
污水处理站 Sewage treatment plant	各污水构筑物 Various sewage structures	无组织排放 Non-organized discharge	氨气 Ammonia	系数法 Factor method	/	/	0.129	/	/	系数法 Factor method	/	/	0.129	8160
			硫化氢 Hydrogen sulfide	系数法 Factor method		/	0.0006		/	系数法 Factor method		/	0.0006	
加油站 Gas station	储油罐 Oil storage tank	无组织排放 Non-organized discharge	非甲烷总烃 Non-methane hydrocarbon	物料衡算 Material balance	/	/	0.013	/	/	物料衡算 Material balance	/	/	0.013	8160

4.交通运输移动废气源

4. Mobile waste gas source due to transportation

本项目所需原材料主要为木片，本项目以外购桉木原木、外购桉木片等为原料。原料来源有以下几种方式：①广西本地桉木资源；②太阳纸业老挝林基地；③印尼、马来西亚、越南、缅甸、老挝等木材资源丰富，可从这些国家进口木片，北海市海运条件得天独厚，运输成本较内地其他地方优势明显，其中越南和澳大利亚是目前世界上出口木片最大的两个国家，距离铁山港距离均比较近。

The raw materials required by the Project are mainly wood chips, which are made of purchased eucalyptus logs, and eucalyptus chips. The sources of raw materials include: ① Local eucalyptus resources in Guangxi;②Forest bases of Sun Paper in Laos; ③Indonesia, Malaysia, Vietnam, Myanmar, and Laos with rich wood resources, and wood chips can be imported from these countries; Beihai City is unique in shipping conditions, with obviously lower transportation cost than the mainland; Vietnam and Australia are currently the two countries with the largest export of wood chips in the world, which are closer to Tieshangang Port.

运输方式主要为公路运输和海上运输。公路运输涉及的交通道路主要为 209 省道、北铁一级公路、工业园区道路及厂内道路。

The transportation methods are mainly road transportation and marine transportation. Road transportation mainly involves S209, Beitie Class 1 Highway, industrial park roads and factory-in roads.

汽车尾气的排放量与车型、车况和车辆数等有关，参考《环境保护实用手册》，有代表性的汽车排出物的测定结果和大气污染物排放系数见表 2.2.5-30。

The exhaust gas emission of vehicles is related to the vehicle model, vehicle conditions and number of vehicles; referring to *Practical Handbook of Environmental Protection*, the measurement results of representative vehicle emissions and atmospheric pollutant emission coefficients are shown in Table 2.2.5-30.

表 2.2.5-30 国家工况测试各种车型的平均排放系数

Table 2.2.5-30 Average emission coefficients of various vehicle models tested under national working conditions

车种 Vehicle type	单位 Unit	平均排放系数 Average emission factor		
		NO_X	CO	THC

小型车 Small vehicle	g/km	1.5	44.2	5.2
中型车 Middle-sized vehicle	g/km	4.3	51.7	8.1
大型车 Large vehicle	g/km	14.65	2.87	0.51

项目全部建成后需要木片 232.8 万 t/a（绝干），原煤 726387t/a，加上其他原辅材料，合计运输量约 350 万 t/a。项目运输时车辆为中型车（载重 20t）、大型车（载重 50t），其比例分别为 20%、80%，平均每天运输车辆预计为 330 辆车（其中型车 66 辆，大型车 264 辆），则车辆运输时产生的汽车尾气污染物为 NO_X、CO、THC 排放量分别为 4.15kg/km、4.17g/km、0.66kg/km。

After completion of the Project, 2,328,000 t/a (absolute dry) of wood chips, 726,387t/a of raw coal, and other raw and auxiliary materials will be required; the total transportation volume will be about 3.5 million t/a. The Project mainly adopts middle-sized vehicles (load: 20t) and large vehicles (load: 50t), with the proportion of 20% and 80%, respectively. The number of vehicles is estimated to be 330 each day on average (66 middle-sized vehicles, and 264 large vehicle), so the emissions of exhaust pollutants NO_X, CO, and THC during transport are 4.15kg/km, 4.17g/km, and 0.66kg/km, respectively.

表 2.2.5-31 国家工况测试各种车型的平均排放系数
Table 2.2.5-31 Average emission coefficients of various vehicle models tested under national working conditions

运输方式 Mode of transport		交通量 Traffic	排放污染物 Emission pollutants	排放量（kg/km） Emission (kg/km)
交通运输移动源 Mobile waste gas source due to transportation	车辆运输 Vehicle transportation	330 辆/d 330 vehicles/d	NO_X	4.15
			CO	4.17
			THC	0.66

5.臭气排放及控制措施

5. Odor emission and control measures

硫酸盐法制浆过程产生的气体排入大气形成独特的硫酸盐浆厂的气味。臭气的主要成份为硫化氢、甲硫醇、二甲硫醇和二甲二硫腿，统称为总还原硫（TRS），其量以 H_2S 的相当量表示，浆厂的臭气主要分高浓度不凝气(CNCG)、低浓度不凝气(DNCG)、气提气(SOG)以及碱回收炉、石灰窑、污水处理站臭气。

The gas produced by sulfate pulping will form special odor of sulfate pulp mill after being emitted to the atmosphere. Main components of odor include hydrogen sulfide, methanthiol, methyl mercaptan and dimethyl disulfide, collectively known as total reduced sulfur (TRS), which is expressed in the equivalent amount of H_2S. The odors in the pulp mill mainly include concentrated non-condensable gas (CNCG), diluted non-condensable gas (DNCG), stripper off-gas (SOG) and odor from the alkali recovery furnace, lime kiln, and sewage treatment plant.

高浓度不凝气(CNCG)：主要来源于蒸发器热井、重污冷凝水槽、高浓黑液槽、入炉高浓黑液槽等，总还原硫的浓度一般为 5000~20000mg/Nm^3。

Concentrated non-condensable gas (CNCG) is mainly produced by hot well of the evaporator, heavily polluted condensate tank, concentrated black liquor tank, and tank of concentrated black liquor into the furnace; the concentration of the total reduced sulfur is generally 5,000~20,000mg/Nm^3.

汽提气(SOG)：主要来源于碱回收蒸发工段汽提污冷凝水的汽提塔，它含有 50％(质量比)甲醇和 40% (质量比)水蒸气，其余成分 10%包含 TRS、氮气和氧气，属于高浓臭气。

Stripper off-gas (SOG) is mainly from the stripping tower for stripping polluted condensate from the alkali recovery evaporation section; it contains 50% (mass ratio) methanol and 40% (mass ratio) water vapor, and the rest 10% contains TRS, nitrogen and oxygen, which are high-consistency odors.

低浓度不凝气(DNCG)：主要来源于化学浆车间蒸煮工段的木片仓、喷放锅、中浓浆液贮存槽、过滤机、筛选设备、洗涤器、真空泵和滤液槽，以及碱回收车间蒸发工段的稀黑液槽、二次冷凝水槽、中浓黑液槽、碱炉溶解槽、碱灰混合槽、污冷凝水槽，苛化工段的洗涤器、苛化器、绿液稳定槽、绿泥混合槽等槽罐，总还原硫的浓度一般为小于 100~1500mg/Nm^3。

Diluted non-condensable gas (DNCG) is mainly produced by the wood chip bin, blow tank, medium-consistency pulp storage tank, filter, screening equipment, washer, vacuum pump and filtrate tank of the cooking section in the chemical pulp workshop; the diluted black liquor tank, secondary condensate tank, medium-consistency black liquor tank, alkali furnace dissolution tank, alkali ash mixing tank, polluted condensate tank of the evaporation section in the alkali recovery workshop; the washer, causticizer, green liquor stabilization tank, and green mud mixing tank of the causticization section; and the sewage treatment plant. The concentration of the total reduced sulfur is generally lower than 100~1,500mg/Nm^3.

还有一部分来源于碱回收炉烟气、石灰窑烟气以及排水沟等分散臭气。正常情况下这些分散臭气源中的总还原硫的浓度一般为0~5mg/Nm^3，现代浆厂由于在源头采取了有效的控制，分散气源对空气质量影响的贡献是有限的。

There is also flue gas from the alkali recovery furnace, flue gas from the lime kiln and dispersed odor from drainage ditches. Under normal circumstances, the concentration of total reduced sulfur in the dispersed sources of odor is generally 0~5mg/Nm^3; modern pulp mills have adopted effective control at the source, so the dispersed sources will have limited impact on air quality.

由以上分析可知，项目的臭气污染源主要是：化学浆车间蒸煮系统、洗选系统、蒸发站、苛化工段，碱回收炉、石灰窑、污水处理站。

As analyzed above, the odor pollution sources of the Project are mainly cooking system, washing and separation system, evaporation station, and caustic chemical section in the chemical pulp workshop, as well as the alkali recovery furnace, lime kiln, and sewage treatment plant.

（1）蒸煮、洗选、蒸发、苛化系统

（1）Cooking, washing, evaporation, and causticization system

拟建项目硫酸盐木浆蒸煮采用连续蒸煮技术。黑液蒸发采用降膜式蒸发器，拟建项目设臭气收集系统，包括高浓度不凝气(CNCG)系统、低浓度不凝气(DNCG)系统和汽提气(SOG)系统三套处理系统，分别将蒸煮、洗涤及碱回收蒸发、燃烧、苛化过程中产生的不凝气全部收集起来，高浓臭气和汽提气经处理后直接送到碱回收炉燃烧，低浓臭气经碱液洗涤后送碱回收炉作二次送风。

Sulfated wood pulp cooking of the proposed project adopts a continuous cooking technology. Black liquor evaporation is performed by falling film evaporators; the proposed project will be set with a odor collection system, consisting of the concentrated non-condensable gas (CNCG) system, diluted non-condensable gas (DNCG) system and stripper off-gas (SOG) system, which can collect all non-condensable gases produced by cooking, washing, alkali recovery evaporation, combustion, and causticization; the high-consistency odor and stripper off-gas will be directly sent to the alkali recovery furnace for combustion after treatment, and low-consistency odor will be sent to the alkali recovery furnace for secondary air supply after alkali washing.

臭气收集系统均为密闭收集系统，通过控制收集风机，保证收集点位置为负压状态，废气全部进行收集。封闭化学浆车间、碱炉工段厂房，使其车间内部微负压，废气与全厂低浓臭气经处理后一起作为碱回收炉二次风。为避免臭气处理系统事故时直接排放，在碱回收炉北侧安装1套臭气焚烧器，在事故工况下，高浓臭气、低浓臭气，通过臭气备用焚烧器燃烧后排放，以避免臭气直接排空。

Odor collection systems are all closed collection systems; through controlling the collection fans, and ensuring the negative pressure at the collection points, all flue gases can be collected. The chemical pulp workshop, and plant of the alkali furnace section shall be closed, to maintain the internal negative pressure; the exhaust gas and low-consistency odor will be taken as secondary air of the alkali recovery furnace after treatment. In order to avoid direct emission in the case that the odor treatment system fails, one odor incinerator is equipped at the north side of the alkali recovery furnace; under accident conditions, high-consistency odor and low-consistency odor will be emitted after being incinerated by the standby incinerator, to avoid direct emission of odor.

（2）碱回收炉

(2) Alkali recovery furnace

碱回收炉采用低臭炉，蒸发站来的浓度为80%的浓黑液与补充芒硝混合后送碱炉燃烧，减少了直接蒸发时产生的含硫臭气。蒸煮和蒸发等过程中产生的高浓度不凝气、低浓度不凝气、汽提气中恶臭物质在碱回收炉中经充分燃烧，减少了恶臭物质的量，存在的少量恶臭物质被碱回收炉中碱吸收，类比湛江晨鸣项目监测结果，碱炉烟气中总还原硫的浓度小于2.3mg/Nm^3。

The alkali recovery furnace adopts a low odor furnace, and the concentrated black liquor with a concentration of 80% from the evaporation station is mixed with supplementary mirabilite and then sent to the alkali furnace for combustion, thus reducing sulfur-containing odor generated during direct evaporation. The repugnant substances in concentrated non-condensable gas, diluted non-condensable gas, stripper off-gas produced during cooking and evaporation will be fully combusted in the alkali recovery furnace, which can reduce the amount of repugnant substances; a small amount of repugnant substances remained will be absorbed by alkali in the alkali recovery furnace; referring to the monitoring results of the Zhanjiang Chenming Project, the concentration of total reduced sulfur in flue gas of the alkali furnace is less than 2.3mg/Nm^3.

（3）石灰窑

(3) Lime kiln

石灰窑用天然气作燃料，石灰窑排放的 H_2S 是由白泥中残留的 Na_2S 所引起，白泥在石灰窑的低温部分进行干燥，部分 Na_2S 的硫以 H_2S 放出，白泥充分洗涤、脱水，在进石灰窑煅烧之前干燥到80~85％，可降低 H_2S 的排放量。类比湛江晨鸣项目监测结果，石灰窑烟气中总还原硫的浓度小于2.9mg/Nm^3。

The lime kiln takes natural gas as fuel, H_2S emitted from the lime kiln is generated by Na_2S remained in white mud, which is first dried in the low-temperature part of the lime kiln, and part of sulfur in Na_2S is emitted from H_2S; the white mud is fully washed, dewatered and dried to 80~85％ before calcination in the lime kiln, which can reduce the emission of H_2S. Referring to the monitoring results of Zhanjiang Chenming Project, the concentration of total reduced sulfur in lime kiln flue gas is less than 2.9mg/Nm^3.

（4）污水处理站

(4) Sewage treatment plant

项目对污水处理站产生臭气的构筑物进行加盖密封，并配置一套碱洗除臭系统，臭气经抽风管送至除臭系统，经喷淋洗涤后，送至生产区碱炉内燃烧分解后，经过碱炉烟囱排放。焚烧化学方程式如下：

The Project covers and seals the structures of the sewage treatment plant that may produce odor, and arranges a alkali washing deodorization system; the odor is sent to the deodorization system through the exhaust column, and then to the alkali furnace for combustion in the production area after spray washing; finally, it will be emitted through the alkali furnace chimney. The chemical equations of incineration are as follows:

$$2H_2S+3O_2=2SO_2+2H_2O$$

$$4NH_3+7O_2=4NO_2+6H_2O$$

臭气与氧气充分接触的条件下利用高温将臭气分解为 SO_2、NO_2，经烟气洗涤器处理后通过碱炉烟囱排放。

Under the condition that odor is in full contact with oxygen, the odor is decomposed to SO_2 and NO_2 under high temperature, and then emitted through the alkali furnace chimney after being treated with the flue gas washer.

拟建项目各臭气源排放情况见表 2.2.5-28、29，H_2S、NH_3 排放可满足《恶臭污染物排放标准》（GB14554-93）的表 2 的排放限值要求。

The emission of odor at each source of the proposed project is shown in Table 2.2.5-28 & 29, and the emission of H_2S and NH_3 can meet the emission limit requirements of Table 2 in *Emission standards for odor pollutants* (GB14554-93).

6.造纸车间天然气燃烧尾气

6. Natural gas combustion tail gas of papermaking workshop

本项目采用天然气作为造纸车间纸机烘干冲击干燥燃料、杨克烘缸燃气气罩燃料。根据海南金海浆纸业有限公司 70 万 t/a 生活用纸及 90 万 t/a 文化纸项目实测数据，天然气燃烧后废气直接排放，纸机烘缸配套燃烧器排气筒烟尘排放浓度为 0.061mg/m^3，二氧化硫排放浓度为 0.009mg/m^3，氮氧化物排放浓度为 6mg/m^3，各污染物排放浓度远小于《大气污染物综合排放标准》（GB16297-1996）新污染源大气污染物排放限值（烟尘 120mg/m^3、二氧化硫 550mg/m^3、氮氧化物 240mg/m^3）。

The Project takes natural gas as the fuel for the paper machine for drying, and for gas mask of Yankee dryer. According to the measured data of the 700,000 t/a household paper and 900,000 t/a cultural paper project of Hainan Jinhai Pulp and Paper Co., Ltd., the exhaust gas of combustion of natural gas is directly emitted, the smoke dust emission concentration of exhaust funnel of the combustor supported paper machine dryer is 0.061mg/m^3, the emission concentration of sulfur dioxide is 0.009mg/m^3, and that of nitrogen oxides is 6mg/m^3; the emission concentration of each pollutant is far less than the emission limits of air pollutants from new sources in *Integrated emission standard of air pollutants* (GB16297-1996) (smoke dust: 120mg/m^3, sulfur dioxide: 550mg/m^3, nitrogen oxides: 240mg/m^3).

本项目纸制品包括是文化用纸、特种纸、白卡纸和生活用纸，各造纸车间天然气合计用量 1638 万 m^3/a，造纸车间天然气燃烧后烟尘、二氧化硫、氮氧化物排放浓度较小，本评价不再进行定量分析。

The paper products of the Project include cultural paper, special paper, ivory board and household paper; the total amount of natural gas used in all papermaking workshops is 16.38 million m^3/a; after the combustion of natural gas, the smoke dust, emission concentration of sulfur dioxide and nitrogen oxides is small; no quantitative analysis is required in this evaluation.

2.2.5.3 废水源强分析

2.2.5.3 Analysis on wastewater source intensity

（1）废水来源

(1) Source of wastewater

①木片洗涤废水：木片蒸煮前洗涤产生。

①Wood chip washing wastewater: From washing prior to cooking.

②制浆中段废水：主要是洗涤、筛选时产生。

②Wastewater from middle section of pulping: Mainly from washing and screening.

③造纸白水：主要是白水回收系统产生。

③Papermaking white water: Mainly from the white water recovery system.

④污冷凝水：主要来自制浆废液的蒸发系统、蒸煮废气热回收系统以及碱回收系统等。

④Polluted condensate: Mainly from the evaporation system of pulping waste liquor, cooking exhaust gas heat recovery system and alkali recovery system.

⑤热电站排水：主要来自动力车间锅炉污排水和软化废水。

⑤Drainage of thermal power plant: Mainly from the wastewater of the boiler in the power workshop and softened wastewater.

⑥其他废水：生产车间地面冲洗、设备清洗等过程产生少量废水及下雨天气时，雨水渗入木片堆，产生少量淋滤水。

⑥Other wastewater: A small amount of wastewater due to ground washing and equipment cleaning in the production workshop, and a small amount of leaching water due to the falling of rainwater into the wood chip piles.

⑦办公生活污水：项目办公生活区产生少量生活污水。

⑦Office domestic sewage: A small amount of domestic sewage in the office and living area of the Project.

（2）废水水质及水量

(2) Wastewater quality and amount

①木片洗涤废水

①Wood chip washing wastewater

属高浓度有机废水，主要污染物为 CODcr、BOD_5、SS 和氨氮等。污水性质大致为 COD_{Cr}7000～9000mg/l，BOD_5 4500～6000mg/l，SS 250～350mg/l，pH 值 4.7～5.7，水温 40℃，污水可生化性好。

It is high-consistency organic wastewater, with the main pollutants of CODcr, BOD_5, SS and ammonia nitrogen. The nature of sewage is roughly COD_{Cr}7,000～9,000mg/l, BOD_5 4,500～6,000mg/l, SS 250～350mg/l, pH value 4.7～5.7, water temperature 40℃, and sewage biodegradability is good.

②制浆中段废水

②Middle-section wastewater of pulping

洗选漂废水主要污染物为耗氧有机物质、固体悬浮物以及一些有色物质，中段废水污染物浓度负荷与黑液提取率有关，黑液提取率越高，排入中段废水的污染物将越少。主要污染物为 CODcr、。BOD_5、SS 和氨氮等。参照《制浆造纸工业污染防治可行技术指南》（HJ 2302-2018），化学法制浆中段废水水质：COD1200～2500mg/L、$BOD_5$350～800mg/L、SS 250～1500mg/L、氨氮 2~5mg/L；化机浆中段废水水质：COD6000～16000mg/L、$BOD_5$1800～4000mg/L、SS 1800～3800mg/L、氨氮 3~5mg/L。

Main pollutants of washing, screening and bleaching wastewater are oxygen-consuming organic substances, solid suspended solids and some colored substances; the concentration load of pollutants in middle-section wastewater is related to the extraction rate of black liquor, the higher the extraction rate of black liquor, the less pollutants will be discharged into the middle-section wastewater. Main pollutants are CODcr, BOD_5, SS and ammonia nitrogen. Referring to the *Guideline for available techniques of pollution prevention and control for pulp and paper industry* (HJ 2302-2018), the quality ofmiddle-section wastewater of chemical pulping: COD 1,200～2,500mg/L, BOD_5 350～800mg/L, SS 250～1,500mg/L, and ammonia nitrogen 2~5mg/L; the quality ofmiddle-section wastewater of APMP: COD6,000～16,000mg/L, $BOD_5$1,800～4,000mg/L, SS 1,800～3,800mg/L, and ammonia nitrogen 3~5mg/L.

③污冷凝水：碱回收系统的二次蒸汽污冷凝水中含有甲醇、硫化物。蒸煮系统及热回收系统产生的污冷凝水的成分与蒸煮工艺有关，蒸煮过程中产生的污冷凝水，主要含有萜烯化合物、甲醇、乙醇、丙酮、丁酮及糠醛等污染物。项目轻污无冷凝水主要进入洗浆工段洗浆，重污冷凝水进入污水处理站系统处理。

③Polluted condensate: The polluted condensate of secondary steam in the alkali recovery system contains methanol, and sulfide. The components of polluted condensate produced by cooking system and heat recovery system are related to cooking process, and polluted condensate produced by cooking mainly contains terpene compounds, methanol, ethyl alcohol, acetone, butanone and furfural, etc. The lightly polluted and non-condensed water is mainly used for pulp washing, and heavily polluted condensate is sent to the sewage treatment plant system for treatment.

④造纸白水

④Papermaking white water

机制纸及纸板制造过程在打浆、压榨、成型等工序产生白水，主要污染物为CODcr、。BOD5、SS和氨氮等，参照《制浆造纸工业污染防治可行技术指南》（HJ 2302-2018），机制纸及纸板制造白水水质：COD 500～1800mg/L、BOD_5 180～800mg/L、SS 250～1500mg/L、氨氮 1~3mg/L。

The manufacturing process of machine paper and paperboard will produce white water in the processes of beating, pressing and forming; main pollutants are CODcr, BOD5, SS and ammonia nitrogen; referring to the *Guideline for available techniques of pollution prevention and control for pulp and paper industry* (HJ 2302-2018), the quality of white water for machine paper and paper boards: COD 500～1,800mg/L, BOD_5 180～800mg/L, SS 250～1,500mg/L, and ammonia nitrogen 1~3mg/L.

⑤其他废水

⑤Other wastewater

A.动力车间、车间保洁等其他废水

A. Other wastewater from power workshop and workshop cleaning

该部分废水废水性质较简单。污染负荷较上述两类废水低：SS400mg/L，COD450mg/L，$BOD_5$250mg/L。

The nature of wastewater is relatively simple. The pollution load is lower than the above two types of wastewater: SS400mg/L, COD450mg/L, $BOD_5$250mg/L.

B.木片堆场淋滤水

B. Leaching water in wood chip stockyard

项目木材原料采用先筛后存储工艺，采购木片含水率约 40~50%，堆场自然通风，木片在堆存过程被一定程度风干，根据企业多年生产运行经验，正常情况下木片堆存过程几乎不产生渗滤液。当遇到降雨时，雨水淋湿堆存的木材，部分雨水被木材吸收，由于木材的吸水性能一般，过饱和后的雨水不再被木材吸收，流入堆场四周的集水沟，初期雨水经收集后送项目污水处理站处理，后期清净雨水经雨水排放口排放。降雨结束后，堆场表面木材吸收的水份在日照和风吹的情况下大部分挥发进入大气，只有少部分在长期堆存后渗滤出来，经堆场地面流入淋滤水收集池。本项目木片原料周转较快，一般堆存时间不超过 1 个月，淋滤液的产生量较小，除少量流入淋滤液收集池外，部分随下一次降雨的初期雨水进入初期雨水收集池。淋滤液的产生量跟当地天气、木片周转时间等条件有关，产生量波动较大，难以定量估算每天产生量，本评价将该部分废水产生量计入其他水量统一考虑。堆场淋滤水水质与木片洗涤废水相似，污水水质为 COD_{Cr} 7000～9000mg/l，BOD_5 4500～6000mg/l，SS 250～350mg/l。

The raw materials of the Project will first be screened and then stored, the water content of the purchased wood chips is about 40~50%; the stockyard adopts natural ventilation, so the wood chips can be air-dried to a certain degree during storage; according to years of production and operation experience, the storage of wood chips will almost produce no leachate under normal circumstances. In the case of rain, the stocked wood will be wet; part of rainwater will be absorbed by wood, but due to the general water absorption performance, the over-saturated rainwater will not be absorbed by the wood, and flow to the catchment ditch around the stockyard; the initial rainwater shall be collected and sent to the sewage treatment plant, and the later clean rainwater can be discharged through the rainwater discharge outlet. After the rainfall, most of the water absorbed by the wood on the surface of the stockyard will evaporate into the atmosphere under sunshine and wind, and only a small amount will leach out after long-term storage and flow into the leaching water collection pool from ground of the stockyard. Considering the rapid turnover, the wood chips are generally stored for less than a month, so there will be only a small amount of leachate; in addition to the part flowing into the leachate collection pool, the rest part will flow to the initial rainwater collection tank along with the initial rainwater of the next rainfall. The amount of leachate is related to local weather, and turnover of wood chips; the production volume fluctuates greatly, so it is hard to estimate the daily production; in this evaluation, the production volume of wastewater produced in this section is included into other wastewater. The quality of leaching water of stockyard is similar to that of wastewater produced by washing of wood chips, with the quality of COD_{Cr} 7,000～9,000mg/l, BOD_5 4,500～6,000mg/l, SS 250～350mg/l.

项目主要废水排放源见表 2.2.5-32。

Main wastewater discharge sources of the Project are shown in Table 2.2.5-32.

表 2.2.5-32 废水污染来源
Table 2.2.5-32 Wastewater pollution sources

时段 Period	车间/工段 Workshop/section		废水量 m³/d Waste water volume m³/d	污染源 Source of pollution	污染物 Pollutant	污染控制措施 Pollution control measures
一期 Phase I	化学浆车间 Chemical pulp workshop	蒸煮后初步洗浆 Initial pulp washing after cooking	18710	黑液 Black liquor	高浓度有机污染物、固体悬浮物等 High-consistency organic pollutants, and solid suspended solids, etc.	送碱回收系统回收碱 It is sent to the alkali recovery system for recovering alkali
		洗选漂工段 Washing and bleaching	43660	漂白废水 Bleaching wastewater	COD_{Cr}、BOD_5、SS、NH_3N 等 COD_{Cr}, BOD_5, SS, and NH_3N, etc.	送污水处理站处理 They are sent to the sewage treatment plant

时段 Period	车间/工段 Workshop/section		废水量 m^3/d Waste water volume m^3/d	污染源 Source of pollution	污染物 Pollutant	污染控制措施 Pollution control measures
		section				
	化机浆车间及 MVR 蒸发站 APMP workshop and MVR evaporation station	洗选初段 Initial section of washing	667	稀黑液 Diluted black liquor	高浓度有机污染物、固体悬浮物等 High-consistency organic pollutants, and solid suspended solids, etc.	经 MVR 蒸发站处理后送碱回收蒸发工段 It is sent to alkali recovery evaporation section after treatment in the MVR section
		木片洗涤、洗浆、蒸发 Wood chip washing, pulp washing, evaporation	1176	洗涤废水、冷凝水 Washing wastewater, condensate	COD_{Cr}、BOD_5、SS、NH_3N 等 COD_{Cr}, BOD_5, SS, and NH_3N, etc.	送污水处理站处理 They are sent to the sewage treatment plant
	文化用纸车间 Cultural paper		9706	造纸白水 Paper-making white water	COD_{Cr}、BOD_5、SS、NH_3N 等 COD_{Cr}, BOD_5, SS, and NH_3N, etc.	送污水处理站处理 They are sent to the sewage treatment plant
	浆板车间 Pulp board workshop		662	造纸白水 Paper-making white water		
	特种纸车间 Special paper		8897	造纸白水 Paper-making white water		
	碱回收车间 Alkaline recovery workshop		2222	污冷凝水 Polluted condensate		
	热电站 Thermal power plant		4056	锅炉排污水和软化处理废水 Boiler sewage and softening wastewater		
	热力循环水系统排水 Heat circulating water system drainage		720	排污水 Sewerage		
	工艺循环水系统排水 Process circulating water system drainage		432	排污水 Sewerage		
	其他 Other		167	地面冲洗废、堆场淋滤水等 Floor washing wastewater, and stockyard leaching water		
	净水站		432	浓水		

时段 Period	车间/工段 Workshop/section		废水量 m³/d Waste water volume m³/d	污染源 Source of pollution	污染物 Pollutant	污染控制措施 Pollution control measures
	Water purification station			Concentrated water		
	办公生活 Office life		259	生活污水 Domestic sewage	进园区污水处理厂处理 It is sent to the sewage treatment plant of the industrial park for treatment	
一期+二期 Phase I + Phase II	制浆车间、Pulping workshop,	蒸煮工段 cooking section	18710	黑液 Black liquor	高浓度有机污染物、固体悬浮物等 High-consistency organic pollutants, and solid suspended solids, etc.	送碱回收系统回收碱 It is sent to the alkali recovery system for recovering alkali
		木片洗涤 Washing of wood chips	43660	洗涤废水 Washing wastewater	COD_{Cr}、BOD_5、SS、NH_3N 等 COD_{Cr}, BOD_5, SS, and NH_3N, etc.	送污水处理站处理 They are sent to the sewage treatment plant
		洗选漂工段 Washing and bleaching section		漂白废水 Bleaching wastewater		
	化机浆车间及MVR蒸发站 APMP workshop and MVR evaporation station	洗选初段 Initial section of washing	2000	稀黑液 Diluted black liquor	高浓度有机污染物、固体悬浮物等 High-consistency organic pollutants, and solid suspended solids, etc.	经MVR蒸发站处理后送碱回收蒸发工段 It is sent to alkali recovery evaporation section after treatment in the MVR section
		木片洗涤、洗浆、蒸发 Wood chip washing, pulp washing, evaporation	3529	洗涤废水、冷凝水 Washing wastewater, condensate	COD_{Cr}、BOD_5、SS、NH_3N 等 COD_{Cr}, BOD_5, SS, and NH_3N, etc.	送污水处理站处理 They are sent to the sewage treatment plant
	碱回收车间 Alkaline recovery workshop		2222	污冷凝水 Polluted condensate		
	文化用纸车间 Cultural paper		9706	造纸白水 Paper-making white water		
	浆板车间 Pulp board workshop		265	造纸白水 Paper-making white water		
	特种纸车间 Special paper		8897	造纸白水 Paper-making white water		

时段 Period	车间/工段 Workshop/section	废水量 m^3/d Waste water volume m^3/d	污染源 Source of pollution	污染物 Pollutant	污染控制措施 Pollution control measures
	生活用纸车间 Life paper	2206	造纸白水 Paper-making white water		
	白卡纸车间 Ivory board	17206	造纸白水 Paper-making white water		
	热电站 Thermal power plant	5064	锅炉排污水和软化处理废水 Boiler sewage and softening wastewater		
	热力循环水系统排水 Heat circulating water system drainage	1120	排污水 Sewerage		
	工艺循环水系统排水 Process circulating water system drainage	432	排污水 Sewerage		
	其他 Other	247	地面冲洗废、堆场淋滤水等 Floor washing wastewater, and stockyard leaching water		
	净水站 Water purification station	469	浓水 Concentrated water		
	办公生活 Office life	324	生活污水 Domestic sewage	进园区污水处理厂处理 It is sent to the sewage treatment plant of the industrial park for treatment	

（2）废水产生源强

(2) Wastewater source intensity

项目产生废水的节点较多，各类废水水质有一定的差异，通过调查同类企业废水产生情况，结合《制浆造纸工业污染防治可行技术指南》（HJ 2302-2018），本评价综合废水 COD、BOD_5、SS 的产生浓度通过对各类废水的水量和污染物浓度进行加权计算得到，产生浓度主要参照《制浆造纸工业污染防治可行技术指南》（HJ 2302-2018）取值，同类企业废水中氨氮、总氮、总磷、AOX 实际产生浓度较高，因此综合废水氨氮、总氮、总磷、AOX 参照同类企业综合废水浓度取值。HJ 2302-2018 典型制浆造纸废水水质范围及项目取值见表 2.2.5-33，同类项目综合废水水质情况及项目取值见表 2.2.5-34

There are many nodes of the Project that may produce wastewater, and there are certain differences in water quality of various types of wastewater. Through investigating the generation of wastewater from similar enterprises, and referring to the *Guideline for available techniques of pollution prevention and control for pulp and paper industry* (HJ 2302-2018), the concentrations of COD, BOD_5, and SS are calculated by weighing water volume and pollutant concentration of various types of wastewater; the concentrations mainly adopt the values in the *Guideline for available techniques of pollution prevention and control for pulp and paper industry* (HJ 2302-2018). The concentrations of ammonia nitrogen, total nitrogen, total phosphorus and AOX in wastewater of similar enterprises are higher, so the concentrations of ammonia nitrogen, total nitrogen, total phosphorus and AOX in comprehensive wastewater shall be determined while referring to the concentrations in comprehensive wastewater of similar enterprises. The typical pulp and paper wastewater quality range and project values as stated in HJ 2302-2018 are shown in Table 2.2.5-33, and the comprehensive wastewater quality status and project values of similar projects are shown in Table 2.2.5-34

表 2.2.5-33 典型制浆造纸废水水质范围及项目取值见表
Table 2.2.5-33 Typical pulp and paper wastewater quality range and project values

污染物 Pollutant	废水种类 Wastewater type					
	化学浆(1) Chemical pulp (1)	项目取值 Project value	化学机械浆(2) APMP(2)	项目取值 Project value	造纸废水(3)) Paper-making wastewater(3))	项目取值 Project value
COD（mg/L）	1200~2500	1500	6000~16000	10000	500~1800	1300
BOD_5（mg/L）	350~800	600	1800~4000	2000	180~800	500
SS（mg/L	250~1300	1200	1800~3800	3800	250~1300	1300
说明：(1)木浆取中低值，非木浆取高值，项目为木浆；(2)化学机械浆水质指标为高浓度制浆废水未进行蒸发燃烧处理的指标，项目化机浆设有 MVR 蒸发工段；(3)国产小型纸机取中低值，进口纸机取高值，项目为进口纸机。 Description: (1) Medium and low values for wood pulp, and high values for non-wood pulp; wood pulp is adopted in the Project; (2) The water quality index of APMP is the index of high-consistency pulping wastewater before evaporation and combustion, APMP of the Project is set with a MVR evaporation						

section; (3) Medium and low values for domestic small paper machines and high values for imported paper machines; paper machines are adopted in the Project.

表 **2.2.5-34** 废水污染物取值一览表

Table 2.2.5-34 List of values of pollutants in wastewater

序号 **S.N.**	污染物 **Pollutant**	同类化学浆企业综合废水 **Comprehensive wastewater of similar chemical pulp enterprises** (湛江晨鸣项目、江苏王子项目) **(Zhanjiang Chenming Project, Jiangsu Wangzi Project)**	同类化机浆企业综合废水(金桂浆纸项目和金隆浆纸项目) **Comprehensive wastewater of similar APMP enterprises (Jingui Pulp and Paper Project and Jinlong Pulp and Paper Project)**	本项目取值 **Value of the Project**
1	NH_3-N	9.69	13.2	14
2	TN	14.1	14.1	15
3	TP	12.7	16.9	17
4	AOX	9.12~11.3	/	11.3

表 2.2.5-35 项目一期废水污染源源强核算结果及相关参数一览表（一期）

Table 2.2.5-35 List of accounting results and relevant parameters of waste water pollution source intensity (Phase I)

废水来源 Wastewater source	废水产生量（m^3/d）Wastewater volume (m^3/d)	COD		BOD_5		SS		氨氮 Ammonia nitrogen		总氮 Total nitrogen		总磷 Total phosphorus		AOX	
		(mg/L)	(t/d)	(mg/L)	(t/d)	(mg/L)	(t/d)	(mg/L)	(t/d)	(mg/L)	(t/d)	(mg/L)	(t/d)	(mg/L)	(t/d)
化学浆车间 Chemical pulp workshop	43660	1500	65.49	600	26.20	1200	52.39	—	—	—	—	—	—	11.3	0.493
化机浆及 MVR 蒸发车间 APMP and MVR evaporation workshop	1176	10000	11.76	2000	2.35	3800	4.47	—	—	—	—	—	—	—	—
碱回收车间 Alkaline recovery workshop	2222	1100	2.44	500	1.11	450	1.00	—	—	—	—	—	—	—	—
文化用纸车间 Cultural paper	9706	1300	12.62	500	4.85	1300	12.62	—	—	—	—	—	—	—	—
浆板车间 Pulp board workshop	662	1300	0.86	500	0.33	1300	0.86	—	—	—	—	—	—	—	—
特种纸车间 Special paper	8897	1300	11.47	500	4.41	1300	11.47	—	—	—	—	—	—	—	—
热电站 Thermal power plant	4056	400	1.62	250	1.01	400	1.62	—	—	—	—	—	—	—	—
热力循环水系统排水 Heat circulating water system drainage	720	400	0.29	250	0.18	400	0.29	—	—	—	—	—	—	—	—
工艺循环水系统排水 Process circulating water system drainage	432	400	0.17	250	0.11	400	0.17	—	—	—	—	—	—	—	—

其他 Other	167	7000	1.68	4500	1.08	400	0.10	—	—	—	—	—	—	—	—
净水站 Water purification station	432	50	0.02	20	0.01	100	0.04	—	—	—	—	—	—	—	—
综合废水浓度 Comprehensive wastewater concentration	**72130**	**1497**	**108.01**	**573**	**41.35**	**1180**	**85.10**	**14**	**1.01**	**15**	**1.08**	**17**	**1.23**	**6.8**	**0.493**

表 2.2.5-36 项目二期建成后污水处理站废水污染源源强核算结果及相关参数一览表（一期+二期）
Table 2.2.5-36 List of accounting results and relevant parameters of waste water pollution source intensity after completion of Phase II (Phase I + Phase II)

废水来源 Wastewater source	废水产生量（m^3/d） Wastewater volume (m^3/d)	COD		BOD_5		SS		氨氮 Ammonia nitrogen		总氮 Total nitrogen		总磷 Total phosphorus		AOX	
		(mg/L)	(t/d)	(mg/L)	(t/d)	(mg/L)	(t/d)	(mg/L)	(t/d)	(mg/L)	(t/d)	(mg/L)	(t/d)	(mg/L)	(t/d)
制浆车间 Pulping workshop	43660	1500	65.49	600	26.20	1200	52.39	—	—	—	—	—	—	11.3	0.493
化机浆及MVR蒸发车间 APMP and MVR evaporation workshop	3529	10000	35.29	2000	7.06	3800	13.41	—	—	—	—	—	—	—	—
碱回收车间	2222	1100	2.4442	500	1.11	450	1.00	—	—	—	—	—	—	—	—

Alkaline recovery workshop														
文化用纸车间 Cultural paper	9706	1300	12.6178	500	4.85	1300	12.62	—	—	—	—	—	—	—	—
浆板车间 Pulp board workshop	265	1300	0.3445	500	0.13	1300	0.34	—	—	—	—	—	—	—	—
特种纸车间 Special paper	8896	1300	11.4712	500	4.41	1300	11.47	—	—	—	—	—	—	—	—
生活用纸车间 Life paper	2206	1300	2.8678	500	1.10	1300	2.87	—	—	—	—	—	—	—	—
白卡纸车间 Ivory board	17206	1300	22.3678	500	8.60	1300	22.37								
热电站 Thermal power plant	5064	400	2.0256	250	1.27	400	2.03								
热力循环水系统排水 Heat circulating water system drainage	1120	400	0.448	250	0.28	400	0.45	—	—	—	—	—	—	—	—
工艺循环水系统排水 Process circulating water system drainage	432	400	0.1728	250	0.11	400	0.17	—	—	—	—	—	—	—	—
其他 Other	247	7000	2.24	4500	1.44	400	0.13	—	—	—	—	—	—	—	—
净水站 Water purification station	469	50	0.02345	20	0.01	100	0.05	—	—	—	—	—	—	—	—
综合废水浓度 Comprehensive wastewater concentration	**95023**	**1656**	**157.39**	**592**	**56.28**	**1256**	**119.36**	14	1.33	**15**	**1.43**	**17**	**1.62**	**5.2**	**0.493**

（3）漂白废水 AOX、二噁英产生及控制措施

(3) Generation and control measures of AOX and Dioxin in bleaching wastewater

①漂白废水 AOX 排放

① AOX discharge from bleaching wastewater

漂白废水（酸性废水、碱性废水）中含有的木素降解产物与含氯漂剂反应产生的酚类及其有机氯化物，主要是氯代酚类化合物，目前多以 TOCl(Total Organic Cholorinate)和 AOX（Adsorbable Organic Halogen）表示。

Phenols and their organic chlorides produced by reaction of lignin degradation products contained in bleaching wastewater (acid wastewater, alkaline wastewater) with chlorine-containing bleaching agents are mainly chlorinated phenolic compounds, which are currently expressed as TOCl (Total Organic Cholorinate) and AOX (Adsorbable Organic Halogen).

AOX 发生量与漂白工艺所用活性氯量有直接关系，随二氧化氯取代液氯量的增加，废水中 AOX 发生量大幅减少。本项目采用 ECF 无元素漂白技术，随二氧化氯取代液氯，废水中 AOX 发生量将大幅减少，可有效减轻漂白废水中的 AOX 污染。根据湛江晨鸣项目及江苏王子项目制浆漂白车间废水中 AOX 的监测结果，其 AOX 产生为 0.31~11.3mg/L，ECF 漂白车间废水中 AOX 产生浓度可以达到车间排放浓度≤12mg/L。

The amount of AOX is directly related to the amount of active chlorine used during bleaching. With the increase in the amount of chlorine dioxide instead of liquid chlorine, the amount of AOX in wastewater will decrease significantly. The ECF element-free bleaching technology is adopted in the Project, and with the replacement of liquid chlorine by chlorine dioxide, the amount of AOX in wastewater will decrease significantly, which can effectively reduce AOX pollution in bleaching wastewater. According to the monitoring results of AOX in wastewater of pulping bleaching workshops of Zhanjiang Chenming Project and Jiangsu Wangzi Project, the amount of AOX is 0.31~11.3mg/L, concentration of AOX produced in wastewater of ECF bleaching workshop can reach the workshop discharge concentration of ≤12mg/L.

可吸附有机卤化物（AOX）仅表示废水中卤化物数量，但不能分辨相同数量下的毒

性差异。以前，纸浆厂排放废水中的 AOX 被当作是潜在的和长期的影响环境的重要因素，现在采用了 ECF 漂白技术，浆厂排放的废水中 AOX 含量非常低，基本在吨浆 0.1～0.3kg 的范围内。对鱼和其它水生生物长期观察的结果显示，现代的硫酸盐浆厂采用 ECF 漂白技术和现代化的二级生化废水处理手段后，排放的废水中 AOX 浓度很低，对水生生物几乎没有影响。另外研究也表明，浆厂排水中的急性或慢性毒性与漂白车间排水中的 AOX 之间没有关系（摘自《漂白废水对水生环境的影响》，Tana 1996 赫尔辛基，芬兰环境署）。

AOX only represents the amount of halides in wastewater, but cannot distinguish the toxicity difference under the same amount. In the past, AOX in wastewater discharged from pulp mills was regarded as a potential and long-term factor affecting the environment; due to the adopting of ECF bleaching at present, the content of AOX becomes quite low in the discharged wastewater, basically 0.1～0.3kg of each ton of pulp. The results of long-term observation on its effect on fish and other aquatic organisms show that the content of AOX is quite low in wastewater discharged by modern sulfate pulp mills after adopting the ECF bleaching technology and modern secondary biochemical wastewater treatment method, and it almost has no effect on aquatic organisms. Other studies show that acute or chronic toxicity in wastewater discharged by pulp mills has nothing to do with the AOX in wastewater of bleaching workshop (From: Effects of bleaching wastewater on the aquatic environment, Tana 1996, Helsinki, Finnish Environment Agency).

②漂白废水二噁英排放

② Dioxin in bleaching wastewater

造纸工业中，二噁英类主要来自含氯漂白剂，通过控制漂白的氯化过程可以从源头上控制二噁英类污染物的产生。本项目蒸煮工段采取连续蒸煮方法，中浓筛选，二段氧脱木素，多段逆流洗涤，漂白工段采用无元素氯漂白技术，无 Cl_2 漂白。与传统的氯漂相比，本项目不再新产生二噁英，主要为原料本身自带的二噁英，可大大降低二噁英类物质的排放量。

In paper industry, dioxins are mainly from chlorine-containing bleaching agents, so through controlling the chlorination process of bleaching, the production of dioxin pollutants can be controlled from the source. The cooking section of the Project adopts continuous cooking, medium-consistency screening, two-stage oxygen delignification, and multi-stage countercurrent washing; and the bleaching section adopts element-free chlorine bleaching technology, and non-Cl_2 bleaching. Compared with traditional chlorine bleaching, the Project will not produce new dioxin, and the only dioxin is from raw materials, so this can greatly reduce the emission of dioxin substances.

根据世界卫生组织修订的毒性当量因子，漂白车间废水二噁英排放限值为 13.19 pgTEQ/L。这是世界上对制浆漂白废水中二噁英最严格的限值要求。随着 ECF 漂白工艺的运用和现代化制浆技术的采用，制浆工业已完全满足此项规定的要求。

According to the toxicity equivalent factor revised by the World Health Organization, the dioxin discharge limit in wastewater of bleaching workshop is 13.19 pgTEQ/L. This is the most stringent limit for dioxin in wastewater of pulp bleaching in the world. With the application of the ECF bleaching process and the adoption of modern pulping technology, and pulping industry has fully met the requirements of this regulation.

类比湛江晨鸣项目，制浆车间排口二噁英浓度为 0.25~3.77pgTEQ/L，远低于《制浆造纸工业水污染物排放标准》（GB3544-2008）中二噁英 30 pgTEQ/L 控制限值的要求。因此项目制浆车间排水的二噁英浓度远低于《制浆造纸工业水污染物排放标准》（GB3544-2008）中二噁英 30 pgTEQ/L 控制限值的要求。

Referring to the Zhanjiang Chenming Project, the concentration of dioxin at the outlet of the pulping workshop is 0.25~3.77 pgTEQ/L, which is far less than the control limit of 30 pgTEQ/L specified in the *Discharge Standards for Water Pollutants of Pulp and Papermaking Industry* (GB3544-2008). Therefore, the concentration of dioxin in wastewater of the pulping workshop is far less than the control limit of 30 pgTEQ/L specified in the *Discharge Standards for Water Pollutants of Pulp and Papermaking Industry* (GB3544-2008).

根据《污染源源强核算技术指南 制浆造纸》（HJ887-2018）和《造纸行业排污许可证申请与核发技术规范》，采用不含元素氯漂白工艺的制浆造纸企业，本评价不定量核算二噁英源强。

According to the *Technical Guidelines of Accounting Method for Pollution Source*

Intensity - Pulp and Paper Industry (HJ887-2018) and *Technical Specifications for Application and Approval of Discharge Permits in Paper Industry*, this evaluation will not quantitatively determine the Dioxin source intensity for pulp and paper enterprises adopting element-free chlorine bleaching process.

（4）废水污染控制措施

(4) Wastewater pollution control measures

根据本项目污水的水质特性和水量，拟建设总处理规模为 100000m^3/d 的污水处理系统。由于生产污水负荷较高，项目拟在好氧处理单元前设置厌氧处理单元，采用 EGSB 厌氧反应器，好氧处理工艺采用卡鲁赛尔氧化沟，三级处理单元采用化学氧化处理，废水处理达标后排入铁山港区深海排放管网系统，在铁山港 B3 排污口深海排放。污水处理流程图见图 2.2.5-1。

According to the quality and quantity of sewage in this project, a mixed sewage treatment system with a treatment scale of 100,000m^3/d will be built. Due to the high sewage load of production, the Project plans to set an anaerobic treatment unit prior to the aerobic treatment unit, and adopts EGSB anaerobic reactor; the aerobic treatment process adopts Carrousel oxidation ditch, and the tertiary treatment unit adopts chemical oxidation treatment. The sewage is discharged into the deep-sea discharge pipe network system of Tieshangang District after being processed, and then discharged into the deep sea at the sewage outlet B3 of Tieshangang The sewage treatment process flow is shown in Fig. 2.2.5-1.

（5）项目废水排放源强

(5) Wastewater source intensity

根据本项目废水产生特性及污水处理设施设计去除效率，项目废水排放情况见表 2.2.5-37、表 2.2.5-38。

According to the wastewater generation characteristics and the removal efficiency of sewage treatment facility, the wastewater discharge conditions are shown in Table 2.2.5-37 and Table 2.2.5-38.

图 2.2.5-1 项目污水处理工艺流程

Fig. 2.2.5-1 Sewage treatment process flow diagram of the Project

表 2.2.5-37 项目一期废水污染源源强核算结果及相关参数一览表（一期）

Table 2.2.5-37 List of accounting results and relevant parameters of waste water pollution source intensity (Phase I)

工序 Working procedure	污染物 Pollutant	污染物的产生 Production of pollutants				治理措施 Control measures		污染物的排放 Discharge of pollutants				排放标准 (mg/m^3) Discharge standard (mg/m^3)	排放时间 Discharge time
		核算方法 Accounting method	废水产生量（m^3/h）Wastewater volume (m^3/h)	产生浓度（mg/L）Generation concentration (mg/L)	产生量 (kg/h) Output (kg/h)	工艺 Process	效率(%) Efficiency (%)	核算方法 Accounting method	废水排放量 (m^3/h) Wastewater volume (m^3/h)	排放浓度 (mg/m^3) Discharge concentration (mg/m^3)	排放速率 (kg/h) Discharge rate (kg/h)		
污水处理站 Sewage treatment plant	COD	类比法 Analogy method	3005.4	1497	4500.52	初沉池+厌氧反应器+生物选择池+卡鲁塞尔氧化沟+高级氧化池 Primary sedimentation tank + Anaerobic reactor + biological selection tank + Carrousel oxidation ditch + advanced oxidation tank	95.1	类比法 Analogy method	3005.4	73.4	220.53	90	8160
	BOD_5	类比法 Analogy method		573	1723.07		97.0	类比法 Analogy method		17.2	51.69	20	
	SS	类比法 Analogy method		1180	3545.77		98.0	类比法 Analogy method		23.6	70.92	30	
	NH_3-N	类比法 Analogy method		14	42.08		65.0	类比法 Analogy method		4.9	14.73	5	
	TN	类比法 Analogy method		15	45.08		50.0	类比法 Analogy method		7.5	22.54	10	
	TP	类比法 Analogy method		17	51.09		96.0	类比法 Analogy method		0.7	2.04	0.8	
	AOX	类比法 Analogy method		6.8	20.54		50	类比法 Analogy method		3.4	10.27	12	

注：1、根据《制浆造纸工业水污染物排放标准》（GB3544-2008）表 2 要求，新建制浆和造纸联合生产企业，要求单位产品基准排水量的限值为 40 t/t（绝干浆）。项目一期设计产量为 1000000Adt/a，外购商品浆数量总和为 1163200Adt/a，项目一期完成后全厂合计绝干浆 1046880t/a，单位产品基准排水量为 23.4t/t（绝干浆），符合《制浆造纸工业水污染物排放标准》（GB3544-2008）要求。2、排放标准中 AOX 指车间废水排放口排放浓度限值。

Note: 1. According to the requirements in Table 2 of *Discharge Standards for Water Pollutants of Pulp- and Papermaking Industry* (GB3544-2008), the newly built joint pulp and paper enterprise shall meet the requirements for the limit of benchmark water discharge per unit product of 40 t/t (absolute dry pulp). The designed output of Phase I is 1,000,000Adt/a, the total amount of purchased commercial pulp is 1,163,200Adt/a; after completion of Phase I, the total absolute dry pulp is 1,046,880t/a, and benchmark water discharge per unit product is 23.4t/t (absolute dry pulp), meeting the requirements in the *Discharge Standards for Water Pollutants of Pulp and Papermaking Industry* (GB3544-2008). 2. In the discharge standard, AOX refers to the discharge concentration limit at the wastewater outlet of the workshop.

表 2.2.5-38 项目二期建成后污水处理站废水污染源源强核算结果及相关参数一览表（一期+二期）

Table 2.2.5-38 List of accounting results and relevant parameters of waste water pollution source intensity after completion of Phase II (Phase I + Phase II)

工序 Working procedure	污染物 Pollutant	污染物的产生 Production of pollutants				治理措施 Control measures		污染物的排放 Discharge of pollutants				排放标准 (mg/m³) Discharge standard (mg/m³)	排放时间 Discharge time
		核算方法 Accounting method	废水产生量（m³/h） Wastewater volume (m³/h)	产生浓度（mg/L） Generation concentration (mg/L)	产生量 (kg/h) Output (kg/h)	工艺 Process	效率(%) Efficiency (%)	核算方法 Accounting method	废水排放量 (m³/h) Wastewater volume (m³/h)	排放浓度 (mg/m³) Discharge concentration (mg/m³)	排放速率 (kg/h) Discharge rate (kg/h)		
污水处理站 Sewage treatment plant	COD	类比法 Analogy method	3959.3	1656	6557.79	初沉池+厌氧反应器+生物选择池+卡鲁塞尔氧化沟+高级氧化池 Primary sedimentation tank + Anaerobic reactor + biological selection tank + Carrousel oxidation ditch + advanced oxidation tank	95.6	类比法 Analogy method	3959.3	73.0	289.20	90	8160
	BOD_5	类比法 Analogy method		592	2345.00		97.0	类比法 Analogy method		17.8	70.35	20	
	SS	类比法 Analogy method		1256	4973.26		98.0	类比法 Analogy method		25.1	99.47	30	
	NH_3-N	类比法 Analogy method		14	55.43		65.0	类比法 Analogy method		4.9	19.40	5	
	TN	类比法 Analogy method		15	59.39		50.0	类比法 Analogy method		7.5	29.69	10	
	TP	类比法 Analogy method		17	67.31		96.0	类比法 Analogy method		0.7	2.69	0.8	
	AOX	类比法 Analogy method		5.2	20.54		50	类比法 Analogy method		2.6	10.27	12	

注：1、根据《制浆造纸工业水污染物排放标准》（GB3544-2008）表 2 要求，新建制浆和造纸联合生产企业，要求单位产品基准排水量的限值为 40 t/t（绝干浆）。项目二期建成后全厂设计产量为 1400000Adt/a，外购商品浆数量总和为 328289Adt/a，项目二期完成后全厂合计绝干浆 1555460t/a，单位产品基准排水量为 20.8t/t（绝干浆），符合《制浆造纸工业水污染物排放标准》（GB3544-2008）要求。2、排放标准中 AOX 指车间废水排放口排放浓度限值。

Note: 1. According to the requirements in Table 2 of *Discharge Standards for Water Pollutants of Pulp- and Papermaking Industry* (GB3544-2008), the newly built joint pulp and paper enterprise shall meet the requirements for the limit of benchmark water discharge per unit product of 40 t/t (absolute dry pulp). After completion of Phase II, the designed output of the plant is 1,400,000Adt/a, the total amount of purchased commercial pulp is 328,289Adt/a; the total absolute dry pulp is 1,555,460t/a, and benchmark water discharge per unit product is 20.8t/t (absolute dry pulp), meeting the requirements in the *Discharge Standards for Water Pollutants of Pulp and Papermaking Industry* (GB3544-2008). 2. In the discharge standard, AOX refers to the discharge concentration limit at the wastewater outlet of the workshop.

2.2.5.4 噪声污染源分析

2.2.5.4 Analysis on noise pollution sources

项目噪声源主要为备料工段水洗机，制浆车间的除砂器、浆泵、真空泵等，造纸车间磨浆机、纸机等，二氧化氯制备车间的药剂泵和水泵，制氧站的鼓风机、真空泵、氧压机等机械设备，根据《污染源源强核算技术指南 制浆造纸》，一期工程设备主要噪声源强见表 2.2.5-39。

The noise sources of the Project mainly include washing machine in the preparation section; grit separator, pulp pump, and vacuum pump of the preparation section; fiberizer and paper machine in the papermaking workshop; reagent pump and water pump in the chlorine dioxide preparation workshop; blower, vacuum pump, and oxygen compressor in the oxygen generation station; according to the *Technical Guidelines of Accounting Method for Pollution Source Intensity - Pulp and Paper Industry* (HJ887-2018), the main noise source intensity of engineering equipment in Phase I is shown in Table 2.2.5-39.

表 2.2.5-39 一期主要噪声源
Table 2.2.5-39 Main noise sources of Phase I

工序/生产线 Process/production line	噪声源 Noise sources	生源类型 Source type	噪声源强 Noise source intensity		降噪措施 Noise reduction measures		数量（台） Quantity (set)	持续时间 Duration
			核算方法 Accounting method	噪声值 dB(A) Noise value dB (A)	工艺 Process	降噪后噪声值 dB(A) Noise after noise reduction dB(A)		
原料堆场及备料车间 Raw material stockyard and preparation workshop	削片机 Chipping machine	频发 Frequent	类比法 Analogy method	89~105	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	64~80	3	8160
	木片筛 Wood chip screen	频发 Frequent	类比法 Analogy method	85~90	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	4	8160
	再碎机 Rechipper	频发 Frequent	类比法 Analogy method	85~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	64~80	1	8160
制浆车间 Pulping workshop	除砂器 Grit separator	频发 Frequent	类比法 Analogy method	81~90	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	56~65	1	8160
	压力筛 Pressurized screen	频发 Frequent	类比法 Analogy method	85~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	3	8160
	洗浆机 Pulp washer	频发 Frequent	类比法 Analogy method	78~91	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	53~66	5	8160
	浆泵 Pulp pump	频发 Frequent	类比法 Analogy method	85~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	9	8160
二氧化氯制备车间 Chlorine dioxide	料泵 Material pump	频发 Freque	类比法 Analogy	85~90	基础减振、车间阻隔 Foundation vibration reduction and	60~65	1	8160

工序/生产线 Process/production line	噪声源 Noise sources	生源类型 Source type	噪声源强 Noise source intensity		降噪措施 Noise reduction measures		数量（台） Quantity (set)	持续时间 Duration
			核算方法 Accounting method	噪声值 dB(A) Noise value dB (A)	工艺 Process	降噪后噪声值 dB(A) Noise after noise reduction dB(A)		
preparation workshop		nt	method		vehicle blocking			
	水泵 Water pump	频发 Frequent	类比法 Analogy method	80~94	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	55~69	1	8160
化机浆车间 Chemimechanical pulp workshop	洗涤机 Washing machine	频发 Frequent	类比法 Analogy method	80~90	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	55~65	1	8160
	料塞螺旋 Material plug screw	频发 Frequent	类比法 Analogy method	83~89	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	58~64	1	8160
	高浓磨浆机 High-consistency fiberizer	频发 Frequent	类比法 Analogy method	91~100	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	66~75	4	8160
	低浓磨浆机 Low-consistency fiberizer	频发 Frequent	类比法 Analogy method	87~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	62~70	4	8160
	木片泵 Wood chip pump	频发 Frequent	类比法 Analogy method	85~90	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~65	1	8160
	压力筛 Pressurized screen	频发 Frequent	类比法 Analogy method	85~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	3 套 3 sets	8160
	渣浆磨 Slag pulp mill	频发 Frequent	类比法 Analogy method	86~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	61~70	2	8160

工序/生产线 Process/production line	噪声源 Noise sources	生源类型 Source type	噪声源强 Noise source intensity		降噪措施 Noise reduction measures		数量（台） Quantity (set)	持续时间 Duration
			核算方法 Accounting method	噪声值 dB(A) Noise value dB (A)	工艺 Process	降噪后噪声值 dB(A) Noise after noise reduction dB(A)		
	浆泵 Pulp pump	频发 Frequent	类比法 Analogy method	85~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	1 套 1 set	8160
空压站 Air compressor station	空压机 Air compressor	频发 Frequent	类比法 Analogy method	85~90	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	4	8160
浆板车间 Pulp board workshop	真空泵 Vacuum pump	频发 Frequent	类比法 Analogy method	85~100	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~75	4	8160
	碎浆机 Pulper	频发 Frequent	类比法 Analogy method	85~93	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~68	2	8160
	浆板机 Pulp machine	频发 Frequent	类比法 Analogy method	80~85	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	50~60	1	8160
文化用纸车间 Cultural paper	除砂器 Grit separator	频发 Frequent	类比法 Analogy method	85~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	2	8160
	磨浆机 Fiberizer	频发 Frequent	类比法 Analogy method	91~100	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	66~75	2	8160
	纸机 Paper-making machine	频发 Frequent	类比法 Analogy method	92~108	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	67~83	1	8160
特种纸车间	除砂器	频发	类比法	85~95	基础减振、车间阻隔	60~70	2	8160

工序/生产线 **Process/production line**	噪声源 **Noise sources**	生源类型 **Source type**	噪声源强 **Noise source intensity**		降噪措施 **Noise reduction measures**		数量（台） **Quantity (set)**	持续时间 **Duration**
			核算方法 **Accounting method**	噪声值 dB(A) **Noise value dB (A)**	工艺 **Process**	降噪后噪声值 dB(A) **Noise after noise reduction dB(A)**		
Special paper	Grit separator	Frequent	Analogy method		Foundation vibration reduction and vehicle blocking			
	磨浆机 Fiberizer	频发 Frequent	类比法 Analogy method	91~100	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	66~75	2	8160
	纸机 Paper-making machine	频发 Frequent	类比法 Analogy method	92~108	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	67~83	1	8160
碱回收车间 Alkaline recovery workshop	风机 Fan	频发 Frequent	类比法 Analogy method	78~91	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	53~66	6	8160
	真空泵 Vacuum pump	频发 Frequent	类比法 Analogy method	85~100	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~75	3	8160
热电站 Thermal power plant	汽轮机 Steam turbine	频发 Frequent	类比法 Analogy method	85~90	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	3	8160
	发电机 Generator	频发 Frequent	类比法 Analogy method	85~90	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	3	8160
	风机 Fan	频发 Frequent	类比法 Analogy method	78~91	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	53~66	4	8160
污水处理站 Sewage treatment plant	泵类 Pump	频发 Freque	类比法 Analogy	65~94	基础减振、车间阻隔 Foundation vibration reduction and	55~69	44	8160

工序/生产线 Process/production line	噪声源 Noise sources	生源类型 Source type	噪声源强 Noise source intensity		降噪措施 Noise reduction measures		数量（台） Quantity (set)	持续时间 Duration
			核算方法 Accounting method	噪声值 dB(A) Noise value dB (A)	工艺 Process	降噪后噪声值 dB(A) Noise after noise reduction dB(A)		
		nt	method		vehicle blocking			
	风机 Fan	频发 Frequent	类比法 Analogy method	78~91	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	53~66	8	8160

表 2.2.5-40　二期主要噪声源

Table 2.2.5-40 Main noise sources of Phase II

工序/生产线 Process/production line	噪声源 Noise sources	生源类型 Source type	噪声源强 Noise source intensity		降噪措施 Noise reduction measures		数量（台） Quantity (set)	持续时间 Duration
			核算方法 Accounting method	噪声值 dB(A) Noise value dB (A)	工艺 Process	降噪后噪声值 dB(A) Noise after noise reduction dB(A)		
原料堆场及备料车间 Raw material stockyard and preparation workshop	木片筛 Wood chip screen	频发 Frequent	类比法 Analogy method	85~90	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	4	8160
化机浆车间 Chemimechanical pulp workshop	洗涤机 Washing machine	频发 Frequent	类比法 Analogy method	80~90	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	55~65	1	8160
	料塞螺旋 Material plug screw	频发 Frequent	类比法 Analogy method	83~89	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	58~64	1	8160
	高浓磨浆机	频发	类比法	91~100	基础减振、车间阻隔	66~75	4	8160

工序/生产线 Process/production line	噪声源 Noise sources	生源类型 Source type	噪声源强 Noise source intensity		降噪措施 Noise reduction measures		数量（台）Quantity (set)	持续时间 Duration
			核算方法 Accounting method	噪声值 dB(A) Noise value dB (A)	工艺 Process	降噪后噪声值 dB(A) Noise after noise reduction dB(A)		
	High-consistency fiberizer	Frequent	Analogy method		Foundation vibration reduction and vehicle blocking			
	低浓磨浆机 Low-consistency fiberizer	频发 Frequent	类比法 Analogy method	87~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	62~70	4	8160
	木片泵 Wood chip pump	频发 Frequent	类比法 Analogy method	85~90	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~65	1	8160
	压力筛 Pressurized screen	频发 Frequent	类比法 Analogy method	85~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	3 套 3 sets	8160
	渣浆磨 Slag pulp mill	频发 Frequent	类比法 Analogy method	86~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	61~70	2	8160
	浆泵 Pulp pump	频发 Frequent	类比法 Analogy method	85~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	1 套 1 set	8160
生活用纸车间 Life paper	真空泵 Vacuum pump	频发 Frequent	类比法 Analogy method	85~100	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~75	6	8160
	碎浆机 Pulper	频发 Frequent	类比法 Analogy method	85~93	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~68	9	8160
	压力筛 Pressurized	频发 Freque	类比法 Analogy	85~95	基础减振、车间阻隔 Foundation vibration reduction and	60~70	9	8160

工序/生产线 Process/production line	噪声源 Noise sources	生源类型 Source type	噪声源强 Noise source intensity		降噪措施 Noise reduction measures		数量（台） Quantity (set)	持续时间 Duration
			核算方法 Accounting method	噪声值 dB(A) Noise value dB (A)	工艺 Process	降噪后噪声值 dB(A) Noise after noise reduction dB(A)		
	screen	nt	method		vehicle blocking			
	纸机 Paper-making machine	频发 Frequent	类比法 Analogy method	92~108	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	67~83	3	8160
白卡纸车间 Ivory board	除砂器 Grit separator	频发 Frequent	类比法 Analogy method	85~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	5	8160
	磨浆机 Fiberizer	频发 Frequent	类比法 Analogy method	91~100	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	66~75	13	8160
	碎浆机 Pulper	频发 Frequent	类比法 Analogy method	85~93	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~68	8	8160
	压力筛 Pressurized screen	频发 Frequent	类比法 Analogy method	85~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	4	8160
	纸机 Paper-making machine	频发 Frequent	类比法 Analogy method	92~108	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	67~83	1	8160
热电站 Thermal power plant	汽轮机 Steam turbine	频发 Frequent	类比法 Analogy method	85~90	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	1	8160
	发电机 Generator	频发 Frequent	类比法 Analogy method	85~90	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	1	8160

工序/生产线 **Process/production line**	噪声源 **Noise sources**	生源类型 **Source type**	噪声源强 **Noise source intensity**		降噪措施 **Noise reduction measures**		数量（台） **Quantity (set)**	持续时间 **Duration**
			核算方法 **Accounting method**	噪声值 dB(A) **Noise value dB (A)**	工艺 **Process**	降噪后噪声值 dB(A) **Noise after noise reduction dB(A)**		
	风机 Fan	频发 Frequent	类比法 Analogy method	78~91	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	53~66	2	8160

2.2.5.5 固体废物污染源分析

2.2.5.5 Analysis on solid waste pollution source

项目生产过程产生的固体废物主要有废木屑，锅炉渣及煤灰，浆渣，白泥、绿泥，石灰渣和污水处理污泥及生活垃圾等。

The solid wastes generated during production mainly include waste chippings, boiler slag and coal ash, pulp slag, white mud, green mud, lime slag, sewage treatment sludge and domestic garbage.

（1）废木屑（S1）

(1) Waste chippings (S1)

项目在备料工段将产生一定量的废木屑、树皮。根据物料衡算，项目一期产生废木屑 215t/d（绝干），合计 73100t/a（绝干）；全部建成后全厂产生废木屑 250t/d（绝干），合计 85000t/a（绝干）。废木屑、树皮热值较高，拟送项目固废综合利用锅炉燃烧回收热能。

The preparation section will produce a certain amount of waste chippings and bark. According to material balance, Phase I may create 215t/d of waste chippings (absolute dry), and 73,100t/a (absolute dry) in total; after completion of all structures, the plant will create 250t/d of waste chippings (absolute dry), and 85,000t/a (absolute dry) in total. Waste chippings and bark have high calorific values, and they are planned to be sent to the solid waste comprehensive utilization boiler for combustion, to recover heat energy.

（2）浆渣、节子（S2）

(2) Pulp slag, knot (S2)

浆渣、节子主要来自制浆车间压力除节机。根据物料衡算，一期浆渣产生量为 30t/d（绝干），合计 10200t/a（绝干）；全部建成后全厂产生量为 50t/d（绝干），合计 17000t/a（绝干）。渣节含纤维较多，送项目固废综合利用锅炉燃烧回收热能。

Pulp slag and knots are mainly from the knotter in the pulping workshop. According to material balance, Phase I may create 30t/d of pulp slag (absolute dry), and 10,200t/a (absolute dry) in total; after completion of all structures, the plant will create 50t/d of pulp slag (absolute dry), and 17,000t/a (absolute dry) in total. The slag and knots contain much fiber, so they can be sent to the solid waste comprehensive utilization boiler for combustion, to recover heat energy.

当日产生的浆渣暂存于制浆车间的浆渣间，每日安排车辆将浆渣倒运至生物质炉的原料厂，供生物质炉燃烧使用。浆渣干度约 25-30%，为块状状态，无游离废液，在浆渣间用铲车将浆渣放置于运输车，在厂内倒运至热电站原料库。

The pulp slag generated on the same day is temporarily stored in the slag room of the pulping workshop, and vehicles will be arranged to transport the pulp slag to the plant with biomass furnace for combustion. The dryness of the pulp slag is about 25-30%, which is mainly made into blocks, without free waste liquid. In the pulp slag room, forklifts are used to load the pulp slag to trucks, which will transport the slag to the raw material warehouse of the thermal power station.

（3）黑液（S3）

(3) Black liquor (S3)

蒸煮废液中污染物的大部分经过洗涤工段被提取出来，初步洗涤提取的制浆废液称为黑液，主要污染物为高浓度有机污染物、固体悬浮物等，其碱性强、色度高、悬浮物多、溶解性有机物含量高，COD 浓度高。根据《国家危险废物名录》（环境保护部令第39号），黑液属于危险废物，编号为HW35。根据物料衡算，一期黑液产生量为19377t/d，合计 658.82 万 t/a；二期建成后全厂 20710 t/d，合计 704.14 万 t/a。黑液进入碱回收系统回收碱，在生产线中循环，不外排。

Most of the contaminants in the waste liquid of cooking can be extracted from the washing section, and the pulping waste liquid extracted from initial washing wastewater is called black liquor, which mainly contains high-consistency organic pollutants and solid suspended solids, which have high alkalinity, high chromaticity, more suspended matters, high content of dissolved organic matters, and high concentration of COD. According to the *National Catalogue of Hazardous Wastes* (Ministry of Environmental Protection Order No. 39), black liquor belongs to hazardous waste, with the number of HW35. According to material balance, the black liquor volume in Phase I is 19,377t/d, and 6,588,200 t/a in total; and after completion of Phase II, the black liquor volume of the plant will be 20,710 t/d, and

7,041,400 t/a in total. The black liquor will be sent to the alkali recovery system to recover alkali, which will circulate in the production line, without being discharged.

（4）白泥、绿泥、石灰渣（S4、S5、S6）

(4) White mud, green mud, lime slag (S4, S5, S6)

制浆车间产生黑液送入碱回收车间蒸发、燃烧处理，得到绿液，再经苛化处理可回收烧碱，在此过程中产生白泥、绿泥和石灰渣，其中白泥主要成分为碳酸钙，绿泥主要成分为碳酸钠，石灰渣主要成分为石灰杂质。

The black liquor generated in the pulping workshop pulping workshop is sent to the alkali recovery workshop for evaporation and combustion, and then the green liquor will be obtained; after causticization, caustic soda can be recovered. White mud, green mud and lime slag will be produced in this process, and white mud mainly includes calcium carbonate, green mud mainly includes sodium carbonate, and lime slag mainly includes lime impurities.

根据湛江晨鸣项目验收监测统计数据，类比可行性见2.2.7.1章，该项目白泥产生量为171615t（绝干），折算化学木浆白泥产生产污系数为245kg/t（风干浆），根据《污染源源强核算技术指南 制浆造纸》，化学机械浆白泥产生产污系数为56kg/t（风干浆），经核算，一期白泥产生量为207200t/a（绝干），二期22400t/a（绝干），全部建成后全厂绿泥产生量为229600t/a（绝干）。

According to the statistical data of acceptance monitoring of Zhanjiang Chenming Project, the feasibility of analogy is shown in Chapter 2.2.7.1, the white mud volume of the project is 171,615t(absolute dry), and it can be converted that the production coefficient of white mud from chemical mechanical pulp is 245kg/t (air-dried pulp); according to *Technical Guidelines of Accounting Method for Pollution Source Intensity* - Pulping amd Papermaking, the production coefficient of white mud from chemical mechanical pulp is 56kg/t (air-dried pulp). After accounting, the white mud volume is 207,200t/a (absolute dry) in Phase I, and 22,400t/a (absolute dry) in Phase II; after completion of the project, the green mud volume will be 229,600t/a (absolute dry).

根据湛江晨鸣项目验收监测统计数据，类比可行性见2.2.7.1章，该项目绿泥产生量为6985t（绝干），折算化学木浆绿泥产生产污系数为10kg/t（风干浆），根据《污染

源源强核算技术指南 制浆造纸》，化学机械浆绿泥产生产污系数为2.5kg/t（风干浆）。经核算，一期绿泥产生量为 8500t/a（绝干），二期 1000t/a（绝干），全部建成后全厂绿泥产生量为9500t/a（绝干）。根据湛江晨鸣项目验收监测统计数据，项目系数取值合理。

According to the statistical data of acceptance monitoring of Zhanjiang Chenming Project, the feasibility of analogy is shown in Chapter 2.2.7.1, the green mud volume of the project is 6,985t(absolute dry), and it can be converted that the production coefficient of white mud from chemical mechanical pulp is 10kg/t (air-dried pulp); according to *Technical Guidelines of Accounting Method for Pollution Source Intensity* - Pulping amd Papermaking, the production coefficient of green mud from chemical mechanical pulp is 2.5kg/t (air-dried pulp). After accounting, Phase I may create 8,500t/d of green mud (absolute dry), and 1,000t/a (absolute dry) in Phase II; after completion of all structures, the plant will create 9,500t/a (absolute dry) of green mud. According to statistical data of the acceptance inspection on Zhanjiang Chenming Project, the values of the project coefficients are reasonable.

根据湛江晨鸣项目验收监测统计数据，该项目处理 3900tds/d 黑液固形物石灰渣产生量为 1700t/a，则项目一期石灰渣产生量约为 1831t/a，二期新增黑液 200t/d，石灰渣新增产生量约为87t/a，全部建成后全厂石灰渣产生量为1918t/a。

According to statistical data of the acceptance inspection on Zhanjiang Chenming Project, the lime slag volume of the treatment of 3,900tds/d black liquor is 1,700t/a, the lime slag volume of Phase I is 1,831t/a, the newly added black liquor in Phase II is 200t/d, the newly-increased production volume of lime slag is about 87t/a, and the lime slag volume after completion of the plant will be 1,918t/a.

根据《固体废物排污申报登记指南》及《工业固体废物名录》第3项明确规定，白泥属于含钙固体废物，属于一般工业固体废物，白泥送本项目石灰窑回收处置；绿泥、石灰渣送一般工业固体废物集中处置场填埋。

According to the *Guidelines for the Declaration and Registration of Solid Waste Discharge* and Item 3 of *Catalog of Industrial Solid Wastes*, white mud belongs to calcium-containing solid waste and general industrial solid waste; white mud will be sent to the lime kiln for recovery; green mud and lime slag will be sent to the general industrial solid waste centralized disposal site for landfill.

（5）锅炉灰渣（S7）

(5) Boiler ash (S7)

①飞灰

①Fly ash

根据《污染源源强核算技术指南 火电》（HJ888-2018）飞灰计算公式计算项目飞灰产生量。

The volume of fly ash will be calculated by the computational formula stated in the *Technical Guidelines of Accounting Method for Pollution Source Intensity - Thermal Power* (HJ888-2018).

$$N_{\mathrm{h}} = B_{\mathrm{g}} \times \left(\frac{A_{\mathrm{ar}}}{100} + \frac{q_4 \times Q_{\mathrm{net,ar}}}{100 \times 33870} \right) \times \alpha_{\mathrm{fh}}$$

式中：

Where:

N_h——核算时段内飞灰产生量，t；

N_h - Fly ash volume in the accounting period, t;

B_g——核算时段内锅炉燃料耗量，t；

B_g - Boiler fuel consumption in the accounting period, t;

A_{ar}——收到基灰分的质量分数，%；

A_{ar} - The mass fraction of the basic ash received, %;

q_4——锅炉机械不完全燃烧热损失，%，取 2.5%；

q_4 - Heat loss due to incomplete combustion of the boiler, %, 2.5% is adopted;

$Q_{net,ar}$——收到基低位发热量，kJ/kg；

$Q_{net,ar}$ - The low calorific value received, kJ/kg;

α_{lz}——锅炉烟气带出飞灰的份额，取 0.6。

α_{lz} - Proportion of fly ash brought by boiler flue gas, 0.6.

220t/h 固废锅炉燃料消耗量：一期木屑燃烧量为 73100t/a（绝干），浆渣为 10200t/a

（绝干），污泥为 81600t/a（绝干），原煤消耗量 41180t/a；二期建成后木屑燃烧量为 85000t/a（绝干），浆渣为 17000t/a（绝干），污泥为 108800t/a（绝干），原煤消耗量 96451t/a。

Fuel consumption of 220t/h solid waste boiler: In Phase I, the wood chipping combustion amount is 73,100t/a (absolute dry), pulp slag is 10,200t/a (absolute dry), sludge is 81,600t/a (absolute dry), and raw coal consumption is 41,180t/a; after completion of Phase II, the wood chipping combustion amount is 85,000t/a (absolute dry), pulp slag is 17,000t/a (absolute dry), sludge is 108,800t/a (absolute dry), and raw coal consumption is 96,451t/a.

2 台 280t/h 燃煤锅炉燃料消耗量：一期原煤消耗量 314225t/a；二期建成后原煤消耗量 612555t/a。

The fuel consumption of two 280t/h coal-fired boilers: In Phase I, the raw coal consumption is 314,225t/a; and after completion of Phase II, it will be 612,555t/a.

经核算得 220t/h 固废锅炉一期飞灰量 13573t/a，二期建成后固废锅炉飞灰量 22174t/a；2 台 280t/h 燃煤锅炉一期飞灰量 32553t/a，二期建成后燃煤锅炉飞灰量 63459t/a。

After accounting, the fly ash volume of the 220t/h solid waste boiler in Phase I is 13,573t/a, and after completion of Phase II, the fly ash volume will be 22,174t/a; he fly ash volume of two 280t/h coal-fired boilers in Phase I is 32,553t/a, and after completion of Phase II, it will be 63,459t/a.

② 炉渣

② Furnace slag

根据《污染源源强核算技术指南 火电》（HJ888-2018）炉渣计算公式计算项目炉渣产生量。

The volume of furnace slag will be calculated by the computational formula stated in the *Technical Guidelines of Accounting Method for Pollution Source Intensity - Thermal Power* (HJ888-2018).

$$N_z = B_g \times \left(\frac{A_{ar}}{100} + \frac{q_4 \times Q_{net,ar}}{100 \times 33870} \right) \times \alpha_{1z}$$

式中：

Where:

N_z——核算时段内炉渣产生量，t；

N_z - Furnace slag volume in the accounting period, t;

B_g——核算时段内锅炉燃料耗量，t；

B_g - Boiler fuel consumption in the accounting period, t;

A_{ar}——收到基灰分的质量分数，%；

A_{ar} - The mass fraction of the basic ash received, %;

q_4——锅炉机械不完全燃烧热损失，%，取8%；

q_4 - Heat loss due to incomplete combustion of the boiler, %, 8% is adopted;

$Q_{net,ar}$——收到基低位发热量，kJ/kg；

$Q_{net,ar}$ - The low calorific value received, kJ/kg;

α_{lz}——炉渣占燃料灰分的份额，取0.4。

α_{lz} - The proportion of furnace slag in fuel ash, 0.4.

经核算得220t/h固废锅炉一期炉渣量9048t/a，二期建成后固废锅炉炉渣量14783t/a；2台280t/h燃煤锅炉一期炉渣量21702t/a，二期建成后燃煤锅炉炉渣量42306t/a。

After accounting, the furnace slag volume of the 220t/h solid waste boiler in Phase I is 9,048t/a, and after completion of Phase II, the furnace slag volume will be 14,783t/a;the furnace slag volume of two 280t/h coal-fired boilers in Phase I is 21,702t/a, and after completion of Phase II, it will be 42,306t/a.

固废锅炉飞灰含少量重金属及二噁英，本项目焚烧的燃料成分主要为造纸废弃物、造纸渣浆及污泥，考虑到造纸废弃物的成分相对简单，其原生燃料里重金属等有害物质含量本身较低。对照国家危险废物名录，HW18 焚烧处置残渣中未明确规定一般固废和污泥焚烧产生的飞灰属于危险废物。类比山东太阳纸业已建成的造纸固废焚烧发电资源综合利用工程，该项目设有1台180t/h固废锅炉，燃料为造纸污泥、木屑、浆渣、煤。山东省环科院环境检测有限公司对该锅炉烟气除尘产生的飞灰的腐蚀性、易燃性、反应性、急性毒性、浸出毒性、物质毒性进行鉴别，采集飞灰样品100个，采样周期为一个月，鉴定结果显示，飞灰样品不具有GB5085-2007规定的危险特性（见附件19）。本项目固废锅炉燃料与山东太阳纸业固废锅炉燃料种类一致，飞灰性质基本相近，认为不

具有危险特性，但考虑燃料组分和比例的差异性，评价要求本项目建成投产后，定期对固废锅炉的飞灰进行浸出毒性检测，如检测具有危险特性需委托有资质的单位进行处置。锅炉灰渣综合利用价值高，用途较广，可作制砖等。项目设 3 台渣仓，每台渣仓容积为 400m^3，渣仓可贮存锅炉约 234 小时的排渣量，除灰系统设灰库 3 座，灰库容积各 1000m^3，固废锅炉飞灰和燃煤锅炉飞灰分库暂存，可贮存锅炉设计工况下约 318 小时的排灰量。本项目配套一般固废填埋场建成后分区兼做事故备用灰场，防止灰渣综合利用公司因临时停产等原因造成灰渣积压。

The fly ash of solid waste boiler may contain a small amount of heavy metals and dioxins, and the fuel of the Project mainly includes paper-making waste, pulp slag and sludge; considering the simple composition of paper-making waste, the content of harmful substances, such as heavy metals, in parent fuel, is relatively low. Referring to the *National Catalog of Hazardous Wastes*, the fly ash generated through incineration of general solid waste and sludge not clearly specified in incineration by HW18 belongs to hazardous waste. Referring to the established papermaking solid waste incineration power generation comprehensive utilization project of Shandong Sun Paper, the Project is set with a 180t/h solid waste boiler, with the fuel of papermaking sludge, wood chippings, pulp slag, and coal. Shandong Academy of Environmental Sciences Environmental Testing Co., Ltd. has identified the corrosivity, flammability, reactivity, acute toxicity, leaching toxicity, and substance toxicity of fly ash generated by dedusting of flue gas of this boiler, and collected 100 fly ash samples, with the sampling period of one month. The results showed that fly ash samples do not have the hazardous characteristics specified in GB5085-2007 (see Appendix 19). The fuel for solid waste boilers of the Project is the same as that for solid waste boilers of Shandong Sun Paper, and the fly ash is basically similar in nature; so it is believed that the fly ash has no hazardous characteristics, but considering the difference in fuel composition and proportion, it is required carrying out regular testing on leaching toxicity of fly ash from solid waste boilers after completion of the Project; the hazardous testing shall be entrusted to a qualified unit for disposal. The boiler ash is high in comprehensive utilization value, wide in application range, and can be used to make bricks. The Project is set with 3 slag bins, each of which has a volume of 400m^3, and they can store about 234 hours of boiler slag; the ash disposal system is set with 3 storages, each of which has a volume of 1,000 m^3; The fly ash of solid waste boiler and that of coal-fired boiler should be stored in separate bins, and such bins can store about 318 hours of ash discharged from the boiler under design conditions. After construction of the general solid waste landfill, it can be used as the standby ash yard in case of accident, so as to prevent ash slag overstock due to the reasons such as temporary production shutdown of the comprehensive utilization enterprise.

（6）脱硫石膏（S8）

(6) Desulfurized gypsum (S8)

项目锅炉烟气处置措施设有炉外石灰石/石膏湿法脱硫工艺脱硫，此措施会产生副产物脱硫石膏，主要成分为碳酸钙，可外售水泥厂作为水泥的缓凝剂或者建材厂制成石膏板、石膏砌块等建材材料。

The boiler flue gas treatment measure is mainly the out-of-furnace limestone/gypsum wet desulphurization process, which may produce the by-product desulfurized gypsum, whose main component is calcium carbonate; and the desulfurized gypsum can be sold to cement plants as the retarder of cement or to building material plants for producing gypsum boards, gypsum blocks and other building materials.

根据《污染源源强核算技术指南 火电》（HJ888-2018），采用石灰石-石膏湿法等烟气脱硫工艺时，脱硫副产物可采用以下公式计算。

According to the *Technical Guidelines of Accounting Method for Pollution Source Intensity - Thermal Power* (HJ888-2018), when the limestone-gypsum wet process and other flue gas desulfurization processes are adopted, the by-products of desulfurization can be calculated by the following formula.

$$M = M_L \times \frac{M_F}{M_S \times \left(1 - \frac{C_s}{100}\right) \times \frac{C_g}{100}}$$

式中：

Where:

M——核算时段内脱硫副产物产生量，t；

M - Volume of desulfurization by-products produced in the accounting period, t;

M_F——脱硫副产物摩尔质量；

M_F - Molar mass of desulfurization by-products;

M_L——核算时段内二氧化硫脱除量，t；

M_L - Sulfur dioxide removing amount in the accounting period, t;

M_S——二氧化硫摩尔质量；

M_S - Molar mass of sulfur dioxide;

C_s——脱硫副产物含水率，%，副产物为石膏时含水率一般≤10%，取 10%；

C_s - Moisture content of desulfurization by-product, %, if it is gypsum, the moisture content is generally ≤10%, and 10% is adopted;

C_g——脱硫副产物纯度，%，副产物为石膏时纯度一般≥90%，取 90%。

C_g - Purity of desulfurization by-product, %, if it is gypsum, the purity is generally ≥90%, and 90% is adopted.

根据工程分析，项目一期锅炉烟气 SO_2 脱除量为 4555.39t/a，二期建成后，全厂锅炉烟气 SO_2 脱除量为 8839.56t/a，经核算一期脱硫石膏为 8787t，二期建成后，全厂脱硫石膏为 17052t。

According to engineering analysis, the removal capacity of SO_2 from boiler flue gas is 4,555.39t/a in Phase I; after completion of Phase II, the removal capacity of the plant will be 8,839.56t/a; after accounting, the amount of desulfurized gypsum in Phase I is 8,787t; and after completion of Phase II, the amount of desulfurized gypsum will be 17,052t.

（7）废活性炭（S9）

(7) Waste activated carbon (S9)

项目固废锅炉烟气治理设置有活性炭吸附装置。根据太阳纸业现有项目运行经验，固废锅炉烟气处理系统废活性炭产生量约为100吨/年。根据《国家危险废物名录》（环境保护部令第39号），废活性炭属于危险废物，编号为HW18，委托有资质的单位处置。

The solid waste boiler flue gas treatment system is set with an activated carbon adsorption device. According to the existing operation experience of Sun Paper, the solid waste boiler flue gas treatment system can produce 100 tons of waste activated carbon each year. According to the *National Catalog of Hazardous Wastes* (Ministry of Environmental Protection Order No. 39), waste activated carbon belongs to hazardous waste with the number of HW18, and it shall be entrusted to a qualified unit for disposal.

（8）废分子筛（S10）

(8) Waste molecular sieve (S10)

制氧车间产生废分子筛填料，主要成分为沸石分子筛和活性氧化铝，为一般工业固体废物，约5年更换一次，更换量为7.5t，废分子筛由生产厂家回收再利用。

The oxygen generation workshop will produce waste molecular sieve, with the main components of zeolite molecular sieve and activated aluminium oxide, which are general industrial solid wastes; the molecular sieve shall be replaced once every 5 years, with the replacement amount of 7.5t; the waste molecular sieve shall be recovered and recycled by producers.

（9）废离子交换树脂（S11）

(9)Waste ion exchange resin (S11)

软化水车间产生废离子交换树脂，每3年换一次，更换量为12t，根据《国家危险废物名录》（环境保护部令第39号），废离子交换树脂属于危险废物，编号为HW13，废离子交换树脂委托有资质的单位处理。

The softened water workshop may produce waste ion exchange resin, which shall be replaced every 3 years, with the replacement amount of 12t. According to the *National Catalog of Hazardous Wastes* (Ministry of Environmental Protection Order No. 39), the waste ion exchange resin belongs to hazardous waste, with the number of HW13, and the waste ion exchange resin shall be entrusted to qualified units for disposal.

（10）储油罐残渣（S12）

(10) Oil storage tank residue (S12)

根据《国家危险废物名录》（环境保护部令第39号），储油残渣是一种含油污泥，属于危险废物类，编号为HW08。储油罐每次产生的残渣量约为15kg/罐·次，项目设置有2个储油罐，每次清理油罐所产生的残渣总量约为30kg。储油残渣委托有资质的单位

上门清理，并用专业储存器皿储装运走统一处理。

According to the *National Catalog of Hazardous Wastes* (Ministry of Environmental Protection Order No. 39), oil storage tank residue is a type of oily sludge, belonging to hazardous waste, with the number of HW08. The amount of residue generated by the oil storage tank is about 15kg/tank·time; the Project is set with two oil storage tanks, so the total amount of residue generated by cleaning is about 30kg. The oil storage residue shall be cleaned by a qualified unit, and transported with specialized containers for unified treatment.

（11）隔油池污泥（S13）

(11) Oil separator sludge (S13)

加油站冲洗废水进入三级隔油池，沉淀产生的污泥属于含油污泥，属于危险废物，HW08 废矿物油。隔油池污泥产生量约为 40kg/a，产生的污泥委托有资质的单位处理定期清理、储装，统一运走处理。

The flushing wastewater of the petrol station will flow to the three-stage oil separator, and the sludge generated by sediment is oily sludge, which belongs to hazardous waste - HW08 waste mineral oil. The sludge volume of the oil separator is about 40kg/a, and the sludge shall be entrusted to a qualified unit for regular cleaning, storage, and transportation for disposal.

（12）污水处理站污泥（S14）

(12) Sludge of the sewage treatment plant (S14)

根据设计资料，本项目一期污泥产生量约 81600t/a（绝干），两期建成后全厂污泥产生量为 108800t/a（绝干）。少量化学处理段污泥不宜燃烧送一般工业固体废物集中处置场填埋处置，外送填埋污泥量为一期 9200 t/a（绝干），二期全厂 17000t/a（绝干）。其他污泥成分主要为纤维、腐殖质胶体等，送本项目固废综合利用锅炉燃烧回收热能。

According to the design data, the sludge volume in Phase I is about 81,600t/a (absolute dry), and after completion of the plant, the sludge volume will be 108,800t/a (absolute dry). A small amount of sludge generated by the chemical treatment section shall not be burned, but sent to the general industrial solid waste centralized disposal site for landfill; the amount of sludge for landfill is 9,200 t/a (absolute dry) in Phase I, and 17,000t/a (absolute dry) of the whole plant in Phase II.

Other sludge components mainly include fiber and soil organic colloid, which shall be sent to the solid waste comprehensive utilization boiler for combustion and heat recovery.

（13）废催化剂（S15）

(13) Waste catalyst (S15)

项目热电站锅炉废气脱硝系统，为保证脱硝性能，每隔 3~10 年需更换催化剂，根据太阳纸业现有项目运行经验，按每三年更换一次，每次更换量约 30t，更换下来的废催化剂集中装入原包装容器中，由脱硝催化剂供货厂家回收综合利用。废催化剂属于危险废物 HW50，废物代码 772-007-50。

In order to ensure the denitration performance of the boiler flue gas denitration system of the project's thermal power plant, the catalyst shall be replaced every 3-10 years. According to the existing operation experience of Sun Paper, it shall be replaced every 3 years, with the replacement amount of about 30t; the waste catalyst shall be stored in the original containers, and recycled by the denitration catalyst supplier for comprehensive utilization. The waste catalyst belongs to hazardous waste HW50, with the waste code of 772-007-50.

（14）废机油（S16）

(14) Waste engine oil (S16)

项目设备维护维修过程会产生少量废机油，年产生约 2 吨，采用废机油桶于危废暂存间暂存，委托有资质的单位定期处理。废机油属于危险废物 HW08，委托有资质的单位处置。

Equipment maintenance and repair will generate a small amount of waste engine oil (about 2 tons per year), which shall be placed in waste oil drums and temporarily stored in the hazardous waste storage room; a qualified unit can be entrusted to perform regular disposal. Waste engine oil belongs to hazardous waste HW08, which shall be entrusted to a qualified unit for disposal.

（15）生活垃圾（S17）

(15) Domestic waste (S17)

项目劳动定员 3200 人，其中一期 2440 人，二期 760 人。每人每天按产生 1kg 计，一期生活垃圾产生量约为 829t/a，二期 258t/a，则第二阶段技改后全厂生活垃圾为 1087t/a。

There are 3,200 employees in the Project, where 2,440 in Phase I and 760 in Phase II. Based on the amount of 1kg/day/person, the domestic waste volume is about 829t/a in Phase I, and 258t/a in Phase II; the domestic waste after technical transformation of the second stage will be 1,087t/a.

表 2.2.5-41　一期一般固体废物污染源源强核算结果一览表
Table 2.2.5-41 List of accounting results of general solid waste pollution source intensity (Phase I)

工序/生产线 Process/production line	装置 Plant	固体废物名称 Solid waste name	固废属性 Solid waste property	产生情况 Production situation		厂内堆存情况 Storage situation	最终去向 Final destination
				核算方法 Accounting method	产生量（t/a） Output (t/a)		
备料车间 Material workshop	备料工段 Preparation section	废木屑、树皮（绝干） Waste chippings, bark (absolute dry)	一般工业固废 General industrial solid waste	物料衡算 Material balance	73100	备料车间暂存 Temporarily stored in the preparation workshop	送固废综合利用锅炉作燃料 Sent to solid waste comprehensive utilization boiler as fuel
热电站 Thermal power plant	燃煤锅炉 Coal-fired boiler	锅炉灰渣 Boiler ash	一般工业固废 General industrial solid waste	物料衡算 Material balance	21702	堆放于渣仓 Stored in the slag bin	送水泥厂、砖厂综合利用 Sent to cement plants and brick plants for comprehensive utilization
		锅炉飞灰 Boiler fly ash	一般工业固废 General industrial solid waste	物料衡算 Material balance	32553	堆放于飞灰库 Stored in the fly ash depot	
	固废锅炉 Solid waste boiler	锅炉炉渣 Boiler slag	一般工业固废 General industrial solid waste	物料衡算 Material balance	9048	堆放于渣仓 Stored in the slag bin	
		锅炉飞灰 Boiler fly ash	一般工业固废 General industrial solid waste	物料衡算 Material balance	13573	堆放于飞灰库 Stored in the fly ash depot	投产后定期进行危险特性检测，如检测具有危险特性需委托有资质的单位进行处置 The hazardous characteristics shall be regularly detected after being put into production, and if there is any hazardous property, a qualified unit should be entrusted for disposal.
	锅炉废气处理系统 Boiler exhaust gas treatment system	脱硫石膏 Desulfurized gypsum	一般工业固废 General industrial solid waste	物料衡算 Material balance	8787	堆放于热电站 Stored in the thermal power plant	送水泥厂综合利用 Sent to cement plants for comprehensive utilization
制浆生产线 Pulp production	制浆车间 Pulping workshop	浆渣、节子 Pulp slag, knot （绝干）	一般工业固废 General industrial solid	系数法 Factor method	10200	临时堆放于制浆车间洗选工段 Temporarily stored in the	送固废综合利用锅炉作燃料 Sent to solid waste comprehensive utilization boiler as fuel

line		(Absolute dry)	waste			washing section of the pulping workshop	
碱回收车间 Alkaline recovery workshop	苛化工段 Causticization section	白泥（绝干） White mud (absolute dry)	一般工业固废 General industrial solid waste	系数法 Factor method	207200	暂存于白泥、滤泥板框车间 Temporarily stored in white mud and mud filter frame workshop	一部分送去烟气脱硫，剩余部分送石灰窑回收利用 It is partly used for flue gas desulfurization, and the remaining part is sent to the lime kiln for recycling
		绿泥（绝干） Green mud (absolute dry)	一般工业固废 General industrial solid waste	系数法 Factor method	8500		送填埋场填埋 Sent to the landfill for treatment
		石灰渣 Lime slag	一般工业固废 General industrial solid waste	类比法 Analogy method	1831	暂存于灰渣场内 Temporarily stored in slag yard	
制氧站 Oxygen generation station	分子筛填料 Molecular sieve padding	废分子筛 Waste molecular sieve	一般工业固废 General industrial solid waste	类比法 Analogy method	7.5/5 年 7.5/5 years	暂存于制氧站内 Temporarily stored in oxygen generation station	厂家回收利用 Recovered and recycled by producers
污水处理站 Sewage treatment plant	污泥脱水间 Sludge dewatering room	污泥（物理、生化段） Sludge (Physical and biochemical section)	一般工业固废 General industrial solid waste	类比法 Analogy method	81600	污泥压滤临时堆存间，地面水泥硬化、设顶棚，导排沟 For the temporary storage room for sludge pressure filtration, the ground cement hardening, roofing, and drainage ditch shall be arranged	送固废综合利用锅炉作燃料 Sent to solid waste comprehensive utilization boiler as fuel
		污泥（化学处理段） Sludge (Chemical treatment section)	一般工业固废 General industrial solid waste	类比法 Analogy method	9200		送填埋场填埋 Sent to the landfill for treatment
办公生活 Office life	办公生活区 Office and living quarter	生活垃圾 Domestic waste	/	系数法 Factor method	829	厂内垃圾池 Plant garbage pool	环卫部门统一处理 Treated by environmental sanitation department

表 2.2.5-42　一期危险废物污染源源强核算结果一览表

Table 2.2.5-42 List of accounting results of hazardous waste pollution source intensity (Phase I)

工序/生产线 **Process/production line**	装置 **Plant**	固体废物名称 **Solid waste name**	主要成分 **Main constituents**	危险特性 **Hazard characteristics**	固废属性 **Solid waste property**	产生情况 **Production situation** 核算方法 **Accounting method**	产生情况 **Production situation** 产生量（t/a） **Output (t/a)**	厂内堆存情况 **Storage situation**	最终去向 **Final destination**
软化水车间	制备系统	废离子交换树	丙烯酸系树	T	HW13	类比法	12/3 年	厂家上门更换后综合利用	委托有资质单位处理

Softened water workshop	Preparation system	脂 Waste ion exchange resin	脂 Acrylic resin			Analogy method	12/3 years	或委托有资质单位处置，不在厂内暂存 After replacement by the supplier, they can be recycled for comprehensive utilization, or a qualified unit can be entrusted for disposal, without being temporarily stored in the plant	Entrusted to a qualified unit for treatment
加油站 Gas station	储油罐 Oil storage tank	储油罐残渣 Slag of oil storage tank	含油污泥 Oily sludge	T，I	HW08	类比法 Analogy method	0.03/5 年 0.03/5 years	定期委托有资质单位上门处置，不在厂内暂存 A qualified unit shall be entrusted for disposal, without being temporarily stored in the plant	委托有资质单位处理 Entrusted to a qualified unit for treatment
	隔油池 Oil separator	隔油池污泥 Sludge in the oil separator	含油污泥 Oily sludge	T，I	HW08	类比法 Analogy method	0.04		委托有资质单位处理 Entrusted to a qualified unit for treatment
制浆车间 Pulping workshop	制浆生产线 Pulp production line	黑液 Black liquor	高浓度有机污染物、固体悬浮物 High-consistency organic pollutants, and solid suspended solids	C，T	HW35	物料衡算 Material balance	658.82 万 6,588,200	存在于黑液槽等生产设备中 Present in black liquor tank and other production equipment	进入碱回收系统回收碱，不外排 Sent to the alkali recovery system for recovering alkali, without discharging outside
热电站 Thermal power plant	固废锅炉废气处理系统 Solid waste boiler flue gas treatment system	废活性炭 Waste activated carbon	含重金属、二噁英 Including heavy metals, Dioxins	T	HW18	物料衡算 Material balance	70	厂家上门更换后综合利用或委托有资质单位处置，不在厂内暂存 After replacement by the supplier, they can be recycled for comprehensive utilization, or a qualified unit can be entrusted for disposal, without being temporarily stored in the plant	厂家回收利用或委托有资质单位处理 The supplier recycles for utilization or entrusts a qualified unit for disposal
		废催化剂 Waste catalyst	钒、钨 Vanadium, wolfram	T	HW50	类比法 Analogy method	20 吨/3 年 20 tons/3 years		
机修车间 Mechanical Repair Workshop	机器设备 Machinery equipment	废机油 Waste engine oil	油 Oil	T，I	HW08	类比法 Analogy method	2	暂存于危废暂存库 Temporarily stored in the hazardous waste temporary storage warehouse	委托有资质单位处理 Entrusted to a qualified unit for treatment

表 2.2.5-43 二期建成后，全厂一般固体废物污染源源强核算结果一览表
Table 2.2.5-43 List of accounting results of general solid waste pollution source intensity after completion of Phase II

工序/生产线 Process/production line	装置 Plant	固体废物名称 Solid waste name	固废属性 Solid waste property	产生情况 Production situation: 核算方法 Accounting method	产生情况 Production situation: 产生量（t/a） Output (t/a)	厂内堆存情况 Storage situation	最终去向 Final destination
备料车间 Material workshop	备料工段 Preparation section	废木屑（绝干） Waste wood chippings (absolute dry)	一般工业固废 General industrial solid waste	系数法 Factor method	85000	备料车间暂存 Temporarily stored in the preparation workshop	送固废综合利用锅炉作燃料 Sent to solid waste comprehensive utilization boiler as fuel
热电站 Thermal power plant	燃煤锅炉 Coal-fired boiler	锅炉灰渣 Boiler ash	一般工业固废 General industrial solid waste	物料衡算 Material balance	42306	堆放于渣仓 Stored in the slag bin	送水泥厂、砖厂综合利用 Sent to cement plants and brick plants for comprehensive utilization
		锅炉飞灰 Boiler fly ash	一般工业固废 General industrial solid waste	物料衡算 Material balance	63459	堆放于飞灰库 Stored in the fly ash depot	
	固废锅炉 Solid waste boiler	锅炉炉渣 Boiler slag	一般工业固废 General industrial solid waste	物料衡算 Material balance	14783	堆放于渣仓 Stored in the slag bin	
		锅炉飞灰 Boiler fly ash	一般工业固废 General industrial solid waste	物料衡算 Material balance	22174	堆放于飞灰库 Stored in the fly ash depot	投产后定期进行危险特性检测，如检测具有危险特性需委托有资质的单位进行处置 The hazardous characteristics shall be regularly detected after being put into production, and if there is any hazardous property, a qualified unit should be entrusted for disposal.
	锅炉废气处理系统 Boiler exhaust gas treatment system	脱硫石膏 Desulfurized gypsum	一般工业固废 General industrial solid waste	物料衡算 Material balance	17052	堆放于热电站 Stored in the thermal power plant	送水泥厂综合利用 Sent to cement plants for comprehensive utilization
制浆生产线 Pulp production line	制浆车间 Pulping workshop	浆渣（绝干） Pulp slag (absolute dry)	一般工业固废 General industrial solid waste	系数法 Factor method	17000	临时堆放于制浆车间洗选工段 Temporarily stored in the washing section of the pulping workshop	送固废综合利用锅炉作燃料 Sent to solid waste comprehensive utilization boiler as fuel
碱回收车间 Alkaline	苛化工段 Causticization	白泥（绝干） White mud (absolute	一般工业固废 General industrial	系数法 Factor method	229600	暂存于白泥、滤泥板框车间 Temporarily stored in white	一部分送去烟气脱硫，剩余部分送石灰窑回收利用

工序/生产线 Process/production line	装置 Plant	固体废物名称 Solid waste name	固废属性 Solid waste property	产生情况 Production situation		厂内堆存情况 Storage situation	最终去向 Final destination
				核算方法 Accounting method	产生量（t/a） Output (t/a)		
recovery workshop	section	dry)	solid waste			mud and mud filter frame workshop	It is partly used for flue gas desulfurization, and the remaining part is sent to the lime kiln for recycling
		绿泥（绝干） Green mud (absolute dry)	一般工业固废 General industrial solid waste	系数法 Factor method	9500		送填埋场填埋 Sent to the landfill for treatment
		石灰渣 Lime slag	一般工业固废 General industrial solid waste	类比法 Analogy method	1918	暂存于灰渣场内 Temporarily stored in slag yard	
制氧站 Oxygen generation station	分子筛填料 Molecular sieve padding	废分子筛 Waste molecular sieve	一般工业固废 General industrial solid waste	类比法 Analogy method	7.5/5 年 7.5/5 years	暂存于制氧站内 Temporarily stored in oxygen generation station	厂家回收利用 Recovered and recycled by producers
污水处理站 Sewage treatment plant	污泥脱水间 Sludge dewatering room	污泥（物理、生化段） Sludge (Physical and biochemical section)	一般工业固废 General industrial solid waste	类比法 Analogy method	108800	污泥压滤临时堆存间，地面水泥硬化、设顶棚，导排沟 For the temporary storage room for sludge pressure filtration, the ground cement hardening, roofing, and drainage ditch shall be arranged	送固废综合利用锅炉作燃料 Sent to solid waste comprehensive utilization boiler as fuel
		污泥（化学处理段） Sludge (Chemical treatment section)	一般工业固废 General industrial solid waste	类比法 Analogy method	17000		送填埋场填埋 Sent to the landfill for treatment
办公生活 Office life	办公生活区 Office and living quarter	生活垃圾 Domestic waste	/	系数法 Factor method	1087	厂内垃圾池 Plant garbage pool	环卫部门统一处理 Treated by environmental sanitation department

表 2.2.5-44　二期建成后，全厂危险废物污染源源强核算结果一览表

Table 2.2.5-44 List of accounting results of hazardous waste pollution source intensity after completion of Phase II

工序/生产线 Process/production line	装置 Plant	固体废物名称 Solid waste name	主要成分 Main constituents	危险特性 Hazard characteristics	固废属性 Solid waste property	产生情况 Production situation		厂内堆存情况 Storage situation	最终去向 Final destination
						核算方法 Accounting method	产生量（t/a） Output (t/a)		
软化水车间 Softened water	制备系统 Preparation system	废离子交换树脂	丙烯酸系树脂 Acrylic resin	T	HW13	类比法 Analogy method	12/3 年 12/3 years	厂家上门更换后综合利用或委托有资质单位处置，不在	委托有资质单位处理 Entrusted to a qualified unit for treatment

工序/生产线	装置 Plant	固体废物名称	主要成分 Main	危险特性 Hazard	固废属性 Solid waste	产生情况 Production situation		厂内堆存情况 Storage situation	最终去向 Final destination
workshop		Waste ion exchange resin						厂内暂存 After replacement by the supplier, they can be recycled for comprehensive utilization, or a qualified unit can be entrusted for disposal, without being temporarily stored in the plant	
加油站 Gas station	储油罐 Oil storage tank	储油罐残渣 Slag of oil storage tank	含油污泥 Oily sludge	T，I	HW08	类比法 Analogy method	0.03/5 年 0.03/5 years	定期委托有资质单位上门处置，不在厂内暂存 A qualified unit shall be entrusted for disposal, without being temporarily stored in the plant	委托有资质单位处理 Entrusted to a qualified unit for treatment
	隔油池 Oil separator	隔油池污泥 Sludge in the oil separator	含油污泥 Oily sludge	T，I	HW08	类比法 Analogy method	0.04		委托有资质单位处理 Entrusted to a qualified unit for treatment
制浆车间 Pulping workshop	制浆生产线 Pulp production line	黑液 Black liquor	高浓度有机污染物、固体悬浮物 High-consistency organic pollutants, and solid suspended solids	C，T	HW35	物料衡算 Material balance	704.14 万 7,041,400	存在于黑液槽等生产设备中 Present in black liquor tank and other production equipment	进入碱回收系统回收碱，不外排 Sent to the alkali recovery system for recovering alkali, without discharging outside
热电站 Thermal power plant	固废锅炉废气处理系统 Solid waste boiler flue gas treatment system	废活性炭 Waste activated carbon	含重金属、二噁英 Including heavy metals, Dioxins	T	HW18	物料衡算 Material balance	100	厂家上门更换后综合利用或委托有资质单位处置 After replacement by the supplier, they can be recycled for comprehensive utilization, or a qualified unit can be entrusted for disposal	厂家回收利用或委托有资质单位处理 The supplier recycles for utilization or entrusts a qualified unit for disposal
		废催化剂 Waste catalyst	钒、钨 Vanadium, wolfram	T	HW50	类比法 Analogy method	30 吨/3 年 30 tons/3 years		
机修车间 Mechanical Repair Workshop	机器设备 Machinery equipment	废机油 Waste engine oil	油 Oil	T，I	HW08	类比法 Analogy method	3	暂存于危废暂存库 Temporarily stored in the hazardous waste temporary storage warehouse	委托有资质单位处理 Entrusted to a qualified unit for treatment

2.2.6 项目非正常排放情况分析

2.2.6 Analysis on unusual emission of the Project

2.2.7.1 废气非正常排放

2.2.7.1 Unusual emission of exhaust gas

项目废气非正常排放考虑以下情况：

Unusual emission of exhaust gas shall consider the following conditions:

（1）碱炉、石灰窑开停车阶段，添加助燃剂时污染物排放。根据《污染源强核算技术指南 制浆造纸》（HJ887-2018），碱炉、石灰窑开停车阶段，添加燃料助燃时，污染物排放量根据以下公式计算：

(1) Discharge of pollutants at the time of adding combustion improver in the period of startup and shutdown of the alkali furnace and lime kiln. According to the *Technical Guidelines of Accounting Method for Pollution Source Intensity - Pulp and Paper Industry* (HJ887-2018), the volume of pollutants discharged at the time of adding combustion improver in the period of startup and shutdown of the alkali furnace and lime kiln can be calculated by the following formula:

$$D=c\times S_z\times 10^{-3}$$

式中：

Where:

D—非正常工况下某种污染物排放量，t；

D - Discharge of a certain pollutant under abnormal working conditions, t;

c—燃烧单位助燃剂某种污染物产污系数，kg/t 或 kg/10^4 m^3；

c- Production coefficient of a certain pollutant generated by combustion of combustion improver, kg/t or kg/10^4 m^3;

S_z—非正常工况下助燃剂消耗量，t 或 10^4 m^3。

S_z - Consumption of combustion improver under abnormal working conditions, t or 10^4 m^3.

表 2.2.6-1 助燃剂产污系数取值表

Table 2.2.6-1 Pollutants production coefficient of combustion improver

污染源 **Source of pollution**	助燃剂 **Combustion improver**	污染物指标 **Pollutant index**	单位 **Unit**	产污系数 **Pollutants production coefficient**
碱炉、石灰窑 Alkali furnace, lime kiln	天然气 Natural gas	二氧化硫 Sulfur dioxide	$kg/10^4m^3$	0.02S
		氮氧化物 Nitrogen oxide (NOx)	$kg/10^4m^3$	18.71

注：S 为燃气收到基硫分含量，单位为 mg/m^3。
Note: S refers to the basic sulfur content of the fuel gas, unit: mg/m^3.

项目碱炉、石灰窑开停车天然气用量分别为 20 万 m^3、14 万 m^3，二氧化硫排污系数按照《天然气》（GB17820-2012）中二类天然气总硫含量 $200mg/m^3$。

The natural gas consumption of the alkali furnace and lime kiln of the Project is 200,000 m^3, and 140,000 m^3, respectively; the sulfur dioxide emission coefficient is determined according to total sulfur content of Class II natural gas in *Natural Gas* (GB17820-2012), namely 200 mg/m^3.

（2）项目生产过程中，由于人为原因操作不当或废气治理设施故障，导致废气处理效率下降。

(2) During the production process, the exhaust gas treatment efficiency decreases due to improper manual operation or malfunction of exhaust gas treatment facilities.

①4600tds/d 碱炉除尘效率下降至 95%；

① The dust removal efficiency of the 4,600tds/d alkali furnace decreases to 95%;

②850t/d 石灰窑除尘效率下降至 95%；

② The dust removal efficiency of the 850t/d lime kiln decreases to 95%;

③220t/h 固废锅炉除尘效率按降低至 95%，脱硫、脱硝效率下降至 50%；

③ The dust removal efficiency of the 220t/h solid waste boiler decreases to 95%, and the desulfurization and denitration efficiency decreases to 50%;

④280 t/h 燃煤锅炉除尘效率按降低至 95%，脱硫、脱硝效率下降至 50%；

④ The dust removal efficiency of the 280 t/h coal-fired boiler decreases to 95%, and the desulfurization and denitration efficiency decreases to 50%;

⑤二氧化氯制备尾气去除效率下降至 0%。

⑤ The removal efficiency of the tail gas of preparation of chlorine dioxide decreases to

0%.

（3）碱炉停机或事故情况下，臭气收集系统收集的臭气送到臭气焚烧器燃烧后排放。

(3) In case of shutdown or accident of alkali furnace, the odor collected by the odor collection system will be delivered to the odor incinerator for discharge upon incineration.

评价根据周军等人编著的《制浆造纸工业的恶臭污染评价及防治》对硫酸盐浆纸厂排放恶臭气体的研究来核算本项目恶臭产生情况，该研究以实测数据为基础，探讨了制浆造纸工业恶臭源强的计算方法，研究得出经验系数如下：

In this evaluation, the odor production of the Project is studied based on the research on odor emitted by sulfate pulp and paper mills in Assessment on and Prevention of Odor Pollution in Pulp and Paper Industry prepared by Zhou Jun et. al. Based on the measured data, this study discusses the calculation method of odor source intensity in the pulp and paper industry, and obtains the following empirical coefficients:

表 2.2.6-2 硫酸盐浆纸厂各工段恶臭污染物排放量

Table 2.2.6-2 Discharge of odor pollutants from various sections of the sulfate pulp and paper mill

排污工序/设备 Discharge process/equipment		总还原硫/（kg/t） Total reduced sulfur/(kg/t)
制浆造纸系统 Pulping and papermaking system	连续蒸煮锅 Continuous cooking tank	0.7
	洗浆机 Pulp washer	0.2
黑液回收系统 Black liquor recovery system	蒸发站 Evaporation station	1.8
	碱回收炉 Alkali recovery furnace	4.8
	溶解槽 Dissolution tank	0.9
	石灰窑 Lime kiln	0.5

项目制浆恶臭污染物产生量以 H_2S 的相当量表示，硫酸盐制浆量为 80 万 t/a，计算得 H_2S 产生量为 873kg/h。焚烧炉处理系统设计保证燃尽率大于 99.5%，则臭气经焚烧炉焚烧后 H_2S 排放量为 4.4kg/h，臭气经处理后经一根 150mH×Φ1.5m 排气筒排放，风量为 54720 Nm³/h，烟气温度为 80℃。

The odor pollutant production amount of the Project is expressed in the equivalent amount of H_2S, the sulfate pulping capacity is 800,000 t/a, and the calculated production amount of H_2S is 873 kg/h. The design of the incinerator treatment system ensures that the burn-off rate is over 99.5%, so the discharge of H_2S after odor incineration is 4.4kg/h; the treated odor can be discharged through a 150mH×Φ1.5m exhaust funnel, with the capacity of 54,720 Nm^3/h, and flue gas temperature of 80℃.

废气非正常排放见表2.2.6-3。

Unusual emission of exhaust gas is shown in Table 2.2.6-3.

表 2.2.6-3 项目废气非正常排放污染源排放情况
Table 2.2.6-3 Unusual emission sources of project exhaust gas

序号 S.N.	污染源 Source of pollution	非正常排放情景 Unusual emission situation	非正常排放速率(kg/h) Unusual emission rate (kg/h)						单次持续时间/h Single duration/h	年发生频次/次 Annual occurrence frequency/time
			烟尘 Smoke dust	SO_2	NO_x	Cl_2	HCl	H_2S		
1	4600tds/d 碱炉 4,600tds/d alkali furnace	开停车阶段，添加天然气助燃 Add natural gas for supporting combustion in the startup and shutdown period	/	80	374.2	/	/	/	1	2
2	850t/d 石灰窑 850t/d lime kiln		/	56	261.94	/	/	/	1	2
3	4600tds/d 碱炉 4,600tds/d alkali furnace	废气治理设施故障导致除尘效率降至95% Exhaust gas treatment facility failure makes the dust removal efficiency drop to 95%	1688.16	/	/	/	/	/	2	2
4	850t/d 石灰窑 850t/d lime kiln	废气治理设施故障导致除尘效率降至95% Exhaust gas treatment facility failure makes the dust removal efficiency drop to 95%	139.17	/	/	/	/	/	2	2
5	220t/h 锅炉 220t/h boiler	废气治理设施故障导致除尘效率降至95%，脱硫、脱硝效率下降至50% Exhaust gas treatment facility failure makes the dust removal efficiency drop to 95%, and desulfurization and denitration efficiency drop to 50%	172.69	90.4	34.56	/	/	/	2	2
6	280t/h 锅炉 280t/h boiler	废气治理设施故障导致除尘效率降至95%，脱硫、脱硝效率下降至50% Exhaust gas treatment facility failure makes the dust removal	275.76	201.66	44.32	/	/	/	2	2

		efficiency drop to 95%, and desulfurization and denitration efficiency drop to 50%								
7	二氧化氯车间过量氢气排空尾气 Excessive hydrogen tail gas of chlorine dioxide workshop	废气治理设施故障导致去除率降至0% Exhaust gas treatment facility failure makes the removal efficiency drop to 0%	/	/	/	0.05	/	/	2	2
8	二氧化氯车间盐酸合成尾气 Tail gas from hydrochloric acid synthesis in chlorine dioxide workshop		/	/	/	0.05	0.13	/	2	2
9	二氧化氯车间槽罐尾气 Tail gas from tank of chlorine dioxide workshop		/	/	/	0.13	/	/	2	2
10	焚烧器 Incinerator	碱炉停机或事故情况下 In case of alkali furnace shutdown or accident	/	/	/	/	/	4.4	2	2

2.2.7.2 废水非正常排放

2.2.7.2 Unusual discharge of wastewater

污水处理站发生事故的原因有：生物处理受到有害物质冲击，如酸、碱，以及生物反应池中供氧不足，微生物生长受到抑制，导致生物处理效率大幅度下降，甚至使系统崩溃废水水质、水量变化大，引起处理效率下降。

The causes of accidents in a sewage treatment plant mainly include: Biological treatment is impacted by harmful substances, such as acids and alkali; the lack of oxygen supply in the biological reaction tank inhibits the growth of microorganisms, greatly reducing the biological treatment efficiency, and even making the system collapse; the great change in quality and amount of wastewater reduces the treatment efficiency.

本项目污水处理站采用一级+二级+三级处理工艺，其中一级处理单元主要为初沉池，二级处理单元主要为EGSB厌氧反应器+卡鲁赛尔氧化沟，三级处理单元主要采用化学氧化处理，废水处理达标后排入铁山港区深海排放管网系统，在铁山港B3排污口深海排放。本次评价按二级处理单元故障，仅一级和三级处理单元有效的情景考虑，污染因子主要为COD、NH_3-N，根据《制浆造纸废水治理工程技术规范》（HJ2011-2012），

该情景下，COD、NH_3-N 综合去除效率分别取 50%，0%。污水处理站非正常排放每年发生频次为 2 次，每次持续 6h。废水非正常排放预测排放情况见表 2.2.6-4。

The sewage treatment plant of the Project adopts the primary + secondary + tertiary process, where the primary unit is the primary sedimentation tank, the secondary unit is EGSB anaerobic reactor + Carrousel oxidation ditch, and the tertiary unit mainly adopts chemical oxidation. The sewage is discharged into the deep-sea discharge pipe network system of Tieshangang District after being processed, and then discharged into the deep sea at the sewage outlet B3 of Tieshangang. This evaluation is carried out based on the failed secondary treatment unit, and normal primary and tertiary treatment units; the pollution factors mainly include COD and NH_3-N. According to the *Technical specifications for pulp and paper industry wastewater treatment* (HJ2011-2012), the comprehensive removal efficiency of COD and NH_3-N is 50% and 0% respectively in this situation. Unusual discharge of the sewage treatment plant occurs twice a year, with the duration of 6h. Unusual discharge sources of project wastewater is shown in Table 2.2.6-4.

表 2.2.6-4 项目废水非正常排放污染源排放情况
Table 2.2.6-4 Unusual discharge sources of project wastewater

序号 S.N.	污染源 Source of pollution	非正常排放情景 Unusual emission situation	废水量 Wastewater volume （m^3/h）(m^3/h)	非正常排放浓度(mg/L) Unusual emission concentration (mg/L)		单次持续时间/h Single duration/h	年发生频次/次 Annual occurrence frequency /time
				COD	NH_3-N		
1	污水处理站 Sewage treatment plant	一期污水处理站二级处理单元故障 Failure of secondary treatment unit of the sewage treatment plant in Phase I	3005.4	748.5	14	6	2
2	污水处理站 Sewage treatment plant	二期建成后，污水处理站二级处理单元故障 Failure of the secondary treatment unit of the sewage treatment plant after completion of Phase II	3959.3	828	14	6	2

2.2.7 项目"三废"排放情况

2.2.7 Discharge of the "three wastes" of the Project

本项目"三废"排放情况汇总见表 2.2.7-1。

The discharge conditions of the "three wastes" are shown in Table 2.2.7-1.

表 2.2.7-1 项目"三废"排放情况汇总表
Table 2.2.7-1 Summary of discharge conditions of the "three wastes" of the Project

类型 Type	污染物 Pollutant		单位 Unit	产生量 Generation amount	削减量 Reduction amount	排放量 Discharge amount
一期工程"三废"排放情况 Discharge conditions of the "three wastes" in Phase I						
废水 Waste water	废水量 Wastewater amount		万 m^3/a 10,000 m^3/a	2452.41	0.00	2452.41
	COD		t/a	36724.24	34924.72	1799.52
	BOD_5		t/a	14060.25	13638.46	421.79
	SS		t/a	28933.48	28354.78	578.71
	NH_3-N		t/a	343.37	223.18	120.20
	TN		t/a	367.85	183.93	183.93
	TP		t/a	416.89	400.25	16.65
	AOX		t/a	167.62	83.81	83.81
废气 Exhaust gas	有组织排放 Organized discharge	烟尘 Smoke dust (颗粒物) (Particulate matters)	t/a	305767.28	305452.53	314.75
		SO_2	t/a	5145.84	4555.39	590.45
		NO_x	t/a	3152.5	957.5	2195
		TRS (以 H_2S 计) (As H_2S)	t/a	50.3	0	50.3
		Cl_2	t/a	2.13	1.6	0.53
		氯化氢 Hydrogen chloride	t/a	339.67	305.5	34.17
		一氧化碳 Carbon monoxide	t/a	/	/	135.46
		汞 Mercury	t/a	0.109	0.0699	0.0391
		镉 Cadmium	t/a	0.418	0.2938	0.1242
		铊 Thallium	t/a	0.036	0.0252	0.0108
		锑 Antimony	t/a	0.005	0.0035	0.0015

类型 Type	污染物 Pollutant		单位 Unit	产生量 Generation amount	削减量 Reduction amount	排放量 Discharge amount
		砷 Arsenic	t/a	0.1	0.085	0.015
		铅 Lead	t/a	3.38	2.873	0.507
		铬 Chromium	t/a	3.816	3.2437	0.5723
		钴 Cobalt	t/a	0.025	0.0213	0.0037
		铜 Copper	t/a	0.094	0.0799	0.0141
		锰 Manganese	t/a	0.442	0.3758	0.0662
		镍 Nickel	t/a	1.138	0.9673	0.1707
		镉+铊 Cadmium +thallium	t/a	0.45	0.315	0.135
		锑+砷+铅+铬+钴+铜+锰+镍 Antimony+arsenic+lead+chromium +cobalt+copper+manganese+nickel	t/a	9.647	8.2964	1.3506
		二噁英 Dioxin	mg/a	0.447	0.4023	0.0447
	无组织排放 Non-organized discharge	颗粒物 Particulate Matters (PM)	t/a	94.49	53.94	40.56
		NH_3	t/a	1.053	0	1.053
		H_2S	t/a	0.005	0	0.005
		非甲烷总烃 Non-methane hydrocarbon	t/a	0.106	0	0.106
		Cl_2	t/a	0.46	0	0.46
		HCl	t/a	0.46	0	0.46
固体废物 Solid waste	废木屑（绝干） Waste wood chippings (absolute dry)		t/a	73100	73100	0
	黑液 Black liquor		万 t/a	658.82	658.82	0
	固废锅炉 Solid waste boiler	飞灰 Fly ash	t/a	13573	13573	0
		炉渣 Furnace slag	t/a	9048	9048	0
	燃煤锅炉 Coal-fired	飞灰 Fly ash	t/a	32553	32553	0

类型 Type	污染物 Pollutant		单位 Unit	产生量 Generation amount	削减量 Reduction amount	排放量 Discharge amount
	boiler	炉渣 Furnace slag	t/a	21702	21702	0
	脱硫石膏 Desulfurization gypsum		t/a	8787	8787	0
	废活性炭 Waste activated carbon		t/a	100	100	0
	浆渣（绝干） Pulp slag (absolute dry)		t/a	10200	10200	0
	白泥（绝干） White mud (absolute dry)		t/a	71200	71200	0
	绿泥（绝干） Green mud (absolute dry)		t/a	8500	8500	0
	石灰渣 Lime slag		t/a	1831	1831	0
	废分子筛 Waste molecular sieve		t/a	7.5/5 年 7.5/5 years	7.5/5 年 7.5/5 years	0
	废离子交换树脂 Waste ion exchange resin		t/a	12/3 年 12/3 years	12/3 年 12/3 years	0
	储油罐残渣 Slag of oil storage tank		t/a	0.03/5 年 0.03/5 years	0.03/5 年 0.03/5 years	0
	隔油池污泥 Sludge in the oil separator		t/a	0.04	0.04	0
	污水处理站生化污泥（绝干） Sewage treatment plant biochemical sludge (absolutely dry)		t/a	81600	81600	0
	化学污泥 Chemical sludge		t/a	9200	9200	0
	废催化剂 Waste catalyst		t/a	20/3 年 20/3 years	20/3 年 20/3 years	0
	废机油 Waste engine oil		t/a	2	2	0
	生活垃圾 Domestic waste		t/a	829	829	0
一期+二期工程“三废”排放情况 Discharge conditions of the “three wastes” in Phase I +Phase II						
废水 Waste water	废水量 Wastewater amount		万 m^3/a 10,000 m^3/a	3230.79	0.00	3230.79
	COD		t/a	53511.57	51151.69	2359.87
	BOD_5		t/a	19135.20	18561.14	574.06
	SS		t/a	40581.80	39770.13	811.68
	NH_3-N		t/a	452.31	294.00	158.30
	TN		t/a	484.62	242.35	242.27
	TP		t/a	549.25	527.30	21.95
	AOX		t/a	167.62	83.81	83.81

类型 **Type**	污染物 **Pollutant**		单位 **Unit**	产生量 **Generation amount**	削减量 **Reduction amount**	排放量 **Discharge amount**
废气 Exhaust gas	有组织排放 Organized discharge	烟尘 Smoke dust (颗粒物) (Particulate matters)	t/a	369467.26	369104.71	362.28
		SO_2	t/a	9568.09	8839.56	728.58
		NO_x	t/a	4153.68	1676.472	2477.24
		TRS(以 H_2S 计) TRS (as H_2S)	t/a	54.1	0	54.1
		Cl_2	t/a	2.13	1.6	0.53
		氯化氢 Hydrogen chloride	t/a	471.08	423.77	47.31
		一氧化碳 Carbon monoxide	t/a	/	/	187.99
		汞 Mercury	t/a	0.2007	0.129	0.0777
		镉 Cadmium	t/a	0.5614	0.3931	0.1683
		铊 Thallium	t/a	0.049	0.0343	0.015
		锑 Antimony	t/a	0.0163	0.0139	0.0021
		砷 Arsenic	t/a	0.1306	0.1102	0.0201
		铅 Lead	t/a	4.5206	3.8417	0.6786
		铬 Chromium	t/a	5.1	4.3346	0.765
		钴 Cobalt	t/a	0.0326	0.0277	0.0052
		铜 Copper	t/a	0.1306	0.111	0.0196
		锰 Manganese	t/a	0.612	0.5198	0.0919
		镍 Nickel	t/a	1.583	1.3464	0.2369
		镉+铊 Cadmium +thallium	t/a	0.612	0.4284	0.1833
		锑+砷+铅+铬+钴+铜+锰+镍 Antimony+arsenic+lead+chromium +cobalt+copper+ manganese+nickel	t/a	12.1258	10.3069	1.8193

类型 Type	污染物 Pollutant		单位 Unit	产生量 Generation amount	削减量 Reduction amount	排放量 Discharge amount
		二噁英 Dioxin	mg/a	0.6202	0.5581	0.062
	无组织排放 Non-organized discharge	颗粒物 Particulate Matters (PM)	t/a	95.06	53.94	41.13
		NH_3	t/a	1.053	0	1.053
		H_2S	t/a	0.005	0	0.005
		非甲烷总烃 Non-methane hydrocarbon	t/a	0.106	0	0.106
		Cl_2	t/a	0.46	0	0.46
		HCl	t/a	0.46	0	0.46
固体废物 Solid waste	废木屑、树皮（绝干） Waste chippings, bark (absolute dry)		t/a	85000	85000	0
	黑液 Black liquor		万 t/a	704.14	704.14	0
	固废锅炉 Solid waste boiler	飞灰 Fly ash	t/a	22174	22174	0
		炉渣 Furnace slag	t/a	14783	14783	0
	燃煤锅炉 Coal-fired boiler	飞灰 Fly ash	t/a	63459	63459	0
		炉渣 Furnace slag	t/a	42306	42306	0
	脱硫石膏 Desulfurization gypsum		t/a	17052	17052	0
	废活性炭 Waste activated carbon		t/a	100	100	0
	浆渣（绝干） Pulp slag (absolute dry)		t/a	17000	17000	0
	白泥（绝干） White mud (absolute dry)		t/a	229600	229600	0
	绿泥（绝干） Green mud (absolute dry)		t/a	9500	9500	0
	石灰渣 Lime slag		t/a	1918	1918	0
	废分子筛 Waste molecular sieve		t/a	7.5/5 年 7.5/5 years	7.5/5 年 7.5/5 years	0
	废离子交换树脂 Waste ion exchange resin		t/a	12/3 年 12/3 years	12/3 年 12/3 years	0
	储油罐残渣 Slag of oil storage tank		t/a	0.03/5 年 0.03/5 years	0.03/5 年 0.03/5 years	0
	隔油池污泥 Sludge in the oil separator		t/a	0.04	0.04	0
	污水处理站生化污泥（绝干） Sewage treatment plant biochemical sludge (absolutely		t/a	108800	108800	0

类型 Type	污染物 Pollutant	单位 Unit	产生量 Generation amount	削减量 Reduction amount	排放量 Discharge amount
	dry)				
	化学污泥 Chemical sludge	t/a	17000	17000	0
	废催化剂 Waste catalyst	t/a	30/3 年 30/3 years	30/3 年 30/3 years	0
	废机油 Waste engine oil	t/a	3	3	0
	生活垃圾 Domestic waste	t/a	1087	1087	0

2.2.8 项目清洁生产水平分析

2.2.8 Analysis on performance for clean production of the Project

根据《制浆造纸行业清洁生产评价指标体系》（国家发改委 2015 年第 9 号），项目漂白硫酸盐木浆、化学机械浆、各纸产品清洁生产分析见表 2.2.8-1~8。

According to the *Clean Production Evaluation Index System of Pulp and Paper Industry* (National Development and Reform Commission Order No. 9 (2015)), the analysis on performance for clean production has been conducted for bleached sulfate wood pulp, APMP, and various paper products; the results are shown in Table 2.2.8-1~8.

表 2.2.8-1　漂白硫酸盐木浆评价指标项目、权重及基准值

Table 2.2.8-1 Bleached sulfate wood pulp evaluation indicators, weights and reference values

序号 S. N.	一级指标 Indicators for Class I	一级指标权重 Weight of indicators for Class I	二级指标 Indicators for Class II	单位 Unit	二级指标权重 Weight of indicators for Class II	I 级基准值 Reference value for Class I	II 级基准值 Reference value for Class II	III级基准值 Reference value for Class III	本项目情况 Conditions of this Project
1	生产工艺及设备要求 Production process and equipment requirements	0.3	原料 Raw materials		0.05	符合国家有关森林管理的规定及林纸一体化相关规定的木片（竹片） Wood chips (bamboo chips) conforming to national regulations on forest management and forest-paper integration			本项目原料来源有广西本地桉木资源；东南亚地区，2009 年太阳纸业与老挝政府签订林浆纸一体化建设合同，至今已完成实施造林 32000 公顷，并计划用 5-7 年的时间在老挝南部沙湾拿吉、甘蒙、阿素坡、占巴色等省份再增加植树造林 30 万公顷可为本项目提供木材原料，I 级。 The raw materials of the Project include local eucalyptus resources in Guangxi; the forest-pulp-paper integration contract was signed by Sun Paper and the Lao government in 2009, and 32,000 hectares of afforestation have been completed; and Sun Paper also plans to add 300,000 hectares of forests in Savannakhet, Khammouan, Attapeu and

序号 S. N.	一级指标 Indicators for Class I	一级指标权重 Weight of indicators for Class I	二级指标 Indicators for Class II	单位 Unit	二级指标权重 Weight of indicators for Class II	I 级基准值 Reference value for Class I	II 级基准值 Reference value for Class II	III级基准值 Reference value for Class III	本项目情况 Conditions of this Project
									Champasak in 5-7 years, which can provide Level I raw materials for the Project.
2			备料 Material preparation		0.15	干法剥皮，冲洗水循环利用或直接采购木片（竹片） Peeling in dry conditions, reuse of washing water or direct purchasing of wood chips (bamboo chips)			项目原料主要为直接采购木片，少量原木采用要干法剥皮，I 级。 Raw materials of the Project are mainly directly purchased wood chips, and peeling in dry conditions is adopted for a small amount of logs, Level I.
3			蒸煮工艺 Cooking process		0.2	低能耗连续或间歇蒸煮，氧脱木素 Low-energy continuous or intermittent cooking, oxygen delignification		低能耗连续或间歇蒸煮 Low-energy continuous or intermittent cooking	项目采用低能耗间歇蒸煮，氧脱木素，I 级。 The Project adopts low-energy intermittent cooking, oxygen delignification, Level I.
4			洗涤工艺 Washing process		0.15	多段逆流洗涤 Multi-stage countercurrent washing			项目采用多段逆流洗涤，I 级。 The Project adopts multi-stage countercurrent washing, Level I.
5			筛选工艺 Screening process		0.15	全封闭压力筛选 Fully enclosed pressurized screening		压力筛选 Pressurized screening	项目采用全封闭压力筛选，I 级。 The Project adopts fully enclosed pressurized screening, Level I.
6			漂白工艺 Bleaching process		0.2	TCF 或ECF 漂白 TCF or ECF bleaching			项目采用 ECF 漂白，I 级。 The Project adopts ECF bleaching, Level I.

序号 S. N.	一级指标 Indicators for Class I	一级指标权重 Weight of indicators for Class I	二级指标 Indicators for Class II		单位 Unit	二级指标权重 Weight of indicators for Class II	I 级基准值 Reference value for Class I	II 级基准值 Reference value for Class II	III级基准值 Reference value for Class III	本项目情况 Conditions of this Project
7			碱回收工艺 Alkali recovery process			0.1	有污冷凝水汽提、臭气收集和焚烧、副产品回收、热电联产 Polluted condensate stripping, odor collection and incineration, by-product recovery, and combined heat and power generation		碱回收设施配套齐全，运行正常 Alkali recovery facilities are complete and normal in operation	项目制浆臭气有污冷凝水汽提、臭气收集和焚烧系统、设置石灰窑回收白泥以及热电站，I 级。For pulping odor, the polluted condensate stripping, odor collection and incineration system is adopted, the lime kiln is set to recover white mud for the thermal power plant, Level I.
8	资源和能源消耗指标 Resources and energy consumption indicators	0.2	*单位产品取水量 *Water withdrawal per unit product	木浆 Wood pulp	m^3/ Adt	0.5	33	38	60	项目为 29.5kg/Adt，I 级。The project is 29.5kg/Adt, Level I.
9			*单位产品综合能耗 * Comprehensive energy consumption per unit product（外购能源）(Purchased energy)	木浆 Wood pulp	kgce/ Adt	0.5	160	330	420	项目为 141.7kgce /Adt，I 级。The project is 141.7kgce /Adt, Level I.
10	资源综合利用指标 Comprehensive	0.2	*黑液提取率 *Black liquor extraction rate	木浆 Wood pulp	%	0.1	99	97	96	项目为 99%，I 级。The project is 99%, Level I.
11			*碱回收率 *Alkali recovery rate	木浆 Wood pulp	%	0.26	98	96	94	项目为 98%，I 级。The project is 98%, Level I.

序号 S. N.	一级指标 Indicators for Class I	一级指标权重 Weight of indicators for Class I	二级指标 Indicators for Class II		单位 Unit	二级指标权重 Weight of indicators for Class II	I 级基准值 Reference value for Class I	II 级基准值 Reference value for Class II	III级基准值 Reference value for Class III	本项目情况 Conditions of this Project
12	utilization indicators of resources		*碱炉热效率 *Alkali furnace thermal efficiency	木浆 Wood pulp	%	0.23	72	70	68	项目为 72%，I 级。 The project is 72%, Level I.
13			白泥综合利用率 White mud comprehensive utilization rate	*木浆* Wood pulp	%	0.1	98	95	92	项目设置石灰窑回收白泥，综合利用率 100%，I 级。 The Project is set with a lime kiln to recover white mud, with the comprehensive utilization rate of 100%, Level I.
14			水重复利用率 Reuse rate of water		%	0.17	90	85	80	项目为 93.11%，I 级。 The project is 93.11%, Level I.
15			锅炉灰渣综合利用率 Comprehensive utilization rate of boiler ash		%	0.07	100	100	100	项目锅炉灰渣外运综合利用率 100%，I 级。 Comprehensive utilization of boiler ash transported outside is 100%, Level I.
16			备料渣（指木屑、竹屑等）综合利用率 Comprehensive utilization rate of preparation slag (wood and bamboo chippings)		%	0.07	100	100	100	项目木屑作为固废综合利用锅炉燃料，综合利用率 100%，I 级。 The wood chippings are taken as the fuel of the solid waste comprehensive utilization boiler, with the comprehensive utilization rate of 100%, Level I.
17	污染物产生指	0.15	*单位产品废水产生量 *Wastewater volume	木浆	m^3/Adt	0.47	28	32	50	项目为 21.0m^3，I 级。 The project is 21.0m^3, Level I.

序号 S. N.	一级指标 Indicators for Class I	一级指标权重 Weight of indicators for Class I	二级指标 Indicators for Class II		单位 Unit	二级指标权重 Weight of indicators for Class II	I 级基准值 Reference value for Class I	II 级基准值 Reference value for Class II	III级基准值 Reference value for Class III	本项目情况 Conditions of this Project
	标 Pollutant production indicators		per unit product	Wood pulp						
18			*单位产品 COD_{cr}产生量 *COD_{cr}volume per unit product	木浆 Wood pulp	kg/Adt	0.33	30	37	42	项目为 29.4 kg/Adt，I 级。 The project is 29.4 kg/Adt, Level I.
19			可吸附有机卤素（AOX）产生量 Absorbable organic halogen (AOX) production	木浆 Wood pulp	kg/Adt	0.2	0.2	0.35	0.6	项目为 0.2 kg/Adt，I 级。 The project is 0.2 kg/Adt, Level I.
20	清洁生产管理指标 Clean production management	0.15	参见表 2.2.8-7 Refer to Table 2.2.8-7							

序号 S. N.	一级指标 Indicators for Class I	一级指标权重 Weight of indicators for Class I	二级指标 Indicators for Class II	单位 Unit	二级指标权重 Weight of indicators for Class II	I 级基准值 Reference value for Class I	II级基准值 Reference value for Class II	III级基准值 Reference value for Class III	本项目情况 Conditions of this Project
	indicators								

注：
Note:
1、带*的指标为限定性指标，以下同。
1. The indicators marked with * are limited indicators, and the same below.
2、化学品制备只包括二氧化氯、二氧化硫和氧气的制备。
2. Chemical preparation only involves chlorine dioxide, sulfur dioxide and oxygen.
3、Adt 表示吨风干浆，以下同。
3. Adt refers to tons of air-dried pulp, and the same below.
4、表 2.2.8-7 计算结果为本表的一部分，计算方法与本表其他指标相同。
4. The calculation results of Table 2.2.8-7 form a part of this table, and the calculation method is the same as that for other indicators.

表 2.2.8-2 化学机械木浆评价指标项目、权重及基准值

Table 2.2.8-2 APMP evaluation indicators, weights and reference values

序号 S.N.	一级指标 Indicators for Class I	一级指标权重 Weight	二级指标 Indicators for Class II	单位 Unit	二级指标 Indicators for Class	I 级基准值 Reference value for	II级基准值 Reference value for	III级基准值 Reference value for	本项目情况 Conditions of this Project
1	生产工艺及装备指 Production process	0.3	化学预浸渍		0.5	碱性浸渍			项目为碱性浸渍，I 级。
			磨浆 Defibrination		0.5	高浓磨浆机 High-consistency fiberizer			项目采用高浓磨浆机，I 级。 The Project adopts a high-consistency fiberizer, Level I

2	资源和能源消耗指标	0.2	*单位产品取水量	APMP	m3/Adt	0.5	13	20	38	11.4 m^3/Adt，I 级。
3			*单位产品综合能耗（自用浆） * Comprehensive energy		kgce/Adt	0.5	250	300	350	221.4kgce/Adt，I 级。 221.4 kgce/Adt, Level I.
4	资源综合利用指标 Comprehensive utilization indicators	0.2	水重复利用率		%	0.5	90	85	80	项目为 90.64%，I 级。
5			锅炉灰渣综合利用率 Comprehensive utilization rate of		%	0.25	100	100	100	项目锅炉灰渣外运综合利用率 100%，I 级。
6			备料渣（指木屑等）综合利用率 Comprehensive utilization rate of		%	0.25	100	100	100	项目木屑作为固废综合利用锅炉燃料，综合利用率 100%，I 级。
7	污染物产生指标 Pollutant production	0.15	*单位产品废水产生量	APMP	m3/Adt	0.6	10	15	32	2.2 m^3/Adt，I 级。
8			*单位产品 COD_{cr} 产生量	APMP	kg/ Adt	0.4	110	130	190	20.4kg /Adt，I 级。 20.4kg /Adt, Level I.
9	清洁生产管理指标 Clean	0.15	参见表 2.2.8-7 Refer to Table 2.2.8-7							

注：1、表 2.2.8-7 计算结果为本表的一部分，计算方法与本表其他指标相同。
Note: 1. The calculation results of Table 2.2.8-7 form a part of this table, and the calculation method is the same as that for other indicators.

表 2.2.8-3　白卡纸评价指标项目、权重及基准值

Table 2.2.8-3 Ivory board evaluation indicators, weights and reference values

序号	一级指标	一级指标权重	二级指标		单位	二级指标权重	I 级基准值	II 级基准值	III级基准值	本项目情况
1	资源和能源消耗指标 Resources and energy	0.2	*单位产品取水量	白纸板 White	m^3/t	0.5	10	15	26	项目为4.9 m^3/t，I级。 The project is 4.9 m^3/t,

2	consumption indicators		*单位产品综合能耗	白纸板 White	kgce/t	0.5	250	300	330	项目为221.4 kgce/t，I级。The project is 221.4 kgce/t,
3	资源综合利用指标	0.1	水重复利用率		%	1	90	85	80	项目为97%，I级。
4	污染物产生指标 Pollutant production indicators	0.3	*单位产品废水产生量	白纸板 White	m^3/t	0.5	8	12	22	项目为7.0 m^3/t，I级。The project is 7.0 m^3/t,
5			*单位产品 COD_{cr} 产生量		kg/t	0.5	11	15	22	项目为8.6kg/t，I级。
6	纸产品定性评价指标	0.4	参见表2.2.8-8							

注：1、综合能耗指标只限纸机抄造过程。
Note: 1. The comprehensive energy consumption indicators are only limited to the forming & pressing by paper machine.
2、表2.2.8-8 计算结果为本表的一部分，计算方法与本表其他指标相同。
Note: 2. The calculation results of Table 2.2.8-8 form a part of this table, and the calculation method is the same as that for other indicators.

表 2.2.8-4 文化纸定量评价指标项目、权重及基准值

Table 2.2.8-4 Cultural paper quantitative evaluation indicators, weights and reference values

序号	一级指标	一级指标权重	二级指标	单位	二级指标权重	I 级基准值	II 级基准值	III级基准值	本项目情况
1	资源和能源消耗指标 Resources and energy consumption indicators	0.2	*单位产品取水量 *Water withdrawal per unit	m^3/t	0.5	13	20	24	4.9 m^3/t，I 级。4.9 m^3/t, Level I.
2			*单位产品综合能耗 * Comprehensive energy	kgce/t	0.5	280	330	420	项目为 250.0 kgce/t，I级。
3	资源综合利用指标	0.1	水重复利用率	%	1	90	85	80	项目为 97%，I 级。
4	污染物产生指标 Pollutant production indicators	0.3	*单位产品废水产生量 *Wastewater volume of	m^3/t	0.5	11	17	20	项目为 6.5 m^3/t，I 级。The project is 6.5 m^3/t,
5			*单位产品 COD_{cr} 产生量 *COD_{cr}volume per unit	kg/t	0.5	10	15	18	项目为 7.9kg/t，I 级。The project is 7.9kg/t,
6	纸产品定性评价指标	0.4	参见表 2.2.8-8						

注：1、综合能耗指标只限纸机抄造过程。
Note: 1. The comprehensive energy consumption indicators are only limited to the forming & pressing by paper machine.
2、表 2.2.8-8 计算结果为本表的一部分，计算方法与本表其他指标相同。
2. The calculation results of Table 2.2.8-8 form a part of this table, and the calculation method is the same as that for other indicators.

表 2.2.8-5　生活用纸定量评价指标项目、权重及基准值

Table 2.2.8-5 Household paper quantitative evaluation indicators, weights and reference values

序号	一级指标	一级指标权重	二级指标	单位	二级指标权重	I 级基准值	II 级基准值	III级基准值	本项目情况
1	资源和能源消耗指标 Resources and energy consumption indicators	0.2	*单位产品取水量	m^3/t	0.5	15	23	30	项目为 $4.3m^3/t$，I 级。
2			*单位产品综合能耗 * Comprehensive energy	kgce/t	0.5	400	510	580	项目为 354.2 kgce/t，I 级。The project is 354.2
3	资源综合利用指标	0.1	水重复利用率	%	1	90	85	80	项目为 95%，I 级。
4	污染物产生指标 Pollutant production	0.3	*单位产品废水产生量	m^3/t	0.5	12	20	25	项目为 5.4 m^3/t，I 级。
5			*单位产品 COD_{cr} 产生量	kg/t	0.5	10	15	22	项目为 6.6 kg/t，I 级。
6	纸产品定性评价指标	0.4	参见表 2.2.8-8						

注：1、综合能耗指标只限纸机抄造过程。
Note: 1. The comprehensive energy consumption indicators are only limited to the forming & pressing by paper machine.
2、表 2.2.8-8 计算结果为本表的一部分，计算方法与本表其他指标相同。
2. The calculation results of Table 2.2.8-8 form a part of this table, and the calculation method is the same as that for other indicators.

表 2.2.8-6　特种纸定量评价指标项目、权重及基准值

Table 2.2.8-6 Special paper quantitative evaluation indicators, weights and reference values

序号	一级指标	一级指标权重	二级指标	单位	二级指标权	I级基准值	II 级基准值	III级基准值	本项目情况
1	资源和能源消耗指标 Resources and energy consumption indicators	0.2	*单位产品取水量 *Water withdrawal per	m^3/t	0.5	14	19	26	项目为5.6 m^3/t，I级。The project is 5.6 m^3/t,
2			*单位产品综合能耗 * Comprehensive energy	kgce/ t	0.5	320	380	430	项目为283.4 kgce/ t，I级。
3	资源综合利用指标	0.1	水重复利用率	%	1	90	85	80	项目为96/90%，I级。
4	污染物产生指标 Pollutant production indicators	0.3	*单位产品废水产生量	m^3/t	0.5	12	16	23	项目为6.5m^3/t，I级。
5			*单位产品CODcr产生量 * CODcr volume of unit	kg/ t	0.5	11	16	19	项目为7.9kg/ t，I级。The project is 7.9kg/ t

6	纸产品定性评价指标	0.4	参见表表2.2.8-8

注：1、综合能耗包括纸机抄造和涂布过程。
Note: 1. Comprehensive energy consumption involves forming & pressing and coating by paper machine.
2、表2.2.8-8计算结果为本表的一部分，计算方法与本表其他指标相同。
2. The calculation results of Table 2.2.8-8 form a part of this table, and the calculation method is the same as that for other indicators.

表 2.2.8-7　制浆企业清洁生产管理指标项目基准值

Table 2.2.8-7 Reference values of clean production management indicators of the pulping enterprises

序号	一级指标	二级指标	指标分值	Ⅰ 级基准值	Ⅱ 级基准值	Ⅲ级基准值	本项目情况
1	清洁生产管理指标 Clean production management indicators	*环境法律法规标准执行情况 * Implementation of	0.155	符合国家和地方有关环境法律、法规，废水、废气、噪声等污染物排放符合国家和地方排放标准；污染物排放应达到国家和地方污染物排放总量控制指标和排污许可证管理要求			符合，I级 Coincident, Level I
2		*产业政策执行情况 * Implementation of	0.065	生产规模符合国家和地方相关产业政策，不使用国家和地方明令淘汰的落后工艺和装备			符合，I级 Coincident,
3		*固体废物处理处置 * Solid waste treatment and	0.065	采用符合国家规定的废物处置方法处置废物；一般固体废物按照GB 18599 相关规定执行；危险废物按照GB18597 相关规定执行			符合，I级 Coincident,
4		清洁生产审核情况	0.065	按照国家和地方要求，开展清洁生产审核			符合，I级
5		环境管理体系制度 Environmental management system	0.065	按照GB/T 24001 建立并运行环境管理体系，环境管理程序文件及作业文件齐备 Establish and operate an environmental management system in		拥有健全的环境管理体系和完备的管理文件	符合，I级 Coincident, Level I
6		废水处理设施运行管理 Operation and management	0.065	建有废水处理设施运行中控系统，建立治污设施运行台账	建立治污设施运行台账 Establish a monitoring account for pollution control		符合，I级 Coincident,
7		污染物排放监测 Pollutant discharge monitoring	0.065	按照《污染源自动监控管理办法》的规定，安装污染物排放自动监控设备，并与环境保护主管部门的监控设备联网，并保证设备正常运行		对污染物排放实行定期监测 Regular	符合，I级 Coincident, Level I
8		能源计量器具配备情况 Allocation of energy	0.065	能源计量器具配备率符合GB The allocation ratio of energy	能源计量器具配备率符合GB 17167、GB 24789 二级计量要求		符合，I级 Coincident,

9		环境管理制度和机构	0.065	具有完善的环境管理制度；设置专门环境管理机构和专职管理人员		符合，I级
10		污水排放口管理	0.065	排污口符合《排污口规范化整治技术要求（试行）》相关要求		符合，I级
11		危险化学品管理	0.065	符合《危险化学品安全管理条例》相关要求		符合，I级
12		环境应急 Environmental emergency	0.065	编制系统的环境应急预案并开展环境应急演练	编制系统的环境应急预案 Prepare a systematic environmental emergency plans	符合，I级 Coincident,
13		环境信息公开 Environmental information disclosure	0.065	按照《环境信息公开办法（试行）》第十九条要求公开环境信息 Expose environmental information in accordance with Article 19 of the *Environmental Information Disclosure Measures* (Trial)	按照《环境信息公开办法（试行）》第二十条要求公开	符合，I级 Coincident, Level I
14			0.065	按照HJ 617 编写企业环境报告书		符合，I级

表 2.2.8-8 纸产品企业定性评价指标项目及权重

Table 2.2.8-8 Paper product enterprise quantitative evaluation indicators and weights

序号 S.N	一级指标 Indicators	指标分值 Indicator	二级指标 Indicators for Class II		指标分值 Indicator	I 级基准值 Reference value for Class I	II级基准值 Reference value for Class II	III级基准值 Reference value	项目情况 Project
1	生产工艺及装备指标 Production process and equipment indicators	0.375	真空系统		0.2	循环使用水			符合，I 级
2			冷凝水回收系统		0.2	采用冷凝水回收系统			符合，I 级
3			废水再利用系统		0.2	拥有白水回收利用系统			符合，I 级
4			填料回收系统		0.13	拥有填料回收系统（涂布纸有涂料回收系统）			符合，I 级
5			汽罩排风余热回收系统 Steam hood exhaust heat		0.13	采用闭式汽罩及热回收 Adopt closed steam hood and heat recovery			符合，I 级
6			能源利用		0.14	拥有热电联产设施			符合，I 级
7	产品特征指标 Product characteristic indicators	0.25	*染料 * Dye	新闻纸/印刷书写纸/生活用纸	0.4	不使用附录 2 中所列染料 Do not use the dyes listed in Appendix 2			符合，I 级 Coincident,
				涂布纸		不使用附录 2 中所列染料，不使用含甲醛的涂料			符合，I 级
8			*增白剂 *	纸巾纸/ 食品包装纸/纸杯	0.2	不使用荧光增白剂 Do not use the fluorescent whitening agent			符合，I 级 Coincident,
9			环境 Environment	复印纸	0.4	符合 HJ/T410 相关要求			符合，I 级
10				再生纸制品		符合 HJ/T205 相关要求			符合，I 级

序号 S.N	一级指标 Indicators	指标分值 Indicator	二级指标 Indicators for Class II	指标分值 Indicator	Ⅰ 级基准值 Reference value for Class I	Ⅱ级基准值 Reference value for Class II	Ⅲ级基准值 Reference value	项目情况 Project
11	清洁生产管理指标 Clean production management indicators	0.375	*环境法律法规标准执行情况 * Implementation of	0.155	符合国家和地方有关环境法律、法规，废水、废气、噪声等污染物排放符合国家和地方排放标准；污染物排放应达到国家和地方污染物排放总量控制指标和排污许可证管理要求			符合，Ⅰ级 Coincident, Level I
12			*产业政策执行情况 * Implementation of	0.065	生产规模符合国家和地方相关产业政策，不使用国家和地方明令淘汰的落后工艺和装备			符合，Ⅰ级 Coincident,
13			*固体废物处理处置 * Solid waste treatment	0.065	采用符合国家规定的废物处置方法处置废物；一般固体废物按照 GB 18599 相关规定执行；危险废物按照 GB 18597 相关规定执行			符合，Ⅰ级 Coincident,
14			清洁生产审核情况	0.065	按照国家和地方要求，开展清洁生产审核			符合，Ⅰ级
15			环境管理体系制度 Environmental management system	0.065	按照 GB/T 24001 建立并运行环境管理体系，环境管理程序文件及作业文件齐备 Establish and operate an environmental management system in accordance with GB/T24001; have complete environmental		拥有健全的环境管理体系和完备的管理文件	符合，Ⅰ级 Coincident, Level I
16			废水处理设施运行管理 Operation and management of	0.065	建有废水处理设施运行中控系统，建立治污设施运行台账 Establish a central control	建立治污设施运行台账 Establish a monitoring account for pollution control facilities		符合，Ⅰ级 Coincident, Level I
17			污染物排放监测 Pollutant discharge monitoring	0.065	按照《污染源自动监控管理办法》的规定，安装污染物排放自动监控设备，并与环境保护主管部门的监控设备联网，并保证设备正常运行		对污染物排放实行定期监测 Regular	符合，Ⅰ级 Coincident, Level I
18			能源计量器具配备情况 Allocation of energy	0.065	能源计量器具配备率符合 GB The allocation ratio of energy	能源计量器具配备率符合 GB 17167、GB 24789 二级计量要求		符合，Ⅰ级 Coincident,
19			环境管理制度和机构	0.065	具有完善的环境管理制度；设置专门环境管理机构和专职管理人员			符合，Ⅰ级
20			污水排放口管理	0.065	排污口符合《排污口规范化整治技术要求（试行）》相关要求			符合，Ⅰ级
21			危险化学品管理	0.065	符合《危险化学品安全管理条例》相关要求			符合，Ⅰ级
22			环境应急 Environmental	0.065	编制系统的环境应急预案；开展环境应急演练	编制系统的环境应急预案 Prepare a systematic environmental emergency		符合，Ⅰ级 Coincident,

（1）各单元综合评价指数 Ygk

(1) Comprehensive evaluation indicator of each unit - Y_{gk}

通过与《制浆造纸行业清洁生产评价指标体系》中各项指标要求对比分析，根据各级指标计算结果可得各单元综合评价指数，见表 2.2.8-9。

Through comparative analysis with the requirements of indicators in *Clean Production Evaluation Indicator System in Pulp and Paper Industry*, the comprehensive evaluation indicators of each unit can be obtained based on the calculation results of indicators at all levels, which are shown in Table 2.2.8-9.

表 2.2.8-9　各单元综合评价指数 Y_{gk}

Table 2.2.8-9　Comprehensive evaluation indicator of each unit - Y_{gk}

单元 Unit	Y_{g1}	Y_{g2}	Y_{g3}
硫酸盐木浆 Sulphate softwood pulp	100	100	100
化机浆 APMP	100	100	100
文化用纸 Cultural paper	100	100	100
特种纸 Special paper	100	100	100
白卡纸 Ivory board	100	100	100
生活用纸 Life paper	100	100	100

（2）浆纸联合生产企业综合评价指数

(2) Comprehensive evaluation indicators of pulp and paper joint production enterprises

浆纸联合生产企业综合评价指数是描述和评价浆纸联合生产企业在考核年度内清洁生产总体水平的一项综合指标。

Comprehensive evaluation indicators of pulp and paper joint production enterprises are the comprehensive evaluation indicators describing and evaluating the overall level of clean production of pulp and paper joint production enterprises in the assessment year.

$$Y'_{g_k} = \frac{26}{28} \times \sum_{i=1}^{4} \frac{I_i \times X_i}{I_1X_1 + I_2X_2 + I_3X_3 + I_4X_4} \times Y^i_{g_k} + \frac{2}{28} \times Y^5_{g_k}$$

式中:

Where:

$Y_{gk}{}'$——浆纸联合生产企业综合评价指数；

$Y_{gk}{}'$ - Comprehensive evaluation indicators of pulp and paper joint production enterprises;

$Y_{gk}{}^{i}$——分别为浆纸联合生产企业各类纸浆制浆部分和造纸部分在级别 gk 上综合评价指数。其中，$Y_{gk}{}^{1}$为化学非木浆的综合评价指数，$Y_{gk}{}^{2}$为化学木浆的综合评价指数，$Y_{gk}{}^{3}$为机械浆的综合评价指数，$Y_{gk}{}^{4}$为废纸浆的综合评价指数，$Y_{gk}{}^{5}$为纸产品的综合评价指数。

$Y_{gk}{}^{i}$ - Respectively refer to comprehensive evaluation indicators of pulping and papermaking sections of a pulp and paper joint production enterprise at the level of gk. Where, $Y_{gk}{}^{1}$ is the comprehensive evaluation indicator of chemical non-wood pulp, $Y_{gk}{}^{2}$ is the comprehensive evaluation indicator of chemical wood pulp, $Y_{gk}{}^{3}$ is the comprehensive evaluation indicator of mechanical pulp, $Y_{gk}{}^{4}$ is the comprehensive evaluation indicator of waste paper pulp, and $Y_{gk}{}^{5}$ is the comprehensive evaluation indicator of paper products.

化学木浆包括前文提到的漂白硫酸盐木(竹)浆和本色硫酸盐木(竹)浆。如果企业同时还生产多种纸产品，可以将各种纸产品的综合评价指数按其产量进行加权平均，即可得到$Y_{gk}{}^{5}$。

Chemical wood pulp includes the above-mentioned bleached sulfate wood (bamboo) pulp and natural sulfate wood (bamboo) pulp. If the enterprise also produces other paper products, the comprehensive evaluation indicators of various paper products can be weighted based on the output, and $Y_{gk}{}^{5}$ can be obtained.

I_i——分别为化学非木浆(I_1)、化学木浆(I_2)、机械浆(I_3)、废纸浆(I_4)、纸产品(I_5)的污染系数。其中如果该企业没有生产其中一种或几种浆，则相应的 I_i＝0。

I_i - The contamination factor of chemical non-wood pulp (I_1), chemical wood pulp (I_2), mechanical pulp (I_3), waste paper pulp (I_4), and paper product (I_5). If the enterprise does not produce one or several pulps, the corresponding $I_i=0$.

X_i%——分别为化学草浆(X_1)、化学木浆(X_2)、机械浆(X_3)、废纸浆(X_4)在企业生产的各种纸浆产量中所占的百分比，且$\sum_{i=1}^{4} X_i = 100\%$。

X_i% - The percentage of chemical straw pulp (X_1), chemical wood pulp (X_2), mechanical pulp (X_3), waste paper pulp (X_4) in the output of various pulps produced by the enterprise, and $\sum_{i=1}^{4} X_i = 100\%$.

经计算，项目Y_{I}'=100，Y_{II}'=100，Y_{III}'=100，项目各限定性指标全部满足I级基准值要求，对照表2.2.8-10，本项目清洁生产水平总体可达到I级，即可达到国际清洁生产领先水平。

As calculated, Y_{I}'=100, Y_{II}'=100, Y_{III}'=100, and all limited indicators meet the requirements of reference value of Level I; referring to Table 2.2.8-10, the overall clean production level can reach Level I, namely, it can reach the leading level of international clean production.

表 2.2.8-10 制浆造纸行业不同等级清洁生产综合评价指数

Table 2.2.8-10 Comprehensive evaluation indicators of different levels of clean production in the pulp and paper industry

企业清洁生产水平 **Clean production level of enterprises**	评定条件 **Evaluation conditions**
Ⅰ级（国际清洁生产领先水平） Level Ⅰ (Leading level of international clean production)	同时满足：Y_{I}'≥85；限定性指标全部满足Ⅰ级基准值要求。 Also meet the requirement of Y_{I}'≥85; all the limit indicators meet the requirements of reference value at Level I.
Ⅱ级（国内清洁生产领先水平） Level II (Leading level of domestic clean production)	同时满足：Y_{II}'≥85；限定性指标全部满足Ⅱ级基准值要求。 Also meet the requirement of Y_{II}'≥85; all the limit indicators meet the requirements of reference value at Level II.
Ⅲ级（国内清洁生产一般水平） Level III (General level of domestic clean production)	同时满足：Y_{III}'≥85；限定性指标全部满足Ⅲ级基准值要求。 Also meet the requirement of Y_{III}'≥85; All the limit indicators meet the requirements of reference value at Level III.

2.2.9 项目生产工艺先进性分析

2.2.9 Analysis on advancement of production process

（1）备料工段采取先筛后存工艺，有效抑制了堆料过程中的扬尘现象。使用小孔

（45mm）的筛板（同行一般为 50-55mm），降低了过大片的比例，且木片在进蒸煮工段前再经过一次筛选，进一步降低木屑含量，木片合格率可提高 5%，确保了木片的质量。蒸煮工段可降低用碱量或蒸煮温度，保证了产品质量。

(1) Preparation section adopts the process of storage after screening, which effectively suppresses the production of dust during stacking of materials. The small-hole (45mm) sieve plate (generally 50-55mm in similar enterprises) reduces the proportion of oversized chips, and wood chips are screened again prior to the cooking section, which further reduces the content of chippings, and increases the qualification rate of wood chips by 5%, thus ensuring the quality of wood chips. The cooking section can reduce the amount of alkali or cooking temperature, thus ensuring the product quality.

（2）项目采用低固形物或紧凑连续蒸煮技术。低固形物蒸煮技术是将木片浸渍液及大量脱木素阶段和最终脱木素阶段的蒸煮液抽出，大幅降低蒸煮液中固形物浓度的蒸煮技术，该技术可最大限度地降低大量脱木素阶段蒸煮液中的有机物。紧凑蒸煮技术是在大量脱木素阶段，通过增加氢氧根离子和硫氢根离子浓度，提高硫酸盐蒸煮的选择性，并提高该阶段的木素脱除率，从而减少慢速反应阶段的残余木素量。与传统立式连续蒸煮相比，该技术具有蒸煮温度低、电耗低、纸浆得率高、卡伯值低及可漂性好等特点，属国际领先技术。紧凑式塔式连蒸技术或低固形物连续蒸煮技术，生产过程采用置换方式，蒸煮汽耗降到 0.6t/adt，较常规蒸煮 2.3t/adt，能耗降低 73.9%，大大降低了能源消耗。

(2)The Project adopts the low-solid or compact continuous cooking technology. The low-solid cooking technology is the technology that can significantly reduce the concentration of solids in cooking liquid through extracting the wood chip impregnating liquid and cooking liquid at the stage of large-amount delignification and final delignification; and this technology can minimize the amount of organic matters in cooking liquor at the stage of large-amount delignification. The compact cooking technology is the technology that can improve the selectivity of sulfate cooking, and increase the rate of delignification, thus reducing the residual lignin at the slow-reaction stage through increasing the concentration of hydroxyl ions and sulfhydryl ions at the stage of large-amount delignification. Compared with the traditional vertical continuous cooking, this technology is an international leading technology with the advantages of low cooking temperature, low power consumption, high pulp yield, low Kappa value and good bleachability. As for the compact tower continuous cooking or low-solid continuous cooking, the the replacement method is adopted during production, the steam consumption of cooking is reduced to 0.6t/adt, which is reduced by 2.3t/adt than normal cooking; the energy consumption is greatly reduced by 73.9%.

（3）本项目采用的是多段逆流洗涤、全封闭热筛选系统。全封闭热筛选系统是将筛浆和洗浆连为一体，整体筛浆作业过程不与外界空气接触，筛浆所需的稀释水可在系统内循环且筛浆浓度较高（2%～3%）。封闭筛选系统封闭筛选（压力筛选）系统是最新的筛选理念，国际大型纸浆厂目前均采用此项技术，其优点是纸浆的质量好，节水、节电，流程紧凑，占地面积小，纤维的流失小，对筛选工艺进行改革，采用封闭系统进行浆料筛选，具有杂质剔除率高，设备组合灵活，浆料滞留时间短和低水耗、低能耗等优点，在国际造纸产业中占有很大的地位。

(3) The Project adopts multi-stage countercurrent washing, and fully enclosed thermal screening system. The fully enclosed thermal screening system combines pulp sieving and washing; the pulp sieving process does not contact with external air, and the dilution water can be circulated in the system, and the pulp consistency can be high (2%～3%) . Closed screening system The closed screening (pressurized screening) system is the latest concept of screening, which is adopted by large international pulp mills, for it can produce high-quality pulp, with the advantages of water and electricity saving, compact process, small floor area, and small fiber loss; the reform of the screening process, and the use of a closed system for pulp screening can effectively remove impurities, flexibly set the equipment, shorten the residence time of pulp, and lower water and and energy consumption; it can play a great role in the international paper industry.

（4）项目采用中浓氧脱木素技术。蒸煮后的纸浆用氧处理可以进一步脱除部分木素，达到一定漂白效果而不会产生氯化有机物。氧脱木素可以减少后续漂白的药品用量和所生成的污染物。氧脱木素后洗浆废液送去碱回收炉，可以明显降低漂白车间废水量。氧脱木素具有诸多优点：环境污染小、漂白费用低，且白度稳定，返黄值小，脱水性能

好，清洁度高。当今世界所有新建的现代化漂白硫酸盐浆厂均采用了氧脱木素生产工艺。本项目增强了洗涤设备的配置，洗涤能力强，可有效保证氧脱木素的效率，预期脱木素率可达 55%，高于同行 45-50%的脱木素率。本项目在中浓封闭筛选的基础上进一步做了优化，降低了压力筛的筛缝，拟采用 0.22mm 的筛框（同行一般使用 0.25-0.35mm），降低浆料中纤维束的含量，提高产品质量。

(4) The Project adopts the medium-consistency oxygen delignification technology. Oxygen processing of cooked pulp can further remove part of the lignin, and achieve a certain bleaching effect, without generating chlorinated organics. Oxygen delignification can reduce amount of subsequent bleaching agent, and that of the generated pollutants. The washing wastewater after oxygen delignification is sent to the alkali recovery furnace, which can significantly reduce the amount of wastewater generated in the bleaching workshop. Oxygen delignification has many advantages: Low environmental pollution, low bleaching cost, stable whiteness, small yellow index, good dewatering performance, and high cleanliness. At present, all newly built modern bleached sulphate pulp plants adopt oxygen delignification. The Project increases washing equipment with high washing capacity, which can effectively ensure the efficiency of oxygen delignification; the expected delignification rate can reach 55%, which is higher than 45-50% of similar enterprises. The Project makes further optimization based on the medium-consistency closed screening: it narrows the joints of pressurized screen, plans to use the screen frame of 0.22mm (generally 0.25-0.35mm in similar enterprises), to reduce the content of fiber bundles in pulp, and improve the product quality.

（5）项目拟采用以二氧化氯为主要漂白剂的无元素氯漂白工艺，A-D_0-EOP-D_1 或 Dht-EOP-D_1 漂白。二氧化氯是一种优良的对环境友好的漂白剂，与单独使用元素氯，或者元素氯与二氧化氯结合使用相比，它具有更强的木素脱除能力和更好的脱木素选择性，可用在漂白流程的首段来脱除木素(D0)，避免引起纤维素和半纤维素的严重降解。其次，它是优良的增白剂，用在漂白流程的末段(D1 或 D2)来实现纸浆的高白度，而且白度稳定性好。以 ClO_2 为核心的 ECF 漂白技术是目前欧洲和北美许多工厂采用的主流漂白方法之一，ECF 漂白技术典型的流程为 D_0-EOP-D_1。世界上约有 75%的化学浆是采用

ECF 漂白方法制得的，TCF 漂白是不采用任何含氯漂剂，利用 O_2、H_2O_2、臭氧及过醋酸等含氧化学药品进行漂白。超过40万吨规模的漂白化学浆（目标白度88%ISO），使用 TCF 漂白方式几乎未有。国内几家大型浆厂采用的漂白工艺均为以二氧化氯为主的漂白工艺：

(5) The Project plans to adopt the element-free chlorine bleaching process with chlorine dioxide as the main bleaching agent, A-D_0-EOP-D_1 or Dht-EOP-D_1bleaching. Chlorine dioxide is an excellent environmentally friendly bleaching agent, compared with the exclusive use of chlorine, or the combination of chlorine and chlorine dioxide, it has stronger lignin removal ability and better delignification selectivity; so it can be used at the initial section of bleaching for removing lignin (D0), thus avoiding severe degradation of cellulose and hemicellulose. In addition, it is an excellent whitening agent, the end of bleaching (D1 or D2) can be used to achieve high whiteness of pulp with good stability of whiteness. ECF bleaching based on ClO_2 is currently one of the mainstream bleaching methods adopted by factories in Europe and North America. The typical process of ECF bleaching is D_0-EOP-D_1, and about 75% of chemical pulp in the world is prepared by ECF bleaching. TCF bleaching refers to the bleaching with O_2, H_2O_2, ozone and peracetic acid and other oxygen-containing chemicals, rather than chlorine-containing bleaching agent. The bleached chemical pulp of over 400,000 tons (target whiteness: 88%ISO) has almost never been bleached by TCF bleaching. Several large pulp mills in China adopt the bleaching processes based on chlorine dioxide:

湛江晨鸣：A-D0-EOP-D1

Zhanjiang Chenming: A-D0-EOP-D1

海南金海：Dht-E-D1-D2

Hainan Jinhai: Dht-E-D1-D2

日照森博：Dht-E-D1-D2

Rizhao Senbo: Dht-E-D1-D2

寿光晨鸣：A-Z-D-EOP-D1（Z 段效果有限，仍以二氧化氯为主）。

Shouguang Chenming: A-Z-D-EOP-D1 (Section Z has limited effect, and chlorine dioxide is mainly used).

近年来，海外投产最大的 OKI 项目（2016 年开机），260 万吨产能，也使用了无元素氯 Dht-EOP-D1 漂白，未使用臭氧漂。

In recent years, the largest OKI project overseas (started in 2016), with the capacity of 2.6 million tons, also adopts the ECF bleaching (Dht-EOP-D1) bleaching, rather than ozone bleaching.

ECF 纸浆市场占有率远远高于 TCF，而且 ECF 的发展远比 TCF 迅速得多。欧洲和美国环境权威部门均承认 ECF 和 TCF 都是制浆造纸工业的最佳实用技术，认为这两种技术对环境的影响没有区别。曾有大量的研究对 ECF 和 TCF 漂白废水进行比较，总的结论是它们的毒性都主要来自木材的天然成分，在毒性上并无明显区别，没有科学证据认为 TCF 漂白废水对环境的影响比 ECF 漂白废水小。

The market share of ECF pulp is much higher than that of TCF pulp, and the development of ECF is much faster than that of TCF. European and American environmental authorities recognize that ECF and TCF are the best practical technologies in pulp and paper industry, and they believe that there is no difference in the environmental impact between these two technologies.. A large number of studies have compared the wastewater of ECF and TCF bleaching, and concluded that their toxicity mainly comes from the natural ingredients of wood, there is no obvious difference in toxicity, and no scientific evidence shoes that TCF bleaching wastewater has less environmental impact than ECF bleaching wastewater.

以上工艺技术，均为国际领先且成熟可靠的技术，本项目在原成熟工艺的基础上，备料工段通过增加大量的设备，强化了木片筛选系统，提高了进入系统木片的质量。通过使用最为先进的洗涤设备，并在主流洗涤工艺基础上增加洗涤设备，提高了浆料的洗净程度，提高了氧脱木素效率，在保证得率的前提下降低了未漂浆的卡伯值及 COD 携带量，有效降低了漂白段化学品的使用量，降低了中段废水的排放量及 COD，达到世界领先水平。

The above process technologies are internationally leading, mature and reliable, and based on the original mature process, the preparation section strengthens the wood chip screening system through adding a large number of equipment, thus increasing the quality of wood chips. The use of the most advanced washing equipment, and the adding of washing equipment based on the mainstream washing process, improve the washing degree of pulp, and increase the efficiency of oxygen delignification; while ensuring the yield, it reduces the Kappa value and COD carrying amount of unbleached pulp, effectively reduces the amount of chemicals used in the bleaching section, and reduces the discharge of wastewater and COD at the middle stage, thus reaching the world's leading level.

（6）传统碱回收技术的核心是资源的充分利用，形成企业内部的良性循环。制浆车间提取的黑液经蒸发浓缩后送碱回收炉燃烧，使黑液中的有机物转化为二氧化碳和水的同时回收部分热能，热能生产的蒸汽可发电，黑液中的无机物则转化为碱作为蒸煮化学品再利用。通过碱回收处理可以降低生产工艺过程中产生的90%的污染负荷，本项目采用国内技术成熟可靠的蒸发、燃烧、苛化工艺流程处理制浆黑液。

(6) The core of traditional alkali recovery technology is to make full use of resources, and form a benign cycle within the enterprise. The black liquor extracted from the pulping workshop is sent to the alkali recovery furnace for combustion after concentration by evaporation, to transfer the organic matters in black liquor to carbon dioxide and water, and also recover partial heat energy; the steam produced by the thermal energy can be used to generate electricity, and inorganic matters in black liquor can be transferred to alkali as the cooking chemicals for reuse. Alkali recovery can reduce 90% of the pollution load generated during production, and the Project adopts the domestic mature and reliable evaporation, combustion, and causticization process for treating pulping black liquor.

（7）大力推进生产节水，废水排放量及污染物排放优于制浆造纸企业国家标准，达到国际领先水平。

(7) Vigorously promote water conservation, the wastewater volume and pollutant discharge are superior to the national standards for pulp and paper enterprises, and reach the international advanced level.

①本项目坚持走循环经济、清洁生产的道路，对生产过程产生的废水按照“减量化、再循环、再利用”原则，进行分级处理，按质回用，形成全公司的车间内部的“一级水循环”和各车间之间的“二级水循环”的两级节水模式，最大限度提高水的重复利用率。

项目通过实施清洁生产、循环经济等举措，全厂区循环水利用量占比达到 80%以上，优于制浆造纸企业国家标准，达到国际领先水平。

①The Project adheres to circular economy and clean production; perform staged treatment and use by nature of the wastewater according to the principle of “reduction, recycling and reuse”; forms the two-stage water conservation mode of “primary water cycle” in all workshops of the enterprise and “secondary water cycle” between workshops, so as to maximize the repeated utilization factor of water. Through taking the measures such as clean production and circular economy, the Project makes the proportion of recycled water usage reach over 80%, which is superior to the national standards of pulp and paper enterprises, and reaches the international advanced level.

②本项目在设备选型时，把水耗、能耗放在重要的位置。将引进使用先进的设备，加大水循环量，进一步减少水的用量。

②When selecting equipment, the Project focuses on water consumption and energy consumption. The Project will introduce advanced equipment, increase the amount of water circulation, and further reduce the water consumption.

化机浆项目。本项目采用国际上先进的碱性过氧化氢机械浆工艺，关键设备和自动控制系统设备从国外引进；其中磨浆线大型关键设备和备木车间主体设备均为进口设备，同时在该项目上大胆引进新技术，采用国内外先进的 MVR 蒸发系统来处理化机浆废水，使化机浆内部高浓废水废水达到了零排放，浓缩后的废水进入碱炉燃烧，蒸发产生的冷凝水回用，作为清水使用，达到节水的目的。本项目运用化机浆浓废水与化学浆黑液混合处理的模式（华南理工大学、中国制浆研究院合作实施），制浆产生的废液经蒸发工段浓缩后送碱回收车间处理；只有少量生产冲洗水和蒸发冷凝水，回用于木片洗涤，排放到污水处理站，吨浆实际排水仅 2 方，从而实现清洁生产、减少清水用量的目标，具有环保、节能和废物资源化利用等特点，技术达到国际先进水平。

APMP project. The Project adopts the internationally advanced alkaline hydrogen peroxide mechanical pulping process; the key equipment and automatic control system and equipment are imported from foreign countries; where the large-scale key equipment of the pulping line and main equipment of the wood preparation workshop are all imported equipment; at the same time, the Project boldly introduces new technologies and adopts the advanced MVR evaporation systems at home and abroad to treat APMP wastewater, thus realizing zero discharge of high-consistency wastewater of APMP; the concentrated wastewater is sent to the alkali furnace combustion, and the condensate generated by evaporation is reused as fresh water, so as to achieve the purpose of saving water. The Project adopts the mixed treatment mode of concentrated APMP wastewater and black liquor of chemical pulp (cooperatively implemented by South China University of Technology and China National Pulp and Paper Research Institute); the wastewater of pulping is evaporated and concentrated, and then sent to the alkali recovery workshop for treatment; only a small amount of production flushing water and evaporation condensate can be reused for washing wood chips, which will then discharged to the sewage treatment plant. The actual drainage per ton of pulp is only 2 m^3, so as to achieve the objective of clean production and reduce the assumption of fresh water. With the characteristics of environmental protection, energy saving and waste utilization, the technology adopted by the Project reaches the international advanced level.

化学浆项目。国内同等规模的浆厂主要有，海南金海纸业，日照森博纸业，湛江晨鸣纸业等，规模为70-160万吨，均采用连续蒸煮、氧脱木素、封闭筛选、无元素氯漂白。本项目拟采用同等工艺流程，使用最新型号、最先进的洗涤设备，并且在黑浆洗涤段增加一台洗涤设备，降低了纸浆进入漂白段携带的COD总量，相比同行业，本项目未漂浆携带的COD总量可降低20%。得益于黑浆段强大的洗涤能力，漂白段化工消耗量降低，二氧化氯用量预期可较同行降低20%，中段废水COD含量可较同行降低200mg/L以上。本项目拟在漂白末端增加一台洗涤设备，增强洗涤，提高产品质量，强化了洗浆废水的逆流和封闭循环，进一步降低中段废水排放量。制浆生产线吨浆排水可低至20m^3（包含碱回收车间，浆板机车间），远低于行业标准40m^3/t浆。GB3544-2008《制浆造纸工业水污染物排放标准》

Chemical pulp project. Domestic pulp mills of equivalent scale include Hainan Jinhai, Rizhao Senbo, and Zhanjiang Chenming, with the scale of 700,000-1,600,000 tons, all of which adopt continuous cooking, oxygen delignification, closed screening, and element-free chlorine bleaching. The Project plans to adopt the equivalent process flow, use the most advanced washing equipment of the latest model, and adds a washing equipment at the black pulp washing section, which can reduce total amount of COD in pulp sent to the bleaching section; compared with other enterprises in the same industry, the total amount of COD in unbleached pulp of the Project can be reduced by 20%. By virtue of the strong washing capacity of the black pulp section, the chemical consumption of the bleaching section is reduced, the consumption of chlorine dioxide is expected to be reduced by 20% compared with the peer enterprises, and the content of COD in middle section wastewater is expected to be reduced by over 200mg/L compared with the peer enterprises. The Project plans to add a washing equipment at the end of bleaching section, to enhance washing, improve product quality, and strengthen the countercurrent and closed circulation of pulp washing wastewater, thus further reducing the discharge of middle-section wastewater. The drainage per ton of pulp of the pulping line can be reduced to 20m^3 (including alkali recovery workshop, and pulp machine workshop), which is far below the industry standard of 40m^3/t. *Discharge Standards for Water Pollutants of Pulp and Papermaking Industry* (GB3544-2008)

纸机项目。本项目积极与冷凝水回收专业研究院所合作，增设回收设施，冷凝水回收率处于行业领先水平；同时使用先进的透平机技术，代替大量水循环冲洗的老工艺；采用膜过滤实现涂料废水回收。

Paper machine project. The Project actively cooperates with the professional research institute of condensate water recycling, to set up new recycling facilities, so its condensate recovery rate is leading in the industry; at the same time, the advanced turbine technology is adopted to replace the old process needing a large amount of flushing water; membrane filtration is adopted to recover the coating wastewater.

③管理创新，健全节约用水管理办法。为达到节水的目的，本项目将实施节约用水管理办法、用水考核与奖惩办法、取水定额管理办法等一批节水管理制度。将用水指标与工资效益挂钩，按月对车间进行考核，将用水指标落实到车间、班组，并实施月度考核，实现用水指标层层落实，层层考核，节奖超罚，提高节水积极性。

③Management innovation, improving the water saving management methods. In order to achieve the objective of water saving, the Project will take water-saving management systems including water-saving management methods, water assessment and reward & punishment methods, and water quota management methods. Associate water consumption indicators with wage benefits, perform monthly assessment on the workshop, implement the water consumption indicators in workshops and shifts, and implement monthly assessment, so as to achieve the implementation of water consumption indicators, assessments, awards and punishments by layers, thus increasing the enthusiasm for water conservation.

④根据太阳纸业现有制浆厂的多年运行管理经验，可采用的节水措施见下表：

④ According to years of operation and management experience of the existing pulp mills of Sun Paper, the water saving measures that can be adopted are shown in the following table:

表 2.2.9-1 太阳纸业节水措施汇总表
Table 2.2.9-1 Summary of water saving measures adopted by Sun Paper

车间 Work shop	措施名称 Name of measures	措施简介 Introduction of measures
化机浆 APMP	用木片洗涤水作为常压涤汽器冲洗水 Use wood chip washing water to flush the atmospheric steam scrubber	车间采用清滤液作为常压涤汽器冲洗水，然后排入水处理车间，这样浪费水资源，增加水处理成本，改进工艺，用木片洗涤水作为常压涤汽器冲洗水 If the workshop uses clear filtrate to flush the atmospheric steam scrubber, and then discharges it to the water treatment workshop, it will waste water resource and increase the cost of water treatment; so the process shall be improved, to use wood chip washing water to flush the atmospheric steam scrubber
	将车间的木片洗涤水用作主磨排污槽和闪急槽的冲洗水 Use wood chip washing water to flush the main mill sewage tank and flash tank	主磨每次开机、停机时，排污和闪急槽的冲洗水都会打开大约6分钟，每次耗水14.4方，每月平均8次，而木片洗涤水则是终端水，不在水消耗里面，可将此终端水用作主磨排污和闪急槽的冲洗水 Upon each startup and shutdown of the main mill, the flushing water of the sewage tank and flash tank will be opened for about 6 min, namely, 14.4 m3 of water will be consumed; the operation will be performed for an average of 8 times per month; wood chip washing water is the terminal water, which is not accounted in water consumption, so such washing water can be used as the water for flushing the sewage tank and flash tank of the main mill
	多圆盘滤液回用 Multi-disc filtrate reuse	多圆盘滤液回用 Multi-disc filtrate reuse
	夹网白水回用 Laminated white water reuse	夹网白水回用 Laminated white water reuse
	蒸发请污回用 Evaporation and decontamination for reuse	蒸发请污回用至主磨稀释水槽及密封水槽 Evaporation and decontamination for reuse at the main mill dilution water tank and sealed water tank
化学浆 Chemical pulp	再沸器排污水回收 Reboiler sewage recovery	将再沸器的排污管线焊接回收管道至回收槽，用泵送到热水槽回用 Weld the recovery pipeline of the reboiler to the recovery tank, and pump the sewage to the hot water tank for reuse
	白水加热器冷凝水回收 White water heater condensate recovery	新上一压力罐，蒸汽形成的冷凝水进入压力罐，通过压力的作用，把水输送到漂白工段的双棍滤液槽 A new pressure tank is equipped, the condensate of steam can be sent to the pressure tank, which can then send the water to the twin-roll filtrate tank of the bleaching section under pressure

车间 **Work shop**	措施名称 **Name of measures**	措施简介 **Introduction of measures**
纸机 Paper-making machine	冷却塔排水代替新鲜水 Replace fresh water with water discharged from cooling tower	使用凉水塔水代替新鲜水作为造纸的毛布洗涤水及工艺用水等 Replace fresh water with water from the cooling tower as the cloth washing water and process water
	回收并利用干燥部抽出的湿热空气 Recover and use hot and humid air extracted from the drying section	从干燥部抽出的湿热空气通过换热器加热补充到干空气，凝结的冷凝水用于网部洗涤 Heat the hot and humid air extracted from the drying section with the heat exchanger and supplement to dry air, and the condensate water can be used for screen washing
	助留剂稀释水系统改造 Retention agent diluted water system transformation	助留剂稀释水改用 Trumpjet 系统，停用新鲜水稀释系统 Retention agent diluted water adopts the Trumpjet system, and the fresh water dilution system shall be disabled
	网部高压喷淋水改造方案 Screen high-pressure spray water reconstruction scheme	采用韩国大宇网部清洗设备，提高清洗效率的同时，减少清水的使用量 Daewoo cleaning devices are used, which can improve the cleaning efficiency, and reduce the usage of clean water
	复卷机除尘用水改造 Transformation of dust removal water for re-reeling machine	复卷机除尘用水由清水改为清滤液 The dust removal water for re-reeling machine is changed to clear filtrate from clean water
	喷淋水改造 Spray water transformation	超清白水过滤用于纸机喷淋 Ultra-clear white water can be filtered and used for paper machine spraying
	多圆盘技术 Multi-disc technology	多圆盘应用 Multi-disc application
其他 Other	冷取水密封水回收 Cool water and sealing water recovery	冷取水密封水回收作为浆料稀释水 Cool water and sealing water can be taken as water for diluting the pulp

（8）本项目主要生产工艺及参数与国内同规模项目对比见表 2.2.9-2。

(8) The comparison between main production process and parameters of the Project and domestic projects of the same scale is shown in Table 2.2.9-2.

根据与国内同类大型制浆造纸项目对比，本项目采取的化学制浆漂白、二氧化氯制备等主体工艺属于行业主流工艺，碱回收率、黑液提取率、水重复利用率等主要指标达到行业同规模企业水平。

As compared with similar large-scale domestic pulp and paper projects, the processes such as chemical pulp bleaching and chlorine dioxide preparation adopted in the Project are mainstream processes in the industry; the main indicators such as alkali recovery rate, black liquor extraction rate and water reuse rate reach the level of enterprises of the same size in the industry.

本项目单位产品废水排放量、单位浆纸产品 COD 排放量、执行的废水排放标准等关键指标，基本均优于广西区内的斯道拉恩索（广西）项目和广西金桂浆纸项目；化学浆、化机浆、文化纸、特种纸、生活纸、白卡纸等主要生产线单位产品废水排放指标基本达到或优于国内同规模的大型纸浆企业的水平。总体而言，本项目的工艺水平和排污水平基本达到或优于国内同行业同规模企业设计水平。

The key indicators of the Project, such as wastewater discharge per unit product, COD emission of unit pulp and paper products, and the implemented wastewater discharge standards are basically superior to Stora Enso (Guangxi) Project and Guangxi Jingui Pulp and Paper Project; the unit product wastewater discharge indicators of the production lines of chemical pulp, APMP, cultural paper, special paper, household paper and ivory board basically reach or are superior to the levels of domestic large-scale pulp enterprises. In general, the process level and sewage discharge level of the Project basically reach or are superior to the designed levels of domestic enterprises of the same size in the industry.

3 环境现状调查与评价

3 Survey and assessment of environmental status

3.1 自然环境现状调查与评价

3.1 Investigation and evaluation about current natural environmental status

3.1.1 地理位置

3.1.1 Geographical location

北海市铁山港（临海）工业园区位于广西壮族自治区南端、北海市东部，东邻广东省湛江市，南邻北部湾，西面为北海市，北面为灵山县、浦北县和博白县，具体位置为东经 109°15'～109°45'，北纬 21°26'～21°40'。铁山港区距北海市 40 公里，距自治区首府南宁市 250 公里，距广东省湛江市约 150 公里，距海南省首府海口市 124 海里。铁山港区西面有钦北铁路，北面有北海至湛江高速公路经过。合浦一河唇铁路、玉林至合浦十字路乡铁路、合浦十字路乡至铁山港铁路支线、玉林至铁山港高速公路贯穿该区。

BeihaiTieshangang District (Linhai) Industrial Parkis located in the Southern Side of Guangxi Zhuang Autonomous Region and eastern side of Beihai City, bordering Zhanjiang City, Guangdong Province in the east, closing to Beibu Gulf in the south, facing Beihai City in the south and adjoining Lingshan County, Pubei County and Bobai County in the north. The detailed position is shown as follows: east longitude 109°15'～109°45' and northern latitude 21°26'～21°40'. Tieshangang District is 40km from Beihai City, 250km from the Nanning City, the capital city of the Autonomous Region, about 150km from Zhanjiang City, Guangdong Province and 124 sea mile from Haikou City, the capital city of Hainan Province. Qinzhou - Beihai Railway passes through the western part of Tieshangang District and Beihai - Zhanjiang Expressway passes through the northern part. Hepu - Hechun Railway, Yulin - Hepu Shizilu Village Railway, Hepu Shizilu Village - Tieshangang District Railway Branch Line, Yulin - Tieshangang District Expressway pass through the zone.

本项目位于北海市铁山港(临海)工业区，北面毗邻斯道拉恩索（广西）林浆纸有限公司，项目中心地理坐标为东经 109°32'52.48"，北纬 21°31'36.46"，项目地理位置示意图详见附图 1。

The Project is located in Beihai Tieshangang District (Linhai) Industrial Park, bordering

Stora Enso (Guangxi) Forestry Co., Ltd. In the north. The geographical coordinates of the project center is east longitude 109°32'52.48" and northern latitude 21°31'36.46”. Refer to Attached Figure 1 for detailed sketch of geographical position of the Project.

3.1.2 地形、地貌及地质情况

3.1.2 Topography, landform and geological conditions

北海市北枕丘陵，南滨大海，地势由北向南倾斜，间有低山丘陵、平原、台地等多种地貌类型。市区内地势平坦，为北部湾海岸上升而形成的侵蚀阶地，属滨海相沉积物，地质情况较为简单，上层覆土为第四系下更新统北海组，主要岩性为砂粘土、粘砂土、砂土、砂砾土，下层为上第四系更新统湛江组，主要岩性为粘土、粘砂土、砂砾土等，浅海滩涂面积宽广。沿海滩涂（潮间带）4.68 万公顷，其中沙质滩、半沙滩、泥质滩分别为 3.04、0.96、0.68 万公顷，各占滩涂总面积的 65.0%、20.5%、14.5%，港湾河川密布，曲折的海岸线和众多的港湾水道使该海域拥有较多的天然海港，沿海可开发万吨级泊位 150 多个，10 万至 20 万吨级泊位 20 多个。

Beihai City, connecting hills in the north and bordering seas in the south, inclines from north to south. Such landform as low mountains and hills, plains, tablelands are distributed alternatively. The topography in the city is quite flat. It’s erosion terrace caused by rising of coasts of Beibu Gulf, which is coastal sediments.The geological conditions are quite simple. The upper earthing is Quaternary System Lower Pleistocene Series Beihai Group comprising of sand clay, silty soil, sand and gravel soil. The lower layer is Upper Quaternary Pleistocene Series Zhanjiang Group mainly comprising of clay, silty soil, gravel soil, etc. The shallow sea mud flat is quite wide. The coastal mud flat (intertidal zone) covers an area of 46,800 ha., including 30,400 ha. Sandy beach, 9,600ha. semi-sandbeach and 6,800 ha. muddy beach, accounting for 65.0%, 20.5% and 14.5% of total mud flat respectively. The Gulf is densely distributed with rivers. Winding coastlines and plenty of harbor waterways make the sea featuring with lots of natural gulfs. Thus, over 150 10,000-ton berths and over 20 100,000-ton to 200,000 berths can be developed along the sea.

铁山港属台地溺谷湾，是从凹陷构造的基础上经冰冻后期海平面上升溺淹而形成的长 40km（湾顶至外挡门浅滩）、宽 3～4km 的狭长潮汐通道。湾内通道（深槽）以潮汐作用为主，即是由涨潮与落潮流冲刷共同塑造而形成的深槽。从地貌和沉积物分布反映出，落潮三角洲发育明显，湾口至湾内有一条明显潮流冲刷槽，也就是铁山港湾的主

槽。口门及口门以外水域，潮流冲刷槽出现分异，形成东、西两个深槽，东槽为落潮所形成，西槽为涨潮所形成，东槽与主槽贯通，在东、西槽之间有拦沙坝和浅滩。铁山港湾水下地形见图 3.1-1。

Tieshangang Port belongs to terrace caleta. It’s a narrow tidal channel with length of 40km (from gulf top to the outboard shoal) and width of 3~4km caused by drowning due to rising sea level in the later freezing period based on the sinking structure. Channels (deep grooves) in gulfs are mainly caused by tidal action. That is to say, channels are deep grooves scoured jointly by rising tide and tide falling flows. According to distribution of landform and sediments, ebb delta is developed obviously. There is one obvious tide scour trough from the bay mouth to the bay, i.e., the main channel of Tieshangang District. Tide scour troughs at the entrance and water area beyond the entrance are differentiated. Deep troughs are formed in the east and west respectively. The east trough is formed through tide falling and the west trough is caused by rising tide. The east trough is connected with the main channel. Sediment storage dams and shoals are formed between east and west troughs. Refer to Fig. 3.1-1 for underwater topography of Tieshangang District.

本区地势从北向南倾斜，东北、西北为丘陵，南部沿海为台地和平原。市区海滨平原土地占总面积 70%以上，土质由砂质粘土、砂砾构成，地层结构稳定，承压力强，一般为 18～25 吨/平方米。海洋滩涂约占市区土地总面积 20%左右，这种土地耐力较低，为 12～16 吨/平方米。

The area inclines from the north to the south. Hills are distributed in the northeast and northwest and tablelands and plains are distributed along the sea in the south. In the city, the beach plain covers over 70% of land. The soil mainly comprises of sandy clay and gravel. The stratum is featuring with stable structure and strong bearing capacity, generally, 18～25 t/m2. Coastal mud flat covers an area of about 20% of total area of the city. The endurance of land is relatively low, i.e., 12~16 t/m2.

根据《中国地震烈度区划图(1990)》，北海市所在区域地震烈度为Ⅵ度区(设计基本地震加速度值为 0.05g，设计特征周期为 0.35s)，属区域性相对稳定的地块。

According to Earthquake Intensity Zoning Map of China (1990), the seismic intensity of the area where Beihai is located is VII degree (the design basic earthquake acceleration is 0.05g and design characteristic period is 0.35s). It’s a relatively stable plot.

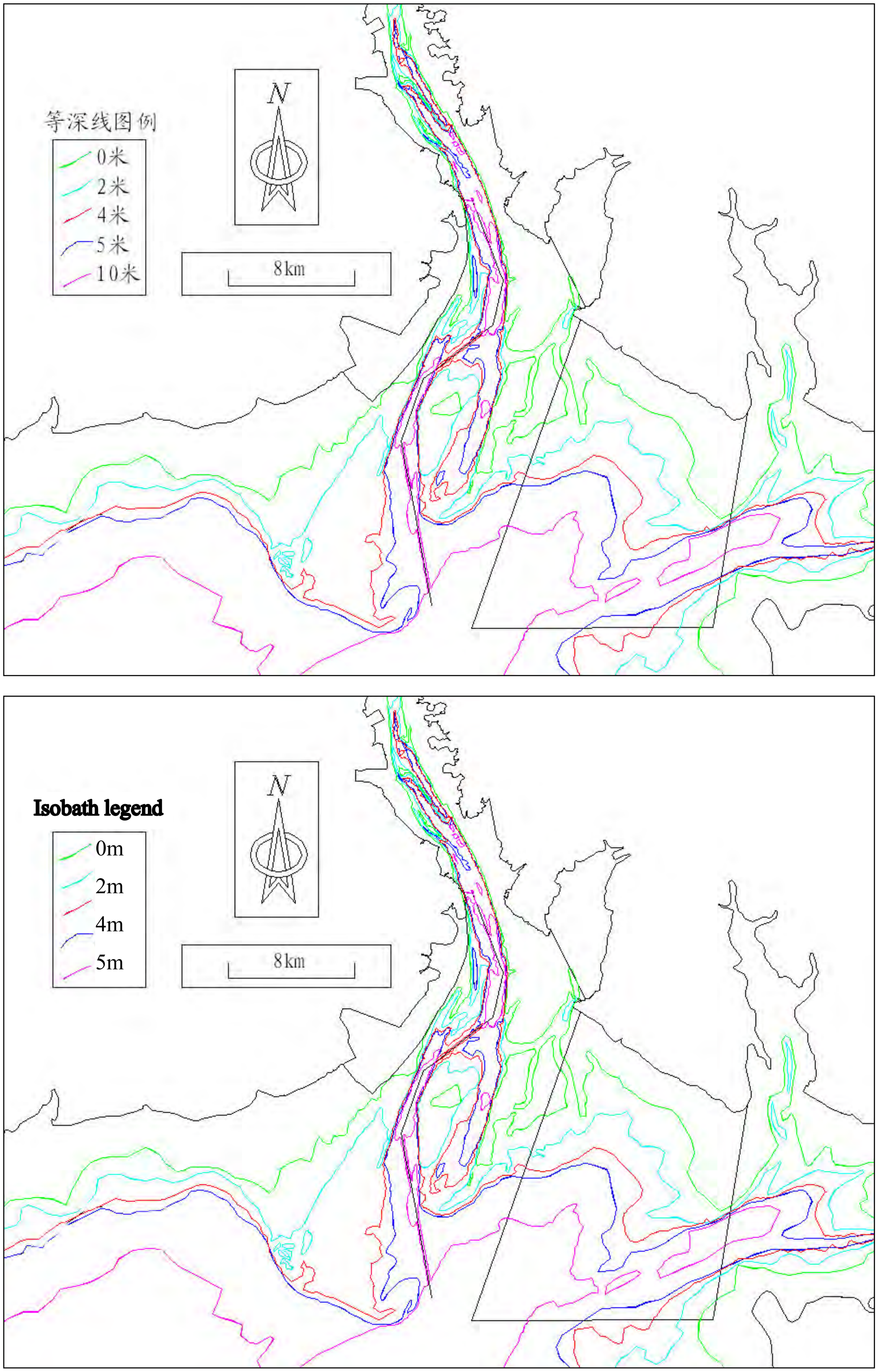


图 3.1-1　铁山港湾水下地形等值线

Fig. 3.1-1 Underwater topography isogram of Tieshangang District

3.1.3 气候气象

3.1.3 Weather and climate

（1）气象

(1) Weather

北海市地处低纬度，属南亚热带海洋性气候，温暖潮湿。据对北海市 30 年气候资料的统计，铁山港区年平均气温 22.6℃，极端最高气温为 36.1℃，极端最低气温为 2.0℃。年平均降水量为 1548mm，多集中于 6～9 月，降雨量占全年的 83％以上，年最大降水量 1774.6mm，年平均暴雨日数为 8.2d，年平均蒸发量为 1869.6mm。平均相对湿度 81%，平均日照时数 2088.7 h。北海市常年盛行风向为北风，频率为 22％，冬季盛行偏北风，夏季盛行偏南风，静风频率为 5%，年平均风速 3.2m/s。雾主要出现在冬末春初（1～3 月），尤其以 3 月份雾日最多，多年平均雾日 13.2d。

Beihai is located in low latitude, belonging to south subtropical oceanic climate. It's warm and wet here. According to statistics of climate data of Beihai in the last 30 years, annual average temperature of Tieshangang District is 22.6℃, extreme maximum temperature is 36.1℃ and extreme minimum temperature is 2.0℃. The annual average precipitation is 1548mm. Most rainfall is concentrated from June to September. The precipitation accounts for over 83% of annual precipitation. The annual maximum precipitation is 1774.6mm, annual average days with rainstorm is 8.2d and annual average evaporation is 1869.6mm. The average relative humidity is 81% and average sunshine duration is 2088.7 h. The dominant wind direction throughout the year in Beihai is north wind with frequency of 22％. Northerly wind is prevalent in summer, southernly wind is prevalent in summer, frequency of calm wind is 5% and annual mean wind speed is 3.2m/s. Fog mainly occurs during late winter and early spring (January - March). There are most foggy days in March. And perennial average fog days is 13.2d.

（2）气候灾害

(2) Climatic disaster

当地的主要气候灾害有干旱、暴雨洪涝、台风等。

Local main climatic disasters include drought, torrential rain and flood, typhoon, etc.

①干旱：受季风活动变化的影响，北海市少雨干旱的天气以春旱出现频率较高。少

数年份夏季和秋季也会出现少雨天气，严重的年份可造成工农业生产用水不足。

① Drought: Due to impact by changes in monsoon activities, dry weather in Beihai city with a little rainfall mainly occurs in Spring. During some years, drought also occurs during summer and autumn. If conditions worsen, water for industrial and agricultural production may be insufficient.

②暴雨洪涝：北海市年平均暴雨日数 8.2d，主要出现在 4～10 月份，以 6～8 月份出现频率高，降水强度大，是洪涝多发季节。据对降水资料的统计，北海市 6、7、8 月份的最大日降水量可达 260mm 以上。

② Torrential rain and flood: annual average days with rainstorm in Beihai City is 8.2d, mainly occurring from April to October. The frequency of rainstorm is high from June to August, the rainfall is intense and flood is mostly occurred during the period. According to statistics of precipitation data, maximum daily precipitation in Beihai in June, July and August can reach over 260mm.

③台风：夏秋两季台风强烈，年影响 0～6 次，因受到海南岛和雷州半岛的阻挡，风力一般为 5～6 级，10 级以上大风少见，延时约 24 小时左右，最大风速为 40m/s。台风一般伴随着大雨，当遇上大潮时则形成风暴潮。

③ Typhoon: typhoon is quite strong during summer and autumn. It may occur 0~6 times. Due to hindering of Hainan Island and Leizhou Peninsula, the wind scale is generally 5~6. Wind scale of over 10 can be seldom seen. It may be delayed by about 24h. Maximum wind speed can reach 40m/s. Typhoon and heavy rain may come together. In case of spring tide, storm tide may be formed.

④雷暴：年雷暴影响天数约 10d。

④ Thunderstorm: Annual number of days affected with thunderstorm are about 10d.

3.1.4 水文

3.1.4 Hydrology

3.1.4.1 海洋

3.1.4.1 Ocean

（1）潮汐

(1) Tide

铁山港所在海区潮汐属不正规日潮为主的混合潮型。据石头埠验潮站（位于铁山港

西岸石头埠村，距港区北面约 11km）多年潮位资料，港湾潮汐有两大特点：其一，潮差大，最大潮差为 6.25m，多年平均潮差为 2.45m；其二，涨潮历时大于落潮历时，涨潮历时约 15h，落潮历时约 10h。该区潮汐作用较强，历年最高潮位 5.40m，平均高潮位 3.90m，平均潮位 2.55m，平均低潮位 1.38m，最低潮位 0.19m。

The tide in the sea area where Tieshangang Port is located belongs to mixed tide type mainly comprising of irregular diurnal tide. According to perennial sea level data of Shitoubu Tide Station (located in Shitoubu Village on the west bank of Tieshangang Port, about 11km from the northern side of the port), gulf tide is featuring with the following two characteristics: firstly, huge tidal range. The maximum tidal range can reach 6.25m and perennial average tidal range is 2.45m. Secondly, duration of tidal rise is longer than that of tidal falling. The duration of tidal rise is about 15h and duration of tidal falling is about 10h. The role of tide is relatively strong in this area. Perennial maximum tide level is 5.40m, average high tide level is 3.90m, average tide level is 2.55m, average low tide level is 1.38m and the lowest tide level is 0.19m.

（2）波浪

(2) Wave

由于受雷州半岛掩护，铁山港海区波浪较弱。根据涠洲岛长期的波浪观测资料，年平均波高为 0.67m。该区强波向为 SSW，频率 8.9%；常波向为 NNE、NE 和 E，频率分别为 10.67%、10.39%和 10.07%；波高<0.5m 的风浪，频率为 38.85%，波高>1.5m 的风浪，频率为 4.6%。

To to protection by Leizhou Peninsula, waves in Tieshangang District is relatively weak. According to long-term wave observation data of Weizhou Island, annual average wave height is 0.67m. In this area, the strong wave direction is SSW and frequency is 8.9%. Ordinary wave direction is NNE, NE and E and frequency are 10.67%, 10.39% and 10.07% respectively. As for wave with height <0.5m, the frequency is 38.85%. As for wave with height >1.5m, the frequency is 4.6%.

（3）海流

(3) Ocean current

①潮流

① Tide

铁山港为台地溺谷海湾，因受地形的影响和制约，湾口附近的潮流是沿等深线运动

的往复流，转流历时较短；湾外至涠洲岛一带逐渐过渡为旋转流，但长轴仍为 NE～SW 方向。通常涨潮历时大于落潮历时，且涨潮流速过程线呈双峰型，即在中潮位附近，潮位曲线有时出现一个稳定的时间历程，有时略有回落，致使涨潮流速减小，甚至出现短暂的落潮流。转流方向由落潮转涨潮一般为顺时针方向，由涨潮转为落潮则为逆时针方向。

Tieshangang Port belongs to terrace caleta. Due to impact and restriction of the topography, tide around the port is reversing current moving along the isobath, which is featuring with relatively short duration of turn of tidal current. Tide from outside the Port to Weizhou Island is transformed into rotating flow. However, the long axis is still along NE~SW. Generally, duration of tidal rise is longer than that of tidal falling. The tidal rise speed process line is of bimodal pattern, i.e., tide curve may show a stable time history sometimes. Sometimes, the tide curve may drop slightly, resulting reduced tidal rise speed and sometimes transient ebb current. As for turn direction of tidal current, the direction from falling tide to rising tide is clockwise and that from rising tide to falling tide is anticlockwise.

②余流

② Residual current

铁山港海域的表层余流主要是由风海流组成的，因风向不同而变化；中、底层主要为潮汐余流，方向与涨潮方向相近。表层余流流速较大，最大在湾顶达 0.22m/s，底层余流流速约为 0.17m/s。近湾口的海区，余流方向主要指向湾内，而湾外的余流主要指向外海。

Residual current on the surface layer of Tieshangang area mainly comprises of wind current and changes according to different directions. Tide residual current is mainly discovered at the middle and bottom layers. The direction of tide residual current is closing to rising tide direction. The speed of residual current on the surface layer is relatively large, reaching maximum value of 0.22m/s at the gulf top. And speed of residual current on the bottom layer is about 0.17m/s. As for sea area near the port, residual current points into the gulf. And the residual current outside the gulf mainly points open seas.

（4）泥沙

(4) Sediment

铁山港的泥沙来源分为陆相来沙和海相来沙。

Sediment in Tieshangang Port mainly comes from continental sand and marine sand.

陆相来沙主要来源于港湾周围的小河流，其中较大者为流入丹兜港的白沙河，其年输沙量约 16～18 万 t，其余小河流如公馆河、闸利河、白坭江也有少量泥沙汇入海湾。另外台地上的冲沟和高潮线以上因浪蚀形成的陡坎也给海湾提供少量泥沙来源。估计整个海湾陆相来沙每年约为 30 万 t，主要是细颗粒泥沙，也有一些粗颗粒泥沙，细颗粒泥沙主要沉积于丹兜港内或东南侧，以及铁山港湾顶老鸦洲附近区域。

Continental sand mainly comes from small rivers around the gulf. Larger ones flow into Baisha River of Dandou Port. Where, annual sediment runoff is about 160,000~180,000t. Some sediments also flow from Gongguan River, Zhali River, Baini River and other small rivers into the gulf. Moreover, gullies on tablelands and steep ridges caused by abrasion above high-water lines can provide a few amount of sediments to the gulf. According to estimation, continental sand of the entire gulf is about 300,000t/a. It mainly comprises of fine sediment. There is also coarse sediment in it. Fine sediments are mainly concentrated in Dandou Port or the southeast side and area around Laoyazhou on the top of the Tieshangang District.

海相来沙以较粗的砂质物为主，海湾的东、西、北三个潮流冲刷槽分布有砾砂、中砂、中细砂、砂等沉积物，各槽两侧的浅滩以细砂为主；落潮三角洲东南部较深水域和丹兜港南侧外海分布有粉砂质砂、粘土质砂、中细砂、砂和沙－粉砂－粘土物质，是细粒沉积物较多的区域，也是铁山港海域海相来沙的主要沙源地。在风浪和潮流共同作用下形成含沙量较高的水体，使泥沙不断向岸推移，湾内最大含沙量为 0.068kg/m^3。冬季盛行北风和东北风，由于风区范围较窄，风向与涨潮流流向正好相反，因而整个海湾内冬季含沙量较夏季小。

Marine sand mainly comprises of coarse sand. East, west and north tide scour troughs of the harbor are distributed with gravelly sand, medium sand, medium and fine sand, sand and other sediments. The shoal on both sides of each trough is mainly distributed with fine sand. Relatively deep water area on the southeast part of the falling tide delta and open sea at the south side of Dandou Port are distributed with silty sand, clayey sand, medium and fine sand, sand and sand - silt - clay materials. It’s the area with much fin sediments and main sand source for marine sand of Tieshangang Port sea area. Water body with relatively high sediment content is formed under joint action of waves and tides, pushing sediments to the bank continuously. The maximum sediment content of the gulf is 0.068kg/m^3. North wind and northeast wind are prevalent in winter. Due to relatively narrow scope of the wind district, wind direction and rising tide direction are contrary to each other, making sediment content of the entire gulf in winter smaller than that in summer.

3.1.4.2 地表水

3.1.4.2 Surface water

铁山港区内的主要地表水体为南康江，供水水源为合浦水库供水工程。

The main surface water body in the Tieshangang District is Nankang River. The water source is Hepu Reservoir Water Supply Project.

（1）南康江

(1) Nankang River

南康江是独流入海的河流，发源于合浦县十字路乡白水塘东面的山地，由北向南流经北海市铁山港区南康镇、兴港镇、营盘镇，于营盘镇青山头的沙角嘴注入铁山港，流域面积 193.8km^2，主河道长 31km，多年平均径流量约 1.36×10^{8}m^3/a，枯季流量约 1.55m^3/s。近出海口的 3km 为开阔的河滩，岸宽 1～1.2km，河滩颗粒粗大。沿河有 12 条支沟，其中较大的有 6 条，树枝状注入主河道。河两岸一级台地 0.5～2km 地带均为农田。南康江出口海域的潮汐属于混合潮，附近的石头埠潮位站最大潮差 6.25m，平均潮差 2.45m。潮汐的变化规律是涨潮历时比落潮时间长，平均涨潮历时为 8 小时 50 分，平均落潮时间为 6 小时 52 分。局部河段淤积，尤其靠近出海口青山头挡潮闸河段，由于河床变宽，流速减缓，逐年淤积，已呈冲积扇状态。

Nankang River is the only river flowing into sea in the area. It originates from the mountain land on the east side of Baishuitang, Shizilu Township, Hepu County, flows from north to south crossing Nankang Town, Xinggang Town and Panying Town of Tieshangang District, Beihai City and injects into Tieshangang Port at Shajiaozui of Qingshantou, Panying Town. The watershed area covers about 193.8km^2, the main river course is 31km long, the perennial annual average runoff is about 1.36×10^{8}m^3/a and the flow during the dry season is about 1.55m^3/s. The area about 3km from the sea port is open benchland with bank width of 1~1.2km and coarse benchland granules. There are 12 ditches along the river, including 6 larger ones. All of them inject into the main river course in the form of branches. The 0.5～2km zone on the first level tableland on both banks of the river is farmland. The tide in the sea body at the outlet of Nankang River is mixed tide. Maximum tidal range at the nearby Shitoubu Tide Station is 6.25m and average tidal range is 2.45m. According to the tide change rule, duration of tidal rise is longer than that of tidal falling. Average duration of tidal rise is 8h50min. And average duration of falling tide is 6h52min. Some river sections are deposited, in particular, the river section adjacent to the tide gate of Qingshantou nearby the marine outfall. Due to widened riverbed, the speed has been reduced, it has been deposited year on year and displaying alluvial fan state.

本项目厂址西距南康江约 6.5km，项目排水（包括污水及雨水）与南康江无水力联系。

The factory site is about 6.5km from Nankang River. Drainage from the project (including sewage and rainwater is irrelevant to Nankang River).

（2）合浦水库

(2) Hepu Reservoir

合浦水库是一座以灌溉为主、兼顾供水、防洪、发电、种养、旅游等综合利用的大（一）型水利工程，于 1960 年 3 月建成投入运行，共有主副坝 89 座，溢洪道 13 座，大渡槽 1 座。合浦水库工程通过南流江大渡槽连接旺盛江～六湖水库（二）型水库，通过湖海运河与闸口水库、清水江水库、石康水库、牛尾岭水库等 4 座中型水库连通，统称合浦水库群。库区控制集雨面积 1052.8km^2，总库容 12.502 亿 m^3，有效库容 5.32 亿 m^3，死库容 2.203 亿 m^3，设计灌溉面积 70.1 万亩。

Hepu Reservoir is a comprehensive large (I) water conservancy project mainly used for irrigation while taking into consideration of water supply, flood control, power generation, cultivation, tourism, etc. It has been constructed and put into operation since Mar. 1960. Altogether, 89 main and axillary dams, 13 spillways and 1 large aqueduct are arranged. Hepu Reservoir connects with Wangsheng River ~ Liuhu Reservoir (II) through the large aqueduct of Nanliu River and 4 medium reservoirs including Zhakou Reservoir, Qingshuijiang Reservoir, Shikang Reservoir and Niuweiling Reservoir through lakes and rivers. Those reservoirs are called as Hepu Reservoir Group. The catchment area controlled by the reservoir area is 1052.8km^2, total storage capacity is 1.2502 billion m^3, effective storage capacity is 532 million m^3, dead storage capacity is 220.3 million m^3 and design irrigation area is 701,000 mu.

合浦水库灌区内河流属桂南沿海水系，河流流向多由北向南流，主要河流是南流江及其支流小江(又称马江)、常乐河、白沙江、石康河、七里河、清水江等。灌区范围跨越玉林市博白县、钦州市浦北县、北海市一县三区，目前有效灌溉面积 45 万亩。主干渠、支、斗、毛渠全长 1783.56km，其中的南康干渠直通铁山港区。

Rivers in the irrigated area of Hepu Reservoir belongs to Southern Guangxi coastal water system. The rivers mainly flow from north to south. Main rivers are Nanliu River and its branch (Majiang River), Changle River, Baisha River, Shikang River, Qili River, Qingshui River, etc. The scope of the irrigated area includes Bobai County of Yulin City, Pubei County of Qinzhou City and one county and three districts of Beihai City. Currently, the effective irrigation area covers 450,000 mu. The total length of main trunk canals, branch canals, head ditches and sublateral canals is 1783.56km. Where, Nankang trunk canal is connected with Tieshangang Port directly.

3.1.4.3 地下水

3.1.4.3 Underground water

（1）地下水类型及补给、排泄方式

(1) Type of groundwater and recharge and discharge mode

拟建项目所在区域地质构造上属南康盆地。南康盆地为一个独立的水文地质单元，面积约 1200km^2，该单元中地下水类型主要有基岩裂隙水、碳酸盐岩溶裂隙水和松散岩类孔隙水三大类。南康盆地的地下水主要接受降雨和渠道水的补给，北侧部分地区有山区基岩裂隙水的侧向补给。地下水的径流排泄主要受地形控制，总体上是由北向南以泉或分散流的形式排泄入海。

Geological structure of the area where the proposed project is located belongs to Nankang Basin. Nankang Basin is an independent hydrogeological unit with an area of about 1200km^2. Groundwater in the unit is mainly bedrock fissure water, carbonate karst fissure water and unconsolidated rock pore water. Groundwater in Nankang Basin is mainly supplemented by rainfall and channel water. In the northern part, bedrock fissure water provides lateral supply. The discharge of groundwater runoff is mainly controlled by topography. Generally, it’s discharged into sea from north to south in the form of spring or dispersed flow.

（2）地下水位动态特征

2. Dynamic characteristics of groundwater level

地下水动态变化主要受控于大气降水、潮汐涨落、地表水蒸发及农田活动的影响，枯水期降雨量少，渠道停止放水，地下水位降低；春季渠道放水灌溉，丰水期降雨量充沛，地下水位上升。空隙潜水位年变幅可达 2～5m，近海岸地带 2km 范围的承压水受潮汐影响，地下水位变幅可达 2～3m。

Dynamic change in groundwater is mainly affected by atmospheric precipitation, tiding, surface water evaporation and farmland activities. During the dry season, the precipitation has been reduced, the channels stop discharging and groundwater level has been decreased too. During spring, the channels discharge water for irrigation. During the wet season, the precipitation is abundant and groundwater level increases. Annual change amplitude of phreatic water level may reach 2~5m. Due to tide impact of confined water within 2km from the coastal area, changes in groundwater level may reach 2~3m.

（3）地下水化学特征

(3) Chemical characteristics of groundwater

南康盆地孔隙潜水和孔隙承压水化学类型以 HCO_3Cl-CaNa 型和 Cl-Na 型为主，呈弱酸性-中性，矿化度小于 0.05g/L，总硬度为 0.2～0.39mmol/L，裂隙水以 HCO_3-Ca 型为主，中性微硬，矿化度为 0.15～0.30g/L。沿海岸带受海水影响，变为 Cl-Na 型硬水或极硬水。

Chemical type of phreatic water and gap confined water of Nankang Basin mainly includes HCO_3Cl-CaNa and Cl-Na, which is of faintly acid and neutral type. The degree of mineralization is less than 0.05g/L and total hardness is 0.2～0.39mmol/L. Fracture water mainly comprises of HCO_3-Ca, which is of neutral type and slightly hard. The degree of mineralization is 0.15～0.30g/L. Due to impact of sea water, coastal zones will turn into Cl-Na type hard water or extremely hard water.

3.1.5 航道

3.1.5 Navigation channel

铁山港水深条件好，从涠洲岛附近至铁山港口近 60km 长的外航道，天然水深均超过 16m，对十万吨级航道而言，不必开挖，为天然深水航道，对十五万吨级和二十万吨级航道而言，开挖深度仅 1～2m，进港航道段天然水深为 7.7～18m。本港潮差大，最大潮差达 5.37m，可利用的乘潮水位在 3m 以上，航道开挖工程量少。铁山港纳潮量大，大潮纳潮量可达 3×10^8～$4\times10^8m^3$，潮流作用较强，有利于航道开挖后水深的维持。根据水下地形对比结果，铁山港海域水深稳定，冲淤变化幅度很小，回淤量不大，航道水深可以靠疏浚维持。

Tieshangang Port is featuring with deep water and favorable conditions. As for external channels from the area around Weizhou Island to Tieshangang Port with a length of almost 60km, natural water depth exceeds 16m. As for 100,000t level channels, there is no need for excavation. It's a natural deep-water channel. As for 150,000t and 200,000t channels, the depth of excavation is only 1~2m. Natural water depth of the inbound channel is 7.7~18m. The Port is featuring with huge tidal range. Maximum tidal range may reach 5.37m. Available tide-bound water level is above 3m. And few quantities is required for channel excavation. Tieshangang Port is featuring with huge tidal prism. And tidal prism of spring tide may reach $3\times10^{8}\sim4\times10^{8}m^{3}$. The role of tide is quite strong, which is beneficial for maintaining water depth upon excavation of channels. According to underwater topography comparison results, water depth in Tieshangang Port sea area is quite stable, range of change of erosion and deposition is relatively small, back silting quantity is not large and depth of the channel can be maintained through dredging.

3.1.6 文物古迹

3.1.6 Cultural relics

本项目所在评价区域内没有发现属于国家和地方保护的文物古迹。

Cultural relics under protection of the nation and local government are not discovered within the assessment area where the Project is located.

3.1.7 区域海洋资源及海域开发利用与保护状况

3.1.7 Regional ocean resources and development, utilization and protection status of sea area

铁山港湾区域具有丰富的自然资源和优越的自然条件。其中港口资源和水产资源居各种自然资源前列。其次为滩涂资源和盐业资源，还有矿产资源。

Tieshangang Port area is featuring rich natural resources and advantageous natural conditions. Where, port resources and aquatic resources are ranking the first among various types of natural sources. Mud flat resources, salt resources and mineral resources follow behind.

3.1.7.1 港口资源

3.1.7.1 Port resources

铁山港是一个狭长的台地溺谷型海湾，形似喇叭状，水域南北长约 40km，东西大约宽 4km，是华南地区自然条件最优越的天然深水良港。铁山港有东西两条深槽，为天然航道，航道底宽 500-1000m，水深 10-22.5m。航道条件非常优越。从涠洲岛附近至铁山港口门近 60km 长的外航道，天然水深均超过 16m，对十万吨级航道而言，不必开挖，

为天然深水航道，对二十万吨级航道，开挖度仅 1～2m。由于铁山港纳潮量大，落潮流速大于涨潮流速，港内波浪小，泥沙动力条件较弱，加上本区无大河流入，泥沙来源少，因而港口建成之后，港池航道易于维护，维护费用低。有关数学模型试验表明：航道开挖后，码头港池的年回淤量仅为 0.07m，港内主航道稳定后年回淤量为 0.04m。铁山港是华南沿海潮差最大的海区，最大潮差 5.37m，船舶可利用乘潮水位约 3m 进出港区，从而大大降低港池和航道的开挖费用。根据铁山港港口总体布局规划，铁山港两岸可利用建码头岸线长约 53km，整个铁山港可建 1～20 万吨级的深水泊位 145 个以上。铁山港底质为砂质沉积物，无礁石，滩涂面积达 8000hm^2，易于通过开挖吹填形成人工岸线和港池，港口建设工程造价低，建设周期短，而且，铁山港的大风、大雨、大雾等灾害性天气作用时间短，可作业天数每年可达 330 天以上。

Tieshangang Port is a narrow terrace caleta of horn shape. The south-north length of the water area is about 40km and east-west width is about 4km. It’s a natural deep-water port with the most advantageous natural conditions in the South China. Tieshangang Port have two deep grooves in the east and west. It’s a natural channel with bottom width of 500-1000m and water depth of 10-22.5m. Conditions of channels are quite advantageous. As for external channels from the area around Weizhou Island to Tieshangang entrance with a length of almost 60km, natural water depth exceeds 16m. As for 100,000t level channels, there is no need for excavation. It’s a natural deep-water channel. As for 200,000t channels, the depth of excavation is only 1~2m. Due to huge tidal prism of Tieshangang Port, the speed of tide falling is larger than that of rising tide. Wave in the port is small. And dynamic conditions of sediments are relatively weak. As there is no large river nearby the area, source of sediment is limited. Therefore, it’s quite easy maintain the port channel upon port construction and maintenance expenses are relatively low. According to tests of relevant mathematic models, annual back silting quantity of the pools is only 0.07m after excavation of channels and annual back silting quantity is only 0.04m upon stabilization of the main channel in the port. Tieshangang Port is the sea area with the largest tidal range along the coast of South China. Maximum tidal range may reach 5.37m. Ships may pass the port area through the tide-bound water level about 3m, which can reduce excavation expenses of port pools and channels substantially. According to overall allocation plan of Tieshangang Port, about 53km long water fronts can be used on both banks of Tieshangang Port and over 145 10,000 - 200,000t deep-water berths can be constructed along the entire Tieshangang Port. Sandy sediments are allocated at the bottom of Tieshangang Port. No reef is discovered. The area of mud flat reaches 8000hm^2. Therefore, it’s quite easy to form artificial water fronts and port pools through excavation and filling. The port construction works is featuring low cost and short construction period. Moreover, due to short duration of high wind, heavy rain, heavy fog and other disastrous weather of Tieshangang Port, annual days of operation may reach over 330 days.

3.1.7.2 渔业资源

3.1.7.2 Fishery resources

（1）海产品

(1) Marine products

铁山港区位于北海市东部，濒临全国四大渔场之一的北部湾渔场，渔业资源丰富，是世界著名的“南珠”产地。全区海岸线长达 50 公里，拥有-10 米以内等深线的浅海滩涂面积 38.6 成亩，规划养殖总面积 10.8 万亩，是珍珠贝、对虾、蛤、方格星虫、象鼻螺、牡蛎等优质名贵海产品的天然养殖场所。

Tieshangang District, located in the east part of Beihai City, is bordering Beibu Gulf Fishery, one of the four largest fisheries in China. Beibu Gulf Fishery, featuring rich fishery resource, is a world famous “Southern Pearl” production site. The coastline of the district reaches 50km, including 38.6 mu shallow sea mud flat with less than -10m isobath. The total planned cultivation area is 108,000mu. It's a natural cultivation place for pearl shells, prawns, clams, Sipunculus nudus, oysters and other high-quality and famous marine products.

（2）海洋捕捞

(2) Marine fishing

铁山港区渔业主要经济种类有二长棘明、沙丁鱼、马鲛、石斑鱼、鱿鱼、墨鱼、江篱、口月贝、文蛤、牡蝠、青蟹、长毛对虾、口树虾和赤虾等。铁山港湾沿岸从事渔业捕捞生产的人口约 1 万人，主要分布铁山港西岸的营盘乡沿海一带。主要的捕捞场地为北部湾渔场及湾外的深水区域，湾口的沙田外海和营盘外海仅有季节性的对虾捕捞，湾内禁止拖网捕捞，只有小型的渔业活动，如流刺网、延绳钓等捕捞方式。

Main economic categories of fishery industry of Tieshangang Port include Parargyrops edita, sardine, Scomberomorus, garrupa, sleeve-fish, cuttlefish, Gracilaria, clams, blue crabs, penaeus penicillatus, shrimps, red shrimpss, etc. About 10,000 people along Tieshangang Port is engaging in fishing, which is mainly distributed in the coastal area in Yingpan Township at the west bank of Tieshangang Port. Main fishing site includes Beibu Gulf Fishery and deep-water area outside the gulf. Only seasonal prawn fishing is allowed in the tidal land outer sea and camp outer sea at the port. Fishing with nets is prohibited in the gulf. Only small fishery activities including drift netters, long-line fishing, etc. is allowed.

（3）海水养殖

(3) Mariculture

近年来，铁山港区海水养殖业发展迅猛，目前，集中成片的养殖区主要分布于湾顶的闸口沿海河湾中部至湾口的白沙坪一带，以及湾口西侧营盘至石头埠一带。主要有对虾养殖、珍珠养殖、文蛤和方格星虫养殖等北海特色海产品。

Recently, marine aquaculture industry in the Tieshangang District develops rapidly. Currently, concentrated aquiculture area is mainly distributed from the middle of the gate coastal bay on the top of the gulf to Baishaping at the bay mouth and the area from the camp to Shitoubu on the west side of the bay mouth. Prawns, pearls, clams, sipunculus nudus and other special Beihai coastal products are bred.

3.1.7.3 滩涂和浅海资源

3.1.7.3 Mud flat and shallow sea resources

北海海洋资源：海岸线东起与广东廉江县交界的英罗湾，西至与钦州市交界的大风江港，全长 500.13 公里（其中海岸线 31.9 公里）；，海滩涂（潮间带）4.84 万 hm^2，浅海（0～10 米水深）面积 15.08 万 hm^2。可供养殖面积 1.4 万 hm^2（其中水面 0.59 万 hm^2）。

Marine resources of Beihai: the coastline ranges from Yingluo Bay bordering with Lianjiang County, Guangdong Province in the east to Dafengjiang Bay bordering Qinzhou in the west. It’s 500.13km long in total (including 31.9km coastline), 48,400 hm^2 mud flat (intertidal zone) and 150,800 hm^2 (0～10m deep water) shallow sea. Available breeding area reaches 14,000hm^2 (including 5,900hm^2 water surface).

铁山港湾，海岸线长 170km，海湾面积约 340km^2。其中：滩涂面积 173km^2。规划养殖总面积 0.72 万 hm^2，是珍珠贝、对虾、蛤、方格星虫、象鼻螺、牡蛎等优质名贵海产品的天然养殖场所。已开发利用浅海面积 0.14 万 hm^2，滩涂面积 0.10 万 hm^2，铁山港区还形成了以南康江沿岸为主的淡水渔养殖基地，养殖面积为 852.48hm^2，淡水养殖年产量可达 4852t。

Tieshangang Port, with 170km long coastline, enjoys bay area of about 340km^2. Wherein, the area of mud flat is 173km^2. The total planned breeding area is 7,200 hm^2. It’s a natural breeding place for pearl shells, clams, Sipunculus nudus, oysters and other high-quality and famous marine products. Currently, 1,400hm^2 shallow sea and 1,000 hm^2 mud flat have been developed. A freshwater fish breeding base mainly along the coast of Nankang River has been formed in Tieshangang District. It's breeding area is 852.48hm^2. And annual breeding productivity may reach 4852t.

3.1.7.4 红树林、海草资源

3.1.7.4 Mangrove and sea grass resources

（1）红树林资源

(1) Mangrove resource

铁山港区红树林资源较丰富，港内有红树林滩涂面积约 2100 hm^2，主要分布在山口（467 hm^2）、公馆（167 hm^2）、沙田（67 hm^2）、白沙（733 hm^2）、闸口（200 hm^2）、南康（467 hm^2）等 6 个乡镇沿岸潮滩。红树林群落长势茂盛，结构紧密，一般树高 2～3m，最高 7～8m。根据其组成种类和环境条件特点，铁山港红树林属海滩红树林和半红树林种类。

Mangrove resource is quite rich in Tieshangang District. The area of mangrove mud flat in the port is about 2100 hm^2, which are mainly distributed in the following 6 towns and townships including Shankou (467 hm^2), Gongguan (167 hm^2), Shatian (67 hm^2), Baisha (733 hm^2), Zhakou (200 hm^2) and Nankang (467 hm^2). Mangrove community is featuring luxuriant growth and compact structure. Generally, the trees are 2~3m high, 7~8m high at maximum. According to its species type and environmental conditions, mangrove in Tieshangang Port belongs to beach mangrove s and semi-mangrove s.

山口国家级红树林生态自然保护区位于广西合浦县沙田半岛东西两侧，东侧英罗港，西侧丹兜港，经纬度为 E109°43′～10°46′，N21°28′～21°36′，保护区总面积为 8000 hm^2（海域 4000 hm^2，陆域 4000 hm^2），1990 年 9 月经国务院批准建立的我国首批（5 个）国家级海洋类型保护区之一，保护对象是红树林生态系统，区内的红树林是我国大陆海岸红树林典型代表，具有发育良好，结构独特，连片较大，保存较完整的天然红树林。区内有红树植物有红树林 13 种（真红树 8 种，木榄、秋茄、红海榄、桐花树、白骨壤、海桑、榄李、老鼠勒；半红树 5 种，卤蕨、节槿、杨叶肖槿、水黄皮、海芒果）。有林面积 800hm^2，其他常见高等植物 19 种，浮游植物 96 种，底栖硅藻 158 种，浮游动物 26 种，鱼类 82 种，贝类 90 种，虾蟹 61 种，鸟类 106 种，昆虫 258 种，其他动物 16

种。在保护区的红树林边缘尚有连片的护花米草生长。互花米草生长迅速，可以促淤互岸，净化环境，为合浦县 1979 年引种。山口保护区红树林的总生物量是 75.64 t/hm^2， 其中地上部生物量 39.06 t/hm^2，地下部生物量 36.58 t/hm^2。红树植物群落的地上部分净生产力因群落类型和群落的发育状况而波动于 1.48~15.37 t/hm^2.a 之间，全保护区红树林地上部的总体平均生产力为 4.58 t/hm^2.a。

National Shankou mangrove Nature Reserve is located on east and west sides of Shatian Peninsula in Hepu County, Guangxi Province, bordering Yingluo Port on the east side and Dandou Port on the west side. The longitude and latitude is E109°43′～10°46′, N21°28′～21°36′. The total area of the Nature Reserve is 8000 hm^2 (sea area 4000 hm^2 and land area 4000 hm^2). In September 1990, it was approved by the State Council as one of the first batch (5) of national marine type reserves in China. It’s used to protect the mangrove ecosystem. The mangrove in the area is a typical example of continental coast mangrove in China. It's a natural mangrove featuring favorable development, unique structure, large area and relatively complete protection. There are 13 types of mangroove in the Reserve (8 types of mangrooves including Bruguiera gymnorrhiz, Kandelia candel, Rhizophora stylos, Aegiceras corniculatum, Avicennia marina, Sonneratia caseolaris, Lumnitzera racemosa Willd and Acanthus ilicifolius; 5 types of semi-mangrooves including Acrostichum aureum, Thespesia populnea and Cerbera manghas). Within the forest area of 800hm^2, there are 19 types of other common higher plants, 96 types of phytoplankton, 158 types of benthic diatoms, 26 types of zooplankters, 82 types of fishes, 90 types of shells, 61 types of crabs and shrimps, 106 types of birds, 258 types of insects and 16 types of other animals. Vast stretches of Spartina alterniflora Loisel growing at the edge of the mangroove in the Natural Reserve. Spartina alterniflora Loisel grows rapidly. It can facilitate dredging and purify environment. It was introduced by Hepu County in 1979. The total biomass of mangroove in Shankou Nature Reserve is 75.64 t/hm^2, including biomass of aboveground part 39.06 t/hm^2 and biomass of underground part 36.58 t/hm^2. Net productivity of aboveground part of mangrove community changes according to community type and community development conditions, ranging from 1.48 to 15.37 t/hm^2.a. The total average productivity of aboveground part of mangrove in the Nature Reserve is 4.58 t/hm^2.a.

（2）海草资源

(2) Sea grass resources

铁山港湾的东岸海滩涂生长着成片大面积的海草是颇具特色的海洋生态资源之一。海草是生长在热带和温带海域浅水中的单子叶植物，具有全球生态重要性。海草床面积

存在明显的季节和年份变化。合浦的海草床是我国海草保护的最重要的生境之一，铁山港湾海草床也是我国一级保护哺乳动物儒艮活动和觅食的场所。

Vast stretches of sea grass growing on the east mud flat of Tieshangang Port is one type of particular marine ecological resource. Sea grass is monocotyledon growing in sea area shallow water in the tropical zone and temperate zone of global ecological importance. The area of sea grass bed is showing obvious seasonal and yearly change. Hepu sea grass bed is one of the most important habitat for sea grass protection in China. The sea grass bed in Tieshangang Port is the activity and foraging place for dugongs, one type of first class protected mammal in China.

铁山港湾的东岸海滩涂生长着成片大面积的海草是颇具特色的海洋生态资源之一。海草是生长在热带和温带海域浅水中的单子叶植物，具有全球生态重要性。海草床面积存在明显的季节和年份变化。合浦的海草床是我国海草保护的最重要的生境之一。铁山港湾海域滩涂中生长的海草主要有喜盐草（Halophila ovalis）、二药藻（Halodule uninervis）、贝壳喜盐草、日本大叶藻（Zostera japonica）等四种。英罗港至铁山港海域滩涂有 6 个草场，面积约 280hm²，铁山港湾海草床也是我国一级保护哺乳动物儒艮活动和觅食的场所。

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广西各地的海草受到明显的人为威胁，主要包括滩涂养殖、围网养殖、毒鱼和电鱼、挖螺（贝）与拖网，陆地和海上（主要为交通、倾废和投饵养殖等）排放的污染以及开挖港池航道与台风等。上述影响造成了广西海草床的明显衰退，并存在加速衰退的趋势。其中北暮海草床区，2012 年 7 月后由于受区域海洋开发活动影响，潮间带滩涂上已被沙覆盖，该片海草床已不存在。本项目排污口距离东北侧淀洲沙沙背和下龙尾海草区较近，最近距离分别约 3km。

Sea grass in various places in Guangxi Province is subject to obvious man-made threats, which include mud flat aquaculture, barrier net aquiculture, fish poisoning and electrification, shell digging and net trawling, land and ocean (mainly transportation, waste discharge, bait casting breeding, etc.) discharge pollution, port channel excavation, typhoon, etc. As a result, sea grass bed in Guangxi Province has been declined obviously, showing accelerated declining trend. Wherein, due to impact of regional ocean development activity, the intertidal zone mud flat of Beimuhai grass bed has been covered with sand since July 2012. The sea grass bed no longer exists. The sewage outlet of the Project is nearby Dianzhousha shabei and Xialongwei sea grass areas. The shortest distance is only about 3km.

3.2 铁山港（临海）工业区分区规划概况

3.2 Overview of zonal planning of Tieshangang (Linhai) Industrial Park

铁山港区是 1994 年 12 月 17 日经国务院批复同意新设的北海市辖行政区，现辖南康、营盘、兴港三镇，总面积 394km^2，海岸线总长 50km，滩涂 80km^2。根据《北海市城市总体规划（2008～2025）》，“铁山港区重点发展以石油化工、煤化工、能源电力、林浆纸一体化以及装备制造等临港工业为主的现代化海港”，“铁山港东组团布置一类、二类、三类工业用地，包括出口加工区铁山港分区、化工区和高新技术产业园区。工业依托林浆纸业积极吸引上下游相关配套企业入驻，打造为重要的纸浆业生产基地。”

Tieshangang District is an administrative district under the jurisdiction of Beihai newly arranged upon obtaining approval from the State Council on Dec. 17, 1994. Now, it now governs Nankang Town, Yingpan Town and Xinggang Town. Tieshangang District, with a total area of 394km^2, has 50km long coastline and 80km^2 mud flat. According to Urban Overall Plan of Beihai (2008~2025), “Tieshangang District is a modern harbor mainly underlining development of petrochemical engineering, coal chemical industry, energy and power, forest-pulp-and-paper integration, equipment manufacture and other harbor industries”, “The east cluster of Tieshangang is arranged with Class I, Class II and Class III industrial land, including Export Processing Zone Tieshangang Branch, chemical industrial area and high technology industry park”. Forest-pulp-and-paper industry will be used to attract relevant upstream and downstream auxiliary enterprises to create an important paper pulp industry production base.

北海市专门编制了《北海市铁山港（临海）工业区分区规划（2009-2025）》（以

下简称"《分区规划》"），并已正式印发。北海市铁山港（临海）工业区是《广西北部湾经济区发展规划》提出的北部湾经济区三大临海重化工业集中区之一，规划总面积约为 123 平方公里，规划人口 30 万人。近期规划建设面积 20 平方公里，重点发展石油化工、新材料、林浆纸、能源、船舶修造、港口物流等临港产业及配套产业。

Zonal Planning of Beihai Tieshangang (Linhai) Industrial Park (2009-2025)(hereinafter referred to as "Zonal Planning") has been prepared by Beihai Municipal Government and has been printed and issued initially. Beihai Tieshangang (Linhai) Industrial Park is one of the three Linhai heavy chemical industry concentrated zones in Beibu Gulf Economic Zone proposed in Development Planning of Beibu Gulf Economic Zone of Guangxi. The total planned area is about 123km2 and planned population is 300,000 persons. In the near term, the planned construction area is 20km^2. Attention will be paid to development of petrochemical engineering, new materials, pulp paper, energy, ship building, port logistics and other port-centered industry and auxiliary industry.

3.2.1 规划区范围

3.2.1 Range of the planned area

规划西至南康江，北至铁山港区北铁一级公路，东至石头埠，南临铁山港湾，规划区用地规模为 123 平方公里。

The planned area starts from Nankang River in the west, extends to Beitie Class I Highway in Tieshangang District in the north, reaches Shitoubu in the east and adjoins Tieshangang Port in the south. The land scale of the planned area is 123km^2.

3.2.2 规划期限及人口规模

3.2.2 Planning period and population

（1）规划期限

(1) Planning period

近期：2009 年-2015 年；远期：2016 年-2025 年。

Near term: 2009-2015. Long-term: 2016-2025

（2）人口规模

(2) Population

至 2015 年，规划区人口为 12 万人；

By 2015, the population of the planned area would be 120,000.

至 2025 年，规划区人口为 30 万人。

By 2025, the population of the planned area will be 300,000.

3.2.3 产业发展定位

3.2.3 Industrial development positioning

（1）产业发展类型

(1) Industry development type

①石油化工；

① Petrochemical engineering;

②林浆纸业；

② Forest-pulp-and-paper industry;

③现代物流；

③ Modern logistics;

④船舶修造；

④ Ship building;

⑤综合产业。

⑤ Comprehensive industry.

（2）产业发展定位

(2) Industry development positioning

以石油化工产业为主体，重点发展林浆纸业、船舶修造及现代物流业，协调发展出口加工、资源加工、新材料加工、能源电力和先进制造业等综合产业，从循环经济的角度出发，打造环保型的临海工业基地、区域性国际化物流中心。

Create an environmental-friendly coastal industrial base and a regional international logistics center taking petrochemical engineering industry as the main body, underlining development of forest-pulp-and-paper industry, ship building and modern logistics industry, developing export processing, resource processing, new material processing, energy and power, advanced manufacturing industry and other comprehensive industries at the same time in a coordinated manner from the perspective of circular economy.

3.2.4 建设用地规模

3.2.4 Scale of construction land

至 2025 年，总建设用地为 123 平方公里（含填海用地面积 49.8 平方公里和规划建成区内兴港镇及部分营盘镇建设用地 23.3 平方公里）。

By 2025, the total area of construction land will be 123km^2 (including 49.8km^2 reclaimed land and 23.3km^2 construction land in Xinggang Town and Yingpan Town of the planned construction area).

3.2.5 工业用地规划

3.2.5 Planning of industrial land

规划工业用地总面积为 5117.14 公顷，占总建设用地总面积的 41.76%。工业用地集中布置在铁路东部与西部的工业片区，包括一类、二类和三类工业用地，以石油化工产业为主体，重点发展林浆纸业、船舶修造，协调发展出口加工、资源加工、能源电力和先进制造业等综合产业。

The total area of planned industrial land is 5117.14 ha., accounting for 41.76% of total construction land. The industrial land is arranged in concentration in the industrial cluster on the east and west part of the railway, which includes Class I, Class II and Class III land. Attention will be paid to developing forest-pulp-and-paper industry and ship building. Export processing, resource processing, energy and power, advanced manufacturing industry and other comprehensive industries will also be developed at the same time in a coordinated manner.

（1）一类工业用地面积为 524.15 公顷，主要在布置兴港综合组团生活区东面，以配套加工业和出口加工业为主。

(1) Class I industrial land, with an area of 524.15 ha., is mainly arranged on the east side of the Xinggang comprehensive cluster living quarter. Auxiliary processing industry and export processing are mainly developed.

（2）二类工业用地面积为 267.72 公顷，此类工业对居住和公共设施等干扰和污染较小，主要布置在铁山港高新技术产业园内。

(2) Class II industrial land, with an area of 267.72 ha., is mainly arranged in Tieshangang High and New Technology Industry Park. Such type of industry has a little interference and pollution on living, public facilities, etc.

（3）三类工业用地面积为 4325.28 公顷，主要沿海岸线布置，利用深水岸线形成大规模临海工业，主要包括石油化工、造纸、资源加工、新材料加工、能源电力、船舶修造等。

(3) Class III industrial land, with an area of 4325.28 ha., is mainly arranged along the coastline. Deep-water coastlines are used to form large-scale coastal industries, including petrochemical engineering, paper making, resource processing, new material processing, energy and power, ship building, etc.

3.2.6 产业用地布局

3.2.6 Layout of industrial land

充分考虑工业区自然、区位、资源等产业发展条件，结合各类产业自身的发展空间及工业区产业发展的弹性要求，科学合理布局产业用地

Industrial land shall be arranged scientifically and reasonably taking into consideration of natural, zone position, resource and other industrial development conditions while considering development space of respective industry and elastic requirements for industrial development of the industrial zone.

（1）石油化工：用地规模 60 平方公里（其中发展备用地 23.45 平方公里），主要布局在兴港路以西工业片区及发展备用地内。

(1) Petrochemical engineering: scale of land use, 60km^2 (including 23.45 km^2 development reserve land), mainly distributed in the industrial area and development reserve land to the west of Xinggang Road.

（2）林浆纸业：用地规模 4.67 平方公里，主要布局在兴港路交营闸路东北。

(2) Forest-pulp-and-paper industry: scale of land use, 4.67km^2, mainly arranged in the northeast part of connection between Xinggang Road and Yingzha Road.

（3）现代物流：用地规模 11.68 平方公里，主要布局在工业区南部，临近港口。

(3) Modern logistics: scale of land use, 11.68km2, mainly arranged in the southern part of the industrial park which is close to the port.

（4）船舶修造：用地规模 4.96 平方公里，主要布局在工业区东部沿海。

(4) Ship building: scale of land use, 4.96km2, mainly arranged in the east coastal area of the industrial park.

（5）综合产业：用地面积 30.37 平方公里，主要布局在规划区东部，包括出口加工、资源加工、新材料加工、能源电力和先进制造业等现代产业。

(5) Comprehensive industry: scale of land use, 30.37km^2, mainly arranged in the east part of the planned area, including export processing, resource processing, new material processing, energy and power, advanced manufacturing industry etc. modern industries.

3.2.7 市政设施规划

3.2.7 Planning of municipal facilities

3.2.7.1 给水工程规划

3.2.7.1 Planning of water supply engineering

规划内容：预测到 2020 年城市总用水量为 76 万 t/d。城市供水水源近期主要使用地下水作为水源和合浦水库水源，远期以合浦水库水源为主。规划给水管网系统采用生活、工业、分质分区给水系统，规划给水管呈环状布置，分期实施，形成分区供水的环状网系统格局。合浦水库至铁山港工业区的供水水源及输水管网一期工程已全面建成，供水能力达到 44.7 万 m^3/d，完全可以满足大型项目用水需求。

Planning content: it’s estimated that the total water consumption of the city by 2020 is 760,000 t/d. As for urban water supply source, groundwater and water from Hepu Reservoir is mainly used in the near term. In the long term, water from Hepu source will be mainly used. The Planned water supply pipe network system uses living, industrial and zonal water supply system. The planned water supply pipes are arranged in loop form and be implemented per stages to form a loop network system with zonal water supply. Water supply source and water transportation pipe network Phase I from Hepu Reservoir to Tieshangang Industrial Park have been constructed. The water supply capability can reach 447,000m^3/d. Thus, it can satisfy power consumption requirements of large projects.

3.2.7.2 排水工程规划

3.2.7.2 Planning of drainage works

规划城市排水体制为雨污分流制排水体系。根据 GB50318-2000《城市排水工程规划规范》和 GB50282-98《城市给水工程规划规范》，以合河铁路铁山港支线为界，将规划区划分为东、西两个片区，根据污水量预测，工业污水量约 61.5 万 m^3/d，综合生活污水量约 3.2 万 m^3/d。规划区规划 3 座污水处理厂，分别为污水处理一厂、污水二厂和污水处理三厂，规模分别为 24 万 m^3/d、36 万 m^3/d 和 5 万 m^3/d（注：环评建议修改为取消污水处理三厂，污水处理二厂规模 36 万 m^3/d 调整为满足 B3 排污区 NH_3-N 排放环境容量规模，包括林浆纸 11m^3/d 污水处理规模，并保留已批准的污水处理 4 万 m^3/d，

在满足 NH_3-N 排放环境容量的情况下，可适当增加规模。污水处理一厂规模 24 万 m^3/d 调整为 50 万 m^3/d，往 A1 排放口排放）。

The planned urban drainage system is rain and sewage diversion system. According to Code of Urban Wastewater Engineering Planning (GB50318-2000) and Code for Urban Water Supply Engineering Planning (GB50282-98), the planning area can be divided into east and west zones taking Tieshangang Branch of Hepu - Hechun Railway as the boundary. According to sewage prediction, industrial sewage is about 615,000m^3/d and comprehensive production sewage is about 32,000m^3/d. 3 sewage treatment plants are planned in the planned area, which are Sewage Treatment Plant 1, Sewage Treatment Plant 2 and Sewage Treatment Plant 3. The scale of the 3 sewage treatment plants are 240,000m^3/d, 360,000 m^3/d and 50,000m^3/d respectively (Note: according to the environmental impact assessment, it's suggested to cancel Sewage Treatment Plant 3. The scale of Sewage Treatment Plant 2 shall be adjusted from 360,000 m^3/d to satisfy NH_3-N discharge environmental capacity scale of B3 sewage discharge area, including 11m^3/d sewage treatment scale for forest-pulp-paper. Meanwhile, 40,000m^3/d approved sewage treatment will be reserved. The scale can be increased appropriately under the premise of satisfying requirements for NH_3-N discharge environmental capacity. The scale of Sewage Treatment Plant 1 will be adjusted from 240,000m^3/d to 500,000m^3/d. It will be discharged from A1 discharge outlet.

本区域污水综合排放水质执行国家污水排放标准，经处理达标后方可排入市政污水管。规划区近期污水处理达标后，由深海排放管排入南部大海；远期可考虑部分污水经处理达到中水回用标准后，用于工业用水回用。

Comprehensive discharge quality of sewage from the area shall comply with national sewage discharge standard. Only those reaching standards upon treatment can be discharged into the municipal sewage pipes. As for the planned area, sewage reaching standards will be discharged into southern sea through deep-sea discharge pipes. In the long term, some sewage may be used as industrial water after reaching reclaimed water utilization standard upon treatment.

3.2.7.3 雨水排放规划

3.2.7.3 Planning of rainwater discharge

在现有自然冲沟整治的基础上，建设排水明渠，明渠采用混凝土或浆砌石护面，提高明渠的泄洪能力，预计线路全长约 7995 米，干渠设计雨水排泄量为 177.07 立方米/

秒。目前已累计完成 d2400 混凝土管道铺设 660m，盖板涵浇注 73m，渠道挡墙 5825m，渠底 7060.6m，渠道栏杆 3450m，渠堤填土 5850m，K0+918 便桥，一、二号跨渠桥梁及一、二、三号跨渠便桥完成桥面板浇筑。

Surface water channels, using concrete or grouted rubble protective covering, are constructed based on treatment of existing natural gullies to improve flood discharge capacity of surface channels. The total length of the proposed line is about 7995m. Design rainwater discharge of main canals is 177.07m^3/s. Currently, 660m d2400 concrete pipe laying, 73m slab culvert pouring, 5825m channel retaining walls, 7060.6m channel bottoms, 3450m channel rails, 5850m channel fill, K0+918 makeshift bridge, cross ditch bridges 1 and 2 and decking pouring of cross ditch bridges 1, 2 and 3.

同时新建 15 个人工雨水排出口，分别对临海码头和南康江出口附近区域进行组织排水，规划区共形成 14 个雨水排水区域。

Meanwhile, 15 artificial rainwater outlets are constructed at the same time for drainage at coastal docks and around Nankang River outlet. 14 rainwater discharge areas will be formed in the planned area.

3.2.7.4 供电工程规划

3.2.7.4 Planning of power supply engineering

规划内容：规划总用电负荷为 207.7 万千瓦。在规划区内新建 220kV 户外变电站 9 座（3 座公用变电站，6 座专用变电站），每座占地 5.28 公顷；新建 110KV 户外变电站 11 座，每座占地 0.96 公顷，电源来自广西主电网及北海电厂。规划片区内的公用环网柜、开闭所、箱变设在人行道上，按每 500 米预留用地，地块面积控制为 4 米×6 米。用户设备由用户根据实际情况，设在用户用地内。

Planning content: the planned total electrical load is 2,077,000kw. It’s planned to construct 9 sets of 220kV outdoor substations in the planned area (3 public substations and 6 special substations). Each substation covers an area of 5.28ha. 11 sets of 110KV outdoor substations will be constructed. Each set of substation covers an area of 0.96 ha. The power comes from the main grid of Guangxi Province and Beihai Power Plant. Public ring main units, switching stations, box transformers, etc. in the planned area are arranged on sidewalks. Land shall be reserved as per 500m distance. Plot area shall be controlled at 4m×6m. User equipment shall be arranged in the user land by users according to actual conditions.

3.2.8 道路交通规划

3.2.8 Planning of road and traffic

3.2.8.1 公路规划

3.2.8.1 Planning of highways

规划形成五个对外道路出口通道，分别是北铁公路东出口、北铁公路西出口、兴港路北出口、营闸路北出口和四号路北出口。其中北铁公路、兴港路、营闸路主要承担物流交通功能。

It’s planned to construct five foreign road exit channels, which are Beitie Highway East Exit, Beitie Highway West Exit, Beitie Highway North Exit, Yingzha Road North Exit and Road 4 North Exit. Wherein, Beitie Highway, Xinggang Road and Yingzha Road are mainly responsible for logistics transportation.

（1）北铁公路：快速路，双向 6 车道，规划红线 70M，西联北海市区，向东规划修建过海隧道（或跨海大桥）连接铁山港湾东岸，目前已建成。

(1) Beitie Highway: it’s a bi-directional expressway with 6 lanes. The planned boundary line is 70M. It connects Beihai City in the west. A cross-harbor tunnel (or cross-harbor bridge) to the east to connect the east bank of Tieshangang Port is planned. Now, it has been completed.

（2）兴港路：快速路，双向 6 车道，规划红线 70M，向北连接玉林至铁山港高速公路及合浦-山口高速公路，目前已建成。

(2) Xinggang Road: it’s a bi-directional expressway with 6 lanes. The planned boundary line is 70M. It connects Yulin - Tieshangang Expressway and Hepu - Shankou Expressway in the north. Now, it has been completed.

（3）营闸路：工业区内主干路，北上为二级公路，双向六车道，规划红线 70M，南联工业区，北接合浦—山口高速公路，目前兴港路至三号路段已建成。

(3) Yingzha road: It’s the trunk road in the industrial park, connecting with Class II highway in the north. It’s a bi-directional roads with six lanes. The planned boundary line is 70M. It connects the industrial park in the south and Hepu - Shankou Expressway in the north. Currently, the section from Xinggang Road to Road Section 3 has been completed.

此外，铁山港区内 4 号路、7 号路、滨海大道等线路已基本建设完成。

Moreover, Road 4, Road 7, Binhai Avenue and other lines in the Tieshangang District have been completed basically.

3.2.8.2 铁路规划

3.2.8.2 Planning of railways

（1）建设合河铁路铁山港支线，向南延伸至沿海港口工业区和仓储区，沿东西方向沿海区域形成支线。目前基本修通，从铁山港到达广西玉林，已经通车。

(1) Build Tieshangang Branch of Hepu - Hechun Railway, extending south to the coastal port industrial area and warehousing area and form a branch line along east-west direction to the coastal area. Currently, it has been basically completed. The section from Tieshangang to Yulin has been open to traffic.

（2）建设 1 个铁路货运站，位于铁山港工业区中部，满足各种货物运输的需求。

(2) Build one railway freight station, which is located in the central part of Tieshangang Industrial Park, capable of satisfying various freight transportation requirements.

（3）规划 3 个小型货运站，分布于沿海铁路支线，满足仓储物流和工业的货物运输要求。

(3) Plan 3 small freight stations, which are located at coastal railway branches, capable of satisfying warehousing, logistics and industrial freight transportation requirements.

（4）在规划区北面规划一座铁路编组站，大量办理货物列车的解体和编组作业。用地规模约 8-10 平方公里。

(4) Plan one railway marshaling station in the northern side of the planned area to handle disassembly and marshaling of freight trains. The scale of land use is about 8-10km^2.

3.2.8.3 港口码头规划

3.2.8.3 Planning of port docks

规划内容：规划建设亿吨大港。以为西部地区和粤西中转大宗物资运输为主，兼顾为石油化工、林浆纸业、船舶修造以及综合工业服务，积极发展装卸及仓储、中转换装、运输组织管理、临港工业、信息服务、生产生活服务、现代物流服务、保税以及配套服务等九大功能。已建成 4 个 10 万 t 级码头，分别为 1#-4#。拟新建 6 个码头，其中 5#-7#为 15 万 t 级，8#-10#为 10 万 t 级。

Planning content: it’s planned to construct a 100,000,000t port. It’s mainly used to transport bulk materials to the west part and West Guangzhou Province while serving petrochemical engineering, forest-pulp-and-paper, ship building and comprehensive industry.

Such nine major functions handling and warehousing, transient reloading, transportation organization management, harbor industry, information service, production and living services, modern logistics services, bonded warehouse and auxiliary services will be developed actively. Now, 4 docks with capacity of 100,000t have been constructed, which are Dock 1, Dock 2, Dock 3 and Dock 4 respectively. 6 docks are proposed, where, Dock 5 - Dock 7 are of 150,000t and Dock 8 to Dock 10 are of 100,000t.

3.2.9 环境保护规划

3.2.9 Planning of environmental protection

1、水环境：广西合浦儒艮国家级自然保护区、山口红树林生态海洋自然保护区、北海珍珠贝海洋保护区的海域为第一类海水水质功能区，海水水质执行《海水水质标准》（GB3097-1997）第一类水质标准；其余近海海域水质达到相应功能区的水质标准（GB3097-1997《海水水质标准》）。

1. Water environment: sea areas of Guangxi Hepu Dugong National Nature Reserve and Shankou Mangrove Ecological Marine Nature Reserve, Beihai Pearl Shell Marine nature reserve are Class I sea water quality function area. Quality of sea water shall comply with Class I water quality standard in Sea Water Quality Standard (GB3097-1997). Quality of water in other offshore sea areas shall reach quality standard in Sea Water Quality Standard (GB3097-1997) of appropriate functional areas.

2、大气环境：项目所在区域大气环境质量为二类功能区，执行《环境空气质量标准》（GB3095-2012）二级标准。

2. Atmospheric environment: atmospheric environmental quality of the area where the project is located belongs to Class II function area, which shall comply with Level II standard in Ambient Air Quality Standard (GB3095-2012).

3、声环境：项目位于铁山港工业区内，声环境质量为 3 类声环境功能区，执行《声环境质量标准》（GB3096-2008）中的 3 类标准。

3. Acoustic environment: the Project is located in Tieshangang Industrial Park. The acoustic environment quality shall be Class 3 acoustic environment function area, complying with Class 3 standard in Environmental Quality Standard for Noise (GB3096-2008).

4、生态环境：保护近岸海域水体的水生生态系统、区域景观格局、周边农业生态系统。

4. Ecological environment: protect aquatic ecosystem, regional landscape pattern and

surrounding agroecological system of the nearby sea water.

3.2.10 铁山港区基础设施建设情况

3.2.10 Construction of infrastructure in Tieshangang district

1、供水

1. Water supply

园区由北海市湖海水利供水有限公司负责园区供水设施的建设，园区从合浦水库群的东岭水库引水，通过 4 条直径 1.2 米、长 26.4km 的供水管网封闭引水至工业区，现已建成水厂一座、加压泵站一座，原水供水能力 44.7 万 m^3/d，净水供水能力 2.5 万 m^3/d，供水覆盖范围 123 平方公里。目前根据园区的道路建设情况，已经铺设完成 DN100 至 DN1800 配套管网共 57.85km，以满足园区落户企业的用水需求。

Beihai Huhai Hydraulic Engineering Water Supply Co., Ltd. Is responsible for constructing water supply facilities of the industrial park. Water is led into the industrial park from Dongling Reservoir of Hepu Reservoir Group through 4 pieces of water supply pipe networks with diameter of 1.2m and length of 26.4km in an enclosed manner. Now, one power plant and one booster pump station have been constructed. The raw water supply capability is 447,000m^3/d, clean water supply capability is 25,000m^3/d and scope of coverage of water supply is 123km^2. According to road construction of the industrial park, altogether 57.85km long DN100 to DN1800 auxiliary pipe networks have been laid to satisfy power consumption requirement of enterprises in the industrial park.

2、供电

2. Power supply

座落在港区的北海电厂项目一期工程两台 30 万 kW 的发电机组已顺利投产发电，平阳至电厂 110kV、电厂至冲口 220kV、电厂至博白 220 kV 线路已全部建成。

Two sets of 300,000kW generator sets of Beihai Power Plant Project Phase I Works located in the industrial park have been put into operation smoothly. Lines from Pingyang to the power plant 110kV, from the power plant to Chongkou 220kV and from the power plant to Bobai 220 kV have been completed.

3、铁路

3. Railways

北海市连通滇、黔、桂三省（区）的国家干线铁路有湘桂线、黔桂线、黔昆线、南昆线和南（宁）防（城）线，钦州至北海的钦北铁路与南防线相接。南宁至北海高速铁

路正式运营，标志着北海迈进了高铁时代；总长 132 公里、投资超过 50 亿元的玉林至铁山港铁路全线铺通；规划建设的合浦～河唇铁路、玉林至铁山港铁路支线将构建铁山港作为大西南便捷的出海通道。北海炼化正在建设的铁路专用线与兴港地区工业铁路相接，与玉林至铁山港铁路、合浦至湛江铁路相连。届时铁山港工业区可与南昆、湘桂、枝柳、京广等国家干线接通。

National trunk railways in Beihai City connecting Yunnan Province, Guizhou Province and Guangxi Province include Hengyang - Pingxiang Railway, Longli - Liuzhou Railway, Guizhou - Kunming Railway, Nanning-Kunming Railway and Nanning- Fangcheng Railway. Qinzhou - Beihai Railway connects with Nanning - Fangchenggang Railway. Official operation of Nanning - Beihai High-speed Railway symbolizes that Beihai has entered into the stage with high-speed railways. Yulin - Tieshangang Railway, with total length of 132km and investment over RMB 5 billion, has been completed. The planned Hepu - Hechun Railway and Yulin - Tieshangang Railway branch will constitute a convenient access to the sea for southwest China. Railway special line under construction of SINOPEC Beihai Refinery is connected with industrial road of Xinggang area, Yulin - Tieshangang Railway and Hepu - Zhanjiang Railway. Then, Tieshangang Industrial Park will be connected with such national trunk railway lines as Nanning-Kunming Railway, Hengyang - Youyiguan Railway, Zhicheng - Liuzhou Railway and Beijing-Guangzhou Railway.

4、公路

4. Highways

已建成的北海--铁山港一级公路直达港口，玉林至铁山港高速公路投入使用，可与北海--南宁、北海--广东的高速公路相连接；贵港至合浦高速公路项目加快推进。铁山港区已建成的道路有进港路、北铁一级公路、进港路，四号路（4 号城市快速干道）机动车道和营闸路（营盘一闸口滨海公路）已经通车，正在建设的有兴港路和七号路。

The completed Beihai - Tieshangang First-class Highway connects with the port directly. After putting into operation, Yulin - Tieshangang Expressway can connect with Beihai - Nanning Expressway and Beihai - Guangdong Expressway. Guigang - Hepu Expressway Project is accelerated. Roads already completed in Tieshangang District include the approach road and Beihai - Tieshangang First-class Highway. The approach road, Road 4 (urban expressway 4) motorway, Yingzha Road (Yingpan - Zhakou Coastal Highway) have been open to traffic. Xinggang Road and Road 7 are under construction.

5、港口

5. Ports

现有石头埠边贸口岸码头、北海电厂 5 万吨级煤码头、3 千吨重件码头，铁山港 1～6#万吨级散货码头已建成，可直接与防城、海南、湛江、越南等地港口通航。进港利用现有 5 万吨级进港航道。北海炼化建设的石化码头已建成通航，该码头设计 2 个 5000 吨级泊位，水工结构按 5 万吨级预留。汽柴油、液化气、石脑油、丙烯、苯、二甲苯、航煤等产品可通过即将建成的 5000 吨级石化码头海运。

Currently, Shitoubu border trade dock, Beihai Power Plant 50,000t coal dock, 3,000t heavy object dock and Tieshangang 10,000t - 60,000t bulk cargo dock have been completed, capable of navigating with ports in Fangcheng, Hainan, Zhanjiang, Vietnam and other places. The existing 50,000t approach channel is used for arriving at ports. Shihua Dock of SINOPEC Beihai Refinery has been completed and open to traffic. The dock is designed with 2 berths with capacity of 5,000t. And hydraulic structures are reserved as per 50,000t. Gasoline, diesel, liquefied gas, naphtha, propylene, benzene, xylene, aviation fuel and other products can be transported through the 5,000t Shihua Dock to be completed.

6、环保设施

6. Environmental protection facilities

①港区污水处理厂

① Port sewage treatment plant

铁山港区污水处理厂建设规模为日处理污水 4 万立方米，配套建设污水收集管网 26.75km，污水泵站 3 座，采用“微孔爆气氧化沟”处理工艺。污水处理厂已于 2014 年 6 月投入试生产，目前部分配套管网已建成，部分配套排污及排雨管道正在建设中。污水处理厂废水处理达到《城镇污水处理厂污染物排放标准》（GB18918—2002）一级 A 标准后尾水通过 B3 排污口深海排放。

According to construction scale of Tieshangang District, daily sewage treatment is 40,000m^2, 26.75km long sewage collection pipe network and 3 sewage pump stations will be constructed. “Micropore oxidation detonating gas ditch” treatment process is used. The sewage treatment plant has been put into trial operation since June 2014. Currently, some auxiliary pipe networks have been completed. Some auxiliary sewage discharge and rain pipes are under construction. After wastewater from the sewage treatment plant reaching Class IA standard in Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant (GB18918-2002), tail water shall be discharged into deep sea via B3 sewage draining exit.

②深海排放管网工程

② Deep-sea discharge pipe network project

铁山港区污水深海排放工程路上管网已建成，海域段正在建设；海域管道自陆上深海排放井 B3 排放口约 4km，其中浅埋段排海管线 750m 采用 DN1500 钢管，管底高程+3.0m；深埋段长约 3200m 采用 DN2000 钢管，管底高程-21.5m；扩散管段长 400m，扩散管段排海管线主体部分管底高程-13m，起始端为 DN1500 钢管，管径逐段减小，末段为 DN300 钢管，沿管线布置有 DN300 竖向排水管，间距 8m，工程总投资约 2.5 亿元。目前已投入使用。

Land part pipe network of sewage deep-sea discharge pipe network project of Tieshangang District has been completed. The ocean section is under construction. Pipes in oceans are about 4km from land deep-sea discharge well B3 sewage draining exit, where, 750m seaward sewage discharge pipelines of the shallow buried section use DN1500 steel pipes and the pipe bottom elevation is +3.0m. 3200m long pipelines of the deep buried section use DN2000 steel pipes and the pipe bottom elevation is -21.5m. The diffuser section is 400m long. The pipe bottom elevation of the main part of seaward sewage discharge pipelines of the diffuser section is -13m. DN1500 steel pipes are used at the starting end. The pipe diameter reduces section by section. DN300 steel pipes are used at the end. DN300 vertical drainage pipes are arranged along pipelines at an interval of 8m. The total investment of the Project is about RMB 250 million. Currently, it has been put into operation.

③铁山港区集中供热工程

③ Central heating works of Tieshangang District

目前工业区已建有集中供热蒸汽管网，设一支供热管道由北海电厂向铁山港区供应热蒸汽，管道总长度约 15 公里，最大供汽量约 200 吨/小时。

Currently, central heating steam pipe network has been constructed in the industrial park. One heating supply pipeline is arranged to supply superheated steam from Beihai Power Plant to Tieshangang District. The pipes, with total length of about 15km, have maximum steam supply quantity of about 200t/h.

④固体废物填埋场

④ Solid waste landfill

工业区规划建设一座一般工业固废填埋场，选址位于北海市铁山港工业区中石化配

套道路以南，中石化火炬区以东，规划总用地面积约为 100000 平方米，作为一般工业固体废物的贮存、处置 II 类场，填埋库区面积约为 54000 平方米，填埋库容约为 45.08 万立方米，服务年限 15 年。目前项目环评文件已获批复，目前正在建设。

One general industrial solid waste landfill is planned to be built in the industrial park. It’s located to the south of auxiliary roads for petrochemical and east of SINOPEC torch area of Beihai Tieshangang Industrial Park. The total planned area is about 100,000m^2. It will be deemed as Class II yard for storage and disposal of general industrial solid wastes. The area of the landfill is about 54,000m^2, the landfill storage capacity is about 450,800m^2 and service life is 15 years. Currently, environmental impact assessment documents of the Project has been approved and the Project is under construction.

⑤北部湾资源再生环保服务中心

⑤ Beibu Gulf Resource Regeneration and Environmental Protection Service Center

工业区规划建设一座危险废物处置场，即北部湾资源再生环保服务中心项目，项目优先处置北部湾表面处理中心项目以及北海市工业企业所产危险废物，并辐射广西北部湾地区及周边危险废物产废单位。总建设规模为年处理危险废物 14.8 万吨，（一期 6.4 万吨/年，二期 8.4 万吨/年）。其中，一期 6.4 万吨/年包括：焚烧处理 1.65 万吨/年，固化填埋处理 3 万吨/年（其中处置项目内部产生废物为 1.5 万吨/年），物化处理 1 万吨/年，蚀刻液综合利用 0.75 万吨/年。目前一期项目环评文件已获批复，目前正在开工建设，尚未投入使用。

One hazardous waste disposal site is planned to be constructed in the industrial park, i.e., Beibu Gulf Resource Regeneration and Environmental Protection Service Center Project. Hazardous wastes generated from Beibu Gulf Surface Treatment Center Project and Beihai industrial enterprises will be disposed in priority. And it will also serve hazardous waste production organization in Guangxi Beibu Gulf area and surrounding areas. It can dispose 148,000t hazardous wastes per year (Phase I: 64,000t/a; Phase II: 84,000t/a). Wherein, 64,000t/a of Phase I includes: 16,500t/a incineration treatment, 30,000t/a solid chemical landfill (wherein, the disposal project will generate 15,000t/a wastes), 10,000t/a physical and chemical treatment and 7,500t/a comprehensive utilization of etching solution. Currently, environmental impact assessment documents of Phase I Project has been approved. Phase I Project is under construction. It hasn’t been put into operation yet.

3.3 区域饮用水源、敏感目标、污染源调查

3.3 Investigation of regional drinking water sources, sensitive targets and pollution sources

3.3.1 区域饮用水源地情况

3.3.1 Conditions of regional drinking water source

经过调查，项目评价范围内无集中式饮用水源地分布。项目周边村屯主要水源为地下水，通过分散民井供水。

According to investigation, there is no centralized drinking water source distributed in the scope of assessment of this project. Main water sources for villages around the Project are groundwater. Villagers take water from dispersed wells.

3.3.2 区域敏感目标

3.3.2 Regional sensitive targets

项目位于北海铁山港（临港）工业区，陆域评价范围内无风景名胜区、自然保护区、饮用水源地保护区、集中式饮用取水口等敏感保护目标，也无珍稀动、植物物种，主要环境敏感目标为居住区，包括川江、邓屋、坡尾底、新铺村等村屯。项目厂区内分布有岸泽村、北暮村等敏感目标，厂区外最近敏感目标为项目用地南面的川江和坡尾底。

The project is located in Beihai Tieshangang (Linhai) Industrial Park. There is no scenic resort, natural reserve, drinking water source protection zone, centralized drinking water intake and other sensitive protection target in the scope of assessment of this project. Besides, there is no rare animal or plant discovered too. Main environmentally sensitive targets are residential areas, including Chuanjiang Village, Dengwu Village, Poweidi Village, Xinpu Village and other villages. Anze Village, Beimu Village and other sensitive targets are distributed in the plant area. Chuanjiang and Poweidi on the southern side of the project area are the nearest sensitive objects outside the plant area.

项目废水最终在铁山港排污区 B3 排污口深海排放，纳污海域分布有山口国家级红树林自然保护区（东北面，距离核心区 6km、试验区 3km）、广西合浦儒艮国家级自然保护区（东面，距离 5km）、营盘附近农渔业区（西南面，距离 12km）、北部湾二长棘鲷长毛对虾国家级种质资源保护区（西南面，距离 12km）等。

Wastewater generated from the Project is finally discharged to the deep sea via B3 sewage draining exit of Tieshangang sewage discharge area. The sea area affected by pollution includes Shankou National Mangrove Nature Reserve (northeast side, 6km from the core area and 3km from the pilot area), Guangxi Hepu Dugong National Nature Reserve (east side, 5km), agriculture and fishery area around Yingpan (southwest, 12km), Beibu Gulf

Parargyrops Edita and Penaeus Penicillatus National Aquatic Germplasm Resource Nature Reserve (southwest side, 12km), etc.

区域生态敏感目标情况如下：

Refer to the following for regional ecological sensitive targets:

3.3.2.1 广西合浦儒艮国家级自然保护区

3.3.2.1 Guangxi Hepu Dugong National Nature Reserve

（1）总体概况

(1) Overview

1）建设概况

1) Construction overview

1986 年，广西壮族自治区人民政府以桂政办函[1986]122 号文和桂编[1986]192 号文批准成立自治区级合浦儒艮自然保护区；1992 年 10 月，国务院国函[1992]166 号文批准保护区为国家级自然保护区。1996 年成立广西壮族自治区合浦儒艮国家级自然保护区管理站，是儒艮自然保护区的管理机构，隶属广西壮族自治区环境保护局。

In 1986, People's Government of Guangxi Zhuang Autonomous Region approved establishment of autonomous region level Hepu Dugong Nature Reserve through GZBH [1986] 122 and GB [1986] 192. In October 1992, the State Council approved the nature reserve as national nature reserve through GH [1992] 166. In 1996, Hepu Dugong National Nature Reserve Management Station of Guangxi Zhuang Autonomous Region was established. It’s a management organization of Dugong Nature Reserve subordinate to the environmental protection agency of Guangxi Zhuang Autonomous Region.

2）位置和范围

2) Position and scope

广西合浦儒艮国家级自然保护区位于中国广西壮族自治区北海市合浦县东南部海域，东起合浦县山口镇英罗港，西至沙田镇海域，海岸线全长 43km。具体界线为北部湾地理坐标（109°38′30″，21°30′）、（109°46′30″，21°30′）、（109°34′30″，21°18′）、（109°44′，21°18′）四点连线内的海域。

Guangxi Hepu Dugong National Nature Reserve is located in southeast sea area of Hepu County, Beihai City, Guangxi Zhuang Autonomous Region, China. It starts from Yingluo Port of Shankou Town of Hepu County and ends at sea area in Shatian Town. The total length of the coastline is 43km. It refers to the sea area within boundary lines connected by such four points with geological coordinates as follows: (109°38′30″, 21°30′), (109°46′30″ , 21°30′), (109°34′30″, 21°18′) and (109°44′, 21°18′).

3）面积和功能区划

3) Area and function division

广西合浦儒艮国家级自然保护区总面积 35000 hm^2，其中核心区面积 13200 hm^2，缓冲区面积 11000 hm^2，实验区面积 10800 hm^2，是我国唯一的儒艮自然保护区，具体见图 3.3.2-1。

The total area of Guangxi Hepu Dugong National Nature Reserve is 35,000 hm^2, including 13,200 hm^2 core area, 11,000 hm^2 buffer area and 10,800 hm^2 pilot area. It's the only Dugong Nature Reserve in China. Refer to Fig. 3.3.2-1 for details.

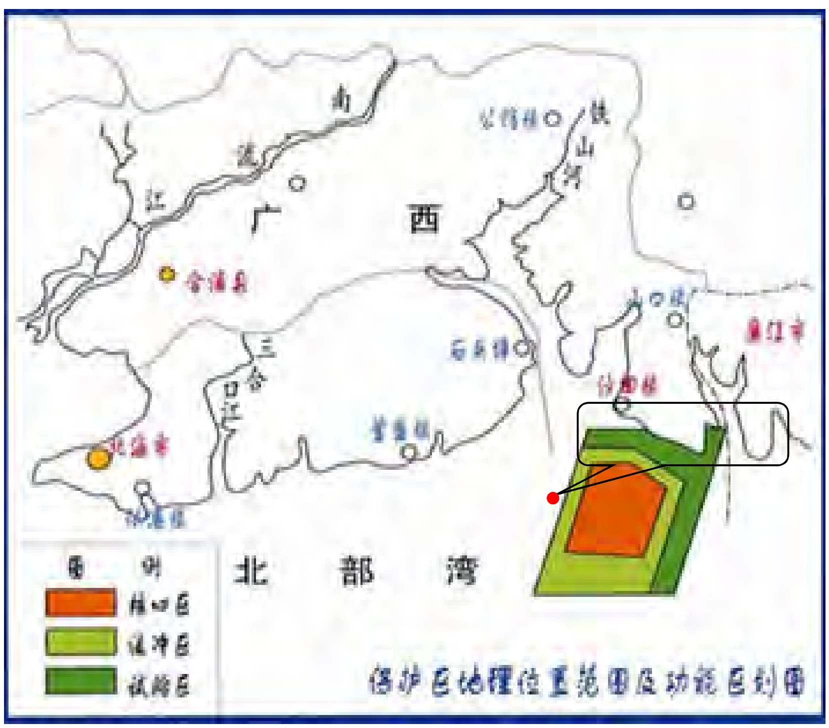


图 3.3.2-1　广西合浦儒艮国家级自然保护区地理位置范围及功能区划图

Fig. 3.3.2-1 Scope of geological position and function division chart of Guangxi Hepu Dugong National Nature Reserve

4）主要保护对象

4) Major protection objects

图 3.3.2-2　儒艮（左）和中华白海豚（右）

Fig. 3.3.2-2 Dugong (Left) and Chinese white dolphin (right)

①保护以儒艮和中华白海豚（见图 7.4.2）为主的珍稀海生动物及其栖息环境，维护生物多样性；②保护儒艮的主要食料——茜草、龟蓬草等海生植物，保护海草床生态系统。

① Protect valuable and rare sea animals mainly including dugongs and Chinese white dolphins (See Fig. 7.4.2) and their habitat environment and maintain biodiversity; ② Protect main foodstuff - *madder, Holophila ovalis* and other sea plants of Dugongs and the sea grass bed ecosystem.

（2）评价海域儒艮资源概况

(2) Evaluate overview of Dugong resource in the assessed sea area

广西合浦儒艮国家级自然保护区有海底深槽，深槽附近有滩涂，滩涂上生长着儒艮的主要食物——二药藻和喜盐草。这里海水温度、盐度等理化性质均适合儒艮生长，是儒艮在我国的主要栖息地之一，但目前在保护区内儒艮十分稀少，保护儒艮已迫在眉睫。

There are deep grooves in Guangxi Hepu Dugong National Nature Reserve. Mud flat is around deep grooves. Halodule Endl, Halophila ovalis and other main food of dugongs are growing on the mud flat. Temperature, salinity and other physical and chemical properties of seawater here are appropriate for growth of dugongs. However, currently, there is only a little dugongs in the nature reserve. It's urgent to protect dugongs.

1）生物学特征

1) Biological characteristics

儒艮属（Dugong）儒艮属海牛目儒艮科（Dugongidae），别名：海牛、人鱼、美人鱼、南海牛等，属濒临灭绝的珍稀海洋哺乳动物，被列入《中国国家重点保护野生动物名录》国家一级重点保护水生野生动物和《中国濒危动物红皮书》濒危级（E）。

Dugongs belong to Dugongidae of Sirenia Order. It's also named as sea cow, merman, mermaid, South China sea cow, etc. It's a type of endangered and rare sea mammal listed in List of Wildlife under Special State Protection, as Class I Aquatic Wildlife under Special State

Protection and endangered level (E) in China Red Data Book of Endangered Animals.

儒艮个体大型，体长 2.4~4.0m，体重 230kg~908kg。体呈纺锤形，身体肥圆，无明显颈部，头部比例小。头前端如截形，向下方倾斜；吻端突出，宽而扁平的嘴位于吻部末端下方，向腹面张开；鼻孔位于吻部顶端，眼小，无背鳍。儒艮没有外耳壳，只有小的耳孔，后肢仅存简单肢带，体末端有扁平尾鳍。成体背部深灰色，幼体呈奶油色，全身长有稀而细短毛。

Dugongs are quite large, 2.4~4.0m long and 230kg~908kg heavy. Dugongs, of spindle form, are quite fat and round. Necks are not obvious and ratio of heads is relatively small. The front end of the head is of truncating form inclining downward. The rostral side is quite outstanding. The wide and flat mouth is below the end of the rostral side and open to the abdomen. Nares are on top of the rostral side, eyes are small and no dorsal fins are found. Dugongs don’t have outer earlaps. Only small earholes can be found. As for hind legs, only simple limbs can be discovered. Flat tail fins can be discovered at the end of the body. The back of the adult dugong is dark gray and the back of the infant dugong is of cream color. Dugongs have long, sparse, fine and short fur all over the body.

2）分布

2) Distribution

世界上现存儒艮大部分在澳大利亚北部沿，我国儒艮分布区狭窄，数量稀少，文献记载儒艮在中国海域分布于广西沿岸、广东、海南和台湾沿岸。其中广西沿海，由合浦县英罗港至防城港竹山港一带均有儒艮分布，包括了北海、钦州、防城沿海海域，但以北海市合浦县沙田一带海域发现的最多，主要分布在北海市营盘至合浦沙田 2m~30m 水深海域，即铁山港口门及外侧附近海域。但根据调查发现铁山港口门西侧营盘一带海域近年没有发现儒艮活动踪影，推测分析可能与这一带海区人类生产活动和生态环境改变有关，儒艮正常栖息、摄食受到影响，迫使儒艮往东部海区迁移。

Most dugongs on the world are distributed in northern part of Australia. The dugong distribution area in China is quite narrow. Only small amount of dugongs can be found. According to literatures, dugongs are distributed on banks along Guangxi Province, Guangdong Province, Hainan Province and Taiwan Province. Where, dugongs are distributed from Yingluo Port of Hepu County to Zhushangang of Fangchenggang along seas of Guangxi Province, including coastal waters of Beihai, Qinzhou and Fangcheng. However, most dugongs are discovered along the sea in Shatian Town, Hepu County, Beihai City. Most of them are distributed in 2m~30m deep sea area from Yingpan of Beihai City to Shatian Town of Hepu County, i.e., Tieshangang entrance and surrounding external sea areas. However, according to investigation, recently, no dugong is discovered in Yingpan sea area on the west side of Tieshangang entrance. According to estimation and analysis, it might be related to production activities of mankind in the sea area and changes in ecological environment. Normal inhabit and ingestion of dugongs are affected, forcing dugongs migrating to the east sea area.

3）栖息环境与生活习性

3) Habitat environment and life habit

儒艮为海洋哺乳动物，草食性，一般栖息在深度不超过 20 米的海底，白天静卧海底，夜幕降临开始觅食。它们以浅海海沟、滩涂中海藻、水草等为食，喜群体活动。广西沿海儒艮幼年期（1 年多）以母乳为食，成体主要以潮间带和浅海二药藻（*Holoduie uninervis*，俗称茜草）和喜盐草 （*Holophila ovalis*，俗称龟蓬草）为食，食量很大，摄食量想当于体重的 5%~10%。其摄食活动区随潮汐涨落而移动，涨潮时成群来吃草，退潮后离去。多单独及 2~3 头或小群活动，儒艮游泳能力较弱，平均游泳速度 3km/h。

Dugongs are sea mammals of herbivority. Generally, they are inhabiting on the sea bottom with depth not exceeding 20m. They lay horizontally on the sea bottom during daytime and start to find food in the evening when darkness has fallen. They take alga, aquatic plants and others on shallow trenches and mud flat as food and prefer group activities. During the infant period (over 1 year), dugongs in coastal areas of Guangxi take breast milk. The adults mainly take *Holoduie uninervis* and *Holophila ovalis* on the intertidal zone and shallow sea as food. They eat much food with food ration equivalent to 5%~10% of body weight. The food intake movement area moves with tiding. They eat grass in groups during rising tide and leave away during falling tide. During most time, one dugong, 2~3 dugongs, or a small group of dugongs move together. Their swimming ability is quite weak. Average swimming speed is 3km/h.

4）种群现状

4) Current situations of population

根据资料分析，20 世纪 70 年代前广西儒艮自然种群资源数量尚较丰，但由于近年来的各种致危因素，现种群数量已极枯竭。据已有的调查观测和报道，在保护区范围内已多年没有获得儒艮的照片和实体证据，目前保护区范围内儒艮已极少，具体数量不详。

据报道，最近一次发现儒艮是 2006 年 4 月 3 日，在合浦儒艮国家级自然保护区所在地沙田镇附近海边发现一头约重 200kg 儒艮。表 3.3.2-1 是根据历史记录、调查和统计资料汇总的合浦县沙田海域儒艮历史被发现和捕捉情况统计表。由表 3.3.2-1 可见，与历史比较，现在儒艮数量已降低到极少。

According to data analysis, natural population resource is quite rich in Ruliang County, Guangxi Province before 1970s. However, due to many dangerous factors in recent years, current population quantity is nearly extinct. According to existing investigation, observation and report, photos and physical evidences of dugongs haven't been obtained in recent years within the area of the nature reserve. Currently, there is only a few dugongs in the nature reserve. And detailed quantity is not clear. According to reports, it was on Apr. 3, 2006 that the dugong was discovered for the last time. One dugong with weight of about 200kg was discovered by the seaside around Shatian Town, where Hepu Dugong National Nature Reserve is located. Table 3.3.2-1 shows statistics of discovery and capture conditions of dugoons in the history in Shatian sea area of Hepu County summarized according to history, investigation and statistical data. We can see from Table 3.3.2-1 that compared with those in the history, quantity of dugoons has been reduced to the minimum amount.

广西合浦儒艮国家级自然保护区管理站曾委托南京师范大学 2010 年 12 月-2012 年 4 月期间对合浦儒艮自然保护区及邻近水域进行过儒艮种群现状的调查，根据调查报告，在 2010 年 12 月-2012 年 4 月调查期间，野外船只调查未发现儒艮实体。采访问卷调查表明，2000 年以后当地没有人看到死亡个体或实体。调查报告分析认为考虑到目前调查海域的儒艮的主要食物海草分布的情况，很难有儒艮在沙田及周边水域长期存活。

Guangxi Hepu Dugong National Nature Reserve Management Station had entrusted Nanjing Normal University to investigate current situations of dugoon population in Hepu Dugong National Nature Reserve and surrounding water area during Dec. 2010 - Apr. 2012. According to the investigation report, during the period from Dec. 2010 - Apr. 2012, no dugoon is discovered through outside ship investigation. According to questionnaire investigation, no dead or live dugoon is discovered by local people since 2000. According to analysis of the investigation report, taking into consideration of distribution of the sea grass mainly eaten by dugongs, it's hard for dugongs to live in Shatian Town and surrounding water area for a long time.

表 3.3.2-1 广西北海市合浦县沙田海域儒艮历史被发现和被捕捉情况统计表
Table 3.3.2-1 Statistics of discovery and capture conditions of dugoons in the history in Shatian sea area, Hepu County, Beihai City, Guangxi Province

记录、调查统计时间 Recording, investigation and statistical time	发现或捕捉儒艮数量 Quantity of dugongs discovered or captured	备注 Remarks
1955.5.14	发现1头 One	北海海滩，重 416kg 雄性儒艮 Beihai beach, male dugoon with weight of 416kg
1958~1962	捕捉216头 216 heads captured	
1975~1976	2年发现28头 28 heads discovered in 2 years	
1976	捕捉23头 23 heads captured	科研型捕捉 Research-based type capture
1978~1994	56头次 56 head times	沙田海域 51 头次；北海市附近海域 4 头次 51 head times in Shatian sea area and 4 head times in sea area around Beihai City
1997.2~2001.7	31头次 31 head times	活的 28头次，死的3。头 28 head times of live dugongs and 3 dead heads.
2006.4.3	发现1头 One	沙田海域 Shatian sea area

（3）评价海域中华白海豚资源概况

(3) Overview of Chinese white dolphin resource in the assessed sea area

1）生物学特征

1) Biological characteristics

中华白海豚属目海豚科（Delphinidae）弓背海豚属（Sousa），属我国珍稀濒危的国家一级保护海洋哺乳动物。身体修长，呈流线型、纺锤状，吻突狭长，呈侧扁状；头额部隆起，呈半球形；眼小且呈椭圆形；外耳孔小；呼吸孔一个，位于头顶部；背鳍呈三角形，位于体背中间；鳍肢短而宽；尾柄高而侧扁。身体多呈乳白色，初生时体长 1m 左右，成年个体长达 2.2m~2.5m 左右。幼体及未成年个体背部灰蓝色，腹部灰白色；成年个体全身呈粉红色或背、腹和尾部粉红色；体表多处散布灰黑色斑点。

Chinese white dolphins belong to Sousa Genus of Delphinidae Family. It's a type of Class I rare and endangered sea mammal under state protection in China. Chinese white dolphins are of slender, fairshaped and cambiform body, long and narrow and flat type muzzle, raised hemispheric head, small and oval eyes, small outer earholes, one blow hole on the head, triangular dorsal fin on the back, short and wide flippers and high and flat side tail caudal peduncle. Chinese white dolphins are of milk white. They are about 1m long at the time of birth. And adult Chinese white dolphins are about 2.2m~2.5m long. Both infant and adult

Chinese white dolphins have grayish blue backs and offwhite abdomens. The entire body is pink or the back, abdomen and tail are pink. Ash black spots are distributed on many parts of the surface.

2）分布

2) Distribution

中华白海豚为近海暖水性小型齿鲸类，主要分布于河口咸淡水交汇水域，在我国东海和南海都有分布，主要活跃在香港北大屿山一带海域、厦门九龙江口水域、广东珠江口等水域。在广西沿海也经常发现，主要分布于北海、合浦、钦州、防城，其中以钦州三娘湾一带资源较丰。根据南京师范大学和广西合浦儒艮国家级自然保护区管理站 2012 年专题调查研究报告，在广西合浦儒艮国家级自然保护区及铁山口门外海域也分布有中华白海豚。

Chinese white dolphins are small offshore warm toothed whales which are mainly distributed in the water area where salt water and fresh water at the estuary are connected. They are also distributed in East Sea and South Sea in China, mainly active in the sea area around Dayu Mountain, Hongkong, water area at the entrance of Jiulong River of Xiamen, Guangdong Pearl River port and other water areas. They are also frequently found in seas along Guangxi Province, mainly including Beihai, Hepu, Qinzhou and Fangcheng. Where, there are plenty of Chinese white dolphins in Sanniang Bay, Qinzhou. According to theme investigation and research report conducted by Nanjing Normal University and Guangxi Hepu Dugong National Nature Reserve Management Station jointly in 2012, Chinese white dolphins are distributed in Guangxi Hepu Dugong National Nature Reserve and the sea area outside Tieshangang entrance.

3）栖息环境与捕食、繁殖

3) Habitat environment, predation and breeding

中华白海豚多栖息在港湾及河口一带，一般都生活在习惯海区，洄游路线较短，不集结成大群，一般 2~3 头或 3~5 头游动。多雌雄或母子豚一起并游。中华白海豚性情活泼，善于游泳，喜欢随饵料而游，常沿岩礁海域捕食鱼类，食物主要是活动在海湾的小动物，如鱼、磷虾等。冬、春两季大潮涨潮时间，常尾随鱼群进入内湾小港，直至低潮前后，吞够了足够的食物之后，才徐徐退出。夏秋两季常迂回在作业渔船周围，有时也上溯江河。

Chinese white dolphins are mostly inhabiting in harbors and estuaries. Generally, they are living in customary sea area. The breeding migration line is relatively short. Generally, 2~3 heads or 3~5 heads are moving together. Most of the time, male and female Chinese white dolphins or mother and child Chinese white dolphins are moving together. Chinese white dolphins are quite lively, good at swimming and prefer swimming with baits. They frequently prey on fish in the sea area with lithoherm. The food are mainly small animals moving in the harbors, for example, fish, euphausiid, etc. During rising tide of winter and spring tide, Chinese white dolphins usually follow the fish school into the small harbor of the inner bay and then return to the sea after eating enough food till around low tide. During summer and autumn, Chinese white dolphins usually detour around fishing vessels. Sometimes, they may swim upstream into rivers.

中华白海豚大多喜欢在春、夏季交配，母豚的怀孕期约为 11 个月左右。每胎大多只怀一头小海豚，出生后母豚需哺乳幼豚至少一年。母豚大多间隔至少 3 年才生一胎，繁殖能力可以说是相当低的。

Most Chinese white dolphins prefer to mating in spring and summer. The duration of pregnancy of female dolphins is around 11 months. The female dolphin can give birth to only one baby dolphin per time. After birth of the baby dolphin, the mother dolphin will provide breastfeeding for at least one year. Mother dolphins can give birth to one baby dolphin per at least 3 years. Therefore, we can say that the fertility is relatively low.

4）活动方式

4) Mode of activity

中华白海豚通过头部背面的半月形呼吸孔露出水面呼吸空气。迁移、觅食、求偶、集群和嬉戏时会跃出水面，两次间隔 1-5 分钟，平时最常见到其露出水面的背鳍。多数时间是潜入水中或较长时间贴紧水面，仅呼吸孔露出水面进行呼吸。

Chinese white dolphins breathe air by exposing the half-moon-shaped spiracle on the back of the head out of water. They may jump out of water during migration, finding food, courtship, gathering and playing at an interval of 1-5 min. At ordinary times, dorsal fins are mostly frequently seen. During most of the time, Chinese white dolphins are diving into water or closing to water surface for a long time, breathing by exposing spiracles out of water.

中华白海豚游泳的速度很快，有时可达每小时 12 海里以上。呼吸的时间间隔不规律，有时 3-5s，有时为 10-20s，也有时长达 1-2m。其生活还会配合潮水涨退和日出日落的时间：涨潮时是它们捕食的时间，活动最频繁的时间是黎明和黄昏。

Chinese white dolphins can swim rapidly. Sometimes, Chinese white dolphins can reach over 12 sea miles per hour. The breathing interval is irregular, sometimes, 3-5s, 10-20s, or 1-2m. Their life is also connected with ebb and flow and sunrise and sunset. They are prey on food at the time of rising tide and move around most frequently during dawn and nightfall.

5）种群现状

5) Current situations of population

2003 年 9-10 月及 2004 年 4 月广西合浦儒艮自然保护区工作人员与南京师范大学专家联合考察发现中华白海豚 77 头次，发现中华白海豚数量仅 39 头；观察到的中华白海豚种群结构合理，是具有老年、中年和幼仔的种群，且具有繁衍能力，一年四季均有活动。

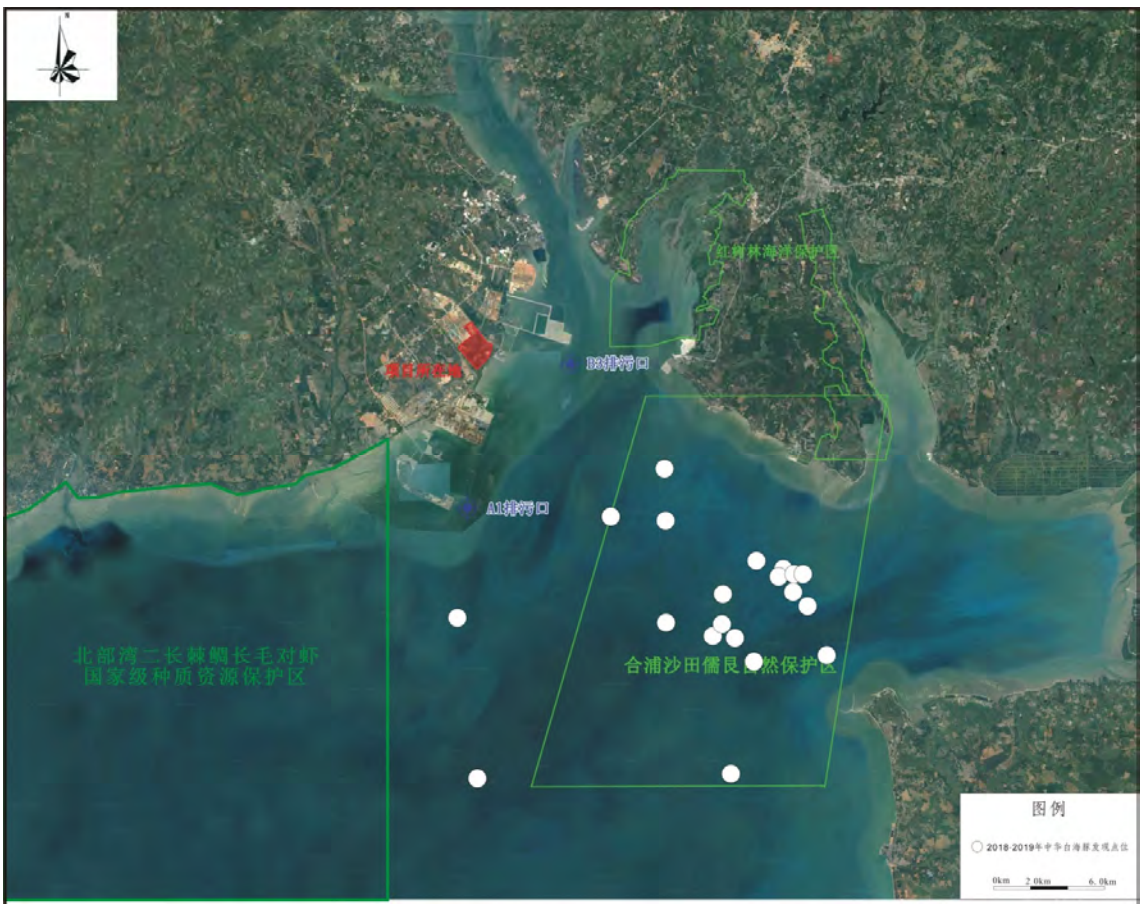
According to combined investigation conducted by workers of Guangxi Hepu Dugong National Nature Reserve and experts from Nanjing Normal University in September - October, 2003 and April, 2004, 77 head times of Chinese white dolphins were found, and only 39 heads were found. According to the observation, the Chinese white dolphin population is featuring reasonable structure including old dolphins, middle-aged dolphins and young dolphins. The population is featuring breeding capability and moving during all four seas of the year.

2011-2012 年，广西合浦儒艮国家级自然保护区管理站联合南京师范大学对儒艮保护区保护对象进行了一次全面综合科学考察活动。在考察中，共发现中华白海豚 18 次，318 头·次，综合 Popan 模型和发现曲线模拟法，估算沙田海域中华白海豚数量约为 90 至 120 头，遇见率为 0.107 头/公里。发现国家二级保护动物江豚 6 次，遇见率为 0.005 头/公里。江豚主要分布于中华白海豚的外围远岸水域，同时两个物种的分布区有小部分重叠，与 2005 年调查相比中华白海豚核心域向东扩增至沙田正南区域。该次科考在保护区内发现的这个中华白海豚种群是一个非常活跃的种群，种群中“青壮年”个体占比重最大，繁殖能力强，种群非常健康，其可觅食的鱼类资源也非常丰富。

In 2011- 2012, Guangxi Hepu Dugong National Nature Reserve Management Station and Nanjing Normal University conducted a comprehensive scientific investigation activity for protection targets within the Dugong National Nature Reserve. According to the investigation, Chinese white dolphins were discovered for 18 times and 318 head times. According to the Popan model and development curve simulation method, it was estimated that there were about 90 to 120 heads of Chinese white dolphins in Shatian sea area and the encounter rate was 0.107 head/km. Class II animal under state protection cowfish were discovered for 6 times and the encounter rate was 0.005 head/km. Cowfish was mainly distributed in periphery offshore waters of Chinese white dolphins. Meanwhile, the distribution area of two species were overlapping to some extent. Compared with the investigation in 2005, core area of Chinese white dolphins are extending east to the area on the south side of Shatian Town. According to the investigation, the Chinese white dolphin was a very active population. The ratio of “young adults” in the population was the largest. The fertility is strong, the population is very healthy and the foraging fish resources are very rich.

根据最新的 2018 年~2019 年调查，估算儒艮自然保护区及周边海域中华白海豚数量保守估算约为 106 头。发现位置见图 3.3.2-3。

According to the latest 2018~2019 investigation, it was estimated that conservative number of Chinese white dolphins in Dugong National Nature Reserve and surrounding sea areas was about 106 heads. Refer to Fig. 3.3.2-3 for the discovery position.



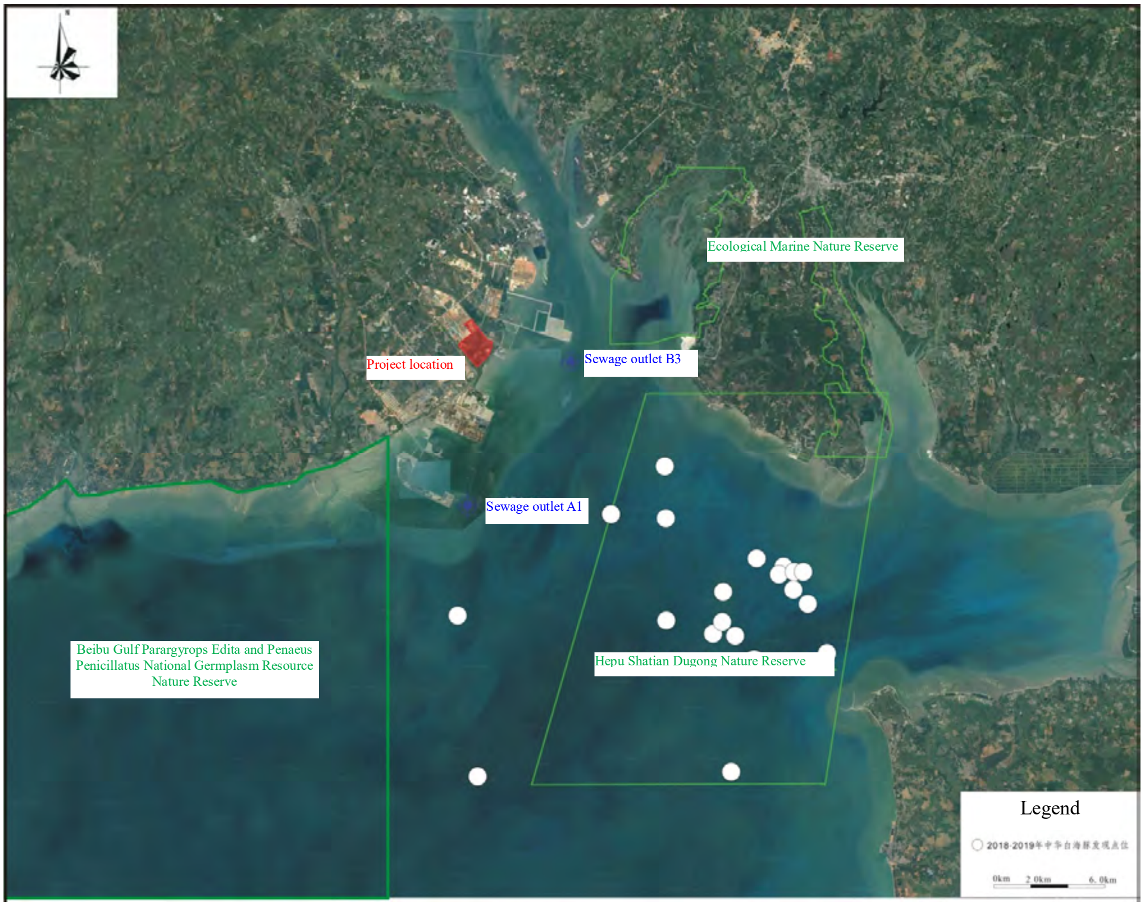


图 3.3.2-3 儒艮自然保护区及周边海域中华白海豚发现位置示意图

Fig. 3.3.2-3 Sketch of discovery position of Chinese white dolphins in Dugong National Nature Reserve and surrounding sea areas

（4）评价海域海草资源概况

(4) Overview of sea grass resources in the assessed sea area

1）生态学特征

1) Ecology characteristics

海草是生活于热带和温带海域浅水中的单子叶、水生种子植物，是唯一淹没在浅海水下的被子植物，其花在水下结果，然后再发芽。海草生长在中潮带至潮下带，有发育良好的根状茎[水平方向的茎），且紧密结合在一起，根具根毛；叶片柔软，呈带状或切面构造为圆柱状，海草的花着生于叶丛的基部，雄蕊（花药）和雌蕊（花柱和柱头）高出花瓣以上；花粉一般为念珠形且黏结成链状。

Sea grass is monocotyledon and aquatic seed plant living in shallow water in the tropical and temperate sea area. It’s the only angiosperm submerged in shallow sea water. Flowers bear fruits under water and then fruits will sprout out. Sea grass, growing between middle intertidal zone and subtidal zone, has well-developed rhizome (horizontal stem) bonded tightly. The leaves are quite soft, of strip type or cylindrical section structure. Flowers of sea grass are growing at bases of leafage. Stamen (anther) and pistil (stylus and stylus head) are higher than petals. Generally, pollens are of moniliform form and bonded into chains.

2）评价海域海草床分布概况

2) Overview of distribution of sea grass bed in the assessed sea area

根据广西壮族自治区合浦儒艮国家级自然保护区管理站《广西壮族自治区合浦儒艮国家级自然保护区海草资源现状调查报告》，评价海域海草主要分布在合浦附近海域，即英罗-铁山港的潮间带和浅海区域，近五年调查结果显示该区域主要分布着 6 块海草床，即北暮、淀洲沙沙背、淀洲沙下龙尾、榕根山、九合井底、英罗，其中榕根山、九合井底、英罗海草区位于广西合浦儒艮国家级自然保护区内（图 3.3-3）。其中北暮海草床区，2012 年 7 月后由于受区域海洋开发活动影响，潮间带滩涂上已被沙覆盖，该片海草床已不存在。

According to Report on Status Survey of Sea Grass Resources in Guangxi Hepu Dugong National Nature Reserve of Guangxi Hepu Dugong National Nature Reserve Management Station, sea grass in the assessed sea area is mainly distributed in the sea area around Hepu, i.e., intertidal zone and shallow sea area of Hepu - Tieshangang District. According to five years investigation results, the area is mainly distributed with 6 pieces of sea grass beds, i.e., Bei Mu, Dianzhousha Shabei, Dianzhousha Xialongwei, Ronggenshan, Jiuhe Jingdi, Yingluo, where, Ronggenshan, Jiuhe Jingdi and Yingluo sea grass areas are located in Guangxi Hepu Dugong National Nature Reserve (Fig. 3.3-3). Wherein, due to impact of regional ocean development activity, the intertidal zone mud flat of Beimuhai grass bed has been covered with sand since July 2012. The sea grass bed no longer exists.

本项目排污口距离东北侧淀洲沙沙背和下龙尾海草区较近，最近距离约 3km（附图 2-2）。

The sewage outlet of the Project is nearby Dianzhousha Shabei and Xialongwei sea grass areas. The shortest distance is only about 3km (Fig. 2-2).

近七年的调查数据显示，合浦海草床总面积 2011 年 29.32 公顷，2012 年 44.09 公顷，2013 年 90.97 公顷，2014 年急剧下降到 2 公顷，主要原因可能是铁山港疏浚作业，产生大量淤泥将海草床覆盖，影响了沙背和下龙尾两处海草床的正常生长，另外 2014

年 2 月至 5 月浒苔爆发，堆积覆盖海滩厚度达 30 厘米以上，严重影响了海草的光合作用，导致海草床总面积萎缩。2015 年，因浒苔爆发缓解，疏浚力度减弱，同时广西壮族自治区合浦儒良国家级自然保护区积极开展海草床生境保护与恢复工作，与当地政府及相关部门加大巡护执法力度、进行海草人工种植恢复等，合浦海草床总面积上升至 25 公顷。2016 年合浦海草床海草面积 99.4 公顷，面积继续上升，但海草种类开始呈现单一化趋势，日本鳗草加速退化，仅零星分布九合井底海草床，目前海草主要以卵叶喜盐草为主。

According to investigation data in the last seven years, the total area of Hepu sea grass bed was 29.32 ha. in 2011, 44.09 ha. in 2012 and 90.97 ha. in 2013. It was dropped rapidly to 2 ha. in 2014. Dredging in Tieshangang was probably the main reason. Large amount of sludge generated cover the sea grass bed, affecting normal growth of Shabei and Xialongwei sea grass beds. Moreover, Enteromorpha broke out during Feb. 2014 to May 2014, covering on the beach for over 30cm, which had affected photosynthesis of sea grass seriously and resulted in shrinkage of total area of sea grass bed. In 2015, due to outburst of Enteromorpha, degree of dredging had been weakened. Meanwhile, Guangxi Hepu Dugoon National Nature Reserve had developed protection and recovery of sea grass bed habitat actively, increased patrol and law enforcement effort and conducted artificial cultivation, recovery, etc. of sea grass with local government and relevant departments. The total area of Hepu sea grass bed has increased to 25ha. In 2016, the area of sea grass in Hepu sea grass bed was 99.4 ha. The area had been increased continuously. However, types of sea grass were displaying simplification trend. Japanese eelgrass was degrading in an accelerated manner, displaying in sporadical distribution in Jiuhe Jingdi sea grass bed. Currently, Halophila ovalis was the main sea grass.

2017 年全年合浦海草床有草总面积在 0.52~48.48 公顷之间，年均有草面积为 27.21 公顷，总有草总面积呈现缓慢增长—急剧下降—缓慢增长的趋势，其中二季度最高为 58.48 公顷，三季度最低为 0.52 公顷，海草种类有卵叶喜盐草、贝克喜盐草和日本蔓草共 3 种，群落单生。其中卵叶喜盐草年均占比 80.74%，贝克喜盐草年均占比 19.26%，日本蔓草面积极小。除了榕根山海草床的贝克喜盐草外，其他海草种类在时空分布上既不均匀也不连续，主要草种卵叶喜盐草种群整体老化，进入三季度后各类草种的有草面积均大幅下降。2017 年影响海草床海草面积变化的主要因素是卵叶喜盐草群落老化、西南浪的卷袭和底质类型改变，其次是互花米草入侵以及人类活动的影响，对其影响较小

的是大型海藻爆发和台风影响。

In 2017, the total area of Hepu sea grass bed with grass all the year around was 0.52~48.48 ha. Average area with grass was 27.21 ha. The total area of sea grass bed with grass was displaying such trend of slow growth - sharp decline - slow growth. Where, maximum total area of sea grass bed with grass in the second quarter was 58.48 ha. and the minimum total area of sea grass bed with grass in the third quarter was 0.52 ha. There are three types of sea grass including Halophila ovalis, Halophila beccarii Asch and Japanese eelgrass. The community is of single type. Where, average ratio of Halophila ovalis was 80.74%, average ratio of Halophila beccarii Asch was 19.26% and ratio of Japanese eelgrass was the lowest. Except for Halophila beccarii Asch on Ronggenshan sea grass bed, other sea grass types are neither even nor continuous in terms of spatial and temporal distribution. Population of the main grass Halophila ovalis was aging. After entering into the third quarter, grass area of various types of grasses would decline substantially. In 2017, aging of Halophila ovalispopulation, taking over of southwest waves and change in substrate type were major factors affecting changes in area of sea grass on the sea grass bed, followed by invasion of Spartina alterniflora Loisel and influence of human activities. Outburst of kelps and impact of typhoon had little impact.

3）评价海域海草种类

3) Type of sea grass in the assessed sea area

全世界海草分 6 科 14 属，共 66 种，已知中国海区有 10 属 20 种。评价海域记录到的海草种类共 4 科 4 属 7 种海草（表 3.3.2-2），其中喜盐草（*Halophila ovalis*）（俗称龟蓬草）、二药藻（*Haloduie uninervis*）（俗称龟蓬草）、矮大叶藻（*Zostera japonica*）和贝克喜盐草（*Halophila beccarii*）为四个主要种类。

Sea grass all over the world can be divided into 14 genus of 6 families. There are altogether 66 species. It’s known that there are 20 species under 10 genus in sea areas in China. 7 species of 4 genus of 4 families of sea grass are recorded in the assessed sea area (Table 3.3.2-2), where, *Halophila ovalis*, *Haloduie uninervis*, *Zostera japonica* and *Halophila beccarii* are four major types.

表 3.3.2-2 评价海域海域海草种类

Table 3.3.2-2 Type of sea grass in the assessed sea area

科Family Family	种名（拉丁名） Specific name (Latin	种名（中文名） Specific name (Chinese Name)

	Name)	
大叶藻科Zosteraceae Zosteraceae	*Zostera japonica*	矮大叶藻 Zostera japonica
海神草科Cymodoceaceae Cymodoceaceae	*Halodule uninervis*	二药藻 Halodule uninervis
	Halodule pinifolia	圆头二药藻 Halodule pinifolia
水鳖科Hydrochmritaceae Hydrochmritaceae	*Halophila ovalis*	（卵叶）喜盐草；龟蓬草 Halophila ovalis
	Halophila beccarii	贝克喜盐草 Halophila beccarii
	Halophila minor	小喜盐草 Halophila minor
眼子菜科Potamogetonaceae Potamogetonaceae	*Ruppia maritima*	流苏藻；川蔓藻 Ruppia maritima

喜盐草：属于水鳖科（Hydrocharitoceae），是评价海域海草的优势种，喜盐草群落为评价海域面积分布最大的海草群落，喜盐草为该群落的主要成分，有时也可在该海草群落中见到小簇的矮大叶藻，或非常稀疏的小斑块的贝克喜盐草或小喜盐草。喜盐草群落在潮带所占据空间较广，从潮间带地区到潮下带水较深的地方均可出现。该群落的底质变化也较大，从较软的淤泥到较硬的沙砾环境都可发现喜盐草群落。

Halophila ovalis, belonging to Hydrocharitoceae, is a type of advantageous grass on the bank of the assessed sea area. Halophila ovalis population is the largest sea grass population distributed in the assessed sea area. Halophila ovalis is the main component of the population. Sometimes, a small cluster of Zostera japonica or very sparse Halophila beccarii Asch or Halophila minor with small dots can be seen in the sea grass population. Halophila ovalis population occupies large area in the tide zone, from intertidal zone area to deep place in the subtidal zone. Substrate of the population changes significantly. The Halophila ovalis population can be found from soft sludge to hard gravel environment.

4）评价海域海草床生态系统健康状况

4) State of health of sea grass bed ecosystem in the assessed sea area

从 2007 年~2017 年，评价海域铁山港湾海草床生态系统一直呈亚健康状态，海草床生态系统比较脆弱，群落较不稳定，主要受挖沙虫、耙贝、挖螺、耙螺、电鱼虾、围网捕鱼、养蚝、抽沙、围填海、码头及航道疏浚等人为干扰活动影响。

From 2007 to 2017, the sea grass bed ecosystem in Tieshangang Port of the assessed sea area was always under sub-health state, the sea grass bed ecosystem was relatively weak and the population was instable, which was mainly affected by sandworm excavation, shell raking, spiral shell excavation, spiral shell raking, fish and shrimp electrification, fishing by netting, oyster cultivation, sand pumping, sea reclamation, dock and channel dredging and other man-made interference activities.

3.3.2.2 广西山口国家级红树林生态自然保护区

3.3.2.2 Guangxi Shankou National Mangrove Nature Reserve

（1）总体概况

(1) Overview

1）建设概况

1) Construction overview

广西山口国家级红树林生态自然保护区由国务院 1990 年 9 月批准建立（国函〔1990〕83 号），为国家级海洋类型自然保护区，属海洋部门管理。1993 年 6 月国家海洋局发布《关于山口红树林生态自然保护区建设方案的批复》（国海管发〔1993〕266 号），同年成立广西山口国家级红树林生态自然保护区管理处，现为广西壮族自治区国土资源厅（海洋局）直属事业单位；1994 年 7 月广西壮族自治区人民政府颁布《广西壮族自治区山口红树林生态自然保护区管理办法》（桂政发〔1994〕51 号），并分别于 1997 年、2004 年和 2010 年进行了修正；2011 年广西海洋局委托广西红树林研究中心和广西山口红树林生态自然保护区管理处编制《广西山口国家级红树林生态自然保护区总体规划（2011 年~2020 年）》，2013 年获国家海洋局批复（国海环字〔2013〕134 号）。

Guangxi Shankou National Mangrove Nature Reserve is a national-level ocean nature reserve established under approval of the State Council in September 1990 (GH [1990] No. 83). It's managed by the ocean department. In June 1993, Approval on Construction Scheme of Shankou Mangrove Ecological Nature Reserve (GHGF [1993] No. 266) was issued by the State Oceanic Administration. During the same year, Guangxi Shankou Mangrove Ecological Nature Reserve Management Department was established. It was now a direct public institution under the Department of Natural Resources of Guangxi Zhuang Autonomous Region (Ocean Bureau). In July 1994, Management Methods for Shankou Mangrove Ecological Nature Reserve of Guangxi Zhuang Autonomous Region (GZF (1994) No. 51) was issued by the People's Government of Guangxi Zhuang Autonomous Region in July 1994 and was revised in 1997, 2004 and 2010 respectively. In 2011, the Ocean Bureau of Guangxi Zhuang Autonomous Region entrusted Guangxi Mangroove Research Center and Guangxi Shankou Mangrove Ecological Nature Reserve Management Department to prepare Overall

Planning of Guangxi Shankou National Mangroove Ecological Nature Reserve (2011-2020). In 2013, reply from the State Oceanic Administration was obtained in 2013 (GHHZ (2013) No. 134).

2）位置和范围

2) Position and scope

广西山口国家级红树林生态自然保护区"位于自治区合浦县东南部的沙田半岛东西两侧，保护区范围为东经 109°37'00"~109°47'00″，北纬 21°28'22″~21°37'00″，海域和陆域总面积为 80 平方公里"，具体见图 3.3-4。

Guangxi Shankou Mangrove Ecological Nature Reserve is located on east and west sides of Shatian Peninsula on the northeast part of Hepu County of Guangxi Zhuang Autonomous Region. The scope of the nature reserve shall be as follows: east longitude 109°37'00"~109°47'00″ and northern latitude: 21°28'22″~21°37'00″. The total area of the sea area and land area was 80 km^2. Refer to Fig. 3.3-4 for details.

3）面积和功能区划

3) Area and function division

广西山口国家级红树林生态自然保护区由合浦县沙田半岛东侧的英罗港和西侧丹兜海两个区域组成，总岸线长 40.9km，总面积 8000hm^2，其中核心区面积 824.1hm^2，缓冲区面积 3600.4hm^2，实验区面积 3575.5 hm^2。保护区总面积中海域面积 4970.5hm^2，陆地 3029.5hm^2。各功能区具体划分和分布分别见图 3.3.2-4 和表 3.3.2-3。

Guangxi Shankou Mangrove Ecological Nature Reserve comprises of Yingluo Port on the east side and Dandou Sea on the west side of Shatian Peninsula of Hepu County. The total length of the coastline is 40.9km and total area is 8,000hm^2, including 824.1hm^2 core area, 3,600.4hm^2 buffer area and 3,575.5 pilot area. As for total area of the nature reserve, the area of sea area is 4,970.5hm^2 and the area of land area is 3,029.5hm^2. Refer to Fig. 3.3.2-4 and Table 3.3.2-3 for detailed division and distribution of each functional zone.

表 3.3.2-3　广西山口国家级红树林生态自然保护区功能区划分区面积（hm^2）

Table3.3.2-3 Function division and division area of Guangxi Shankou National Mangrove Nature Reserve (hm^2)

区域 Region	功能区 Functional zone			合计 Total
	核心区 Core area	缓冲区 Buffer area	实验区 Pilot area	
英罗港 Yingluo Port	556.3	884.2	1424.9	2865.4

丹兜海 Dandou Sea	267.8	2716.2	2150.6	5134.6
合计 Total	824.1	3600.4	3575.5	8000.0
功能区面积比例（%） Ratio of area of the functional zone	10.3	45.0	44.7	100.0

4）主要保护对象

4) Major protection objects

主要保护对象是红树林自然生态系。其中最重要的保护对象为：①我国连片面积最大、最古老的港湾红海榄林，其次是木榄群林、连片的白骨壤林；②经济价值或科研价值较高的底栖动物自然种群，以及全球濒危鸟类黑脸琵鹭和其它珍稀鸟类及其栖息地。

Main protection target is the mangrove natural ecosystem. The most important protection targets are as follows: ① the largest and the oldest Rhizophora stylosa forest, followed by Bruguiear gymnorrhiza forest and avicennia marina forest; ②benthonic animal natural population with relatively high economic value or scientific research value, black-faced spoonbill in imminent danger in the world and other rare birds and their habitats.

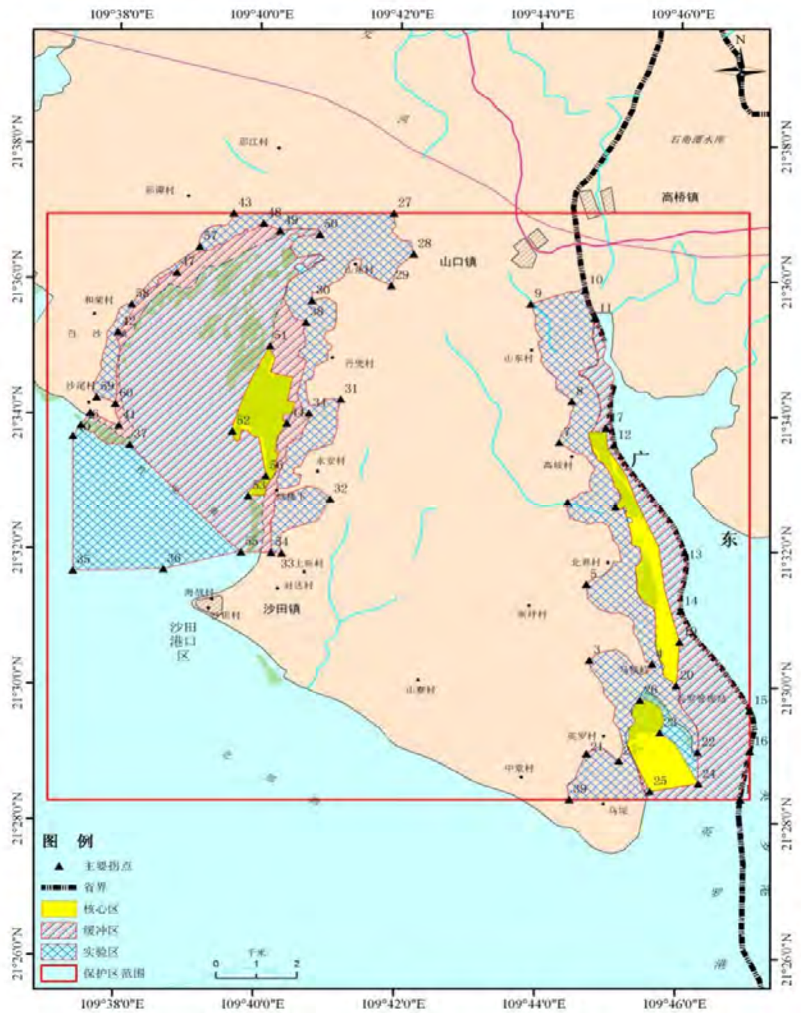


图 3.3.2-4　广西山口国家级红树林生态自然保护区功能区划图

Fig. 3.3.2-4 Function Division Chart of Guangxi Shankou National Mangrove Forest Nature Reserve

（2）生态环境状况

(2) Ecological environment

保护区由该半岛东侧和西侧的海域、陆域及全部滩涂组成。东侧是火山灰发育的土壤，滩涂淤泥肥沃，红树林生长特别茂盛。西岸滩涂全为淤泥质，适宜红树林生长。而且保护区所处地理位置光热条件较好，冬季低温影响小，海湾侵入内陆，封闭性好，风浪、潮汐、余流的作用较弱，岸滩比较稳定，海水污染程度很低，水质洁净，是红树林大面积分布和生存的理想区域，构成良好的生态系统。这里是我国大陆海岸发育较好、连片较大、结构典型、保存较好的天然红树林分布区。区内的红树林是我国大陆海岸红树林典型代表，发育良好，结构独特，连片较大，保存较完整的天然红树林。

The nature reserve comprises of sea area, land area and all mud flats on east and west sides of the peninsula. Soil developed from trass volcanic ash can be discovered on the east side. The sludge on the mud flat is fertile. Mangroove grow quite exuberantly. The mud flat on the west bank is sludge, which is appropriate for growth of mangroove. Meanwhile, geological position of the nature reserve can ensure relatively favorable solar-thermal conditions and low temperature impact during winter. The bay has intruded into the inland. It’s featuring with favorable closure. The role of wave, tide and residual current is relatively weak, the bank is relatively stable, degree of pollution of seawater is relatively low and water is clean. It’s an ideal area for large area distribution and survival of mangroove, capable of constituting a favorable ecosystem. It's the natural mangroove distribution area featuring favorable development, large area, typical structure and favorable storage along the continental coast of China. The mangroove in the nature reserve is a typical example of mangroove along the continental coast of China. It's the natural mangroove featuring favorable development, unique structure, large piece and favorable storage along the continental coast of China.

①主要群落类型：红海榄群落、木榄群落、秋茄群落、海漆群落、桐花树群落和白骨壤群落。

①The main community types include Rhizophora stylosa community, Bruguiear gymnorrhiza community, Kandelia candel community, Excoecaria agallocha community, aegiceras corniculatum community and avicennia marina community.

②红树植物种类：卤蕨、海漆、木榄、秋茄、红海榄、榄李、白骨壤、桐花树、老鼠簕、水黄皮、黄槿、杨叶肖槿、海檬果、钝叶臭黄荆、苦郎树。

② Types of mangroove include Acrostichum aureum, Excoecaria agallocha Linn., Bruguiear gymnorrhiza, Kandelia candel, Rhizophora stylosa, Lumnitzera racemosa Willd., avicennia marina, aegiceras corniculatum, Acanthus ilicifolius, Pongamia pinnata (L)Pierre, Hibiscus tiliaceus Linn., Thespesia populnea (Linn.) Soland. ex Corr., Cerbera manghas Linn, Premna ligustroides Hemsl. And Clerodendrum inerme (L.) Gaertn.

③动物资源

③ Animal resources

区内底栖硅藻 158 种，鱼 82 种，贝 90 种，虾蟹 61 种，鸟类 132 种，昆虫 258 种，其他动物 26 种。鱼类有鲈鱼、真绸、鲻鱼、梭鱼、弹涂鱼、狼牙虾、虎鱼、海龙、海马、黄鳝及鳗鲡等。虾类有墨吉对虾、长毛对虾、脊尾对虾、周民新毛虾及中华管鞭对

虾等。蟹类有锯缘青蟹、招潮蟹等。贝类有牡蛎、僧帽牡蛎、中国绿螂、蓝虫蛤及泥蚶等。红树林下泥滩底栖生物有沙蚕、蠕虫和星虫，以及蛇类等。栖居于红树林外侧的儒艮是世界稀有珍贵的海洋哺乳动物。林内还栖居有猫头鹰、树鹞、白鹤等鸟类。

There are 158 types of benthic diatoms, 82 types of fish, 90 types of shells, 61 types of shrimps and crabs, 132 types of birds, 258 types of insects and 26 types of other animals in the nature reserve. Fishes can be divided into weevers, Pagrus majors, Mugil cephalus, mullets, Periophthalmus cantonensis, Odontamblyopus rubicundus, Syngnathus, hippocampus, Monopterus albus, Anguilla japonica, etc. Shrimps can be divided into banana prawns, penaeus penicillatus, Exopalaemon carinicauda and Solenocera crassicornis. Crabs can be divided into mud crabs, fiddler crabs, etc. Shells can be divided into oysters, Saccostrea cucullata, Glaucomya chinensis, blue clams, Tegillarca granosa Linnaeus, etc. Benthos on the bottom of the mud flat under the mangroove include clam worms, worms, siphon-worms, snakes, etc. Dugongs dwelling on the outside part of the mangroove is a rare and precious sea mammal on the world. Owls, tree pies, white cranes and other birds are also dwelling in the forest.

④植物资源

④ Plant resources

这里是中国大陆海岸发育较好、连片较大、结构典型、保存较好的天然红树林分布区。区内的红树林是中国大陆海岸红树林典型代表，发育良好，结构独特，连片较大，保存较完整的天然红树林。有红树植物 15 种，（真红树 10 种，木榄、秋茄、红海榄、桐花树、白骨壤、海桑、榄李、老鼠勒、银叶树、海漆。半红树 5 种，卤蕨、节槿、杨叶肖槿，水黄皮、海芒果。）浮游植物 96 种。

It’ a natural mangroove distribution area featuring favorable development, large area, typical structure and favorable storage along the continental coast of China. The mangroove in the nature reserve is a typical example of mangroove along the continental coast of China. It's featuring favorable development, unique structure, large piece and favorable storage. There are 15 types of mangroove (10 types of Bruguiera gymnorrhiz, Kandelia candel, Rhizophora stylos, Aegiceras corniculatum, Avicennia marina, Sonneratia caseolaris, Lumnitzera racemosa Willd and Acanthus ilicifolius, Heritiera littoralis and Excoecaria agallocha. 5 types of semi-mangrooves including Acrostichum aureum, Thespesia populnea and Cerbera manghas). There are 96 types of phytoplankton.

3.3.2.3 北部湾二长棘鲷长毛对虾国家级水产种质资源保护区

3.3.2.3 Beibu Gulf Parargyrops Edita and Penaeus Penicillatus National Aquatic Germplasm Resource Nature Reserve

（1）保护区总体概况

(1) Overview of the Nature Reserve

1）保护区位置、范围及功能区划

1) Position, scope and function division of the Nature Reserve

北部湾二长棘鲷长毛对虾国家级水产种质资源保护区是农业部 2008 年 12 月批准公布的 63 个国家级水产种质资源保护区之一（农业部公告 1130 号）。该保护区位于北部湾东北部沿岸区域，由北纬 21°31′线、五个拐点连线及广西自治区防城港市、北海市海岸线组成，拐点坐标分别为（108°04′E，21°31′N；108°30′E，21°00′N；109°00′E，20°30′N；109°30′E，20°30′N；109°30′E，21°29′N），总面积 1142158.03 公顷，其中核心区面积 808771.36 公顷，实验区面积 333386.67 公顷。其中核心区由五个拐点连线组成，拐点坐标分别为（108°15′E，21°15′ N；108°30′E，21°00 ′N；109°00′E，20°30′N；109°30′E，20°30 N′；109°30′E，21°15′N）；实验区由北纬 21°31′线、四个拐点连线及广西壮族自治区防城港市、北海市海岸线组成，拐点坐标分别为（108°04′E，21°31 N′；108°15′E，21°15′N ；109°30′E，21°15′N；109°30′E，21°29′N）。具体见图 3.3.2-5。

Beibu Gulf Parargyrops Edita and Penaeus Penicillatus National Aquatic Germplasm Resource Nature Reserve is one of the 63 national-level aquatic germplasm resources approved by the Ministry of Agriculture in December 2008 (No. 1130 announcement of the Ministry of Agriculture). The Nature Reserve is located along the bank on the northeast part of Beibu Gulf. It comprises of northern latitude 21°31′ line, connecting lines of 5 inflection points and coastlines of Fangchenggang City and Beihai City of Guangxi Zhuang Autonomous Region. The coordinates are as follows (108°04′E, 21°31′N; 108°30′E, 21°00′N; 109°00′E, 20°30′N; 109°30′E, 20°30′N; 109°30′E, 21°29′N). The total area is 1142,158.03 ha., including 808,771.36 ha. Core area and 333,386.67 pilot area. Where, the core area is formed by connecting lines of 5 inflection points. The coordinates of inflection points are as follows 108°15′E, 21°15′ N; 108°30′E, 21°00 ′N; 109°00′E, 20°30′N; 109°30′E, 20°30 N′; 109°30′E, 21°15′N. The pilot area is formed by northern latitude 21°31′ line, connecting lines of 4 inflection points and coastlines of Fangchenggang City and Beihai City of Guangxi Zhuang

Autonomous Region. The coordinates of inflection points are as follows: 108°04′E, 21°31 N′; 108°15′E, 21°15′N; 109°30′E, 21°15′N; 109°30′E, 21°29′N. Refer to Fig. 3.3.2-5 for details.

保护区实验区位于核心区北面近岸地带，距离本项目最近约 SW10.4km，是众多经济鱼类产卵场分布区。

The pilot area of the Nature Reserve is located at the coastal part on the northern side of the core area. It’s about SW10.4km from the Project. It’s a spawning site distribution area for various types of commercial fishes.

2）主要保护对象

2) Major protection objects

主要保护对象为二长棘犁齿鲷（现改为“二长棘犁齿鲷”）和长毛对虾，其他保护物种包括金线鱼、蓝圆鲹、黄带绯鲤、长尾大眼鲷、蛇鲻类、日本金线鱼、墨吉对虾、长足鹰爪虾、中华管鞭虾、锈斑蟳、逍遥馒头蟹、日本蟳、珠母贝、方格星虫等，以及其生存环境。

Evynnis cardinalis and penaeus penicillatus are main protection targets. Other species under protection include Nemipterus virgatus, decapterus maruadsi, Upeneus sulphureus Cuvier et Valenciennes, Priacanthus tayenus, lizard fish, Nemipterus japonicus, Penaeusmerguiensis, Long-leg rough shrimps, Solenocera crassicornis, Charybdis feriatus, Calappa philargius, Charybdis japonica, pearl oysters, Sipunculus nudus and their living environment.

其中核心区：是二长棘鲷、金线鱼、日本金线鱼、黄带绯鲤、蓝圆鲹、长尾大眼鲷、蛇鲻等重要经济鱼类及墨吉对虾、长毛对虾等南海常见虾类主要产卵繁育场所集中地。核心区特别保护期为 1 月 15 日至 3 月 1 日，期间禁止任何形式的渔业生产行为；一般保护期为每年 3 月 1 日～6 月 30 日及 12 月 1 日～1 月 15 日，禁止底拖网、拖虾渔船及捕捞此类幼鱼幼虾为主的其它作业渔船进入生产。

Where, the core area is the main oviposition and breeding place concentrated area for such important commercial fishes as Parargyrops Edita, Nemipterus virgatus, Japanese threadfin bream, Upeneus sulphureus Cuvier et Valenciennes, Decapterus maruadsi, Priacanthus tayenus, lizard fish and common shrimps in the South China Sea. The special protection period of the core area is Jan. 15 - Mar. 1. Any form of fishery production is prohibited during such period. The general protection period is Mar. 1 - Jun. 30 and Dec. 1 - Jan. 15 of the next year. Bottom trawling, shrimp fishing vessels and other fishing vessels mainly capturing such juvenile fish and prawn shall not enter into the area.

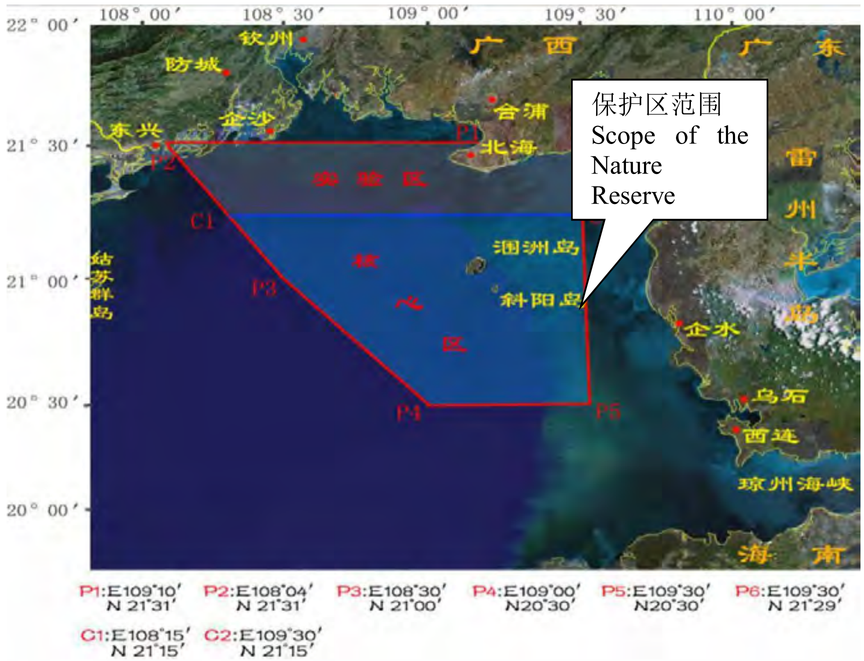


图 3.3.2-5 北部湾二长棘鲷长毛对虾国家级水产种质资源保护区范围及功能区划图

Fig. 3.3.2-5 Scope and function division chart of Beibu Gulf Parargyrops Edita and Penaeus Penicillatus National Aquatic Germplasm Resource Nature Reserve

（2）主要保护对象二长棘鲷、长毛对虾、蓝圆鲹概况

(2) Overview of such main protection objects including parargyrops edita, penaeus penicillatus and decapterus maruadsi

1）二长棘鲷

1) Parargyrops edita

二长棘鲷现名二长棘犁齿鲷，属鲈形目犁齿鲷科，俗称立鱼、红立等，为暖温性近底层鱼类，在南海北部和东海南部数量较多。在北部湾海域，二长棘犁齿鲷是底拖网的主要捕捞对象。二长棘犁齿鲷是低级肉食性鱼类，其摄食的饵料生物类群主要是 1~2 营养级，食物链较短，以底栖生物为主食，兼食游泳动物和浮游生物。

Parargyrops edita, now known as evynnis cardinalis, belongs to evynnis japonica family of Perciformes. It’s a type of warm-type near-bottom fish. They are mainly distributed in the northern part of South Sea and southern part of East Sea. Evynnis cardinalis is the main fishing object of bottom trawling in Beibu Gulf sea area. Evynnis cardinalis is a low-level carnivorous fish. The bait biological group taken is mainly 1 ~ 2 trophic level. The food chain is relatively short. Benthos are the main food. They also eat nektons and planktons.

二长棘犁齿鲷平面分布随季节不同有明显差异，在北部湾总体趋势是高密度分布区

主要是北部湾北部沿岸水域，低密度则分布于中、南部远离大陆海域。二长棘犁齿鲷性腺发育和成熟产卵对环境因子的要求比较严格，产卵场也相对集中，位于湾北部 108°以东，北 20°~21°30′，主要产卵场位于海南岛西北海域。在生殖期间（12~2 月），二长棘犁齿鲷群体均集中于北纬 20°以北，东经 107°30′以东海区，性腺成熟皆达Ⅳ~Ⅴ期，同时鱼群密集，平均网产较高；其他海区则分布较少，且性腺不成熟。北部湾二长棘犁齿鲷“三场一通”分布见图 3.3.2-6。

Plane distribution of evynnis cardinalis changes significantly with different seasons. In Beibu Gulf area, the high density distribution area is mainly water area along the bank of the northern part of Beibu Gulf and low density distribution area is the sea area in the middle and south far away from the mainland. Gonad development, maturation and spawn of evynnis cardinalis raise quite strict requirements for environmental factors. The spawning ground is relatively concentrated. It’s located to the east of the northern part of Beibu Gulf 108°, north 20°~21°30′. The main spawning ground is located on the norhtwest sea area of Hainan Island. During the reproduction period (December to February of the next year), evynnis cardinalis group is mainly concentrated in the sea area to the north of northern latitude 20° and to the east of east longitude 107°30′. Gonadal maturation can reach Phase Ⅳ~Ⅴ.

Meanwhile, the fish school is quite intensive and average net production is relatively high. Little evynnis cardinalis is distributed in other sea areas. And the gonad is not mature.

Refer to Fig. 3.3.2-6 for distribution of “three grounds and one passage” for evynnis cardinalis in Beibu Gulf.

2）长毛对虾

2) Penaeus penicillatus

长毛对虾是北部湾主要经济虾类之一，隶属于十足目，枝鳃亚目，对虾科，对虾属。目前是福建、广东、广西、海南等沿海地区的主要养殖对象。长毛对虾一般为一年生虾类，在一生中要经过几个不同发育阶段，每个阶段对外界环境条件要求不同。在自然海区，长毛对虾幼虾常喜欢聚集于浅水内湾及河口附近觅食。随着幼虾迅速发育成长和生理生态上的变化，逐渐离开浅海内湾及河口区域向较深水域栖息活动。

Penaeus penicillatus is one major economic shrimp in Beibu Gulf. It’s belongs to Penaeus, Penaeidae, Decapoda and Dedrobranchlta. Currently, it’s the main breeding object in Fujian Province, Guangdong Province, Guangxi Province, Hainan Province and other coastal areas. Penaeus penicillatus is generally annual shrimp passing different developmental stages during the lifetime. It raises different requirements for external environmental conditions during each stage. In the natural sea area, juvenile prawns of penaeus penicillatus prefer to gather in shallow inner bays and finding food around estuaries. With rapid development and growth and changes in physiological ecology of juvenile prawns, penaeus penicillatus will leave shallow inner bays and estuaries gradually to deeper water area for inhabiting.

长毛对虾食性很广，幼体发育阶段，食物主要以单细胞藻类为主，如小型硅藻类，甲藻类以及其他动物幼体和有机碎屑等；随着增长，食物组成逐步扩大，主要食物以动物性底栖生物。

Food of penaeus penicillatus is quite wide. During development of penaeus penicillatus, the food is mainly unicellular algae, for example, small diatoms, dinoflagellate, larva of animal, organic detritus, etc. With the growth of penaeus penicillatus, the food group has been enlarged gradually. The main food is animal benthos.

秋末冬初，随着水温下降，长毛对虾逐渐向较深海区进行过冬，到了春天，随着水温回升，亲虾便开始交尾生殖活动。海捕渔汛为每年 10 月至翌年 1 月份。

During winter, water temperature has reduced. Penaeus penicillatus starts to move to deeper sea area to pass the winter. When spring comes, with temperature rise, penaeus penicillatus start mating and reproduction activities. Sea fishing catching season shall be October to January of the next year.

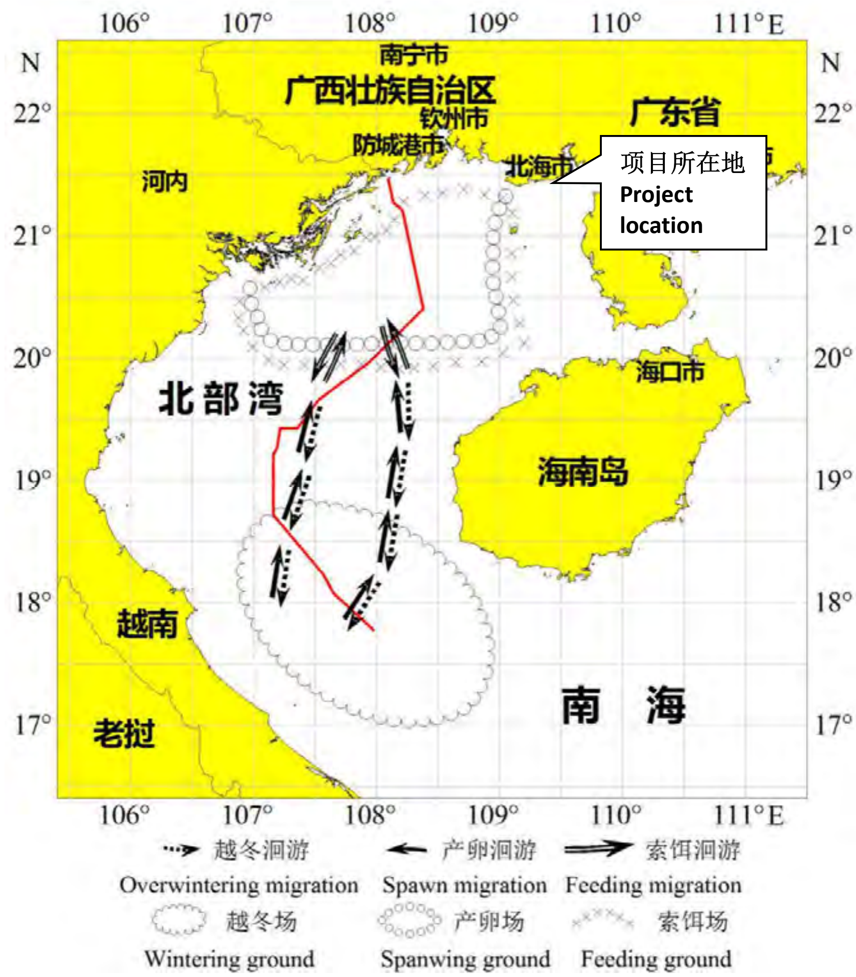


图 3.3.2-6　北部湾二长棘犁齿鲷“三场一通”分布

Fig. 3.3.2-6 Distribution of “three grounds and one passage” for evynnis cardinalis in Beibu Gulf

3）蓝圆鲹

3) Decapterus maruadsi

蓝圆鲹隶属鲈形目鲹科圆鲹属，俗称池鱼、黄占，是近海暖水性、喜集群、有趋光性中上层鱼类，但有时也栖息于近底层。

Decapterus maruadsi belongs to Decapterus, Carangidae, Perciformes. It’s also called as pond fish. It's a type of offshore warm water pelagic fishes preferring schooling and phototaxis. Sometimes, they also inhabiting on the near-bottom.

南海的蓝圆鲹主要分布在南海北部陆架区内，范围很广，东部与粤闽种群相连，西部可达北部湾，南海中南部都有出现。其分布尤以水深 180m 以内较为密集，水深 180m 以外鱼群较分散。有关蓝圆鲹洄游分布目前没有统一的说法，近年来较为一致的看法是蓝圆鲹不作长距离洄游，仅作南北深浅移动，也就是说蓝圆鲹从深海区到浅海区产卵，

产完卵后又回到深海区。

Decapterus maruadsi in South China Sea is mainly distributed on the continental shelf of northern part of South China Sea. It's quite wide. It's connected with Guangdong - Fujian population in the east and Beibu Gulf in the west. It's also appearing in the middle and southern part of South China Sea. It's mainly distributed in the area within depth of 180m. The fish school is quite disperse when water is over 180m deep. Currently, there is no uniform statement on migration distribution of decapterus maruadsi. Recently, there is a consistent view that decapterus maruadsi will not migrate for a long distance. Only south-north deep-shallow movement is conducted. That is to say, decapterus maruadsi will swim from deep sea area to shallow sea area for oviposition and swim back to the deep sea area after oviposition.

在北部湾的蓝圆鲹每年 12 月到翌年 1 月，从湾的南部向涠洲至雾水洲一带海域做索饵洄游，此时性腺开始发育。至 3~4 月份性腺成熟，在水深 15~20m 泥沙底质场所产卵。产卵结束后，鱼群逐渐分散于北部湾内各海区栖息。至 5 月间，在涠洲岛附近海区皆可发现蓝圆鲹幼体，这些幼鱼继续在产卵场附近索饵成长，随后转移至湾内各水域。北部湾蓝圆鲹“三场一通”分布见图3.3-7。

During December to January of the next year, decapterus maruadsi in Beibu Gulf will migrate from the southern part of the bay to the sea area between Weizhou Island and Wushuizhou Island for forage. During this period, the gonad starts to develop. By March to April, the gonad becomes mature. And decapterus maruadsi starts oviposition on places with sediment bottom with water depth of 15~20m. After oviposition, the fish school will disperse in each sea area in Beibu Gulf for inhabiting. By May, decapterus maruadsi larva can be seen in sea area around Weizhou Island. These larva will forage and grow in the oviposition ground and then migrate to each water area in the bay. Refer to Fig. 3.3-7 for distribution of “three grounds and one passage” for decapterus maruadsi in Beibu Gulf.

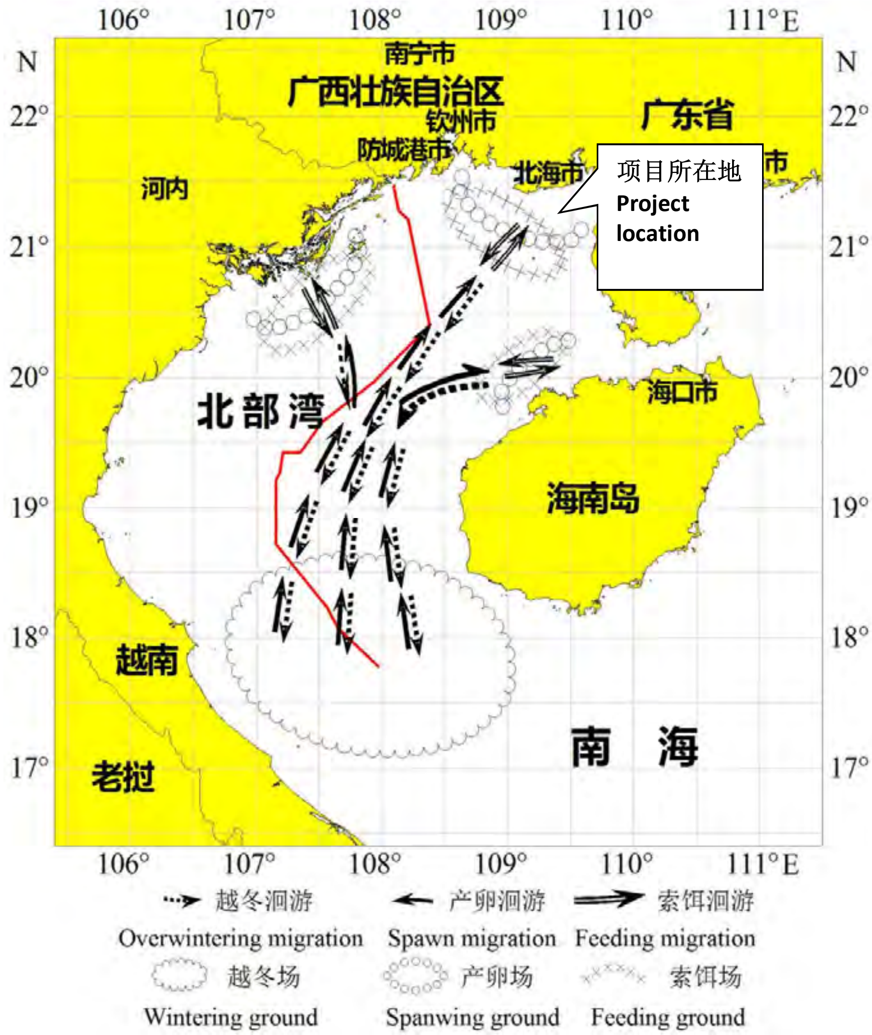


图 3.3.2-7 北部湾蓝圆鲹“三场一通”分布

Fig. 3.3.2-7 Distribution of “three grounds and one passage” for decapterus maruadsi in Beibu Gulf

3.3.3 区域污染源及污染物排放情况

3.3.3 Regional pollution sources and discharge of pollutants

3.3.3.1 铁山港（临海）工业区重点污染源

3.3.3.1 Important pollution sources in Tieshangang (Linhai) Industrial Park

铁山港（临海）工业区重点污染源污染物排放情况见表 3.3.3-1~3.3.3-3。

Refer to Table 3.3.3-1~3.3.3-3 for discharge of pollutants from pollution sources in Tieshangang (Linhai) Industrial Park

根据下表，铁山港（临海）工业区入驻的重点企业排放的主要大气污染物包括：颗粒物、二氧化硫、氮氧化物、非甲烷总烃、VOCs 等。排放的废水污染物主要包括：SS、 COD、BOD_5、氨氮、石油类、硫化物等。

According to the following table, major air pollutants discharged by important enterprises in Tieshangang (Linhai) Industrial Park include particulate matters, sulfur dioxide, nitric oxide, non-methane hydrocarbon, VOCs, etc. Wastewater pollutants discharged mainly include SS, COD, BOD_5, ammonia nitrogen, petroleums, sulfides, etc.

表 3.3.3-1　铁山港区重点污染源排放情况表（废气）

Table 3.3.3-1 List of discharge from important pollution sources in Tieshangang District (Waste gas)

单位：t/a

Unit: t/a

序号 S.N.	企业名称 Enterprise name	废气 Exhaust gas																	
		TSP	SO_2 排放量 SO_2 emission	NOx 排放量 NOx emission	硫酸雾 Sulfuric acid mist	氟化物 Fluoride	氨气 Ammonia	铬及其化合物 Chromium and its compound	镍及其化合物 Nickel and its compound	铅及其化合物 Lead and its compound	砷及其化合物 Arsenic and its compound	镉及其化合物 Cadmium and its compounds	汞及其化合物 Mercury and its compounds	HCL	烃类（非甲烷总烃）Hydrocarbon (Non-methane hydrocarbon)	苯 Benzene	甲苯 Toluene	二甲苯 Xylene	H_2S	VOC
1	中国石化北海炼化有限责任公司 SINOPEC Beihai Refinery Co., Ltd.	180.79	947.57	1045.58			0.08							0.04	450.09	3.24		5.91	0.25	464.64
2	中国石化集团管道储运公司 SINOPEC Pipeline Storage and Transportation Company														226.4					226.4

序号 S.N.	企业名称 Enterprise name	废气 Exhaust gas																		
		TSP	SO_2排放量 SO_2 emission	NOx 排放量 NOx emission	硫酸雾 Sulfuric acid mist	氟化物 Fluoride	氨气 Ammonia	铬及其化合物 Chromium and its compound	镍及其化合物 Nickel and its compound	铅及其化合物 Lead and its compound	砷及其化合物 Arsenic and its compound	镉及其化合物 Cadmium and its compounds	汞及其化合物 Mercury and its compounds	HCL	烃类（非甲烷总烃） Hydrocarbon (Non-methane hydrocarbon)	苯 Benzene	甲苯 Toluene	二甲苯 Xylene	H_2S	VOC
3	广西北海和源石化有限公司 Guangxi Beihai Heyuan Petrochemical Co., Ltd.	1.64	10.96	19.73											23.111	2.478				25.589
4	广西新鑫能源科技有限公司 Guangxi Xinxin Energy Technology Co., Ltd.	0.14	4.19	35.52											12.29					13.6
5	广西凯丰燃气有限公司 Guangxi Kaifeng Fuel Gas Co., Ltd.														4.85					4.85

序号 S. N.	企业名称 Enterprise name	废气 Exhaust gas																		
		TSP	SO_2排放量 SO_2 emission	NOx 排放量 NOx emission	硫酸雾 Sulfuric acid mist	氟化物 Fluoride	氨气 Ammonia	铬及其化合物 Chromium and its compound	镍及其化合物 Nickel and its compound	铅及其化合物 Lead and its compound	砷及其化合物 Arsenic and its compound	镉及其化合物 Cadmium and its compounds	汞及其化合物 Mercury and its compounds	HCL	烃类（非甲烷总烃） Hydrocarbon (Non-methane hydrocarbon)	苯 Benzene	甲苯 Toluene	二甲苯 Xylene	H_2S	VOC
6	北海诚德镍业有限公司 Beihai Chengde Nickel Industry Co., Ltd.	1079	2074	6458.09		2.90			1.35											
7	北海诚德金属压延有限公司 Beihai Chengde Metal Rolling Co., Ltd.	981.96	688.53	381.27	1.38	1.32	0.34		0.80											

序号 S.N.	企业名称 Enterprise name	废气 Exhaust gas																		
		TSP	SO_2排放量 SO_2 emission	NOx 排放量 NOx emission	硫酸雾 Sulfuric acid mist	氟化物 Fluoride	氨气 Ammonia	铬及其化合物 Chromium and its compound	镍及其化合物 Nickel and its compound	铅及其化合物 Lead and its compound	砷及其化合物 Arsenic and its compound	镉及其化合物 Cadmium and its compounds	汞及其化合物 Mercury and its compounds	HCL	烃类（非甲烷总烃） Hydrocarbon (Non-methane hydrocarbon)	苯 Benzene	甲苯 Toluene	二甲苯 Xylene	H_2S	VOC
8	北海诚德不锈钢有限公司 Beihai Chengde Stainless Steel Co., Ltd.	3.84	6.00	350.03	5.44	2.45	0.49													
9	北海诚钢矿业有限公司 Beihai Chenggang Mine Industry Co., Ltd.	269.4	35.7	33.8																

序号 S.N.	企业名称 Enterprise name	废气 Exhaust gas																		
		TSP	SO_2 排放量 SO_2 emission	NOx 排放量 NOx emission	硫酸雾 Sulfuric acid mist	氟化物 Fluoride	氨气 Ammonia	铬及其化合物 Chromium and its compound	镍及其化合物 Nickel and its compound	铅及其化合物 Lead and its compound	砷及其化合物 Arsenic and its compound	镉及其化合物 Cadmium and its compounds	汞及其化合物 Mercury and its compounds	HCL	烃类（非甲烷总烃） Hydrocarbon (Non-methane hydrocarbon)	苯 Benzene	甲苯 Toluene	二甲苯 Xylene	H_2S	VOC
10	广西瑞德环保科技有限公司 Guangxi Ruide Environmental Protection and Technology Co., Ltd.	1.782																		
11	斯道拉恩索（广西）浆纸有限公司 Stora Enso (Guangxi) Pulp Paper Co., Ltd.	418.68	1855.53	2271.8			4.762												46.155	

序号 S.N.	企业名称 Enterprise name	废气 Exhaust gas																		
		TSP	SO_2 排放量 SO_2 emission	NOx 排放量 NOx emission	硫酸雾 Sulfuric acid mist	氟化物 Fluoride	氨气 Ammonia	铬及其化合物 Chromium and its compound	镍及其化合物 Nickel and its compound	铅及其化合物 Lead and its compound	砷及其化合物 Arsenic and its compound	镉及其化合物 Cadmium and its compounds	汞及其化合物 Mercury and its compounds	HCL	烃类（非甲烷总烃） Hydrocarbon (Non-methane hydrocarbon)	苯 Benzene	甲苯 Toluene	二甲苯 Xylene	H_2S	VOC
12	国投北部湾发电有限公司 SDIC Beibu Gulf Power Generation Co., Ltd.	72	310	334																
13	广西北部湾海洋重工股份有限公司 Guangxi Beibu Gulf Marine Heavy Industry Co., Ltd.	6.75															15.38	23.06		38.44
14	北海港铁山港西港区 West port area of Tieshangang, Beihai Port	465	56.4	73.2																27

序号 S. N.	企业名称 Enterprise name	废气 Exhaust gas																		
		TSP	SO_2 排放量 SO_2 emission	NOx 排放量 NOx emission	硫酸雾 Sulfuric acid mist	氟化物 Fluoride	氨气 Ammonia	铬及其化合物 Chromium and its compound	镍及其化合物 Nickel and its compound	铅及其化合物 Lead and its compound	砷及其化合物 Arsenic and its compound	镉及其化合物 Cadmium and its compounds	汞及其化合物 Mercury and its compounds	HCL	烃类（非甲烷总烃） Hydrocarbon (Non-methane hydrocarbon)	苯 Benzene	甲苯 Toluene	二甲苯 Xylene	H_2S	VOC
15	广西北海圣安时代科技有限公司 Guangxi Beihai Sheng'an Shidai Science Co., Ltd.														20.586	0.417				21.003
16	广西渤海农业发展有限公司 Guangxi Bohai Agriculture Development Co., Ltd.		242	242																
总计		3523.80	6230.876	11245.25	6.82	6.67	14.722	1.2304	2.15	0.0186	0.01005	0.43	0.01	0.04	737.327	6.135	15.38	28.97	46.755	821.522

注：VOCs 部分项目未核算，以非甲烷总烃+苯系物排放量计入。以上数据主要来源《广西北部湾经济区北海市铁山港工业区规划环境影响跟踪评价报告书》（2019 年）调查数据。

Notes: VOCs of some projects are not calculated. Discharge of non-methane hydrocarbon and benzene products is calculated. The aforementioned data mainly comes from investigation data in Tracking Report on Planning Environmental Impact Assessment of Beihai Tieshangang Industrial Park in Beibu Gulf Economic

Zone of Guangxi (2019).

表 3.3.3-2 铁山港区重点污染源排放情况表（废水）

Table 3.3.3-2 List of discharge from important pollution sources in Tieshangang District (Waste water)

单位：t/a

Unit: t/a

序号 S.N.	企业名称 Enterprise name	项目名称 Project Name	水污染物排放（t/a） Discharge of water pollutants (t/a)							
			废水排放量（万 t/a） Discharge amount of wastewater (10,000t/a)	排放去向 Discharge destination	SS	CODcr	BOD_5	氨氮 Ammonia nitrogen	石油类 Petroleum category	硫化物 Sulfide
1	中国石化北海炼化有限责任公司 SINOPEC Beihai Refinery Co., Ltd.	北海炼油异地改造石油化工（20万吨/年 聚丙烯）项目产品质量升级改造项目（含 催化裂化装置富氧再生配套设施） Product Quality Update Reconstruction Project of Beihai Refinery Relocation Reconstruction Petrochemical Engineering (200,000t/a Polypropylene) Project (including oxygen-rich regeneration auxiliary facilities of catalytic cracking units)	150.96	生活污水深海排放 Deep-sea discharge of domestic sewage		90.58		18.85	7.43	1.26

2	中石化北海液化天然气有限责任公司 SINOPEC Beihai Liquefied Natural Gas Co., Ltd.	广西液化天然气（LNG）项目 Guangxi Liquefied Natural Gas (LNG) Project	3.7355	深海排放 Deep-sea discharge		3.8		0.6		
3	斯道拉恩索(广西)浆纸有限公司 Stora Enso (Guangxi) Pulp Paper Co., Ltd.	90 万吨浆、90 万吨纸和纸板项目+年产 900,000t and 900,000t paper and paperboard project + production 20 万吨化学机械浆项目 200,000t chemical machinery pulp project	3198.460	深海排放 Deep-sea discharge	959.538	2878.615	639.692	191.907		
4	广西北部湾海洋重工股份有限公司 Guangxi Beibu Gulf Marine Heavy Industry Co., Ltd.（原名广西北海远洋船舶修造股份有限公司）(Original Guangxi Beihai Ocean Vessel Build and Manufacture Co., Ltd.)	北海远洋船舶修造股份有限公司修造船 厂工程 Guangxi Beihai Ocean Vessel Build and Manufacture Co., Ltd. Ship Build and Manufacture Works	16.54	排海 Sea discharge	2.70	6.219	1.39	0.16	0.62	
5	广西北海市铁山港区污水处理工程	广西北海市铁山港区污水处理工程	937.75	深海排放 Deep-sea discharge	292	876	292	116.8		

	Sewage treatment works of Guangxi Beihai Tieshangang District	Sewage treatment works of Guangxi Beihai Tieshangang District								
6	广西渤海农业发展有限公司 Guangxi Bohai Agriculture Development Co., Ltd.	4800 吨/天高蛋白饲料粕物流及加工项目 4,800T/a high protein feed logistics and processing project	8.9240	外排附近海域 Discharging into surrounding sea area		43.5		4.9		
合计 Total			4316.37		1254.238	3900.514	933.082	333.217	8.05	1.26

注：废水排入铁山港区污水处理厂的企业不再统计排放量。以上数据主要来源《广西北部湾经济区北海市铁山港工业区规划环境影响跟踪评价报告书》（2019年）调查数据。

Note: discharge of enterprises with wastewater discharged into the sewage treatment plant of Tieshangang District will not be calculated. The aforementioned data mainly comes from investigation data in Tracking Report on Planning Environmental Impact Assessment of Beihai Tieshangang Industrial Park in Beibu Gulf Economic Zone of Guangxi (2019).

表 3.3.3-3　铁山港区重点污染源排放情况表（固废）

Table 3.3.3-3 List of discharge from important pollution sources in Tieshangang District (solid wastes)

单位：t/a

Unit: t/a

序号 S. N.	企业名称 Enterprise name	项目名称 Project Name	一般固废（t/a） General solid waste (t/a)			危险废物（t/a） Hazardous waste (t/a)			生活垃圾（t/a） Domestic waste (t/a)	合计委托处置量（t/a） Total amount of solid wastes entrusted for disposal
			产生量 Output	综合利用量 Amount of comprehensive utilization	委托处置量 Amount of entrusted disposal	产生量 Output	综合利用量 Amount of comprehensive utilization	委托处置量 Amount of entrusted disposal	委托处置量 Amount of entrusted disposal	合计委托处置量（t/a） Total amount of solid wastes entrusted for disposal
1	中国石化北海炼化有限责任公司 SINOPEC Beihai Refinery Co., Ltd.	北海炼油异地改造石油化工（20 万吨/年聚丙烯）项目产品质量升级改造项目（含催化裂化装置富氧再生配套设施） Product Quality Update Reconstruction Project of Beihai Refinery Relocation Reconstruction Petrochemical Engineering (200,000t/a Polypropylene) Project (including oxygen-rich regeneration auxiliary facilities of catalytic cracking units)	514	0	514	4614	0	4614	150	5278
2	中国石化集团管道储运公司 SINOPEC Pipeline	北海原油商业储备基地工程（一期+二期） Beihai Crude Oil Commercial Reserve	2000	0	2000	24	0	24	/	24

序号 S. N.	企业名称 Enterprise name	项目名称 Project Name	一般固废（t/a） General solid waste (t/a)			危险废物（t/a） Hazardous waste (t/a)			生活垃圾（t/a） Domestic waste (t/a)	合计委托处置量（t/a） Total amount of solid wastes entrusted for disposal
			产生量 Output	综合利用量 Amount of comprehensive utilization	委托处置量 Amount of entrusted disposal	产生量 Output	综合利用量 Amount of comprehensive utilization	委托处置量 Amount of entrusted disposal	委托处置量 Amount of entrusted disposal	合计委托处置量（t/a） Total amount of solid wastes entrusted for disposal
	Storage and Transportation Company	Base Project (Phase I + Phase II)								
3	中石化北海液化天然气有限责任公司 SINOPEC Beihai Liquefied Natural Gas Co., Ltd.	广西液化天然气（LNG）项目 Guangxi Liquefied Natural Gas (LNG) Project	0	0	0	0.6	0	0.6	42.71	43.31
4	广西北海和源石化有限公司 Guangxi Beihai Heyuan Petrochemical Co., Ltd.	15 万吨/年混合芳烃（抽余油）项目（已投产年处理 3 万吨抽余油项目，已验收；年处理 12 万吨混合芳烃处于暂停封闭状态，也未验收）+30 万吨/年油浆处理装置项目	0	0	0	156	0	156	13.45	169.45

序号 S. N.	企业名称 Enterprise name	项目名称 Project Name	一般固废（t/a） General solid waste (t/a)			危险废物（t/a） Hazardous waste (t/a)			生活垃圾（t/a） Domestic waste (t/a)	合计委托处置量（t/a） Total amount of solid wastes entrusted for disposal
			产生量 Output	综合利用量 Amount of comprehensive utilization	委托处置量 Amount of entrusted disposal	产生量 Output	综合利用量 Amount of comprehensive utilization	委托处置量 Amount of entrusted disposal	委托处置量 Amount of entrusted disposal	合计委托处置量（t/a） Total amount of solid wastes entrusted for disposal
		150,000T/a BTX Aromatics (Raffinate Oil) Project (30,000t/a Raffinate Oil Project has been put into operation and accepted; 120,000t/a BTX Aromatics is under closed state temporarily and hasn't been accepted) + 300,000t/a Slurry Treatment Device Project								
5	广西新鑫能源科技有限公司 Guangxi Xinxin Energy Technology Co., Ltd.	广西新鑫能源科技有限公司 2×15 万吨 Guangxi Xinxin Energy Technology Co., Ltd. 2×150,000t	0	0	0	15104.5	15000	104.5	15.84	120.34
7	北海诚德镍业有限	北海诚德镍业有限公司新材料生产项目	1282852	1282852	0	30	0	30	890	920

序号 S. N.	企业名称 Enterprise name	项目名称 Project Name	一般固废（t/a） General solid waste (t/a)			危险废物（t/a） Hazardous waste (t/a)			生活垃圾（t/a） Domestic waste (t/a)	合计委托处置量（t/a） Total amount of solid wastes entrusted for disposal
			产生量 Output	综合利用量 Amount of comprehensive utilization	委托处置量 Amount of entrusted disposal	产生量 Output	综合利用量 Amount of comprehensive utilization	委托处置量 Amount of entrusted disposal	委托处置量 Amount of entrusted disposal	合计委托处置量（t/a） Total amount of solid wastes entrusted for disposal
	公司 Beihai Chengde Nickel Industry Co., Ltd.	Beihai Chengde Nickel Industry Co., Ltd. New Material Production Project								
8	北海诚德金属压延有限公司 Beihai Chengde Metal Rolling Co., Ltd.	北海诚德新材料扩能改造（一期）项目 Beihai Chengde New Material Expansion Reconstruction (Phase I) Project	838300	833100	5200	3650	550	3100	/	8300
9	北海诚德不锈钢有限公司 Beihai Chengde Stainless steel Co., Ltd.	北海诚德新材料扩能改造（二期）项目 Beihai Chengde New Material Expansion Reconstruction (Phase II) Project	132800	103800	29000	4950	1650	3300	/	32300

序号 S. N.	企业名称 Enterprise name	项目名称 Project Name	一般固废（t/a） General solid waste (t/a)			危险废物（t/a） Hazardous waste (t/a)			生活垃圾（t/a） Domestic waste (t/a)	合计委托处置量（t/a） Total amount of solid wastes entrusted for disposal
			产生量 Output	综合利用量 Amount of comprehensive utilization	委托处置量 Amount of entrusted disposal	产生量 Output	综合利用量 Amount of comprehensive utilization	委托处置量 Amount of entrusted disposal	委托处置量 Amount of entrusted disposal	合计委托处置量（t/a） Total amount of solid wastes entrusted for disposal
10	北海诚钢矿业有限公司 Beihai Chenggang Mine Industry Co., Ltd.	年产 100 万吨矿渣微粉生产线转型升级 为年产 100 万吨海工硅酸盐水泥节能技术 Upgrading from 1,000,000t/a superfine slag powder production line into 1,000,000t/a marinetime Portland cement energy conservation technology	512.5	512.5	0	0.6	0	0.6	45	45.6
11	广西瑞德环保科技有限责任公司 Guangxi Ruide Environmental Protection and Technology Co., Ltd.	年处理 600 万吨不锈钢废渣项目（一期年 处理 66 万吨） 6,000,000T/a stainless steel waste residue project (Phase I: 660,000t/a)	100.5	100.5	0	0	0	0	2.48	2.48

序号 S. N.	企业名称 Enterprise name	项目名称 Project Name	一般固废（t/a） General solid waste (t/a)			危险废物（t/a） Hazardous waste (t/a)			生活垃圾（t/a） Domestic waste (t/a)	合计委托处置量（t/a） Total amount of solid wastes entrusted for disposal
			产生量 Output	综合利用量 Amount of comprehensive utilization	委托处置量 Amount of entrusted disposal	产生量 Output	综合利用量 Amount of comprehensive utilization	委托处置量 Amount of entrusted disposal	委托处置量 Amount of entrusted disposal	合计委托处置量（t/a） Total amount of solid wastes entrusted for disposal
12	斯道拉恩索（广西）浆纸有限公司 Stora Enso (Guangxi) Pulp Paper Co., Ltd.	90 万吨浆、90 万吨纸和纸板项目+年产 900,000t and 900,000t paper and paperboard project + production 20 万吨化学机械浆项目 200,000t chemical machinery pulp project	843863	788353	55510	0	0	0	42480	97990
13	欧米亚钙业（北海）有限公司 Omya Calcium Industry (Beihai) Co., Ltd.	年产 5 万吨微米碳酸钙工程项目 50,000T/a Micron Calcium Carbonate Project	1530	1530	0	0	0	0	2.8	2.8
14	国投北部湾发电有限公司 SDIC Beibu Gulf	一期工程 2X320MW 燃煤机组 2X320MW Coal-fired Unit of Phase I Project	292700	292700	0	0	0	0	/	/

序号 S. N.	企业名称 Enterprise name	项目名称 Project Name	一般固废（t/a） General solid waste (t/a)			危险废物（t/a） Hazardous waste (t/a)			生活垃圾（t/a） Domestic waste (t/a)	合计委托处置量（t/a） Total amount of solid wastes entrusted for disposal
			产生量 Output	综合利用量 Amount of comprehensive utilization	委托处置量 Amount of entrusted disposal	产生量 Output	综合利用量 Amount of comprehensive utilization	委托处置量 Amount of entrusted disposal	委托处置量 Amount of entrusted disposal	合计委托处置量（t/a） Total amount of solid wastes entrusted for disposal
	Power Generation Co., Ltd.									
18	广西北部湾海洋重工股份有限公司 Guangxi Beibu Gulf Marine Heavy Industry Co., Ltd.（原名广西北海远洋船舶修造股份有限公司）(Original Guangxi Beihai Ocean Vessel Build and Manufacture	北海远洋船舶修造股份有限公司修造船厂工程 Guangxi Beihai Ocean Vessel Build and Manufacture Co., Ltd. Ship Build and Manufacture Works	2570	2370	200	201.5	0	201.5	151.2	552.7

序号 S. N.	企业名称 Enterprise name	项目名称 Project Name	一般固废（t/a） General solid waste (t/a)			危险废物（t/a） Hazardous waste (t/a)			生活垃圾（t/a） Domestic waste (t/a)	合计委托处置量（t/a） Total amount of solid wastes entrusted for disposal
			产生量 Output	综合利用量 Amount of comprehensive utilization	委托处置量 Amount of entrusted disposal	产生量 Output	综合利用量 Amount of comprehensive utilization	委托处置量 Amount of entrusted disposal	委托处置量 Amount of entrusted disposal	合计委托处置量（t/a） Total amount of solid wastes entrusted for disposal
	Co., Ltd.)									
19	北海港铁山港西港区 West port area of Tieshangang, Beihai Port	北海港铁山港西港区（码头、泊位、进港 航道） West port area of Tieshangang, Beihai Port (docks, berths and approach channels)	1033.54	1033.54	0	92.24	0	92.24	2659.8	2752.04
20	广西北海圣安时代科技有限公司 Guangxi Beihai Sheng'an Shidai Science Co., Ltd.	年产 4 万吨苯加氢制环己烷项目和年产 2 40,000T/a benzene hydrogenation cyclohexane project and 万吨提纯正戊烷和异戊烷项目 20,000T/a purified n-pentane and isopentane project	0	0	0	25	0	25	6.8	31.8

序号 S. N.	企业名称 Enterprise name	项目名称 Project Name	一般固废（t/a） General solid waste (t/a)			危险废物（t/a） Hazardous waste (t/a)			生活垃圾（t/a） Domestic waste (t/a)	合计委托处置量（t/a） Total amount of solid wastes entrusted for disposal
			产生量 Output	综合利用量 Amount of comprehensive utilization	委托处置量 Amount of entrusted disposal	产生量 Output	综合利用量 Amount of comprehensive utilization	委托处置量 Amount of entrusted disposal	委托处置量 Amount of entrusted disposal	合计委托处置量（t/a） Total amount of solid wastes entrusted for disposal
21	广西北海市铁山港区污水处理工程 Sewage treatment works of Guangxi Beihai Tieshangang District	广西北海市铁山港区污水处理工程 Sewage treatment works of Guangxi Beihai Tieshangang District	7300	0	7300	0	0	0	10	7310
合计 Total			3406075.54	3306351.54	99724	28912.94	17200	11707.54	46551.54	155983.08

注：以上数据主要来源《广西北部湾经济区北海市铁山港工业区规划环境影响跟踪评价报告书》（2019 年）调查数据。

Note: The aforementioned data mainly comes from investigation data in Tracking Report on Planning Environmental Impact Assessment of Beihai Tieshangang Industrial Park in Beibu Gulf Economic Zone of Guangxi (2019).

3.3.3.2 铁山港已批复拟建主要项目污染源调查

3.3.3.2 Investigation of pollution sources of approved and proposed main projects in Tieshangang District

铁山港（临海）工业区已经批复的拟建项目污染物排放情况见表 3.3.3-4~3.3.3-6。

Refer to Table 3.3.3-4~3.3.3-6 for discharge of pollutants of approved and proposed main projects in Tieshangang (Linhai) Industrial Park

表 3.3.3-4 铁山港区拟建污染源排放情况表（废气）

Table 3.3.3-4 List of discharge of proposed pollution sources in Tieshangang District (waste gas)

单位：t/a

Unit: t/a

序号 S.N.	企业名称 Enterprise name	废气 Exhaust gas																		
		TSP	SO_2 排放量 SO_2 emission	NOx 排放量 NOx emission	硫酸雾 Sulfuric acid mist	氟化物 Fluoride	氨气 Ammonia	铬及其化合物 Chromium and its compound	镍及其化合物 Nickel and its compound	铅及其化合物 Lead and its compound	砷及其化合物 Arsenic and its compound	镉及其化合物 Cadmium and its compounds	汞及其化合物 Mercury and its compounds	HCL	烃类（非甲烷总烃）Hydrocarbon (Non-methane hydrocarbon)	苯 Benzene	甲苯 Toluene	二甲苯 Xylene	H_2S	VOC
1	广西信义光伏产业有限公司 Guangxi Xinyi Photovoltaic Industry Co., Ltd.	84.47	257.106	521.66		1.00	1.55							12.83						

2	广西宏大化工有限公司 Guangxi Hongda Chemical Engineering Co., Ltd.		7.5	15.0											2.112					44.1
3	信义玻璃（广西）有限公司 Xinyi Glass (Guangxi) Co., Ltd.	200.96	615	1223.4		2.34	1.55							20.53	0.455			6.87×10^{-6}		
4	广西博世科环保科技股份有限公司 Guangxi BOSSCO Environmental Protection and Technology Co., Ltd.	5.77	19.4	40.54		0.443	0.719	0.165		0.0763	0.02384	0.00576	0.00288	7.25					0.0403	0.192

5	北海炼油异地改造石油化工（20 万吨/年聚丙烯）项目结构调整改造项目 Structural Adjustment and Reconstruction Project of Beihai Refinery Relocation Reconstruction Petrochemical Engineering (200,000t/a Polypropylene) Project	20.83	17.72	116.34											554.23					
合计 Total		312.03	916.726	1916.94	0	3.783	3.819	0.165	0	0.0763	0.02384	0.00576	0.00288	40.61	556.797	0	0	6.87×10^{-6}	0.0403	44.292

注：以上数据主要来源各项目环评报告书预测排放量。

Note: the aforementioned data mainly comes from estimated discharge in environmental impact assessment reports on various projects.

表 3.3.3-5 铁山港区拟建污染源排放情况表（废水）

Table 3.3.3-5 List of discharge of proposed pollution sources in Tieshangang District (wastewater)

单位：t/a

Unit: t/a

序号 S.N.	企业名称 Enterprise name	项目名称 Project Name	水污染物排放（t/a） Discharge of water pollutants (t/a)							
			废水排放量（万 t/a） Discharge amount of wastewater (10,000t/a)	排放去向 Discharge destination	SS	CODcr	BOD_5	氨氮 Ammonia nitrogen	石油类 Petroleum category	硫化物 Sulfide
1	广西信义光伏产业有限公司 Guangxi Xinyi Photovoltaic Industry Co., Ltd.	年产 60 万吨超白太阳能玻璃生产线项目 600,000T/a Super-white Solar Glass Production Line Project	29. 8	排入园区污水处理，最终排海 Discharge into the sewage treatment plant of the industrial park and finally into the sea	17.89	24.48	6.16	1.67		
2	广西宏大化工有限公司 Guangxi Hongda Chemical Engineering Co., Ltd.	广西宏大化工有限公司双氧水项目（一期） Guangxi Hongda Chemical Engineering Co., Ltd. Hydrogen Peroxide Project (Phase I)	12.785	排入园区污水处理厂，最终排海 Discharge into the sewage treatment plant of the industrial park and finally into the sea	10.58	14.89		0.11	0.11	
3	信义玻璃（广西）有限公司 Xinyi Glass (Guangxi) Co., Ltd.	特种超白超厚超薄优质浮法玻璃生产线及深加工项目 Special Super-white Super-thick Super-thin High-quality Float	136.58	生产废水经沉淀后与生活污水合流排入园区污水处理，最终排海 After sedimentation,	86.52	93.96	15.33		0.19	

序号 S.N.	企业名称 Enterprise name	项目名称 Project Name	水污染物排放（t/a） Discharge of water pollutants (t/a)							
			废水排放量（万 t/a） Discharge amount of wastewater (10,000t/a)	排放去向 Discharge destination	SS	CODcr	BOD_5	氨氮 Ammonia nitrogen	石油类 Petroleum category	硫化物 Sulfide
		Glass Production Line and Deep Processing Project		production wastewater and domestic sewage will be discharged into the sewage treatment plant of the industrial park and finally into the sea						
4	广西博和环保科技有限公司 Guangxi BOSSCO Environmental Protection and Technology Co., Ltd.	广西北部湾表面处理中心项目 Guangxi Beibu Gulf Surface Treatment Center Project （含北部湾资源再生环保服务中心项目一期） (Including Beibu Gulf Resource Regeneration and Environmental Protection Service Center Project Phase I)	90.75	自行处理达标后，从 B3 排污口深海排放 After reaching standards upon treatment, it will be discharged into deep sea through B3 sewage draining exit	3.541	5.660	3.541	0.461	0.035	
5	中国石化北海炼化有限责任公司 SINOPEC Beihai Refinery Co., Ltd.	北海炼油异地改造石油化工（20 万吨/年聚丙烯）项目结构调整改造项目 Structural Adjustment and Reconstruction Project of Beihai Refinery Relocation	17.72	依托北海炼化现有排放系统，在 B3 排污口深海排放 It will be discharged into deep sea through B3 sewage draining exit using		8.683		0.113	0.016	0.001

序号 S.N.	企业名称 Enterprise name	项目名称 Project Name	水污染物排放（t/a） Discharge of water pollutants (t/a)							
			废水排放量（万 t/a） Discharge amount of wastewater (10,000t/a)	排放去向 Discharge destination	SS	CODcr	BOD_5	氨氮 Ammonia nitrogen	石油类 Petroleum category	硫化物 Sulfide
		Reconstruction Petrochemical Engineering (200,000t/a Polypropylene) Project		existing drainage system of Beihai Refinery						
合计 Total			257.835		118.531	147.673	25.031	2.354	0.351	0.001

注：以上数据主要来源各项目环评报告书预测排放量。

Note: the aforementioned data mainly comes from estimated discharge in environmental impact assessment reports on various projects.

表 3.3.3-6　铁山港区拟建污染源排放情况表（固废）

Table 3.3.3-6 List of discharge of proposed pollution sources in Tieshangang District (solid waste)

单位：t/a

Unit: t/a

序号 S. N.	企业名称 Enterprise name	项目名称 Project Name	一般固废（t/a） General solid waste (t/a)			危险废物（t/a） Hazardous waste (t/a)			生活垃圾（t/a） Domestic waste (t/a)	合计委托处置量（t/a） Total amount of solid wastes entrusted for disposal
			产生量 Output	综合利用量 Amount of comprehensive utilization	委托处置量 Amount of entrusted disposal	产生量 Output	综合利用量 Amount of comprehensive utilization	委托处置量 Amount of entrusted disposal	委托处置量 Amount of entrusted disposal	合计委托处置量（t/a） Total amount of solid wastes entrusted for disposal
1	广西信义光伏产业有限公司 Guangxi Xinyi Photovoltaic Industry Co., Ltd.	年产 60 万吨超白太阳能玻璃生产线项目 600,000T/a Super-white Solar Glass Production Line Project	90028.17	89737.85	290.32	26.66	0	26.66	116.8	433.78
2	广西宏大化工有限公司 Guangxi Hongda Chemical Engineering Co., Ltd.	广西宏大化工有限公司双氧水项目（一期） Guangxi Hongda Chemical Engineering Co., Ltd. Hydrogen Peroxide Project (Phase I)	811.55	811.55	0	53.73	0	53.73	16.5	70.23

3	信义玻璃（广西）有限公司 Xinyi Glass (Guangxi) Co., Ltd.	特种超白超厚超薄优质浮法玻璃生产线及深加工项目 Special Super-white Super-thick Super-thin High-quality Float Glass Production Line and Deep Processing Project	196796.9	196131	665.85	56.58	0	56.58	365	1087.43
4	广西博和环保科技有限公司 Guangxi BOSSCO Environmental Protection and Technology Co., Ltd.	广西北部湾表面处理中心项目 Guangxi Beibu Gulf Surface Treatment Center Project				8826	8811	15	300	315
5	广西博世科环保科技股份有限公司 Guangxi BOSSCO Environmental Protection and Technology Co., Ltd.	北部湾资源再生环保服务中心项目（一期） Beibu Gulf Resource Regeneration and Environmental Protection Service Center Project Phase I	0	0	0	12373.8	12373.8	0	35.6	35.6

注：以上数据主要来源各项目环评报告书预测排放量。

Note: the aforementioned data mainly comes from estimated discharge in environmental impact assessment reports on various projects.

3.3.3.3 铁山港B3排污口排污状况调查

3.3.3.3 Investigation of pollution discharge conditions of B3 sewage draining exit of Tieshangang Port

根据调查，铁山港（临海）工业区B3排污口污染源情况见表3.3.3-7和表3.3.3-8。

According to the investigation, refer to Table 3.3.3-7 and Table 3.3.3-8 for pollution sources at B3 sewage draining exit of Tieshangang (Linhai) Industrial Park.

表3.3.3-7　B3排污口污染源情况（环评批复）

Table 3.3.3-7 Pollution sources at B3 sewage draining exit (environmental impact assessment replies)

污染源 Source of pollution	废水量 Wastewater volume m^3/d	CODcr mg/L	无机氮 Inorganic nitrogen mg/L	SS mg/L	总磷 Total phosphorus mg/L	执行标准 Implementation standards
铁山港区污水处理厂 Sewage treatment plant of Tieshangang District	40000	50	5	10	0.5	《城镇污水处理厂污染物排放标准》（GB18919-2002）一级A标准 Pollutant Discharge Standard for Urban Sewage Treatment Plants (GB18919-2002) Class IA Standard
斯道拉恩索项目 Stora Enso Project	90352	90	8	30	0.8	《制浆造纸工业水污染物排放标准》（GB3544-2008）表2 Table 2 of Discharge Standards for Water Pollutants of Pulp- and Papermaking Industry (GB3544-2008)
北海炼化项目 Beihai Refinery Project	2340	60	10	35	1	《石油炼制工业污染物排放标准》（GB31570-2015）表1 Table 1 of Pollutant Discharge Standards for Petrochemical Industry (GB31570-2015)
北部湾表面处理中心 Beibu Gulf Surface Treatment Center	2750	80	15	15	1	《电镀污染物排放标准》（GB21900-2008）表2 Table 2 in Emission Standard of Pollutants for Electroplating (GB21900-2008)

表3.3.3-8　B3排污口污染源已排放及拟排放情况一览表

Table 3.3.3-8 Summary of discharged and proposed discharge from pollution sources at B3 sewage draining exit

污染源 **Source of pollution**	批复情况 **Reply m^3/d**	已排放情况 **Discharging condition m^3/d**	已批复未排放 **Replied yet not discharged**

			m^3/d
铁山港区污水处理厂 Sewage treatment plant of Tieshangang District	40000	3500	36500
斯道拉恩索项目 Stora Enso Project	90352	19596（化机浆+一期） 19596 (chemi-thermo mechanical pulping + Phase I)	70756
北海炼化项目 Beihai Refinery Project	2340	2340	/
北部湾表面处理中心 Beibu Gulf Surface Treatment Center	2750	0	2750
合计 Total	135442	25436	110006

根据表 3.3.3-8，B3 排污口已获环评批复的项目废水排放量为 13.54 万 m^3/d，实际排放量仅 25436m^3/d，主要污染物排放情况见表 3.3.3-9。

According to Table 3.3.3-8, amount of wastewater discharge from the Project already obtaining environmental impact assessment approval of B3 sewage draining exit was 135,400 m^3/d and actual discharge was only 25,436m^3/d. Refer to Table 3.3.3-9 for discharge of main pollutants.

表 3.3.3-9　B3 排污口污染源已排放及拟排放情况一览表

Table 3.3.3-9 Summary of discharged and proposed discharge from pollution sources at B3 sewage draining exit

污染源 **Source of pollution**	废水量 **Wastewater volume** **m^3/d**	**CODcr** **t/a**	无机氮 **Inorganic nitrogen** **t/a**	总磷 **Total phosphorus** **t/a**
已环评批复 Already obtaining environmental impact assessment approval	135442	3731.15	350.86	34.62
已排放 Already discharged	25436	735.94	69.84	6.98

3.4 环境空气质量现状调查与评价

3.4 Investigation and evaluation about current status of ambient air quality

3.4.1 北海市空气质量达标区判定

3.4.1 Judgment of air quality standard zone in Beihai City

根据北海市生态环境局发布的 2018 年环境空气质量数据，北海市 2018 年二氧化硫、二氧化氮和可吸入颗粒物（$PM_{2.5}$）、可吸入颗粒物（PM_{10}）年平均质量浓度、一氧化碳年评价浓度（第 95 百分位数）、臭氧年评价浓度（第 90 百分位数）均达到《环境空气质量标准》（GB3095-2012）二级标准。项目所在区域为达标区。

According to 2018 ambient air quality data issued by Beihai Bureau of Ecological Environment, sulfur dioxide, nitrogen dioxide and inhalable particle ($PM_{2.5}$), inhalable particle (PM_{10}) annual average mass concentration, carbon monoxide annual evaluation concentration (the 95th percentile), ozone annual evaluation concentration (the 90th percentile) can reach Level II standard in Ambient Air Quality Standard (GB3095-2012). The project area is standard area.

表 3.4-1 区域空气质量现状评价表

Table 3.4-2 Form of evaluation of current status of regional air quality

污染物 **Pollutant**	年评价指标 **Annual evaluation indicator**	现状浓度（μg/m^3）**Current concentration** (μg/m^3)	标准值（μg/m^3）**Standard value** (μg/m^3)	占标率（%）**Ratio of Measured Value to Standard Value (%)**	达标情况 **Up-to-standard status**
SO_2	年平均质量浓度 Annual average mass concentration	9	60	15	达标 Reaching standard
NO_2	年平均质量浓度 Annual average mass concentration	15	40	37.5	达标 Reaching standard

CO	百分位数日平均质量浓度 Percentile daily mean mass concentration	1300	4000	32.5	达标 Yes
O_3	百分位数 8h 平均质量浓度 Percentile 8h mean mass concentration	138	160	86.25	达标 Yes
PM_{10}	年平均质量浓度 Annual average mass concentration	46	70	65.71	达标 Reaching standard
$PM_{2.5}$	年平均质量浓度 Annual average mass concentration	27	35	77.14	达标 Reaching standard

3.4.2 基本污染物环境质量现状评价

3.4.2 Evaluation of current environment quality condition of basic pollutants

根据本项目所在区域北海市监测站的分布情况，评价选用距离本项目位置最近的牛尾岭水库监测站监测数据作为本项目基本污染物现状调查情况，各站点与本项目位置关系见图 3.4-1，基本情况见表 3.4-2。

According to distribution conditions of monitoring stations of Beihai in the project area, monitoring data of Niuweiling Reservoir Monitoring Station the nearest to the Project is used to investigate current status of basic pollutants from the Project. Refer to Fig. 3.4-1 for relationship between location of each station and the Project and Table 3.4-2 for basic conditions.

表 3.4-3 北海市各监测站点位基本信息

Table 3.4-4 Basic information of point location of each monitoring station of Beihai City

监测站名称 Name of monitoring station	监测站坐标 Coordinate of monitoring station		监测因子 Monitoring factor	相对厂区方位 Relative location to plant area	相对厂界距离/km Relative distance from plant boundary/ km	备注 Remarks
	X	Y				
北海工业园 Beihai Industrial	109.167860	21.524218	SO_2、NO_2、PM_{10}、$PM_{2.5}$、	西 West	38	城市站 City station

Park			O_3、CO			
海滩公园 Beach park	109.134987	21.412266	SO_2, NO_2, PM_{10}, $PM_{2.5}$, O_3 and CO	西 West	44	城市站 City station
牛尾岭水库 Niuweiling Reservoir	109.223122	21.600506		西北 Northwest	34	城市站 City station
新市环保局 Environmental Protection Bureau	109.098455	21.466061		西 West	47	城市站 City station

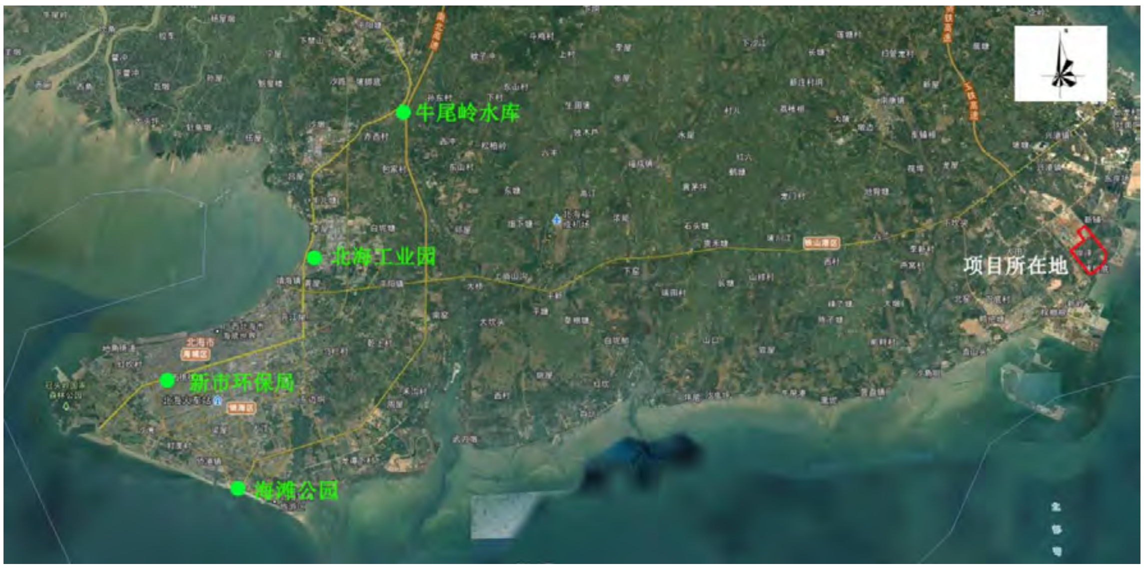


图 3.4-1 北海市空气质量自动监测站点分布图

Fig. 3.4-1 Distribution diagram of air quality automatic monitoring station in Beihai City

根据《环境影响评价技术导则 大气环境》（HJ2.2-2018）以及广西壮族自治区生态环境厅数据中心空气质量数据，对各基本污染物标进行环境质量现状评价。

According to Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018) and air quality data of Data Center of Ecological Environment of Guangxi Zhuang Autonomous Region, current situation of environmental quality of each basic pollutant has been evaluated.

（1）评价标准

(1) Assessment criteria

本项目位于环境空气二类功能区，SO_2、NO_2、PM_{10}、$PM_{2.5}$、CO、O_3 执行《环境空气质量标准》（GB3095-2012）二级标准。

The Project is located in ambient air Class II functional zone. SO_2, NO_2, PM_{10}, $PM_{2.5}$, CO and O_3 shall comply with Ambient Air Quality Standard (GB3095-2012) Class II standard.

（2）评价方法

(2) Evaluation Method

百分位数按照《环境空气质量评价技术规范（试行）》（HJ663-2013）中的统计方法对各污染物的年评价指标进行环境质量现状评价。

As for percentiles, current environment quality condition for annual evaluation indicators of various types of pollutants is assessed with statistical approaches in Technical Regulation for Ambient Air Quality Assessment (On Trial) (HJ663-2013).

污染物浓度序列的第p百分位数计算方法如下：

Calculation method for the p^{th} percentile of the pollutant concentration sequence is as follows:

①将污染物浓度序列按数值从小到大排序，排序后的浓度序列为化，i= 1,2,--n}。

① Pollutant concentration sequence is arranged from small to large. The ordered concentration sequence is as follows: i= 1,2,--n}.

②计算第p百分位数 m_p 的序数k，序数k按式(A.1)计算

② Calculate ordinal number k of the p^{th} percentile. The ordinal number k shall be calculated as per Formula (A.1)

$$k=1+(n-1).\ p\% \qquad (A.1)$$

$$k=1+(n-1).\ p\% \qquad (A.1)$$

式中：

Where:

k 一 p%位置对应的序数。

K 一 Ordinal number corresponding to p% position.

n—污染物浓度序列中的浓度值数量。

n—Concentration value in the pollutant concentration sequence.

③第p百分位数 m_p 按式(A.2)计算:

② m_p of the p^{th} percentile shall be calculated as per Formula (A.2):

$$m_p=X_{(s)}+(X_{(s+1)}-X_{(s)})*(k-s) \quad (A.2)$$

式中：

Where:

s 一 k 的整数部分，当 k 为整数时 s 与 k 相等。

s 一 integer pat of k, when k is an integer, s and k are the same.

（3）监测结果及评价

(3) Monitoring results and assessment

本次基本污染物现状监测结果见表 3.4-3。由表可知，SO_2、NO_2 年平均及 24 小时平均第 98 百分位数浓度；$PM_{2.5}$ 年平均及 24 小时平均第 95 百分位数浓度、PM_{10} 年平均及 24 小时平均第 95 百分位数浓；CO 24 小时平均第 95 百分位数、O_3 日最大 8 小时平均第 90 百分位数浓度均能达到《环境空气质量标准》（GB3095-2012）二级标准。

Refer to 表 3.4-3 for monitoring results condition of basic pollutants. According to the table, annual mean and 24h mean 98th percentile concentration of SO_2 and NO_2, annual mean and 24h mean 95th percentile concentration of $PM_{2.5}$, annual mean and 24h mean 95th percentile concentration of PM_{10}, 24h mean 95th percentile concentration of CO and daily maximum 8h average 90th percentile concentration of CO can reach Level II standard in Ambient Air Quality Standard (GB3095-2012).

表 3.4-3 基本污染物环境质量现状

Table 3.4-3 Environment quality condition of basic pollutants

点位名称 Point position name	监测点坐标 Coordinate of monitoring point		污染物 Pollutant	年评价指标 Annual evaluation indicator	评价标准 μg/m³ Evaluation standard μg/m³	现状浓度（μg/m³） Current concentration (μg/m³)	最大浓度占标率% Pi maximum concentration %	超标频率% Exceeding frequency %	达标情况 Up-to-standard status
牛尾岭水库 Niuweiling Reservoir	° E 109.223122	° N 21.600506	SO_2	24 小时平均 24-hour average	150	17	11.33	-	达标 Yes
				年平均 Annual average	60	9	15	-	达标 Yes
			NO_2	24 小时平均 24-hour average	80	26	32.5	-	达标 Yes

				年平均 Annual average	40	15	37.5	-	达标 Yes
			PM_{10}	24 小时平均 24-hour average	150	87	58	-	达标 Yes
				年平均 Annual average	70	42	60	-	达标 Yes
			$PM_{2.5}$	24 小时平均 24-hour average	75	70	93.33	-	达标 Yes
				年平均 Annual average	35	31	88.57	-	达标 Yes
			CO	24 小时平均 24-hour average	4000	800	20	-	达标 Yes
			O_3	日最大 8 小时平均 Daily maximum 8-hour average	160	146	91.25	-	达标 Yes

3.4.3 补充污染物环境质量现状评价

3.4.3 Evaluation of environmental quality status for other pollutants

项目位于北海市铁山港（临海）工业区，所在区域部分环境空气质量监测数据引用《北部湾资源再生环保服务中心环境影响评价报告书》项目监测数据，监测日期为2019年2月16日~2019年2月19日，监测单位为广西壮族自治区化工环保监测站；二噁英监测委托江西志科检测技术有限公司于2018年5月20日~2018年5月22日采样监测。同时，本项目于2019年7月31日~8月6日委托广西壮族自治区化工环保监测站进行了补充监测。监测完成至今，评价范围2.5km内的没有未有新企业投产运行，因此，引用数据基本能反映出本工程区域大气环境质量现状，引用有效可行。

The Project is located in Beihai Tieshangang (Linhai) Industrial Park. Some ambient air quality monitoring data of the area is quoted from monitoring data in Environmental Impact Assessment Report of Beibu Gulf Resource Regeneration and Environmental Protection

Service Center. The monitoring data was obtained from Feb. 16, 2019 to Feb. 19, 2019 by Chemical Industry and Environmental Protection Monitoring Station of Guangxi Zhuang Autonomous Region. As for dioxin monitoring, Jiangxi ZEK Detection Technology Co., Ltd. Was entrusted to conduct sampling monitoring from May 20, 2018 to May 22, 2018. Meanwhile, Chemical Industry and Environmental Protection Monitoring Station of Guangxi Zhuang Autonomous Region was entrusted to conduct supplementary monitoring from Jul. 31, 2019 to Aug. 6, 2019. By far, no new enterprise has been put into operation within 2.5km from the assessment range. Therefore, quoted data can basically reflect ambient air quality condition of the project area and the reference is effective and feasible.

3.4.3.1 监测布点及监测因子

3.4.3.1 Monitoring point and monitoring factors

根据项目的规模和性质、评价区域大气污染现状以及敏感点的分布情况，结合本地区的地形和污染气象等自然因素综合考虑，项目共布置了5个环境空气质量现状监测点。各点位基本情况见表3.4-4。

According to scale and nature of the Project, air pollution condition of the assessment area and distribution of sensitive points, taking into consideration of topography, pollution condition and other natural factors, the Project is arranged with 5 ambient air quality condition monitoring points. Refer to Table 3.4-4 for basic conditions of each point.

表3.4-4 环境空气质量现状监测点

Table 3.4-4 Ambient air quality condition monitoring points

点位名称 **Point position name**	监测点坐标 **Coordinate of monitoring point**	引用监测因子 **Monitoring factor quoted**	本次监测因子 **Monitoring factor**	相对风向 **Relative wind direction**	相对方位及距离 **Relative direction and distance**
G1厂区中部 Middle part of G1 plant	N21°31′34.41″ E109°32′48.32″	/	氯化氢、氨、硫化氢、氯气、TSP、臭气浓度、非甲烷总烃 Hydrogen chloride, ammonia, hydrogen sulfide, chlorine, TSP,	场址 Site	厂区内 Inside the plant area
G2川江 G2 Chuanjiang	N21°30′57.92″ E109°32′53.51″			下风向 Downwind	南面，100m South,

点位名称 Point position name	监测点坐标 Coordinate of monitoring point	引用监测因子 Monitoring factor quoted	本次监测因子 Monitoring factor	相对风向 Relative wind direction	相对方位及距离 Relative direction and distance
			stench concentration and non-methane hydrocarbon	direction	100m
G3 北面厂界（污水处理站北面） G3 north boundary (the northern side of the sewage treatment plant)	N21°32′22.67″ E109°32′42.57″	/	氨、硫化氢、臭气浓度 Ammonia, hydrogen sulfide and stench concentration	上风向 Upwind direction	/
G4 北面厂界（斯道交界） G4 north boundary (Sidao boundary)	N21°32′52.70″ E109°32′33.02″			上风向 Upwind direction	/
G5 中石化倒班宿舍（阳关海岸） G5 SINOPEC shift dormitory (Yangguang coast)	N:21°30′17.6″ E:109°31′48.5″	Cr^{6+}、Pb、As、Hg、Cd、二噁英 Cr^{6+}, Pb, As, Hg, Cd and dioxin	/	侧下风向 Lateral downward direction	西面，1100m West, 1100m

3.4.3.2 监测时间和频率

3.4.3.2 Monitoring time and frequency

1、监测时间

1 Monitoring time

G1 厂区中部、G2 川江点位的所有因子监测时间为 2019 年 7 月 31 日~2019 年 8 月 6 日。

Monitoring time for all factors for middle part of G1 plant and G2 Chuanjiang should be Jul. 31, 2019 - Aug. 6, 2019.

G3 北面厂界（污水处理站北面）、G4 北面厂界（斯道交界）监测时间为 2019 年 7

月31日~2019年8月2日。

Monitoring time for all factors for G3 north boundary (the northern side of the sewage treatment plant) and G4 north boundary (Sidao boundary) shall be Jul. 31, 2019 - Aug. 2, 2019.

G5中石化倒班宿舍监测点Cr^{6+}、Pb、As、Hg、Cd监测时间为2018年6月9日~2018年6月15日、2019年2月16日~2019年2月19日.

Monitoring time for G5 SINOPEC shift dormitory monitoring points Cr^{6+},Pb, As, Hg and Cd should be Jun. 9, 2018 - Jun. 15, 2018 and Feb. 16, 2019 - Feb. 19, 2019.

二噁英监测委托江西志科检测技术有限公司于2018年5月20日~2018年5月22日采样监测。通过对项目周边企业生产运行情况调查，监测区内目前无无明显排放二噁英的污染源，根据《环境二噁英类监测技术规范》（HJ916-2017），本次二噁英监测时间为3d。

As for dioxin monitoring, Jiangxi ZEK Detection Technology Co., Ltd. Was entrusted to conduct sampling monitoring from May 20, 2018 to May 22, 2018. According to investigation of production and operation of enterprises surrounding the Project, there is no obvious dioxin pollution source in the monitoring area. According to Environmental Dioxins Monitoring Technical Specification (HJ916-2017), the dioxin monitoring duration is 3d.

2、监测频率

2. Monitoring frequency

氯化氢、硫化氢、氨、Cr^{6+}、Pb、As、Hg、Cd、非甲烷总烃、臭气浓度监测7天。小时值每天监测4次，监测时间为02:00、08:00、14:00、20:00，每次至少有45min采样时间。Pb、As、Hg、Cd日均值连续采样24小时，其余因子日均值连续采样20小时。

Hydrogen chloride, hydrogen sulfide, ammonia, Cr^{6+}, Pb, As, Hg, Cd, non-methane hydrocarbon, and stench concentration shall be monitored for seven days. The hourly value shall be monitored 4 times per day. The monitoring time shall be 02:00, 08:00, 14:00 and 20:00. At least 45min. sampling time shall be allowed per time. Daily average value of Pb, As, Hg and Cd shall be sampled for 24h continuously and that of other factors shall be sampled for 20h continuously.

3、监测方法及检出限

3. Monitoring method and detection limit

按 HJ/T194-2017《环境空气质量手工监测技术规范》和国家环保局《大气和废气监测分析方法》（2003 年第四版）进行监测。分析方法按《环境空气质量标准》（GB3095-2012）的要求进行。二噁英监测按《环境二噁英类监测技术规范》 (HJ 916-2017)中的有关规定进行。所用的方法及检出限见表 3.4-5。

As per Technical Specifications on Manual Methods for Ambient Air Quality Monitoring (HJ/T194-2017) and Air and Wastewater Monitoring and Analysis Method (Fourth Edition, 2003) of the State Environmental Protection Administration. The analysis method shall comply with requirements in Ambient Air Quality Standard (GB3095-2012). Monitoring of dioxins shall comply with relevant regulations in Environmental Dioxins Monitoring Technical Specification (HJ916-2017). Refer to Table 3.4-5 for Monitoring method and detection limit.

表 3.4-5 监测项目及分析方法

Table 3.4-5 Monitoring item and analysis method

序号 S. N.	监测项目 Monitoring item	分析方法 Analysis method	检出限或测定下限 Detection limit or limit of determination
1	总悬浮颗粒物 Total suspended Particulate Matters (PM)	环境空气 总悬浮颗粒物的测定 重量法 GB/T15432-1995 及修改单 Ambient Air - Determination of Total Suspended Particulates - Gravimetric Method GB/T 15432-1995 and addendum	1μg/m^3
2	非甲烷总烃 Non-methane hydrocarbon	环境空气 总烃、甲烷和非甲烷总烃的测定 Ambient Air - Determination of Total Hydrocarbons, Methane and Nonmethane Hydrocarbons 直接进样-气相色谱法 HJ604-2017 Direct Injection/Gas Chromatography HJ604-2017	0.07mg/m^3（以碳计） (Calculate as per carbon)
3	硫化氢 Hydrogen sulfide	亚甲基蓝分光光度法（B）《空气和废气监测分析方法》 Methylene Blue Spectrophotometric Method (B) Air and Waste gas Monitor and Analysis Method （第四版）国家环保总局 2003 年 (The 4th edition) State Environmental Protection Administration, 2003	0.001mg/m^3（采样体积为 60L 时） 0.001Mg/m3^3 (sampling volume is 60L)
4	氯化氢 Hydrogen chloride	环境空气和废气 氯化氢的测定 离子色谱法 HJ549-2016 Ambient Air and Stationary Source Emission - Determination of Hydrogen Chloride- Ion Chromatography HJ549-2016	1h 平均：0.02mg/m^3 1H average: 0.02mg/m^3
5	氨 Ammonia	环境空气和废气 氨的测定 纳氏试剂分光光度法 HJ533-2009 Determination of Exhaust Gas Ammonia in Ambient air-Nessler's	0.01mg/m^3

		Reagent Spectrophotometric Method HJ 533-2009	
6	氯 气 Chlorine	固定污染源排气中氯气的测定 Stationary Source Emission - Determination of Chlorine 甲基橙分光光度法 HJ/T30-1999 Methyl Orange Spectrophotometric Method HJ/T30-1999	0.03mg/m^3（采样体积为 30L 时） 0.03Mg/m3^3 (sampling volume is 30L)
7	臭气浓度 Stink concentration	空气质量 恶臭的测定 Air Quality - Determination of Odor - 三点比较式臭袋法 GB/T14675-93 Triangle Odor Bag Method GB/T14675-93	10(无量纲) 10 (Non-dimensional)
8	铬酸雾（六价铬） Mist of chromic acid (hexavalent chromium)	二苯碳酰二肼分光光度法（B）《空气和废气监测分析方法》（第四版）国家环保总局 2003 年 Diphenylcarbohydrazide Spectrophotometric Method (B) Air and Waste gas Monitor and Analysis Method (the 4th edition) State Environmental Protection Administration, 2003	0.04μg/ m^3（采样 30m^3 时） (When 30m^3 is sampled)
9	镉 Cadmium	石墨炉原子吸收分光光度法（A）《空气和废气监测分析方法》（第四版） 国家环保总局 2003 年 Graphite Furnace Atomic Absorption Spectrometry (A) Air and Waste gas Monitor and Analysis Method (the 4th edition) State Environmental Protection Administration, 2003	0.0003μg/m^3（采 10m^3，定容 100ml） 0.0003Mg/m3(sampling^3(sampling 10m^3, constant volume 100ml)
10	砷 Arsenic	原子荧光法（B）《空气和废气监测分析方法》 Atomic Fluorescence Spectrometry (B) Air and Waste gas Monitor and Analysis Method （第四版） 国家环保总局 2003 年 (The 4th edition) State Environmental Protection Administration, 2003	0.003μg/m^3（采样 10m^3，定容 50ml） 0.003μg/m^3 (sampling 10m^3, constant volume 50ml)
11	汞 Mercury	环境空气 汞的测定 Ambient Air - Determination of Mercury and Its Compounds 巯基棉富集-冷原子荧光分光光度法（暂行）HJ542-2009 Cold Atomic Fluorescent Spectrophotometry after Sulfhydryl Cotton Preconcentration (Provisional) HJ542-2009	0.0066μg/m^3（采 15L，定容 10ml） 0.0066μg/m^3 (sampling 15L, constant volume 10ml)
12	铅 Lead	环境空气 铅的测定 石墨炉原子吸收分光光度法 HJ539-2015 Ambient Air - Determination of Lead - Graphite Furnace Atomic Absorption Spectrometry HJ539-2015	0.009μg/m^3（采 10m^3，定容 50ml） 0.009Mg/m3(sampling^3(sampling 10m^3, constant volume 50ml)
13	非甲烷总烃（以碳计） Non-methane hydrocarbon (calculate as per carbon)	环境空气 总烃、甲烷和非甲烷总烃的测定 Ambient Air - Determination of Total Hydrocarbons, Methane and Nonmethane Hydrocarbons 直接进样-气相色谱法 HJ604-2017 Direct Injection/Gas Chromatography HJ604-2017	0.07 mg/m^3
14	二噁英	《环境空气和废气二德英类的测定同位素稀释高分辨气相色	—

	Dioxin	谱高分辨质谱法》（HJ 77.2-2008） Ambient Air and Waste Gas - Determination of Polychlorinated Dibenzo-p-dioxins (PCCDs) and Polychlorinated Dibenzofurans (PCDFs) Isotype Dilution HRGC - HRMS (HJ 77.2-2008)	

4、评价方法

4. Evaluation Method

（1）评价方法

(1) Evaluation Method

采用占标率进行评价：

Pi is used for assessment:

$$P_{i.}=C_{i.}/C_{oi}$$

式中：$P_{i.}$ ——某污染物的浓度占标率，%；

Where, $P_{i.}$ - Pi concentration of some pollutant, %;

C_i——某污染物的实测浓度，mg/m^3；

C_i——Measured concentration of some pollutant, mg/m^3;

C_{oi}——某污染物的评价标准，mg/m^3。

C_{oi}——Evaluation standard of some pollutant, mg/m^3;

$P_{i.}\leq 1$达标；$P_{i.}>1$超标。

$P_{i.}\leq 1$ reaching standard; $P_{i.}>1$ exceeding standard.

（2）评价标准

(2) Assessment criteria

项目选址所在区域为环境空气质量二类功能区，SO_2、NO_2、TSP、PM_{10}、$PM_{2.5}$、CO、O_3、Pb（年均值）、Cd（年均值）、Hg（年均值）、As（年均值）、六价铬（年均值）执行《环境空气质量标准》（GB3095-2012）二级标准，硫化氢、氨、氯化氢、氯、总挥发性有机物执行参照《环境影响评价技术导则 大气环境》（HJ 2.2-2018）附录 D 其他污染物空气质量浓度参考限值；Pb（日均值）、Hg（日均值）、As（日均值）、六价铬（一次值）参照执行《工业企业设计卫生标准》（TJ36-79）居民区有害物质最高允许浓度要求；非甲烷总烃参照执行《大气污染物综合排放标准详解》推荐值；二噁英日均值、Cd 日均值、臭气浓度留作背景，不做评价。

The project site is located in ambient air quality Class II functional zone. SO_2, NO_2, TSP, PM_{10}, $PM_{2.5}$, CO, O_3, Pb (average value), Cd (average value), Hg (average value), As (average value) and hexavalent chromium (average value) shall comply with Ambient Air Quality Standard (GB3095-2012) Class II standard. Hydrogen sulfide, ammonia, hydrogen chloride, chlorine and total volatile organic compounds shall comply with air quality concentration reference value of other pollutants in Annex D of Guidelines for Environmental Impact Assessment Atmospheric Environment (HJ 2.2-2018). Pb (daily average), Hg (daily average), As (daily average) and hexavalent chromium (primary value) shall refer to maximum allowable concentration requirement for hazardous substances in residential quarters

in Hygienic Standard of Industrial Enterprise Design (TJ36-79). Non-methane hydrocarbon shall comply with recommended value in Detailed Annotation of Comprehensive Emission Standard for Air Pollutants. Daily average of dioxin, daily average of Cd and stench concentration are used as background and no evaluation is conducted.

3.4.2.3 监测结果

3.4.2.3 Monitoring result

补充污染物环境空气质量监测结果见表 3.4-6。

Refer to Table 3.4-6 for ambient air quality monitoring results of other pollutants.

根据监测结果，评价区域内各监测点的氨、硫化氢、氯化氢能满足《环境影响评价技术导则 大气环境》（HJ 2.2-2018）附录 D 其他污染物空气质量浓度参考限值要求；Pb（日均值）、Hg（日均值）、As（日均值）、六价铬（一次值）浓度满足参照执行的《工业企业设计卫生标准》（TJ36-79）居民区有害物质最高允许浓度要求；非甲烷总烃浓度满足《大气污染物综合排放标准详解》推荐值。评价区域环境空气质量总体能满足环境功能区要求。

According to monitoring results, ammonia, hydrogen sulfide and hydrogen chloride of each monitoring point in the assessment area could satisfy air quality concentration reference limit requirement for other pollutants in Annex D of Guidelines for Environmental Impact Assessment Atmospheric Environment (HJ 2.2-2018). Pb (daily average), Hg (daily average), As (daily average) and hexavalent chromium (primary value) concentration could satisfy maximum allowable concentration requirement for hazardous substances in residential quarters in Hygienic Standard of Industrial Enterprise Design (TJ36-79). Concentration of non-methane hydrocarbon could comply with recommended value in Detailed Annotation of Comprehensive Emission Standard for Air Pollutants. As a whole, ambient air quality of the assessment area could satisfy requirement of the environment functional zone.

表 3.4-6 各污染物环境质量现状评价

Table 3.4-6 Evaluation of environment quality condition of each pollutant

3.5 地下水环境现状调查与评价

3.5 Investigation and evaluation on groundwater environment condition

3.5.1 区域地质条件

3.5.1 Regional geological conditions

拟建项目场区地处冲洪积滨海平原的前缘地带，地形较平坦开阔，海拔标高 0～40m，一般 10～20m，大体上由北向南微向海洋倾斜。

The proposed project site is located at the frontal zone of the alluvial-proluvial coastal plain. The topography is quite flat and broad. The height above sea level is 0～40m, 10～20m generally. In general, it inclines to sea from north to south.

3.5.1.1 地质构造

3.5.1.1 Geological structure

调查区域位于新华夏系第二巨型沉降带的西南端与南岭纬向构造带的复合地带的南康盆地之中。该盆地为沉降盆地，盆地基底主要为志留系泥质砂岩、粉砂岩、砂岩等。南康盆地由上第三系松散岩层组成，沉积厚度约200m左右，上覆第四系松散岩层，上覆地层由上而下主要为第四系中更新统北海组（Q_{2b}）和下更新统湛江组（Q_{1z}）等地层。盆地呈近东西向，往南倾斜入北部湾。测区范围内无断层发育，区域稳定性良好。

The investigation area is located in Nankang Basin between the southwest end of the second giant subsidence zone of neocathaysian and composite zone of Nanling zonal tectonic zone. The basin is a subsiding basin. The basin base is mainly silurian argillaceous sandstone, siltstone, sandstone, etc. Nankang Basin comprises of Tertiary ravelly ground. The deposition thickness is about 200m. It’s covered with the Quaternary ravelly ground. The overlying strata mainly comprises from Quaternary Middle Pleistocene Series Beihai Fm (Q_{2b}) and Lower Pleistocene Series Zhanjiang Fm (Q_{1z}) and other stratum from top to bottom. The basin is of east-west direction, inclining to the south into Beibu Gulf. There is no fault developed in the assessment area and the area is featuring favorable stability.

3.5.1.2 地层岩性

3.5.1.2 Stratum lithology

根据野外地质调查和区域地质资料，调查区域地层主要由新生界第四系（Q）和第三系（N）等松散岩类地层组成。地层由上至下分述如下：

According to field geological investigation and regional geological, the stratum in the assessment area mainly comprises of cenozoic quaternary system (Q) and tertiary system (N) and other loose rock stratum. The stratum can be descriped as follows from top to down:

1、第四系（Q）

1. Quaternary system (Q)

（1）第四系全新统(Q_4)：主要由黏土、粉质黏土、细砂、中粗砂及砾石组成，厚度2～42m，主要分布于河流、沟谷及海滩等地带。

(1) Quaternary holocene (Q_4): mainly comprises of clay, silty clay, fine sand, medium-coarse sand and gravel, thickness 2～42m, mainly distributed in drivers, valleys, beaches, etc. belts.

（2）第四系中更新统北海组(Q_2b)：主要由黏土、细砂、中粗砂组成，厚度 4～22m，广泛分布。

(2) Quaternary middle pleistocene series Beihai Fm (Q_2b): mainly comprises of clay, fine sand and medium-coarse sand, thickness 4～22m, widely distributed.

（3）第四系下更新统湛江组(Q_1z)：主要由黏土、细砂、中粗砂组成，厚度 12～93m，局部出露于滨海平原与滩涂过渡地带及冲沟陡坎处。

(3) Quaternary Lower Pleistocene Series Zhanjiang Group (Q_1z): mainly comprises of clay, fine sand and medium-coarse sand, thickness 12～93m, with part exposed beyond transition zone between coastal plain and mud flat, gullies, steep ridges, etc.

2、第三系上新统白沙江组（N_2b）

2. Tertiary Pliocene Series Baishajiang Group (N_2b)

主要由黏土、粉质黏土、砂、砾砂组成，厚度 31～133m，主要分布于沟谷地带。

mainly comprises of clay, silty clay, sand and gravel, thickness of 31~133m, mainly distributed in ravines.

3.5.1.3 区域水文地质条件

3.5.1.3 Regional hydrogeological conditions

1、地下水类型及富水性特征

1) Type and water yield property of groundwater

据野外地质调查结果，结合区域水文地质资料分析，按地下水的赋存条件、水理性质、水动力特征等特点，调查区域内的地下水以松散岩类孔隙水为主。

According to field geological investigation result, analysis based on regional hydrological and geological data as well as occurrence conditions, water-physical property, hydrodynamic characteristic and other characteristics of groundwater, groundwater in the investigation area is mainly loose rock pore water.

松散岩类孔隙水主要赋存于第四系和第三系砂、砂砾、砾石层中，主要接受大气降水的补给，单井涌水量＜100～1000 m^3/d，富水性贫乏至中等。

Loose rock pore water is mainly endowed in Quaternary and Tertiary sand, gravel and gravel layer and supplemented by atmospheric precipitation. The single-well water inflow is ＜100～1000 m^3/d. The water yield property is from scarce to medium.

根据钻孔揭露和区域地质资料分析，本区第四系和第三系地层厚度大，具多元结构，砂、砂砾、砾石层与黏性土层互层，部分地段黏性土层分布不连续，下部砂、砂砾、砾石层与上部砂、砂砾、砾石层连通，无明显隔水层。

According to drilling exposure and analysis of regional geological data, Quaternary and Tertiary stratum in the area is quite thick. It’s featuring multiple structure. Sand, gravel, gravel layer and clay layer are interbedding. In some sections, the distribution of viscous soil layer is not continuous. Lower sand, gravel and gravel layer and upper sand, gravel and gravel layer are connected. There is no obvious water-resisting layer.

2、区域水文地质单元

2. Regional hydrogeological unit

调查区域地处南康盆地东隅，地形大体上由北向南微向海洋倾斜，区域地下水属南康盆地水文地质单元的排泄区。从地形地貌和地层岩性上分析，结合现有水文地质资料及本次调查结果，本区地下水分水岭与地表分水岭基本一致，于板塘—浸谷塘—下底村—沙角咀连线存在一条地下水和地表水分水岭。因此，本区域水文地质单元可进一步划分为前卫单元和大江口单元 2 个次一级的水文地质单元，这 2 个次级的地下水单元相互独立，没有明显的水力联系。各次级单元的水文地质边界条件分述如下：

The investigation area is located on the east side of Nankang Basin. In terms of topography, it inclines to sea slightly from north to south. Regional groundwater belongs to discharge area of hydrogeological units of Nankang Basin. According to analysis of topography, landform and stratum lithology and taking into consideration of existing hydrogeological data and the investigation result, the groundwater watershed and surface water watershed are basically consistent. One groundwater and surface water watershed exist along Bantang - Jingutang - Xiadi Village - Shajiaoju. Therefore, the hydrogeological unit of the area can be further divided into two sub-level hydrogeological unit including Qianwei Unit and Dajiangkou Unit. The two sub-level hydrogeological units are mutually independent. There is no obvious hydraulic connection. Hydrogeological boundary conditions of each sub-level unit are described as follows:

（1）前卫单元

(1) Qianwei Unit

前卫单元位于项目厂址区西侧 1.5km 以外，其东面以板塘—浸谷塘—下底村—沙角咀连线的地下水分水岭为界，西面以南康江为排泄边界，南面以北部湾海域为排泄边界。

Qianwei Unit, about 1.5km on the west side of the plant area, has groundwater watershed of Bantang - Jingutang - Xiadi Village - Shajiaoju as its east boundary, Nankang River as its western drainage boundary and Beibu Gulf sea as its southern drainage boundary.

（2）大江口单元

(2) Dajiangkou Unit

大江口单元位于前卫单元的东侧，拟建项目厂址位于其中，其西面以板塘—浸谷塘—下底村—沙角咀连线的地下水分水岭为界，东、北东和南东三面均以北部湾海域为排泄边界。

Dajiangkou Unit is located on the east side of Qianwei Unit. The plant site is within Dajiangkou Unit. Dajiangkou Unit takes groundwater watershed of Bantang - Jingutang - Xiadi Village - Shajiaoju as its west boundary and Beibu Gulf sea as its eastern, northeastern and southern drainage boundary.

图 3.5-1　　区域水文地质单元简图

Fig. 3.5-1 Sketch of regional hydrogeological units

3、地下水补给、径流、排泄条件

3. Groundwater recharge, runoff and discharge conditions

本区域地处南康盆地水文地质单元的东隅，地下水主要接受大气降水的垂向渗入补给，地下水流向与地形坡向基本一致，地下水最终排泄于南康江和北部湾海域。北部湾海域为区域地下水、地表水最低排泄基准面。

The area is located on the east side of Nankang Basin hydrogeological unit. Groundwater is mainly supplemented by vertical infiltration of atmospheric precipitation. Groundwater flow direction and topography slope direction are basically consistent. Groundwater is finally discharged into Nankang River and Beibu Gulf sea. Beibu Gulf sea is minimum drainage base level of regional groundwater and surface water.

根据本区域的水文地质条件，本区域的水文地质单元又可进一步划分为前卫单元和大江口单元两个次一级的水文地质单元，这两个水文地质单元各具有其独特的补给、径流、排泄条件。

According to hydrogeological conditions of the area, the hydrogeological unit of the region can be further divided into two sub-level hydrogeological unit including Qianwei Unit and Dajiangkou Unit. These two hydrogeological units have their respective recharge, runoff and discharge conditions.

（1）前卫单元

(1) Qianwei Unit

前卫单元的地下水主要靠大气降水的渗入补给，大气降水大部分形成地表径流向溪沟中汇流，而后排泄于南康江流入北部湾海域，少量以垂向渗流方式，下渗补给松散岩类孔隙水。该单元的地下水处在相对独立的地下水系统之中，地下水运移于松散岩类孔隙中，由北东向南西径流，地下水流程较短，以渗流的方式排泄于南康江，而后汇入北部弯海域。

Groundwater of Qianwei Unit is mainly recharged by infiltration of atmospheric precipitation. Most atmospheric precipitation will form direct surface runoff and gather in trenches and then be discharged into Nankang River and thereby Beibu Gulf sea. Small part of it will be infiltrated to recharge loose rock pore water in the form of vertical infiltration. Groundwater of the unit is a relatively independent groundwater system. Groundwater is moving between loose rock pores and running from northeast to southwest. The groundwater flow is relatively short. Groundwater will be discharged into Nankang River in the form of seepage and then gather in Beibu Gulf sea.

（2）大江口单元

(2) Dajiangkou Unit

拟建项目厂址位于大江口单元之中，大江口单元以北部湾海域为最低排泄基准面，该单元的地下水亦主要靠大气降水的渗入补给，大气降水大部分以地表径流方式排泄于北部湾海域，少量以垂向渗流方式，下渗补给松散岩类孔隙水。该单元的地下水亦处在

相对独立的地下水系统之中，地下水运移于松散岩类孔隙中，大体上由北西向南东径流，地下水流程较短，以渗流的方式排泄入北部湾海域

The proposed plant site is located in Dajiangkou Unit. Dajiangkou Unit takes Beibu Gulf sea as the minimum drainage base level. Groundwater of the unit is mainly recharged by infiltration of atmospheric precipitation. Most atmospheric precipitation will be discharged into Beibu Gulf sea in the form of surface runoff. Small part of it will be infiltrated to recharge loose rock pore water through vertical infiltration. Groundwater of the unit is also a relatively independent groundwater system. Groundwater is moving between loose rock pores and running from northeast to southwest. The groundwater flow is relatively short. Groundwater will be discharged into Beibu Gulf sea in the form of seepage.

3.5.2 评价区水文地质条件

3.5.2 Hydrogeological conditions of the assessment area

3.5.2.1 地形地貌

3.5.2.1 Topography and landform

拟建项目场区地处冲洪积滨海平原的前缘地带，地形较平坦开阔。场地内原始地貌北部稍微高于南部，南部现有较多养虾场。总体而言。地势由西北向东南倾斜，地面高程 10.0～20.0m，大体上由北向南微向海洋倾斜。

The proposed project site is located at the frontal zone of the alluvial-proluvial coastal plain. The topography is quite flat and broad. As for original landform, the northern part is slightly higher than the southern part. Now, there are many prawn parks in the southern part. In general, the plant site is inclining from northwest to southeast. The ground elevation is 10.0～20.0m. By and large, it inclines slightly to the sea from north to south.

3.5.2.2 地层岩性

3.5.2.2 Stratum lithology

据收集区域地质资料及本项目场区岩土工程初步勘察工作，场地分布的地层有第四系全新统人工填土层、第四系中更新统北海组冲洪积层和第四系下更新统湛江组冲洪积层。根据岩土的物理力学性质及工程特性，场区岩土层自上而下分述如下：

According to regional geological data collected and preliminary investigation of geotechnical engineering of the plant site, the stratum distributed on the site includes Quaternary Holocene artificial fill, Quaternary Middle Pleistocene Series Beihai Fm alluvial-proluvial layer and Quaternary Lower Pleistocene Series Zhanjiang Group alluvial-proluvial layer. According to physical and mechanical properties and engineering characteristics of rocks, the rock and soil layer in the plant area from top to down can be described as follows:

人工填土(Q_4ml)①：杂色，稍湿，松散。主要以石英砂及黏性土为主，含少量有机质，土体均匀性差，为新近堆填，尚未完成自重固结。该层大部分钻孔有揭露，层厚0.80~6.00m，平均2.56m。

Artificial fill (Q_4ml) ①: variegated, slightly wet and loose. Mainly including quartz sand and cohesive soil, including a little organic matter; soil uniformity: poor; it's a new dumping with self-weight consolidation not completed yet. Most boreholes in the layer are exposed. The layer is 0.80~6.00m thick. Average thickness is 2.56m.

含淤泥中砂②(Q_4^m)：灰黑色，饱和，松散，以石英质中细砂为主，局部地段淤泥含量较大，具腥臭味，土质不均匀。该层大部分钻孔有揭露，层厚0.50~5.00m，平均1.94m。

Medium sand with sludge ②(Q_4^m): ash black, saturated, loose, mainly including quartziferous medium and fine sand. Some sections have large sludge content. It's stenching and soil is uneven. Most boreholes in the layer are exposed. The layer is 0.50~5.00m thick. Average thickness is 1.94m.

中砂③（Q_2b）：灰白色，稍密状为主，饱和。主要成分为石英质中、粗砂，颗粒粒径多在0.5～2mm间，呈次棱角状，级配良好。该层大部分钻孔有揭露，层厚0.60~8.70m，平均5.31m。

Medium sand ③ (Q_2b): ashen, slightly dense, saturated. Mainly including quartziferous medium and fine sand with particle diameter of 0.5~2mm. Medium sand, of subangular shape, is featuring favorable gradation. Most boreholes in the layer are exposed. The layer is 0.60~8.70m thick. Average thickness is 5.31m.

黏土④（Q_1z）：灰白杂红褐色，硬塑状为主，主要成分为高岭土矿物，土体干强度高，切面光滑，韧性中等，无摇振反应。该层全部钻孔均有揭露，尚未揭穿，揭示厚度7.60~13.30m，平均10.37m。

Clay ④(Q_1z): ashen and bronzing, mainly of hard plastic shape, main constituent:

kaolin mineral. Soil mass is featuring high strength, smooth section and medium tenacity. It's free from shake vibration response. All boreholes in the layer are exposed not penetrated. The revelation thickness is 7.60~13.30m and average thickness is 10.37m.

根据区域地质资料显示，场地黏土④层以下以湛江组硬塑状黏性土或中密状为主的石英砂类为主，土体力学性质良好。

According to regional geological data, Zhanjiang Group hard plastic cohesive soil or medium-density quartz sand are mainly below clay ④ of the site. The soil mass is featuring favorable mechanical property.

3.5.2.3 场地包气带特征

3.5.2.3 Characteristics of aeration zones on the site

场地包气带地层以第四系人工素填土层、冲洪积含砂粘土、含粘性土中粗砂、粘土、中粗砂等层为主，层厚 0.2-15.8m，分布不连续。其中，场地东南侧地块（规划物流用地）包气带厚度为 0.2~5.0m，岩性以素填土、含淤泥中砂及中砂为主；场地中部及污水处理站地块包气带层厚为 3.3~15.8m，岩性以素填土、粘土、含粘性土中砂为主。

Aeration zones on the site mainly include Quaternary artificial plain fill layer, alluvial-proluvial sand clay, medium-coarse sand with cohesive soil, clay, medium-coarse sand and other layers. The aeration zone is 0.2-15.8m thick and distributed discontinuously. Where, the aeration zone on the southeast side plot (planned logistics land) of the site is 0.2~5.0m thick. In terms of lithology, it's mainly plain fill, medium sand with sludge and medium sand. The aeration zones in the middle of the site and the sewage treatment plant plot are 3.3~15.8m thick. It mainly comprises of plain fill, clay and medium sand with cohesive soil.

3.5.2.4 评价区地下水类型及富水性特征

3.5.2.4 Type and water yield property of groundwater in the assessment area

场区地处滨海平原的前缘，地下水类型主要为松散岩类孔隙水，主要赋存于第四系砂层中，富水性中等，具弱承压性。场区内分布的第四系松散层，具多元结构，砂层与黏性土层呈互层分布，但黏性土层分布不连续，无明显的隔水层，各砂层之间具有一定的连通性。本次最大勘探深度范围内，见一层地下水，属潜水类型，主要赋存于含淤泥中砂②、中砂③层中，地下水量较丰富，属强透水层。

The plot is located on the front edge of the coastal plain. Groundwater mainly include loose rock pore water. It's mainly endowed in Quaternary sand layer. It's featuring medium water yield property and weak pressure-bearing capacity. The site is distributed with Quaternary unconsolidated formation which is featuring diversified structure. Sand layer and cohesive soil are distributed in a interbedding manner. However, cohesive soil is not distributed continuously. There is no water-resisting layer. Different sand layers are featuring certain connectivity. One layer of groundwater can be seen within maximum exploration depth. It's phreatic water mainly endowed in medium sand with sludge ② and medium sand ③. The amount of groundwater is relatively rich. It's strong permeable stratum.

3.5.2.5 评价区水文地质单元

3.5.2.5 Hydrogeological units of the assessment area

场区地处南康盆地水文地质单元东隅的大江口次一级水文地质单元的径流区。大江口单元为相对独立的水文地质单元，该单元以西面板塘—浸谷塘—下底村—沙角咀连线的地下水分水岭为界，东、北东和南东三面均以北部湾海域为排泄边界。

The site is located in the runoff area of Dajiangkou sub-level hydrogeological unit on the east side of Nankang Basin hydrogeological unit. Dajiangkou Unit is a relatively independent hydrological unit. The Unit takes groundwater watershed of Bantang - Jingutang - Xiadi Village - Shajiaoju as its west boundary and Beibu Gulf sea as its eastern, northeastern and southern drainage boundary.

3.5.2.6 评价区地下水补给、径流、排泻条件

3.5.2.6 Recharge, runoff and discharge conditions of groundwater in the assessment area

场区地处大江口次一级水文地质单元的径流区。主要接受大气降水的垂直渗入和西侧同单元地下水的侧向补给，以及少量地表水和农灌水的渗漏补给。场地范围内，北暮村，岸泽村一代地势较高。场地中部目前现状为养虾场，地势较低。川江坡尾底一带地势均高于场地中部杨下场一带。且场地主要地下水类型为赋存于砂层中的第四系孔隙水。因此，受场地地貌影响，场地范围内地下水由北西向南东径流，以渗流的方式排泄于北部湾海域。

The site is located in the runoff area of Dajiangkou sub-level hydrogeological unit. It's mainly recharged by vertical infiltration of atmospheric precipitation, lateral recharge by groundwater of the same unit on the west side and seepage recharge by some surface water and agricultural irrigation water. Beimu Village and Anze Village in the site are relatively high. Currently, the prawn park in the middle of the site is quite low. Chuanjiang and Poweidi areas are higher than Yangxiachang in the middle of the site. And main groundwater type on the site is Quaternary pore water in the sand layer. Therefore, due to impact of site landform, groundwater in the site flows from northwest to southeast and drains into Beibu Gulf sea area in the form of seepage.

3.5.2.7 评价区地下水动态特征

3.5.2.7 Dynamic characteristics of groundwater in the assessment area

本区内浅层地下水（或是潜水）水位动态主要受降雨入渗补给的影响而发生变化；此外，由于本区临海，滨海区地下水动态还受到海潮的影响。依据影响地下水动态的主要因素，可将本区内地下水动态大体上划分为两种类型即为入渗径流型和潮汐效应型。

Dynamic state of water level of groundwater (or phreatic water) in the shallow layer of the area mainly changes according to impact of rainfall infiltration. Moreover, as the area is adjacent to sea, dynamic state of groundwater in coastal area is also affected by sea tide. According to major factors affecting dynamic state of groundwater, dynamic state of groundwater in the area can be roughly divided into such two types as infiltration runoff type and tidal effect type.

（1）入渗径流型

(1) Infiltration runoff type

在接受降雨入渗补给之后，地下水位逐渐抬升；降雨入渗补给停止之后，地下水位下降，这是本区潜水最主要的动态类型。研究区滨海平原地势平缓，包气带岩层岩性是第四系中更新统北海组砂层、亚粘土，包气带透水性较好。且由于地势平缓，降雨汇积起来更加容易，地表径流不易形成，本区的地表岩性和地形条件有利于大气降水入渗补给地下水。因此，本区内潜水动态受到降雨动态的影响，但是水位变化相对于降水存在滞后现象，见图 3.5-2（引自《广西北海市海水入侵灾害勘察报告》 1998 年，其中 S224-潜水井，ZK20、ZK70-承压水井）。

Groundwater level raises gradually after being recharged by rainfall infiltration. After recharging by rainfall infiltration, the groundwater level reduces. It’s a main dynamic type of phreatic water of the area. In the research area, the coastal plain is quite flat. Stratum in the aeration zone includes Quaternary Middle Pleistocene Series Beihai Fm sand layer and loam. The aeration zone is featuring favorable water permeability. Meanwhile, as the terrain is quite flat, rainfall can accumulate much more easily. It's hard to form surface runoff. Surface lithology and terrain conditions are beneficial for atmospheric precipitation to infiltrate into groundwater. Therefore, dynamic state of phreatic water in the area is affected by dynamic state of rainfall. However, compared with rainfall, water level change is lagging. Refer to Fig. 3.5-2 (quoted from Report on Survey of Seawater Intrusion in Guangxi Beihai, 1998, where, S224-phreatic well, ZK20 and ZK70- confined water well).

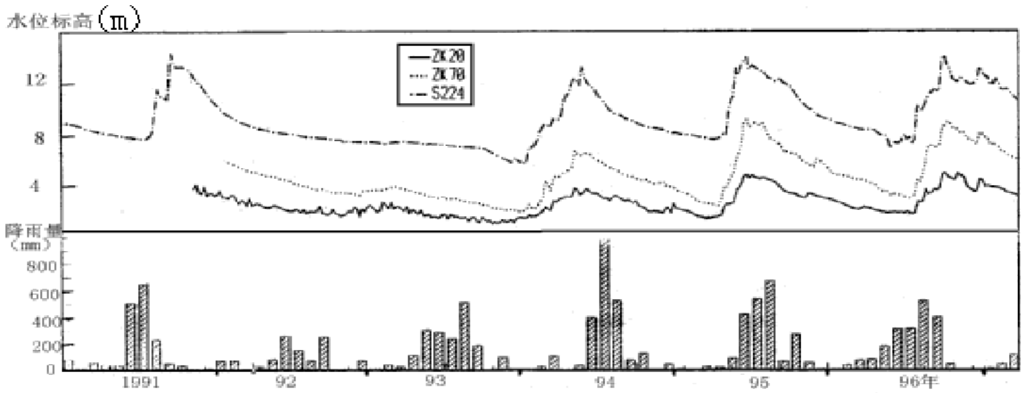


图 3.5-2　　区域地下水位动态曲线图

Fig. 3.5-2 Curve chart of dynamic state of groundwater in the area

（2）潮汐效应型

(2) Tidal effect type

受海潮波动的影响，滨海地区地下水水位出现有规律的波动。地下水的波动与涨潮落潮有一致性，但水位变化小于海潮的水位变化；随着与海岸距离的增加，含水层水位受潮汐的影响逐渐变弱，也就是随着离岸距离的增加地下水变幅减小、滞后时间增大。

Due to impact of tide fluctuation, groundwater level in the coastal area is showing regular fluctuation. Fluctuation of groundwater and ebb-and-flood are consistent. However, water level change is smaller than tide water level change. With the increase of distance from the bank, the impact of tide on water level of the aquifer has been weakened gradually. That is to say, with the increase of offshore distance, groundwater variation amplitude reduces and retardation time has been prolonged.

3.5.2.8 水文地质参数

3.5.2.8 Hydrogeological parameters

（1）表层土垂向渗透系数

(1) Topsoil vertical penetration coefficient

项目区域表层土垂向渗透系数结果见表 3.5-1。

Refer to Table 3.5-1 for vertical penetration coefficient result of topsoil in the area.

表 3.5-1 试坑渗水试验成果统计表

Table 3.5-1 Statistical table of water seepage test results of test pits

试坑渗水试验点位与本项目位置关系见图 3.5-2。

Refer to Fig. 3.5-2 for position relationship between test pit seepage test point and the project.

图 3.5-3 水文地质试验点位与本项目位置关系

Fig. 3.5-3 Position relationship between hydrogeological test point and the project

（2）注水试验

(2) Water injection test

在 7 个水文地质钻孔中进行了 7 段注水试验，即分别在含粘土中砂中作了 3 段、粘土中作了 3 段、含淤泥质中粗砂中作了 1 段注水试验，试验成果统计见表 3.5-2。试验点位与本项目位置关系见附图 3.5-3。

7 sections of water injection tests have been conducted at 7 hydrogeological boreholes, i.e., 3 sections for medium sand with clay, 3 sections for clay and 1 section for mucky medium-coarse sand. Refer to Table 3.5-2 for statistics of test results. Refer to Fig. 3.5-3 for position relationship between test points and the Project.

表 3.5-2 试坑渗水试验成果统计表

Table 3.5-2 Statistical table of water seepage test results of test pits

（3）抽水试验

(3) Pumping test

据抽水试验成果，采用解析法计算的有关参数见表 3.5-3。

According to pumping test results, relevant parameters are calculated with analysis method. Refer to Table 3.5-3 for details.

表 3.5-3 钻孔简易抽水试验成果统计

Table 3.5-3 Statistics of simple pumping test results of boreholes

（4）水文地质参数综合建议值

(4) Comprehensive suggested value for hydrogeological parameters

通过上述场地及场地周围的水文地质试验结果，综合确定场地包气带及主要含水层的渗透系数建议值如下表 3.5-4。

According to hydrogeological test results of aforementioned site and surrounding site, suggested value for permeability coefficient of site aeration zones and main aquifers are determined in a comprehensive manner. Refer to Table 3.5-4 for details.

表 3.5-4 水文地质参数综合建议值

Table 3.5-4 Comprehensive suggested value for hydrogeological parameters

3.5.3 地下水水位监测

3.5.3 Groundwater level monitoring

本次勘察地下水动态观测选取场区及其周边具代表性的民井、机井同时开展观测。勘查时间为 2019 年 7 月 30 日，地下水水位调查结果见表 3.5-5。

When observing dynamic state of groundwater during the investigation, representative civil wells and machine wells in the site and surrounding areas are observed simultaneously. The survey is conducted on Jul. 30, 2019. Refer to Table 3.5-5 for groundwater level investigation result.

表 3.5-5　地下水点位调查表　单位：m

Table 3.5-5 Groundwater point investigation list Unit: m

根据监测结果，调查区地下水水位埋深一般 3.30～15.83m，标高 2.29～33.6m，地下水水位 0.33~18.2m。

According to monitoring results, buried depth of groundwater level in the investigation area is generally 3.30～15.83m, elevation is 2.29～33.6m and groundwater level is 0.33~18.2m.

3.5.4 地下水环境质量现状调查

3.5.4 Investigation of groundwater environment quality condition

3.5.4.1 监测点布设

3.5.4.1 Monitoring point layout:

根据《环境影响评价技术导则　地下水环境》（HJ 610-2016），二级评价项目潜水含水层的水质监测点应不少于5个，可能受建设项目影响且具有饮用水开发利用价值的含水层2-4个。项目区民井主要取用深层地下水，故本项目设置潜水含水层监测点5个、具有饮用水开发利用价值的含水层监测点2个。

According to Technical Guidelines for Environmental Impact Assessment - Groundwater Environment (HJ 610-2016), at least 5 water quality monitoring points shall be arranged for phreatic aquifers of Phase II evaluation project. 2-4 aquifers with drinking water development and utilization value might be affected by the project. Civil wells in the project area are mainly deep groundwater. Therefore, the project is arranged with 5 phreatic aquifer monitoring points and 2 aquifer monitoring points with drinking water development and utilization value.

表 3.5-6　地下水监测点位、监测因子及水位一览表
Table 3.5-6 Summary of groundwater monitoring points, monitoring factors and level

编号 No.	具体位置 Detailed position	监测因子 Monitoring factor	性质 Nature	备注 Remarks
U1	谢家村 Xiejiacun Village	pH 值、色度、总硬度、耗氧量（COD_{Mn}）、溶解性总固体、硫化物、氨氮、氯化物、硫酸盐、挥发性酚类、阴离子合成洗涤剂、硝酸盐（NO_3^-）、亚硝酸盐（NO^{2-}）、K^+、Na^+、Ca^{2+}、Mg^{2+}、CO_3^{2-}、HCO_3^-共 19 项。Such 19 items including pH value, chromaticity, total hardness, oxygen consumption (COD_{Mn}), total dissolved solids, sulfide, ammonia nitrogen, chloride, sulfate, volatile phenols, anion synthetic detergent, nitrate (NO_3^-), nitrite (NO^{2-}), K^+, Na^+, Ca^{2+}, Mg^{2+}, CO_3^{2-} and HCO_3^-	具有饮用水开发利用价值含水层 Aquifers with drinking water development and utilization value	项目场地侧向 Lateral direction of the project area
U2	北暮盐场 Beimu saltworks		潜水含水层 Phreatic aquifer	项目场内 Within the project site
U3	邓屋饮用水点 Dengwu drinking water point		潜水含水层 Phreatic aquifer	项目场地上游 Upstream of the project site
U4	坡尾底 Poweidi		具有饮用水开发利用价值含水层 Aquifers with drinking water development and utilization value	项目场地下游 Downstream of the project site

U5	对面垌 Duimiandong		潜水含水层 Phreatic aquifer	项目场地上游 Upstream of the project site
U6	川江水井 Chuanjiang well		潜水含水层 Phreatic aquifer	项目场地侧向 Lateral direction of the project area
U7	岸泽水井（近北厂界） Anze Well (near to the north boundary)		潜水含水层 Phreatic aquifer	项目场内上游 Within the upstream of the project site

3.5.3.2 监测时间及频率

3.5.3.2 Monitoring time and frequency

监测时间：2019 年 7 月 31 日，监测 1 天，每天采样监测 1 次。

Monitoring time: Jul. 31, 2019, one day, one sampling and monitoring per day

3.5.3.3 分析方法

3.5.3.3 Analysis method

地下水水质监测分析方法按照 HJ/T164-2004《地下水环境监测技术规范》和《水和废水监测分析方法》（2002 版）有关规定进行。各因子监测方法及检出限详见表 3.5-7。

Groundwater quality monitoring and analysis methods shall comply with relevant regulations in HJ/T164-2004 Technical Specifications for Environmental Monitoring of Groundwater and Water and Wastewater Monitoring and Analysis Method (Version 2002). Refer to Table 3.5-7 for details of monitoring methods for various factors and detection limits.

表 3.5-7 地下水监测项目及分析方法

Table 3.5-7 Monitoring items and analysis methods for groundwater

序号 S. N.	监测项目 Monitoring item	分析方法 Analysis method	检出限或测定下限 Detection limit or limit of determination
1	pH 值 pH value	水质 pH 值的测定 玻璃电极法 GB6920-86 Water Quality - Determination of pH Value - Glass Electrode Method GB6920-86	0.01pH
2	色度 Chromaticity	水质 色度的测定 GB11903-89 铂钴比色法 Water Quality - Determination of Colority GB11903-89 Platinum Cobalt Colorimetric Method	5 度 5 degree
3	总硬度 Total hardness	水质 钙和镁总量的测定 EDTA 滴定法 GB7477-87 Water Quality - Determination of the Sum of Calcium and Magnesium - EDTA Titration Method GB7477-87	5mg/L

4	高锰酸盐指数（耗氧量） Permanganate index (oxygen consumption)	水质 高锰酸盐指数的测定 GB11892-89 Water Quality - Determination of Permanganate Index GB11892-89	0.5mg/L
5	溶解性总固体 Solubility Total solids	生活饮用水标准检验方法 感官性状和物理指标 称量法 GB/T5750.4-2006 Standard Examination Methods for Drinking Water - Organoleptic and Physical Parameters - Weighing Method GB/T5750.4-2006	4mg/L
6	硫化物 Sulfide	水质 硫化物的测定 亚甲基蓝分光光度法 GB/T16489-1996 Water Quality - Determination of Sulfide - Methylene Blue Spectrophotometric Method GB/T16489-1996	0.005mg/L
7	氨 氮 Ammonia nitrogen	水质 氨氮的测定 纳氏试剂分光光度法 HJ535-2009 Water Quality - Determination of Ammonia Nitrogen - Nessler's Reagent Spectrophotometry HJ535-2009	0.025 mg/L
8	亚硝酸盐氮 Nitrite nitrogen	水质 亚硝酸盐氮的测定 分光光度法 GB7493-87 Water Quality - Determination of Nitrogen (Nitrite)-Spectrophotometric Method GB7493-87	0.003mg/L
9	挥发酚 Volatile phenol	水质 挥发酚的测定 Water Quality - Determination of Volatile Phenolic Compounds - 4−氨基安替比林分光光度法 HJ503-2009 4-AAP Spectrophotometric Method HJ503-2009	萃取法：0.0003mg/L Extraction method: 0.0003mg/L
10	阴离子表面活性剂 Anionic surfactant	水质 阴离子表面活性剂的测定 Water Quality - Determination of Anionic Surfactants - 亚甲蓝分光光度法 GB7494-87 Methylene Blue Spectrophotometric Method GB7494-87	0.050mg/L
11	氯化物 Chloride	水质 无机阴离子（F^-、Cl^-、NO_2^-、Br^-、NO_3^-、PO_4^{3-}、SO_3^{2-}、SO_4^{2-}）的测定 离子色谱法 HJ84-2016 Ambient Air - Determination of the Water Soluble Anions (F^-, Cl^-, NO_2^-, Br^-, NO_3^-, PO_4^{3-}, SO_3^{2-} and SO_4^{2-}) from Atmospheric Particles - Ion Chromatography HJ84-2016	0.007mg/L
12	硝酸盐氮 Nitrate nitrogen		0.004mg/L
13	硫酸盐 Sulfate		0.018mg/L
14	CO_3^{2-}	酸碱指示剂滴定法（B）《水和废水监测分析方法》 Acid-base Indicator Titration Method (B) Water and Wastewater Monitoring and Analysis Method （第四版） 国家环保总局 2002 年 (The 4th edition) State Environmental Protection Administration, 2002	—
15	HCO_3^-		—
16	K^+	水质 钾和钠的测定 Water Quality - Determination of Potassium and Sodium 火焰原子吸收分光光度法 GB11904-89 Flame Atomic Absorption Spectrophotometry GB11904-89	0.03mg/L
17	Na^+		0.010mg/L
18	Ca^{2+}	水质 钙和镁的测定 Water Quality—Determination of Calcium and Magnesium 火焰原子吸收分光光度法 GB11905-89 Flame Atomic Absorption Spectrophotometry GB11905-89	0.02mg/L
19	Mg^{2+}		0.002mg/L

3.5.3.4 评价方法及评价标准

3.5.3.4 Evaluation method and evaluation standard

采用《环境影响评价技术导则 地下水环境》（HJ610-2016）推荐的标准指数法进行评价。公式为：

Standard index method recommended in the Technical Guidelines for Environmental Impact Assessment - Groundwater Environment (HJ610-2016) is used for assessment. The formula shall be as follows:

$$P_i = C_{i.}/C_{si}$$

式中：

Where:

P_i——第 i 个水质因子的标准指数，无量纲。标准指数大于1，说明水质已超标；

P_i——standard index of the ith water quality factor, dimensionless; If the standard index is larger than 1, water quality has exceeded standard;

$C_{i.}$——第 i 个水质因子的监测浓度值，mg/L；

$C_{i.}$—— Monitoring concentration value of the ith water quality factor, mg/L;

C_{si}——第 i 个水质因子的标准浓度值，mg/L。

C_{si}——Standard concentration value of the ith water quality factor, mg/L.

pH 值的水质指数为：

$$P_{pH} = \frac{7.0 - pH}{7.0 - pH_{sd}} \qquad pH \le 7.0$$

Water quality index of pH value:

$$P_{pH} = \frac{7.0 - pH}{7.0 - pH_{sd}} \qquad pH \le 7.0$$

$$P_{pH} = \frac{pH - 7.0}{pH_{su} - 7.0} \qquad pH > 7.0$$

式中：P_{pH}——pH 的标准指数，无量纲；

Where: P_{pH}——standard index of pH, dimensionless;

pH——pH 值监测值；

pH——pH monitoring value;

pH_{su}——标准中的 pH 值上限值；

pH_{su}——Upper limit of pH value in the standard;

pH_{sd}——标准中的 pH 值下限值。

pH_{sd}——Lower limit of pH value in standard.

地下水各监测因子执行《地下水质量标准（GB14848-2017）》III类水质标准，标准值详见表 1.3-5。

Various groundwater monitoring factors shall comply with Class III water quality standard in Standard for Groundwater Quality (GB14848-2017). Refer to Table 1.3-5 for details of standard values.

3.5.3.5 监测结果及评价

3.5.3.5 Monitoring results and assessment

各监测结果及评价见表 3.5-8。

Refer to Table 3.5-8 for each monitoring result and assessment.

表 3.5-8　地下水环境质量现状监测结果一览表　单位：mg/L（除 pH 值、色度外）

Table 3.5-8 Summary of monitoring result of groundwater environment quality state Unit: mg/L (except for pH value and chromaticity)

注：监测浓度低于方法检出限时以“ND”表示(CO_3^{2-}除外)。
Note: Displaying with “ND” if monitoring concentration is lower than detection limit in the method (except for CO_3^{2-})

本项目地下水水质监测结果显示，2019 年 7 月监测期间，各监测点位除 6#（川江）外，pH 值均呈偏酸性。1#（谢家村）氯化物出现超标，超标 0.51 倍，根据现场走访调查，谢家村一带海水养殖业排污不规范，养殖污染物乱排，以及养殖海水的渗漏，村民反应地下水时有咸味。其他监测点的各项监测因子均能满足《地下水环境质量标准》（GBT14848-2017）III类标准。

According to groundwater quality monitoring result of the Project, during the monitoring period in July 2019, pH value of each monitoring point is slightly acid except for Monitoring point 6 (Chuanjiang). Chloride in Monitoring point 1 (Xiejia Village) had exceeded standard by 0.51 times. According to field interview and investigation, the pollution discharge of marine aquaculture industry in Xiejia Village was not normalized, cultivation pollutants were stacking everywhere, cultivation seawater was leaking and villagers said that sometimes groundwater is salty. Each monitoring factor of other monitoring points can satisfy Class III standard in Standard for Groundwater Quality (GBT14848-2017).

3.5.3.6 地下水 pH 值现状监测值对比说明

3.5.3.6 Description of comparison of monitoring value of pH value of groundwater

根据项目地下水水质监测结果，项目区域地下水 pH 值存在一定的波动，呈偏酸性。通过对区域历史资料的分析，北海市滨海平原松散沉积物中分布有潜水含水层以及承压

含水层。地下水的 pH 值普遍偏低，一般 4.0~6.0 者居多。第四系松散沉积物的矿物成分石英占 50%~80%，含少量黏土矿物，化学成分中 SiO_2 占大多数。以难溶成分为主的沉积物和长期的淋滤作用使地下水具有低矿化度。天然状态下偏酸性地下水的 H^+来源于碳酸的离解、粘土层的 H_2O^+及雨水中的酸度。碳酸则是由 CO_2 溶解于水而形成，其中 CO_2 主要来源于生物成因。地下含水系统中缺少可以中和酸的碱性物质，有利于 H^+聚集，使得地下水 pH 值偏低。天然状态下，北海滨海平原地区地下水 pH 值为 3.33~7.0，平均值为 5.12，其中潜水 3.67~7.0，平均值 5.17；承压水 3.33~6.97，平均值 5.07。一般在丰水期要略高于枯水期。北海市 1989 年~2004 年地下水 pH 值统计结果见下图 3.5-6（引用自李锐、周训等著《北海市偏酸性地下水 pH 值的特点及其影响因素简析》）。

According to groundwater quality monitoring result of the Project, pH value of groundwater of the project area had fluctuated to some extent and groundwater was slightly acidic. According to analysis of regional historical data, loose sediment in Beihai coastal plain included phreatic aquifers and confined aquifers. pH value of groundwater was generally low, generally, between 4.0~6.0. As for mineral composition of Quaternary loose sediments, quartz accounted for 50%~80%. Some clay minerals were included. SiO_2 accounted for majority in term of chemical composition. Groundwater was featuring with low degree of mineralization due to sediments mainly comprising of undissolved ingredients and long-term leaching. Naturally, H^+ of acidic groundwater came from dissociation of carbonic acid, H_2O^+ from claypan and acidity in rainwater. Carbonic acid was formed by dissolving CO_2 into water. Wherein, CO_2 mainly came from biogenic factors. The underground water system lacks alkaline substances which can be used to neutralize acid, which was beneficial for accumulation of H^+ and could make pH value of groundwater slightly lower. Naturally, pH value of groundwater in Beihai coastal plain area was 3.33~7.0 and average value was 5.12, including phreatic water: 3.67~7.0, average value 5.17; confined water 3.33~6.97, average value 5.07/ Generally, pH value in wet season was higher than that in dry season. Refer to Fig. 3.5-6 for statistical results of pH value of groundwater in Beihai from 1989 - 2004 (Quoted from Brief Analysis of Characteristics of pH Value of Acidic Groundwater in Beihai City and Its Influential Factors.

因此本项目 pH 值范围 4.25~7.07 属于正常范围内。

Therefore, scope of pH value of the Project, 4.25~7.07, was normal.

时间	潜水			承压水			时间	潜水			承压水		
（年－月）	最大值	最小值	平均值	最大值	最小值	平均值	（年－月）	最大值	最小值	平均值	最大值	最小值	平均值
1989－03	5.2	5	5.1	5.3	5.1	5.18	1989－09	6.4	4.8	5.43	6.5	4.6	4.89
1990－03	6.7	4.7	5.47	6.6	4.6	5.05	1990－09	6.4	4	4.89	5.7	4.1	4.94
1991－03	6.9	4.5	5.61	6.2	5.2	5.44	1991－09	6	4.7	5.18	5.4	4.7	5.06
1992－03	6.5	4.4	5.3	6.7	4.8	5.35	1992－09	6.5	4.8	5.69	4.8	6.6	5.41
1993－03	6.8	4.6	5.28	6.2	4.9	5.21	1993－09	6.5	4.9	5.48	6.8	4.9	5.59
1994－03	6	4.5	5.1	6	4.6	5.06	1994－09	6.3	4.6	5.28	5.6	4.6	5.06
1995－03	5.5	4.6	4.9	5.8	1.8	4.82	1995－09	6.2	4.8	5.27	6.2	4.8	5.01
1996－03	5.6	4.2	4.81	6.4	4.35	5.12	1996－09	6.39	4.2	5.17	5.59	4.23	4.91
1997－03	6.56	4.2	5.1	5.72	4.38	5.03	1997－09	6.4	4.63	5.49	6.49	4.6	5.49
1998－03	5.2	4.3	4.93	6.7	3.73	4.91	1998－09	6.7	4.3	5.26	5.4	4	4.76
1999－03	6.51	4.84	5.42	6.75	4.64	5.37	1999－09	5.56	3.68	4.69	5.23	3.33	4.35
2000－03	4.64	4.2	4.49	5.5	3.96	4.76	2000－09	6.17	4.51	5.17	6.29	4.33	5.21
2001－03	5.92	4.37	5.34	5.76	4	5.24	2001－09	5.5	4.06	5.02	5.62	3.93	4.95
2002－03	6.27	3.94	4.91	5.57	3.76	4.53	2002－09	6.84	4.03	5.83	6.84	3.85	5.52
2003－03	5.2	3.81	4.69	6.81	3.81	4.8	2003－09	5.1	4.18	4.7	6.93	3.81	4.92
2004－03	7	4.55	5.82	8.23	4.14	6.33	2004－09	4.99	4.09	4.66	6.97	3.67	4.8
平均值	6.03	4.42	5.14	6.27	4.24	5.13	平均值	6.12	4.39	5.20	6.02	4.38	5.05

图 3.5-6 北海市 1989 年~2004 年地下水 PH 值统计结果

Fig. 3.5-6 Statistical result of pH value of groundwater of Beihai City from 1989 to 2004

3.6 土壤环境质量现状调查与评价

3.6 Survey and assessment of soil environment quality condition

3.6.1 调查评价范围

3.6.1 Scope of survey and assessment

调查评价范围应包括建设项目可能影响的范围，参考《环境影响评价技术导则 土壤环境（试行）》（HJ964-2018）表 5，确定本项目土壤评价范围为场区及周边 1km 范围。

The scope of survey and assessment includes scope that might be affected by construction project. According to Table 5 in Technical Guidelines for Environmental Impact Assessment Soil Environment (Provisional) (HJ964-2018), the scope of assessment of soil in the Project should be the plant area and 1km around the plant site.

3.6.2 场地及周边环境调查

3.6.2 Investigation of site and surrounding environment

项目厂区北部及南部土地利用现状以农村宅基地、未利用地和少量农用地为主，其

中北部污水处理站用地已进行土地平整，厂区中部分布有水产养殖为主的水塘，土地利用现状为设施农用地。根据广西壮族自治区土壤类型图，区域主要土壤类型为砖红壤。

Land at the northern and southern parts of the plant area mainly compose of rural housing land, unused land and some farmland. Where, the sewage treatment plant at the northern part had been leveled. There were some pools for aquaculture in the middle part of the plant. The land was now facility land. According to soil type map of Guangxi Zhuang Autonomous Region, main soil type in the region was laterite.

广西壮族自治区土壤类型图

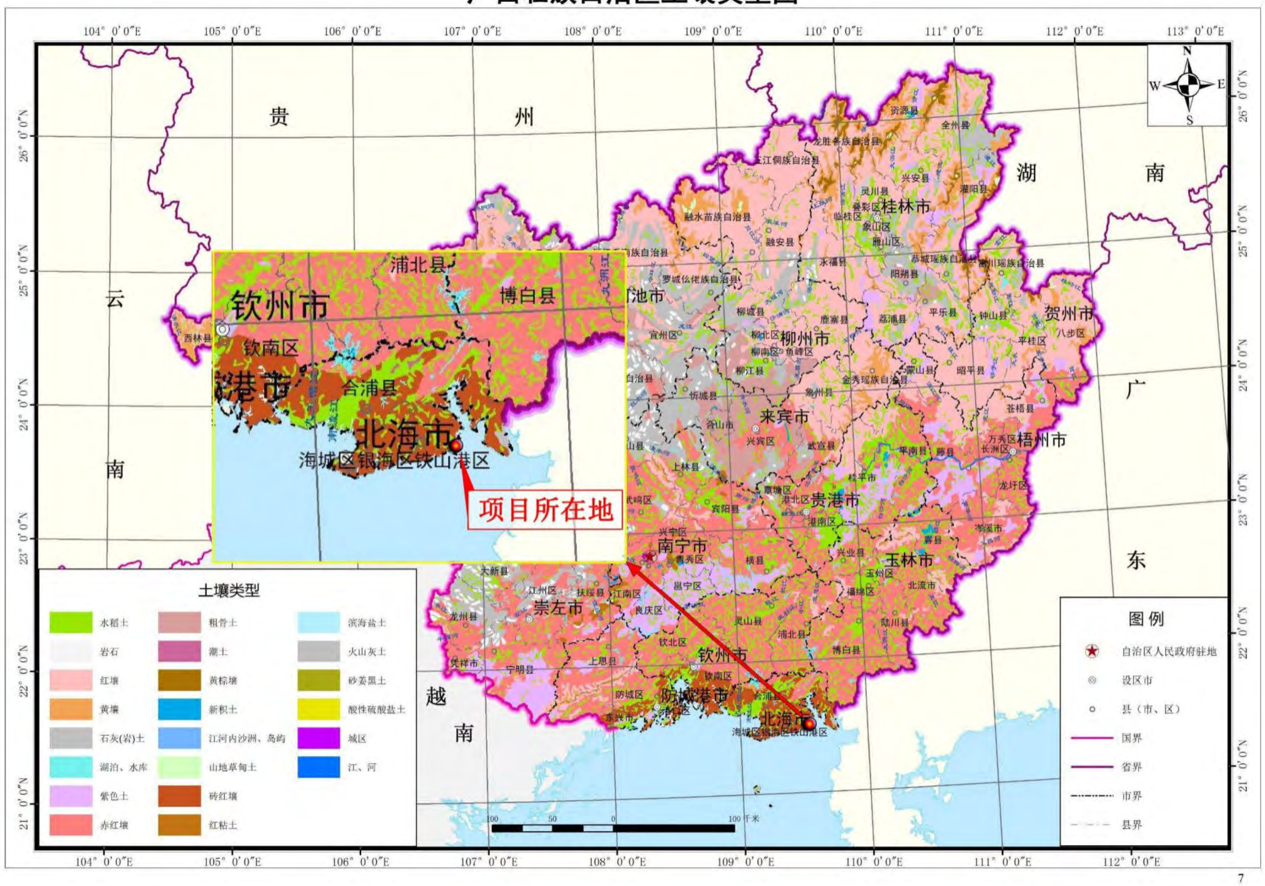


Diagram for Soil Type of Guangxi Zhuang Autonomous Region

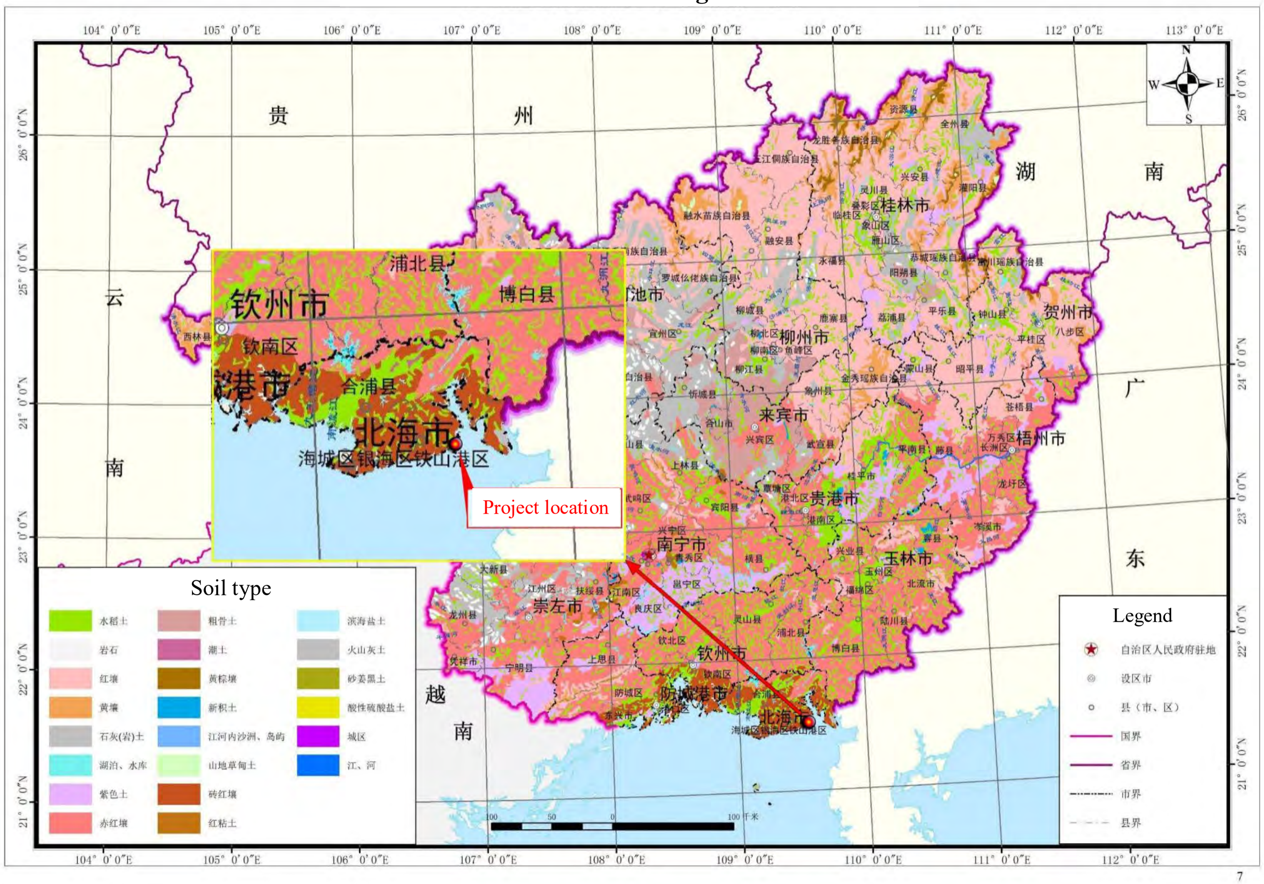


图 3.6-1　土壤类型分布图

Fig. 3.6-1 Soil type distribution map

3.6.3 理化特性调查

3.6.3 Investigation of physical and chemical properties

经查阅相关资料，区域土壤类型为暗红湿润铁铝土，根据土壤环境影响类型、建设项目特征，本项目土壤理化特性调查见下表。

According to relevant data, the soil type in the area was dull-red wet ferralsol. According to soil environment impact type and characteristics of the construction project, refer to the following table for investigation of physical and chemical properties of soil in the Project.

表 3.6-1 土壤理化特性调查表

Table 3.6-1 Schedule of survey of physical and chemical properties of soil

表 3.6-2 土体构型（土壤剖面）调查表

Table 3.6-2 Schedule of survey of structure of soil mass (soil section)

表 3.6-3 土壤理化特性调查表

Table 3.6-3 Schedule of survey of physical and chemical properties of soil

表 3.6-4 土体构型（土壤剖面）调查表

Table 3.6-4 Schedule of survey of structure of soil mass (soil section)

3.6.4 影响源调查

3.6.4 Investigation of impact sources

项目位于铁山港（临海）工业园区，厂区北面（上风向）为斯道拉恩索（广西）林浆纸有限公司。该公司与本项目属于同类型企业，污染特征类似。项目场地内分布有大量鱼虾养殖场，养殖海水及污染物对土壤造成一定影响。

The Project is located in Tieshangang (Linhai) Industrial Park. Stora Enso (Guangxi) Forestry Co., Ltd. Is located at the northern part (upwind direction) of the plant area. The Company and the Project are of the same type. Pollution characteristics are similar. There are plenty of fish and shrimp farms distributed in the project area. Aquaculture seawater and pollutants will impose certain impact on soil.

3.6.5 土壤环境质量现状调查与评价

3.6.5 Survey and assessment of soil environment quality condition

本次土壤环境质量现状监测委托广西壮族自治区化工环保监测站于 2019 年 8 月 3 日对项目土壤环境进行现场采样监测；同时引用区域《北部湾资源再生环保服务中心项

目（一期）环境影响报告书》2018 年 5 月 22 日对项目周边农用地土壤二噁英的监测结果，经调查 2018 年 5 月 22 日至今，评价范围内未有新增同类型污染源投产，区域土壤环境质量状况变化不大，引用的二噁英数据具有代表性。

As for soil environment quality condition monitoring, Chemical Industry and Environmental Protection Monitoring Station of Guangxi Zhuang Autonomous Region was entrusted to conduct field sampling and monitoring for soil environment on Aug. 3, 2019. Monitoring result on dioxin in soil in surrounding farmland was quoted from Environmental Impact Assessment Report on Beibu Gulf Resource Regeneration and Environmental Protection Service Center Project (Phase I) completed on May 22, 2018. By far, similar pollution source hasn't been put into operation within the assessment range from May 22, 2018. Soil environment quality condition of the area changes slightly. Quoted dioxin data was representative.

3.6.5.1 监测布点

3.6.5.1 Monitoring points

土壤监测共设置 3 个建设用地柱状样监测点，6 个建设用地表层样监测点，3 个周边农用地表层样监测点，具体位置及详细情况见表 3.6-5 和附图 4。

As for soil monitoring, 3 column sample monitoring points for construction land and 6 monitoring points for samples taken from surface course of construction land and 3 monitoring points for samples taken from surface course of surrounding farmland had been arranged. Refer to Table 3.6-5 and Fig. 4 for detailed position and detailed conditions.

表 3.6-5 土壤监测布点

Table 3.6-5 Soil monitoring points

序号 S. N.	监测点名称 Name of monitoring point	坐标 Coordinate	土地类型 Land type	采样类型 Sampling type	监测因子 Monitoring factor	备注 Remarks
1#	厂区制浆车间 Plant pulping workshop	N21°31′33.67″, E109°32′54.39″	建设用地 Construction land	柱状样，0~0.5m、0.5~1.5m、1.5~3m Column sample, 0~0.5m, 0.5~1.5m	pH 值、铅、砷、镉、汞、六价铬 pH value, lead, arsenic, cadmium, mercury and hexavalent chromium	占地范围内 Withi
2#	厂区碱炉车间 Alkali refining workshop in	N21°31′46.47″, E109°33′04.40″	建设用地 Constr			

序号 S. N.	监测点名称 **Name of monitoring point**	坐标 **Coordinate**	土地类型 **Land type**	采样类型 **Sampling type**	监测因子 **Monitoring factor**	备注 **Remarks**
	the plant area		uction land	and 1.5~3m		n occupied area
3#	厂区污水处理站 Wastewater treatment station in the plant area	N21°32′10.38″, E109°32′40.57″	建设用地 Construction land			
4#	碱回收蒸发工段 Alkali recovery evaporation section	N21°31′39.39″, E109°33′03.93″	建设用地 Construction land	表层样（0~0.2m）Samples taken from surface course (0~0.2m)	pH 值 pH value	
5#	碱回收苛化工段（石灰窑车间）Alkali recovery causticization section (lime kiln workshop)	N21°31′42.95″, E109°33′08.22″	建设用地 Construction land		pH 值 pH value	
6#	二氧化氯制备车间 Chlorine dioxide preparation workshop	N21°31′30.17″, E109°32′51.22″	建设用地 Construction land		pH 值 pH value	
7#	锅炉车间（煤棚）Boiler workshop (coal shed)	N21°31′47.70″, E109°33′03.20″	建设用地 Construction land		pH 值、铅、砷、镉、汞、六价铬 pH value, lead, arsenic, cadmium, mercury and hexavalent chromium	
8#	油库、化学品库 Oil depot and chemicals warehouse	N21°31′43.08″, E109°33′13.51″	建设用地 Construction land		pH 值、石油烃 pH value and petroleum hydrocarbon	
9#	厂区西北角 Northwest corner of the plant area	N21°31′34.51″, E109°32′44.28″	建设用地 Construction land		见注① See note ①	
10#	厂区动力车间 Power workshop of the plant area	N21°31′46.97″, E109°33′07.63″	建设用地 Construction land	表层样（0~0.2m）Samples taken from surface course	二噁英 Dioxin	

序号 S. N.	监测点名称 Name of monitoring point	坐标 Coordinate	土地类型 Land type	采样类型 Sampling type	监测因子 Monitoring factor	备注 Remarks
				(0~0.2m)		
11#	坡尾底村旱地 Dry land in Poweidi Village	N21°31′15.42″, E109°33′12.77″	农用地 Farmland	表层样（0~0.2m） Samples taken from surface course (0~0.2m)	pH 值、铅、砷、镉、汞、铜、铬、镍、锌 pH value, lead, arsenic, cadmium, mercury, copper, chromium, nickel and zinc	占地范围外 Outside of the land occupation range
12#	西厂界外旱地 Dry land outside the western plant boundary	N21°31′05.51″, E109°32′46.42″	农用地 Farmland	表层样（0~0.2m） Samples taken from surface course (0~0.2m)		
13#	厂界南侧外旱地 Dry land outside the northern plant boundary	N21°31′01.70″, E109°33′02.53″	农用地 Farmland	表层样（0~0.2m） Samples taken from surface course (0~0.2m)	二噁英 Dioxin	
14#	槟榔根 Binlanggen	N21°30′2.5″, E109°31′46.5″	农用地（旱地） Farmland (dry land)	表层样（0~0.2m） Samples taken from surface course (0~0.2m)	二噁英（引用区域《北部湾资源再生环保服务中心项目（一期）环境影响报告书》2018 年 5 月 22 日的监测数据） Dioxin (quoted from monitoring data in Environmental Impact Assessment Report on Beibu Gulf Resource Regeneration and Environmental Protection Service Center Project (Phase I) dated on May 22, 2018)	

注①：监测因子为镉、铅、铜、镍、砷、汞、铬（六价）、四氯化碳、氯仿、氯甲烷、1,1-二氯乙烷、1,2-二氯乙烷、1,1-二氯乙烯、顺-1,2-二氯乙烯、反-1,2-二氯乙烯、二氯甲烷、1,2-二氯丙烷、1,1,1,2-四氯乙烷、1,1,2,2-四氯乙烷、四氯乙烯、1,1,1-三氯乙烷、1,1,2-三氯乙烷、三氯乙烯、1,2,3-三氯丙烷、氯乙烯、苯、氯苯、1,2-二氯苯、1,4-二氯苯、乙苯、苯乙烯、甲苯、间二甲苯+对二甲苯、邻二甲苯、硝基苯、苯胺、2-氯酚、苯并[a]蒽、苯并[a]芘、苯并[b]荧蒽、苯并[k]荧蒽、䓛、二苯并[a,h]蒽、茚并[1,2,3-cd]芘、萘共 45 项

Note ①: monitoring factors include such 45 items as cadmium, lead, copper, nickel, arsenic, mercury, hexavalent chromium, carbon tetrachloride, chloroform, methyl chloride, 1, 1-dichloroethane, 1, 2-dichloroethane, 1,1-dichloroethylene, cis-1, 2-dichloroethylene, trans-1, 2-dichloroethylene, dichlormethane, 1,2-dichloropropane, 1, 1, 1, 2-tetrachloroethane, 1,1,2,2-tetrachloroethane, tetrachloroethylene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloro ethylene, 1,2,3-trichloropropane, chloroethylene, benzene, chlorobenzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, ethylbenzene, styrene, toluene, m-Xylene + p-Xylene, o-xylene, nitrobenzene, aniline, 2-chlorophenol, Benz(a)anthracene,

序号 S. N.	监测点名称 Name of monitoring point	坐标 Coordinate	土地类型 Land type	采样类型 Sampling type	监测因子 Monitoring factor	备注 Remarks
Benzoapyrene[a], Benzo[b]fluoranthene, Benzo[k]fluoranthene, chrysene, Dibenz[a,h] anthracene, Indeno[1,2,3-cd]Pyrene and naphthalene						

3.6.5.2 监测因子

3.6.5.2 Monitoring factor

监测因子为：pH值、砷、镉、铜、铅、锌、铬、汞、镍、六价铬、石油烃、二噁英、挥发性有机物（四氯化碳、氯仿、氯甲烷、1,1-二氯乙烷、1,2-二氯乙烷、1,1-二氯乙烯、顺-1,2-二氯乙烯、反-1,2-二氯乙烯、二氯甲烷、1,2-二氯丙烷、1,1,1,2-四氯乙烷、1,1,2,2-四氯乙烷、四氯乙烯、1,1,1-三氯乙烷、1,1,2-三氯乙烷、三氯乙烯、1,2,3-三氯丙烷、氯乙烯、苯、氯苯、1,2-二氯苯、1,4-二氯苯、乙苯、苯乙烯、甲苯、间二甲苯+对二甲苯、邻二甲苯）、以及半挥发性有机物（硝基苯、苯胺、2-氯酚、苯并[a]蒽、苯并[a]芘、苯并[b]荧蒽、苯并[k]荧蒽、䓛、二苯并[a,h]蒽、茚并[1,2,3-cd]芘、萘）共50项。

Monitoring factors include such 50 items such as pH value, arsenic, cadmium, copper, lead, zinc, chromium, mercury, nickel, hexavalent chromium, petroleum hydrocarbon, dioxin, volatile organic compounds (carbon tetrachloride, chloroform, chloromethane, 1, 1-dichloroethane, 1, 2-dichloroethane, 1, 1-dichloroethylene, cis-1, 2-dichloroethylene, trans-1, 2-dichloroethylene, dichlormethane, 1,2-dichloropropane, 1,1,1,2-tetrachloroethane, 1,1,2,2-tetrachloroethane, tetrachloroethylene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloro ethylene, 1,2,3-trichloropropane, chloroethylene, benzene, chlorobenzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, ethylbenzene, styrene, m-Xylene + p-Xylene, o-xylene) and semi-volatile organic compounds (nitrobenzene, aniline, 2-chlorophenol, Benz(a)anthracene, Benzoapyrene[a], Benzo[b]fluoranthene,Benzo[k]fluoranthene, chrysene, Dibenz[a,h] anthracene, Indeno[1,2,3-cd]Pyrene and naphthalene).

3.6.5.3 监测时间和频率

3.6.5.3 Monitoring time and frequency

1#~9#、11#~12#土壤监测点的采样时间均为2019年8月3日，监测1次。10#和13#土壤监测点的采样时间为2019年9月7日，监测1次。14#监测点二噁英的监测值引用区域《北部湾资源再生环保服务中心项目（一期）环境影响报告书》的监测数据，

监测时间为 2018 年 5 月 22 日。

Soil monitoring points 1-9 and 11-12 were sampled on Aug. 3, 2019 and monitored for one time. Soil monitoring points 10 and 13 were sampled on Sept. 7, 2019 for one time. Dioxin monitoring value at monitoring point 14 was quoted from monitoring data in Environmental Impact Assessment Report on Beibu Gulf Resource Regeneration and Environmental Protection Service Center Project (Phase I) monitored on May 22, 2018.

3.6.5.4 监测方法及检出限

3.6.5.4 Monitoring method and detection limit

按照《土壤环境监测技术规范》(HJ/T166-2004)进行采样监测，检出限详见表 3.6-6。

Sampling and monitoring shall be conducted as per Technical Specification for Soil Environmental Monitoring (HJ/T166-2004). Refer to Table 3.6-6 for detection limit.

表 3.6-6　土壤监测因子分析方法及检出限

Table 3.6-6 Analysis method and detection limit of soil monitoring factors

序号 S. N.	监测项目 Monitoring item	分析方法 Analysis method	检出限 Detection limit
1	pH 值 pH value	土壤 pH 值的测定　NY/T1377-2007 Determination of pH in Soil (NY/T1377-2007)	0.1（无量纲） 0.1 (non-dimensional)
2	铜 Copper	土壤质量 铜、锌的测定 火焰原子吸收分光光度法　GB/T17138-1997 Soil Quality - Determination of Copper, Zinc - Flame Atomic Absorption Spectrophotometry GB/T17138-1997	1.0mg/kg
3	锌 Zinc		0.5mg/kg
4	铅 Lead	土壤质量 铅、镉的测定 石墨炉原子吸收分光光度法　GB/T17141-1997 Soil Quality - Determination of Lead, Cadmium - Graphite Furnace Atomic Absorption Spectrophotometry GB/T17141-1997	0.1mg/kg
5	镉 Cadmium		0.01mg/kg
6	砷 Arsenic	土壤质量 总汞、总砷、总铅的测定 原子荧光法 Soil Quality - Analysis of Total Mercury, Arsenic and Lead Contents - Atomic Fluorescene Spectrometry 第 2 部分：土壤中总砷的测定 GB/T22105.2-2008 - Part 2: Analysis of Total Arsenic Contents in Soils GB/T22105.2-2008	0.01mg/kg
7	汞 Mercury	土壤质量 总汞、总砷、总铅的测定 原子荧光法 Soil Quality - Analysis of Total Mercury, Arsenic and Lead Contents - Atomic Fluorescene Spectrometry 第 1 部分：土壤中总汞的测定 GB/T22105.1-2008 - Part 1: Analysis of Total Mercury Contents in	0.002mg/kg

序号 S. N.	监测项目 Monitoring item	分析方法 Analysis method	检出限 Detection limit
		Soils GB/T22105.1-2008	
8	总 铬 Total chromium	土壤 总铬的测定 火焰原子吸收分光光度法 HJ491-2009 Soil Quality - Determination of Total Chromium- Flame Atomic Absorption Spectrophotometry HJ491-2009	5.0mg/kg
9	镍 Nickel	土壤质量 镍的测定 火焰原子吸收分光光度法 GB/T17139-1997 Soil Quality - Determination of Nickel - Flame Atomic Absorption Spectrophotometry GB/T17139-1997	5mg/kg
10	石油烃 Petroleum hydrocarbon	挥发性/半挥发性总石油类烃 气相色谱法 USEPA8015C-2007 气相色谱仪 YQ-038 Volatile/Non-volatile Total Petroleum Hydrocarbons Gas Chromatography USEPA8015C-2007 Gaschromatograph YQ-038	10mg/kg
11	二噁英 Dioxin	土壤《土壤和沉积物二噁英类的测定同位素稀释高分辨气相色谱一高分辨质谱法》(HJ 77.4-2008） Soil and Sediment- Determination of Polychlorinated Dibenzo-p-dioxins (PCCDs) and Polychlorinated Dibenzofurans (PCDFs) Isotype Dilution HRGC - HRMS (HJ 77.4-2008)	—
12	六价铬 Hexavalent chromium	固体废物 六价铬分析的样品前处理 Solid Wastes - Pretreatment of Samples for Hexavalent Chromium Analysis 碱消解法 GB 5085.3-2007 附录 T Alkali Digestion Method GB 5085.3-2007 Appendix T 固体废物 六价铬的测定 二苯碳酸二肼分光光度法 GB/T 15555.4-1995 Solid Waste - Determination of Chromium (Vi) - 1, 5-diphenylcarbohydrazide Spectrophotometric Method GB/T 15555.4-1995	0.16mg/kg（称样 2.5g，定容至 100ml） 0.16Mg/kg (weighing sample 2.5g, constant volume 100ml)
13	四氯化碳 Carbon tetrachloride	土壤和沉积物 挥发性有机物的测定 Soil and Sediment - Determination of Volatile Organic Compounds 吹扫捕集/气相色谱-质谱法 HJ 605-2011 Purge and Trap Gas Chromatography/Mass Spectrometry Method HJ 605-2011 气相色谱质谱联用仪 YQ-400 Gas chromatograph-mass spectrometer YQ-400	0.0013 mg/kg
14	氯仿 Chloroform		0.0011mg/kg
15	氯甲烷 Chloromethane		0.001mg/kg
16	1,1-二氯乙烷 1,1-Dichloroethane		0.0012mg/kg
17	1,2-二氯乙烷 1,2-dichloroethane		0.0013mg/kg
18	1,1-二氯乙烯 1,1-Dichloroethylene		0.001mg/kg
19	（顺）1,2-二氯乙烯 (Cis)-1, 2-dichloroethylene		0.0013mg/kg

序号 S. N.	监测项目 Monitoring item	分析方法 Analysis method	检出限 Detection limit
20	（反）1,2-二氯乙烯 (Trans)-1, 2-dichloroethylene		0.0014mg/kg
21	二氯甲烷 Dichloromethane		0.0015mg/kg
22	1,2-二氯丙烷 1,2-Dichloropropane		0.0011mg/kg
23	1,1,1,2,-四氯乙烷 1,1,1,2-Tetrachloroethane		0.0012mg/kg
24	1,1,2,2,-四氯乙烷 1,1,2,2-Tetrachloroethane		0.0012mg/kg
25	四氯乙烯 Tetrachloroethylene		0.0014mg/kg
26	1,1,1-三氯乙烷 1,1,1-Trichloroethane		0.0013mg/kg
27	1,1,2-三氯乙烷 1,1,2-Trichloroethane		0.0012mg/kg
28	三氯乙烯 Trichloroethylene		0.0012mg/kg
29	1,2,3-三氯丙烷 1,2,3-Trichloropropane		0.0012mg/kg
30	氯乙烯 Vinyl chloride		0.0010mg/kg
31	苯 Benzene		0.0019mg/kg
32	氯苯 Chlorobenzene		0.0012mg/kg
33	1,2-二氯苯 1,2-Dichlorobenzene		0.0015mg/kg
34	1,4-二氯苯 1, 4-Dichlorobenzene		0.0015mg/kg
35	乙苯 Ethylbenzene		0.0012mg/kg
36	苯乙烯 Styrene		0.0011mg/kg
37	甲苯 Toluene		0.0013mg/kg
38	间二甲苯+对二甲苯 MX+PX		0.0012mg/kg
39	邻二甲苯 O-xylene		0.0012mg/kg
40	苯胺 Aniline	溶剂提取半挥发性有机物 气相色谱/质谱法 Solvent Extraction Semivolatile Organic Compounds Gas Chromatography/ Mass Spectrometry	0.5mg/kg

序号 S. N.	监测项目 Monitoring item	分析方法 Analysis method	检出限 Detection limit
		USEPA8270D-2007 气相色谱质谱联用仪 YQ-213 USEPA8270D-2007 Gas chromatograph-mass spectrometer YQ-213	
41	硝基苯 Nitrobenzene	土壤和沉积物 半挥发性有机物的测定 Soil and Sediment - Determination of Semi Volatile Organic Compounds 气相色谱-质谱法 HJ 834-2017 Gas chromatography - mass spectrometry HJ 834-2017 气相色谱质谱联用仪 YQ-213 Gas chromatograph-mass spectrometer YQ-213	0.09mg/kg
42	2-氯酚 2-Chlorophenol		0.06mg/kg
43	苯并[a]蒽 Benzo [a] anthracene		0.1mg/kg
44	苯并[b]荧蒽 Benzo[b]fluorathene		0.2mg/kg
45	苯并[a]芘 Benzo [a] pyrene		0.1mg/kg
46	苯并[k]荧蒽 Benzo[k]fluoranthene		0.1mg/kg
47	䓛 Chrysene		0.1mg/kg
48	二苯并[a,h]蒽 Dibenzo [a, h] anthracene		0.1mg/kg
49	茚并[1,2,3-cd]芘 Indeno[1,2,3-cd]Pyrene		0.1mg/kg
50	萘 Naphthalene		0.09mg/kg

3.6.5.5 评价方法及评价标准

3.6.5.5 Evaluation method and evaluation standard

采用单项污染指数法对土壤质量现状进行评价。

Single pollution index method is used to evaluate soil mass condition.

$$P_i = \frac{C_i}{S_i}$$

式中：Pi——土壤中 i 元素单项污染指数；

Where: Pi—— single pollution index of i element in soil;

Ci——i 元素的实际浓度 mg/kg；

Ci—— Actual concentration of i element mg/kg;

Si——i 元素的评价标准浓度 mg/kg。

Si——Evaluation standard concentration of i element mg/kg.

项目周边农用地土壤执行《土壤环境质量 农用地土壤污染风险管控标准（试行）》（GB 15618-2018）表 1 农用地土壤污染风险筛选值（基本项目）相关限值；厂区内建设用地土壤执行《土壤环境质量 建设用地土壤污染风险管控标准（试行）》（GB36600-2018）建设用地土壤污染风险筛选值和管制值中第二类用地相关限值，标准值具体见表 1.3-7。

Soil in farmland around the Project shall comply with relevant limit in Table 1 Soil Contamination Risk Screening Value of Farmland (Basic Items) in Soil Environmental Quality - Risk Control Standard for Soil Contamination of Agricultural Land (Trial) (GB 15618-2018). Soil in construction land in the plant area shall comply with soil contamination risk screening value of construction land and relevant limits on Class II land in control values. Refer to Table 1.3-7 for details of standard value in Soil Environmental Quality - Risk Control Standard for Soil Contamination of Construction Land (Trial) (GB36600-2018).

3.6.5.6 监测结果及评价

3.6.5.6 Monitoring results and assessment

监测结果详见表 3.6-7~3.6-10。

Refer to Table 3.6-7~3.6-10 for details of monitoring results.

表 3.6-7 土壤环境监测结果（1#~3#建设用地）

Table 3.6-7 Soil environment monitoring result (Construction land 1-3)

注：除 pH 值外，单位均为 mg/kg。监测浓度低于方法检出限时以“ND”表示。
Note: except for pH value, the unit shall be mg/kg. Use “ND” when monitored concentration is lower than detection limit.

表 3.6-8 土壤环境监测结果（4#~9#为建设用地，11#~12#为农用地）

Table 3.6-8 Soil environment monitoring result (Construction land 4-9 and farmland 11-12)

注：除 pH 值外，单位均为 mg/kg。监测浓度低于方法检出限时以“ND”表示。石油烃的监测由广西华测检测认证有限公司进行监测。
Note: except for pH value, the unit shall be mg/kg. Use “ND” when monitored concentration is lower than detection limit. Petroleum hydrocarbon was monitored by Guangxi Huace Detection and Certification Co., Ltd.

表 3.6-9 9#建设用地土壤环境监测结果（挥发性有机物和半挥发性有机物）

Table 3.6-9 Soil environment monitoring result of construction land 9 (volatile organic compounds and non-volatile organic compounds)

注：单位均为 mg/kg。监测浓度低于方法检出限时以“ND”表示。本表的监测数据由广西华测检测认证有限公司进行监测。
Note: the unit shall be mg/kg. Use “ND” when monitored concentration is lower than detection limit. Monitoring data in the table was monitored by Guangxi Huace Detection and Certification Co., Ltd.

表 3.6-10 土壤二噁英现状监测结果

Table 3.6-10 Monitoring result of dioxin condition in soil

注：14#土壤二噁英的监测数据引用自区域《北部湾资源再生环保服务中心项目（一期）环境影响报告书》2018 年 5 月 22 日的监测数据。

Note: monitoring data on dioxin in soil 14 was quoted from monitoring data in Environmental Impact Assessment Report on Beibu Gulf Resource Regeneration and Environmental Protection Service Center Project (Phase I) dated on May 22, 2018.

据监测结果，11#~14#农用地采样点各监测因子均满足《土壤环境质量 农用地土壤污染风险管控标准（试行）》（GB 15618-2018）中的相关限值，1#~10#九个厂区内建设用地土壤采样点满足《土壤环境质量 建设用地土壤污染风险管控标准（试行）》（GB36600-2018）建设用地土壤污染风险筛选值和管制值中第二类用地相关限值。

According to monitoring results, each monitoring factor of farmland monitoring point 11 -14 can satisfy relevant limits in Soil Environmental Quality - Risk Control Standard for Soil Contamination of Agricultural Land (GB 15618-2018). Soil sampling points 1-10 for construction land in the plant area shall satisfy soil contamination risk screening value of construction land and relevant limits on Class II land in control values in in Soil Environmental Quality - Risk Control Standard for Soil Contamination of Construction Land (Trial) (GB36600-2018).

3.7 声环境质量现状调查与评价

3.7 Investigation and evaluation about current acoustic environment quality condition

本次声环境质量现状监测委托广西壮族自治区化工环保监测站于 2019 年 8 月 3 日至 2019 年 8 月 4 日连续两天进行现场采样监测。

Monitoring of current acoustic environment quality condition was entrusted to Chemical Industry and Environmental Protection Monitoring Station of Guangxi Zhuang Autonomous Region. Field sampling and detection was conducted from Aug. 3, 2019 to Aug. 4, 2019 for two consecutive days.

3.7.1 监测布点

3.7.1 Monitoring points

根据厂区周围现状，在拟建项目厂址四周布设 10 个噪声监测点。监测点的具体情

况见表 3.7-1 及附图 4。

According to current condition around the plant area, 10 noise monitoring points are arranged around the proposed plant site. Refer to Table 3.7-1 and Attached Figure 4 for detailed conditions of monitoring points.

表 3.7-1 声环境质量监测布点
Table 3.7-1 Acoustic environment quality monitoring points

编号	监测点名称	坐标	噪声类别
1#	厂界东面	N21°31′52.36″，E109°33′07.27″	厂界噪声
2#	厂界南面	N21°31′17.63″，E109°33′13.40″	厂界噪声
3#	厂界西面	N21°31′20.18″，E109°32′31.44″	厂界噪声
4#	厂界北面	N21°31′47.82″，E109°32′27.69″	厂界噪声
5#	污水处理站北面	N21°32′17.29″，E109°32′35.20″	厂界噪声
6#	污水处理站西面	N21°32′08.48″，E109°32′38.61″	厂界噪声
7#	污水处理站东面	N21°32′14.61″，E109°32′49.38″	厂界噪声
8#	厂区东南面	N21°31′27.44″，E109°33′18.82″	厂界噪声
9#	厂区西面 2	N21°31′07.59″，E109°32′43.57″	厂界噪声
10#	川江	N21°30′57.92″，E109°32′53.51″	敏感点噪声

3.7.2 监测因子

3.7.2 Monitoring factor

等效连续 A 声级。

Equivalent continuous A sound level

3.7.3 监测时间和频率

3.7.3 Monitoring time and frequency

监测时间为 2019 年 8 月 3 日~8 月 4 日，连续监测 2 天，每天昼间（6:00～22:00）和夜间（22:00～6:00）各测量 1 次。

The monitoring was conducted from Aug. 3, 2019 to Aug. 4, 2019 for 2 days continuously. One measurement will be conducted during daytime (6:00～22:00) and night (22:00～6:00) respectively.

3.7.4 监测方法及检出限

3.7.4 Monitoring method and detection limit

按《声环境质量标准》（GB3096-2008）中有关规定进行监测，原则上选无雨雪、无雷电天气，风速小于 5m/s 时进行监测。

Please monitor according to relevant regulations in Environmental Quality Standard for Noise (GB3096-2008). In principle, monitoring shall be conducted when there is no rain, snow or lightning and wind speed is less than 5m/s.

最低检出限为 30dB（A）。

Minimum detection limit shall be 30dB(A).

3.7.5 评价标准

3.7.5 Assessment standard

本项目厂界声环境执行《声环境质量标准》（GB3096-2008）中的 3 类标准，川江敏感点声环境执行 2 类标准，具体见表 1.3-6。

Acoustic environment at the plant boundary of the Project shall be subject to Class 3 standard as stipulated in the Environmental Quality Standard for Noise (GB3096-2008). Acoustic environment at Chuanjiang sensitive spot shall comply with Class 2 standard. Refer to Table 1.3-6 for details.

3.7.6 监测结果及评价

3.7.6 Monitoring results and assessment

声环境质量监测结果及评价详见表 3.7-2。

Refer to Table 3.7-2 for acoustic environment quality monitoring result and evaluation.

表 3.7-2　声环境质量监测结果一览表　　单位：dB（A）
Table 3.7-2 Summary of acoustic environment quality monitoring result Unit: dB (A)

根据监测结果， 2019 年 8 月监测期间，本项目东、南、西、北面厂界，污水处理站东、西、北面，厂区东南面以及厂区西面的昼夜声环境均能满足《声环境质量标准》（GB3096-2008）中 3 类标准要求，川江敏感点噪声能满足《声环境质量标准》（GB3096-2008）中 2 类标准。

According to monitoring results, during the monitoring period in Aug. 2019, daytime and night acoustic environment at east, south, west and north of the plant boundary, east, west and north of the sewage treatment plant, southeast and west of the plant site could satisfy Class 3 standard requirements in Environmental Quality Standard for Noise (GB3096-2008). Noise at Chuanjiang sensitive spots can satisfy Class 2 standard requirements in Environmental Quality Standard for Noise (GB3096-2008).

3.7.7 小结

3.7.7 Summary

根据厂区周围现状，在拟建项目厂址四周布设 10 个噪声监测点。监测结果表明，2019 年 8 月监测期间，本项目声环境质量昼夜监测值均能满足相应的标准要求。2019 年 8 月监测期间，本项目东、南、西、北面厂界，污水处理站东、西、北面，厂区东南面以及厂区西面的昼夜声环境均能满足《声环境质量标准》（GB3096-2008）中 3 类标准要求，川江敏感点噪声能满足《声环境质量标准》（GB3096-2008）中 2 类标准。

According to current condition around the plant area, 10 noise monitoring points are arranged around the proposed plant site. According to monitoring results, during the monitoring period in Aug. 2019, daytime and night monitoring values of acoustic environment quality of the Project could satisfy requirements in relevant standards. During the monitoring period in Aug. 2019, daytime and night acoustic environment at east, south, west and north of the plant boundary, east, west and north of the sewage treatment plant, southeast and west of the plant site could satisfy Class 3 standard requirements in Environmental Quality Standard for Noise (GB3096-2008). Noise at Chuanjiang sensitive spots can satisfy Class 2 standard requirements in Environmental Quality Standard for Noise (GB3096-2008).

3.8 海洋环境质量现状调查与评价

3.8 Investigation and evaluation about current marine environment quality condition

根据《环境影响评价技术导则 地表水环境》（HJ2.3-2018），项目地表水评价等级为一级评价，近岸海域应至少进行春、秋两个季节的调查。因此本次评价委托了广西红树林研究中心于 2019 年 8 月 27~28 日秋季在铁山港海域设置 20 个海洋水质及沉积物站位（1~20 测站）进行调查，春季调查数据引用《北海市铁山港区南珠养殖区项目（A、 B 区）项目环境影响报告书》监测数据，同时以《广西北部湾经济区北海市铁山港工业区环境影响跟踪评价报告书》海洋调查相关数据作为补充。

According to Technical Guidelines for Environmental Impact Assessment-Surface Water Environment (HJ2.3-2018), surface water in the Project was evaluated as Class I. The offshore area should at least be investigated during spring and autumn. Therefore, during the assessment, Guangxi Mangroove Research Center had investigated 20 marine water quality and sediment stations (1~20 monitoring stations) arranged in Tieshangang sea area in autumn from Aug. 27, 2019 to Aug. 28, 2019. Investigation data on spring was quoted from monitoring data in Environmental Impact Assessment Report on Beihai Tieshangang Southern Pearl Aquiculture Area Project (Area A and Area B). Meanwhile, relevant ocean investigation data of Report on Environmental Impact Tracking Assessment of Tieshangang Industrial Park of Beihai City of Beibu Gulf Economic Zone of Guangxi could be used as supplementation.

3.8.1 海洋水质现状调查

3.8.1 Investigation about current marine water quality

本章节数据来自三部分：

Data in the section came from three parts:

一是引用《北海市铁山港区南珠养殖区项目（A、B 区）项目环境影响报告书》中海洋环境质量现状调查与评价部分的水质监测结果，监测时间为 2016 年 4 月 19 日~21 日，共布设 20 个水质（含叶绿素）站位和 12 个海洋生物站位，沉积物 12 个站位调查。

Firstly, monitoring result on water quality in investigation and assessment of current marine environment quality condition in Environmental Impact Assessment Report on Beihai Tieshangang Southern Pearl Aquiculture Area Project (Area A and Area B) monitored during Apr. 19, 2016 to Apr. 21, 2016. Altogether 20 water quality (including chlorophyll) points, 12 marine organism points and 12 sediment points were investigated.

二是由于铁山港 B3 排污口在 2017 年底启用，为进一步说明铁山港海域环境质量状况，引用《广西北部湾经济区北海市铁山港工业区环境影响跟踪评价报告书》中海洋水环境质量现状质量现状调查及跟踪评价部分海洋调查结果，其中海水水质监测时间为 2018 年 6 月 14 日~16 日，共布设 10 个水质点位和 7 个海洋沉积物点位。

Secondly, B3 sewage draining exit of Tieshangang had been used since the end of 2017. To further describe environmental quality condition of Tieshangang sea area, marine investigation result in marine water environmental quality status, quality status investigation and tracking assessment in Report on Environmental Impact Tracking Assessment of Tieshangang Industrial Park of Beihai City of Beibu Gulf Economic Zone of Guangxi was quoted. Where, seawater quality was monitored from Jun. 14, 2018 to Jun. 16, 2018. Altogether 10 water quality points and 7 marine sediment points were arranged.

三是广西红树林研究中心在铁山港海域设置 20 个海洋水质及沉积物站位，进行了海水水质现状监测，监测时间为 2019 年 8 月 27 日~28 日，共布设 20 的水质点和 12 个海洋生物站位，沉积物 12 个站位调查。

Thirdly, Guangxi Mangroove Research Centerhad arranged 20 marine water quality and sediment stations in Tieshangang sea area to monitor current marine water quality condition from Aug. 27, 2019 to Aug. 28, 2019. Altogether 20 water quality points, 12 marine organism points and 12 sediment points were investigated.

以下将根据调查时间分别以三部分内容进行叙述。

The three parts would be described respectively according to investigation time.

3.8.1.1 2016 年春季水环境质量现状调查与评价

3.8.1.1 Investigation and assessment of water environment quality condition in Spring 2016

1、监测站位

1. Monitoring points

根据国家海洋局北海海洋环境监测中心站在铁山港海域开展海洋环境质量调查的结果进行分析评价，调查时间为 2016 年 4 月 19 日~21 日，共布设 20 个水质（含叶绿素）站位，具体站位布设及质量要求见表 3.8-1 和图 3.8-1 所示。

State Oceanic Administration Beihai Marine Environment Monitoring Center had investigated ocean environment quality in Tieshangang sea area from Apr. 19, 2016 to Apr. 21, 2016 and analyzed and assessed the investigation result. Altogether 20 water quality (including chlorophyll) points were arranged. Refer to Table 3.8-1 and Fig. 3.8-1 for arrangement of detailed points and quality requirements.

表 3.8-1 调查站位及调查内容一览表

Table 3.8-1 Summary of investigation points and investigation content

站号 Point	经度 E Latitude E	纬度 N Longitude N	水质标准 Water quality standard	沉积物标准 Sediment standard	调查因子 Investigation factor

站号 Point	经度 E Latitude E	纬度 N Longitude N	水质标准 Water quality standard	沉积物标准 Sediment standard	调查因子 Investigation factor
1	109°33'10.25"	21°39'15.13"	三类 Class III	二类 Category II	水质、沉积物、生物 Water quality, sediment and biology
2	109°33'49.40"	21°38'02.81"	三类 Class III	二类 Category II	水质、沉积物、生物 Water quality, sediment and biology
3	109°34'46.93"	21°37'05.26"	三类 Class III		水质 Water quality
4	109°35'29.08"	21°35'41.11"	三类 Class III	二类 Category II	水质、沉积物、生物 Water quality, sediment and biology
5	109°35'56.25"	21°34'21.08"	三类 Class III		水质 Water quality
6	109°35'56.25"	21°32'53.12"	三类 Class III		水质 Water quality
7	109°37'02.92"	21°32'53.12"	三类 Class III	二类 Category II	水质、沉积物、生物 Water quality, sediment and biology
8	109°38'30.80"	21°32'53.12"	一类 Class I	一类 Class I	水质、沉积物、生物 Water quality, sediment and biology
9	109°34'46.93"	21°31'06.76"	四类 Class IV	三类 Class III	水质、沉积物、生物 Water quality, sediment and biology
10	109°37'02.92"	21°31'06.76"	四类 Class IV		水质 Water quality
11	109°38'30.80"	21°31'06.76"	三类 Class III	二类 Category II	水质、沉积物、生物 Water quality, sediment and biology
12	109°33'49.40"	21°29'15.46"	三类 Class III	二类 Category II	水质、沉积物、生物 Water quality, sediment and biology
13	109°37'02.92"	21°29'15.46"	三类 Class III		水质 Water quality
14	109°38'30.80"	21°29'15.46"	一类 Class I		水质 Water quality
15	109°32'01.15"	21°27'10.58"	三类 Class III	二类 Category II	水质、沉积物、生物 Water quality, sediment and biology
16	109°34'46.93"	21°27'10.58"	三类 Class III		水质 Water quality
17	109°37'02.92"	21°27'10.58"	三类 Class III	二类 Category II	水质、沉积物、生物 Water quality, sediment and biology
18	109°38'30.80"	21°27'10.58"	一类 Class I	一类 Class I	水质、沉积物、生物 Water quality, sediment and biology

站号 Point	经度 E Latitude E	纬度 N Longitude N	水质标准 Water quality standard	沉积物标准 Sediment standard	调查因子 Investigation factor
19	109°30'12.37"	21°25'02.37"	二类 Category II	一类 Class I	水质、沉积物、生物 Water quality, sediment and biology
20	109°34'46.93"	21°25'02.37"	二类 Category II		水质 Water quality

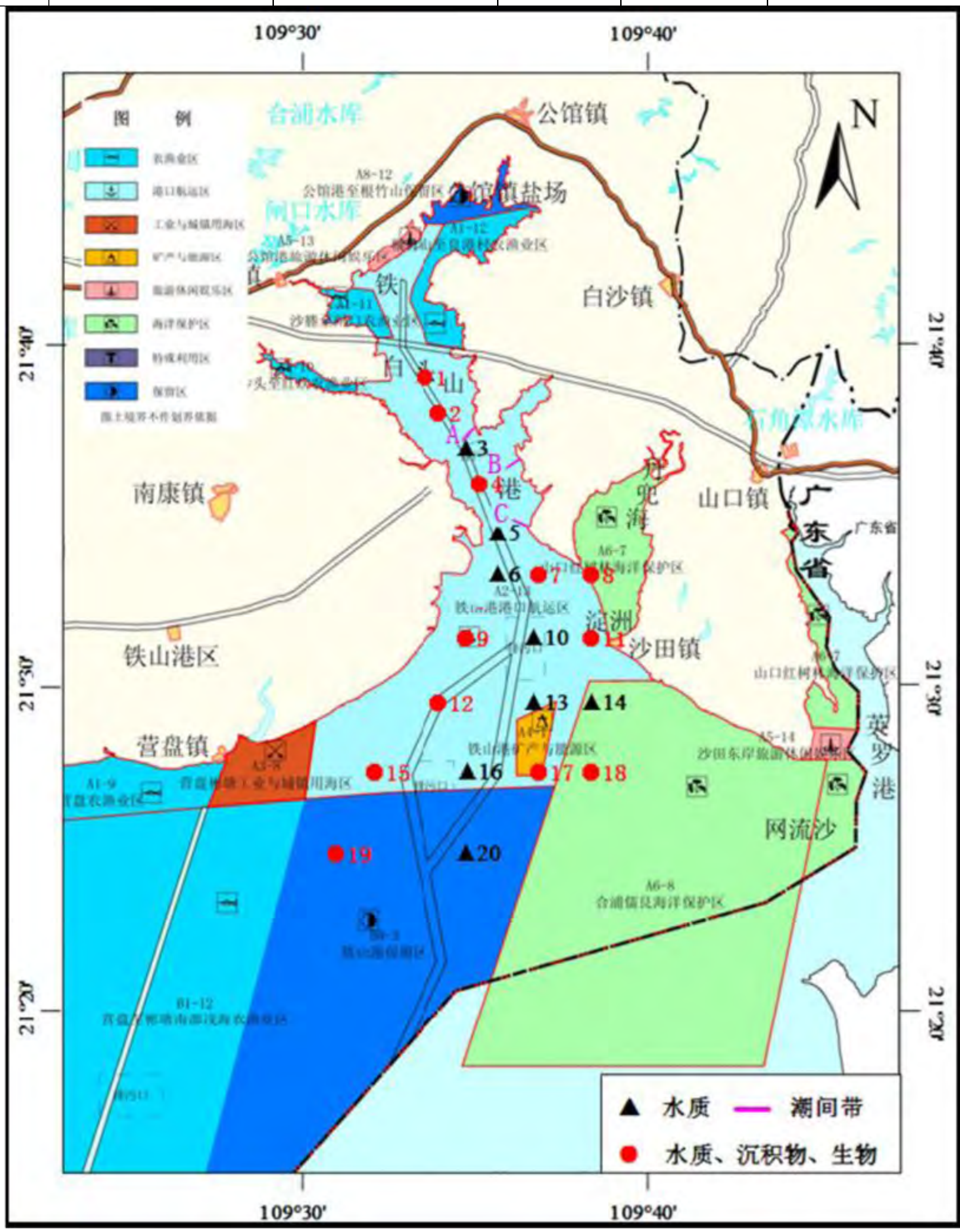


图 3.8-1 2016 年春季水环境调查站位示意图

Fig. 3.8-1 Sketch of water environment investigation point in Spring 2016

2、监测项目

2. Monitoring Items

水温、盐度、pH、悬浮物（SS）、溶解氧（DO）、化学需氧量、无机氮、磷酸盐、石油类、总汞、砷、镉、铅、铜、锌、叶绿素共 16 个要素。各项监测因子的采集和分析均按照《海洋监测规范》（GB17378-2007）进行。

Such 16 elements including temperature, salinity, pH, suspended solids (SS), dissolved oxygen (DO), chemical oxygen demand, mineral nitrogen, phosphate, petroleum, total mercury, arsenic, cadmium, lead, copper, zinc and chlorophyll. Collection and analysis of various monitoring factors shall comply with Specification for Marine Monitoring (GB17378-2007).

3、分析方法

3. Analysis method

水质要素的分析按照《海洋监测规范》（GB17378-2007）进行，具体调查分析方法见表 3.8-2。

Analysis of water quality shall comply with Specification for Marine Monitoring (GB17378-2007). Refer to Table 3.8-2 for detailed investigation and analysis method.

表 3.8-2 水质调查分析方法和检出限

Table 3.8-2 Water quality analysis method and detection limit

序号 S.N.	调查项目 Survey item	分析方法 Analytical method	分析仪器 Analysis instrument	检出限（mg/L） Detection limit (mg/L)
1	水温 Water temperature	温度计法 Thermometer method	表层水温表 Surface thermometer	-
2	盐度 Salinity	盐度计法 Salimeter method	SYA2-2 盐度计 SYA2-2 salimeter	2
3	pH	电位计法 Potentiometer method	PHS-3C 型精密 pH 计 PHS-3C precise pH meter	-
4	悬浮物 Suspended matter	重量法 Gravimetric method	BS210S 电子天平 BS210S electronic scales	-
5	溶解氧 Dissolved oxygen	碘量法 Iodometry	滴定管 Burette	0.02
6	化学需氧量	碱性高锰酸钾法		0.15

序号 S.N.	调查项目 Survey item	分析方法 Analytical method	分析仪器 Analysis instrument	检出限（mg/L） Detection limit (mg/L)
	Chemical oxygen demand	Basic potassium permanganate method		
7	亚硝酸盐 Nitrite	萘乙二胺比色法 Naphthalene ethylenediamine colorimetric method	LACHAT QC8500 流动注射分析仪 Flow injection analyzer	0.3×10^{-3}
8	硝酸盐 Nitrate	镉柱还原法 Cadmium column reduction method		0.7×10^{-3}
9	氨氮 Ammonia nitrogen	次溴酸盐氧化法 Hypobromite oxidation method		0.4×10^{-3}
10	磷酸盐 Phosphate	磷钼蓝比色法 Phosphomolybdenum blue colorimetric method		0.6×10^{-3}
11	汞 Mercury	原子荧光法 Atomic fluorescence spectrometry	AFS8220 原子荧光光度计 AFS8220 atomic fluorescence spectrophotometer	0.007×10^{-3}
12	砷 Arsenic	原子荧光法 Atomic fluorescence spectrometry	AFS8220 原子荧光光度计 AFS8220 atomic fluorescence spectrophotometer	0.5×10^{-3}
13	镉 Cadmium	阳极溶出伏安法 Anodic stripping voltammetry	AD-3 极谱仪 AD-3 polarograph	0.09×10^{-3}
14	铅 Lead			0.3×10^{-3}
15	铜 Copper			0.6×10^{-3}
16	锌 Zinc			1.2×10^{-3}
17	石油类 Petroleum	紫外分光光度法 Ultraviolet spectrophotometry	UV-3 紫外分光光度计 UV-3 ultraviolet spectrophotometer	3.5×10^{-3}
18	叶绿素 a Chlorophyll a	分光光度法 Spectrophotometry	UV-3 紫外分光光度计 UV-3 ultraviolet spectrophotometer	-

4、评价方法

4. Evaluation Method

①各项因子采用《环境影响评价技术导则》中推荐的标准指数法进行评价。公式为：

① Various factors shall be assessed according to the standard index method recommended in the Technical Guidelines for Environmental Impact Assessment. The formula shall be as follows:

Si,j=Ci,j/Csi

式中：

Where:

Si,j—污染物 i 在监测点 j 的标准指数；

Si,j— Standard index of pollutant i at monitoring point j;

Ci,j—污染物 i 在监测点 j 的浓度；

Ci,j— Concentration of pollutant i at monitoring point j;

Csi—水质参数 i 的海水水质标准。

Csi— Sea water quality standard of water quality parameter i.

②DO 的标准指数为：

② Standard index of DO shall be:

式中： $S_{DO,j}$—溶解氧的水质指数，大于 1 表明该水质因子超标；

Where: $S_{DO,j}$— water quality index of dissolved oxygen. Water quality factor is exceeding standard if the index is larger than 1.

DO_f—饱和溶解氧浓度，mg/L；

DO_f—Concentration of saturated dissolved oxygen, mg/L;

DO_s—溶解氧的水质评价标准限值，mg/L；

DO_s—Water quality evaluation standard limit of dissolved oxygen, mg/L;

DO_j—溶解氧在 j 点的实测统计代表值，mg/L；

DO_j—Measured statistical representative value of dissolved oxygen at Point j, mg/L;

DO_f= 468/（31.6+T）

DO_f= 468/(31.6+T)

T—水温，℃。

T—Temperature, ℃.

③pH 的标准指数为：

③Standard index of pH shall be:

$$S_{pH,j}=\frac{7.0-pH_j}{7.0-pH_{sd}} \qquad pH_j\le 7.0$$

$$S_{pH,j}=\frac{7.0-pH_j}{7.0-pH_{sd}} \qquad pH_j\le 7.0$$

$$S_{pH,j} = \frac{pH_j - 7.0}{pH_{su} - 7.0} \qquad pH_j > 7.0$$

式中：$S_{pH.j}$—pH 值单因子指数；

Where: $S_{pH.j}$— Single factor index of pH value;

pH_j—pH 值在 j 点的监测值；

pH_j—Monitoring value of pH value at point j;

pH_{sd}—水质标准中规定的 pH 值下限；

pH_{sd}—Lower limit of pH value stipulated in water quality standard;

pH_{su}—水质标准中规定的 pH 值上限。

pH_{su}— Upper limit of pH value stipulated in water quality standard.

水质参数的标准指数＞1，表明该水质参数超过了规定的水质标准限值，水质参数的标准指数越大，说明该水质参数超标越严重。

If standard index of water quality parameter is ＞1, the water quality parameter has exceeded stipulated water quality standard limit. The larger the standard index of water quality parameter, the severer the exceeding degree of water quality parameter.

5、评价标准

5. Assessment standard

根据《广西近岸海域环境功能区划调整方案》的相关要求，铁山港海域的水质要求涉及一类到四类海水水质标准，本次调查的 1、2、3、4、5、6、7、11、12、13、15、16 和 17 号站位的海水水质执行三类标准；9 和 10 号站位的海水水质执行四类标准；8、14 和 18 号站位的海水水质执行一类标准；19 和 20 号站位的海水水质执行二类标准。

According to relevant requirements in Adjustment Scheme of Environment Function Zone of Guangxi Offshore Area, requirements for water quality in Tieshangang sea area involved Class I to Class IV sea water quality standard. Sea water quality of Points 1, 2, 3, 4, 5, 6, 7, 11, 12, 13, 15, 16 and 17 shall comply with Class III standard. Sea water quality at Points 9 and 10 shall comply with Class IV standard. Sea water quality at Points 8, 14 and 18 shall comply with Class I standard. Sea water quality at Points 19 and 20 shall comply with Class II standard.

评价标准值见表 3.8-3。

Refer to Table 3.8-3 for assessment standard value.

表 3.8-3 评价标准值一览表

Table 3.8-3 Summary of assessment standard value

单位：mg/L (pH 值除外)

Unit: mg/L (except pH)

序号 S.N.	项目 Item	第一类 Class I	第二类 Class II	第三类 Class III	第四类 Class IV
1	pH	7.8~8.5 同时不超出该海域正常变动范围的 0.2pH 单位 Meanwhile, it does not exceed 0.2 pH unit within the normal fluctuation range of the sea area.		6.8~8.8 同时不超出该海域正常变动范围的 0.5pH 单位 Meanwhile, it does not exceed 0.2 pH unit within the normal fluctuation range of the sea area.	
2	溶解氧> Dissolved oxygen >	6	5	4	3
3	化学需氧量≤ Chemical oxygen demand ≤	2	3	4	5
4	无机氮≤（以 N 计） Inorganic nitrogen ≤ (expressed as N)	0.20	0.30	0.40	0.50
5	磷酸盐≤（以 P 计） Reactive phosphate ≤ (expressed as P)	0.015	0.030		0.045
6	总汞≤ Total mercury ≤	0.00005	0.0002		0.0005
7	镉≤ Cadmium≤	0.001	0.005	0.010	
8	铅≤ Lead≤	0.001	0.005	0.010	0.050
9	砷≤ Arsenic≤	0.020	0.030	0.050	
10	铜≤ Copper≤	0.005	0.010	0.050	
11	锌≤ Zinc≤	0.020	0.050	0.10	0.50
12	石油类≤ Petroleum ≤	0.05		0.30	0.50

6、水质调查结果与分析

6. Investigation result and analysis of water quality

调查海域水质的调查结果见表 3.8-4。评价结果见表 3.8-5。

Refer to Table 3.8-4 for investigation result of water quality in the sea area under investigation. Refer to Table 3.8-5 for assessment results.

表 3.8-4　2016 年 4 月调查水质要素结果统计一览表（nd 指未检出）

Table 3.8-4 Summary of statistics of results of elements of water quality in Apr. 2016 (nd: not detected)

表 3.8-5 2016 年 4 月铁山港海域水质评价标准指数统计结果一览表（nd 指未检出）

Table 3.8-5 Summary of statistical results of standard indexes for assessment of water quality in Tieshangang sea area in Apr. 2016 (nd: not detected)

由表 3.8-5 可知，合浦儒艮海洋保护区和山口红树林保护区海域内分别有 1 个站位的水质评价因子超标。其中山口红树林保护区 8 号站溶解氧、化学需氧量、无机氮等评价标准指数均大于 1，合浦儒艮海洋保护区 18 号站位中的无机氮的标准指数大于 1。另外在铁山港保留区的 19 号站位出现石油类超标。从评价结果看，溶解氧、化学需氧量、无机氮、石油类超标率分别为 5%、5%、10%、5%。结合近岸海域海水水质趋势分析，枯水期化学需氧量、无机氮及石油类变化趋势总体平稳，水质均符合第一类海水水质标准；除个别站点偶有超标外，大部分点位水质均为第一类或第二类海水水质。

According to Table 3.8-5, water quality assessment factor of one point in Hepu Dugong National Nature Reserve and Shankou Mangrove Ecological Marine Nature Reserve exceeded standards respectively. Where, dissolved oxygen, chemical oxygen demand, inorganic nitrogen and other assessment standard indexes at Point 8 of Shankou Mangrove Ecological Marine Nature Reserve was larger than 1. Standard index of inorganic nitrogen at Point 18 of Hepu Dugong National Nature Reserve was larger than 1. Moreover, petroleum at Point 19 of Tieshangang Reserve Zone was exceeding standard. According to assessment results, exceeding standard rate of dissolved oxygen, chemical oxygen demand, inorganic nitrogen and petroleums were 5%, 5%, 10% and 5% respectively. According to analysis of trend of sea water quality of offshore area, change trend of chemical oxygen demand, inorganic nitrogen and petroleum in dry season was basically stable. Water quality could comply with Class I sea water quality standard. Except for slight over standard of some points, water quality of most points complied with Class I or Class II sea water quality.

3.8.1.2 2018 年水环境质量现状调查与评价

3.8.1.2 Investigation and assessment of water environment quality condition in 2018

1、监测站位

1. Monitoring points

根据工业区的评价范围、评价水域环境特点、功能区分布情况，共布设 10 个海水水质监测点，布点位置见表 3.8-6 及图 3.8-2。

According assessment range of the industrial park, environmental characteristics of assessment water area and distribution of functional zones, 10 sea water quality monitoring points were arranged. Refer to Table 3.8-6 and Fig. 3.8-2 for position of points arranged.

表 3.8-6 海洋水环境取样位置情况表

Table 3.8-6 List of marine water environment sampling positions

测点编号	监测点位经纬度	备注
1#	21°37.92′N，109°33.78′E	
2#	21°34.85′N，109°35.69′E	排污区
3#	21°32.77′N，109°38.64′E	山口红树林国家级自然保护区监测点
4#	21°29.58′N，109°35.25′E	排污区
5#	21°26.36′N，109°33.38′E	排污区
6#	21°25.25′N，109°22.72′E	北部湾二长棘鲷长毛对虾国家级水产 种质资源保护区监测点 Monitoring points in Beibu Gulf Parargyrops Edita
7#	21°25.15′N，109°32.28′E	铁山港作业区
8#	21°22.72′N，109°26.80′E	北部湾二长棘鲷长毛对虾国家级水产 Beibu Gulf Parargyrops Edita and Penaeus Penicillatus National Aquatic
9#	21°22.98′N，109°36.28′E	儒艮国家级自然保护区监测点
10#	21°25.33′N，109°45.46′E	养殖区


GX012
GX023
GX030
GX034
GX032
GX029
BH6
铁山港区
福成
营盘
山口
沙田
南
江
河
康
1#
2#
3#
4#
5#
6#
7#
8#
9#
10#
0 2 4 6 8 10公里
比例尺
图 例
本次海洋水质监测点
海洋沉积物监测点
广西近岸海域区控站位
广西近岸海域国控站位

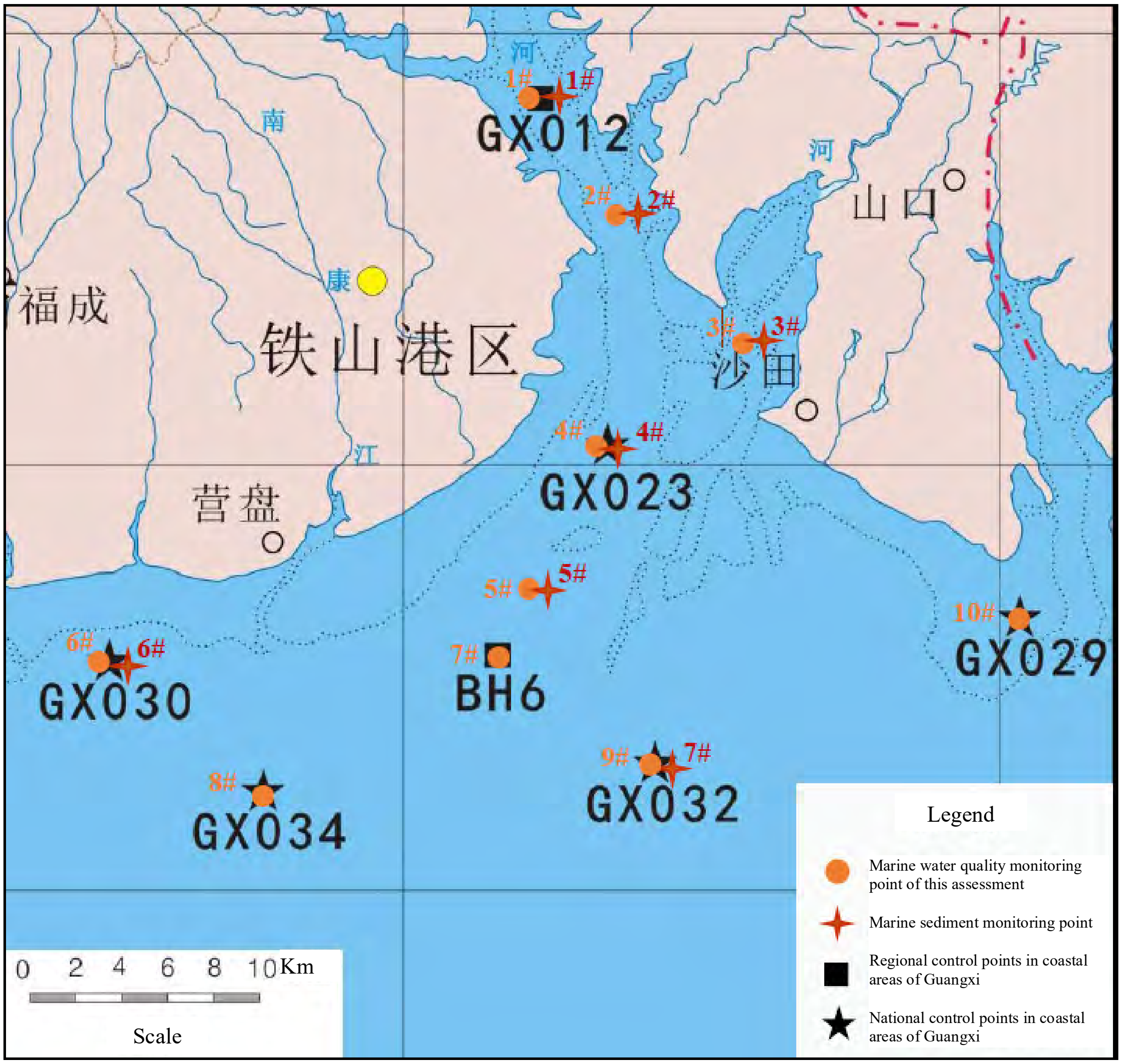


图 3.8-2 监测点位分布图

Fig. 3.8-2 Monitoring point distribution diagram

2、评价因子

2. Assessment factor

调查评价的海水监测因子包括：水温、pH 值、悬浮物、COD_{Mn}、BOD_5、DO、石油类、无机氮、活性磷酸盐、氰化物、硫化物、挥发酚、汞、镉、铅、六价铬、砷、铜等 19 项。

Investigated and assessed sea water monitoring factors include such 19 items as temperature, pH, suspended solids, COD_{Mn}, BOD_5, DO, petroleum, inorganic nitrogen, reactive phosphate, cyanide, sulfide, volatile penol, mercury, cadmium, lead, hexavalent chromium, arsenic, copper.

3、监测时间及频次

3. Monitoring time and frequency

2018 年 6 月 14 日至 2018 年 6 月 16 日连续监测 3 天，每日分高潮、低潮各采样监测 1 次。

3 days continuously from Jun. 14, 2018 to Jun. 16, 2018, one sampling and monitoring during high tide and low tide respectively

4、分析方法及检出限

4. Analysis method and detection limit

本次海水分析方法及检出限详见下表。

Refer to the following table for sea water analysis method and detection limit

表 3.8-7 海水检测方法及检出限一览表

Table 3.8-7 Summary of sea water testing method and detection limit

类别 Type	分析项目 Analysis item	分析方法及来源 Analysis method and source	检出限 Detection limit	使用仪器 Instrument used	仪器编号 Instrument No.
海水 Sea water	pH 值 pH value	海洋监测规范第 4 部分:海水分析 pH 计法 GB 17378.4-2007 The Specification for Marine Monitoring—Part 4: Seawater Analysis pH Meter Method GB 17378.4-2007	0.01（无量纲）(dimensionless)	PHS-3C pH 计 pH meter	LH-YQ-A-013
	水温 Water temperature	海洋监测规范 第 4 部分 海水分析 GB 17378.4-2007（25） The Specification for Marine Monitoring—Part 4: Seawater Analysis GB 17378.4-2007(25)	0.1℃	水银温度计 Mercurial Thermometer	LH-YQ-A-081
	悬浮物 Suspended matter	海洋监测规范 第 4 部分：海水分析 重量法 GB 17378.4-2007 The Specification for Marine Monitoring—Part 4: Seawater Analysis Weight Method GB 17378.4-2007	0.4mg/L	FA2204B 电子天平 Electronic balance	LH-YQ-A-008
	溶解氧 Dissolved	海洋监测规范第 4 部分:海水分析 碘量法 GB	0.2mg/L	25mL 酸式滴定管	D0025-001

类别 Type	分析项目 Analysis item	分析方法及来源 Analysis method and source	检出限 Detection limit	使用仪器 Instrument used	仪器编号 Instrument No.
	oxygen	17378.4-2007 The Specification for Marine Monitoring—Part 4: Seawater Analysis Iodometry GB 17378.4-2007		Acid burette	
	生化需氧量 Biochemical oxygen demand	海洋监测规范 The Specification for Marine Monitoring 第 4 部分：海水分析五日培养法 GB 17378.4-2007 Part 4: Seawater Analysis Five-day cultivation Method GB 17378.4-2007	0.5mg/L	25mL 酸式滴定管 Acid burette	D0025-001
	氰化物 Cyanide	海洋监测规范第 4 部分：海水分析 异烟酸-吡唑啉酮分光光度法 GB 17378.4-2007 The Specification for Marine Monitoring—Part 4: Seawater Analysis Isonicotinic Acid-Pyrazolone Spectrophotometry GB 17378.4-2007	0.001 mg/L	7230G 可见分光光度计 Visible spectrophotometer	LH-YQ-A-006
	挥发性 酚 Volatile phenol	海洋监测规范 第 4 部分：海水分析 4-氨基安替比林分光光度法 GB 17378.4-2007 The Specification for Marine Monitoring—Part 4: Seawater Analysis 4-ampyrone Spectrophotometry GB 17378.4-2007	0.001 mg/L	7230G 可见分光光度计 Visible spectrophotometer	LH-YQ-A-006
	油类 Oils	海洋监测规范 第 4 部分：海水分析紫外分光光度法 GB 17378.4-2007 The Specification for Marine Monitoring—Part 4: Seawater Analysis UV-spectrophotometry GB 17378.4-2007	0.04 mg/L	T6 新世纪 紫外可见分光光 度计 T6 new century ultraviolet and visible spectrophotometer	LH-YQ-A-005
	无机磷 Inorganic phosphorus （活性磷酸盐） (Reactive phosphate)	海洋监测规范 第 4 部分 海水分析（39.1 无机磷 磷钼蓝 分光光度法）GB17378.4-2007 39 The Specification for Marine Monitoring—Part 4: Seawater Analysis (39.1 Inorganic Phosphorus Phosphomolybdenum Blue Spectrophotometry) GB17378.4-2007 39	/L	7230G 可见分光光度计 Visible spectrophotometer	LH-YQ-A-006
	化学需 氧量 Chemical	海洋监测规范 第 4 部分：海水分析 碱性高锰酸钾法	0.5 mg/L	25mL 酸式滴定管	D0025-001

<table>
<tr><th>类别
Type</th><th colspan="2">分析项目
Analysis item</th><th>分析方法及来源
Analysis method and source</th><th>检出限
Detection limit</th><th>使用仪器
Instrument used</th><th>仪器编号
Instrument No.</th></tr>
<tr><td rowspan="2"></td><td colspan="2">oxygen demand</td><td>The Specification for Marine Monitoring—Part 4: Seawater Analysis Alkalinity Potassium Permanganate Method
GB17378.4-2007（32）
GB17378.4-2007 (32)</td><td></td><td>Acid burette</td><td></td></tr>
<tr><td colspan="2">*硫化物
*Sulfide</td><td>海洋监测规范 第 4 部分：海水分析 亚甲基蓝分光光度法 GB 17378.4-2007
The Specification for Marine Monitoring—Part 4: Seawater Analysis Methylene Blue Spectrophotometric Method GB 17378.4-2007</td><td>0.002 mg/L</td><td rowspan="5">紫外/可见分光光度 计/ UV-7504
紫外/可见分光光度
UV/VIS spectrophotometer / UV-7504
UV/VIS spectrophotometry</td><td rowspan="5">YHK-122</td></tr>
<tr><td rowspan="5"></td><td rowspan="3">*无机氮
* Inorganic nitrogen</td><td>氨
Ammonia</td><td>海洋监测规范第 4 部分:海水分析靛酚蓝分光光度法 GB 17378.4-2007（36.1）
The Specification for Marine Monitoring—Part 4: Seawater Analysis Indiophenol Blue Spectrophotometry GB 17378.4-2007(36.1)</td><td>0.0007 mg/L</td></tr>
<tr><td>亚硝酸盐
Nitrite</td><td>海洋监测规范 第 4 部分：海水分析 萘乙二胺分光光度法 GB17378.4-2007（37）
The Specification for Marine Monitoring—Part 4: Seawater Analysis Naphthalene Ethylenediamine Spectrophotometry GB17378.4-2007(37)</td><td>0.0003 mg/L</td></tr>
<tr><td>硝酸盐
Nitrate</td><td>海洋监测规范 第 4 部分：海水分析 镉柱还原法 GB 17378.4-2007（38.1）
The Specification for Marine Monitoring—Part 4: Seawater Analysis Cadmium Column Reduction Method GB 17378.4-2007(38.1)</td><td>0.0007 mg/L</td></tr>
<tr><td colspan="2">*六价铬
* Hexavalent chromium</td><td>水质 六价铬的测定 二苯 碳酰二肼分光光度法
Water Quality - Determination of Chromium (VI) - 1,5 Diphenylcarbazide Spectrophotometry Method GB/T 7 467-1987</td><td>0.004 mg/L</td></tr>
<tr><td colspan="2">*铜
* Copper</td><td>海洋监测规范 第 4 部分：海水分析 火焰原子吸收分光光</td><td>0.0011 mg/L</td><td>原子吸收分光光度 计/AA-7000</td><td>YHK-206</td></tr>
</table>

类别 Type	分析项目 Analysis item	分析方法及来源 Analysis method and source	检出限 Detection limit	使用仪器 Instrument used	仪器编号 Instrument No.
		度法 GB 17378.4-2007（6.3） The Specification for Marine Monitoring—Part 4: Seawater Analysis Flame Atomic Absorption Spectrophotometry GB 17378.4-2007 (6.3)		Atomic Absorption Spectrophotometer/ AA-7000	
	*铅 *Lead	海洋监测规范 第 4 部分：海水分析 火焰原子吸收分光光度法 GB 17378.4-2007（7.3） The Specification for Marine Monitoring—Part 4: Seawater Analysis Flame Atomic Absorption Spectrophotometry GB 17378.4-2007 (7.3)	0.0018 mg/L	原子吸收分光光度 计/AA-7000 Atomic Absorption Spectrophotometer/ AA-7000	YHK-206
	*镉 *Cadmium	海洋监测规范 第 4 部分：海水分析 火焰原子吸收分光光度法 GB17378.4-2007（8.3） The Specification for Marine Monitoring—Part 4: Seawater Analysis Flame Atomic Absorption Spectrophotometry GB17378.4-2007(8.3)	0.0003 mg/L	原子吸收分光光度 计/AA-7000 Atomic Absorption Spectrophotometer/ AA-7000	YHK-206
	*砷 *Arsenic	海洋监测规范 第 4 部分：海水分析 原子荧光法 The Specification for Marine Monitoring—Part 4: Seawater Analysis Atomic Fluorescence Method GB17378.4-2007（11.1） GB17378.4-2007 (11.1)	0.0005 mg/L	原子荧光光度计 Atomic fluorescence photometer /RGF-6200	YHK-093
	*汞 *Mercury	海洋监测规范 第 4 部分：海水分析 原子荧光法 GB17378.4-2007（5.1） The Specification for Marine Monitoring—Part 4: Seawater Analysis Atomic Fluorescence Method GB17378.4-2007(5.1)	0.000007 mg/L	原子荧光光度计 Atomic fluorescence photometer /RGF-6200	YHK-093

5、评价方法及标准

5. Evaluation method and standard

评价方法：各项因子评价方法同 3.8.1.1 章节内容。

Evaluation method: the evaluation method for various factors is the same with that in Section 3.8.1.1.

评价标准：根据《广西近岸海域环境功能区划》的相关要求，本次调查的 1#站位位

于铁山港水产养殖区，海水水质执行二类标准；2#、4#、5#站位位于主导功能为港口、工业、生活排污用海的海域，属四类环境功能区，海水水质执行四类标准；3#站位位于山口红树林国家级自然保护区，海水水质执行一类标准；6#、8#站位位于北部湾二长棘鲷长毛对虾国家级水产种质资源保护区，海水水质执行一类标准；7#站位位于铁山港作业区的水质过渡带，海水水质执行三类标准；9#站位位于广西合浦儒艮国家级自然保护区，海水水质执行一类标准 10#站位位于养殖区，海水水质执行二类标准；。评价标准见表 1.3-4。

Evaluation standard: according to relevant requirements in Environment Function Zone of Guangxi Offshore Area, Point 1 investigated was located in Tieshangang aquafarm and sea water standard should comply with Class II standard. Points 2, 4 and 5 were in sea areas used for ports, industry and domestic sewage. They were Class IV environmental protection zone. Sea water standard should comply with Class IV standard. Point 3 was located in Shankou Mangrove Ecological Marine Nature Reserve. Sea water standard should comply with Class I standard. Points 6 and 8 were Beibu Gulf Parargyrops Edita and Penaeus Penicillatus National Aquatic Germplasm Resource Nature Reserve. Sea water standard should comply with Class I standard. Point 7 was located in water quality transitional zone of Tieshangang operation area. Sea water standard should comply with Class III standard. Point 9 was located in Guangxi Hepu Dugong National Nature Reserve. Sea water standard should comply with Class I standard. Point 10 was located in the aquiculture area. Sea water standard should comply with Class II standard. Refer to Table 1.3-4 for assessment standards.

6、监测结果及评价

6. Monitoring results and assessment

评价海域海水水质监测结果见表 3.8-8，标准指数评价结果见表 3.8-9。

Refer to Table 3.8-8 for sea water monitoring result of assessed sea area. Refer to Table 3.8-9 for standard index assessment result.

表 3.8-8　海水水质监测结果　单位：mg/L（pH、盐度除外）

Table 3.8-8 Sea water quality monitoring result unit: mg/L (except for pH and salinity)

表 3.8-9　海水水质标准指数评价结果一览表

Table 3.8-9 Summary of sea water quality standard index assessment result

注：低于检出限的监测值标准指数以检出限 1/2 参与统计。
Note: monitoring value standard index lower than detection limit shall be calculated as per 1/2 of detection limit.

本次海水现状调查监测了水温、pH 值、悬浮物、COD、BOD5、DO、石油类、无机氮、活性磷酸盐、氰化物、硫化物、挥发酚、汞、镉、铅、六价铬、砷、铜等 19 项指标。其中《海水水质标准》（GB3097-1997）标准中有关水温、悬浮物质标准的规定，强调的是“人为增加”，对浓度限值无要求，不宜用标准值对监测结果做出直接评价。因此，本次调查水温、悬浮物质的结果仅作为背景值保留，不列入评价项目。

When investigating current status of seawater, such 19 indexes as temperature, pH value, suspended solids, OD, BOD5, DO, petroleum, inorganic nitrogen, reactive phosphate, cyanide, sulfide, volatile penol, mercury, cadmium, lead, hexavalent chromium, arsenic and copper were monitored. Where, regulation on temperature and suspended solid standard in Sea Water Quality Standard (GB3097-1997) underlined “artificial increase”. There was no concentration limit requirement. Standard values should not be used for direct assessment of monitoring results Therefore, temperature and suspended solid result during the investigation were only reserved as background value. And they would not be listed as assessment items.

根据监测结果可知，本次监测的 10 个站位所有监测因子均能达到《海水水质标准》（GB3097-1997）中的相应标准限值。

According to monitoring results, all monitoring factors of 10 points could reach appropriate standard limit in Sea Water Quality Standard (GB3097-1997).

3.8.1.3 2019 年水环境质量现状调查与评价

3.8.1.3 Investigation and assessment of water environment quality condition in 2019

1、监测点位

1. Monitoring points

涨潮期和落潮期水质调查共布设监测站位 20 个，具体站位见表 3.8-10 和图 3.8-3 所示。

Altogether 20 monitoring points are arranged for investigation during rising tide period and falling tide period. Refer to Table 3.8-10 and Fig. 3.8-3 for detailed points.

表 3.8-10 海洋水质环境及沉积物调查点位一览表

Table 3.8-10 Summary of marine water quality environment and sediment investigation points

编号 No.	海洋功能区划 Functional zone of marine	近岸海域环境功能区划 Functional zone of offshore area environment	沉积物标准 Sediment standard	备注 Remarks	点位坐标 Coordinates of points
1	铁山港东岸排污区 Tieshangang East Coast Sewage Discharge Area	四类水质目标 Class IV quality goal	三类标准 Class III standard	水质、沉积物 Water quality and sediment	109.594534 21.594918
2	铁山港排污区 Tieshangang sewage discharge area	四类水质目标 Class IV quality goal	三类标准 Class III standard	水质、沉积物 Water quality and sediment	109.593847 21.4974148
3	英罗港养殖区 Yingluogang Breeding Area	二类水质目标 Class II quality goal	一类标准 Class I standard	水质、沉积物 Water quality and sediment	109.611162 21.5444721
4	铁山港排污区 Tieshangang sewage discharge area	四类水质目标 Class IV quality goal	三类标准 Class III standard	水质、沉积物 Water quality and sediment	109.567560 21.497780
5	合浦沙田儒艮自然保护区 Hepu Shatian Dugong National Nature Reserve	一类水质目标 Class I quality goal	一类标准 Class I standard	水质、沉积物 Water quality and sediment	109.660257 21.4946903
6	英罗港养殖区 Yingluogang Breeding Area	二类水质目标 Class II quality goal	一类标准 Class I standard	水质、沉积物 Water quality and sediment	109.522070 21.4113702
7	铁山港排污区 Tieshangang sewage discharge area	四类水质目标 Class IV quality goal	三类标准 Class III standard	水质、沉积物 Water quality and sediment	109.549021 21.4524616
8	合浦沙田儒艮自然保护区 Hepu Shatian Dugong National Nature Reserve	一类水质目标 Class I quality goal	一类标准 Class I standard	水质、沉积物 Water quality and sediment	109.671244 21.4490284
9	铁山港作业区 Tieshangang operation area	四类水质目标 Class IV quality goal	三类标准 Class III standard	水质、沉积物 Water quality and sediment	109.514002 21.4476551
10	铁山港保留区 Tieshangang reserve area	二类水质目标 Class II quality goal	一类标准（参照） Class I standard (reference)	水质、沉积物 Water quality and sediment	109.571680 21.4119385
11	铁山港保留区 Tieshangang reserve area	二类水质目标 Class II quality goal	一类标准（参照） Class I standard (reference)	水质、沉积物 Water quality and sediment	109.536017 21.3386355

编号 No.	海洋功能区划 Functional zone of marine	近岸海域环境功能区划 Functional zone of offshore area environment	沉积物标准 Sediment standard	备注 Remarks	点位坐标 Coordinates of points
12	合浦沙田儒艮自然保护区 Hepu Shatian Dugong National Nature Reserve	一类水质目标 Class I quality goal	一类标准 Class I standard	水质、沉积物 Water quality and sediment	109.696692 21.3310824
13	合浦沙田儒艮自然保护区 Hepu Shatian Dugong National Nature Reserve	一类水质目标 Class I quality goal	一类标准 Class I standard	水质 Water quality	109.704975 21.4036093
14	红树林海洋保护区 Mangroove Forest Nature Reserve	一类水质目标 Class I quality goal	一类标准 Class I standard	水质 Water quality	109.640387 21.5442858
15	铁山港作业区 Tieshangang operation area	四类水质目标 Class IV quality goal	三类标准 Class III standard	水质 Water quality	109.594039 21.5449725
16	沙田港航道区 Waterway area of Shatian Harbor	三类水质目标 Class III quality goal	三类标准 Class III standard	水质 Water quality	109.625281 21.4951907
17	英罗港养殖区 Yingluogang Breeding Area	二类水质目标 Class II quality goal	一类标准 Class I standard	水质 Water quality	109.586486 21.4515887
18	营盘至彬塘南部浅海农渔业区 From Yingpan to agricultural fishery area in the shallow sea on the southern part of Bintang	二类水质目标 Class II quality goal	一类标准 Class I standard	水质 Water quality	109.439651 21.3349663
19	合浦沙田儒艮自然保护区 Hepu Shatian Dugong National Nature Reserve	一类水质目标 Class I quality goal	一类标准 Class I standard	水质 Water quality	109.637984 21.4094421
20	合浦沙田儒艮自然保护区 Hepu Shatian Dugong National Nature Reserve	一类水质目标 Class I quality goal	一类标准 Class I standard	水质 Water quality	109.614210 21.3311607

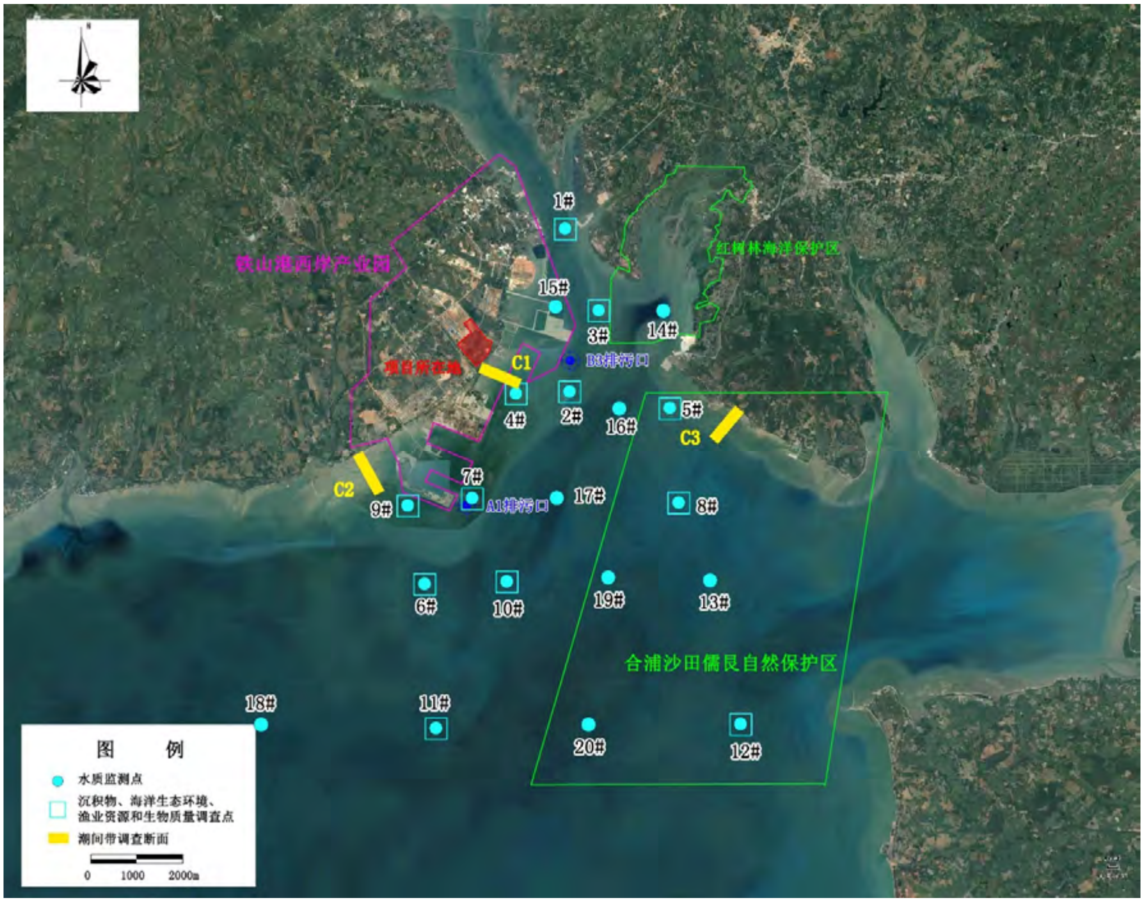

铁山港西岸产业园
红树林海洋保护区
项目所在地
B3排污口
A1排污口
合浦沙田儒艮自然保护区
C1
C2
C3
1#
2#
3#
4#
5#
6#
7#
8#
9#
10#
11#
12#
13#
14#
15#
16#
17#
18#
19#
20#
图 例
水质监测点
沉积物、海洋生态环境、渔业资源和生物质量调查点
潮间带调查断面
0 1000 2000m

图 3.8-3　海洋监测布点图

Fig. 3.8-3 Ocean monitoring point chart

2、调查项目

2. Investigation items

海洋水质调查因子：水温、盐度、pH、悬浮物、溶解氧、COD_{Mn}、无机氮（硝酸盐氮、亚硝酸盐氮、氨氮）、重金属（As、Hg、Cu、Pb、Zn、Cd、Cr）活性磷酸盐、石油类、色度、总磷、总氮、BOD_5、粪大肠菌群等 23 项。

Ocean water quality investigation factors include such 23 items as temperature, salinity, pH, suspended solid, dissolved oxygen, COD_{Mn}, inorganic nitrogen (nitrate nitrogen, nitrous nitrogen and ammonia nitrogen), heavy metal (As, Hg, Cu, Pb, Zn, Cd and Cr) reactive phosphate, petroleum, chromaticity, total phosphorus, total nitrogen, BOD_5, fecal coliform, etc.

3、监测时间

3 Monitoring time

监测时间2019年8月27日落潮期监测一次，2019年8月28日涨潮期监测一次。

One monitoring during falling tide period on Aug. 27, 2019 and one monitoring during rising tide period on Aug. 28, 2019

4、分析方法

4. Analysis method

各项监测因子的采集和分析均按照GB17378-2007《海洋监测规范》进行。

Collection and analysis of various monitoring factors shall comply with Specification for Marine Monitoring (GB17378-2007).

5、评价方法及标准

5. Evaluation method and standard

评价方法：各项因子评价方法同3.8.1.1章节内容。

Evaluation method: the evaluation method for various factors is the same with that in Section 3.8.1.1.

6、评价结果

6. Evaluation result

各因子监测数据见表3.8-11，标准指数评价结果见表3.8-12。

Refer to Table 3.8-11 for monitoring data of various factors and Table 3.8-12 for standard index assessment result.

表 3.8-11　水质监测因子调查结果统计一览表

Table 3.8-11 Summary of statistics of water quality monitoring factor investigation result

注：“<”表示小于该检测项目的检出限。“-”表示该站位无该检测项目。
Note: “<” shows less than detection limit of the detection item. “-” showsno detection item at the point.

表 3.8-12 海水水质标准指数评价结果一览表

Table 3.8-12 Summary of marine water quality standard index assessment result

本次海水现状调查监测了水温、盐度、pH、悬浮物、溶解氧、COD、无机氮（亚硝酸盐、硝酸盐、氨）、汞、镉、铅、铬、砷、铜、锌、活性磷酸盐、石油类、水色、总磷、总氮、BOD、叶绿素a等24项指标。其中盐度、亚硝酸盐、硝酸盐、氨、总磷、总氮、叶绿素a末列入《海水水质标准》（GB3097-1997）中，标准中有关水温、水色、悬浮物质标准的规定，强调的是“人为增加”，对浓度限值无要求，不宜用标准值对监测结果做出直接评价。因此，本次调查盐度、总磷、总氮、叶绿素a、水温、水色和悬浮物质的结果仅作为背景值保留，不列入评价项目。

During seawater condition investigation, such 24 items as temperature, salinity, pH, suspended solid, dissolved oxygen, COD, inorganic nitrogen (nitrite, nitrate and ammonia), mercury, cadmium, lead, chromium, arsenic, copper, zinc, reactive phosphate, petroleum, water color, total phosphorus, total nitrogen, BOD, chlorophyll a were monitored. Where, salinity, nitrite, nitrate, ammonia, total phosphorus, total nitrogen and chlorophyll a were not listed into Sea Water Quality Standard (GB3097-1997). Regulation on temperature, water color and suspended solid in the standard underlined “artificial increase”. There was no concentration limit requirement. Standard values should not be used for direct assessment of monitoring results. Therefore, salinity, total phosphorus, total nitrogen, chlorophyll a, temperature, water color and suspended solid result during the investigation were reserved as background value and would not be listed into assessment items.

根据监测结果可知，本次监测的20个站位所有监测因子均能达到《海水水质标准》（GB3097-1997）中的相应标准限值。

According to monitoring results, all monitoring factors of 20 points could reach appropriate standard limit in Sea Water Quality Standard (GB3097-1997).

3.8.2 海洋沉积物现状调查与评价

3.8.2 Investigation and assessment about current marine sediment condition

3.8.2.1 2016年海洋沉积物现状调查与评价

3.8.2.1 Investigation and assessment about marine sediment condition in 2016

1、调查站位

1. Investigation points

与 2016 年 4 月 19 日~21 日的水质调查同步，只进行一次调查，在铁山港调查海域内共设 12 个沉积物调查站位，调查站位布设见表 3.8-1 和图 3.8-1。

In synchronization with the water quality investigation from April 19 to 21, 2016, one investigation was conducted. A total of 12 sediment investigation points were set up in the investigation area of Tieshangang. See Table 3.8-1 and Figure 3.8-1 for point layout.

2、调查项目及方法

2. Investigation items and methods

（1）调查项目

(1) Investigation item

总汞、镉、铅、砷、铜、锌、石油类和有机碳，共 8 项。

8 items in total: total mercury, cadmium, lead, arsenic, copper, zinc, petroleum and organic carbon.

（2）分析方法

(2) Analytical method

沉积物样品的采集、保存和分析均按《海洋监测规范》（GB17378.5-2007）中的相应要求执行，沉积物分析方法见表 3.8-13。

The collection, preservation and analysis of sediment samples are carried out in accordance with the corresponding requirements in the *Specification for Marine Monitoring* (GB17378.5-2007). See Table 3.8-13 for sediment analysis methods.

表 3.8-13 沉积物分析方法

Table 3.8-13 Sediment Analysis Methods

序号 S.N.	调查项目 Survey item	分析方法 Analytical method	分析仪器 Analysis instrument	检出限 Detection limit
1	汞 Mercury	原子荧光法 Atomic fluorescence spectrometry	YXG-1011A 原子荧光光度计 Atomic fluorescence photometer	0.002×10^{-6}
2	砷 Arsenic			0.06×10^{-6}
3	镉 Cadmium	火焰原子吸收分光光度法 Atomic absorption spectrometry (AAS) with flame	T986 原子吸收分光光度计 Atomic absorption spectrophotometer	0.04×10^{-6}
4	铅 Lead			1.0×10^{-6}
5	铜			0.5×10^{-6}

	Copper			
6	锌 Zinc			6.0×10^{-6}
7	石油类 Petroleum	紫外分光光度法 Ultraviolet spectrophotometry	UV-3 紫外分光光度计 UV-3 ultraviolet spectrophotometer	3.0×10^{-6}
8	有机碳 Organic carbon	重铬酸钾氧化-还原容量法 Potassium dichromate oxidation-reduction volumetry	滴定管 Burette	0.03×10^{-6}

3、评价标准

3. Assessment standard

根据沉积物调查所属海域及《广西壮族自治区海洋功能区划（2011-2020 年）》的要求，各站位沉积物质量评价分别执行《海洋沉积物质量》（GB18668-2002）中的一类、二类和三类标准，本次调查的 1、2、4、7、11、12、15 和 17 号站位表层沉积物均执行二类标准；8、18 和 19 号站位表层沉积物执行一类标准；9 号站位表层沉积物执行三类标准。各评价因子的评价标准值见表 3.8-14。

According to the investigated sea area and the requirements of the *Functional Zone of Marine in Guangxi Zhuang Autonomous Region (2011-2020)*, the sediment quality assessment at each point shall follow Class I, II and III standards stipulated in *Marine Sediment Quality* (GB18668-2002). The surface sediments at Point 1, 2, 4, 7, 11, 12, 15 and 17 shall follow Class II standard; the surface sediments at Point 8, 18 and 19 shall follow Class I standard; the surface sediments at Point 9 shall follow Class III standard. Refer to Table 3.8-14 for assessment standard value of each assessment factor

表 3.8-14 《海洋沉积物质量》（GB18668-2002）标准

Table 3.8-14 *Marine Sediment Quality* (GB18668-2002) Standard

单位：$\times10^{-6}$

Unit: $\times10^{-6}$

项目	第一类标准	第二类标准	第三类标准
汞	0.2	0.50	1.00
铜	35	100	200
铅	60	130	250
镉	0.5	1.50	5.00
锌	150	350	600
砷	20	65.0	93.0
石油类	500	1000	1500
有机碳	2.0%	3.0%	4.0%

4、评价方法

4. Evaluation Method

采用单项因子质量指数法进行评价，公式为：

The single factor quality index is adopted for assessment, and the calculation formula is shown below:

Ii = Ci / Si

式中：Ii—沉积物污染物的质量指数，Ii>1，说明沉积物已受到污染；

Where: I_i is the quality index of sediment pollutants; if I_i> 1, the sediment has been polluted;

Ci—沉积物中污染物的实测含量；

C_i is the measured content of pollutants in sediment;

Si——评价标准。

S_i is the assessment criteria.

5、监测结果及评价

5. Monitoring results and assessment

铁山港调查海区沉积物的调查结果见表 3.8-15。评价结果见表 3.8-16。

See Table 3.8-15 for the investigation results of the sediments in the investigation area of Tieshangang. Refer to Table 3.8-16 for assessment results.

表 3.8-15 铁山港海区沉积物结果统计一览表 （nd 指未检出）

Table 3.8-15 Summary of Statistical Results of Sediment in Tieshangang Sea Area (“nd” means “Not Detected”)

表 3.8-16 铁山港海区沉积物标准指数统计一览表 （/指未检出）

Table 3.8-16 Summary of Statistical Standard Index of Sediment in Tieshangang Sea Area (“/” means “Not Detected”)

统计结果表明，评价因子有机碳、汞、镉、铅、砷、铜、锌、石油类在调查海区的标准评价指数都小于 1，调查海区沉积物中各评价因子的含量均不高，沉积物质量符合相应海洋功能区划要求。

The statistical results show that the assessment factors of organic carbon, mercury, cadmium, lead, arsenic, copper, zinc and petroleum in the investigated sea area are all less than 1, and the content of each factor in the sediments of the surveyed sea area is not high. The quality meets the requirements of the corresponding marine functional zoning.

3.8.2.2 2018 年海洋沉积物调查

3.8.2.2 Investigation about Marine Sediment Condition in 2018

1、监测点位布设

1. Setting monitoring points

共布设 7 个海洋沉积物监测点，点位布设详见表 3.8-17 和图 3.8-2。

A total of 7 marine sediment monitoring points are set, as shown in Table 3.8-17 and Figure 3.8-2.

表 3.8-17 海洋沉积物现状监测布点一览表

Table 3.8-17 Summary of Monitoring Points for Current Marine Sediment Conditions

编号	监测点位经纬度	备注
1#	21º37.92′N，109º33.78′E	
2#	21º34.85′N，109º35.69′E	排污区
3#	21º32.77′N，109º38.64′E	山口红树林国家级自然保护区监测点
4#	21º29.58′N，109º35.25′E	排污区
5#	21º26.36′N，109º33.38′E	排污区
6#	21º25.25′N，109º22.72′E	北部湾二长棘鲷长毛对虾国家级水产种质资源保护区监测点 Monitoring points in Beibu Gulf Parargyrops Edita and
7#	21º22.98′N，109º36.28′E	儒艮国家级自然保护区监测点

2、监测因子

2. Monitoring factors

监测因子为 pH 值、石油类、有机质、硫化物、镉、铅、六价铬、砷、铜共 9 项。

The monitoring factors are pH, petroleum, organic matter, sulfide, cadmium, lead, hexavalent chromium, arsenic, and copper.

3、监测时间及频率

3. Monitoring time and frequency

监测于 2018 年 6 月进行，各站位采样 1 次。

The monitoring was conducted in June 2018, and each point was sampled once.

4、监测分析方法及检出限

4. Monitoring and analysis method and detection limit

海洋沉积物监测分析方法及检出限见下表。

The monitoring and analysis methods and detection limits of marine sediments are shown in the table below.

表 3.8-18 海洋沉积物监测分析方法及检出限一览表

Table 3.8-18 Summary of Monitoring and Analysis Methods and Detection Limits of Marine Sediments

类别 Categor	分析项目 Analysis	分析方法及来源 Analysis method and source	检出限 Detection limit	使用仪器 Instrument used	仪器编号 Instrument No.
海洋沉积物 Marine sediment	*pH 值 *pH value	土壤 pH 值的测定 NY/T 1377-2007 Determination of pH in soil	—	pH 计/pHS-3C pH meter / pHS-3C	YHK-027
	*石油类 *Petroleum	海洋监测规范 第 5 部分沉积物分析油的测定 紫外分光光度法 GB17378.5-2007（13.2）	3.0mg/kg	紫外可见分光光 度计/UV-7504 Ultraviolet and visible	YHK-122
	*有机质 * Organic matter	土壤检测 第六部分 土壤有机质的测定 NY/T 1121.6-2006	—	滴定管/50.00ml Burette / 50.00mL	—
	*硫化物 *Sulfide	海洋监测规范 第 5 部分沉积物分析 硫化物的测定亚甲基蓝分光光度法 GB 17378.5-2007（17.1）	0.3mg/kg	紫外可见分光光 度计/UV-7504 Ultraviolet and visible	YHK-122
	*六价铬 * Hexavalent	固 体 废 物 六 价 铬 的 测 定碱消解/火焰原子吸收分光光度法 HJ 687-2014	2 mg/kg	原子吸收分光光 度计/AA7000 Atomic absorption spectrophotometer / AA7000	YHK-206
	*铜 * Copper	海洋监测规范 第 5 部分沉积物分析 铜的测定 火焰原子吸收分光光度法 GB 17378.5-2007（6.2）	2 mg/kg		
	*铅 *Lead	海洋监测规范 第 5 部分沉积物分析 铅的测定 无火焰原子吸收分光光度法 GB 17378.5-2007（7.1）	1.0mg/kg		
	*镉 *Cadmium	海洋监测规范 第 5 部分沉积物分析 镉的测定 无火焰原子吸收分光光度法 GB 17378.5-2007（8.2）	0.05mg/kg		

	*总砷 *Total arsenic	海洋监测规范 第 5 部分沉积物分析 砷的测定原子荧光法 GB17378.5-2007（11.1） Atomic fluorescence	0.06mg/kg	原子荧光光度计/RGF6200 Atomic fluorescence photometer / RGF6200	YHK-093
	*总汞 *Total mercury	海洋监测规范 第 5 部分沉积物分析 总汞的测定原子荧光法 GB 17378.5-2007（5.1） Atomic fluorescence	0.002mg/kg		

5、评价标准

5. Assessment standard

采用《海洋沉积物质量》（GB18668-2002）中的标准，详见表 1.3-8，各站点执行情况见表 3.8-19。

The standards in *Marine Sediment Quality* (GB18668-2002) are adopted. See Table 1.3-8 for details, and Table 3.8-19 for the implementation status at each point.

表 3.8-19 各监测站位执行标准

Table 3.8-19 Executive Standards at Each Point

监测点位	监测点位经纬度	执行标准（GB18668-2002）类别
1#	21º37.92′N，109º33.78′E	第三类
2#	21º34.85′N，109º35.69′E	第三类
3#	21º32.77′N，109º38.64′E	第一类
4#	21º29.58′N，109º35.25′E	第三类
5#	21º26.36′N，109º33.38′E	第三类
6#	21º25.25′N，109º22.72′E	第一类
7#	21º22.98′N，109º36.28′E	第一类

6、评价方法

6. Evaluation Method

评价方法见&3.8.2.1 章节。

For the assessment method, see Section & 3.8.2.1.

7、监测结果及评价

7. Monitoring results and assessment

本次评价监测于 2018 年 6 月进行，沉积物监测结果见表 3.8-20，评价结果见表 3.8-21。

The assessment monitoring was conducted in June 2018. The results of sediment monitoring are shown in Table 3.8-20, and the assessment results are shown in Table 3.8-21.

表 3.8-20 海洋沉积物监测结果

Table 3.8-20 Marine Sediment Monitoring Results

单位：×10^{-6}

Unit: ×10^{-6}

表 3.8-21 沉积物质量指数表(Ii)

Table 3.8-21 Sediment Quality Index (I_i)

由上表可见，统计结果表明，评价因子硫化物、有机碳、镉、铅、砷、铜、锌、石油类在调查海区的标准评价指数都小于1，调查海区沉积物中各评价因子的含量均不高，沉积物质量符合相应海洋功能区划要求。

As indicated in the table above, the statistical results show that the assessment factors of sulfide, organic carbon, cadmium, lead, arsenic, copper, zinc and petroleum in the investigated sea area are all less than 1, and the content of each factor in the sediments of the surveyed sea area is not high. The quality meets the requirements of the corresponding marine functional zoning.

3.8.2.3 2019 年海洋沉积物现状调查与评价

3.8.2.3 Investigation and assessment about marine sediment condition in 2019

1、监测点位布设

1. Setting monitoring points

共布设 12 个海洋沉积物监测点，点位布设详见前面表 3.8-10 和附图 4。

A total of 12 marine sediment monitoring points are set, as shown in Table 3.8-10 and Attached Figure 4.

2、监测因子

2. Monitoring factors

监测因子为有机碳、硫化物、铜、铅、镉、锌、砷、油类、汞，共 9 项。

Monitored factors: 9 in total, such as organic carbon, sulfide, copper, lead, cadmium, zinc, arsenic, oil and mercury

3、监测时间及频率

3. Monitoring time and frequency

监测于 2019 年 8 月 27 日进行，各站位采样 1 次。

The monitoring was conducted on August 27, 2019, and each point was sampled once.

4、监测分析方法及检出限

4. Monitoring and analysis method and detection limit

海洋沉积物监测分析方法及检出限见下表。

The monitoring and analysis methods and detection limits of marine sediments are shown in the table below.

表 3.8-22 海洋沉积物监测分析方法及检出限一览表

Table 3.8-22 Summary of Monitoring and Analysis Methods and Detection Limits of Marine Sediments

序号 S.N.	项目 Item	分析方法与技术依据 Analysis method and technical basis	仪器设备 Instrument and equipment	检出限 Detection limit
1	铜 Copper	火焰原子吸收分光光度法 Atomic absorption spectrometry (AAS) with flame GB17378.5-2007 /6.2	原子吸收分光光度计（PinAAcle 900T） Atomic absorption spectrophotometer (PinAAcle 900T)	2.0×10^{-6}
2	铅 Lead	无火焰原子吸收分光光度法 Nonflame atomic absorption spectrophotometry GB17378.5-2007 /7.1		1.0×10^{-6}
3	锌 Zinc	火焰原子吸收分光光度法 Atomic absorption spectrometry (AAS) with flame GB17378.5-2007 /9		6.0×10^{-6}
4	镉 Cadmium	无火焰原子吸收分光光度法 Nonflame atomic absorption spectrophotometry GB17378.5-2007 /8.1		0.04×10^{-6}
5	汞 Mercury	原子荧光法 Atomic fluorescence spectrometry GB17378.5-2007 /5.1	SK-2003AZ 原子荧光光谱仪 Atomic fluorescence spectrometer	0.002×10^{-6}
6	砷 Arsenic	原子荧光法 Atomic fluorescence spectrometry GB17378.5-2007 /11.1	SK-2003AZ 原子荧光光谱仪	0.06×10^{-6}

			Atomic fluorescence spectrometer	
7	油类 Oils	紫外分光光度法 Ultraviolet spectrophotometry GB17378.5-2007 /13.2	UV-2100 分光光度计 Spectrophotometer	3.0×10^{-6}
8	硫化物 Sulfide	碘量法 Iodometry GB17378.5-2007/17.3	250ml 半微量凯氏定氮装置 Semimicro-Kjeldahl nitrogen determination device	4.0×10^{-6}
9	有机碳 Organic carbon	重铬酸钾氧化一还原容量法 Potassium dichromate oxidation - reduction volumetry GB17378.5-2007/18.1	25mL 酸式滴定管 Acid burette	/

5、评价标准

5. Assessment standard

采用《海洋沉积物质量》（GB18668-2002）中的标准，详见表 1.3-8，各沉积物站点标准执行情况见前表 3.8-10。

The standards in *Marine Sediment Quality* (GB18668-2002) are adopted. See Table 1.3-8 for details, and Table 3.8-10 for the implementation status of standards at each point.

6、评价方法

6. Evaluation Method

评价方法见&3.8.2.1 章节。

For the assessment method, see Section & 3.8.2.1.

7、监测结果及评价

7. Monitoring results and assessment

本次评价监测于 2019 年 8 月 27 日进行，沉积物监测结果见表 3.8-23，评价结果见表 3.8-24。

The assessment monitoring was conducted in on August 27, 2019. The results of sediment monitoring are shown in Table 3.8-23, and the assessment results are shown in Table 3.8-24.

表 3.8-23 海洋沉积物监测结果

Table 3.8-23 Marine Sediment Monitoring Results

表 3.8-24 沉积物质量指数表(Ii)

Table 3.8-24 Sediment Quality Index (I_i)

统计结果表明，评价因子硫化物、有机碳、汞、镉、铅、砷、铜、锌、石油类在调查海区的标准评价指数都小于 1，调查海区沉积物中各评价因子的含量均不高，沉积物质量符合相应海洋功能区划要求。

The statistical results show that the assessment factors of sulfide, organic carbon, mercury, cadmium, lead, arsenic, copper, zinc and petroleum in the investigated sea area are all less than 1, and the content of each factor in the sediments of the surveyed sea area is not high. The quality meets the requirements of the corresponding marine functional zoning.

3.8.3 海洋生物现状调查与评价

3.8.3 Investigation and assessment about current marine organism condition

3.8.3.1 2016 年海洋生物现状调查与评价

3.8.3.1 Investigation and assessment about marine organism condition in 2016

海洋生物现状调查内容主要包括叶绿素、浮游植物、浮游动物、底栖生物、潮间带生物、生物残毒和渔业资源等，其中叶绿素、浮游植物、浮游动物、底栖生物调查与水质调查同步，为 2016 年 4 月；渔业资源、生物残毒调查时间为 2016 年 3 月，潮间带的调查时间为 2015 年 6 月和 2015 年 12 月。调查站位布设见表 3.8-1 和图 3.8-1。

The investigated contents mainly include chlorophyll, phytoplankton, zooplankton, benthos, intertidal organisms, biological residues and fishery resources. Among them, the investigation on chlorophyll, phytoplankton, zooplankton, benthos was synchronized with that on water quality in April 2016. The investigation on fishery resources and biological residues was in March 2016, while the investigation on intertidal organisms was in June 2015 and December 2015. See Table 3.8-1 and Figure 3.8-1 for investigation point layout.

3.8.3.2 2018 年海洋生物现状调查与评价

3.8.3.2 Investigation and assessment about marine organism condition in 2018

1、调查站位

1. Investigation points

本次评价引用广西海洋环境监测中心站 2017 年在铁山港海域进行的海洋生物生态现状调查结果，其调查站位见表 3.8-37 和图 3.8-10。

The assessment quoted the results of the investigation on the status of marine organisms in 2017 carried out by the Guangxi Marine Environmental Monitoring Center Station in the waters of Tieshangang. The locations of the investigation points are shown in Table 3.8-37 and Figure 3.8-10.

表 3.8-37 2017 年铁山港附近海域海洋生物调查站位

Table 3.8-37 Marine Organism Investigation Points near Tieshangang in 2017

序号 **S.N.**	站位编号 **Point number**	备注 **Remarks**
1	GX012	广西近岸海域区控站位 Regional control point in the coastal waters of Guangxi
2	GC023	广西近岸海域国控站位 National control point in the coastal waters of Guangxi
3	GX029	广西近岸海域国控站位 National control point in the coastal waters of Guangxi
4	GX030	广西近岸海域国控站位 National control point in the coastal waters of Guangxi
5	GX032	广西近岸海域国控站位 National control point in the coastal waters of Guangxi
6	GX034	广西近岸海域国控站位 National control point in the coastal waters of Guangxi
7	GX037	广西近岸海域国控站位 National control point in the coastal waters of Guangxi
8	BH6	广西近岸海域区控站位 Regional control point in the coastal waters of Guangxi

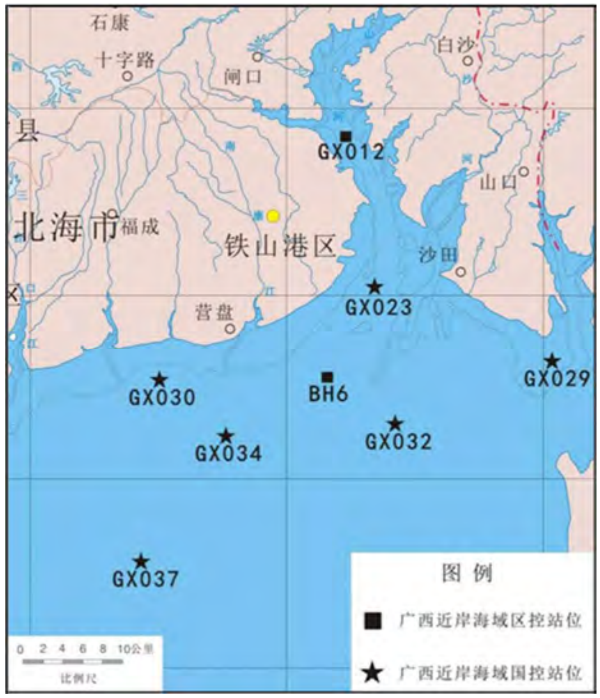


图 3.8-10 海洋生态现状调查站位分布图

Figure 3.8-10 Distribution of Current Marine Organism Status Investigation Points

2、调查内容及调查项目

2. Investigation contents and items

（1）调查内容

(1) Investigation contents

调查内容包括叶绿素 a、初级生产力、浮游生物、浮游植物、大型底栖生物。

The investigation contents include chlorophyll a, primary productivity, plankton, phytoplankton, and macrobenthos.

（2）调查项目

(2) Investigation item

浮游动物：种类、丰度、湿重生物量；

Zooplankton: species, abundance, wet weight biomass;

浮游植物：种类、细胞密度；

Phytoplankton: species, cell density;

大型底栖生物：种类、栖息密度、生物量。

Macrobenthos: species, habitat density, biomass.

3、调查结果及评价

3. Investigation results and assessment

3.8.3.3 本次环评监测海洋生态和生物资源现状调查与评价

3.8.3.3 The investigation and assessment of the current status of marine organism and biological resources in this EIA monitoring

1、调查站位

1. Investigation points

按照一级评价的原则，潮间带设 3 个调查断面（每条断面分高潮区、中潮区和低潮区，其中高潮区设 1 个站位、中潮区设 3 个站位、低潮区 1 个站位，每个潮间带共布置 5 个站位），海洋生态环境、鱼卵仔稚鱼、渔业资源现状和海洋生物质量现状的调查站位均为 12 个，其调查站位布设见表 3.8-48 和附图 4。

According to the principle of Level I assessment, there are 3 investigation sections in the intertidal zone (each section is divided into high tide zone (1 investigation point), middle tide zone (3 investigation points) and low tide zone (1 investigation point). There are 5 points in each intertidal zone). The number of investigation points for marine ecological environment, fish eggs, larvae and juveniles, fishery resources and marine organism quality is all 12. The layout of the points is shown in the Table 3.8-48 and Attached Figure 4.

表 3.8-48 海洋生态环境与渔业资源现状调查站位一览表
Table 3.8-48 Summary of Investigation Points of Marine Ecological Environment and Fishery Resources

站位 Points	调查内容 Investigation contents
1	海洋生态、渔业资源、海洋生物质量 Marine ecology, fishery resources, marine organism quality
2	海洋生态、渔业资源、海洋生物质量 Marine ecology, fishery resources, marine organism quality
3	海洋生态、渔业资源、海洋生物质量 Marine ecology, fishery resources, marine organism quality
4	海洋生态、渔业资源、海洋生物质量 Marine ecology, fishery resources, marine organism quality
5	海洋生态、渔业资源、海洋生物质量 Marine ecology, fishery resources, marine organism quality
6	海洋生态、渔业资源、海洋生物质量 Marine ecology, fishery resources, marine organism quality

7	海洋生态、渔业资源、海洋生物质量 Marine ecology, fishery resources, marine organism quality
8	海洋生态、渔业资源、海洋生物质量 Marine ecology, fishery resources, marine organism quality
9	海洋生态、渔业资源、海洋生物质量 Marine ecology, fishery resources, marine organism quality
10	海洋生态、渔业资源、海洋生物质量 Marine ecology, fishery resources, marine organism quality
11	海洋生态、渔业资源、海洋生物质量 Marine ecology, fishery resources, marine organism quality
12	海洋生态、渔业资源、海洋生物质量 Marine ecology, fishery resources, marine organism quality
C1	潮间带 Intertidal zone
C2	潮间带 Intertidal zone
C3	潮间带 Intertidal zone

2、海洋生态环境调查要求

2. Requirements for investigation of marine ecological environment

（1）调查内容及采样频率

(1) Investigation contents and sampling frequency

12个点位的调查内容包括叶绿素a、初级生产力、浮游生物（植物、动物）、大型底栖生物、潮间带生物和海洋生物质量调查。潮间带断面走向与海岸垂直，潮间带每条断面分高潮区、中潮区和低潮区，其中高潮区设1个站位、中潮区设3个站位、低潮区1个站位，每个潮间带共布置5个站位。进行一次采样调查。

The investigation contents at 12 points include chlorophyll a, primary productivity, plankton (phytoplankton, zooplankton), macrobenthos, intertidal organisms and marine organism quality investigation. The section of the intertidal zone is perpendicular to the coast. Each section is divided into high tide zone (1 investigation point), middle tide zone (3 investigation points) and low tide zone (1 investigation point). There are 5 points in each intertidal zone One sampling is required.

（2）采样方法

(2) Sampling method

叶绿素 a：使用 2.5L 有机玻璃采水器采集水样。每份样品取 300mL，加入 2mL 碳酸镁溶液，用孔径 0.45μm 聚酯纤维滤膜过滤，滤膜用 90%丙酮萃取，定容至 10mL，低温下萃取 20h 后，用 Eclipes 荧光仪测定。采样及分析均按照《海洋监测规范》GB17378.7-2007 的要求进行。

Chlorophyll a: Use 2.5L plexiglass water collector to collect water samples. Take 300mL from each sample, add 2mL of magnesium carbonate solution, and filter with a 0.45μm polyester fiber filter. Extract the filter with 90% acetone, dilute to 10mL, and extract at a low temperature for 20h, then measure by Eclipes fluorometer. Sampling and analysis are carried out in accordance with the requirements of *Specification for Marine Monitoring* (GB17378.7-2007).

初级生产力：初级生产力依据《水质 初级生产力测定“黑白瓶”测氧法》SL354-2006。

Primary productivity: Primary productivity is based on *Water Quality - Determination of Primary Productivity - “Black and White Bottle” Dissolved Oxygen Method* (SL354-2006).

浮游植物：采样过程严格按《海洋监测规范》规定要求等进行。采水体积 5L，水样用鲁哥溶液现场固定。回到实验室后倒入高型玻璃容器进行反复静置、浓缩，再抽取样品在日本产 Olympux BX-50 光学显微镜下进行种类鉴定和计数，计数结果以 cells/m^3 表达。采样及分析均按照《海洋监测规范》GB17378.7-2007 的要求进行。

Phytoplankton: The sampling process is strictly in accordance with the requirements of *Specification for Marine Monitoring*. The volume of collected water is 5L, and the water sample is fixed on-site with Lugol solution. After returning to the laboratory, pour it into a tall glass container for repeated standing and concentration, and then put the sample under the Olympux BX-50 optical microscope made in Japan for species identification and counting. The result is in cells/m^3. Sampling and analysis are carried out in accordance with the requirements of *Specification for Marine Monitoring* (GB17378.7-2007).

浮游动物：定量样品采集采用浅水 I 型网（网口直径 50cm，网长 145cm，筛绢孔径 0.505mm）从底至表垂直拖曳所获，加入样品体积 5%的甲醛对样品进行固定。样品鉴定与计数则借助浮游动物计数框、体视显微镜和普通光学显微镜等将全部样品进行种类鉴定并按种计个体数，然后换算成个体密度（ind./m^3）。标本处理以及室内分析和资料整理均按《海洋监测规范》GB17378.7-2007 要求进行。

Zooplankton: Quantitative sample collection uses shallow water type I net (net mouth diameter 50cm, net length 145cm, bolting silk mesh size 0.505mm) to drag vertically from the bottom to the surface, adding 5% sample volume of formaldehyde to fix the sample. For the identification and counting of samples, all samples are identified by means of zooplankton counting frame, stereo microscope and ordinary optical microscope, and the number of individuals is counted by species. Then converte it into individual density (ind./m^3). Sample processing as well as indoor analysis and data collation are carried out in accordance with the requirements of *Specification for Marine Monitoring* (GB17378.7-2007).

大型底栖生物：使用抓斗式采泥器采集，每个站位采集 4~5 个样品，将样品放在套筛上，抽水淘洗，将样品中的大型底栖生物挑至 500mL 广口塑料瓶中，加 75%乙醇固定。标本处理及室内分析和资料整理均按《海洋监测规范》GB17378.7-2007 要求进行。

Macrobenthos: use grab-type bottom sampler to collect samples. Take 4 - 5 samples at each point, place the samples on the plansifter, wash it with water, and pick macrobenthos in samples out and put them into the 500mL plastic wild-mouth bottle. Add 75% ethanol to fix it. Sample processing as well as indoor analysis and data collation are carried out in accordance with the requirements of *Specification for Marine Monitoring* (GB17378.7-2007).

潮间带生物：在每条调查断面上各采集 3 个潮间带生物定量样品和 1 个定性样品，进行种类组成、数量、密度、生物量的调查。样品的采集、处理以及室内鉴定和资料整理均按《海洋监测规范》GB17378.7-2007 和《海洋调查规范》GB/T12763.6-2007 要求进行。

Intertidal organisms: Collect three quantitative samples of intertidal organisms and one qualitative sample on each section to investigate the species composition, quantity, density and biomass. Sample collecting, processing as well as indoor analysis and data collation are carried out in accordance with the requirements of *Specification for Marine Monitoring* (GB17378.7-2007) and *Specification for Oceanographic Survey* (GB/T12763.6-2007).

生物残毒：以游泳动物实际拖网渔获为准，每站位选取 2 个经济种类进行分析，选择的生物种类尽量涵盖鱼类、贝类（双壳类）、甲壳类和头足类。样品的采集、贮存、运输及分析均按《海洋监测规范》（GB17378-2007）和《海洋调查规范》（GB12763-2007）中的规定进行。

Biological residual: Based on the actual trawl catches of swimming animals, two economic species are selected for analysis at each point. The selected biological species shall cover fish, shellfish (bivalves), crustaceans and cephalopods as much as possible. The collection, preservation, transportation and analysis of samples are carried out in accordance with the regulations in the *Specification for Marine Monitoring* (GB17378.7-2007) and *Specification for Oceanographic Survey* (GB/T12763.6-2007).

3、调查结果及评价

3. Investigation results and assessment

3.8.4 渔业资源调查

3.8.4 Investigation of fishery resources

3.8.4.1 2016 年渔业资源调查

3.8.4.1 Investigation of fishery resources in 2016

本章节数据来自引用《北海市铁山港区南珠养殖区项目（A、B 区）项目环境影响报告书》中海洋环境质量现状调查与评价部分的渔业资源调查结果，调查时间为 2016 年 3 月 1 日。

Data here is quoted from the fishery resources investigation results of investigation and assessment of current marine environment quality condition in *Environmental Impact Assessment Report on Beihai Tieshangang Southern Pearl Aquiculture Area Project (Area A and Area B)* monitored on March 1, 2016.

3.8.4.2 2019 年渔业资源调查

3.8.4.2 Investigation of fishery resources in 2019

本次调查时间为 2019 年 9 月 1 日，调查项目包括渔获物的种类组成、渔获率、优势种、渔业资源密度、生物多样性指数等相关参数及鱼卵仔鱼，调查频率为一次采样调查。

The investigation was conducted on September 1, 2019. The investigated items include the types of catches, catch rate, dominant species, fishery resource density, biodiversity index and other related parameters, as well as fish eggs and larvae. Only one sampling was taken.

游泳动物：在设定的站位附近水平拖网，每站拖网约 15min，拖网速度为 3kn。将拖网得到的游泳生物按要求收集、冷冻保存并尽快运回实验室分析。所有游泳生物样品的采集、处理以及室内分析和资料整理均按《海洋调查规范》GB/T12763.6-2007 要求进行。

Swimming animals: Trawl horizontally near the set point, each point for about 15min at speed of 3kn. Collect, freeze and preserve the swimming organisms obtained from the trawl net as required and send them to the laboratory for analysis as soon as possible. Sample collecting, processing as well as indoor analysis and data collation of swimming animals are carried out in accordance with the requirements of *Specification for Oceanographic Survey* (GB/T12763.6-2007).

鱼卵和仔、稚鱼：使用大型浮游生物网在海水表层（0~3m）进行水平拖网，船速 1kn~2kn，拖网时长 10mins~15mins，起网后记录网口流量计流量。加入样品体积 5%的甲醛进行固定。样品的鉴定与计数则借助浮游动物计数框、体视显微镜和普通光学显微镜等将全部样品进行种类鉴定并按种计个体数，然后换算成个体密度（ind./m^3）。样品的采集、处理以及室内分析和资料整理均按照《海洋调查规范》GB/T12763.6-2007 的要求进行。

Fish eggs, larvae, and juveniles: use large plankton nets to trawl horizontally on the surface of seawater (0-3m) for 10-15 minutes with a ship speed of 1kn-2kn. Record the flow rate at the net mouth after hauling the net. Fix the sample with formaldehyde of 5% of the sample volume. For the identification and counting of samples, all samples are identified by means of zooplankton counting frame, stereo microscope and ordinary optical microscope, and the number of individuals is counted by species. Then converte it into individual density (ind./m^3). Sample collecting, processing as well as indoor analysis and data collation are carried out in accordance with the requirements of *Specification for Oceanographic Survey* (GB/T12763.6-2007).

3.8.5 近岸海域海水水质变化势分析

3.8.5 Analysis of seawater quality changes in coastal waters

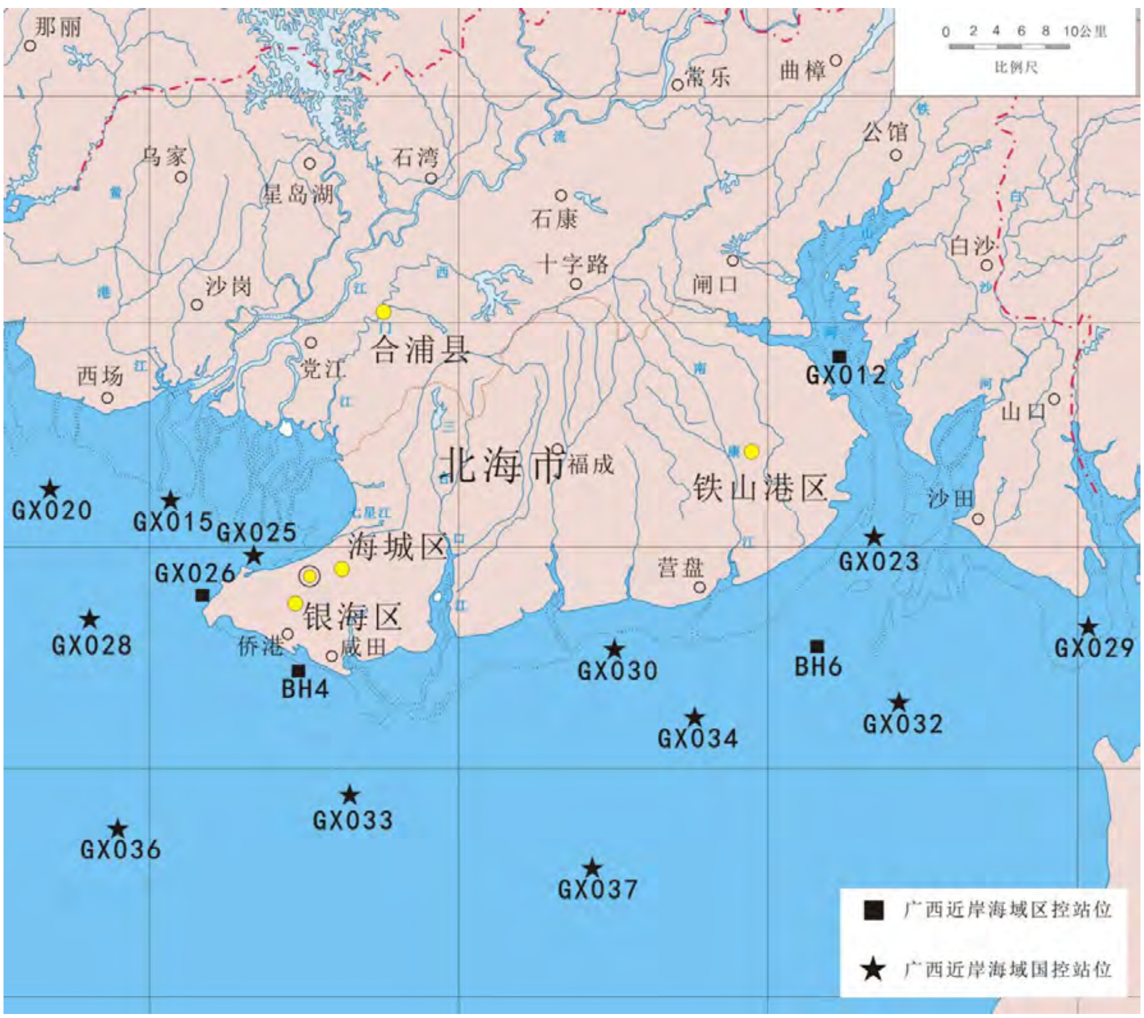
3.8.5.1 近岸海域水质调查结果统计

3.8.5.1 Statistics of water quality investigation results in coastal waters

为了解铁山港近岸海域海水水质的变化情况，评价收集了广西近岸海域国控及区控的海洋环境质量监测站 2016 年~2019 年的监测数据，对项目所在海域海水水质情况进行

趋势分析。根据监测站点分布情况及本项目评价范围，选取 BH6、GX012、GX023、GX029 及 GX032 站点数据进行分析，北海近岸海域监测站点分布情况见下图。

In order to understand the changes of seawater quality in the coastal waters of Tieshangang, the assessment collected the monitoring data of the marine environmental quality monitoring points of the national and regional control point in the coastal waters of Guangxi from 2016 to 2019, and analyzed the trend of seawater quality of the seas where the project is located. According to the layout of monitoring points and the assessment scope of this project, the data of BH6, GX012, GX023, GX029 and GX032 points are selected for analysis. The layout of monitoring points in Beihai coastal area is shown in the figure below.



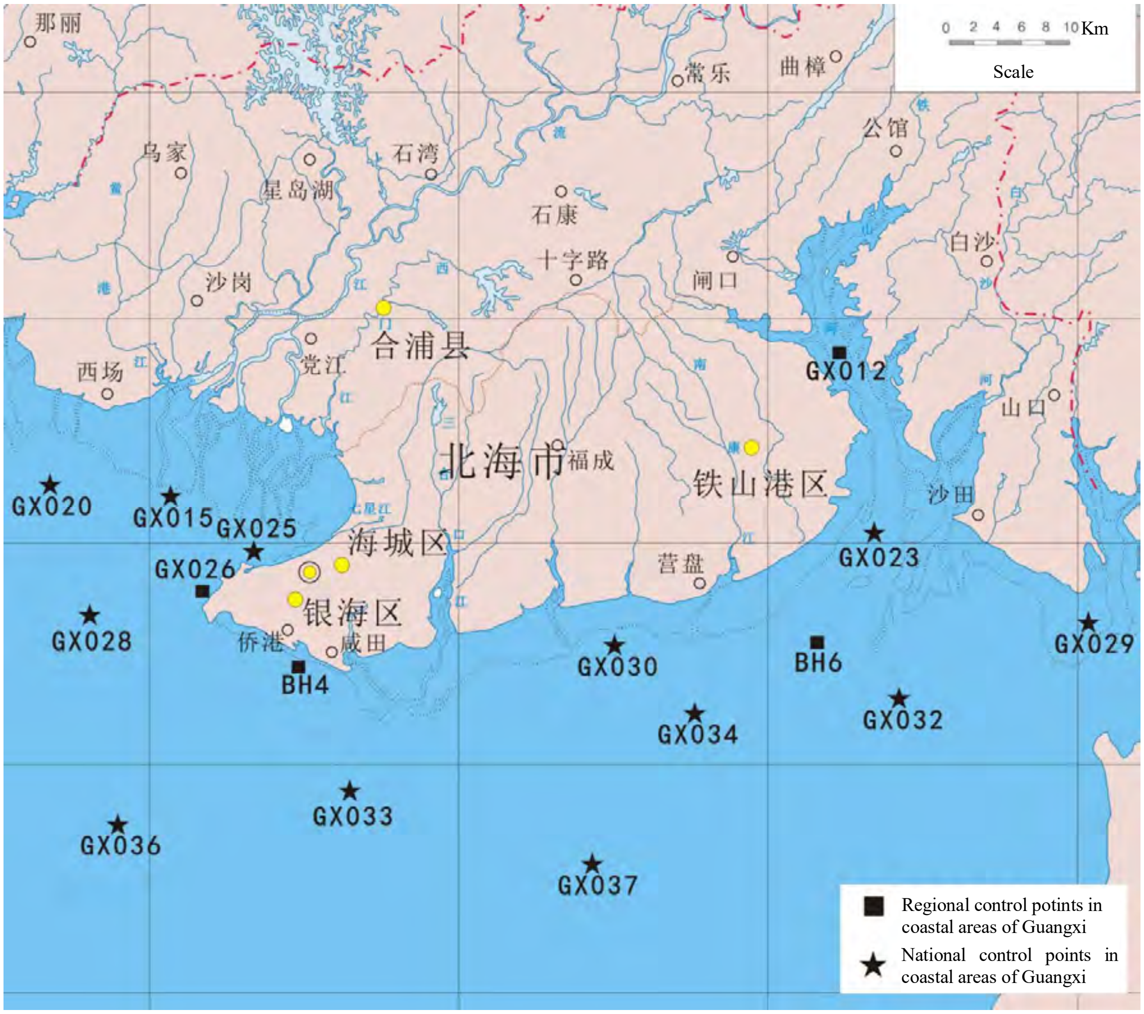


图 3.8-12 北海海洋近岸海域监测站点

Figure 3.8-12 Monitoring Points in Beihai Coastal Area

本次评价选取了有代表性的 COD、活性磷酸盐、无机氮、石油类、汞、铜、铅和镉等 8 个监测因子的监测数据，以分析铁山港工业区近岸海域海水水质的变化情况，各点位水质功能要求见表 3.8-76，评价结果见表 3.8-77。

In this assessment, the monitoring data of 8 monitoring factors such as representative COD, active phosphate, inorganic nitrogen, petroleum, mercury, copper, lead and cadmium were selected to analyze the seawater quality changes of the coastal waters of the Tieshangang Industrial Zone. The functional requirements for water quality at various points are shown in Table 3.8-76, and the assessment results are shown in Table 3.8-77.

表 3.8-76 铁山港各监测站点水质功能要求

Table 3.8-76 Functional Requirements for Water Quality at Various Points of Tieshangang

海域名称 Sea area	站位编号 Point number	水质功能要求 Functional requirements for water quality	备注 Remarks
铁山港水产养殖区 Tieshangang aquaculture area	GX012	二类 Category II	国控 National control
铁山港西岸排污区 1 Tieshangang west bank pollution discharge area 1	GX023	四类 Class IV	国控 National control
广西山口红树林生态自然保护区 and Guangxi Shankou Mangrove Ecological Nature Reserve.	GX029	一类 Class I	国控 National control
广西合浦儒艮国家级自然保护区 Guangxi Hepu Dugong National Nature Reserve	GX032	一类 Class I	国控 National control
北海港铁山港作业区 Tieshangang operation area, Beihai Port	BH6	四类 Class IV	区控 Regional control

表 3.8-77　历年来铁山港工业区近岸海域海水水质现状调查结果统计与评价表

Table 3.8-77 Statistics and Assessment of Investigation Results of Seawater Quality in the Coastal Area of Tieshangang Industrial Zone over the Years

根据表 3.8-77 中的评价结果可知，2016~2019 四年间，汞、铜、铅、镉以及石油类的监测结果均保持不变，水质均符合第一类海水水质标准，水质变化较为稳定，因此评价仅对化学需氧量、活性磷酸盐及无机氮进行海水水质变化趋势分析。

According to the assessment results in Table 3.8-77, the monitoring results of mercury, copper, lead, cadmium and petroleum have remained unchanged during the four years from 2016 to 2019, and the water quality has met the Class I seawater quality standards, and the water quality has been relatively stable Therefore, the assessment only analyzes the trend of seawater quality change from chemical oxygen demand (COD), active phosphate and inorganic nitrogen.

3.8.5.2 丰水期海水水质变化趋势分析

3.8.5.2 Analysis of seawater quality change trend in wet season

由水质监测数据及丰水期水质变化趋势图可知，2016~2018 年化学需氧量丰水期各因子变化趋势均出现先上升后下降趋势，且 18 年水质均好于 16 年及 17 年。各站点中除 17 年 GX029 站点（二类水质）未达到其一类水的水质目标外，其余各站点均能满足相应水质功能要求，化学需氧量浓度变化总体平稳。

According to the water quality monitoring data and the water quality change trend chart in wet season, the change trend of each factor in the COD in wet season from 2016 to 2018 has an upward trend first and then a downward trend, and the water quality in 2018 is better than that in 2016 and 2017. Except for the result at GX029 point in 2017 (Class II water quality), which does not meet the Class I water quality target, results at other points can all meet the corresponding functional requirements for water quality and the concentration change of COD is generally stable.

活性磷酸盐 BH6、GX023、GX032 点位变化趋势同 COD 一致，峰值均出现在 2017 年，但变化总体平稳，满足相应水质目标要求；GX029 年出现逐年递增趋势，2018 年未满足其一类水质目标要求；GX012 点位活性磷酸盐变化波动较大，该点位位于铁山港水产养殖区，因此可能受水产养殖影响较大。

The change trend of active phosphate at BH6, GX023, GX032 points is consistent with that of COD, peaking in 2017. But the changes are generally smooth, and meet the target water quality requirements; result at GX029 shows an increasing trend year by year, and it did not meet its water quality requirements in 2018. The change of active phosphate at GX012 point fluctuates greatly. This point is located in the aquaculture area of Tieshangang, so it may be greatly affected by aquaculture.

无机氮除 GX012 点位呈现逐年递增趋势外，其余站点均出现先上升后下降趋势，但除 GX012 点位外，其余各点均满足相应水质目标要求。GX012 点超标原因可能是受水产养殖的影响，此外丰水期入海河流的大量汇入也是活性磷酸盐和无机氮监测浓度波动的原因。但丰水期整体水质变化不大。

The inorganic nitrogen at GX012 point shows an increasing trend year by year, while the results at other points all show an upward trend first and then a downward trend. Water quality of all other points meet the target water quality requirements except that of GX012. Water quality at GX012 may be influenced by aquaculture. In addition, the large inflow of rivers into the sea in wet season may also lead to fluctuation of the concentration of active phosphate and inorganic nitrogen. However, the overall water quality does not change much in wet season.

3.8.5.3 枯水期海水水质变化趋势分析

3.8.5.3 Analysis of seawater quality change trend in dry season

枯水期水质变化趋势见图 3.8-16~18。

Water quality change trend in dry season is showed in Figure 3.8-16 to 18.

枯水期化学需氧量变化趋势总体平稳，水质均符合第一类海水水质标准；活性磷酸盐除 GX012 和 GX029 点位出现较明显波动外，其余各点变化趋势较为平稳，5 个站位的峰值均出现在 2017 年，后呈逐年下降趋势，监测结果均为第一类或第二类海水水质，活性磷酸盐浓度相对稳定；无机氮除 GX032 站点外，各因子在 2018 年出现低值，站点在 2019 年均呈上升趋势，但水质均为一类或第二类海水水质，未出现超标现象。

The change trend of COD in dry season is generally smooth, and the water quality meets the Class I seawater quality standard. The active phosphate concentration at GX012 and GX029 points shows obvious fluctuations, while that at other points is relatively stable. The peak values of the five points are all appeared in 2017, followed by a year-on-year downward trend. The monitoring results are all Class I or Class II seawater quality, and the concentration of active phosphate is relatively stable. Except for inorganic nitrogen concentration at GX032 point, all factors show a low value in 2018. Results at all points show an upward trend in 2019, but the water quality can all meet Class I or Class II seawater quality standards.

3.8.5.4 平水期海水水质变化趋势分析

3.8.5.4 Analysis of seawater quality change trend in normal season

平水期水质变化趋势见图 3.8-19~21。

Water quality change trend in normal season is showed in Figure 3.8-19 to 21.

平水期化学需氧量 GX029 及 GX032 站点呈先上升后下降趋势，GX012、GX023 及 BH6 站位均先下降后上升，且峰值均出现在 2016 年，各站位除 GX012 点位外变化均较平稳，均为出现超标现象；活性磷酸盐除除 GX012 点位波动较大之外，其余各点总体呈现逐年递增趋势，分析与水产养殖规模增大，污染呈上升趋势有关。无机氮各站点变化趋势无明显规律，但各监测因子水质均为第一类或第二类海水水质，除 GX029 点位 2017、2018 年未达到第一类海水水质目标之外，其余各点位均能满足相应水质目标。

In normal season, the COD at GX029 and GX032 shows an upward trend first and then a downward trend. That at GX012, GX023 and BH6 is on the contrary. All results peak in 2016. The result changes at each station except GX012 are relatively smooth and no violation is found. The active phosphate concentration at GX012 point shows obvious fluctuations, while that at other points shows a year-on-year upward trend. It may be related to expanded aquaculture scale and increase in pollution. There is no obvious regularity in the change trend of inorganic nitrogen at each point, but the water quality all meets Class I or Class II seawater quality standard. Except for the result at GX029 point, which does not meet the Class I seawater quality target in 2017 and 2018, the results of the remaining points can meet the target water quality requirements.

3.5.5.5 小结

3.5.5.5 Summary

根据铁山港近岸海域海水水质现状调查结果及水质变化趋势分析，除个别站点偶有超标外，大部分点位水质均为第一类或第二类海水水质，海水质量状况总体良好，变化趋势较为稳定。从时间变化上看，广西近岸海域水质污染丰水期最重，枯水期其次，平水期污染相对较轻，从站点分布情况来看，河口、海水养殖区污染负荷较高，距海岸越远水质相对越好。海水中，主要的超标因子是无机氮、活性磷酸盐，重金属等污染物变化趋势不显著。

According to the investigation results of the seawater quality and the trend analysis of water quality in coastal waters of Tieshangang, except few result violations at some points, the water quality of most points meet Class I or Class II standards. The seawater quality is generally satisfactory and changes are relatively smooth. From the perspective of time change, the water pollution in Guangxi coastal waters is most serious in the wet season, followed by the dry season, and the pollution in the normal season is relatively mild. From the distribution of the points, the pollution load in the estuary and marine aquaculture area is higher. The farther from the coast, the better the water quality is. In seawater, the main violation factors are inorganic nitrogen and active phosphate. Heavy metals and other pollutants show no obvious fluctuation.

3.9 陆域生态环境质量现状调查

3.9 Investigation on the current status of land ecological environment quality

一、调查范围及方法

I. Investigation scope and method

生态环境调查范围：与大气评价范围一致，调查范围在铁山港工业区内，采用现场调查和查阅资料相结合的方法。

Ecological environment investigation scope: consistent with that of the atmospheric assessment. The investigation scope is within the Tieshangang Industrial Zone. The method is to combine on-site investigation and data review.

二、陆生植物资源现状调查

II. Investigation of the current status of terrestrial plant resources

评价区域植被属于亚热带季节性雨林，原生林已造到破坏，以人工植被占主导地位，物种多样性差，资源数量不多，质量不高。现存植被为次生林及人工林，主要以农作物、桉树等为主，具体物种有：

The vegetation in the assessment area belongs to the subtropical seasonal rainforest. The primary forest has been destroyed. Artificial vegetation dominates, the species diversity is poor, the number of resources is not large, and the quality is not high. Existing vegetation is secondary forest and plantation forest, mainly crops, eucalyptus, etc. Specific species are:

1、乔木：窿缘桉、马尾松、橡胶树、卷夹相思、马占相思、苦楝、木麻黄、海南蒲桃、黄槿、黄葵。

1. Trees: Eucalyptus exserta, Masson pine, rubber tree, acacia crassicarpa, acacia mangium, melia azedarach, casuarina equisetifolia, syzygium jambolanum, hibiscus tiliaceus, and ambrette.

2、灌木：勒仔树、玉叶金花（藤本）、猪屎豆、水茄、地桃花。

2. Shrubs: Mimosa bimucronata, Mussaenda Pubescens Ait.f. (liana), crotalaria mucronata, solanum torvum, and urena lobata.

3、草本：铁芒萁、飞机草、五色梅、土牛膝。

3. Herbs: Dicranopteris linearis, fragrant eupatorium herb, lantana camara, and achyranthes aspera.

4、竹类：观音竹、撑高竹。

4. Bamboo: Bambusa multiplex and bambusa pervariabilis.

5、农作物：水稻、木薯、红薯、玉米、大豆、花生。

5. Crops: rice, cassava, sweet potato, corn, soybean, and peanut.

评价区域植被生物量在 20~78t/hm^2 范围内。

Vegetation biomass in the assessment area is in the range of 20 - 78t/hm^2.

据调查，铁山港工业区规划范围内的植物群落中的乔木多为人工种植的用材树种或经济树种，灌木和草本植物则多为当地常见的野生物种，铁山港工业区范围内没有国家、自治区重点保护野生植物。

According to the investigation, most of the trees in the plant community within the planning scope of the Tieshangang Industrial Zone are artificially grown timber or economic tree species. Shrubs and herbs are mostly local wild species. There are no wild plants under special state and regional protection within this scope.

评价区陆域森林植被类型不多，而且分布比较零散，主要是人工林，质量不高，无重大经济价值的珍惜物种。人工林面积不大，呈现斑块状分布，且植被类型单一，几乎没有完整的自然林，林相结构较单一，森林层次简单，生物物种种类少。

There are not many types of forest vegetation in the land area of the assessment area, and the distribution is relatively scattered, mainly planted forests, which are of low quality and have no significant economic value. The planted forest area is not large, showing patchy distribution, and the vegetation type is single, and there is almost no complete natural forest. The forest structure is relatively single, the forest layer is simple, and there are few species.

三、陆生野生动物调查

III. Investigation of terrestrial wild animals

根据有关资料及调查咨询，评价区范围内，野生动物资源较少，未发现国家重点保护的野生动物，常见的野生动物主要有：

According to relevant information and investigation consultation, within the assessment area, there are few wild animal resources, and no wild animals under national protection have been found. The common wild animals mainly include:

1、兽类：老鼠、蝙蝠等；

1. Beasts: mice, bats, etc .;

2、鸟类：棕背伯劳、大山雀、麻雀、了哥、燕子、画眉等；

2. Birds: Long-tailed shrike, tomtit, sparrow, gracula religiosa, swallow, garrulax canorus, etc .;

3、爬行类：南草蜥、蛇等；

3. Reptiles: Takydromus sexlineatus, snake, etc .;

4、昆虫类：蜜蜂、黑蜂、蜻蜓、蝗、蝴蝶、蝉、蜘蛛、蚕、蟋蟀等。

4. Insects: bees, black bees, dragonflies, locusts, butterflies, cicadas, spiders, silkworms, crickets, etc.

项目评价范围内无受国家保护及地方保护的珍贵野生动、植物。项目评价范围内的动物数量比较少，均为非珍稀动物，迁移适应性强。因此，本项目对珍贵野生动、植物不会构成较大影响。

There are no precious wild animals and plants under national or local protection within the assessment scope. The number of animals in the project assessment scope is relatively small, all of which are non-rare animals and have strong adaptability for migration. Therefore, this project will not have a significant impact on precious wild animals and plants.

四、珍稀保护物种和特殊生态敏感区

IV Rare and protected species and special ecological sensitive areas

评价区无国家、自治区保护的珍稀濒危动、植物种类和自然保护区等特殊生态敏感区。

The assessment area has no rare and endangered animals and plants, plant species or special ecological sensitive areas such as nature reserves protected by the state and autonomous regions.

五、基本农田保护区

V. Basic farmland preservation area

据调查，铁山港工业区规划范围内没有基本农田保护区。

According to the investigation, there is no basic farmland preservation area within the planned scope of the Tieshangang Industrial Zone.

六、小结

VI. Summary

评价范围内没有基本农田保护区，没有发现国家、自治区重点保护野生动植物。与规划环评阶段调查相比，随着开发建设用地逐渐增多，人工植被、天然植被占地面积逐渐减小，植被量逐渐减少，陆生野生动物生境减少及破坏，评价区域内陆地野生动物种类及数量逐渐减少。

There is no basic farmland preservation area in the assessment scope, and no wild animals and plants under special protection of the state and autonomous region have been found. Compared with the investigation at the planning EIA stage, as the land used for development and construction has gradually increased, the area occupied by artificial vegetation and natural vegetation has gradually decreased, the amount of vegetation has gradually decreased, and the habitats of terrestrial wild animals have been reduced and destroyed. The number of wildlife has gradually decreased.

4 环境影响预测与评价

4 Environmental Impact Prediction and Assessment

4.1 施工期环境影响分析

4.1 Analysis of Environmental Impact during the Construction Period

施工期将产生施工扬尘、施工噪声及施工人员生活污水等，对周围空气、水、噪声环境产生一定的影响。

During the construction period, construction dust, construction noise and domestic sewage of construction personnel will be generated, which will have a certain impact on the surrounding air, water and noise environment.

4.1.1 施工期环境空气影响分析

4.1.1 Analysis for atmospheric environmental impact during construction period

施工过程大气污染的主要来源有：新建建（构）筑物施工地基开挖、临时混凝土搅拌站运行、运输车辆、施工机械走行车道所带来的扬尘，施工建筑材料（水泥、石灰、砂石料）的装卸、堆砌过程以及开挖弃土的堆砌、运输过程中造成扬起和洒落；各类施工机械和运输车辆所排放的废气。

Major sources of air pollution in the construction process include: foundation excavation of newly-built buildings (structures), operation of temporary concrete batching plants, dust generated by transportation vehicles and construction machinery travelways, loading and unloading of construction & building materials (cement, lime, aggregate), stockpiling process and stockpiling of excavated spoil, and lifting and spilling during transportation; exhaust gas from various construction machineries and transportation vehicles.

（1）施工扬尘

(1) Construction dust

施工期对大气环境的污染主要是扬尘污染，污染因子为 TSP。这种污染影响是暂时的，随着施工工程结束，污染影响也就随之而停止。但由于平整场地、开挖地基、挖土和填土操作过程中产生的尘埃，还是会在短期内对场地周边环境空气产生一定的影响。粉尘排放量随施工作业的活动水平、特定操作和主导天气而每天变化很大，而且很大一

部分是由于在施工现场临时修筑的道路上，设备车辆往来行驶所引起的。

During construction period, the pollution to the atmospheric environment is mainly dust pollution, and the pollution factor is TSP. Such pollution impact is temporary and will be ceased as construction works are completed. However, due to the dust generated in the course of site leveling, excavation of foundation, earth excavation and filling, certain impact will be impacted on the ambient air around the site in neaer term. Dust emissions vary greatly every day with the activity level of construction working, specific operations and prevailing weather, of which a large part is caused by equipment and vehicles traveling on the temporarily built roads on the construction site.

建筑施工活动的粉尘排放与施工面积、施工水平有关。根据相关工程的现场类比资料调查，施工现场的扬尘（TSP）日均浓度可达 2.7mg/m^3，超过国家空气环境质量标准 8 倍，影响范围大约在距施工中心 50m 的范围内。在距平整土地和混凝土拌合场地 50m 处，产生的扬尘 TSP 可降至 1.0mg/m^3，水泥储料站扬尘影响范围在距其 150m 处 TSP 浓度即可降为 1.0mg/m^3 以下。有关试验表明，在施工场地每天洒水抑尘作业 4~5 次，其扬尘造成的 TSP 污染距离可缩小到 20~50m 范围。

Dust emission from construction activities is related to the area and level of construction. According to the field analogy data investigation of related projects, the daily average concentration of dust (TSP) on the construction site can reach 2.7 mg/m^3, 8 times higher than the national atmospheric environmental quality standard with impact area about 50m away from the construction center. Impact area of the dust TSP generated can be reduced to 1.0 mg/m^3 at the distance of 50m from the leveled land and concrete batching site and to below 1.0 mg/m3 at the distance of 150m from the cement storage yard. Relevant tests show that the TSP pollution distance caused by dust can be reduced to 20-50m by watering for dust suppression working 4-5 times a day at the construction site.

施工期车辆运输过程产生的扬尘约占扬尘总量的 60%，一般情况下，施工场地、施工道路在自然风作用下产生的扬尘所影响的范围在 100m 以内。如果在施工期间对车辆行驶的路面实施洒水抑尘，每天洒水 4~5 次，可使扬尘减少 70%左右，将有效控制施工扬尘对周围农户的影响。表 4.1-1 为施工场地洒水抑尘的试验结果。可见施工期通过洒水，可以有效地抑制扬尘的散发量。

During construction period, dust generated by vehicle transportation accounts for 60% of total dust amount approximately. Generally, the impact area of the dust generated by construction sites and construction roads under natural wind is within 100m. Dust amount can be reduced by 70-80% approximately by watering for dust suppression on vehicle driving pavement 4-5 times a day, which will effectively contain impact of construction dust on surrounding farmers. Table 4.1-1 shows test results of watering for dust suppression at construction site. It can be seen that the emission of dust can be effectively suppressed by watering during the construction period.

表 4.1-1　　施工期场地洒水抑尘试验结果

Table 4.1-1 Test Results of watering for Dust Suppression at Construction Site

与施工场地距离 Distance from construction site		0m	20m	50m	100m	200m
TSP 小时平均浓度（mg/Nm³） Hourly concentration of TSP (mg/Nm³)	不洒水 Without watering	11.03	2.89	1.15	0.86	0.56
	洒水 With watering	2.11	1.4	0.68	0.6	0.29

（2）运输车辆、施工机械燃料废气

(2) Fuel exhaust gas from transportation vehicle and construction machinery

施工中将使用各类大、中、小施工机械，主要以汽油、柴油等燃烧为动力，特别是大型工程机械将使用柴油作动力，排放的尾气、烟气对区域环境空气有一定的影响。燃料废气中主要含 CO、CO_2、NO_X、HC、烟尘等。在施工过程中必须选用高性能、低污染的施工机械，减轻燃料废气对区域环境空气的影响。施工机械燃料废气污染随着工程的结束而结束。

Various small, medium and large sized construction machineries will be used in the construction and are mainly powered by combustion of gasoline and diesel oil, especially the large construction machinery powered by diesel oil, from which the exhaust and flue gas emitted will impose certain impact on the regional ambient air. Fuel exhaust gas contains, among others, CO, CO2, NOX, HC, and smoke dust. In view of this, construction machineries with high performance and low pollution must be selected in the course of construction to reduce impact of fuel exhaust gas on reginal ambient air. The pollution of fuel exhaust gas from construction machinery will terminate with completion of the project.

4.1.2 施工期水环境影响分析

4.1.2 Analysis of impact on water environment during the construction period

施工期废水主要为施工人员生活污水、施工作业废水。

The wastewater during construction period is mainly the domestic wastewater of construction personnel and that from construction working.

（1）生活污水

(1) Domestic sewage

建筑施工所排放的污水主要是施工人员所排放的生活污水。本项目施工高峰期人数约 1000 人，生活污水排放量按 160L/人•d 计，则生活污水排放量为 160.0m^3/d。施工人员生活污水，主要污染物为 COD 和 NH_3-N 等，通过设置临时化粪池进行处理后，接入园区污水管网处理，不直接在项目周边排放，对环境影响不大。

The sewage discharged from construction is mainly domestic sewage discharged by construction personnel. During the construction peak hours of this project, population will reach to about 1,000, and the domestic sewage discharge will be 160L/person • d, rendering a domestic sewage discharge of 160.0 m^3/d. The main pollutants of domestic sewage from construction personnel are COD and NH3-N, etc. After being treated by temporarily provided septic tanks, the sewage will be connected into the sewage pipe network in the park for treatment without direct discharge around the project, thus imposing limited impact on the environment.

（2）施工机械车辆冲洗污水

(2) Flushing sewage from construction machinery

工程土石方施工将投入一定数量的机械设备和运输车辆，机械设备和运输车辆在维修养护时将产生冲洗废水。该类废水中含有较高的泥沙和少量油污，直接外排将对周边环境造成影响。因此，要求建议施工单位根据工点分布情况定点设置固定的施工机械、车辆冲洗维修点，对冲洗污水实行统一收集、管理，经沉淀、隔油后，回用于路面洒水或绿化。

A certain number of mechanical equipment and transportation vehicles will be deployed into the earthwork construction of the project so that flushing wastewater will be generated during maintenance thereof. Such wastewater contains a large amount of content of silt and a small amount of oil stain, which will affect the surrounding environment if directly discharged. Therefore, the construction contractor shall arrange fixed flushing and maintenance places for construction machinery and vehicle at designated locations depending upon distribution of job sites and shall collect and manage flushing sewage in a unified manner. Upon precipitation and oil separation, the flushing sewage shall be reused for road surface watering or greening.

（3）施工场地混凝土搅拌废水

(3) Concrete mixing wastewater at construction site

在搅拌混凝土的生产过程及制作预制构件时会有废水产生，其中又以混凝土转筒和料罐的冲洗废水为主要表现形式。混凝土搅拌排放的废水具有悬浮物浓度高、水量小、间歇集中排放、易于沉淀等特点。据有关数据资料显示，混凝土转筒和料罐每次冲洗产生的污水量约 0.5m^3，SS 浓度约 5000mg/L，pH 值在 12 左右，废水污染物浓度远远超出了《污水综合排放标准》（GB8978-1996）一级排放标准污染物限值要求。要求废水排放前要沉淀，也可将废水收集用于道路洒水，在加强施工期间相关管理的前提下，混凝土搅拌废水不会对环境造成不利影响。

Wastewater will be generated during the production process of mixed concrete and fabrication of prefabricated members, of which flushing wastewater from concrete drum and material tank is the main manifestation. Wastewater discharged from concrete mixing is featured by high concentration of suspended solids, small water volume, intermittent and centralized discharge and easy precipitation, etc. According to relevant data, the amount of sewage generated by each flushing of the concrete drum and the material tank is approx. 0.5m^3 and the SS concentration thereof is approx. 5000mg/L, with pH value of approx. 12. The concentration of wastewater pollutants is far beyond the pollutant limit requirements of the first-class discharge standard in the *Integrated Wastewater Discharge Standard* (GB8978-1996). Prior to discharge, wastewater shall be precipitated and may also be collected and used for road watering. With relevant management being strengthened during construction, the wastewater from concrete mixing will not impose adverse impact on the environment.

施工单位必须加强对施工人员的教育和管理，生活污水和施工废水严禁未经处理随地泼洒、排放，做好施工期环境监理工作，施工期污水禁止直接排入拟建场址周围地表水体。

The construction contractor must strengthen the education and management of the construction personnel. Domestic sewage and construction wastewater shall be strictly prohibited from being splashed and discharged anywhere without treatment. Environmental supervision shall be ensured during the construction period. Sewage during the construction period is prohibited from being directly discharged into the surface water body around the proposed site.

4.1.3 施工期声环境影响分析

4.1.3 Analysis of impact on the acoustic environment during the construction period

施工期，项目建设工程噪声主要来源于场地平整、建筑物基础施工噪声，使用的机械主要有钻孔机、塔吊、空压机、挖掘机、工程自卸车、推土机、铲土机、搅拌机、振动机、电锯、电焊机、电钻等，运行噪声在 90～105 dB(A)之间。根据声源衰减公式，施工机械噪声随距离衰减的预测结果如表 4.1-2 所示。

During the construction period, the noise of the project construction is mainly sourced from the noise of site leveling and building foundation construction. The machinery used include, inter alia, drilling machines, tower cranes, air compressors, excavators, project dump trucks, bulldozers, scrapers, mixers, vibrators, chainsaws, electric welding machines and electric drills, of which operating noise is between 90 and 105 dB (A). According to the noise source attenuation equation, the prediction results of noise attenuation of construction machinery with distance are shown in Table 4.1-2.

$$L_2=L_1-20\lg(r_2/r_2)-\triangle L$$

式中：r_1、r_2——距声源的距离，m

Where, r1, r2 - distance from noise source, m

L_1、L_2——L_1、L_2 处的噪声值， dB(A)

L_1, L_2 - noise value at L1 and L2, dB (A)

△L——周边高大建筑物对噪声阻挡影响值，dB(A)。

△L - the impact value of surrounding high-rise buildings on noise blocking, dB (A).

表 4.1-2 施工噪声预测结果 单位：dB（A）
Table 4.1-2 Prediction Results of the Construction Noise in dB (A)

设备名称 Designation	5m	50m	100m	150m	200m	300m	400m	500m	600m
轮式装载机 Wheel loader	90	70	64	60	58	54	52	50	48
平地机 Grader	90	70	64	60	58	54	52	50	48
推土机 Bulldozer	86	66	60	56	54	50	48	46	44
液压挖掘机 Hydraulic excavator	84	64	58	54	52	48	46	44	42
冲击式钻井机 Impact-type drilling rig	87	67	61	57	55	51	49	47	45
冲击式打桩机 Impact-type pile driver	109	89	83	79	77	73	71	69	67
混凝土搅拌机 Concrete mixer	91	71	65	61	59	55	53	51	49
混凝土泵 Concrete pump	85	65	59	55	53	49	47	45	43
混凝土振捣机 Concrete vibrator	84	64	58	54	52	48	46	44	42
气动扳手 Pneumatic wrench	95	75	69	65	63	59	57	55	53

项目所在区域执行《声环境质量标准》（GB3096-2008）中的 3 类区标准限值，即昼间 65dB(A)、夜间 55dB(A)。由表 4.1-2 预测结果可知，除打桩机外，企业施工机械作业时在 200m 范围外均能满足 3 类区昼间标准限值，打桩机的影响范围将扩大至 600m 范围。根据现场调查，距离项目最近的敏感点为西面 310m 邓屋，施工期间将对其产生一定的噪声影响。项目应尽可能集中噪声强度较大的机械进行突击作业，缩短施工噪声的污染时间，尽量避免夜间施工，缩小施工噪声的影响范围，同时对民居房采取隔声防护措施。

The area where the project is located shall comply with standard limits of Category-III zone in *Environmental Quality Standard for Noise* (GB3096-2008) , i.e. 65dB (A) in daytime and 55dB (A) at night. As revealed by the prediction results in Table 4.1-2, except for pile drivers, the construction machineries of the company can all comply with the daytime standard limits of Category-III zone beyond the range of 200m, and the impact area of pile drivers is expanded to the area of 600m. According to field investigation, the sensitive point closest to the project is Dengwu 310m to the west thereof, which will impose certain noise impact thereon during construction. In the project, the machinery with high noise intensity shall be concentrated as far as possible to carry out urgent working, shorten the pollution time of construction noise so as to minimize construction at night and reduce the impact area of construction noise. Also sound insulation protection measures shall be taken for residential houses.

除此之外，来往于施工场地的运输车辆多为大中型运输车，在加速行驶时，以大型柴油货车的定置噪声限值最高，其噪声值＞100dB（A），会对运输线路两侧居民的生活造成影响。因此，施工期应对建筑材料及废物的运输严格控制，尽量避开居民的休息时间，减少影响范围。

In addition to that, most of the transportation vehicles traveling to and from the construction site are medium- and large-sized vehicles. When accelerating for traveling, the fixed noise limit of large-sized diesel trucks is the highest with noise value > 100dB (A), which will affect the lives of residents on both sides of transportation route. Given that, the transportation of building materials and wastes shall be strictly controlled during the construction period, so as to avoid residents' rest time as much as possible and minimize the impact area.

4.1.4 施工期固体废物环境影响分析

4.1.4 Analysis of impact of solid waste during the construction period

施工垃圾主要来自施工场所产生的建筑垃圾（主要指地面挖掘、道路修筑、管道敷设、材料运输、基础工程和房屋建筑等工程施工期间产生的大量废弃的建筑材料，如砂石、石灰、混凝土、木材和土石方等）以及由于施工人员活动产生的生活垃圾等。

Construction waste mainly comes from construction waste generated in construction sites (mainly refers to a large amount of waste building materials generated during the construction of ground excavation, road construction, pipeline laying, material transportation, foundation works and housing construction, such as aggregate, lime, concrete, wood and earth and rock work, etc.) and domestic waste generated due to the activities of construction personnel, etc.

施工期间产生的建筑垃圾及施工人员带来的生活垃圾如不及时处理会影响环境景观，而且在遇大风干燥天气时，将产生扬尘。建筑垃圾在施工结束后应及时清运，应按照北海市城市市容卫生管理部门有关规定申报，妥善弃置消纳，由市容卫生部门统一处理后，影响较小。

The construction waste and the construction personnel’s domestic waste generated in the construction period, if not disposed of on a timely basis, will not only affect environmental landscape, but also will generate dust in case of gale and dry weather. Construction waste shall be removed on a timely basis upon completion of construction and shall be declared in accordance with relevant provisions of Beihai City Appearance and Sanitation Management Department so as to be properly disposed of or accommodated. Upon unified treatment by the administrative authority on city appearance, the impact thereof will be limited.

生活垃圾如不及时处理，在气温适宜的条件下则会滋生蚊虫、产生恶臭并传播疾病，对周围环境产生不利影响。生活垃圾临时储存后送到市政垃圾处理系统处置。

The domestic waste, if not disposed of on a timely basis, will become mosquito-breeding place, generate stink and propagate disease at a suitable temperature, which will impose adverse impact on surrounding environment. Domestic waste shall be temporarily stored and then transported to the municipal waste treatment system for disposal.

4.2 运营期大气环境影响预测与评价

4.2 Atmospheric environmental impact prediction and assessment for operation period

4.2.1 环境影响预测内容

4.2.1 Content of environmental impact prediction

4.2.1.1 预测因子

4.2.1.1 Prediction factor

根据工程分析，项目废气主要为碱回收车间 4600tds/d 碱炉、850t/d 石灰窑废气，热电站 220t/h 固废锅炉和 280t/h 燃煤锅炉废气，漂白车间废气，二氧化氯制备车间尾气及干煤棚、污水处理站、加油站无组织废气的排放。

According to engineering analysis, the waste gas of the project is mainly the waste gas from the 4,600tds/d alkali furnace in the alkali recovery workshop, the 850t/d lime kiln, the 220t/h solid waste boiler and 280t/h coal-fired boiler of the thermal power plant and the bleaching workshop, the tail gas from chlorine dioxide preparation workshop and fugitive waste gas from dry coal shed, sewage treatment station and petrol station.

根据《环境影响评价技术导则 大气环境》（HJ2.2-2018），通过估算模式筛选，选取有环境空气质量标准的污染物和占标率大于 1%的因子进行预测。

In accordance with *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment* (HJ2.2-2018), pollutants available with environmental air quality standards and factors with Pi more than 1% are selected for prediction through estimation model screening.

正常工况预测因子为 SO_2、NO_2、PM_{10}、$PM_{2.5}$、HCl、H_2S、NH_3、As、Hg、Cd、TSP、Cl_2；叠加区域拟建在建污染源进行预测的因子为 SO_2、NO_2、PM_{10}、$PM_{2.5}$、HCl、As、Hg、Cd、TSP、H_2S、NH_3、Cl_2。非正常排放情况下预测内容为 1h 平均质量浓度，预测因子为 SO_2、NO_2、PM_{10}、HCl、H_2S、Cl_2 进行预测。

The prediction factors under normal working conditions are SO2, NO2, PM10, PM2.5, HCl, H2S, NH3, As, Hg, Cd, TSP, Cl2; The prediction factors of the superposed regional proposed pollution sources and pollution sources under construction in the are SO2, NO2, PM10, PM2.5, HCl, As, Hg, Cd, TSP, H2S, NH3 and Cl2. For prediction under the condition of abnormal emission, the prediction content is 1h average mass concentration, and the prediction factors are SO2, NO2, PM10, HCl, H2S and Cl2.

4.2.1.2 预测范围

4.2.1.2 Prediction range

根据进一步预测结果，项目排放的污染物 NOx 短期浓度最大贡献值超过 10%，最远距离为项目厂址中心西面 6500m，即预测范围为 13km×13km 的网格；项目排放的 SO_2 和 NOx 总量大于 500t/a，需进行二次 $PM_{2.5}$ 预测，经预测，$PM_{2.5}$ 年平均质量浓度贡献值占标率均小于 1%。

Based on further prediction results, the maximum contribution value of short-term NOx concentration of pollutants emitted by the project exceeds 10%, and maximum distance is 6500m west of the center of the project plant site, i.e. the prediction range is a mesh sized 13km × 13km; total amount of SO_2 and NOx emitted by the project is more than 500t/a, necessitating prediction of secondary $PM_{2.5}$. Through prediction, the annual average mass concentration contribution value and Pi of $PM_{2.5}$ are both less than 1%.

由此可知，预测范围已覆盖了评价范围（以厂址为中心，东西向为 X 坐标轴 10km、南北向为 Y 坐标轴 9km 的矩形区域），同时覆盖了 $PM_{2.5}$ 年平均质量浓度贡献值占标率均大于 1%的区域，符合导则规范要求。

From this, it can be seen that the prediction range has covered the assessment range (a rectangular area with the site as the center covering 10km in X coordinate axis along east-west direction and 9km in Y coordinate along north-south direction), and also covered the area with annual average mass concentration contribution value and Pi of $PM_{2.5}$ both less than 1%, which complies with the requirements of the guidelines and specifications.

本次大气预测的范围为：以厂址中心，边长为 13km 的矩形区域。

The range of this atmospheric prediction is: a rectangular area with a side length of 13km with plant site as the center.

4.2.1.3 预测周期

4.2.1.3 Prediction cycle

本次评价基准年为 2018 年，以 2018 年作为预测周期，预测时段取连续 1 年。

In this assessment, the year 2018 is taken as both the base year and prediction cycle, with a consecutive year being taken as the prediction period.

4.2.1.4 预测与评价内容

4.2.1.4 Prediction and assessment contents

（1）达标区的评价项目

(1) Assessment items of up-to-standard area

根据区域环境空气质量现状调查结果，项目位于环境空气质量达标区域，预测内容主要包括：

According to the investigation results of current condition of regional ambient air quality, the project is located in the area where ambient air quality is up to standard. Prediction contents include, inter alia:

1）项目正常排放条件下，预测环境空气保护目标和网格点主要污染物的短期浓度和长期浓度贡献值，评价其最大浓度占标率。

1) The short-term concentration and long-term concentration contribution values of main pollutants of ambient air protection targets and mesh points are predicted and the Pi of the maximum concentration under normal emission conditions of the project is assessed.

2）项目正常排放条件下，预测评价叠加环境空气质量现状浓度+新增污染源-"以新带老"污染源-区域削减污染源+其他在建、拟建项目相关污染源后，环境空气保护目标和网格点主要污染物保证率日平均质量浓度和年平均质量浓度的达标情况。

2) Under normal emission conditions of the project, the daily and annual average mass concentration of ambient air protection targets at guarantee rate of major pollutants at mesh points are predicted and assessed for compliance with standards after superimposing the current concentration of ambient air quality + new pollution sources - "bring the old with the new" pollution sources - regional reduction pollution sources + other relevant pollution sources of the projects under construction and proposed projects.

3）非正常排放情况下，预测环境空气环保目标和网格点主要污染物的 1h 最大浓度贡献值，评价其最大浓度占标率。

3) The short-term concentration and long-term concentration contribution values of main pollutants of ambient air protection targets and mesh points are predicted and the Pi of the maximum concentration under normal emission of the project is assessed.

（2）大气环境防护距离

(2) Atmospheric environmental protection distance

对于项目厂界浓度满足大气污染物厂界浓度限值，但厂界外大气污染物短期贡献值浓度超过环境质量浓度限值的，可以自厂界向外设置一定范围的大气环境防护区域，以确保大气环境防护区域外的污染物贡献浓度满足环境质量标准。

If the plant boundary concentration of the project meets the plant boundary concentration limit of air pollutants while the short-term contribution value concentration of air pollutants outside the plant boundary exceeds the environmental mass concentration limit, a certain atmospheric environmental protection areas can be set out from the plant boundary to ensure that the contribution concentration of pollutants outside the atmospheric environmental protection area meets the environmental quality standard.

采用进一步预测模型模拟评价基准年内，项目所有污染源（改建、扩建项目应包括全厂现有污染源）对厂界外主要污染物的短期贡献浓度分布。厂界外预测网格分辨率不应超过为 50m，本次预测取 50m。

Further prediction model is used to simulate and assess the distribution of all pollution sources of the project (reconstruction and expansion projects shall include the existing pollution sources of the whole plant) over the short-term contribution concentration of major pollutants outside plant boundary within the base year. The resolution of the prediction mesh outside the factory boundary shall not exceed 50m and be taken as 50m for this prediction.

（3）不同评价对象或排放方案对应预测内容和评价要求

(3) Corresponding prediction contents and assessment requirements of different assessment objects or emission schemes.

根据项目的实际情况，设置的预测方案具体见表 4.2-1。

The set prediction scheme is as shown in Table 4.2-1 depending upon actual situation of the project.

表 4.2-1 预测方案设置
Table 4.2-1 Setting of Prediction Scheme

评价对象 **Assessment object**	污染源 **Source of pollution**	污染源排放形式 **Pollution source emission mode**	预测因子 **Forecast factor**	预测内容 **Prediction content**	评价内容 **Assessment content**
达标区评价项目 Assessment items of up-to-standard area	本项目新增污染源 Newly added pollution sources in this project	正常排放 Normal emission	SO_2、NO_2、PM_{10}、$PM_{2.5}$（包括二次 $PM_{2.5}$）、TSP、As、Hg、Cl_2 SO_2, NO_2, PM_{10}, $PM_{2.5}$ (including secondary $PM_{2.5}$), TSP, As, Hg, Cl_2	短期浓度 Short-term concentration 长期浓度 Long-term concentration	最大浓度占标率 Pi of maximum concentration
			HCl、H_2S HCl, H_2S	短期浓度 Short-term concentration	最大浓度占标率 Pi of maximum concentration
	新增污染源-“以新带老”污染源（如有）-区域削减污染源（如有）+其他在建、拟建项目相关污染源 New pollution sources- "bringing the old with the new" pollution sources (if any) - regional reduction pollution sources (if any) + other pollution sources related to projects under construction and proposed projects	正常排放 Normal emission	SO_2、NO_2、PM_{10}、$PM_{2.5}$、As、Hg、HCl、H_2S、Cl_2 SO_2, NO_2, PM_{10}, $PM_{2.5}$, As, Hg, Hcl,, H_2S, Cl_2	短期浓度 长期浓度 Short-term concentration Long-term concentration	叠加环境质量现状浓度后的保证率日平均质量浓度和年平均质量浓度的占标率或短期浓度的达标情况 The Pi of daily and annual average mass concentration at guarantee rate after superimposing the current concentration of environmental quality or compliance of short-term concentration with standards
	新增污染源	非正常	SO_2、NO_2、PM_{10}、HCl、	1h 平均质	最大浓度占标率

评价对象 Assessment object	污染源 Source of pollution	污染源排放形式 Pollution source emission mode	预测因子 Forecast factor	预测内容 Prediction content	评价内容 Assessment content
	New pollution sources	排放 Abnormal emission	H_2S、Cl_2 SO_2, NO_2, PM_{10}, HCl, H_2S, Cl2	量浓度 1h average mass concentration	Pi of maximum concentration
大气环境防护距离 Atmospheric environment protection zone	新增污染源 New pollution sources	正常排放 Normal emission	/	短期浓度 Short-term concentration	大气环境防护距离 Atmospheric environment protection zone

4.2.2 预测模式及预测参数

4.2.2 Prediction model and parameters

4.2.2.1 预测模式

4.2.2.1 Prediction model

根据《环境影响评价技术导则—大气环境》（HJ2.2-2018），项目烟囱处于大型水体（海或湖）岸边 3km 范围内，进行估算模型 AERSCREEN 计算时，已考虑岸边熏烟，估算的最大 1h 平均质量浓度未超过环境质量标准，故项目大气预测模式采用推荐的 AERMOD 模式。

In accordance with *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment* (HJ2.2-2018), the chimney of the project is located within 3km from the shore of large water bodies (seas or lakes). In calculation by using the estimation model AERSCREEN, fumigation at the shore has been considered and the estimated maximum 1h average mass concentration has never exceeded the environmental quality standard. As such, the recommended AERMOD model is adopted as the atmospheric prediction model of the project.

4.2.2.2 预测气象条件

4.22.2 Meteorologic conditions for prediction

本评价采用北海市气象观测站的气象观测资料作为大气预测的资料，北海气象观测站的站号是59644，坐标是东经109.1333N°，北纬21.450°，距离本项目约41km。场址所在地与周边气象站的地形地貌、地理特征、大气环流特征较相似，可采用该站气象数据。本次采用北海气象站2018年气象观测数据，符合《环境影响评价技术导则—大气环境》（HJ2.2-2018）选择近3年中数据相对完整的1个日历年气象资料要求，本次评价采用的北海气象站数据具有代表性和时效性。本项目未做现场气象补充观测。

The meteorological observation data of Beihai Meteorological Observation Station is adopted as the atmospheric prediction data in this assessment. The station number of Beihai Meteorological Observation Station is 59644 and coordinates thereof are 109.1333°E and 21.450°N, which is about 41km away from this project. The location of plant site is similar to the topography, geographical features and atmospheric circulation characteristics of the surrounding meteorological stations so that meteorological data of the station can be used. The meteorological observation data for the year 2018 from Beihai Meteorological Station used in this assessment comply with the requirement in *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment* (HJ2.2-2018) as to select one calendar year with relatively complete data in the past three years. The data of Beihai Meteorological Station used in this assessment are representative and timely. No field supplementary meteorological observation has been carried out in this project.

（1）地面气象观测资料

(1) Observation data of surface meteorological observation data

评价采用北海气象站提供的2018年逐日逐时地面气象观测资料，其内容包括：年、月、日、时、风向、风速、总云量、低云量、干球温度。

The surface meteorological observation data for 2018 on an hourly and daily basis from the Beihai Meteorological Station is adopted in this assessment, which include: year, month, day, hour, wind direction, wind speed, total cloud cover, low cloud cover and dry bulb temperature.

（2）常规高空气象资料

(2) Conventional high-altitude meteorological data

项目高空气象数据由环境保护部环境工程评估中心环境质量模拟重点实验室提供，是采用数值模式 WRF 模拟生成。包括项目区域逐日逐时的探空数据层数、各层气压、高度、干球温度、露点温度、风速、风向等。数据清单见表 4.2-2。

The high-altitude meteorological data of the project are provided by the key laboratory of environmental quality simulation of Assessment Center for Environmental Engineering of Ministry of Environmental Protection and are generated by WRF (World Resources Foundation) simulation using a numerical model, including the number of sounding data layers on a daily and hourly basis in the project area, air pressure, height, dry bulb temperature, dew point temperature, wind speed, wind direction, etc. of each layer. Data list is as shown in Table 4.2-2.

表 4.2-2 高空气象数据清单

Table 4.2-2 High Altitude Meteorological Data List

站点序号 Seq. no. of stations	模拟网格点编号 (X,Y) No. of simulation mesh points (X, Y)	模拟网格中心点位置 Location of center points of simulation mesh		数据年限 Life of data
		经度（°） Longitude (°)	纬度（°） Latitude (°)	
1	124022	109.51	21.5	2018

4.2.2.3 地面特征参数

4.2.2.3 Surface characteristic parameters

评价区土地利用类型主要为城镇建成区，地表湿度主要为湿润气候，按季计算评价区地面特征参数，见下表 4.2-3。

Land use type of the assessment area is mainly urban built-up area, and the surface humidity mainly falls under humid climate. The surface characteristic parameters of the assessment area are calculated on a quarter basis, as shown in Table 4.2-3 below.

表 4.2-3 AERMOD 地面特征参数

Table 4.2-3 AERMOD Surface Characteristic Parameters

扇区 Sector	正午反照率 Noon albedo	BOWEN	粗糙度 Roughness
0-360	0.2075	0.75	1

4.2.2.4 地形数据

4.2.2.4 Topographic data

评价范围内的地形数据采用外部 DEM 文件，并采用 AERMAP 运行计算得出评价范围内各网格及敏感点的地形数据。构建评价范围的预测网格时，采用直角坐标的方式，即坐标形式为(x，y)。

The topographic data within the assessment range are obtained from external DEM files. The topographic data of all mesh and sensitive points within therewithin are obtained by AERMAP operation calculation. When constructing the prediction mesh of assessment range, rectangular coordinates are adopted, which means that the coordinate form is (X, Y).

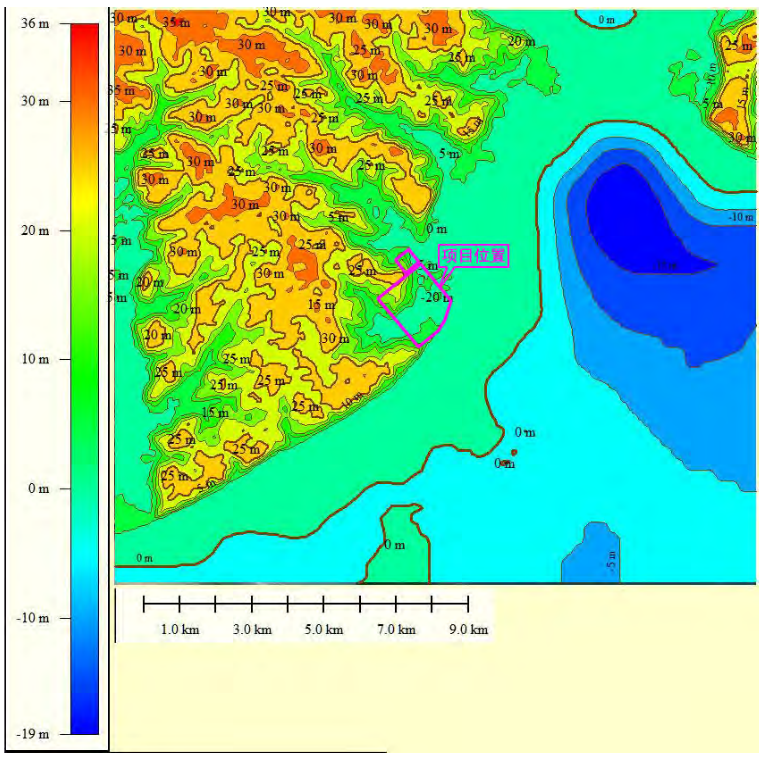


图 4.2-1　项目大气预测地形图

Figure 4.2-1 Atmospheric Prediction Topographic Map of the Project

4.2.2.5 预测网格与计算点

4.2.2.5 Predication mesh and calculation points

（1）网格

(1) Mesh

网格间距：采用近密远疏法，距离预测中心点 1000m 范围内，网格间距取 50m；

1000~6500 范围内，网格间距取 100m。

Mesh spacing: adjacent meshes shall be spaced densely whilst remote ones be spaced in a scattered manner in that the meshes shall be spaced at 50m within 1,000m from the prediction center point and at 100m within 1,000-,6500m from the same.

（2）计算点

(2) Calculation points

环境空气关心点清单见表 4.2-4。

List of points of concern for ambient air is as shown in Table 4.2-4.

表 4.2-4 环境空气关心点清单
Table 4.2-4 List of Ambient Air Care Points

序号 S. N.	名称 Name	坐标/m Coordinate/m			保护对象 Protection target	环境功能区及保护内容 Environmental functoin zone and protection content	相对厂址方位 Relative position of plant site	相对厂址距离 Relative distance between plant site
		X	Y	地面高程 Ground elevation				
1	猪血塘 Zhuxuetang	-2028	-1306	17.18	居民 Resident	《环境空气质量标准》二级标准 Level II standard in *Ambient Air Quality Standard*	西 West	1600
2	百班 Baiban	-2218	-918	29.72	居民 Resident		西 West	1370
3	竹儿根 Zhuergen	-2227	-175	27.84	居民 Resident		西 West	1080
4	彬崇村 Binchong Village	-2184	302	28.08	居民 Resident		西 West	1400
5	山心 Shanxin	-2345	673	31.31	居民 Resident		西 West	920
6	邓屋 Dengwu	-1513	74	19	居民 Resident		西 West	310
7	对面垌 Duimiandong	-1467	-1006	16.87	居民 Resident		西 West	1070

序号 S. N.	名称 Name	坐标/m Coordinate/m			保护对象 Protection target	环境功能区及保护内容 Environmental functoin zone and protection content	相对厂址方位 Relative position of plant site	相对厂址距离 Relative distance between plant site
		X	Y	地面高程 Ground elevation				
8	老妗垌 Laojindong	-1116	-1559	25.38	居民 Resident		西 West	650
9	坡尾底 Poweidi	404	-846	7.99	居民 Resident		南 South	30
10	川江 Chuanjiang	49	-1120	10.15	居民 Resident		南 South	30
11	彬定（新）Binding (New village)	-875	-2276	12.61	居民 Resident		西南 South west	1650
12	大塘村 Datang Village	-2138	-2205	25.05	居民 Resident		西南 South west	1600
13	南乐 Nanyue	-1800	939	23.09	居民 Resident		西 West	740
14	那格塘（陂头）Nagetang (Pitou)	-2493	1298	28.72	居民 Resident		西北 North west	1700
15	亚细 Yaxi	-1868	1965	19.22	居民 Resident		北 North	1430
16	南乐社区 Nanyue Community	-2011	2353	18.43	居民 Resident		北 North	2050
17	海山排 Haishanpai	-1521	2201	19.89	居民 Resident		北 North	1400
18	谢家村 Xiejiacun	-39	2332	13.25	居民 Reside		北 North	1130

序号 S. N.	名称 Name	坐标/m Coordinate/m			保护对象 Protection target	环境功能区及保护内容 Environmental functoin zone and protection content	相对厂址方位 Relative position of plant site	相对厂址距离 Relative distance between plant site
		X	Y	地面高程 Ground elevation				
	Village				nt			
19	阳光海岸 Yangguang Coast	-1758	-2323	24.99	居民 Resident		西南 South west	2180
20	东方海岸大酒店 Oriental Coast Hotel	-1555	-2272	26.35	居民 Resident		南 South	2180
21	华南北苑 Huanan Beiyuan	-1441	-2171	28.32	居民 Resident		西 West	1740
22	新岭 Xinling	-1179	-1855	27.12	居民 Resident		西 West	1300
23	新铺 Xinpu	75	1948	10.65	居民 Resident		北 North	460
24	大田 Datian	-3583	43	24.71	居民 Resident		西 West	2200
25	大竹园 Dazhuyuan	-3192	-1117	16.91	居民 Resident		西南 South west	2400
26	彬垌 Bindong	-2723	-1807	23.39	居民 Resident		西 West	2180
27	新坡村 Xinpo Village	-2710	-2041	26.69	居民 Resident		西北 North west	3600
28	槟榔根 Binlanggen	-1675	-2899	22.86	居民 Resident		西南 South west	2340

4.2.2.6 其他参数选取

4.2. Selection of Other Parameters

①SO_2

① SO_2

SO_2 半衰期取 14400 秒，在进一步预测 SO_2 时考虑“扩散过程的衰减”。

The half-life of SO2 is taken as 14,400 seconds, and "attenuation of diffusion process" will be considered in further prediction of SO2.

②NO_X

② NO_X

筛选模式及进一步预测选取 NO_2 表征 NOx 的预测结果，考虑 NO_2 化学反应。NO_2 转换算法采用烟羽体积摩尔率方法（PVMRM），设定的环境背景 O3 平均浓度数值为 139μg/m^3，设定全部烟道内 NO_2/NO_X 比率为 0.1，设定环境中平衡态 NO_2/NO_X 比率为 0.9。

For screening mode and further prediction, NO2 is selected to characterize the prediction results of NOx, taking into account NO2 chemical reaction. Plume volume molar rate method (PVMRM) is adopted as The NO2 conversion algorithm. The set average O_3 concentration value in the environmental background is 139g/m^3; the set NO2/NOX ratio in all flue is 0.1; the set NO2/NOX ratio in the equilibrium state in the environment is 0.9.

③二次 PM2.5 转化系数

③ Conversion factor of secondary PM2.5

项目 SO_2、NO_2 的转化系数采取导则推荐的比率，ψ_{so_2} 为 0.58、ψ_{no_2} 为 0.44。

The conversion factor of SO2 and NO_2 for the project shall be the ratio recommended in the guidelines, which shall be 0.58 for ψso_2 and 0.44 for ψNO_2.

4.2.3 评价标准及评价方法

4.2.3 Assessment standard and method

4.2.3.1 评价标准

4.2.3.1 Assessment standard

评价标准详见表 1.3-3。

Assessment standard is as shown in Table 1.3-3

4.2.3.2 评价方法

4.2.3.2 Assessment method

（1）环境影响叠加

(1) Environmental impact superposition

预测评价项目建成后各污染物对预测范围的环境影响，应用本项目的贡献浓度，叠加（减去）区域削减污染源以及其他在建、拟建项目污染源环境影响，并叠加环境空气质量现状浓度。计算方法如下：

For prediction and assessment of the environmental impact of each pollutant on the prediction range upon completion of the project, the contribution concentration of the project shall be applied to superimpose (minus) the regional environmental impact of regional reduction pollution sources and other pollution sources of the projects under construction and proposed projects and to superimpose the current concentration of environmental air quality. It is calculated as follows:

$$C_{叠加}(x,y,t)=C_{本项目}(x,y,t)-C_{区域削减}(x,y,t)+C_{拟在建}(x,y,t)+C_{现状}(x,y,t)$$

$$C_{\text{Superposition}}(x,y,t)=C_{\text{this project}}(x,y,t)-C_{\text{regional reduction}}(x,y,t)+C_{\text{proposed and under construction}}(x,y,t)+C_{\text{current condition}}(x,y,t)$$

式中：$C_{叠加}(x,y,t)$——在 t 时刻，预测点（x,y）叠加各污染源及现状浓度后的环境质量浓度，μg/m^3；

Where, $C_{Superposition}$ (x,y,t) - the environmental mass concentration after superimposing each pollution source and the current concentration at the prediction point (x, y) at time t, g/m^3;

$C_{本项目}$（x,y,t）——在t时刻，本项目对预测点（x,y）的贡献浓度，μg/m^3；

$C_{this\ project}$ (x,y,t) - the contribution concentration of this project to the prediction point (x, y) at time t, g/m^3;

$C_{区域削减}$（x,y,t）——在t时刻，区域削减污染源对预测点（x,y）的贡献浓度，μg/m^3；

$C_{regional\ reduction}$ (x,y,t) - the contribution concentration of regional reduction pollution sources to the prediction point (x, y) at time t, g/m^3;

$C_{现状}$（x,y,t）——在t时刻，预测点（x,y）的环境质量现状浓度，μg/m^3；

$C_{current\ condition}$ (x,y,t) - current environmental mass concentration at time t, μg/m^3;

拟在建（x,y,t）——在t时刻，其他在建、拟建项目污染源对预测点（x,y）的贡献浓度，μg/m^3。

$C_{proposed\ and\ under\ construction}$ (x,y,t) - the contribution concentration of other projects under construction and proposed projects to the prediction point (x, y) at time t, μg/m^3;

（2）保证率日平均质量浓度

(2) Daily average mass concentration at guarantee rate

对于保证率日平均质量浓度，首先按《环境影响评价技术导则 大气环境》（HJ2.2-2018）8.8.1.1或8.8.1.2的方法计算叠加后预测点上的日平均质量浓度，然后对该预测点所有日平均质量浓度从小到大进行排序，根据各污染物日平均质量浓度的保证率（p），计算排在p百分位数的第m个序数，序数m对应的日平均质量浓度即为保证率日平均浓度C_m。其中序数m计算方法如下：

As for the daily average mass concentration at guarantee rate, firstly, the daily average mass concentration on the superimposed prediction points is calculated according to the method of 8.8. 1.1 or 8.8.1.2 in the *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018)*. Then, the daily average mass concentration of all pollutants at the prediction point is sorted from small to large. According to the guarantee rate (p) of the daily average mass concentration of each pollutant, the mth ordinal number ranked in the percentile of p is calculated. The daily average mass concentration corresponding to the ordinal number m is the daily average concentration C_m at guarantee rate. Ordinal number m is calculated as follows:

$$m=1+(n-1)\times p$$

式中：p——该污染物日平均质量浓度的保证率，按HJ 663规定的对应污染物年评价中24 h平均百分位数取值，%；

Where, p - the guarantee rate of the daily average mass concentration of the pollutant, which is taken according to the 24 h average percentile in the annual assessment of the corresponding pollutant as specified in HJ 663, %;

n—— 1个日历年内单个预测点上的日平均质量浓度的所有数据个数，个；

n - Number of all data of daily average mass concentration on a single prediction point within 1 calendar year;

m——百分位数p对应的序数（第m个），向上取整数。

m - the ordinal number (mth) corresponding to percentile p, taking an integer upward.

根据《环境空气质量评价技术规范（试行）》（HJ663-2013）中基本评价项目及平均时间，年评价SO_2、NO_2、PM_{10}、$PM_{2.5}$年平均、24小时平均分别为为第98、98、95、95百分位数。

Based on the basic assessment items and average time in the *Technical Regulation for Ambient Air Quality Assessment (On Trial)* (HJ663-2013), the annual average and 24-hour average of SO_2, NO_2, PM_{10} and $PM_{2.5}$ are 98th, 98th, 95th and 95th percentiles respectively.

（3）二次$PM_{2.5}$预测方法

(3) Predication method of secondary $PM_{2.5}$

采用AERMOD、ADMS等模型模拟$PM_{2.5}$时，需将模型模拟的$PM_{2.5}$一次污染物的质量浓度，同步叠加按SO_2、NO_2等前体物转化比率估算的二次$PM_{2.5}$质量浓度，得到$PM_{2.5}$的贡献浓度。前体物转化比率可引用科研成果或有关文献，并注意地域的适用性。对于无法取得SO_2、NO_2等前体物转化比率的，可取φSO_2为0.58、φNO_2为0.44，按下述公式计算二次$PM_{2.5}$贡献浓度：

When AERMOD, ADMS and other models are used to simulate $PM_{2.5}$, the mass concentration of $PM_{2.5}$ primary pollutants simulated by the model shall be synchronously superimposed with the mass concentration of secondary $PM_{2.5}$ estimated based on the conversion ratio of precursors such as SO2 and NO2 to obtain the contribution concentration of PM2.5. For the conversion ratio of precursors, scientific research results or relevant documents can be referenced with care taken to the applicability of regions. If the conversion ratio of precursors such as SO_2 and NO_2, etc. is unobtainable, it can be taken as 0.58 for SO_2

and 0.44 for NO_2. The secondary $PM_{2.5}$ contribution concentration is calculated as follows:

$$C_{二次PM_{2.5}} = \varphi_{SO_2} \times C_{SO_2} + \varphi_{NO_2} \times C_{NO_2}$$

式中：$C_{二次PM_{2.5}}$——二次 $PM_{2.5}$ 质量浓度，μg/m³；

φ_{SO_2}、φ_{NO_2}——SO_2、NO_2 浓度换算为 $PM_{2.5}$ 浓度的系数；

C_{SO_2}、C_{NO_2}——SO_2、NO_2 的预测质量浓度，μg/m³。

4.2.3.3 环境空气质量现状

4.2.3.3 Current quality condition of the atmospheric environment

根据北海市生态环境局发布的2018年环境空气质量数据，所在地评价基准年2018年二氧化硫、二氧化氮和可吸入颗粒物（PM2.5）、可吸入颗粒物（PM10）年平均质量浓度、一氧化碳年评价浓度（第95百分位数）、臭氧年评价浓度（第90百分位数）均达到《环境空气质量标准》（GB3095-2012）二级标准。因此，项目所在区域为达标区。

According to 2018 ambient air quality data issued by Beihai Ecological Environment Bureau, sulfur dioxide, nitrogen dioxide and inhalable particle (PM2.5), inhalable particle (PM10) annual average mass concentration, carbon monoxide annual assessment concentration (the 95th percentile), ozone annual assessment concentration (the 90th percentile) in base year of assessment, 2018, at the project location can reach Level II standard in *Ambient Air Quality Standard* (GB3095-2012). As such, the area where the project is located is an up-to-standard area.

（1）对于预测因子二氧化硫、二氧化氮、可吸入颗粒物（PM2.5）、可吸入颗粒物（PM10）、一氧化碳、臭氧，数据类型选定“长期监测数据序列（365/366d），日均”，输入牛尾岭水库监测站基准年2018年全年逐日日均浓度监测数据。

(1) For the prediction factors of sulfur dioxide, nitrogen dioxide, inhalable particulate matter ($PM_{2.5}$), inhalable particulate matter (PM_{10}), carbon monoxide and ozone, the data type is selected as "Long-term Monitoring Data Sequence (365/366 d), Daily Average" and the daily average concentration monitoring data on a daily basis throughout the year of Niuweiling Reservoir Monitoring Station in 2018, the base year, are input.

（2）对于预测因子氯化氢、氨、硫化氢、氯气、TSP、臭气浓度、非甲烷总烃，监测数据类型选定“补充监测数据序列（7d），日均或最大小时”，输入设定项目厂区中部、江川2个监测点位监测数据。相应环境空气保护目标和预测网格点的小时浓度预测结果贡献值叠加的现状监测值，取的是各监测点最大值。

(2) For the prediction factors hydrogen chloride, ammonia, hydrogen sulfide, chlorine,

TSP, odor concentration and non-methane total hydrocarbons, the monitoring data type is selected as "Supplementary Monitoring Data Sequence (7d), Daily Average or Maximum Hourly", and the monitoring data of the two set monitoring points in center of the plant area and Jiangchuan of the project are input. The current monitoring value superimposed by the contribution value of the hourly concentration prediction result of the corresponding ambient air protection target and the prediction mesh point is taken as the maximum value of each monitoring point.

（3）对于预测因子二噁英日均值、Cd日均值、臭气浓度留作背景，不做评价。

(3) The daily mean value of dioxin, daily mean value of Cd and odor concentration of the prediction factors are kept as the background without assessment.

4.2.4 污染源调查清单

4.2.4 Survey list of pollution sources

（1）正常工况污染源强

(1) Pollution source intensity under normal working condition

大气污染源强详见表 4.2-5 和表 4.2-6。

Air pollution source intensity is detailed in Table 4.2-5 and 4.2-6.

（2）非正常工况污染源强

(2) Pollution source intensity under abnormal working condition

根据工程分析，非正常工况选取碱炉、石灰窑开停车阶段，添加助燃剂时污染物排放；项目生产过程中，由于人为原因操作不当或废气治理设施故障，导致废气处理效率下降；碱炉停机或事故情况下，臭气收集系统收集的臭气送到臭气焚烧器燃烧后排放。

Based on the engineering analysis, the starting and shutdown stages of alkali furnace and lime kiln are selected under abnormal working conditions with pollutants discharged when combustion improver is added. During the production process of the project, the waste gas treatment efficiency will decrease as a result of improper operation due to human factors or failure of waste gas treatment facilities. In case of shutdown or accident of alkali furnace, the odor collected by the odor collection system will be delivered to the odor incinerator for discharge upon incineration.

源强详见表 4.2-7。

Pollution source intensity is detailed in Table 4.2-7.

（3）区域在建拟建企业污染源强

(3) Pollution source intensity of the projects under construction and proposed projects in the area

根据污染源调查，本项目大气评价范围内拟建、在建项目为中国石化北海炼化有限责任公司北海炼油异地改造石油化工（20 万吨/年聚丙烯）项目、中国石化北海炼化有限责任公司 150 万吨年 S-Zorb 催化汽油吸附脱硫装置项目、北部湾资源再生环保服务中心项目、广西宏大化工有限公司双氧水项目、广西信义光伏产业有限公司年产 60 万吨超白太阳能玻璃生产线项目、信义玻璃（广西）有限公司特种超白超厚超薄优质浮法玻璃生产线及深加工项目和斯道拉恩索（广西）林浆纸有限公司 90 万吨浆、90 万吨纸和纸板变更项目（二期、三期未建项目）。

According to the investigation of pollution sources, within the scope of the atmospheric assessment of this project, the project under construction is Beihai Refinery Relocation Reconstruction Petrochemical Engineering (200,000t/a Polypropylene) Project of SINOPEC Beihai Refinery Co., Ltd, 1,500,000t/a S-Zorb Catalytic Gasoline Adsorption and Desulfurization Plant Project of SINOPEC Beihai Refinery Co., Ltd, Beibu Gulf Resource Regeneration and Environmental Protection Service Center Project, Hydrogen Peroxide Project of Guangxi Hongda Chemical Engineering Co., Ltd, 600,000t/a Super-white Solar Glass Production Line Project of Guangxi Xinyi Photovoltaic Industry Co., Ltd, Special Super-white Super-thick Super-thin High-quality Float Glass Production Line and Deep Processing Project of Xinyi Glass (Guangxi) Co., Ltd and 900,000t and 900,000t Paper and Paperboard Modification Project (Phase II and III Projects to be commenced) of Stora Enso (Guangxi) Forestry Co., Ltd.

本次评价叠加该项目源强进行预测，其污染源强见表 4.2-8。

In this assessment, the source intensity of the project is superimposed to predict, and the pollution source intensity thereof is shown in Table 4.2-8.

表 4.2-5 正常工况：大气污染物排放排放清单（一期有组织）
Table 4.2-5 Normal Condition: List of Air Pollutant Emission (Organized in Phase I)

编号 No.		点源名称 Point source	X	Y	排气筒底部海拔高度 Bottom altitude of the exhaust funnel	排气筒高度 Height of the exhaust funnel	排气筒内径 Inner diameter of the exhaust funnel	烟气量 Flue gas volume	烟气出口温度 Temperature of the flue gas outlet	年排放小时数 Annual emission hours	评价因子源强 Source intensity of the assessment factor										
											PM_{10}	SO_2	NOx	HCl	Cl_2	Hg	As	H_2S	NH_3	$PM_{2.5}$	TSP
符号 Symbol	code	name	Xs	Ys	H_0	H	D	Q	T	Hr	Q_{PM10}	Q_{SO2}	Q_{NOX}	Q_{HCL}		Q_{Hg}	$Q_{砷}$	Q_{H2S}	Q_{NH3}	$QPM_{2.5}$	QTSP
单位 Unit			m	m	m	m	m	m^3/h	℃	h	kg/h										
D1	4600tds/d 碱炉 4,600tds/d alkali furnace		231	472	6	150	5.2	894710	130	8160	24.66	40.17	178.94	--	--	--	--	4.02	--	--	--
D2	850t/d 石灰窑 850t/d lime kiln		227	463	6	150	2.6	158760	350	8160	9.28	15.83	66.67	--	--	--	--	2.14	--	--	--
D3	220t/h 固废锅炉+1×280t/h 燃煤锅炉 220t/h solid waste boiler +1×280 t/h coal-fired boiler		236	460	6	150	4.8	469089	55	8160	4.63	16.36	23.39	4.15	--	0.0391	0.0018	--	--	2.315	--
D4	漂白塔 Bleaching tower		232	466	6	150	1.0	16300	25	8160	--	--	--	--	0.065	--	--	--	--	--	--
D5	二氧化氯车间过量氢气排空尾气 Excessive hydrogen tail gas of chlorine dioxide workshop		-104	29	7	25	0.2	2000	25	8160	--	--	--	--	0.0125	--	--	--	--	--	--

D6	二氧化氯车间盐酸合成尾气 Tail gas from hydrochloric acid synthesis in chlorine dioxide workshop	-59	52	7	42	0.25	2500	25	8160	--	--	--	0.038	0.016	--	--	--	--	--	--
D7	二氧化氯车间槽罐尾气 Tail gas from tank of chlorine dioxide workshop	-47	64	7	30	0.3	4500	25	8160	--	--	--	--	0.033	--	--	--	--	--	--

续表 4.2-5　正常工况：大气污染物排放排放清单（一期无组织）
Continued Table 4.2-5 Normal Condition: List of Air Pollutant Emission (Fugitive in Phase I)

	编号 No.	面源名称 Area source	中心点参数 Center point parameters			面源长度 Surface source length	面源宽度 Surface source width	与正北夹角 Angle with the north direction	面源初始排放高度 Initial surface source emission height	年排放小时数 Annual emission hours	评价因子源强（kg/h） Assessment factor source intensity (kg/h)						
			X	Y	海拔高度 Altitude						H_2S	NH_3	PM_{10}	TSP	HCl	Cl_2	非甲烷总烃 Non-methane hydrocarbon
符号 Symbol	code	name	Xs	Ys	H_0	Ll	Lw	Arc	H	Hr	Q_{H2S}	Q_{NH3}	Q_{PM10}	Q_{TSP}	Q_{HCl}		$Q_{非甲烷总烃}$ Q_{NMTHC}
单位 Unit			m	m	m	m	m	°	m	h	kg/h						
M1	木片堆存、备料过程 Wood chip stacking, material preparation		-510	-224	6	980	416	-30	3	8160	--	--	--	4.41	--	--	--
M2	二氧化氯生产、贮存过程 Production and storage process		-46	31	7	93	48	60	12	8160	--	--	--	--	0.0563	0.0563	--

编号 No.		面源名称 Area source	中心点参数 Center point parameters			面源长度 Surface source length	面源宽度 Surface source width	与正北夹角 Angle with the north direction	面源初始排放高度 Initial surface source emission height	年排放小时数 Annual emission hours	评价因子源强（kg/h） Assessment factor source intensity (kg/h)						
			X	Y	海拔高度 Altitude						H_2S	NH_3	PM_{10}	TSP	HCl	Cl_2	非甲烷总烃 Non-methane hydrocarbon
	of chlorine dioxide																
M3	煤堆 Coal pile		192	476	5	100	235	-30	10	8160	--	--	--	0.56	--	--	--
M4	污水处理站 Sewage treatment plant		459	435	6	435	459	-30	10	8160	0.0006	0.129	--	--	--	--	--
M5	储油罐 Oil storage tank		-330	40	7	22	48	60	10	8160	--	--	--	--	--	--	0.013

表 4.2-6 正常工况：大气污染物排放排放清单（二期有组织）
Table 4.2-6 Normal Condition: List of Air Pollutant Emission (Organized in Phase II)

编号 No.		点源名称 Point source	X	Y	排气筒底部海拔高度 Bottom altitude of the exhaust funnel	排气筒高度 Height of the exhaust funnel	排气筒内径 Inner diameter of the exhaust funnel	烟气量 Flue gas volume	烟气出口温度 Temperature of the flue gas outlet	年排放小时数 Annual emission hours	评价因子源强 Source intensity of the assessment factor										
											PM_{10}	SO_2	NO_x	HCl	Cl_2	Hg	As	H_2S	NH_3	$PM_{2.5}$	TSP
符号 Symbol	code	name	Xs	Ys	H_0	H	D	Q	T	Hr	Q_{PM10}	Q_{SO2}	Q_{NOX}	Q_{HCL}		Q_{Hg}	$Q_{\text{砷}}$	Q_{H2S}	Q_{NH3}	$QPM_{2.5}$	QTSP
单位 Unit			m	m	m	m	m	m^3/h	℃	h	kg/h										
D1	4600tds/d 碱炉 4,600tds/d alkali furnace		231	472	6	150	5.2	979920	130	8160	27.01	45.8	195.98	--	--	--	--	4.49	--	--	--
D2	850t/d 石灰窑 850t/d lime kiln		227	463	6	150	2.6	158760	350	8160	9.28	15.83	66.67	--	--	--	--	2.14	--	--	--
D3	220t/h 固废锅炉+2×280t/h 燃煤锅炉 220t/h solid waste boiler +2×280 t/h coal-fired boiler		236	460	6	150	4.8	821239	55	8160	8.11	28.62	40.93	5.76	--	0.00948	0.0025	--	--	4.055	--
D4	漂白塔 Bleaching tower		232	466	6	150	1.0	16300	25	8160	--	--	--	--	0.065	--	--	--	--	--	--
D5	二氧化氯车间过量氢气排空尾气 Excessive hydrogen tail gas of chlorine dioxide		-104	29	7	25	0.2	2000	25	8160	--	--	--	--	0.0125	--	--	--	--	--	--

	workshop																			
D6	二氧化氯车间盐酸合成尾气 Tail gas from hydrochloric acid synthesis in chlorine dioxide workshop	-59	52	7	42	0.25	2500	25	8160	--	--	--	0.038	0.016	--	--	--	--	--	--
D7	二氧化氯车间槽罐尾气 Tail gas from tank of chlorine dioxide workshop	-47	64	7	30	0.3	4500	25	8160	--	--	--	--	0.033	--	--	--	--	--	--

续表 4.2-6 正常工况：大气污染物排放排放清单（二期无组织）

Continued Table 4.2-6 Normal Condition: List of Air Pollutant Emission (Fugitive in Phase II)

	编号 No.	面源名称 Area source	中心点参数 Center point parameters			面源长度 Surface source length	面源宽度 Surface source width	与正北夹角 Angle with the north direction	面源初始排放高度 Initial surface source emission height	年排放小时数 Annual emission hours	评价因子源强（kg/h） Assessment factor source intensity (kg/h)						
			X	Y	海拔高度 Altitude						H_2S	NH_3	PM_{10}	TSP	HCl	Cl_2	非甲烷总烃 Non-methane hydrocarbon
符号 Symbol	code	name	Xs	Ys	H_0	Ll	Lw	Arc	H	Hr	Q_{H2S}	Q_{NH3}	Q_{PM10}	Q_{TSP}	Q_{HCl}		$Q_{非甲烷总烃}$ Q_{NMTHC}
单位 Unit			m	m	m	m	m	°	m	h	kg/h						
M1	木片堆存、备料过程 Wood chip stacking, material preparation		-510	-224	6	980	416	-30	3	8160	--	--	--	4.41	--	--	--
M2	二氧化氯生产、贮存过程 Production and		-46	31	7	93	48	60	12	8160	--	--	--	--	0.0563	0.0563	--

编号 No.	面源名称 Area source	中心点参数 Center point parameters			面源长度 Surface source length	面源宽度 Surface source width	与正北夹角 Angle with the north direction	面源初始排放高度 Initial surface source emission height	年排放小时数 Annual emission hours	评价因子源强（kg/h） Assessment factor source intensity (kg/h)						
		X	Y	海拔高度 Altitude						H_2S	NH_3	PM_{10}	TSP	HCl	Cl_2	非甲烷总烃 Non-methane hydrocarbon
	storage process of chlorine dioxide															
M3	煤堆 Coal pile	192	476	5	100	235	-30	10	8160	--	--	--	0.63	--	--	--
M4	污水处理站 Sewage treatment plant	459	435	6	435	459	-30	10	8160	0.0006	0.129	--	--	--	--	--
M5	储油罐 Oil storage tank	-330	40	7	22	48	60	10	8160	--	--	--	--	--	--	0.013

表 4.2-7 非正常工况：大气污染物排放清单

Table 4.2-7 Abnormal Condition: List of Air Pollutant Emission

编号 No.		点源名称 Point source	X	Y	排气筒底部海拔高度 Bottom altitude of the exhaust funnel	排气筒高度 Height of the exhaust funnel	排气筒内径 Inner diameter of the exhaust funnel	烟气量 Flue gas volume	烟气出口温度 Temperature of the flue gas outlet	情景 Scenarios	评价因子源强 Source intensity of the assessment factor					
											烟尘 Smoke dust	SO_2	NOx	Cl_2	HCl	H_2S
符号 Symbol	code	name	Xs	Ys	H_0	H	D	Q	T	/	Q_{PM10}	Q_{SO2}	Q_{NOx}	Q_{Cl2}	Q_{HCL}	Q_{H2S}
单位 Unit			m	m	m	m	m	m^3/h	℃	/	kg/h					
D1		4600tds/d 碱炉 4,600tds/d alkali furnace	231	472	6	150	5.2	979920	130	开停车阶段，添加天然气助燃 Add natural gas for supporting combustion in the startup and shutdown period	--	80	374.2	--	--	--
			231	472	6	150	5.2	979920	130	废气治理设施故障导致除尘效率降至 95% Exhaust gas treatment facility failure makes the dust removal efficiency drop to 95%	1688.16	--	--	--	--	--
D2		850t/d 石灰窑 850t/d lime kiln	227	463	6	150	2.6	158760	350	开停车阶段，添加天然气助燃 Add natural gas for supporting combustion in the startup and shutdown period	--	56	261.94	--	--	--
			227	463	6	150	2.6	158760	350	废气治理设施故障导致除尘效率降至 95%	139.17	--	--	--	--	--

									Exhaust gas treatment facility failure makes the dust removal efficiency drop to 95%						
D3	220t/h 锅炉 220t/h boiler	236	460	6	150	4.8	308300	55	废气治理设施故障导致除尘效率降至95%，脱硫、脱硝效率下降至 50% Exhaust gas treatment facility failure makes the dust removal efficiency drop to 95%, and desulfurization and denitration efficiency drop to 50%	172.69	90.4	34.56	--	--	--
D3	2×280t/h 锅炉 2×280t/h boiler	236	460	6	150	4.8	702000	55	废气治理设施故障导致除尘效率降至95%，脱硫、脱硝效率下降至 50% Exhaust gas treatment facility failure makes the dust removal efficiency drop to 95%, and desulfurization and denitration efficiency drop to 50%	275.76	201.66	44.32	--	--	--
D5	二氧化氯车间过量氢气排空尾气 Excessive hydrogen tail gas of chlorine dioxide workshop	-104	29	7	25	0.2	2000	25	废气治理设施故障导致去除率降至 0% Exhaust gas treatment facility failure makes the removal efficiency drop to 0%	--	--	--	0.05	--	--
D6	二氧化氯车间盐酸合成尾气 Tail gas from hydrochloric acid	-59	52	7	42	0.25	2500	25	废气治理设施故障导致去除率降至 0% Exhaust gas treatment facility failure makes	--	--	--	0.05	0.13	--

	synthesis in chlorine dioxide workshop								the removal efficiency drop to 0%						
D7	二氧化氯车间槽罐尾气 Tail gas from tank of chlorine dioxide workshop	-47	64	7	30	0.3	4500	25	废气治理设施故障导致去除率降至 0% Exhaust gas treatment facility failure makes the removal efficiency drop to 0%	--	--	--	0.13	--	--
D8	焚烧器 Incinerator	238	468	6	150	1.5	54720	80	碱炉停机或事故情况下 In case of alkali furnace shutdown or accident	--	--	--		--	4.4

表 4.2-8 区域染物排放清单（有组织）

Table 4.2-8 List of Regional Pollutant Emission (Organized)

编号 No.	点源名称 Point source	X	Y	排气筒海拔高度 Bottom altitude of the exhaust funnel	排气筒高度 Height of the exhaust funnel	排气筒内径 Inner diameter of the exhaust funnel	烟气量 Flue gas volume	烟气出口温度 Temperature of the flue gas outlet	年排放小时数 Annual emission hours	评价因子源强 Source intensity of the assessment factor PM$_{10}$	SO$_2$	NO$_2$	H$_2$S	PM$_{2.5}$	Hg	As	NH$_3$	HCl	Cl2	项目名称 Project Name
TSP code	name	Xs	Ys	H$_0$	H	D	Q	T	Hr	Q_{PM10}	Q_{SO2}	Q_{NO2}	Q_{H2S}	$Q_{PM2.5}$	Q_{Hg}	Q_{As}	Q_{NH3}	Q_{HCl}	Q_{Cl2}	
单位 Unit		m	m	m	m	m	m^3/h	℃	h	kg/h										
D1	催柴加氢改质单元 Catalyst diesel hydrogenation modification unit	-1352	-1326	24	50	1	11250	130	8400	/	/	/	0.018	/	/	/	/	/		中国石化北海炼化有限责任公司北海炼油异地改造石油化工（20 万吨/年聚丙烯）项目 Beihai Refinery Relocation Reconstruction Petrochemical Engineering (200,000t/a Polypropylene) Project of SINOPEC Beihai Refinery Co., Ltd
D2	烟气脱硫单元 Flue gas desulfurization unit	-1526	-1487	24	80	3.2	122766	100	8400	0.58	2.00	5.89	0.33	0.29	/	/	/	/		
D3	制氢装置 Hydrogen production plant	-1268	-1471	19	60	1	7392.86	130	8400	/	/	/	0.004	/	/	/	/	/		
D4	加热炉烟气 Off gas from heating furnace	-1163	-1036	15	60	0.6	9900	130	8400	/	/	/	0.00006	/	/	/	/	/		
D5	再生烟气依托催化烟气脱硫装置废气	-1359	-1059	23	90	3.5	198655.8	120	8400	0.37	/	/	/	/	/	/	/	/		

编号 No.		点源名称 Point source	X	Y	排气筒海拔高度 Bottom altitude of the exhaust funnel	排气筒高度 Height of the exhaust funnel	排气筒内径 Inner diameter of the exhaust funnel	烟气量 Flue gas volume	烟气出口温度 Temperature of the flue gas outlet	年排放小时数 Annual emission hours	评价因子源强 Source intensity of the assessment factor										项目名称 Project Name
											PM_{10}	SO_2	NO_2	H_2S	$PM_{2.5}$	Hg	As	NH_3	HCl	Cl2	
TSP	code	name	Xs	Ys	H_0	H	D	Q	T	Hr	Q_{PM10}	Q_{SO2}	Q_{NO2}	Q_{H2S}	$Q_{PM2.5}$	Q_{Hg}	Q_{As}	Q_{NH3}	Q_{HCl}	Q_{Cl2}	
单位 Unit			m	m	m	m	m	m^3/h	℃	h	kg/h										
	Regenerated flue gas relies on waste gas from catalytic flue gas																				
D1	焚烧预处理车间、卸料大厅、破碎间、料坑、无机废物暂存库 Incineration pretreatment workshop, unloading hall, crushing room, material pit and inorganic waste temporary storage warehouse		-2073	-1823	21	15	1.9	160000	25	7920	/	/	/	0.0022	/	/	/	0.0277	0.018		北部湾资源再生环保服务中心项目 Beibu Gulf Resource Regeneration and Environmental Protection Service Center Project
D2	焚烧车间 Incineration workshop		-1972	-1719	21	50	1.12	27000	130	7200	0.80	2.69	5.63	/	0.40	0.0004	0.0033	/	0.96		
D3	物化车间 Physical and chemical workshop		-2150	-1762	21	15	1.4	76000	25	2640	/	/	/	/	/	/	/	/	0.004		
D4	蚀刻液处理车间		-2036	-1664	21	15	1.0	35000	25	2640	/	/	/	/	/	/	/	0.00045	0.00006		

编号 No.		点源名称 Point source	X	Y	排气筒海拔高度 Bottom altitude of the exhaust funnel	排气筒高度 Height of the exhaust funnel	排气筒内径 Inner diameter of the exhaust funnel	烟气量 Flue gas volume	烟气出口温度 Temperature of the flue gas outlet	年排放小时数 Annual emission hours	评价因子源强 Source intensity of the assessment factor										项目名称 Project Name
											PM_{10}	SO_2	NO_2	H_2S	$PM_{2.5}$	Hg	As	NH_3	HCl	Cl2	
TSP	code	name	Xs	Ys	H_0	H	D	Q	T	Hr	Q_{PM10}	Q_{SO2}	Q_{NO2}	Q_{H2S}	$Q_{PM2.5}$	Q_{Hg}	Q_{As}	Q_{NH3}	Q_{HCl}	Q_{Cl2}	
单位 Unit			m	m	m	m	m	m^3/h	℃	h	kg/h										
	Etching solution treatment workshop																				
D5	固化\稳定化车间 Solidification/stabilization workshop		-1932	-1697	21	15	0.6	10000	25	2640	0.37	/	/	/	/	/	/	/	/		
D6	有机废物暂存库 Organic waste temporary storage warehouse		-2070	-1789	21	15	1.5	120000	25	7920	/	/	/	0.002	/	/	/	0.023	0.021		
D7	甲类废物暂存库 Class A waste temporary storage warehouse		-2049	-1713	21	15	1.4	60000	25	7920	/	/	/	0.0009	/	/	/	0.04	/		
D8	污水处理站 Sewage treatment plant		-2119	-1667	21	15	0.3	3600	25	7920	/	/	/	0.002	/	/	/	0.00008	/		
D1	制氢转化炉废气 Waste gas from hydrogen production reformer		-512	868	27	25	1.8	13800	105	8000	/	0.20	0.95	/	/	/	/	/	/		广西宏大化工有限公司双氧水项目（一期） Guangxi Hongda Chemical Engineering

编号 No.		点源名称 Point source	X	Y	排气筒海拔高度 Bottom altitude of the exhaust funnel	排气筒高度 Height of the exhaust funnel	排气筒内径 Inner diameter of the exhaust funnel	烟气量 Flue gas volume	烟气出口温度 Temperature of the flue gas outlet	年排放小时数 Annual emission hours	评价因子源强 Source intensity of the assessment factor										项目名称 Project Name
											PM_{10}	SO_2	NO_2	H_2S	$PM_{2.5}$	Hg	As	NH_3	HCl	Cl2	
TSP	code	name	Xs	Ys	H_0	H	D	Q	T	Hr	Q_{PM10}	Q_{SO2}	Q_{NO2}	Q_{H2S}	$Q_{PM2.5}$	Q_{Hg}	Q_{As}	Q_{NH3}	Q_{HCl}	Q_{Cl2}	
单位 Unit			m	m	m	m	m	m^3/h	℃	h	kg/h										
																					Co., Ltd. Hydrogen Peroxide Project (Phase I)
	2×500t/d 玻璃熔窑 2×500t/d glass furnace		2932	4254	1	100	5	183750	100	8000	5.59	25.3	57.8	/	2.795	/	/	/	0.732		特种超白超厚超薄浮法玻璃生产线及其深加工项目 Special Super-white Super-thick Super-thin Float Glass Production Line and Deep Processing Project
	2×1100t/d 玻璃熔窑 2×1100t/d glass furnace		2879	4153	1	100	5	293333.3	100	8000	9.15	44.9	81.9	/	4.575	/	/	/	1.61		
	2×1000t/d 超白太阳能玻璃生产线 2×1000t/d super-white solar glass production line		2857	4704	4	100	4.1	257400	80	8000	8	29.35	59.55	/	4	/	/	0.64	1.46		年产 60 万吨超白太阳能玻璃生产线项目 600,000T/a Super-white Solar Glass Production Line Project

编号 No.		点源名称 Point source	X	Y	排气筒海拔高度 Bottom altitude of the exhaust funnel	排气筒高度 Height of the exhaust funnel	排气筒内径 Inner diameter of the exhaust funnel	烟气量 Flue gas volume	烟气出口温度 Temperature of the flue gas outlet	年排放小时数 Annual emission hours	评价因子源强 Source intensity of the assessment factor										项目名称 Project Name
											PM_{10}	SO_2	NO_2	H_2S	$PM_{2.5}$	Hg	As	NH_3	HCl	Cl2	
TSP	code	name	Xs	Ys	H_0	H	D	Q	T	Hr	Q_{PM10}	Q_{SO2}	Q_{NO2}	Q_{H2S}	$Q_{PM2.5}$	Q_{Hg}	Q_{As}	Q_{NH3}	Q_{HCl}	Q_{Cl2}	
单位 Unit			m	m	m	m	m	m^3/h	℃	h	kg/h										
		碱回收炉（4000 tDS/d） Alkali recovery furnace (4000 tDS/d)	-655	1268	7	150	3.8	685000	180	8496	19.18	27.4	137	3.425	9.59						斯道拉恩索（广西）林浆纸有限公司 90 万吨浆、90 万吨纸和纸板变更项目（二期、三期未建项目） 900,000t and 900,000t Paper and Paperboard Modification Project (Phase II and III Projects to be commenced) of Stora Enso (Guangxi) Forestry Co., Ltd
		石灰窑(750 t/d) Lime kiln (750t/d)	-736	1149	11	150	1.5	130000	250	8496	6.5	58.5	52	1.95	3.25						
		循环流化床锅炉 Circulating fluidized bed boiler (1×240t/h)	-712	1412	21	120	4	400000	90	8496	11.8	76	39.2		5.9						
		漂白车间 Bleaching workshop	-1095	1043	21	60	1.2	7200	78	8496										0.036	
		二氧化氯制备工段尾气收集塔 Tail gas collection tower in chlorine dioxide preparation section	-1061	996	27	25	0.3	2500	10	8496										0.04	

续表 4.2-8 区域染物排放清单（无组织）

Continued Table 4.2-8 List of Regional Pollutant Emission (Fugitive)

	编号 No.	面源名称 Area source	中心点参数 Center point parameters X	Y	海拔高度 Altitude	面源长度 Surface source length	面源宽度 Surface source width	与正北夹角 Angle with the north direction	面源初始排放高度 Initial surface source emission height	年排放小时数 Annual emission hours	评价因子源强（kg/h） Assessment factor source intensity (kg/h) H_2S	NH_3	PM_{10}	HCl	项目名称 Project Name
符号 Symbol	code	name	Xs	Ys	H_0	Ll	Lw	Arc	H	Hr					
单位 Unit			m	m	m	m	m	°	M	h	Q_{H2S}	Q_{NH3}	Q_{PM10}	Q_{HCl}	中国石化北海炼化有限责任公司 150 万吨年 S-Zorb 催化汽油吸附脱硫装置项目 1,500,000t/a S- Zorb Catalytic Gasoline Adsorption and Desulfurization Plant Project of SINOPEC Beihai Refinery Co., Ltd
M1	硫磺回收装置区 Sulfur recovery plant area		-1159	-1221	17	180	95	37	20	8400	0.0024	/	/	/	
M1	焚烧预处理车间 Incineration pretreatment workshop		-2119	-1817	27	44	21	37	7	7920	0.000117	0.00017	/	/	北部湾资源再生环保服务中心项目 Beibu Gulf Resource Regeneration and Environmental Protection Service Center Project
M2	焚烧车间 Incineration workshop		-2018	-1759	21	99	66	37	12	1200	/	/	0.0007		
M3	物化车间 Physical and chemical workshop		-2171	-1728	21	51	42	37	11	2640	/	/	/	0.004	
M4	蚀刻液处理车间 Etching solution treatment workshop		-2003	-1661	21	43	37	37	11	2640	/	0.00025	/	0.00003	
M5	固化/稳定化车间 Solidification/stabilization workshop		-2000	-1728	21	54	33	37	10	2640	/	/	0.049	/	
M6	有机废物暂存库		-2134	-1774	21	54	42	37	11	7920	0.000333	0.0023	/	0.0105	

	Organic waste temporary storage warehouse													
M7	无机废物暂存库 Inorganic waste temporary storage warehouse	-2156	-1872	21	54	29	37	11	7920	0.000167	0.0016	/	0.009	
M8	甲类废物暂存库 Class A waste temporary storage warehouse	-2082	-1743	21	36	24	37	11	7920	0.00015	0.004	/	/	
M9	污水处理站 Sewage treatment plant	-2122	-1691	21	69	61	37	5	7920	0.0001	0.002	/	/	

4.2.5 一期工程预测结果与分析

4.2.5 Prediction results and analysis for Phase I Project

4.2.5.1 新增污染源预测（最大浓度占标率）

4.2.5.1 Prediction of newly added pollution sources (Pi of maximum concentration)

（1）二氧化硫（SO_2）

(1) Sulfur dioxide (SO_2)

正常排放情况下，SO_2 贡献质量浓度预测结果见表 4.2-9。

The prediction results of SO2 contribution mass concentration under normal emission conditions are shown in Table 4.2-9.

对于环境空气敏感目标而言，项目排放的 SO_2 短期浓度（小时、日均）、长期（年均）浓度贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, the short-term concentration (hourly and daily average) and long-term (annual average) concentration contribution values of SO2 emitted by the project all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，SO_2 短期浓度（小时、日均）贡献值最大值分别为 7.5197μg/m^3、2.5823μg/m^3，最大占标率分别为 1.50%、1.72%，最大浓度占标率均<100%；长期浓度贡献值最大值为 0.4204μg/m^3，最大占标率为 0.7%，最大浓度占标率<30%，SO_2 短期浓度、长期浓度贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, the maximum short-term concentration (hourly and daily average) contribution value of SO2 is 7.5197g/m^3 and 2.5823 g/m^3 respectively, and the maximum Pi is 1.50% and 1.72% respectively with Pi of maximum concentration both <100%. The maximum long-term concentration contribution value is 0.4204 g/m3 and the maximum Pi is 0.7% with Pi of maximum concentration <30%. The short-term and long-term concentration contribution value of SO2 both comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-9　正常工况 SO_2 预测结果表

Table 4.2-9 Prediction Results of SO_2 under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
SO_2	猪血塘 Zhuxuetang	1 小时 1 hour	5.4971	18010608	1.10	达标 Yes
		日平均 Average daily	1.0784	180723	0.72	达标 Yes
		年平均 Annual average	0.1176	平均值 Average value	0.20	达标 Yes
	百班 Baiban	1 小时 1 hour	6.3247	18010608	1.26	达标 Yes
		日平均 Average daily	1.2140	180716	0.81	达标 Yes
		年平均 Annual average	0.1258	平均值 Average value	0.21	达标 Yes
	竹儿根 Zhuergen	1 小时 1 hour	5.5764	18060208	1.12	达标 Yes
		日平均 Average daily	1.4594	180715	0.97	达标 Yes
		年平均 Annual average	0.1652	平均值 Average value	0.28	达标 Yes
	彬崇村 Binchong Village	1 小时 1 hour	6.5119	18072608	1.30	达标 Yes
		日平均 Average daily	1.5825	180918	1.05	达标 Yes
		年平均 Annual average	0.1962	平均值 Average value	0.33	达标 Yes
	山心 Shanxin	1 小时 1 hour	6.4719	18072608	1.29	达标 Yes
		日平均 Average daily	1.7187	180918	1.15	达标 Yes
		年平均 Annual average	0.2075	平均值 Average value	0.35	达标 Yes
	邓屋 Dengwu	1 小时 1 hour	6.2242	18082812	1.24	达标 Yes
		日平均 Average daily	1.7443	180715	1.16	达标 Yes
		年平均	0.2222	平均值	0.37	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		Annual average		Average value		Yes
	对面垌 Duimiandong	1 小时 1 hour	4.9338	18091010	0.99	达标 Yes
		日平均 Average daily	1.3527	180723	0.90	达标 Yes
		年平均 Annual average	0.1425	平均值 Average value	0.24	达标 Yes
	老妗垌 Laojindong	1 小时 1 hour	5.0032	18091010	1.00	达标 Yes
		日平均 Average daily	1.1274	181122	0.75	达标 Yes
		年平均 Annual average	0.1472	平均值 Average value	0.25	达标 Yes
	坡尾底 Poweidi	1 小时 1 hour	6.7783	18022409	1.36	达标 Yes
		日平均 Average daily	1.6693	181101	1.11	达标 Yes
		年平均 Annual average	0.2112	平均值 Average value	0.35	达标 Yes
	川江 Chuanjiang	1 小时 1 hour	6.9693	18022409	1.39	达标 Yes
		日平均 Average daily	1.3295	180225	0.89	达标 Yes
		年平均 Annual average	0.2228	平均值 Average value	0.37	达标 Yes
	彬定（新） Binding (New village)	1 小时 1 hour	4.6243	18022409	0.92	达标 Yes
		日平均 Average daily	0.9242	180308	0.62	达标 Yes
		年平均 Annual average	0.1362	平均值 Average value	0.23	达标 Yes
	大塘村 Datang Village	1 小时 1 hour	4.6637	18061308	0.93	达标 Yes
		日平均 Average daily	1.1024	180131	0.73	达标 Yes
		年平均 Annual average	0.1037	平均值 Average value	0.17	达标 Yes
	南乐	1 小时	5.8335	18030508	1.17	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
	Nanyue	1 hour				Yes
		日平均 Average daily	1.4475	180307	0.97	达标 Yes
		年平均 Annual average	0.2731	平均值 Average value	0.46	达标 Yes
	陂头 Potou	1 小时 1 hour	5.6516	18080607	1.13	达标 Yes
		日平均 Average daily	1.6000	180125	1.07	达标 Yes
		年平均 Annual average	0.2140	平均值 Average value	0.36	达标 Yes
	亚细 Yaxi	1 小时 1 hour	6.6979	18080607	1.34	达标 Yes
		日平均 Average daily	1.2229	180125	0.82	达标 Yes
		年平均 Annual average	0.2181	平均值 Average value	0.36	达标 Yes
	南乐社区 Nanyue Community	1 小时 1 hour	6.0086	18080607	1.20	达标 Yes
		日平均 Average daily	1.0300	180625	0.69	达标 Yes
		年平均 Annual average	0.1790	平均值 Average value	0.30	达标 Yes
	海山排 Haishanpai	1 小时 1 hour	5.4874	18080607	1.10	达标 Yes
		日平均 Average daily	1.3745	180625	0.92	达标 Yes
		年平均 Annual average	0.2000	平均值 Average value	0.33	达标 Yes
	谢家村 Xiejiacun Village	1 小时 1 hour	5.2334	18082409	1.05	达标 Yes
		日平均 Average daily	0.9802	180725	0.65	达标 Yes
		年平均 Annual average	0.1218	平均值 Average value	0.20	达标 Yes
	阳光海岸（中石化倒班宿舍）	1 小时 1 hour	4.5521	18061308	0.91	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
	Yangguang Coast (SINOPEC shift dormitory)					
		日平均 Average daily	1.0110	180131	0.67	达标 Yes
		年平均 Annual average	0.1110	平均值 Average value	0.19	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	4.4568	18091010	0.89	达标 Yes
		日平均 Average daily	0.9243	181122	0.62	达标 Yes
		年平均 Annual average	0.1166	平均值 Average value	0.19	达标 Yes
	华南北苑 Huanan Beiyuan	1 小时 1 hour	4.5272	18091010	0.91	达标 Yes
		日平均 Average daily	0.9633	181122	0.64	达标 Yes
		年平均 Annual average	0.1207	平均值 Average value	0.20	达标 Yes
	新岭 Xinling	1 小时 1 hour	4.7306	18091010	0.95	达标 Yes
		日平均 Average daily	1.0673	181122	0.71	达标 Yes
		年平均 Annual average	0.1363	平均值 Average value	0.23	达标 Yes
	新铺 Xinpu	1 小时 1 hour	5.0025	18062311	1.00	达标 Yes
		日平均 Average daily	1.2714	180526	0.85	达标 Yes
		年平均 Annual average	0.1555	平均值 Average value	0.26	达标 Yes
	大田 Datian	1 小时 1 hour	5.9387	18072608	1.19	达标 Yes
		日平均 Average daily	1.1438	180918	0.76	达标 Yes
		年平均	0.1400	平均值	0.23	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		Annual average		Average value		Yes
	大竹园 Dazhuyuan	1 小时 1 hour	7.2509	18010608	1.45	达标 Yes
		日平均 Average daily	1.0781	180716	0.72	达标 Yes
		年平均 Annual average	0.1063	平均值 Average value	0.18	达标 Yes
	彬垌 Bindong	1 小时 1 hour	6.7016	18010608	1.34	达标 Yes
		日平均 Average daily	0.8741	180723	0.58	达标 Yes
		年平均 Annual average	0.0990	平均值 Average value	0.16	达标 Yes
	新坡村 Xinpo Village	1 小时 1 hour	5.7342	18010608	1.15	达标 Yes
		日平均 Average daily	0.8793	180723	0.59	达标 Yes
		年平均 Annual average	0.0944	平均值 Average value	0.16	达标 Yes
	槟榔根 Binlanggen	1 小时 1 hour	3.9656	18091010	0.79	达标 Yes
		日平均 Average daily	0.8423	181122	0.56	达标 Yes
		年平均 Annual average	0.1054	平均值 Average value	0.18	达标 Yes
	网格 Mesh	1 小时 1 hour	7.5197	18080710	1.50	达标 Yes
		日平均 Average daily	2.5823	180625	1.72	达标 Yes
		年平均 Annual average	0.4204	平均值 Average value	0.70	达标 Yes

（2）二氧化氮（NO_2）

(2) Nitrogen dioxide (NO_2)

正常排放情况下，NO_2 贡献质量浓度预测结果见表 4.2-10。

The prediction results of NO_2 contribution mass concentration under normal emission conditions are shown in Table 4.2-10.

对于环境空气敏感目标而言，NO_2短期浓度（小时、日均）、长期浓度（年均）贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, the short-term concentration (hourly and daily average) and long-term (annual average) concentration contribution values of NO2 all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，NO_2短期浓度（小时平均浓度、日平均浓度）贡献值最大值分别为 22.0526μg/m^3、6.0589μg/m^3，最大占标率分别为 11.03%、7.57%，最大浓度占标率均<100%；长期浓度贡献值最大值为 1.0105g/m^3，最大占标率为 2.53%，最大浓度占标率<30%，NO_2 短期浓度、长期浓度贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, the maximum short-term concentration (hourly and daily average) contribution value of NO_2 is 22.0526μg/m^3 and 6.0589μg/m^3 respectively, and the maximum Pi is 11.03% and 7.57% respectively with Pi of maximum concentration both <100%. The maximum long-term concentration contribution value is 1.0105g/m^3 and the maximum Pi is 2.53% with Pi of maximum concentration <30%. The short-term and long-term concentration contribution value of NO_2 both comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-10 本项目正常工况下 NO_2 贡献质量浓度预测结果表

Table 4.2-10 Prediction Results of Mass Concentration Contribution of NO_2 from the Project under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
NO_2	猪血塘 Zhuxuetang	1 小时 1 hour	14.0656	18040908	7.03	达标 Yes
		日平均 Average daily	3.1984	180723	4.00	达标 Yes
		年平均 Annual	0.3402	平均值 Average value	0.85	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		average				
	百班 Baiban	1 小时 1 hour	15.2901	18040908	7.65	达标 Yes
		日平均 Average daily	3.6058	180716	4.51	达标 Yes
		年平均 Annual average	0.3593	平均值 Average value	0.90	达标 Yes
	竹儿根 Zhuergen	1 小时 1 hour	16.8067	18060208	8.40	达标 Yes
		日平均 Average daily	4.1480	180715	5.19	达标 Yes
		年平均 Annual average	0.4725	平均值 Average value	1.18	达标 Yes
	彬崇村 Binchong Village	1 小时 1 hour	19.8121	18030508	9.91	达标 Yes
		日平均 Average daily	4.5112	180918	5.64	达标 Yes
		年平均 Annual average	0.5682	平均值 Average value	1.42	达标 Yes
	山心 Shanxin	1 小时 1 hour	19.4569	18030508	9.73	达标 Yes
		日平均 Average daily	4.8270	180918	6.03	达标 Yes
		年平均 Annual average	0.6079	平均值 Average value	1.52	达标 Yes
	邓屋 Dengwu	1 小时 1 hour	15.5679	18082308	7.78	达标 Yes
		日平均 Average	4.7795	180715	5.97	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		daily				
		年平均 Annual average	0.6159	平均值 Average value	1.54	达标 Yes
	对面垌 Duimiandong	1 小时 1 hour	15.1458	18091010	7.57	达标 Yes
		日平均 Average daily	3.9894	180723	4.99	达标 Yes
		年平均 Annual average	0.4095	平均值 Average value	1.02	达标 Yes
	老妗垌 Laojindong	1 小时 1 hour	15.4340	18091010	7.72	达标 Yes
		日平均 Average daily	3.3724	181122	4.22	达标 Yes
		年平均 Annual average	0.4314	平均值 Average value	1.08	达标 Yes
	坡尾底 Poweidi	1 小时 1 hour	16.6155	18081908	8.31	达标 Yes
		日平均 Average daily	5.0229	181101	6.28	达标 Yes
		年平均 Annual average	0.5566	平均值 Average value	1.39	达标 Yes
	川江 Chuanjiang	1 小时 1 hour	18.1527	18081908	9.08	达标 Yes
		日平均 Average daily	3.9453	180929	4.93	达标 Yes
		年平均 Annual average	0.6299	平均值 Average value	1.57	达标 Yes
	彬定（新）	1 小时	14.7010	18022409	7.35	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
	Binding (New village)	1 hour				Yes
		日平均 Average daily	2.6946	180308	3.37	达标 Yes
		年平均 Annual average	0.4063	平均值 Average value	1.02	达标 Yes
	大塘村 Datang Village	1 小时 1 hour	14.3205	18061308	7.16	达标 Yes
		日平均 Average daily	3.2433	180131	4.05	达标 Yes
		年平均 Annual average	0.3045	平均值 Average value	0.76	达标 Yes
	南乐 Nanyue	1 小时 1 hour	16.0934	18081908	8.05	达标 Yes
		日平均 Average daily	4.2704	180307	5.34	达标 Yes
		年平均 Annual average	0.7988	平均值 Average value	2.00	达标 Yes
	陂头 Potou	1 小时 1 hour	15.3137	18052407	7.66	达标 Yes
		日平均 Average daily	4.6699	180125	5.84	达标 Yes
		年平均 Annual average	0.6326	平均值 Average value	1.58	达标 Yes
	亚细 Yaxi	1 小时 1 hour	14.3677	18080607	7.18	达标 Yes
		日平均 Average daily	3.6113	180125	4.51	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		年平均 Annual average	0.6578	平均值 Average value	1.64	达标 Yes
	南乐社区 Nanyue Community	1 小时 1 hour	15.6103	18080607	7.81	达标 Yes
		日平均 Average daily	3.1209	180625	3.90	达标 Yes
		年平均 Annual average	0.5459	平均值 Average value	1.36	达标 Yes
	海山排 Haishanpai	1 小时 1 hour	13.2370	18072909	6.62	达标 Yes
		日平均 Average daily	4.2153	180625	5.27	达标 Yes
		年平均 Annual average	0.6084	平均值 Average value	1.52	达标 Yes
	谢家村 Xiejiacun Village	1 小时 1 hour	15.3376	18082409	7.67	达标 Yes
		日平均 Average daily	2.9353	180725	3.67	达标 Yes
		年平均 Annual average	0.3619	平均值 Average value	0.90	达标 Yes
	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	13.9390	18091010	6.97	达标 Yes
		日平均 Average daily	2.9301	180131	3.66	达标 Yes
		年平均	0.3274	平均值	0.82	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		Annual average		Average value		Yes
	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	13.9830	18091010	6.99	达标 Yes
		日平均 Average daily	2.7596	181122	3.45	达标 Yes
		年平均 Annual average	0.3442	平均值 Average value	0.86	达标 Yes
	华南北苑 Huanan Beiyuan	1 小时 1 hour	14.1682	18091010	7.08	达标 Yes
		日平均 Average daily	2.8713	181122	3.59	达标 Yes
		年平均 Annual average	0.3571	平均值 Average value	0.89	达标 Yes
	新岭 Xinling	1 小时 1 hour	14.6943	18091010	7.35	达标 Yes
		日平均 Average daily	3.1755	181122	3.97	达标 Yes
		年平均 Annual average	0.4015	平均值 Average value	1.00	达标 Yes
	新铺 Xinpu	1 小时 1 hour	15.3439	18101415	7.67	达标 Yes
		日平均 Average daily	3.8759	180526	4.84	达标 Yes
		年平均 Annual average	0.4439	平均值 Average value	1.11	达标 Yes
	大田 Datian	1 小时 1 hour	18.2223	18072608	9.11	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		日平均 Average daily	3.3362	180918	4.17	达标 Yes
		年平均 Annual average	0.4076	平均值 Average value	1.02	达标 Yes
	大竹园 Dazhuyuan	1 小时 1 hour	13.5063	18050310	6.75	达标 Yes
		日平均 Average daily	3.1789	180716	3.97	达标 Yes
		年平均 Annual average	0.3040	平均值 Average value	0.76	达标 Yes
	彬垌 Bindong	1 小时 1 hour	13.0781	18040908	6.54	达标 Yes
		日平均 Average daily	2.6362	180723	3.30	达标 Yes
		年平均 Annual average	0.2863	平均值 Average value	0.72	达标 Yes
	新坡村 Xinpo Village	1 小时 1 hour	12.5847	18091010	6.29	达标 Yes
		日平均 Average daily	2.6853	180723	3.36	达标 Yes
		年平均 Annual average	0.2748	平均值 Average value	0.69	达标 Yes
	槟榔根 Binlanggen	1 小时 1 hour	12.5198	18091010	6.26	达标 Yes
		日平均 Average daily	2.5186	181122	3.15	达标 Yes
		年平均 Annual	0.3132	平均值 Average value	0.78	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		average				
	网格 Mesh	1 小时 1 hour	22.0526	18081908	11.03	达标 Yes
		日平均 Average daily	6.0589	180625	7.57	达标 Yes
		年平均 Annual average	1.0105	平均值 Average value	2.53	达标 Yes

（3）颗粒物（PM_{10}）

(3) Particulate matter (PM_{10})

正常排放情况下，PM_{10}的预测计算的结果见表 4.2-11。

The prediction results of PM10 under normal emission conditions are shown in Table 4.2-11.

对于环境空气敏感目标而言，PM_{10}短期浓度（日均）、长期浓度（年均）贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, the short-term concentration (daily average) and long-term (annual average) concentration contribution values of PM_{10} all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，PM_{10}短期浓度（日均）贡献值最大值为 1.2701μg/m^3，最大占标率为 0.85%，最大浓度占标率<100%；长期浓度贡献值最大值为 0.1969μg/m^3，最大占标率为 0.28%，最大浓度占标率<30%，PM_{10}短期浓度、长期浓度贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, the maximum short-term concentration (daily average) contribution value of PM10 is 1.2701μg/m^3, and the maximum Pi is 0.85% with Pi of maximum concentration both <100%. The maximum long-term concentration contribution value is 0.1969μg/m^3 and the maximum Pi is 0.28% with Pi of maximum concentration <30%. The short-term and long-term concentration contribution value of PM10 both comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-11 正常工况 PM_{10} 预测结果表
Table 4.2-11 Prediction Results of SO_{10} under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
PM_{10}	猪血塘 Zhuxuetang	日平均 Average daily	0.5242	180723	0.35	达标 Yes
		年平均 Annual average	0.0570	平均值 Average value	0.08	达标 Yes
	百班 Baiban	日平均 Average daily	0.5908	180716	0.39	达标 Yes
		年平均 Annual average	0.0607	平均值 Average value	0.09	达标 Yes
	竹儿根 Zhuergen	日平均 Average daily	0.6874	180715	0.46	达标 Yes
		年平均 Annual average	0.0795	平均值 Average value	0.11	达标 Yes
	彬崇村 Binchong Village	日平均 Average daily	0.7470	180918	0.50	达标 Yes
		年平均 Annual average	0.0949	平均值 Average value	0.14	达标 Yes
	山心 Shanxin	日平均 Average daily	0.8024	180918	0.53	达标 Yes
		年平均 Annual average	0.1009	平均值 Average value	0.14	达标 Yes
	邓屋 Dengwu	日平均 Average daily	0.8454	180715	0.56	达标 Yes
		年平均	0.1059	平均值	0.15	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		Annual average		Average value		Yes
	对面垌 Duimiandong	日平均 Average daily	0.6548	180723	0.44	达标 Yes
		年平均 Annual average	0.0686	平均值 Average value	0.10	达标 Yes
	老妗垌 Laojindong	日平均 Average daily	0.5516	181122	0.37	达标 Yes
		年平均 Annual average	0.0712	平均值 Average value	0.10	达标 Yes
	坡尾底 Poweidi	日平均 Average daily	0.8300	181101	0.55	达标 Yes
		年平均 Annual average	0.0997	平均值 Average value	0.14	达标 Yes
	川江 Chuanjiang	日平均 Average daily	0.6520	180929	0.43	达标 Yes
		年平均 Annual average	0.1065	平均值 Average value	0.15	达标 Yes
	彬定（新） Binding (New village)	日平均 Average daily	0.4436	180308	0.30	达标 Yes
		年平均 Annual average	0.0667	平均值 Average value	0.10	达标 Yes
	大塘村 Datang Village	日平均 Average daily	0.5327	180131	0.36	达标 Yes
		年平均 Annual	0.0505	平均值 Average value	0.07	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		average				
	南乐 Nanyue	日平均 Average daily	0.7009	180307	0.47	达标 Yes
		年平均 Annual average	0.1326	平均值 Average value	0.19	达标 Yes
	陂头 Potou	日平均 Average daily	0.7685	180125	0.51	达标 Yes
		年平均 Annual average	0.1042	平均值 Average value	0.15	达标 Yes
	亚细 Yaxi	日平均 Average daily	0.5925	180125	0.40	达标 Yes
		年平均 Annual average	0.1078	平均值 Average value	0.15	达标 Yes
	南乐社区 Nanyue Community	日平均 Average daily	0.5088	180625	0.34	达标 Yes
		年平均 Annual average	0.0891	平均值 Average value	0.13	达标 Yes
	海山排 Haishanpai	日平均 Average daily	0.6851	180625	0.46	达标 Yes
		年平均 Annual average	0.0995	平均值 Average value	0.14	达标 Yes
	谢家村 Xiejiacun Village	日平均 Average daily	0.4800	180725	0.32	达标 Yes
		年平均 Annual average	0.0598	平均值 Average value	0.09	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
	阳光海岸（中石化倒班宿舍）Yangguang Coast (SINOPEC shift dormitory)	日平均 Average daily	0.4831	180131	0.32	达标 Yes
		年平均 Annual average	0.0540	平均值 Average value	0.08	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	日平均 Average daily	0.4515	181122	0.30	达标 Yes
		年平均 Annual average	0.0567	平均值 Average value	0.08	达标 Yes
	华南北苑 Huanan Beiyuan	日平均 Average daily	0.4700	181122	0.31	达标 Yes
		年平均 Annual average	0.0587	平均值 Average value	0.08	达标 Yes
	新岭 Xinling	日平均 Average daily	0.5200	181122	0.35	达标 Yes
		年平均 Annual average	0.0661	平均值 Average value	0.09	达标 Yes
	新铺 Xinpu	日平均 Average daily	0.6342	180526	0.42	达标 Yes
		年平均 Annual average	0.0753	平均值 Average value	0.11	达标 Yes
	大田 Datian	日平均 Average daily	0.5491	180918	0.37	达标 Yes
		年平均 Annual average	0.0679	平均值 Average value	0.10	达标 Yes
	大竹园 Dazhuyuan	日平均 Average	0.5218	180716	0.35	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		daily				
		年平均 Annual average	0.0515	平均值 Average value	0.07	达标 Yes
	彬垌 Bindong	日平均 Average daily	0.4302	180723	0.29	达标 Yes
		年平均 Annual average	0.0481	平均值 Average value	0.07	达标 Yes
	新坡村 Xinpo Village	日平均 Average daily	0.4369	180723	0.29	达标 Yes
		年平均 Annual average	0.0460	平均值 Average value	0.07	达标 Yes
	槟榔根 Binlanggen	日平均 Average daily	0.4119	181122	0.27	达标 Yes
		年平均 Annual average	0.0515	平均值 Average value	0.07	达标 Yes
	网格 Mesh	日平均 Average daily	1.2701	180625	0.85	达标 Yes
		年平均 Annual average	0.1969	平均值 Average value	0.28	达标 Yes

（4）颗粒物（$PM_{2.5}$）（含二次 PM2.5）

(4) Particulate matter (PM2.5) (including secondary $PM_{2.5}$)

由于项目排放的 SO_2 和 NOx 总量大于 500t/a，需进行二次 $PM_{2.5}$ 预测，SO_2、NO_2 的转化系数采取导则推荐的比率，ψ_{so_2} 为 0.58、ψ_{no_2} 为 0.44。

Total amount of SO_2 and NOx emitted by the project is more than 500t/a, necessitating prediction of secondary $PM_{2.5}$ prediction. The conversion factor of SO_2 and NO_2 shall be the ratio recommended in the guidelines, which shall be 0.58 for ψso2 and 0.44 for ψNO2.

正常排放情况下，$PM_{2.5}$（含二次 PM2.5）的预测计算的结果见表 4.2-12。

The prediction results of PM2.5 (including secondary PM2.5) under normal emission conditions are shown in Table 4.2-12.

对于环境空气敏感目标而言，$PM_{2.5}$（含二次 PM2.5）短期浓度（日平均浓度）、长期浓度（年平均浓度）贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, the short-term concentration (daily average) and long-term (annual average) concentration contribution values of PM2.5 all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，$PM_{2.5}$（含二次 PM2.5）短期浓度（日平均浓度）贡献值最大值为 4.5912μg/m^3，最大占标率为 6.12%，最大浓度占标率<100%；长期浓度贡献值最大值为 0.7612μg/m^3，最大占标率为 2.17%，最大浓度占标率<30%，$PM_{2.5}$（含二次 PM2.5）短期浓度、长期浓度贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, the maximum short-term (daily average) concentration contribution value of PM2.5 (including secondary PM2.5) is 4.5912μg/m^3, and the maximum Pi is 6.12% with Pi of maximum concentration <100%. The maximum long-term concentration contribution value is 0.7612μg/m^3 and the maximum Pi is 2.17% with Pi of maximum concentration <30%. The short-term and long-term concentration contribution value of PM2.5 (including secondary PM2.5) both comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-12 正常工况 $PM_{2.5}$（含二次 PM2.5）预测结果表

Table 4.2-12 Prediction Results of PM2.5 (including secondary PM2.5) under Normal Working Condition

污染物 **Pollutant**	预测点 **Prediction point**	平均时段 **Average period**	最大贡献值 **(μg/m^3) Maximum contribution (μg/m^3)**	出现时间 **(YYMMDDHH) Occurrence time (HHDDMMYY)**	占标率% **Pi %**	达标情况 **Up-to-standard status**
$PM_{2.5}$	猪血塘 Zhuxuetang	日平均 Average	2.2948	180723	3.06	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		daily				
		年平均 Annual average	0.2464	平均值 Average value	0.70	达标 Yes
	百班 Baiban	日平均 Average daily	2.5860	180716	3.45	达标 Yes
		年平均 Annual average	0.2614	平均值 Average value	0.75	达标 Yes
	竹儿根 Zhuergen	日平均 Average daily	3.0153	180715	4.02	达标 Yes
		年平均 Annual average	0.3434	平均值 Average value	0.98	达标 Yes
	彬崇村 Binchong Village	日平均 Average daily	3.2763	180918	4.37	达标 Yes
		年平均 Annual average	0.4113	平均值 Average value	1.18	达标 Yes
	山心 Shanxin	日平均 Average daily	3.5219	180918	4.70	达标 Yes
		年平均 Annual average	0.4382	平均值 Average value	1.25	达标 Yes
	邓屋 Dengwu	日平均 Average daily	3.5373	180715	4.72	达标 Yes
		年平均 Annual average	0.4528	平均值 Average value	1.29	达标 Yes
	对面垌 Duimiandong	日平均 Average daily	2.8673	180723	3.82	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		年平均 Annual average	0.2971	平均值 Average value	0.85	达标 Yes
	老妗垌 Laojindong	日平均 Average daily	2.4135	181122	3.22	达标 Yes
		年平均 Annual average	0.3108	平均值 Average value	0.89	达标 Yes
	坡尾底 Poweidi	日平均 Average daily	3.5933	181101	4.79	达标 Yes
		年平均 Annual average	0.4172	平均值 Average value	1.19	达标 Yes
	川江 Chuanjiang	日平均 Average daily	2.8302	180929	3.77	达标 Yes
		年平均 Annual average	0.4597	平均值 Average value	1.31	达标 Yes
	彬定（新） Binding (New village)	日平均 Average daily	1.9435	180308	2.59	达标 Yes
		年平均 Annual average	0.2911	平均值 Average value	0.83	达标 Yes
	大塘村 Datang Village	日平均 Average daily	2.3328	180131	3.11	达标 Yes
		年平均 Annual average	0.2193	平均值 Average value	0.63	达标 Yes
	南乐 Nanyue	日平均 Average daily	3.0690	180307	4.09	达标 Yes
		年平均	0.5761	平均值	1.65	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		Annual average		Average value		Yes
	陂头 Potou	日平均 Average daily	3.3670	180125	4.49	达标 Yes
		年平均 Annual average	0.4546	平均值 Average value	1.30	达标 Yes
	亚细 Yaxi	日平均 Average daily	2.5945	180125	3.46	达标 Yes
		年平均 Annual average	0.4698	平均值 Average value	1.34	达标 Yes
	南乐社区 Nanyue Community	日平均 Average daily	2.2250	180625	2.97	达标 Yes
		年平均 Annual average	0.3886	平均值 Average value	1.11	达标 Yes
	海山排 Haishanpai	日平均 Average daily	2.9945	180625	3.99	达标 Yes
		年平均 Annual average	0.4334	平均值 Average value	1.24	达标 Yes
	谢家村 Xiejiacun Village	日平均 Average daily	2.1000	180725	2.80	达标 Yes
		年平均 Annual average	0.2598	平均值 Average value	0.74	达标 Yes
	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	日平均 Average daily	2.1171	180131	2.82	达标 Yes
		年平均 Annual	0.2355	平均值 Average value	0.67	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		average				
	东方海岸大酒店 Oriental Coast Hotel	日平均 Average daily	1.9761	181122	2.63	达标 Yes
		年平均 Annual average	0.2475	平均值 Average value	0.71	达标 Yes
	华南北苑 Huanan Beiyuan	日平均 Average daily	2.0571	181122	2.74	达标 Yes
		年平均 Annual average	0.2565	平均值 Average value	0.73	达标 Yes
	新岭 Xinling	日平均 Average daily	2.2763	181122	3.04	达标 Yes
		年平均 Annual average	0.2888	平均值 Average value	0.83	达标 Yes
	新铺 Xinpu	日平均 Average daily	2.7599	180526	3.68	达标 Yes
		年平均 Annual average	0.3232	平均值 Average value	0.92	达标 Yes
	大田 Datian	日平均 Average daily	2.4059	180918	3.21	达标 Yes
		年平均 Annual average	0.2945	平均值 Average value	0.84	达标 Yes
	大竹园 Dazhuyuan	日平均 Average daily	2.2849	180716	3.05	达标 Yes
		年平均 Annual average	0.2212	平均值 Average value	0.63	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
	彬垌 Bindong	日平均 Average daily	1.8820	180723	2.51	达标 Yes
		年平均 Annual average	0.2074	平均值 Average value	0.59	达标 Yes
	新坡村 Xinpo Village	日平均 Average daily	1.9100	180723	2.55	达标 Yes
		年平均 Annual average	0.1987	平均值 Average value	0.57	达标 Yes
	槟榔根 Binlanggen	日平均 Average daily	1.8027	181122	2.40	达标 Yes
		年平均 Annual average	0.2247	平均值 Average value	0.64	达标 Yes
	网格 Mesh	日平均 Average daily	4.5912	180625	6.12	达标 Yes
		年平均 Annual average	0.7612	平均值 Average value	2.17	达标 Yes

（5）氯化氢（HCl）

(5) Hydrogen chloride (HCl)

正常排放情况下，HCl 的预测计算的结果见表 4.2-13。

The prediction results of HCl under normal emission conditions are shown in Table 4.2-13.

对于环境空气敏感目标而言，HCl 短期浓度（小时、日均）贡献值均满足《环境影响评价技术导则　大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。

In regard to ambient air sensitive targets, the short-term concentration (hourly and daily average) contribution values of HCl all comply with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018)*.

区域最大落地浓度网格点，HCl 短期浓度（小时、日均）贡献值最大值分别为 10.2365μg/m³、0.9232μg/m³，最大占标率分别为 20.47%、6.15%，最大浓度占标率均<100%，HCl 短期浓度贡献值均满足《环境影响评价技术导则 大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。

At the mesh point of regional maximum ground-level concentration, the maximum short-term concentration (hourly and daily average) contribution value of HCl is 10.2365μg/m³ and 0.9232μg/m³ respectively, and the maximum Pi is 20.47% and 6.15% respectively with Pi of maximum concentration both <100%. The short-term concentration contribution values of HCL both comply with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018)*.

表 4.2-13 正常工况 HCl 预测结果表
Table 4.2-13 Prediction Results of HCL under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
HCl	猪血塘 Zhuxuetang	1 小时 1 hour	3.0037	18091421	6.01	达标 Yes
		日平均 Average daily	0.1480	180818	0.99	达标 Yes
	百班 Baiban	1 小时 1 hour	1.2493	18090605	2.50	达标 Yes
		日平均 Average daily	0.1254	180716	0.84	达标 Yes
	竹儿根 Zhuergen	1 小时 1 hour	1.7313	18121807	3.46	达标 Yes
		日平均 Average daily	0.1590	180715	1.06	达标 Yes
	彬崇村 Binchong Village	1 小时 1 hour	2.0039	18112806	4.01	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		日平均 Average daily	0.1802	180918	1.20	达标 Yes
	山心 Shanxin	1 小时 1 hour	0.8811	18112806	1.76	达标 Yes
		日平均 Average daily	0.1886	180918	1.26	达标 Yes
	邓屋 Dengwu	1 小时 1 hour	5.7191	18022022	11.44	达标 Yes
		日平均 Average daily	0.3604	181001	2.40	达标 Yes
	对面垌 Duimiandong	1 小时 1 hour	2.7958	18091421	5.59	达标 Yes
		日平均 Average daily	0.1593	181006	1.06	达标 Yes
	老妗垌 Laojindong	1 小时 1 hour	2.8612	18031505	5.72	达标 Yes
		日平均 Average daily	0.1441	180131	0.96	达标 Yes
	坡尾底 Poweidi	1 小时 1 hour	4.2293	18082304	8.46	达标 Yes
		日平均 Average daily	0.4878	180305	3.25	达标 Yes
	川江 Chuanjiang	1 小时 1 hour	3.9794	18022406	7.96	达标 Yes
		日平均 Average daily	0.5622	180224	3.75	达标 Yes
	彬定（新） Binding (New village)	1 小时 1 hour	1.9316	18091206	3.86	达标 Yes
		日平均	0.1501	181023	1.00	达标

污染物 **Pollutant**	预测点 **Prediction point**	平均时段 **Average period**	最大贡献值 (μg/m^3) **Maximum contribution (μg/m^3)**	出现时间 (YYMMDDHH) **Occurrence time (HHDDMMYY)**	占标率% **Pi %**	达标情况 **Up-to-standard status**
		Average daily				Yes
	大塘村 Datang Village	1 小时 1 hour	0.9968	18121720	1.99	达标 Yes
		日平均 Average daily	0.1085	180131	0.72	达标 Yes
	南乐 Nanyue	1 小时 1 hour	3.6959	18041301	7.39	达标 Yes
		日平均 Average daily	0.2729	181222	1.82	达标 Yes
	陂头 Potou	1 小时 1 hour	1.5100	18041301	3.02	达标 Yes
		日平均 Average daily	0.1595	180125	1.06	达标 Yes
	亚细 Yaxi	1 小时 1 hour	3.0372	18051401	6.07	达标 Yes
		日平均 Average daily	0.1268	180125	0.85	达标 Yes
	南乐社区 Nanyue Community	1 小时 1 hour	3.0888	18051401	6.18	达标 Yes
		日平均 Average daily	0.1306	180505	0.87	达标 Yes
	海山排 Haishanpai	1 小时 1 hour	2.2497	18051401	4.50	达标 Yes
		日平均 Average daily	0.1191	180625	0.79	达标 Yes
	谢家村 Xiejiacun Village	1 小时 1 hour	1.9772	18061906	3.95	达标 Yes
		日平均 Average daily	0.1337	180619	0.89	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	1.3975	18031505	2.79	达标 Yes
		日平均 Average daily	0.1054	180131	0.70	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	2.1372	18031505	4.27	达标 Yes
		日平均 Average daily	0.1061	180131	0.71	达标 Yes
	华南北苑 Huanan Beiyuan	1 小时 1 hour	1.8809	18031505	3.76	达标 Yes
		日平均 Average daily	0.1131	181122	0.75	达标 Yes
	新岭 Xinling	1 小时 1 hour	2.4979	18031505	5.00	达标 Yes
		日平均 Average daily	0.1537	181120	1.02	达标 Yes
	新铺 Xinpu	1 小时 1 hour	2.1915	18111619	4.38	达标 Yes
		日平均 Average daily	0.1779	180619	1.19	达标 Yes
	大田 Datian	1 小时 1 hour	1.6049	18032724	3.21	达标 Yes
		日平均 Average daily	0.1186	180918	0.79	达标 Yes
	大竹园 Dazhuyuan	1 小时 1 hour	1.7887	18100621	3.58	达标 Yes
		日平均 Average daily	0.1323	181006	0.88	达标 Yes
	彬垌 Bindong	1 小时 1 hour	2.0241	18091421	4.05	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		日平均 Average daily	0.1117	180818	0.74	达标 Yes
	新坡村 Xinpo Village	1 小时 1 hour	1.0639	18030421	2.13	达标 Yes
		日平均 Average daily	0.0754	180723	0.50	达标 Yes
	槟榔根 Binlanggen	1 小时 1 hour	2.8701	18031505	5.74	达标 Yes
		日平均 Average daily	0.1313	181120	0.88	达标 Yes
	网格 Mesh	1 小时 1 hour	10.2365	18041301	20.47	达标 Yes
		日平均 Average daily	0.9232	180216	6.15	达标 Yes

（6）硫化氢（H_2S）

(6) Hydrogen chloride (H_2S)

正常排放情况下，H_2S 的预测计算的结果见表 4.2-14。

The prediction results of H2S under normal emission conditions are shown in Table 4.2-14.

对于环境空气敏感目标而言，H_2S 短期浓度（小时）贡献值均满足《环境影响评价技术导则 大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。

In regard to ambient air sensitive targets, the short-term concentration (hourly) contribution values of H2S all comply with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018)*.

区域最大落地浓度网格点，H_2S 短期浓度（小时浓度）贡献值最大值为 1.0433μg/m^3，最大占标率为 10.43%，最大浓度占标率<100%，H_2S 短期浓度贡献值满足《环境影响评

价技术导则 大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。

At the mesh point of regional maximum ground-level concentration, the maximum short-term (hourly) concentration value of H_2S is 1.0433μg/m^3, and the maximum Pi is 10.43% with Pi of maximum concentration <100%. The short-term concentration contribution value of H_2S complies with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018)*.

表 4.2-14 正常工况 H_2S 预测结果表

Table 4.2-14 Prediction Results of H2S under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
H_2S	猪血塘 Zhuxuetang	1 小时 1 hour	0.6534	18091010	6.53	达标 Yes
	百班 Baiban	1 小时 1 hour	0.6287	18091010	6.29	达标 Yes
	竹儿根 Zhuergen	1 小时 1 hour	0.7256	18082812	7.26	达标 Yes
	彬崇村 Binchong Village	1 小时 1 hour	0.7791	18082812	7.79	达标 Yes
	山心 Shanxin	1 小时 1 hour	0.8164	18030508	8.16	达标 Yes
	邓屋 Dengwu	1 小时 1 hour	0.8939	18082812	8.94	达标 Yes
	对面垌 Duimiandong	1 小时 1 hour	0.6431	18091010	6.43	达标 Yes
	老妗垌 Laojindong	1 小时 1 hour	0.6982	18022409	6.98	达标 Yes
	坡尾底 Poweidi	1 小时 1 hour	0.8711	18082812	8.71	达标 Yes
	川江 Chuanjiang	1 小时 1 hour	0.9408	18022409	9.41	达标 Yes
	彬定（新） Binding (New village)	1 小时 1 hour	0.7271	18022409	7.27	达标 Yes
	大塘村 Datang Village	1 小时 1 hour	0.5927	18091010	5.93	达标 Yes
	南乐 Nanyue	1 小时 1 hour	0.8546	18081908	8.55	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
	陂头 Potou	1 小时 1 hour	0.822	18030508	8.22	达标 Yes
	亚细 Yaxi	1 小时 1 hour	0.8201	18080607	8.2	达标 Yes
	南乐社区 Nanyue Community	1 小时 1 hour	0.8122	18080607	8.12	达标 Yes
	海山排 Haishanpai	1 小时 1 hour	0.6025	18030410	6.02	达标 Yes
	谢家村 Xiejiacun Village	1 小时 1 hour	0.707	18051308	7.07	达标 Yes
	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	0.5509	18091010	5.51	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	0.5783	18022409	5.78	达标 Yes
	华南北苑 Huanan Beiyuan	1 小时 1 hour	0.6073	18022409	6.07	达标 Yes
	新岭 Xinling	1 小时 1 hour	0.682	18022409	6.82	达标 Yes
	新铺 Xinpu	1 小时 1 hour	0.6766	18051308	6.77	达标 Yes
	大田 Datian	1 小时 1 hour	0.7112	18060208	7.11	达标 Yes
	大竹园 Dazhuyuan	1 小时 1 hour	0.7795	18010608	7.8	达标 Yes
	彬垌 Bindong	1 小时 1 hour	0.6078	18091010	6.08	达标 Yes
	新坡村 Xinpo Village	1 小时 1 hour	0.601	18091010	6.01	达标 Yes
	槟榔根 Binlanggen	1 小时 1 hour	0.5414	18022409	5.41	达标 Yes
	网格 Mesh	1 小时 1 hour	1.0433	18081908	10.43	达标 Yes

（7）氨（NH_3）

(7) Ammonia (NH_3)

正常排放情况下，NH_3 的预测计算的结果见表 4.2-15。

The prediction results of NH_3 under normal emission conditions are shown in Table 4.2-15.

对于环境空气敏感目标而言，NH_3 短期浓度（小时浓度）贡献值均满足《环境影响评价技术导则　大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。

In regard to ambient air sensitive targets, the short-term (hourly) concentration contribution values of NH_3 all comply with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018)*.

区域最大落地浓度网格点，NH_3 短期浓度（小时浓度）贡献值最大值为 36.9653μg/m^3，最大占标率为 18.48%，最大浓度占标率<100%，NH_3 短期浓度贡献值满足《环境影响评价技术导则　大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。

At the mesh point of regional maximum ground-level concentration, the maximum short-term (hourly) concentration contribution value of NH_3 is 36.9653μg/m$_3$, and the maximum Pi is 18.48% with Pi of maximum concentration <100%. The short-term concentration contribution value of NH_3 complies with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018)*.

表 4.2-15　正常工况 NH_3 预测结果表

Table 4.2-15 Prediction Results of NH3 under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
NH_3	猪血塘 Zhuxuetang	1 小时 1 hour	4.511	18031505	2.26	达标 Yes
	百班 Baiban	1 小时 1 hour	1.5325	18122306	0.77	达标 Yes
	竹儿根 Zhuergen	1 小时 1 hour	3.7103	18022820	1.86	达标 Yes

	彬崇村 Binchong Village	1 小时 1 hour	3.5541	18090605	1.78	达标 Yes
	山心 Shanxin	1 小时 1 hour	2.9353	18032207	1.47	达标 Yes
	邓屋 Dengwu	1 小时 1 hour	7.942	18091421	3.97	达标 Yes
	对面垌 Duimiandong	1 小时 1 hour	9.3825	18031505	4.69	达标 Yes
	老妗垌 Laojindong	1 小时 1 hour	2.6753	18091206	1.34	达标 Yes
	坡尾底 Poweidi	1 小时 1 hour	4.7498	18090403	2.37	达标 Yes
	川江 Chuanjiang	1 小时 1 hour	6.5181	18010621	3.26	达标 Yes
	彬定（新） Binding (New village)	1 小时 1 hour	4.1682	18121803	2.08	达标 Yes
	大塘村 Datang Village	1 小时 1 hour	4.0855	18031505	2.04	达标 Yes
	南乐 Nanyue	1 小时 1 hour	7.412	18032724	3.71	达标 Yes
	陂头 Potou	1 小时 1 hour	3.2016	18112806	1.6	达标 Yes
	亚细 Yaxi	1 小时 1 hour	8.732	18041301	4.37	达标 Yes
	南乐社区 Nanyue Community	1 小时 1 hour	4.641	18041301	2.32	达标 Yes
	海山排 Haishanpai	1 小时 1 hour	8.0462	18051401	4.02	达标 Yes
	谢家村 Xiejiacun Village	1 小时 1 hour	8.565	18111619	4.28	达标 Yes
	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	2.0676	18031505	1.03	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	2.4052	18091206	1.2	达标 Yes
	华南北苑 Huanan Beiyuan	1 小时 1 hour	2.2561	18091206	1.13	达标 Yes
	新岭 Xinling	1 小时 1 hour	2.0478	18091206	1.02	达标 Yes
	新铺 Xinpu	1 小时 1 hour	10.2956	18051802	5.15	达标 Yes
	大田	1 小时	2.2033	18090605	1.1	达标

	Datian	1 hour				Yes
	大竹园 Dazhuyuan	1 小时 1 hour	2.391	18030421	1.2	达标 Yes
	彬垌 Bindong	1 小时 1 hour	2.233	18121720	1.12	达标 Yes
	新坡村 Xinpo Village	1 小时 1 hour	1.9391	18121720	0.97	达标 Yes
	槟榔根 Binlanggen	1 小时 1 hour	2.4172	18091206	1.21	达标 Yes
	网格 Mesh	1 小时 1 hour	36.9653	18022022	18.48	达标 Yes

（8）TSP

(8) TSP

正常排放情况下，TSP 的预测计算的结果见表 4.2-16。

The prediction results of TSP under normal emission conditions are shown in Table 4.2-16.

对于环境空气敏感目标而言，TSP 短期浓度（日均）、长期浓度（年均）贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, the short-term concentration (daily average) and long-term (annual average) concentration contribution values of TSP all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，TSP 短期浓度（日均）贡献值最大值为 2243194μg/m^3，最大占标率为 74.77%，最大浓度占标率<100%；长期浓度贡献值最大值为 62.9776μg/m^3，最大占标率为 31.49%，最大浓度占标率<30%，TSP 短期浓度、长期浓度贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, the maximum short-term (daily average) concentration contribution value of TSP is 2243194μg/m^3, and the maximum Pi is 74.77% with Pi of maximum concentration <100%. The maximum long-term concentration contribution value is 62.9776μg/m^3 and the maximum Pi is 31.49% with Pi of maximum concentration <30%. The short-term and long-term concentration contribution value of TSP both comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-16 正常工况 TSP 预测结果表
Table 4.2-16 Prediction Results of TSP under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
TSP	猪血塘 Zhuxuetang	日平均 Average daily	12.1254	181006	4.04	达标 Yes
		年平均 Annual average	1.3396	平均值 Average value	0.67	达标 Yes
	百班 Baiban	日平均 Average daily	9.8424	180922	3.28	达标 Yes
		年平均 Annual average	1.4481	平均值 Average value	0.72	达标 Yes
	竹儿根 Zhuergen	日平均 Average daily	15.8068	181124	5.27	达标 Yes
		年平均 Annual average	1.7998	平均值 Average value	0.9	达标 Yes
	彬崇村 Binchong Village	日平均 Average daily	9.8228	181004	3.27	达标 Yes
		年平均 Annual average	1.3793	平均值 Average value	0.69	达标 Yes
	山心 Shanxin	日平均 Average daily	8.7894	181222	2.93	达标 Yes
		年平均 Annual average	0.8982	平均值 Average value	0.45	达标 Yes
	邓屋 Dengwu	日平均 Average daily	31.5508	181124	10.52	达标 Yes
		年平均 Annual average	4.2122	平均值 Average value	2.11	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
	对面垌 Duimiandong	日平均 Average daily	21.3984	181006	7.13	达标 Yes
		年平均 Annual average	2.4287	平均值 Average value	1.21	达标 Yes
	老妗垌 Laojindong	日平均 Average daily	11.9866	181120	4	达标 Yes
		年平均 Annual average	1.0812	平均值 Average value	0.54	达标 Yes
	坡尾底 Poweidi	日平均 Average daily	30.7322	180413	10.24	达标 Yes
		年平均 Annual average	1.9298	平均值 Average value	0.96	达标 Yes
	川江 Chuanjiang	日平均 Average daily	31.6477	180508	10.55	达标 Yes
		年平均 Annual average	2.5022	平均值 Average value	1.25	达标 Yes
	彬定（新） Binding (New village)	日平均 Average daily	18.3817	180408	6.13	达标 Yes
		年平均 Annual average	1.6069	平均值 Average value	0.8	达标 Yes
	大塘村 Datang Village	日平均 Average daily	6.9584	180805	2.32	达标 Yes
		年平均 Annual average	0.4613	平均值 Average value	0.23	达标 Yes
	南乐 Nanyue	日平均 Average	10.6224	180521	3.54	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		daily				
		年平均 Annual average	1.2867	平均值 Average value	0.64	达标 Yes
	陂头 Potou	日平均 Average daily	6.6098	180521	2.2	达标 Yes
		年平均 Annual average	0.7045	平均值 Average value	0.35	达标 Yes
	亚细 Yaxi	日平均 Average daily	6.2721	180514	2.09	达标 Yes
		年平均 Annual average	0.4518	平均值 Average value	0.23	达标 Yes
	南乐社区 Nanyue Community	日平均 Average daily	4.7996	180516	1.6	达标 Yes
		年平均 Annual average	0.3592	平均值 Average value	0.18	达标 Yes
	海山排 Haishanpai	日平均 Average daily	8.0326	180802	2.68	达标 Yes
		年平均 Annual average	0.3189	平均值 Average value	0.16	达标 Yes
	谢家村 Xiejiacun Village	日平均 Average daily	7.4469	181116	2.48	达标 Yes
		年平均 Annual average	0.3564	平均值 Average value	0.18	达标 Yes
	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift	日平均 Average daily	7.5204	180315	2.51	达标 Yes
		年平均	0.448	平均值	0.22	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
	dormitory)	Annual average		Average value		Yes
	东方海岸大酒店 Oriental Coast Hotel	日平均 Average daily	9.1322	181120	3.04	达标 Yes
		年平均 Annual average	0.4983	平均值 Average value	0.25	达标 Yes
	华南北苑 Huanan Beiyuan	日平均 Average daily	9.0412	181120	3.01	达标 Yes
		年平均 Annual average	0.5256	平均值 Average value	0.26	达标 Yes
	新岭 Xinling	日平均 Average daily	10.52	181120	3.51	达标 Yes
		年平均 Annual average	0.7737	平均值 Average value	0.39	达标 Yes
	新铺 Xinpu	日平均 Average daily	7.7484	180518	2.58	达标 Yes
		年平均 Annual average	0.5105	平均值 Average value	0.26	达标 Yes
	大田 Datian	日平均 Average daily	8.7327	181004	2.91	达标 Yes
		年平均 Annual average	0.8635	平均值 Average value	0.43	达标 Yes
	大竹园 Dazhuyuan	日平均 Average daily	9.3767	180922	3.13	达标 Yes
		年平均 Annual average	0.9768	平均值 Average value	0.49	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
	彬垌 Bindong	日平均 Average daily	5.8724	180228	1.96	达标 Yes
		年平均 Annual average	0.7091	平均值 Average value	0.35	达标 Yes
	新坡村 Xinpo Village	日平均 Average daily	5.727	180304	1.91	达标 Yes
		年平均 Annual average	0.5158	平均值 Average value	0.26	达标 Yes
	槟榔根 Binlanggen	日平均 Average daily	8.9316	181120	2.98	达标 Yes
		年平均 Annual average	0.4071	平均值 Average value	0.2	达标 Yes
	网格 Mesh	日平均 Average daily	224.3194	180106	74.77	达标 Yes
		年平均 Annual average	62.9776	平均值 Average value	31.49	达标 Yes

（9）汞（Hg）

(9) Mercury (Hg)

正常排放情况下，Hg 的预测计算的结果见表 4.2-17。

The prediction results of Hg under normal emission conditions are shown in Table 4.2-17.

对于环境空气敏感目标而言，Hg 短期浓度（日均浓度）贡献值满足《工业企业设计卫生标准》（TJ36-79）居民区有害物质最高允许浓度要求；长期浓度（年均值）贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, the short-term (daily average) concentration contribution values of Hg all comply with maximum allowable concentration requirement for hazardous substances in residential quarters in *Hygienic Standard of Industrial Enterprise Design* (TJ36-79). The long-term (annual average) concentration contribution values thereof all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，Hg 短期浓度（日平均浓度）贡献值最大值为 0.00034μg/m³，最大占标率为 0.11%，最大浓度占标率<100%；长期浓度贡献值最大值为 0.00006μg/m³，最大占标率为 0.12%，最大浓度占标率<30%，Hg 短期浓度贡献值满足《工业企业设计卫生标准》（TJ36-79）居民区有害物质最高允许浓度要求；长期浓度（年均值）贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, the maximum short-term concentration (daily average) contribution value of Hg is 0.00034μg/m³, and the maximum Pi is 0.11% with Pi of maximum concentration <100%. The maximum long-term concentration contribution value is 0.00006μg/m³ and the maximum Pi is 0.12% with Pi of maximum concentration <30%. The short-term concentration contribution value complies with maximum allowable concentration requirement for hazardous substances in residential quarters in *Hygienic Standard of Industrial Enterprise Design* (TJ36-79). The long-term (annual average) concentration contribution value complies with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-17 正常工况 Hg 预测结果表

Table 4.2-17 Prediction Results of Hg under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
Hg	猪血塘 Zhuxuetang	日平均 Average daily	0.0001	180723	0.03	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.02	达标 Yes
	百班 Baiban	日平均 Average daily	0.00012	180716	0.04	达标 Yes
		年平均	0.00001	平均值	0.02	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		Annual average		Average value		Yes
	竹儿根 Zhuergen	日平均 Average daily	0.00016	180715	0.05	达标 Yes
		年平均 Annual average	0.00002	平均值 Average value	0.04	达标 Yes
	彬崇村 Binchong Village	日平均 Average daily	0.00017	180918	0.06	达标 Yes
		年平均 Annual average	0.00002	平均值 Average value	0.04	达标 Yes
	山心 Shanxin	日平均 Average daily	0.00019	180918	0.06	达标 Yes
		年平均 Annual average	0.00002	平均值 Average value	0.04	达标 Yes
	邓屋 Dengwu	日平均 Average daily	0.00017	180715	0.06	达标 Yes
		年平均 Annual average	0.00002	平均值 Average value	0.04	达标 Yes
	对面垌 Duimiandong	日平均 Average daily	0.00013	180723	0.04	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.02	达标 Yes
	老妗垌 Laojindong	日平均 Average daily	0.00012	180131	0.04	达标 Yes
		年平均 Annual	0.00001	平均值 Average value	0.02	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		average				
	坡尾底 Poweidi	日平均 Average daily	0.00016	180606	0.05	达标 Yes
		年平均 Annual average	0.00002	平均值 Average value	0.04	达标 Yes
	川江 Chuanjiang	日平均 Average daily	0.00014	180225	0.05	达标 Yes
		年平均 Annual average	0.00002	平均值 Average value	0.04	达标 Yes
	彬定（新） Binding (New village)	日平均 Average daily	0.00009	180308	0.03	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.02	达标 Yes
	大塘村 Datang Village	日平均 Average daily	0.00011	180131	0.04	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.02	达标 Yes
	南乐 Nanyue	日平均 Average daily	0.00016	180918	0.05	达标 Yes
		年平均 Annual average	0.00003	平均值 Average value	0.06	达标 Yes
	陂头 Potou	日平均 Average daily	0.00016	180125	0.05	达标 Yes
		年平均 Annual average	0.00002	平均值 Average value	0.04	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
	亚细 Yaxi	日平均 Average daily	0.00012	180125	0.04	达标 Yes
		年平均 Annual average	0.00002	平均值 Average value	0.04	达标 Yes
	南乐社区 Nanyue Community	日平均 Average daily	0.00011	180505	0.04	达标 Yes
		年平均 Annual average	0.00002	平均值 Average value	0.04	达标 Yes
	海山排 Haishanpai	日平均 Average daily	0.00012	180625	0.04	达标 Yes
		年平均 Annual average	0.00002	平均值 Average value	0.04	达标 Yes
	谢家村 Xiejiacun Village	日平均 Average daily	0.00009	180725	0.03	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.02	达标 Yes
	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	日平均 Average daily	0.0001	180131	0.03	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.02	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	日平均 Average daily	0.0001	180131	0.03	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.02	达标 Yes
	华南北苑	日平均	0.00009	181122	0.03	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
	Huanan Beiyuan	Average daily				Yes
		年平均 Annual average	0.00001	平均值 Average value	0.02	达标 Yes
	新岭 Xinling	日平均 Average daily	0.0001	181122	0.03	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.02	达标 Yes
	新铺 Xinpu	日平均 Average daily	0.00012	180725	0.04	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.02	达标 Yes
	大田 Datian	日平均 Average daily	0.00011	180918	0.04	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.02	达标 Yes
	大竹园 Dazhuyuan	日平均 Average daily	0.0001	180716	0.03	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.02	达标 Yes
	彬垌 Bindong	日平均 Average daily	0.00008	180723	0.03	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.02	达标 Yes
	新坡村 Xinpo Village	日平均 Average	0.00008	180723	0.03	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		daily				
		年平均 Annual average	0.00001	平均值 Average value	0.02	达标 Yes
	槟榔根 Binlanggen	日平均 Average daily	0.00008	181122	0.03	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.02	达标 Yes
	网格 Mesh	日平均 Average daily	0.00024	180625	0.08	达标 Yes
		年平均 Annual average	0.00005	平均值 Average value	0.10	达标 Yes

（10）砷（As）

(10) Arsenic (As)

正常排放情况下，As的预测计算的结果见表4.2-18。

The prediction results of As under normal emission conditions are shown in Table 4.2-18.

对于环境空气敏感目标而言，As短期浓度（日均浓度）贡献值满足《工业企业设计卫生标准》（TJ36-79）居民区有害物质最高允许浓度要求；长期浓度（年均值）贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, the short-term (daily average) concentration contribution values of As all comply with maximum allowable concentration requirement for hazardous substances in residential quarters in *Hygienic Standard of Industrial Enterprise Design* (TJ36-79). The long-term (annual average) concentration contribution values thereof all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，As短期浓度（日平均浓度）贡献值最大值为0.0001μg/m^3，

最大占标率为 0.00%，最大浓度占标率<100%；长期浓度贡献值最大值为 0.00002μg/m^3，最大占标率为 0.33%，最大浓度占标率<30%，As 短期浓度贡献值满足《工业企业设计卫生标准》（TJ36-79）居民区有害物质最高允许浓度要求；长期浓度（年均值）贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, the maximum short-term concentration (daily average) contribution value of As is 0.0001μg/m^3, and the maximum Pi is 0.00% with Pi of maximum concentration <100%. The maximum long-term concentration contribution value is 0.00002μg/m^3 and the maximum Pi is 0.33% with Pi of maximum concentration <30%. The short-term concentration contribution value complies with maximum allowable concentration requirement for hazardous substances in residential quarters in *Hygienic Standard of Industrial Enterprise Design* (TJ36-79). The long-term (annual average) concentration contribution value complies with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-18 正常工况 As 预测结果表

Table 4.2-18 Prediction Results of As under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
As	猪血塘 Zhuxuetang	日平均 Average daily	0.00004	180723	0.00	达标 Yes
		年平均 Annual average	0.0	平均值 Average value	0.00	达标 Yes
	百班 Baiban	日平均 Average daily	0.00005	180716	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	竹儿根 Zhuergen	日平均 Average daily	0.00006	180715	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	彬崇村	日平均	0.00007	180918	0.00	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
	Binchong Village	Average daily				Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	山心 Shanxin	日平均 Average daily	0.00008	180918	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	邓屋 Dengwu	日平均 Average daily	0.00007	180715	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	对面垌 Duimiandong	日平均 Average daily	0.00005	180723	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	老妗垌 Laojindong	日平均 Average daily	0.00005	180131	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	坡尾底 Poweidi	日平均 Average daily	0.00006	180606	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	川江 Chuanjiang	日平均 Average	0.00006	180225	0.00	达标 Yes

污染物 **Pollutant**	预测点 **Prediction point**	平均时段 **Average period**	最大贡献值 (μg/m^3) **Maximum contribution (μg/m^3)**	出现时间 (YYMMDDHH) **Occurrence time (HHDDMMYY)**	占标率% **Pi %**	达标情况 **Up-to-standard status**
		daily				
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	彬定（新） Binding (New village)	日平均 Average daily	0.00004	181207	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	大塘村 Datang Village	日平均 Average daily	0.00004	180131	0.00	达标 Yes
		年平均 Annual average	0.0	平均值 Average value	0.00	达标 Yes
	南乐 Nanyue	日平均 Average daily	0.00006	180918	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	陂头 Potou	日平均 Average daily	0.00007	180125	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	亚细 Yaxi	日平均 Average daily	0.00005	180125	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	南乐社区 Nanyue Community	日平均 Average daily	0.00005	180505	0.00	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	海山排 Haishanpai	日平均 Average daily	0.00005	180625	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	谢家村 Xiejiacun Village	日平均 Average daily	0.00004	180725	0.00	达标 Yes
		年平均 Annual average	0.0	平均值 Average value	0.00	达标 Yes
	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	日平均 Average daily	0.00004	180131	0.00	达标 Yes
		年平均 Annual average	0.0	平均值 Average value	0.00	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	日平均 Average daily	0.00004	180131	0.00	达标 Yes
		年平均 Annual average	0.0	平均值 Average value	0.00	达标 Yes
	华南北苑 Huanan Beiyuan	日平均 Average daily	0.00004	180131	0.00	达标 Yes
		年平均 Annual average	0.0	平均值 Average value	0.00	达标 Yes
	新岭 Xinling	日平均 Average daily	0.00004	181122	0.00	达标 Yes
		年平均 Annual	0.00001	平均值 Average value	0.17	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		average				
	新铺 Xinpu	日平均 Average daily	0.00005	180725	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	大田 Datian	日平均 Average daily	0.00005	180918	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	大竹园 Dazhuyuan	日平均 Average daily	0.00004	180716	0.00	达标 Yes
		年平均 Annual average	0.0	平均值 Average value	0.00	达标 Yes
	彬垌 Bindong	日平均 Average daily	0.00003	180723	0.00	达标 Yes
		年平均 Annual average	0.0	平均值 Average value	0.00	达标 Yes
	新坡村 Xinpo Village	日平均 Average daily	0.00003	180723	0.00	达标 Yes
		年平均 Annual average	0.0	平均值 Average value	0.00	达标 Yes
	槟榔根 Binlanggen	日平均 Average daily	0.00003	181122	0.00	达标 Yes
		年平均 Annual average	0.0	平均值 Average value	0.00	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
	网格 Mesh	日平均 Average daily	0.00010	180919	0.00	达标 Yes
		年平均 Annual average	0.00002	平均值 Average value	0.33	达标 Yes

（11）镉（Cd）

(11) Cadmium (Cd)

正常排放情况下，Cd 的预测计算的结果见表 4.2-19。

The prediction results of Cd under normal emission conditions are shown in Table 4.2-19.

对于环境空气敏感目标而言，Cd 长期浓度（年均值）贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, the long-term (annual average) concentration contribution values of Cd all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，Cd 长期浓度贡献值最大值为 0.0002μg/m^3，最大占标率为 4%，最大浓度占标率<30%，满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, the maximum long-term concentration contribution value of Cd is 0.0002μg/m3 and the maximum Pi is 4% with Pi of maximum concentration <30%, which comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-19 正常工况 Cd 预测结果表

Table 4.2-19 Prediction Results of Cd under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
Cd	猪血塘 Zhuxuetang	年平均 Annual average	0.00004	平均值 Average value	0.80	达标 Yes
	百班 Baiban	年平均 Annual average	0.00004	平均值 Average value	0.80	达标 Yes
	竹儿根 Zhuergen	年平均 Annual average	0.00006	平均值 Average value	1.20	达标 Yes
	彬崇村 Binchong Village	年平均 Annual average	0.00007	平均值 Average value	1.40	达标 Yes
	山心 Shanxin	年平均 Annual average	0.00007	平均值 Average value	1.40	达标 Yes
	邓屋 Dengwu	年平均 Annual average	0.00008	平均值 Average value	1.60	达标 Yes
	对面垌 Duimiandong	年平均 Annual average	0.00005	平均值 Average value	1.00	达标 Yes
	老妗垌 Laojindong	年平均 Annual average	0.00005	平均值 Average value	1.00	达标 Yes
	坡尾底 Poweidi	年平均 Annual average	0.00008	平均值 Average value	1.60	达标 Yes
	川江 Chuanjiang	年平均 Annual average	0.00008	平均值 Average value	1.60	达标 Yes
	彬定（新） Binding (New village)	年平均 Annual average	0.00004	平均值 Average value	0.80	达标 Yes
	大塘村 Datang Village	年平均 Annual average	0.00003	平均值 Average value	0.60	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
	南乐 Nanyue	年平均 Annual average	0.00009	平均值 Average value	1.80	达标 Yes
	陂头 Potou	年平均 Annual average	0.00007	平均值 Average value	1.40	达标 Yes
	亚细 Yaxi	年平均 Annual average	0.00007	平均值 Average value	1.40	达标 Yes
	南乐社区 Nanyue Community	年平均 Annual average	0.00005	平均值 Average value	1.00	达标 Yes
	海山排 Haishanpai	年平均 Annual average	0.00006	平均值 Average value	1.20	达标 Yes
	谢家村 Xiejiacun Village	年平均 Annual average	0.00004	平均值 Average value	0.80	达标 Yes
	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	年平均 Annual average	0.00004	平均值 Average value	0.80	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	年平均 Annual average	0.00004	平均值 Average value	0.80	达标 Yes
	华南北苑 Huanan Beiyuan	年平均 Annual average	0.00004	平均值 Average value	0.80	达标 Yes
	新岭 Xinling	年平均 Annual average	0.00005	平均值 Average value	1.00	达标 Yes
	新铺 Xinpu	年平均 Annual average	0.00005	平均值 Average value	1.00	达标 Yes
	大田 Datian	年平均 Annual average	0.00005	平均值 Average value	1.00	达标 Yes
	大竹园	年平均	0.00004	平均值	0.80	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
	Dazhuyuan	Annual average		Average value		Yes
	彬垌 Bindong	年平均 Annual average	0.00003	平均值 Average value	0.60	达标 Yes
	新坡村 Xinpo Village	年平均 Annual average	0.00003	平均值 Average value	0.60	达标 Yes
	槟榔根 Binlanggen	年平均 Annual average	0.00003	平均值 Average value	0.60	达标 Yes
	网格 Mesh	年平均 Annual average	0.00017	平均值 Average value	3.40	达标 Yes

（12）氯气（Cl_2）

(12) Chlorine (Cl_2)

正常排放情况下，Cl_2 的预测计算的结果见表 4.2-20。

The prediction results of Cl2 under normal emission conditions are shown in Table 4.2-20.

对于环境空气敏感目标而言，Cl_2 短期浓度（小时、日均浓度）贡献值均满足《环境影响评价技术导则 大气环境》（HJ 2.2-2018）附录 D 其他污染物空气质量浓度参考限值。区域最大落地浓度网格点，Cl_2 短期浓度（小时、日平均浓度）贡献值最大值分别为 10.2367μg/m^3、0.9184μg/m^3，最大占标率分别为 10.24%、3.06%，最大浓度占标率<100%。

In regard to ambient air sensitive targets, the short-term concentration (hourly and daily) contribution values of Cl2 all comply with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018)*. At the mesh point of regional maximum ground-level concentration, the maximum short-term concentration (hourly and daily average) value of Cl2 is 10.2367μgμg/m3 and 0.9184μg/m3 respectively, and the maximum Pi is 10.24% and 3.06% respectively with Pi of maximum concentration both <100%.

表 4.2-20 正常工况 Cl_2 预测结果表
Table 4.2-20 Prediction Results of Cl_2 under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
Cl_2	猪血塘	1 小时	3.0076	18091421	3.01	达标
		日平均	0.1276	180914	0.43	达标
	百班	1 小时	1.7057	18090605	1.71	达标
		日平均	0.1565	180922	0.52	达标
	竹儿根	1 小时	1.7332	18121807	1.73	达标
		日平均	0.1303	181003	0.43	达标
	彬崇村	1 小时	2.0096	18112806	2.01	达标
		日平均	0.1766	181004	0.59	达标
	山心	1 小时	1.2093	18092224	1.21	达标
		日平均	0.0692	181004	0.23	达标
	邓屋	1 小时	5.7191	18022022	5.72	达标
		日平均	0.3787	181001	1.26	达标
	对面垌	1 小时	2.7966	18091421	2.8	达标
		日平均	0.1571	180304	0.52	达标
	老妗垌	1 小时	2.8628	18031505	2.86	达标
		日平均	0.1356	181120	0.45	达标
	坡尾底	1 小时	4.2293	18082304	4.23	达标
		日平均	0.4301	180305	1.43	达标
	川江	1 小时	3.9794	18022406	3.98	达标
		日平均	0.5039	180224	1.68	达标
	彬定（新）	1 小时	1.9316	18091206	1.93	达标
		日平均	0.1299	180809	0.43	达标
	大塘村	1 小时	1.0017	18121720	1	达标
		日平均	0.0726	180426	0.24	达标
	南乐	1 小时	3.7255	18041301	3.73	达标
		日平均	0.2224	181222	0.74	达标
	陂头	1 小时	1.6281	18041301	1.63	达标
		日平均	0.1147	181222	0.38	达标
	亚细	1 小时	3.0547	18051401	3.05	达标
		日平均	0.1276	180514	0.43	达标
	南乐社区	1 小时	3.0952	18051401	3.1	达标
		日平均	0.1313	180514	0.44	达标
	海山排	1 小时	2.2654	18051401	2.27	达标
		日平均	0.1249	180514	0.42	达标
	谢家村	1 小时	1.9773	18061906	1.98	达标
		日平均	0.1055	180514	0.35	达标
	阳光海岸（中石化倒班宿舍）	1 小时	1.4022	18031505	1.4	达标
		日平均	0.0735	180315	0.25	达标
	东方海岸大酒店	1 小时	2.1418	18031505	2.14	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
	Oriental Coast Hotel	日平均	0.1012	181120	0.34	达标
	华南北苑	1 小时	1.8891	18031505	1.89	达标
		日平均	0.1102	181120	0.37	达标
	新岭	1 小时	2.5027	18031505	2.5	达标
		日平均	0.1496	181120	0.5	达标
	新铺	1 小时	2.1916	18111619	2.19	达标
		日平均	0.1212	180619	0.4	达标
	大田	1 小时	1.6823	18051706	1.68	达标
		日平均	0.1473	181001	0.49	达标
	大竹园	1 小时	1.8605	18100621	1.86	达标
		日平均	0.1168	181006	0.39	达标
	彬垌	1 小时	2.0896	18091421	2.09	达标
		日平均	0.0927	180818	0.31	达标
	新坡村	1 小时	1.155	18091002	1.15	达标
		日平均	0.0798	180304	0.27	达标
	槟榔根	1 小时	2.8704	18031505	2.87	达标
		日平均	0.1275	181120	0.42	达标
	网格	1 小时	10.2367	18041301	10.24	达标
		日平均	0.9184	180216	3.06	达标

4.2.5.2 叠加环境质量现状浓度及区域拟建（在建）项目正常排放预测结果

4.2.5.2 Predication results after superimposing current environmental mass concentration and normal emission of regional proposed projects (projects under construction)

（1）二氧化硫（SO_2）

(1) Sulfur dioxide (SO_2)

区域最大落地浓度网格点，叠加环境质量现状浓度后，SO_2 保证率日平均、年平均质量浓度分别为 19.6055μg/m^3、11.2537μg/m^3，最大占标率分别为 13.07%、18.76%，均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, the daily and annual average mass concentration of SO_2 at guarantee rate after superimposing current environmental mass concentration is 19.6055μg/m3 and 11.2537μg/m3 respectively, and the maximum Pi is 13.07% and 18.76% respectively, which all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-21 SO_2叠加后保证率日平均及年平均环境质量浓度预测结果表

Table 4.2-21 Prediction Results of Daily and Annual Average Mass Concentration of SO2 at Guarantee Rate after Superimposition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
SO_2	猪血塘 Zhuxuetang	日平均 Average daily	2.9681	1.37	14.0000	16.9682	11.31	达标 Yes
		年平均 Annual average	0.8312	1.45	9.1534	9.9846	16.64	达标 Yes
	百班 Baiban	日平均 Average daily	1.9251	1.35	15.0000	16.9251	11.28	达标 Yes
		年平均 Annual average	0.7590	1.33	9.1534	9.9125	16.52	达标 Yes
	竹儿根 Zhuergen	日平均 Average daily	2.4605	1.69	14.0000	16.4605	10.97	达标 Yes
		年平均 Annual average	0.8204	1.46	9.1534	9.9738	16.62	达标 Yes
	彬崇村 Binchong Village	日平均 Average daily	4.8753	3.31	12.0000	16.8753	11.25	达标 Yes
		年平均 Annual	0.9203	1.64	9.1534	10.0737	16.79	达标 Yes

		average						
	山心 Shanxin	日平均 Average daily	1.6464	3.87	15.0000	16.6464	11.10	达标 Yes
		年平均 Annual average	1.0094	1.80	9.1534	10.1628	16.94	达标 Yes
	邓屋 Dengwu	日平均 Average daily	4.2507	2.83	14.0000	18.2507	12.17	达标 Yes
		年平均 Annual average	1.1173	1.98	9.1534	10.2708	17.12	达标 Yes
	对面垌 Duimiandong	日平均 Average daily	3.8900	2.66	14.0000	17.8900	11.93	达标 Yes
		年平均 Annual average	0.9066	1.59	9.1534	10.0601	16.77	达标 Yes
	老妗垌 Laojindong	日平均 Average daily	3.2075	2.31	14.0000	17.2075	11.47	达标 Yes
		年平均 Annual average	0.8145	1.43	9.1534	9.9679	16.61	达标 Yes
	坡尾底 Poweidi	日平均 Average daily	1.7649	1.45	15.0000	16.7649	11.18	达标 Yes
		年平均	0.7331	1.34	9.1534	9.8865	16.48	达标 Yes

		Annual average						
	川江 Chuanjiang	日平均 Average daily	1.8103	1.43	15.0000	16.8103	11.21	达标 Yes
		年平均 Annual average	0.7837	1.43	9.1534	9.9372	16.56	达标 Yes
	彬定（新） Binding (New village)	日平均 Average daily	2.8730	2.14	14.0000	16.8730	11.25	达标 Yes
		年平均 Annual average	0.6851	1.22	9.1534	9.8386	16.40	达标 Yes
	大塘村 Datang Village	日平均 Average daily	3.9778	2.73	14.0000	17.9778	11.99	达标 Yes
		年平均 Annual average	0.8269	1.43	9.1534	9.9804	16.63	达标 Yes
	南乐 Nanyue	日平均 Average daily	0.0933	0.06	17.0000	17.0933	11.40	达标 Yes
		年平均 Annual average	1.3196	2.35	9.1534	10.4730	17.46	达标 Yes
	陂头 Potou	日平均 Average daily	1.0230	0.07	16.0000	17.0230	11.35	达标 Yes
		年平	1.2184	2.1	9.1534	10.3718	17.2	达标

		均 Annual average		5			9	Yes
	亚细 Yaxi	日平均 Average daily	0.0000	0.00	18.0000	18.0000	12.00	达标 Yes
		年平均 Annual average	1.7065	2.98	9.1534	10.8600	18.10	达标 Yes
	南乐社区 Nanyue Community	日平均 Average daily	4.5271	3.21	13.0000	17.5271	11.68	达标 Yes
		年平均 Annual average	1.4074	2.46	9.1534	10.5609	17.60	达标 Yes
	海山排 Haishanpai	日平均 Average daily	0.0000	0.00	18.0000	18.0000	12.00	达标 Yes
		年平均 Annual average	1.5965	2.79	9.1534	10.7500	17.92	达标 Yes
	谢家村 Xiejiacun Village	日平均 Average daily	3.2914	2.27	14.0000	17.2914	11.53	达标 Yes
		年平均 Annual average	1.1870	2.06	9.1534	10.3405	17.23	达标 Yes
	阳光海岸（中石化倒班宿舍）	日平均 Average daily	3.1610	2.22	14.0000	17.1610	11.44	达标 Yes

	Yangguang Coast (SINOPEC shift dormitory)	年平均 Annual average	0.7405	1.29	9.1534	9.8939	16.49	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	日平均 Average daily	3.0242	2.15	14.0000	17.0242	11.35	达标 Yes
		年平均 Annual average	0.7150	1.25	9.1534	9.8684	16.45	达标 Yes
	华南北苑 Huanan Beiyuan	日平均 Average daily	3.0314	2.17	14.0000	17.0314	11.35	达标 Yes
		年平均 Annual average	0.7139	1.26	9.1534	9.8674	16.45	达标 Yes
	新岭 Xinling	日平均 Average daily	3.0875	2.24	14.0000	17.0875	11.39	达标 Yes
		年平均 Annual average	0.7550	1.33	9.1534	9.9085	16.51	达标 Yes
	新铺 Xinpu	日平均 Average daily	3.8470	2.62	14.0000	17.8470	11.90	达标 Yes
		年平均 Annual average	1.2423	2.17	9.1534	10.3957	17.33	达标 Yes
	大田 Datian	日平均 Averag	1.2745	0.86	15.0000	16.2745	10.85	达标 Yes

		e daily						
		年平均 Annual average	0.7260	1.29	9.1534	9.8794	16.47	达标 Yes
	大竹园 Dazhuyuan	日平均 Average daily	0.3470	0.22	16.0000	16.3470	10.90	达标 Yes
		年平均 Annual average	0.7381	1.29	9.1534	9.8915	16.49	达标 Yes
	彬垌 Bindong	日平均 Average daily	1.6973	1.18	15.0000	16.6973	11.13	达标 Yes
		年平均 Annual average	0.8013	1.39	9.1534	9.9547	16.59	达标 Yes
	新坡村 Xinpo Village	日平均 Average daily	1.7206	1.20	15.0000	16.7206	11.15	达标 Yes
		年平均 Annual average	0.7195	1.25	9.1534	9.8730	16.45	达标 Yes
	槟榔根 Binlanggen	日平均 Average daily	3.0964	2.20	14.0000	17.0964	11.40	达标 Yes
		年平均 Annual average	0.6751	1.19	9.1534	9.8285	16.38	达标 Yes
	网格 Mesh	日平均	4.6055	3.07	15.0000	19.6055	13.07	达标 Yes

		Average daily						
		年平均 Annual average	2.0747	3.50	9.1534	11.2281	18.71	达标 Yes

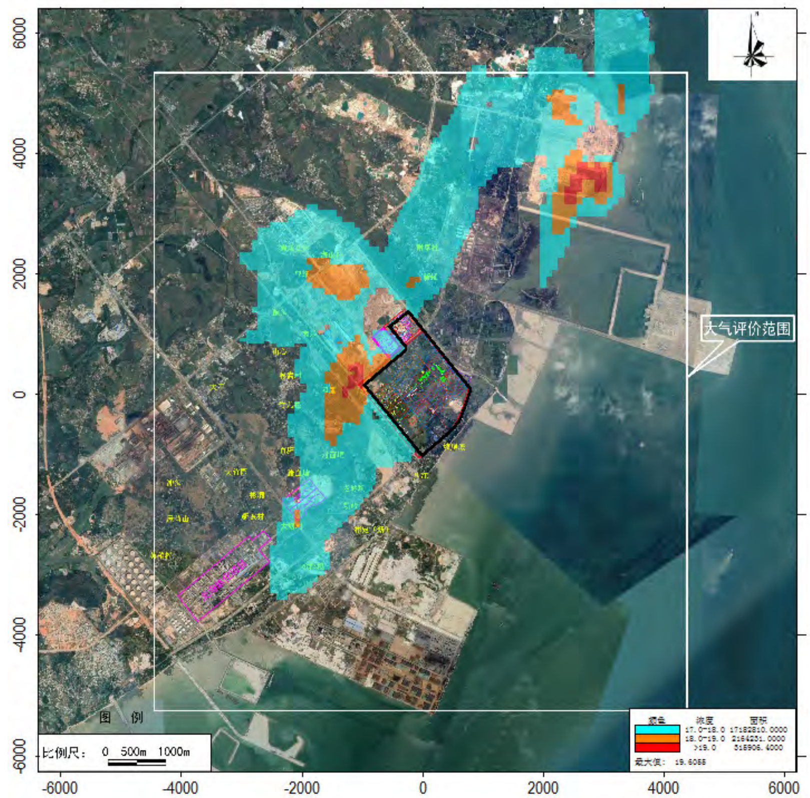


图 4.2-2 正常排放 SO_2 保证率日平均质量浓度分布图(叠加现状浓度及区域污染源，单位：μg/m³)
Figure 4.2-2 Distribution Map of Daily Average Mass Concentration of SO2 at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m³)

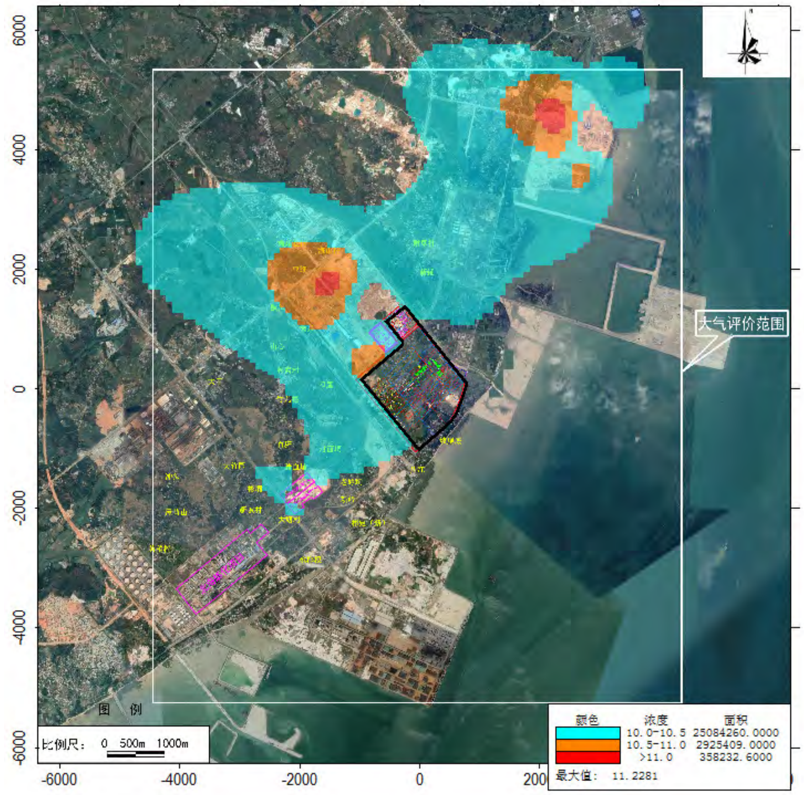


图 4.2-3 正常排放 SO_2 年平均质量浓度分布图（叠加现状浓度及区域污染源，单位：μg/m³）
Figure 4.2-3 Distribution Map of Annual Average Mass Concentration of SO2 at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m³)

（2）二氧化氮（NO_2）

(2) Nitrogen dioxide (NO_2)

正常排放情况下，NO_2 叠加环境质量现状浓度及区域拟建（在建）项目正常排放预测结果后环境质量浓度预测结果见表 4.2-22、图 4.2-4~4.2-5。

4.2.5.2 The prediction results of environmental ,ass concentration of NO_2 after superimposing the predication results of current environmental mass concentration and normal emission of regional proposed projects (projects under construction) under normal emission conditions are shown in Table 4.2-22 and Figure 4.2-4 to 4.2-5.

对于环境空气敏感目标而言，叠加环境质量现状浓度及区域拟建（在建）项目后，NO_2 保证率日平均、年平均质量浓度均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, the daily and annual average mass concentration of NO_2 at guarantee rate after superimposing current environmental mass concentration and regional proposed projects (projects under construction) all comply with

the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，叠加环境质量现状浓度后，NO_2保证率日平均、年平均质量浓度分别为 31.631μg/m^3、16.141μg/m^3，最大占标率分别为 39.54%、40.35%，均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, the daily and annual average mass concentration of NO_2 at guarantee rate after superimposing current environmental mass concentration is 31.631μg/m3 and 16.141μg/m3 respectively, and the maximum Pi is 39.54% and 40.35% respectively, which all comply with the Level II standard requirements in Ambient Air Quality Standard (GB3095-2012) and revision sheet thereof.

表 4.2-22 NO_2叠加后保证率日平均及年平均环境质量浓度预测结果表

Table 4.2-22 Prediction Results of Daily and Annual Average Mass Concentration of NO_2 at Guarantee Rate after Superimposition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
NO_2	猪血塘 Zhuxuetang	日平均 Average daily	0.9654	1.20675	26	26.9654	33.71	达标 Yes
		年平均 Annual average	1.3253	3.31325	13.3438	14.6692	36.67	达标 Yes
	百班 Baiban	日平均 Average daily	0.5629	0.703625	26	26.5629	33.2	达标 Yes
		年平均 Annual average	1.1908	2.977	13.3438	14.5347	36.34	达标 Yes
	竹儿根 Zhuergen	日平均 Average daily	1.7656	2.207	25	26.7656	33.46	达标 Yes
		年平均 Annual average	1.2917	3.22925	13.3438	14.6356	36.59	达标 Yes
	彬崇村 Binchong Village	日平均 Average daily	2.0739	2.592375	25	27.0739	33.84	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		年平均 Annual average	1.4546	3.6365	13.3438	14.7984	37	达标 Yes
	山心 Shanxin	日平均 Average daily	2.0003	2.500375	25	27.0003	33.75	达标 Yes
		年平均 Annual average	1.5678	3.9195	13.3438	14.9116	37.28	达标 Yes
	邓屋 Dengwu	日平均 Average daily	0.9503	1.187875	26	26.9503	33.69	达标 Yes
		年平均 Annual average	1.6606	4.1515	13.3438	15.0045	37.51	达标 Yes
	对面垌 Duimiandong	日平均 Average daily	7.5321	9.415125	20	27.5321	34.42	达标 Yes
		年平均 Annual average	1.4094	3.5235	13.3438	14.7533	36.88	达标 Yes
	老妗垌 Laojindong	日平均 Average daily	0.0057	0.007125	27	27.0057	33.76	达标 Yes
		年平均 Annual average	1.3187	3.29675	13.3438	14.6625	36.66	达标 Yes
	坡尾底 Poweidi	日平均 Average daily	2.8035	3.504375	25	27.8035	34.75	达标 Yes
		年平均 Annual average	1.3151	3.28775	13.3438	14.659	36.65	达标 Yes
	川江 Chuanjiang	日平均 Average daily	2.7118	3.38975	25	27.7118	34.64	达标 Yes
		年平均 Annual	1.4267	3.56675	13.3438	14.7706	36.93	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		average						
	彬定（新） Binding (New village)	日平均 Average daily	0.0004	0.0005	27	27.0004	33.75	达标 Yes
		年平均 Annual average	1.1513	2.87825	13.3438	14.4951	36.24	达标 Yes
	大塘村 Datang Village	日平均 Average daily	0.0218	0.02725	27	27.0218	33.78	达标 Yes
		年平均 Annual average	1.3743	3.43575	13.3438	14.7181	36.8	达标 Yes
	南乐 Nanyue	日平均 Average daily	4.1776	5.222	24	28.1776	35.22	达标 Yes
		年平均 Annual average	1.9483	4.87075	13.3438	15.2921	38.23	达标 Yes
	陂头 Potou	日平均 Average daily	4.5647	5.705875	24	28.5647	35.71	达标 Yes
		年平均 Annual average	1.8041	4.51025	13.3438	15.148	37.87	达标 Yes
	亚细 Yaxi	日平均 Average daily	8.7672	10.959	19	27.7672	34.71	达标 Yes
		年平均 Annual average	2.2505	5.62625	13.3438	15.5943	38.99	达标 Yes
	南乐社区 Nanyue Community	日平均 Average daily	4.7286	5.91075	22	26.7286	33.41	达标 Yes
		年平均 Annual	1.9713	4.92825	13.3438	15.3152	38.29	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		average						
	海山排 Haishanpai	日平均 Average daily	5.9866	7.48325	22	27.9866	34.98	达标 Yes
		年平均 Annual average	2.1041	5.26025	13.3438	15.4479	38.62	达标 Yes
	谢家村 Xiejiacun Village	日平均 Average daily	1.1646	1.45575	25	26.1646	32.71	达标 Yes
		年平均 Annual average	1.6092	4.023	13.3438	14.9531	37.38	达标 Yes
	阳光海岸（中石化倒班宿舍）Yangguang Coast (SINOPEC shift dormitory)	日平均 Average daily	0.0066	0.00825	27	27.0066	33.76	达标 Yes
		年平均 Annual average	1.2063	3.01575	13.3438	14.5502	36.38	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	日平均 Average daily	0.004	0.005	27	27.004	33.76	达标 Yes
		年平均 Annual average	1.1553	2.88825	13.3438	14.4992	36.25	达标 Yes
	华南北苑 Huanan Beiyuan	日平均 Average daily	0.0039	0.004875	27	27.0039	33.75	达标 Yes
		年平均 Annual average	1.1516	2.879	13.3438	14.4954	36.24	达标 Yes
	新岭 Xinling	日平均 Average daily	0.0035	0.004375	27	27.0035	33.75	达标 Yes
		年平均 Annual	1.2259	3.06475	13.3438	14.5697	36.42	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		average						
	新铺 Xinpu	日平均 Average daily	0.051	0.06375	26	26.051	32.56	达标 Yes
		年平均 Annual average	1.6671	4.16775	13.3438	15.0109	37.53	达标 Yes
	大田 Datian	日平均 Average daily	2.3672	2.959	25	27.3672	34.21	达标 Yes
		年平均 Annual average	1.1696	2.924	13.3438	14.5135	36.28	达标 Yes
	大竹园 Dazhuyuan	日平均 Average daily	2.1043	2.630375	25	27.1043	33.88	达标 Yes
		年平均 Annual average	1.2159	3.03975	13.3438	14.5597	36.4	达标 Yes
	彬垌 Bindong	日平均 Average daily	1.8007	2.250875	25	26.8007	33.5	达标 Yes
		年平均 Annual average	1.3303	3.32575	13.3438	14.6741	36.69	达标 Yes
	新坡村 Xinpo Village	日平均 Average daily	0.5653	0.706625	26	26.5653	33.21	达标 Yes
		年平均 Annual average	1.1934	2.9835	13.3438	14.5372	36.34	达标 Yes
	槟榔根 Binlanggen	日平均 Average daily	0	0	27	27	33.75	达标 Yes
		年平均 Annual average	1.0956	2.739	13.3438	14.4395	36.1	达标 Yes
	网格	日平均	7.631	9.53875	24	31.631	39.54	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
	Mesh	Average daily						Yes
		年平均 Annual average	2.7971	6.99275	13.3438	16.141	40.35	达标 Yes

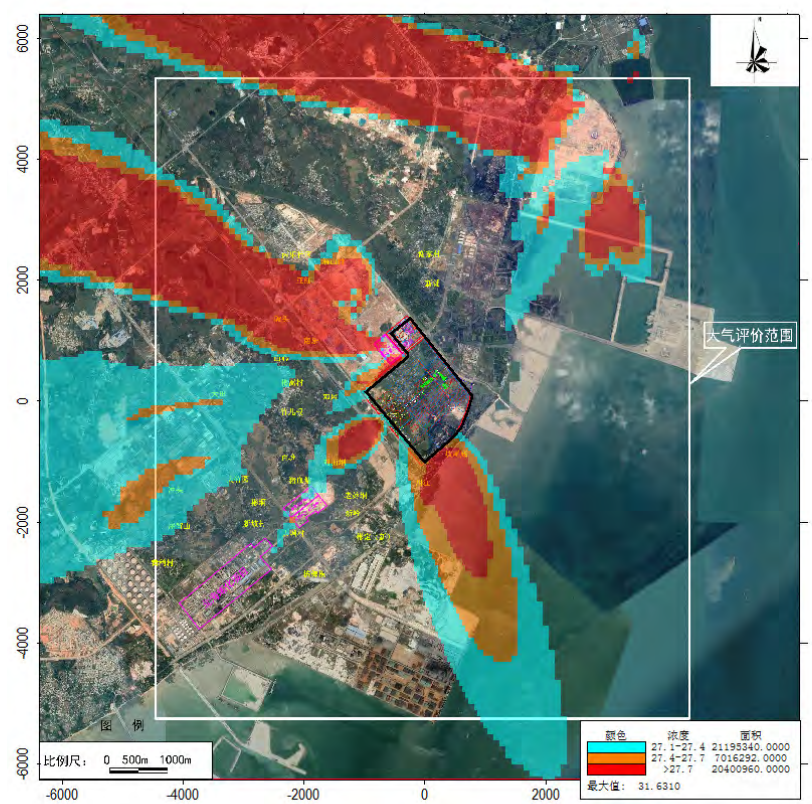


图 4.2-4 正常排放 NO_2 保证率日平均质量浓度分布图（叠加现状浓度及区域污染源，单位：μg/m³）

Figure 4.2-4 Distribution Map of Daily Average Mass Concentration of NO2 at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m³)

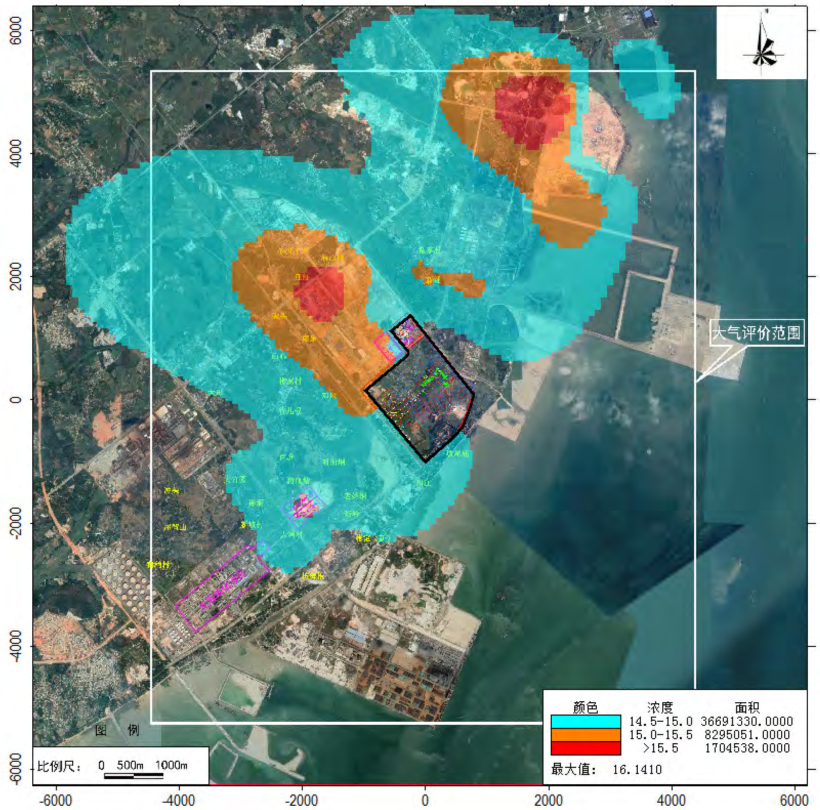


图 4.2-5 正常排放 NO_2 年平均质量浓度分布图（叠加现状浓度及区域污染源，单位：μg/m³）
Figure 4.2-5 Distribution Map of Annual Average Mass Concentration of NO2 at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m³)

（3）颗粒物（PM10）

(3) Particulate matter (PM10)

正常排放情况下，PM_{10} 叠加环境质量现状浓度及区域拟建（在建）项目正常排放预测结果后环境质量浓度预测结果见表 4.2-23、图 4.2-6~4.2-7。

4.2.5.2 The prediction results of environmental ,ass concentration of PM_{10} after superimposing the predication results of current environmental mass concentration and normal emission of regional proposed projects (projects under construction) under normal emission conditions are shown in Table 4.2-23 and Figure 4.2-6 to 4.2-7.

对于环境空气敏感目标而言，叠加环境质量现状浓度及区域拟建（在建）项目后，PM_{10} 保证率日平均、年平均质量浓度均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, the daily and annual average mass concentration of PM_{10} at guarantee rate after superimposing current environmental mass concentration and regional proposed projects (projects under construction) all comply with

the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，叠加环境质量现状浓度后，PM_{10}保证率日平均、年平均质量浓度分别为 89.0142μg/m^3、45.9524μg/m^3，最大占标率分别为 59.34%、65.65%，均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, the daily and annual average mass concentration of PM_{10} at guarantee rate after superimposing current environmental mass concentration is 89.0142μg/m3 and 45.9524μg/m3 respectively, and the maximum Pi is 59.34% and 65.65% respectively, which all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-23 PM_{10}叠加后保证率日平均及年平均环境质量浓度预测结果表

Table 4.2-23 Prediction Results of Daily and Annual Average Mass Concentration of PM_{10} at Guarantee Rate after Superimposition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
PM_{10}	猪血塘 Zhuxuetang	日平均 Average daily	0.3907	0.26	87	87.3907	58.26	达标 Yes
		年平均 Annual average	0.4455	0.64	43.5644	44.0099	62.87	达标 Yes
	百班 Baiban	日平均 Average daily	0.0805	0.05	87	87.0805	58.05	达标 Yes
		年平均 Annual average	0.2725	0.39	43.5644	43.8368	62.62	达标 Yes
	竹儿根 Zhuergen	日平均 Average daily	0.06	0.04	87	87.06	58.04	达标 Yes
		年平均 Annual average	0.2437	0.35	43.5644	43.8081	62.58	达标 Yes
	彬崇村 Binchong Village	日平均 Average daily	0.1016	0.07	87	87.1016	58.07	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		年平均 Annual average	0.2592	0.37	43.5644	43.8236	62.61	达标 Yes
	山心 Shanxin	日平均 Average daily	0.1154	0.08	87	87.1154	58.08	达标 Yes
		年平均 Annual average	0.2735	0.39	43.5644	43.8379	62.63	达标 Yes
	邓屋 Dengwu	日平均 Average daily	0.1845	0.12	87	87.1845	58.12	达标 Yes
		年平均 Annual average	0.3197	0.46	43.5644	43.8841	62.69	达标 Yes
	对面垌 Duimiandong	日平均 Average daily	0.1413	0.09	87	87.1413	58.09	达标 Yes
		年平均 Annual average	0.3647	0.52	43.5644	43.9291	62.76	达标 Yes
	老妗垌 Laojindong	日平均 Average daily	0.3715	0.25	87	87.3715	58.25	达标 Yes
		年平均 Annual average	0.3521	0.50	43.5644	43.9165	62.74	达标 Yes
	坡尾底 Poweidi	日平均 Average daily	0.4924	0.33	87	87.4924	58.33	达标 Yes
		年平均 Annual average	0.2529	0.36	43.5644	43.8173	62.6	达标 Yes
	川江 Chuanjiang	日平均 Average daily	0.4453	0.30	87	87.4453	58.3	达标 Yes
		年平均 Annual	0.2754	0.39	43.5644	43.8398	62.63	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		average						
	彬定（新）Binding (New village)	日平均 Average daily	0.1784	0.12	87	87.1784	58.12	达标 Yes
		年平均 Annual average	0.234	0.33	43.5644	43.7984	62.57	达标 Yes
	大塘村 Datang Village	日平均 Average daily	0.4866	0.32	87	87.4866	58.32	达标 Yes
		年平均 Annual average	0.507	0.72	43.5644	44.0714	62.96	达标 Yes
	南乐 Nanyue	日平均 Average daily	0.3022	0.20	87	87.3022	58.2	达标 Yes
		年平均 Annual average	0.344	0.49	43.5644	43.9084	62.73	达标 Yes
	陂头 Potou	日平均 Average daily	0.2975	0.20	87	87.2975	58.2	达标 Yes
		年平均 Annual average	0.3121	0.45	43.5644	43.8765	62.68	达标 Yes
	亚细 Yaxi	日平均 Average daily	0.7532	0.50	87	87.7532	58.5	达标 Yes
		年平均 Annual average	0.4037	0.58	43.5644	43.9681	62.81	达标 Yes
	南乐社区 Nanyue Community	日平均 Average daily	0.5431	0.36	87	87.5431	58.36	达标 Yes
		年平均 Annual	0.3429	0.49	43.5644	43.9073	62.72	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		average						
	海山排 Haishanpai	日平均 Average daily	0.5436	0.36	87	87.5436	58.36	达标 Yes
		年平均 Annual average	0.3812	0.54	43.5644	43.9456	62.78	达标 Yes
	谢家村 Xiejiacun Village	日平均 Average daily	0.1445	0.10	87	87.1445	58.1	达标 Yes
		年平均 Annual average	0.2849	0.41	43.5644	43.8492	62.64	达标 Yes
	阳光海岸（中石化倒班宿舍）Yangguang Coast (SINOPEC shift dormitory)	日平均 Average daily	0.4806	0.32	87	87.4806	58.32	达标 Yes
		年平均 Annual average	0.3717	0.53	43.5644	43.9361	62.77	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	日平均 Average daily	0.3924	0.26	87	87.3924	58.26	达标 Yes
		年平均 Annual average	0.3046	0.44	43.5644	43.869	62.67	达标 Yes
	华南北苑 Huanan Beiyuan	日平均 Average daily	0.2204	0.15	87	87.2204	58.15	达标 Yes
		年平均 Annual average	0.2796	0.40	43.5644	43.844	62.63	达标 Yes
	新岭 Xinling	日平均 Average daily	0.1278	0.09	87	87.1278	58.09	达标 Yes
		年平均 Annual	0.2796	0.40	43.5644	43.844	62.63	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		average						
	新铺 Xinpu	日平均 Average daily	0.2571	0.17	87	87.2571	58.17	达标 Yes
		年平均 Annual average	0.302	0.43	43.5644	43.8664	62.67	达标 Yes
	大田 Datian	日平均 Average daily	0.062	0.04	87	87.062	58.04	达标 Yes
		年平均 Annual average	0.2196	0.31	43.5644	43.784	62.55	达标 Yes
	大竹园 Dazhuyuan	日平均 Average daily	0.3315	0.22	87	87.3315	58.22	达标 Yes
		年平均 Annual average	0.3382	0.48	43.5644	43.9026	62.72	达标 Yes
	彬垌 Bindong	日平均 Average daily	0.2716	0.18	87	87.2716	58.18	达标 Yes
		年平均 Annual average	0.5644	0.81	43.5644	44.1288	63.04	达标 Yes
	新坡村 Xinpo Village	日平均 Average daily	0.54	0.36	87	87.54	58.36	达标 Yes
		年平均 Annual average	0.523	0.75	43.5644	44.0873	62.98	达标 Yes
	槟榔根 Binlanggen	日平均 Average daily	0.4978	0.33	87	87.4978	58.33	达标 Yes
		年平均 Annual average	0.2717	0.39	43.5644	43.8361	62.62	达标 Yes
	网格	日平均	0.0142	0.01	89	89.0142	59.34	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
	Mesh	Average daily						Yes
		年平均 Annual average	2.388	3.41	43.5644	45.9524	65.65	达标 Yes

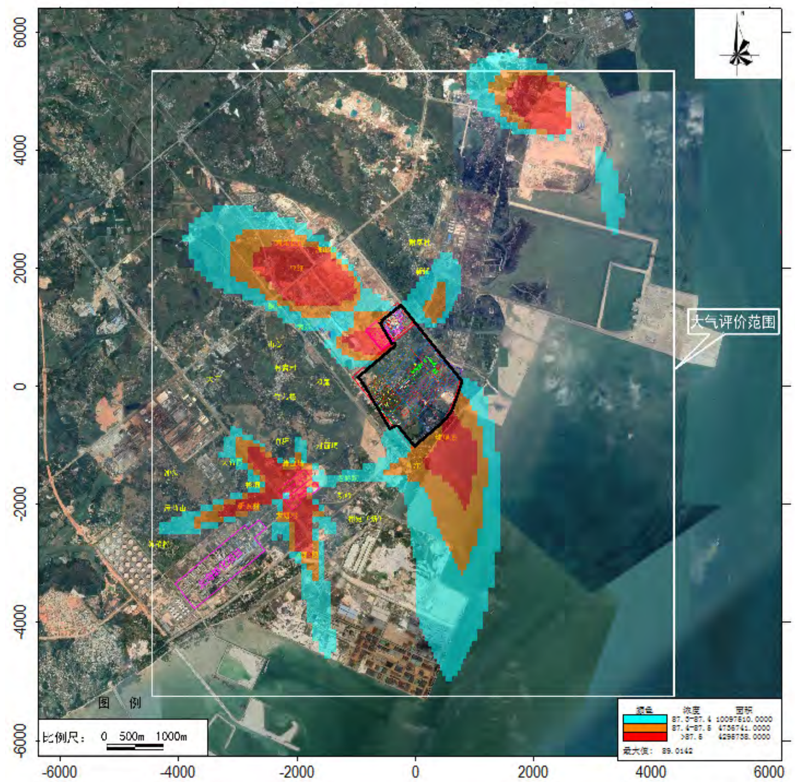


图 4.2-6 正常排放 PM_{10} 保证率日平均质量浓度分布图（叠加现状浓度及区域污染源，单位：$\mu g/m^3$）
Figure 4.2-6 Distribution Map of Daily Average Mass Concentration of PM_{10} at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in $\mu g/m^3$)

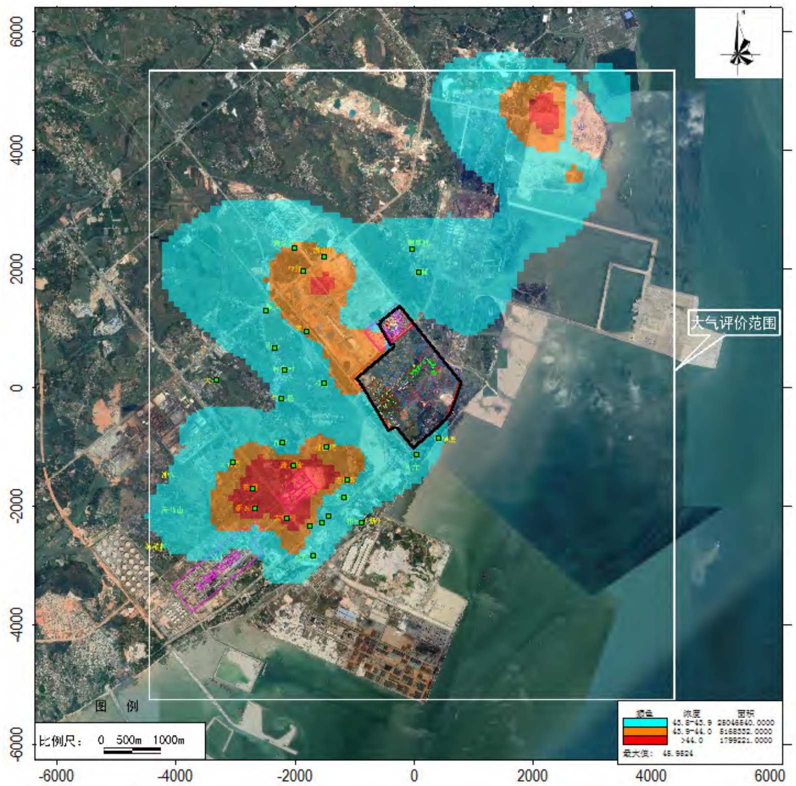


图 4.2-7 正常排放 PM10 年平均质量浓度分布图（叠加现状浓度及区域污染源，单位：μg/m³）

Figure 4.2-7 Distribution Map of Annual Average Mass Concentration of PM10 at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m³)

（4）颗粒物（$PM_{2.5}$）

(4) Particulate matter ($PM_{2.5}$)

正常排放情况下，$PM_{2.5}$ 叠加环境质量现状浓度及区域拟建（在建）项目正常排放预测结果后环境质量浓度预测结果见表 4.2-24、图 4.2-8~4.2-9。

4.2.5.2 The prediction results of environmental ,ass concentration of $PM_{2.5}$ after superimposing the predication results of current environmental mass concentration and normal emission of regional proposed projects (projects under construction) under normal emission conditions are shown in Table 4.2-24 and Figure 4.2-8 to 4.2-9.

对于环境空气敏感目标而言，叠加环境质量现状浓度及区域拟建（在建）项目后，$PM_{2.5}$ 保证率日平均、年平均质量浓度均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, the daily and annual average mass concentration of $PM_{2.5}$ at guarantee rate after superimposing current environmental mass concentration and regional proposed projects (projects under construction) all comply with

the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，叠加环境质量现状浓度后，$PM_{2.5}$ 保证率日平均、年平均质量浓度分别为 70.5357μg/m^3、32.4218μg/m^3，最大占标率分别为 94.05%、92.63%，均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, the daily and annual average mass concentration of $PM_{2.5}$ at guarantee rate after superimposing current environmental mass concentration is 70.5357μg/m3 and 32.4218μg/m3 respectively, and the maximum Pi is 94.05% and 92.63% respectively, which all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-24 $PM_{2.5}$ 叠加后保证率日平均及年平均环境质量浓度预测结果表

Table 4.2-24 Prediction Results of Daily and Annual Average Mass Concentration of $PM_{2.5}$ at Guarantee Rate after Superimposition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
$PM_{2.5}$	猪血塘	日平均	0.0663	0.09	70	70.0663	93.42	达标
		年平均	0.1084	0.31	32.1808	32.2892	92.25	达标
	百班	日平均	0.0694	0.09	70	70.0694	93.43	达标
		年平均	0.0977	0.28	32.1808	32.2786	92.22	达标
	竹儿根	日平均	0.1712	0.23	70	70.1712	93.56	达标
		年平均	0.1059	0.30	32.1808	32.2867	92.25	达标
	彬崇村	日平均	0.2173	0.29	70	70.2173	93.62	达标
		年平均	0.1186	0.34	32.1808	32.2995	92.28	达标
	山心	日平均	0.3038	0.41	70	70.3038	93.74	达标
		年平均	0.1289	0.37	32.1808	32.3097	92.31	达标
	邓屋	日平均	0.2805	0.37	70	70.2805	93.71	达标
		年平均	0.1401	0.40	32.1808	32.3209	92.35	达标
	对面垌	日平均	0.098	0.13	70	70.098	93.46	达标
		年平均	0.1154	0.33	32.1808	32.2962	92.27	达标
	老妗垌	日平均	0.1301	0.17	70	70.1301	93.51	达标
		年平均	0.1064	0.30	32.1808	32.2872	92.25	达标
	坡尾底	日平均	0.2263	0.30	70	70.2263	93.64	达标
		年平均	0.1093	0.31	32.1808	32.2901	92.26	达标
	川江	日平均	0.195	0.26	70	70.195	93.59	达标
		年平均	0.1158	0.33	32.1808	32.2966	92.28	达标
	彬定（新）	日平均	0.1471	0.20	70	70.1471	93.53	达标
		年平均	0.0924	0.26	32.1808	32.2732	92.21	达标
	大塘村	日平均	0.1161	0.15	70	70.1161	93.49	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		年平均	0.1113	0.32	32.1808	32.2921	92.26	达标
	南乐	日平均	0.3162	0.42	70	70.3162	93.75	达标
		年平均	0.164	0.47	32.1808	32.3448	92.41	达标
	陂头	日平均	0.3313	0.44	70	70.3313	93.78	达标
		年平均	0.1506	0.43	32.1808	32.3314	92.38	达标
	亚细	日平均	0.4073	0.54	70	70.4073	93.88	达标
		年平均	0.1977	0.56	32.1808	32.3786	92.51	达标
	南乐社区	日平均	0.2741	0.37	70	70.2741	93.7	达标
		年平均	0.1683	0.48	32.1808	32.3491	92.43	达标
	海山排	日平均	0.2715	0.36	70	70.2715	93.7	达标
		年平均	0.1865	0.53	32.1808	32.3673	92.48	达标
	谢家村	日平均	0.0209	0.03	70	70.0209	93.36	达标
		年平均	0.1368	0.39	32.1808	32.3176	92.34	达标
	阳光海岸	日平均	0.1155	0.15	70	70.1155	93.49	达标
		年平均	0.0975	0.28	32.1808	32.2783	92.22	达标
	东方海岸	日平均	0.1106	0.15	70	70.1106	93.48	达标
		年平均	0.0933	0.27	32.1808	32.2742	92.21	达标
	华南北苑	日平均	0.1119	0.15	70	70.1119	93.48	达标
		年平均	0.0931	0.27	32.1808	32.2739	92.21	达标
	新岭	日平均	0.1272	0.17	70	70.1272	93.5	达标
		年平均	0.0988	0.28	32.1808	32.2796	92.23	达标
	新铺	日平均	0.0207	0.03	70	70.0207	93.36	达标
		年平均	0.1455	0.42	32.1808	32.3263	92.36	达标
	大田	日平均	0.1945	0.26	70	70.1945	93.59	达标
		年平均	0.0943	0.27	32.1808	32.2751	92.21	达标
	大竹园	日平均	0.0877	0.12	70	70.0877	93.45	达标
		年平均	0.0986	0.28	32.1808	32.2794	92.23	达标
	彬垌	日平均	0.1465	0.20	70	70.1465	93.53	达标
		年平均	0.1072	0.31	32.1808	32.288	92.25	达标
	新坡村	日平均	0.073	0.10	70	70.073	93.43	达标
		年平均	0.0962	0.27	32.1808	32.277	92.22	达标
	槟榔根	日平均	0.1168	0.16	70	70.1168	93.49	达标
		年平均	0.0887	0.25	32.1808	32.2695	92.2	达标
	网格	日平均	0.5357	0.71	70	70.5357	94.05	达标
		年平均	0.241	0.69	32.1808	32.4218	92.63	达标

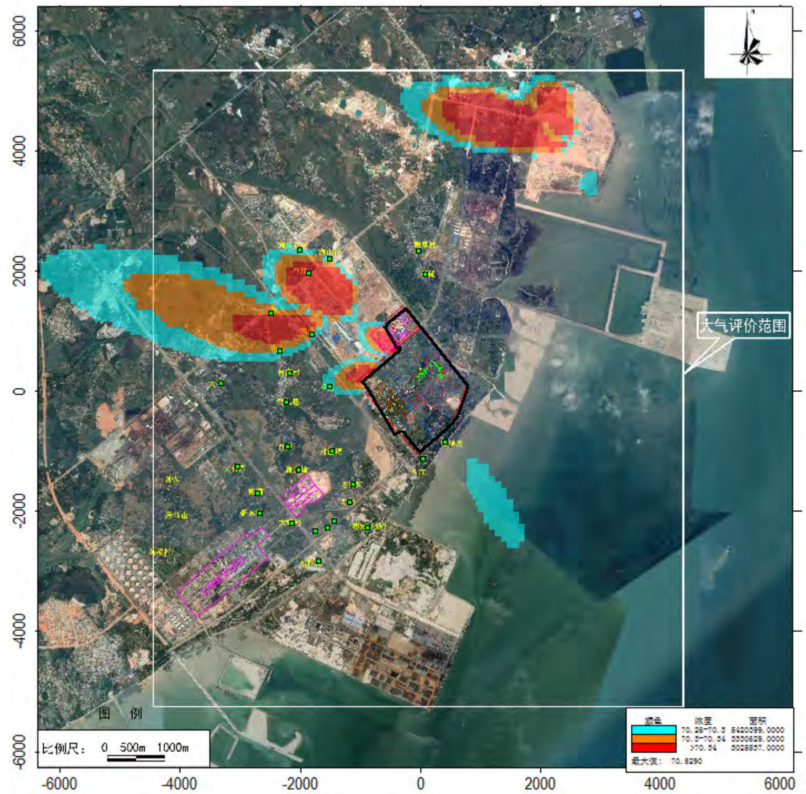


图 4.2-8 正常排放 PM2.5 日平均质量浓度分布图（叠加现状浓度及区域污染源，单位：μg/m3）
Figure 4.2-8 Distribution Map of Daily Average Mass Concentration of PM2.5 at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m3)

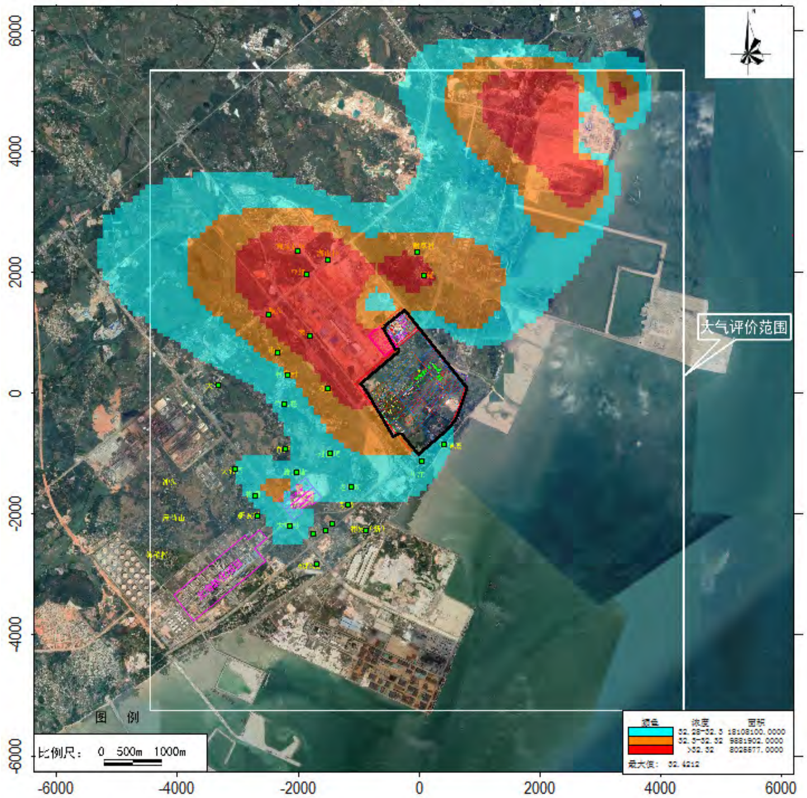


图 4.2-9 正常排放 PM2.5 年平均质量浓度分布图（叠加现状浓度及区域污染源，单位：μg/m3）
Figure 4.2-9 Distribution Map of Annual Average Mass Concentration of PM2.5 at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m3)

（5）氯化氢（HCl）

(5) Hydrogen chloride (HCl)

正常排放情况下，HCl 叠加环境质量现状浓度预测结果后环境质量浓度预测结果见表 4.2-25、图 4.2-10~4.2-11。

The prediction results of environmental mass concentration of HCl after superimposing the predication results of current environmental mass concentration under normal emission conditions are shown in Table 4.2-25 and Figure 4.2-10 to 4.2-11.

对于环境空气敏感目标而言，叠加环境质量现状浓度后，HCl 短期浓度（小时、日平均浓度）贡献值均满足《环境影响评价技术导则 大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。

In regard to ambient air sensitive targets, the short-term concentration (hourly and daily average concentration) contribution values of HCl after superimposing current environmental mass concentration all comply with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere*

Environment (HJ2.2-2018).

区域最大落地浓度网格点，叠加环境质量现状浓度后，HCl 短期浓度（小时、日均）贡献值最大值分别为 20.2365μg/m3、11.5439μg/m3，最大占标率分别为 40.47%、76.96%，最大浓度占标率均<100%，HCl 短期浓度（小时、日均）贡献值均满足《环境影响评价技术导则　大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。

At the mesh point of regional maximum ground-level concentration, the maximum short-term concentration (hourly and daily average) contribution value of HCl is 20.2365μg/m^3 and 11.5439μg/m^3 respectively, and the maximum Pi is 40.47% and 76.96% respectively with Pi of maximum concentration both <100%. The short-term (hourly and daily average) concentration contribution values of HCL both comply with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018).*

表 4.2-25　正常工况 HCl 预测结果表
Table 4.2-25 Prediction Results of HCL under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
HCl	猪血塘 Zhuxuetang	1 小时 1 hour	4.2309	8.46	10	14.2309	28.46	达标 Yes
		日平均 Average daily	0.6056	4.04	10	10.6056	70.7	达标 Yes
	百班 Baiban	1 小时 1 hour	3.1616	6.32	10	13.1616	26.32	达标 Yes
		日平均 Average daily	0.2453	1.64	10	10.2453	68.3	达标 Yes
	竹儿根 Zhuergen	1 小时 1 hour	2.0802	4.16	10	12.0802	24.16	达标 Yes
		日平均 Average daily	0.1995	1.33	10	10.1995	68	达标 Yes
	彬崇村 Binchong Village	1 小时 1 hour	2.004	4.01	10	12.004	24.01	达标 Yes
		日平均 Average daily	0.222	1.48	10	10.222	68.15	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
	山心 Shanxin	1 小时 1 hour	1.4458	2.89	10	11.4458	22.89	达标 Yes
		日平均 Average daily	0.2334	1.56	10	10.2334	68.22	达标 Yes
	邓屋 Dengwu	1 小时 1 hour	5.7191	11.44	10	15.7191	31.44	达标 Yes
		日平均 Average daily	0.395	2.63	10	10.395	69.3	达标 Yes
	对面垌 Duimiandong	1 小时 1 hour	2.7958	5.59	10	12.7958	25.59	达标 Yes
		日平均 Average daily	0.4069	2.71	10	10.4069	69.38	达标 Yes
	老妗垌 Laojindong	1 小时 1 hour	2.9186	5.84	10	12.9186	25.84	达标 Yes
		日平均 Average daily	0.487	3.25	10	10.487	69.91	达标 Yes
	坡尾底 Poweidi	1 小时 1 hour	4.2293	8.46	10	14.2293	28.46	达标 Yes
		日平均 Average daily	0.5132	3.42	10	10.5132	70.09	达标 Yes
	川江 Chuanjiang	1 小时 1 hour	3.9794	7.96	10	13.9794	27.96	达标 Yes
		日平均 Average daily	0.6039	4.03	10	10.6039	70.69	达标 Yes
	彬定（新） Binding (New village)	1 小时 1 hour	1.9316	3.86	10	11.9316	23.86	达标 Yes
		日平均 Average daily	0.2265	1.51	10	10.2265	68.18	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
	大塘村 Datang Village	1 小时 1 hour	3.9253	7.85	10	13.9253	27.85	达标 Yes
		日平均 Average daily	0.824	5.49	10	10.824	72.16	达标 Yes
	南乐 Nanyue	1 小时 1 hour	3.6993	7.40	10	13.6993	27.4	达标 Yes
		日平均 Average daily	0.2943	1.96	10	10.2943	68.63	达标 Yes
	陂头 Potou	1 小时 1 hour	1.5665	3.13	10	11.5665	23.13	达标 Yes
		日平均 Average daily	0.2001	1.33	10	10.2001	68	达标 Yes
	亚细 Yaxi	1 小时 1 hour	3.0592	6.12	10	13.0592	26.12	达标 Yes
		日平均 Average daily	0.1741	1.16	10	10.1741	67.83	达标 Yes
	南乐社区 Nanyue Community	1 小时 1 hour	3.1091	6.22	10	13.1091	26.22	达标 Yes
		日平均 Average daily	0.1748	1.17	10	10.1748	67.83	达标 Yes
	海山排 Haishanpai	1 小时 1 hour	2.2701	4.54	10	12.2701	24.54	达标 Yes
		日平均 Average daily	0.156	1.04	10	10.156	67.71	达标 Yes
	谢家村 Xiejiacun Village	1 小时 1 hour	2.0145	4.03	10	12.0145	24.03	达标 Yes
		日平均 Average	0.1734	1.16	10	10.1734	67.82	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		daily						
	阳光海岸（中石化倒班宿舍）Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	3.5576	7.12	10	13.5576	27.12	达标 Yes
		日平均 Average daily	0.4959	3.31	10	10.4959	69.97	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	3.2955	6.59	10	13.2955	26.59	达标 Yes
		日平均 Average daily	0.3759	2.51	10	10.3759	69.17	达标 Yes
	华南北苑 Huanan Beiyuan	1 小时 1 hour	3.425	6.85	10	13.425	26.85	达标 Yes
		日平均 Average daily	0.4201	2.80	10	10.4201	69.47	达标 Yes
	新岭 Xinling	1 小时 1 hour	2.968	5.94	10	12.968	25.94	达标 Yes
		日平均 Average daily	0.3354	2.24	10	10.3354	68.9	达标 Yes
	新铺 Xinpu	1 小时 1 hour	2.2343	4.47	10	12.2343	24.47	达标 Yes
		日平均 Average daily	0.2252	1.50	10	10.2252	68.17	达标 Yes
	大田 Datian	1 小时 1 hour	1.605	3.21	10	11.605	23.21	达标 Yes
		日平均 Average daily	0.1671	1.11	10	10.1671	67.78	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
	大竹园 Dazhuyuan	1 小时 1 hour	2.6745	5.35	10	12.6745	25.35	达标 Yes
		日平均 Average daily	0.3701	2.47	10	10.3701	69.13	达标 Yes
	彬垌 Bindong	1 小时 1 hour	4.0259	8.05	10	14.0259	28.05	达标 Yes
		日平均 Average daily	0.6337	4.22	10	10.6337	70.89	达标 Yes
	新坡村 Xinpo Village	1 小时 1 hour	3.9768	7.95	10	13.9768	27.95	达标 Yes
		日平均 Average daily	0.7032	4.69	10	10.7032	71.35	达标 Yes
	槟榔根 Binlanggen	1 小时 1 hour	2.8702	5.74	10	12.8702	25.74	达标 Yes
		日平均 Average daily	0.348	2.32	10	10.348	68.99	达标 Yes
	网格 Mesh	1 小时 1 hour	10.2365	20.47	10	20.2365	40.47	达标 Yes
		日平均 Average daily	1.5439	10.29	10	11.5439	76.96	达标 Yes

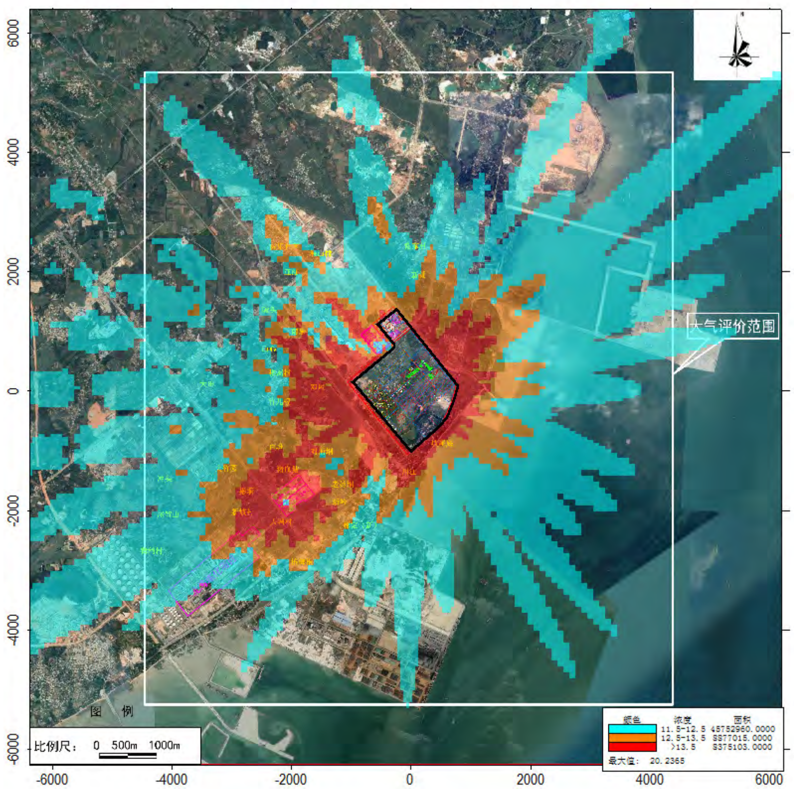


图 4.2-10 正常排放 HCl 小时平均质量浓度分布图（叠加区域污染源及现状浓度，单位：μg/m³）

Figure 4.2-10 Distribution Map of Hourly Average Mass Concentration of HCl at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m³)

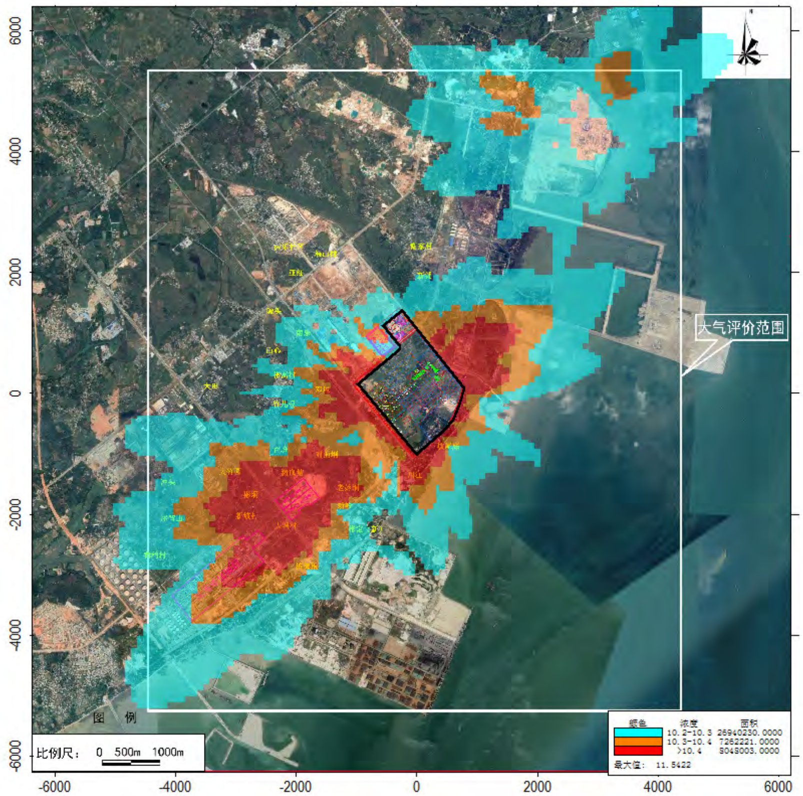


图 4.2-11 正常排放 HCl 日平均质量浓度分布图（叠加区域污染源及现状浓度，单位：μg/m³）
Figure 4.2-11 Distribution Map of Daily Average Mass Concentration of PM10 at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m³)

（6）硫化氢（H_2S）

(6) Hydrogen chloride (H_2S)

正常排放情况下，H_2S 叠加环境质量现状浓度及区域拟建（在建）项目预测结果后环境质量浓度预测结果见表 4.2-26、图 4.2-12。

4.2.5.2 The prediction results of environmental ,ass concentration of H_2S after superimposing the predication results of current environmental mass concentration and normal emission of regional proposed projects (projects under construction) under normal emission conditions are shown in Table 4.2-26 and Figure 4.2-12.

对于环境空气敏感目标而言，叠加环境质量现状浓度后，H_2S 短期浓度（小时浓度）贡献值均满足《环境影响评价技术导则 大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。区域最大落地浓度网格点，叠加环境质量现状浓度后，H_2S 短期浓度（小时浓度）贡献值最大值为 1.9229μg/m³，最大占标率分别为 19.23%，最大浓度占标率均<100%，H_2S 短期浓度贡献值均满足《环境影响评价技术导则 大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。

In regard to ambient air sensitive targets, the short-term (hourly) concentration contribution values of H_2S after superimposing current environmental mass concentration all comply with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018)*. At the mesh point of regional maximum ground-level concentration, the maximum short-term (hourly) concentration value of H_2S is 1.9229μg/m^3, and the maximum Pi is 19.23% with Pi of maximum concentration <100%. The short-term concentration contribution values of H2S all comply with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018)*.

表 4.2-26 正常工况 H_2S 预测结果表

Table 4.2-26 Prediction Results of H_2S under Normal Working Conditions

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
H_2S	猪血塘 Zhuxuetang	1 小时 1 hour	0.4155	4.16	1.25	1.6655	16.65	达标 Yes
	百班 Baiban	1 小时 1 hour	0.3993	3.99	1.25	1.6493	16.49	达标 Yes
	竹儿根 Zhuergen	1 小时 1 hour	0.4113	4.11	1.25	1.6613	16.61	达标 Yes
	彬崇村 Binchong Village	1 小时 1 hour	0.488	4.88	1.25	1.738	17.38	达标 Yes
	山心 Shanxin	1 小时 1 hour	0.4801	4.80	1.25	1.7301	17.3	达标 Yes
	邓屋 Dengwu	1 小时 1 hour	0.4605	4.61	1.25	1.7105	17.11	达标 Yes
	对面垌 Duimiandong	1 小时 1 hour	0.3731	3.73	1.25	1.6231	16.23	达标 Yes
	老妗垌 Laojindong	1 小时 1 hour	0.3802	3.80	1.25	1.6302	16.3	达标 Yes
	坡尾底 Poweidi	1 小时 1 hour	0.5119	5.12	1.25	1.7619	17.62	达标 Yes

	川江 Chuanjiang	1 小时 1 hour	0.542	5.42	1.25	1.792	17.92	达标 Yes
	彬定（新）Binding (New village)	1 小时 1 hour	0.3696	3.70	1.25	1.6196	16.2	达标 Yes
	大塘村 Datang Village	1 小时 1 hour	0.3992	3.99	1.25	1.6492	16.49	达标 Yes
	南乐 Nanyue	1 小时 1 hour	0.431	4.31	1.25	1.681	16.81	达标 Yes
	陂头 Potou	1 小时 1 hour	0.4183	4.18	1.25	1.6683	16.68	达标 Yes
	亚细 Yaxi	1 小时 1 hour	0.4952	4.95	1.25	1.7452	17.45	达标 Yes
	南乐社区 Nanyue Community	1 小时 1 hour	0.4519	4.52	1.25	1.7019	17.02	达标 Yes
	海山排 Haishanpai	1 小时 1 hour	0.3979	3.98	1.25	1.6479	16.48	达标 Yes
	谢家村 Xiejiacun Village	1 小时 1 hour	0.3709	3.71	1.25	1.6209	16.21	达标 Yes
	阳光海岸（中石化倒班宿舍）Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	0.3604	3.60	1.25	1.6104	16.1	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	0.3476	3.48	1.25	1.5976	15.98	达标 Yes
	华南北苑 Huanan Beiyuan	1 小时 1 hour	0.3515	3.52	1.25	1.6015	16.01	达标 Yes
	新岭	1 小时	0.363	3.63	1.25	1.613	16.13	达标

	Xinling	1 hour						Yes
	新铺 Xinpu	1 小时 1 hour	0.3829	3.83	1.25	1.6329	16.33	达标 Yes
	大田 Datian	1 小时 1 hour	0.4456	4.46	1.25	1.6956	16.96	达标 Yes
	大竹园 Dazhuyuan	1 小时 1 hour	0.521	5.21	1.25	1.771	17.71	达标 Yes
	彬垌 Bindong	1 小时 1 hour	0.4777	4.78	1.25	1.7277	17.28	达标 Yes
	新坡村 Xinpo Village	1 小时 1 hour	0.4212	4.21	1.25	1.6712	16.71	达标 Yes
	槟榔根 Binlanggen	1 小时 1 hour	0.3128	3.13	1.25	1.5628	15.63	达标 Yes
	网格 Mesh	1 小时 1 hour	0.6729	6.73	1.25	1.9229	19.23	达标 Yes

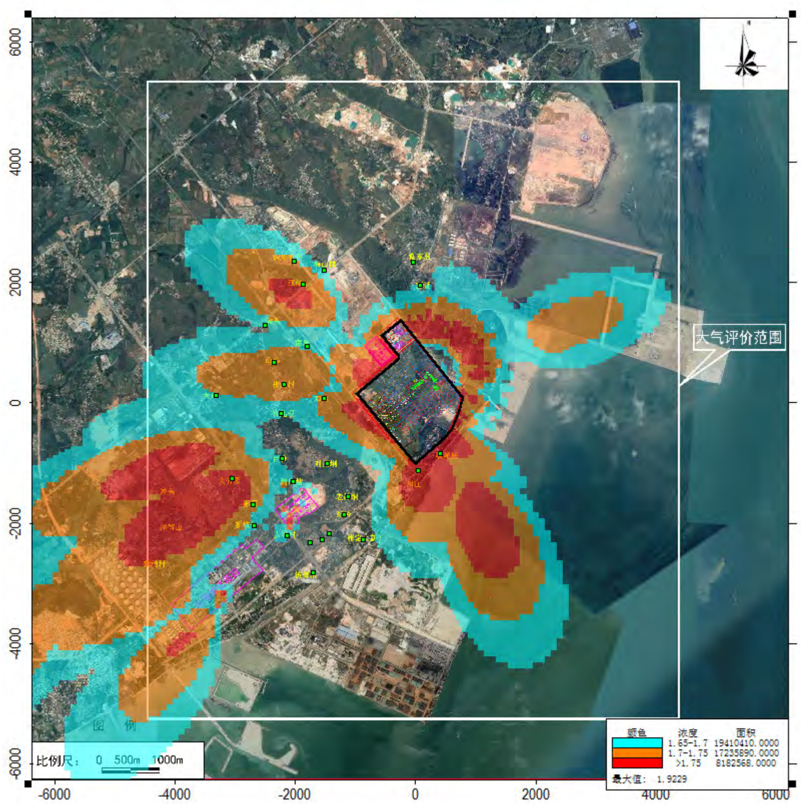


图 4.2-12 正常排放 H_2S 小时平均质量浓度分布图（叠加区域污染源及现状浓度，单位：μg/m³）

Figure 4.2-12 Distribution Map of Hourly Average Mass Concentration of H_2S at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m³)

（7）TSP

(7) TSP

正常排放情况下，TSP 叠加环境质量现状浓度及区域拟建（在建）项目正常排放预测结果后环境质量浓度预测结果见表 4.2-27、图 4.2-13~4.2-14。

4.2.5.2 The prediction results of environmental ,ass concentration of TSP after superimposing the predication results of current environmental mass concentration and normal emission of regional proposed projects (projects under construction) under normal emission conditions are shown in Table 4.2-27 and Figure 4.2-13 to 4.2-14.

对于环境空气敏感目标而言，叠加环境质量现状浓度及区域拟建（在建）项目后，TSP 日平均、年平均质量浓度均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, the daily and annual average mass concentration of TSP at guarantee rate after superimposing current environmental mass concentration and regional proposed projects (projects under construction) all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，叠加环境质量现状浓度后，TSP 日平均、年平均质量浓度分别为 299.0361μg/m^3、145.7286μg/m^3，最大占标率分别为 99.68%、72.86%，均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, the daily and annual average mass concentration of TSP at guarantee rate after superimposing current environmental mass concentration is 299.0361μg/m3 and 145.7286μg/m3 respectively, and the maximum Pi is 99.68% and 72.86% respectively, which all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-27 TSP 叠加后日平均及年平均环境质量浓度预测结果表
Table 4.2-27 Prediction Results of Daily and Annual Average Mass Concentration of TSP at Guarantee Rate after Superimposition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status

污染物 **Pollutant**	预测点 **Prediction point**	平均时段 **Average period**	贡献值 **Contribution value (μg/m^3)**	占标率% **Pi %**	现状浓度 **(μg/m^3) Current concentration (μg/m^3)**	叠加后浓度 **(μg/m^3) Concentration after superimposition (μg/m^3)**	占标率% **Pi %**	达标情况 **Up-to-standard status**
TSP	猪血塘 Zhuxuetang	日平均 Average daily	12.1254	4.04	105.5	117.6254	39.21	达标 Yes
		年平均 Annual average	1.3396	0.67	96.3572	97.6967	48.85	达标 Yes
	百班 Baiban	日平均 Average daily	9.8424	3.28	105.5	115.3424	38.45	达标 Yes
		年平均 Annual average	1.4481	0.72	96.3572	97.8052	48.9	达标 Yes
	竹儿根 Zhuergen	日平均 Average daily	15.8068	5.27	105.5	121.3068	40.44	达标 Yes
		年平均 Annual average	1.7998	0.90	96.3572	98.157	49.08	达标 Yes
	彬崇村 Binchong Village	日平均 Average daily	9.8228	3.27	105.5	115.3228	38.44	达标 Yes
		年平均 Annual average	1.3793	0.69	96.3572	97.7365	48.87	达标 Yes
	山心 Shanxin	日平均 Average daily	8.7894	2.93	105.5	114.2894	38.1	达标 Yes
		年平均 Annual average	0.8982	0.45	96.3572	97.2553	48.63	达标 Yes
	邓屋 Dengwu	日平均 Average daily	31.5508	10.52	105.5	137.0508	45.68	达标 Yes
		年平均 Annual average	4.2122	2.11	96.3572	100.5693	50.28	达标 Yes
	对面垌 Duimiandong	日平均 Average	21.3984	7.13	105.5	126.8984	42.3	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		daily						
		年平均 Annual average	2.4287	1.21	96.3572	98.7858	49.39	达标 Yes
	老妗垌 Laojindong	日平均 Average daily	11.9866	4.00	105.5	117.4866	39.16	达标 Yes
		年平均 Annual average	1.0812	0.54	96.3572	97.4383	48.72	达标 Yes
	坡尾底 Poweidi	日平均 Average daily	30.7322	10.24	105.5	136.2322	45.41	达标 Yes
		年平均 Annual average	1.9298	0.96	96.3572	98.2869	49.14	达标 Yes
	川江 Chuanjiang	日平均 Average daily	31.6477	10.55	105.5	137.1476	45.72	达标 Yes
		年平均 Annual average	2.5022	1.25	96.3572	98.8594	49.43	达标 Yes
	彬定（新） Binding (New village)	日平均 Average daily	18.3817	6.13	105.5	123.8817	41.29	达标 Yes
		年平均 Annual average	1.6069	0.80	96.3572	97.964	48.98	达标 Yes
	大塘村 Datang Village	日平均 Average daily	6.9584	2.32	105.5	112.4584	37.49	达标 Yes
		年平均 Annual average	0.4613	0.23	96.3572	96.8184	48.41	达标 Yes
	南乐 Nanyue	日平均 Average daily	10.6224	3.54	105.5	116.1224	38.71	达标 Yes
		年平均	1.2867	0.64	96.3572	97.6438	48.82	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		Annual average						Yes
	陂头 Potou	日平均 Average daily	6.6098	2.20	105.5	112.1098	37.37	达标 Yes
		年平均 Annual average	0.7045	0.35	96.3572	97.0616	48.53	达标 Yes
	亚细 Yaxi	日平均 Average daily	6.2721	2.09	105.5	111.7721	37.26	达标 Yes
		年平均 Annual average	0.4518	0.23	96.3572	96.809	48.4	达标 Yes
	南乐社区 Nanyue Community	日平均 Average daily	4.7996	1.60	105.5	110.2996	36.77	达标 Yes
		年平均 Annual average	0.3592	0.18	96.3572	96.7164	48.36	达标 Yes
	海山排 Haishanpai	日平均 Average daily	8.0326	2.68	105.5	113.5326	37.84	达标 Yes
		年平均 Annual average	0.3189	0.16	96.3572	96.6761	48.34	达标 Yes
	谢家村 Xiejiacun Village	日平均 Average daily	7.4469	2.48	105.5	112.9469	37.65	达标 Yes
		年平均 Annual average	0.3564	0.18	96.3572	96.7136	48.36	达标 Yes
	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC	日平均 Average daily	7.5204	2.51	105.5	113.0203	37.67	达标 Yes
		年平均 Annual average	0.448	0.22	96.3572	96.8052	48.4	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
	shift dormitory)							
	东方海岸大酒店 Oriental Coast Hotel	日平均 Average daily	9.1322	3.04	105.5	114.6321	38.21	达标 Yes
		年平均 Annual average	0.4983	0.25	96.3572	96.8555	48.43	达标 Yes
	华南北苑 Huanan Beiyuan	日平均 Average daily	9.0412	3.01	105.5	114.5412	38.18	达标 Yes
		年平均 Annual average	0.5256	0.26	96.3572	96.8827	48.44	达标 Yes
	新岭 Xinling	日平均 Average daily	10.52	3.51	105.5	116.02	38.67	达标 Yes
		年平均 Annual average	0.7737	0.39	96.3572	97.1308	48.57	达标 Yes
	新铺 Xinpu	日平均 Average daily	7.7484	2.58	105.5	113.2484	37.75	达标 Yes
		年平均 Annual average	0.5105	0.26	96.3572	96.8677	48.43	达标 Yes
	大田 Datian	日平均 Average daily	8.7327	2.91	105.5	114.2327	38.08	达标 Yes
		年平均 Annual average	0.8635	0.43	96.3572	97.2207	48.61	达标 Yes
	大竹园 Dazhuyuan	日平均 Average daily	9.3767	3.13	105.5	114.8767	38.29	达标 Yes
		年平均 Annual average	0.9768	0.49	96.3572	97.3339	48.67	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
	彬垌 Bindong	日平均 Average daily	5.8724	1.96	105.5	111.3724	37.12	达标 Yes
		年平均 Annual average	0.7091	0.35	96.3572	97.0662	48.53	达标 Yes
	新坡村 Xinpo Village	日平均 Average daily	5.727	1.91	105.5	111.227	37.08	达标 Yes
		年平均 Annual average	0.5158	0.26	96.3572	96.8729	48.44	达标 Yes
	槟榔根 Binlanggen	日平均 Average daily	8.9316	2.98	105.5	114.4316	38.14	达标 Yes
		年平均 Annual average	0.4071	0.20	96.3572	96.7643	48.38	达标 Yes
	网格 Mesh	日平均 Average daily	193.5361	64.51	105.5	299.0361	99.68	达标 Yes
		年平均 Annual average	49.3715	24.69	96.3572	145.7286	72.86	达标 Yes

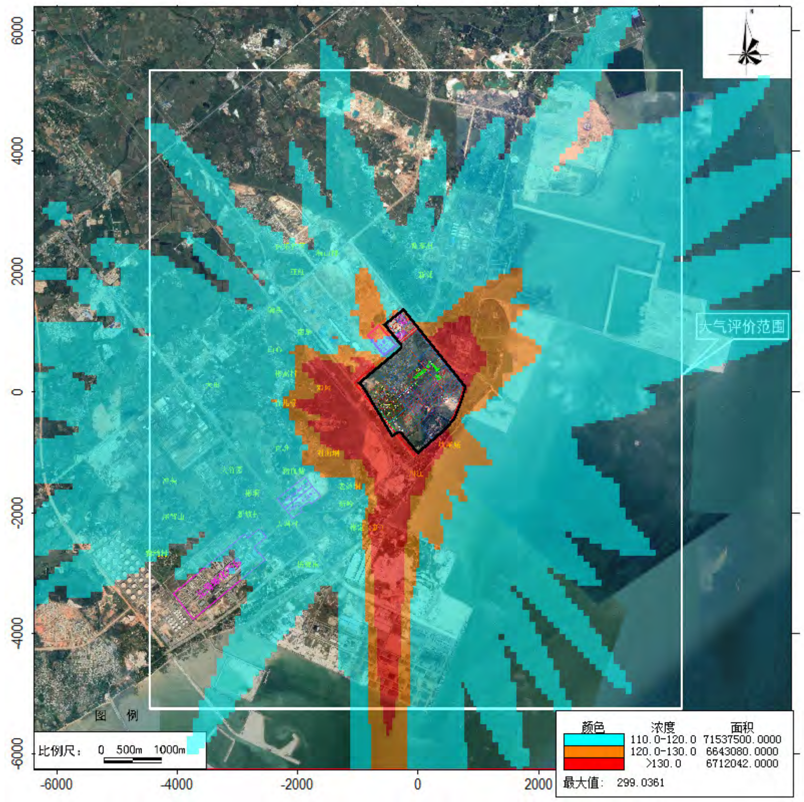


图 4.2-13 正常排放 TSP 日平均质量浓度分布图（叠加区域污染源及现状浓度，单位：μg/m³）

Figure 4.2-13 Distribution Map of Daily Average Mass Concentration of TSP at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m³)

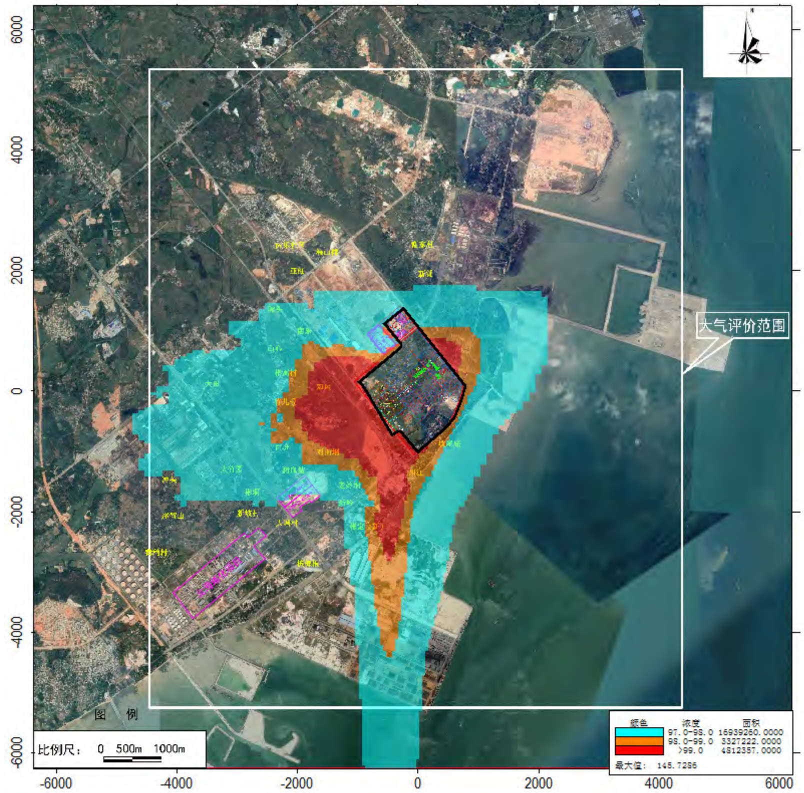


图 4.2-14 正常排放 TSP 年平均质量浓度分布图（叠加区域污染源及现状浓度，单位：μg/m³）
Figure 4.2-14 Distribution Map of Daily Average Mass Concentration of TSP at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m³)

（8）汞（Hg）

(8) Mercury (Hg)

正常排放情况下，Hg 叠加环境质量现状浓度预测结果后环境质量浓度预测结果见表 4.2-28，日平均浓度分布见图 4.2-15~4.2-16。

The prediction results of environmental mass concentration of Hg after superimposing the predication results of current environmental mass concentration under normal emission conditions are shown in Table 4.2-28 and distribution of daily average concentration is as shown in Figure 4.2-15 to 4.2-16.

对于环境空气敏感目标而言，叠加环境质量现状浓度后，Hg 短期浓度（日均浓度）满足《工业企业设计卫生标准》（TJ36-79）居民区有害物质最高允许浓度要求；长期浓度（年均值）贡献值满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, after superimposing current environmental mass concentration, the short-term (daily average) concentration of Hg all comply with maximum allowable concentration requirement for hazardous substances in residential quarters in *Hygienic Standard of Industrial Enterprise Design* (TJ36-79). The long-term (annual average) contribution values thereof all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，叠加环境质量现状浓度后，Hg 短期浓度（日平均浓度）叠加最大值为 0.00367μg/m³，最大占标率为 1.22%，满足《工业企业设计卫生标准》（TJ36-79）居民区有害物质最高允许浓度要求；Hg 长期浓度（年平均浓度）叠加最大值为 0.00336μg/m³，最大占标率为 6.72%，能满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, after superimposing current environmental mass concentration, the maximum superimposed short-term (daily average) concentration value of Hg is 0.00367μg/m³, and the maximum Pi is 1.22%, which comply with maximum allowable concentration requirement for hazardous substances in residential quarters in *Hygienic Standard of Industrial Enterprise Design* (TJ36-79). The maximum superimposed long-term (annual average) concentration of Hg is 0.00336μg/m³, and the maximum Pi is 6.72%, which may comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-28 正常工况 Hg 预测结果表

Table 4.2-28 Prediction Results of Hg under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
Hg	猪血塘 Zhuxuetang	日平均 Average daily	0.00014	0.03	0.0033	0.00344	1.15	达标 Yes
		年平均 Annual average	0.00003	0.00	0.0033	0.00333	6.66	达标 Yes
	百班 Baiban	日平均 Average daily	0.00015	0.07	0.0033	0.00345	1.15	达标 Yes
		年平均	0.00002	0.00	0.0033	0.00332	6.64	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		Annual average						Yes
	竹儿根 Zhuergen	日平均 Average daily	0.00019	0.07	0.0033	0.00349	1.16	达标 Yes
		年平均 Annual average	0.00002	0.00	0.0033	0.00332	6.64	达标 Yes
	彬崇村 Binchong Village	日平均 Average daily	0.00021	0.07	0.0033	0.00351	1.17	达标 Yes
		年平均 Annual average	0.00003	0.00	0.0033	0.00333	6.66	达标 Yes
	山心 Shanxin	日平均 Average daily	0.00024	0.07	0.0033	0.00354	1.18	达标 Yes
		年平均 Annual average	0.00003	0.00	0.0033	0.00333	6.66	达标 Yes
	邓屋 Dengwu	日平均 Average daily	0.00022	0.07	0.0033	0.00352	1.17	达标 Yes
		年平均 Annual average	0.00003	0.00	0.0033	0.00333	6.66	达标 Yes
	对面垌 Duimiandong	日平均 Average daily	0.00017	0.07	0.0033	0.00347	1.16	达标 Yes
		年平均 Annual average	0.00003	0.00	0.0033	0.00333	6.66	达标 Yes
	老妗垌 Laojindong	日平均 Average daily	0.00014	0.03	0.0033	0.00344	1.15	达标 Yes
		年平均 Annual average	0.00003	0.00	0.0033	0.00333	6.66	达标 Yes
	坡尾底 Poweidi	日平均 Average daily	0.00021	0.07	0.0033	0.00351	1.17	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		年平均 Annual average	0.00003	0.00	0.0033	0.00333	6.66	达标 Yes
	川江 Chuanjiang	日平均 Average daily	0.00018	0.07	0.0033	0.00348	1.16	达标 Yes
		年平均 Annual average	0.00003	0.00	0.0033	0.00333	6.66	达标 Yes
	彬定（新） Binding (New village)	日平均 Average daily	0.00012	0.03	0.0033	0.00342	1.14	达标 Yes
		年平均 Annual average	0.00002	0.00	0.0033	0.00332	6.64	达标 Yes
	大塘村 Datang Village	日平均 Average daily	0.00027	0.10	0.0033	0.00357	1.19	达标 Yes
		年平均 Annual average	0.00004	0.00	0.0033	0.00334	6.68	达标 Yes
	南乐 Nanyue	日平均 Average daily	0.00019	0.07	0.0033	0.00349	1.16	达标 Yes
		年平均 Annual average	0.00004	0.00	0.0033	0.00334	6.68	达标 Yes
	陂头 Potou	日平均 Average daily	0.00020	0.07	0.0033	0.00350	1.17	达标 Yes
		年平均 Annual average	0.00003	0.00	0.0033	0.00333	6.66	达标 Yes
	亚细 Yaxi	日平均 Average daily	0.00015	0.07	0.0033	0.00345	1.15	达标 Yes
		年平均 Annual average	0.00003	0.00	0.0033	0.00333	6.66	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
	南乐社区 Nanyue Community	日平均 Average daily	0.00014	0.03	0.0033	0.00344	1.15	达标 Yes
		年平均 Annual average	0.00002	0.00	0.0033	0.00332	6.64	达标 Yes
	海山排 Haishanpai	日平均 Average daily	0.00016	0.07	0.0033	0.00346	1.15	达标 Yes
		年平均 Annual average	0.00002	0.00	0.0033	0.00332	6.64	达标 Yes
	谢家村 Xiejiacun Village	日平均 Average daily	0.00013	0.03	0.0033	0.00343	1.14	达标 Yes
		年平均 Annual average	0.00002	0.00	0.0033	0.00332	6.64	达标 Yes
	阳光海岸（中石化倒班宿舍）Yangguang Coast (SINOPEC shift dormitory)	日平均 Average daily	0.00014	0.03	0.0033	0.00344	1.15	达标 Yes
		年平均 Annual average	0.00003	0.00	0.0033	0.00333	6.66	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	日平均 Average daily	0.00012	0.03	0.0033	0.00342	1.14	达标 Yes
		年平均 Annual average	0.00002	0.00	0.0033	0.00332	6.64	达标 Yes
	华南北苑 Huanan Beiyuan	日平均 Average daily	0.00012	0.03	0.0033	0.00342	1.14	达标 Yes
		年平均 Annual average	0.00002	0.00	0.0033	0.00332	6.64	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
	新岭 Xinling	日平均 Average daily	0.00013	0.03	0.0033	0.00343	1.14	达标 Yes
		年平均 Annual average	0.00002	0.00	0.0033	0.00332	6.64	达标 Yes
	新铺 Xinpu	日平均 Average daily	0.00016	0.07	0.0033	0.00346	1.15	达标 Yes
		年平均 Annual average	0.00002	0.00	0.0033	0.00332	6.64	达标 Yes
	大田 Datian	日平均 Average daily	0.00015	0.07	0.0033	0.00345	1.15	达标 Yes
		年平均 Annual average	0.00002	0.00	0.0033	0.00332	6.64	达标 Yes
	大竹园 Dazhuyuan	日平均 Average daily	0.00014	0.03	0.0033	0.00344	1.15	达标 Yes
		年平均 Annual average	0.00004	0.00	0.0033	0.00334	6.68	达标 Yes
	彬垌 Bindong	日平均 Average daily	0.00024	0.07	0.0033	0.00354	1.18	达标 Yes
		年平均 Annual average	0.00004	0.00	0.0033	0.00334	6.68	达标 Yes
	新坡村 Xinpo Village	日平均 Average daily	0.00024	0.07	0.0033	0.00354	1.18	达标 Yes
		年平均 Annual average	0.00003	0.00	0.0033	0.00333	6.66	达标 Yes
	槟榔根 Binlanggen	日平均 Average daily	0.00012	0.03	0.0033	0.00342	1.14	达标 Yes
		年平均 Annual average	0.00002	0.00	0.0033	0.00332	6.64	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
	网格 Mesh	日平均 Average daily	0.00037	0.13	0.0033	0.00367	1.22	达标 Yes
		年平均 Annual average	0.00006	0.20	0.0033	0.00336	6.72	达标 Yes

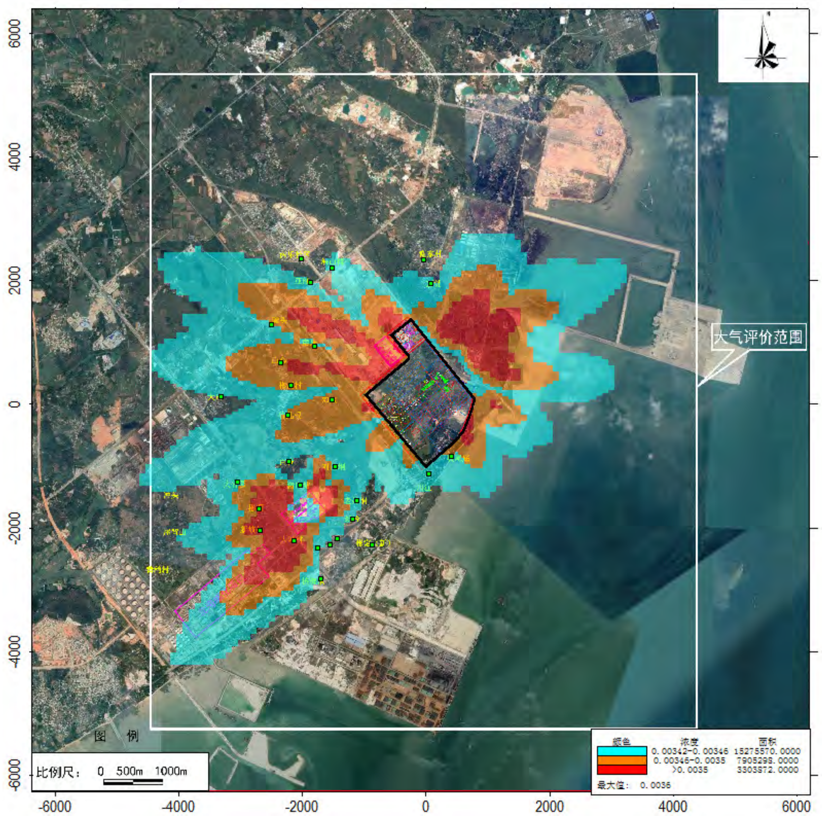


图 4.2-15 正常排放 Hg 日平均质量浓度分布图（叠加现状浓度及区域污染源，单位：μg/m³）
Figure 4.2-15 Distribution Map of Daily Average Mass Concentration of Hg at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m³)

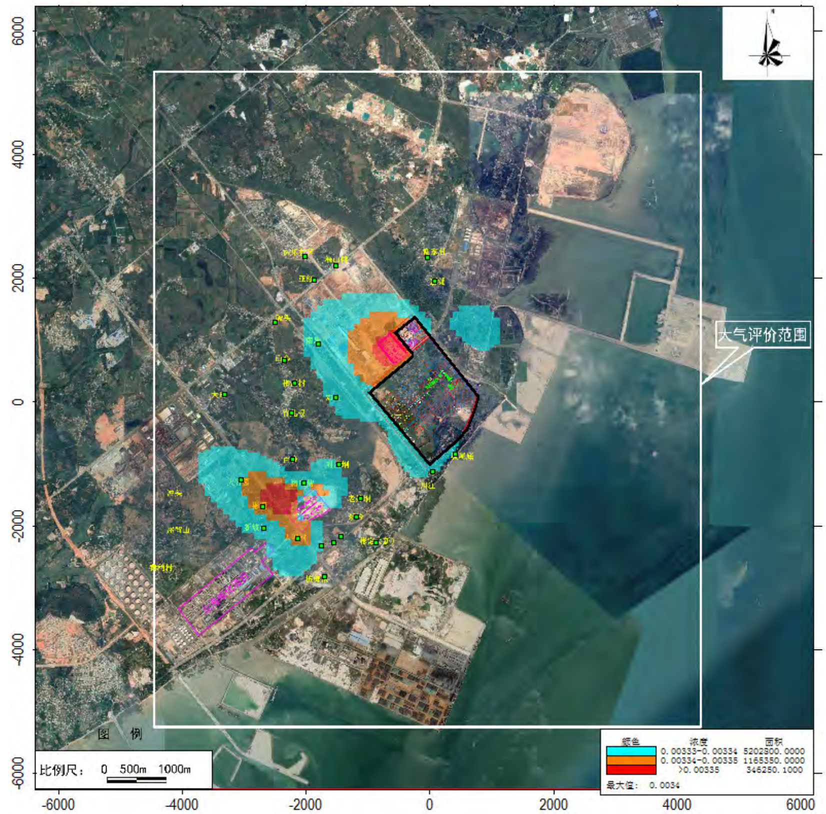


图 4.2-16　正常排放 Hg 年平均质量浓度分布图（叠加现状浓度及区域污染源，单位：μg/m³）

Figure 4.2-16 Distribution Map of Annual Average Mass Concentration of Hg at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m³)

（9）砷（As）

(9) Arsenic (As)

正常排放情况下，As 叠加环境质量现状浓度预测结果后环境质量浓度预测结果见表 4.2-29，日平均浓度分布见图 4.2-17~4.2-18。

The prediction results of environmental mass concentration of As after superimposing the predication results of current environmental mass concentration under normal emission conditions are shown in Table 4.2-29 and distribution of daily average concentration is as shown in Figure 4.2-17 to 4.2-18.

对于环境空气敏感目标而言，叠加环境质量现状浓度后，As 短期浓度（日均浓度）满足《工业企业设计卫生标准》（TJ36-79）居民区有害物质最高允许浓度要求；长期浓度（年均值）叠加值满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, after superimposing current environmental mass concentration, the short-term (daily average) concentration of As all comply with maximum allowable concentration requirement for hazardous substances in residential quarters in *Hygienic Standard of Industrial Enterprise Design* (TJ36-79). The superimposed long-term (annual average) concentration values thereof all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，叠加环境质量现状浓度后，As 短期浓度（日平均浓度）叠加最大值为 0.00778μg/m^3，最大占标率为 0.26%，满足《工业企业设计卫生标准》（TJ36-79）居民区有害物质最高允许浓度要求；As 长期浓度（年平均浓度）叠加最大值为 0.00243μg/m^3，最大占标率为 40.5%，满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, after superimposing current environmental mass concentration, the maximum superimposed short-term (daily average) concentration value of As is 0.00778μg/m^3, and the maximum Pi is 0.26%, which comply with maximum allowable concentration requirement for hazardous substances in residential quarters in *Hygienic Standard of Industrial Enterprise Design* (TJ36-79). The maximum superimposed long-term (annual average) concentration of As is 0.00243μg/m^3, and the maximum Pi is 40.5%, which comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-29　正常工况 As 预测结果表

Table 4.2-29 Prediction Results of As under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标 Up-to-s sta
As	猪血塘 Zhuxuetang	日平均 Average daily	0.00108	0.04	0.005	0.00608	0.2	达 Y
		年平均 Annual average	0.00017	3.33	0.002	0.00217	36.17	达 Y
	百班 Baiban	日平均 Average daily	0.00064	0.02	0.005	0.00564	0.19	达 Y
		年平均	0.00007	1.67	0.002	0.00207	34.5	达

污染物 **Pollutant**	预测点 **Prediction point**	平均时段 **Average period**	贡献值 **Contribution value (μg/m^3)**	占标率% **Pi %**	现状浓度 **(μg/m^3) Current concentration (μg/m^3)**	叠加后浓度 **(μg/m^3) Concentration after superimposition (μg/m^3)**	占标率% **Pi %**	达标 **Up-to-s sta**
		Annual average						Y
	竹儿根 Zhuergen	日平均 Average daily	0.00042	0.01	0.005	0.00542	0.18	达 Y
		年平均 Annual average	0.00003	0.00	0.002	0.00203	33.83	达 Y
	彬崇村 Binchong Village	日平均 Average daily	0.00035	0.01	0.005	0.00535	0.18	达 Y
		年平均 Annual average	0.00003	0.00	0.002	0.00203	33.83	达 Y
	山心 Shanxin	日平均 Average daily	0.00027	0.01	0.005	0.00527	0.18	达 Y
		年平均 Annual average	0.00002	0.00	0.002	0.00202	33.67	达 Y
	邓屋 Dengwu	日平均 Average daily	0.00058	0.02	0.005	0.00558	0.19	达 Y
		年平均 Annual average	0.00004	0.00	0.002	0.00204	34	达 Y
	对面垌 Duimiandong	日平均 Average daily	0.00112	0.04	0.005	0.00612	0.2	达 Y
		年平均 Annual average	0.00010	1.67	0.002	0.00210	35	达 Y
	老妗垌 Laojindong	日平均 Average daily	0.00099	0.03	0.005	0.00599	0.2	达 Y
		年平均 Annual average	0.00007	1.67	0.002	0.00207	34.5	达 Y

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标 Up-to-s sta
	坡尾底 Poweidi	日平均 Average daily	0.00036	0.01	0.005	0.00536	0.18	达 Y
		年平均 Annual average	0.00003	0.00	0.002	0.00203	33.83	达 Y
	川江 Chuanjiang	日平均 Average daily	0.00036	0.01	0.005	0.00536	0.18	达 Y
		年平均 Annual average	0.00003	0.00	0.002	0.00203	33.83	达 Y
	彬定（新）Binding (New village)	日平均 Average daily	0.00063	0.02	0.005	0.00563	0.19	达 Y
		年平均 Annual average	0.00003	0.00	0.002	0.00203	33.83	达 Y
	大塘村 Datang Village	日平均 Average daily	0.00182	0.06	0.005	0.00682	0.23	达 Y
		年平均 Annual average	0.00025	5.00	0.002	0.00225	37.5	达 Y
	南乐 Nanyue	日平均 Average daily	0.00028	0.01	0.005	0.00528	0.18	达 Y
		年平均 Annual average	0.00003	0.00	0.002	0.00203	33.83	达 Y
	陂头 Potou	日平均 Average daily	0.00021	0.01	0.005	0.00521	0.17	达 Y
		年平均 Annual average	0.00002	0.00	0.002	0.00202	33.67	达 Y
	亚细	日平均	0.00018	0.01	0.005	0.00518	0.17	达

污染物 **Pollutant**	预测点 **Prediction point**	平均时段 **Average period**	贡献值 **Contribution value (μg/m^3)**	占标率% **Pi %**	现状浓度 **(μg/m^3) Current concentration (μg/m^3)**	叠加后浓度 **(μg/m^3) Concentration after superimposition (μg/m^3)**	占标率% **Pi %**	达标 **Up-to-s sta**
	Yaxi	Average daily						Y
		年平均 Annual average	0.00002	0.00	0.002	0.00202	33.67	达 Y
	南乐社区 Nanyue Community	日平均 Average daily	0.00016	0.01	0.005	0.00516	0.17	达 Y
		年平均 Annual average	0.00002	0.00	0.002	0.00202	33.67	达 Y
	海山排 Haishanpai	日平均 Average daily	0.00017	0.01	0.005	0.00517	0.17	达 Y
		年平均 Annual average	0.00002	0.00	0.002	0.00202	33.67	达 Y
	谢家村 Xiejiacun Village	日平均 Average daily	0.00019	0.01	0.005	0.00519	0.17	达 Y
		年平均 Annual average	0.00002	0.00	0.002	0.00202	33.67	达 Y
	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	日平均 Average daily	0.00091	0.03	0.005	0.00591	0.2	达 Y
		年平均 Annual average	0.00012	1.67	0.002	0.00212	35.33	达 Y
	东方海岸大酒店 Oriental Coast Hotel	日平均 Average daily	0.00090	0.03	0.005	0.00590	0.2	达 Y
		年平均 Annual average	0.00007	1.67	0.002	0.00207	34.5	达 Y

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标 Up-to-s sta
	华南北苑 Huanan Beiyuan	日平均 Average daily	0.00084	0.03	0.005	0.00584	0.19	达 Y
		年平均 Annual average	0.00006	1.67	0.002	0.00206	34.33	达 Y
	新岭 Xinling	日平均 Average daily	0.00091	0.03	0.005	0.00591	0.2	达 Y
		年平均 Annual average	0.00005	1.67	0.002	0.00205	34.17	达 Y
	新铺 Xinpu	日平均 Average daily	0.00019	0.01	0.005	0.00519	0.17	达 Y
		年平均 Annual average	0.00002	0.00	0.002	0.00202	33.67	达 Y
	大田 Datian	日平均 Average daily	0.00027	0.01	0.005	0.00527	0.18	达 Y
		年平均 Annual average	0.00004	0.00	0.002	0.00204	34	达 Y
	大竹园 Dazhuyuan	日平均 Average daily	0.00114	0.04	0.005	0.00614	0.2	达 Y
		年平均 Annual average	0.00020	3.33	0.002	0.00220	36.67	达 Y
	彬垌 Bindong	日平均 Average daily	0.00195	0.07	0.005	0.00695	0.23	达 Y
		年平均 Annual average	0.00026	5.00	0.002	0.00226	37.67	达 Y
	新坡村 Xinpo	日平均 Average	0.00177	0.06	0.005	0.00677	0.23	达 Y

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标 Up-to-s sta
	Village	daily						
		年平均 Annual average	0.00017	3.33	0.002	0.00217	36.17	达 Y
	槟榔根 Binlanggen	日平均 Average daily	0.00074	0.02	0.005	0.00574	0.19	达 Y
		年平均 Annual average	0.00008	1.67	0.002	0.00208	34.67	达 Y
	网格 Mesh	日平均 Average daily	0.00278	0.09	0.005	0.00778	0.26	达 Y
		年平均 Annual average	0.00043	6.67	0.002	0.00243	40.5	达 Y

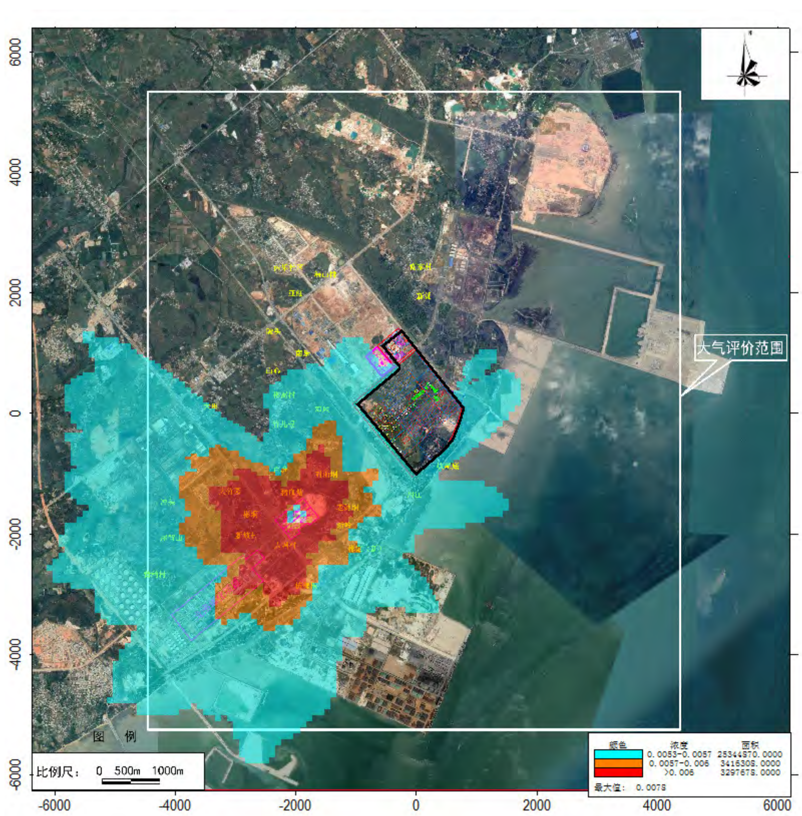


图 4.2-17　正常排放 As 日平均质量浓度分布图（叠加现状浓度，单位：μg/m³）

Figure 4.2-17 Distribution Map of Daily Average Mass Concentration of As at Guarantee Rate under Normal Emission (after Superimposing Current Concentration, in μg/m³)

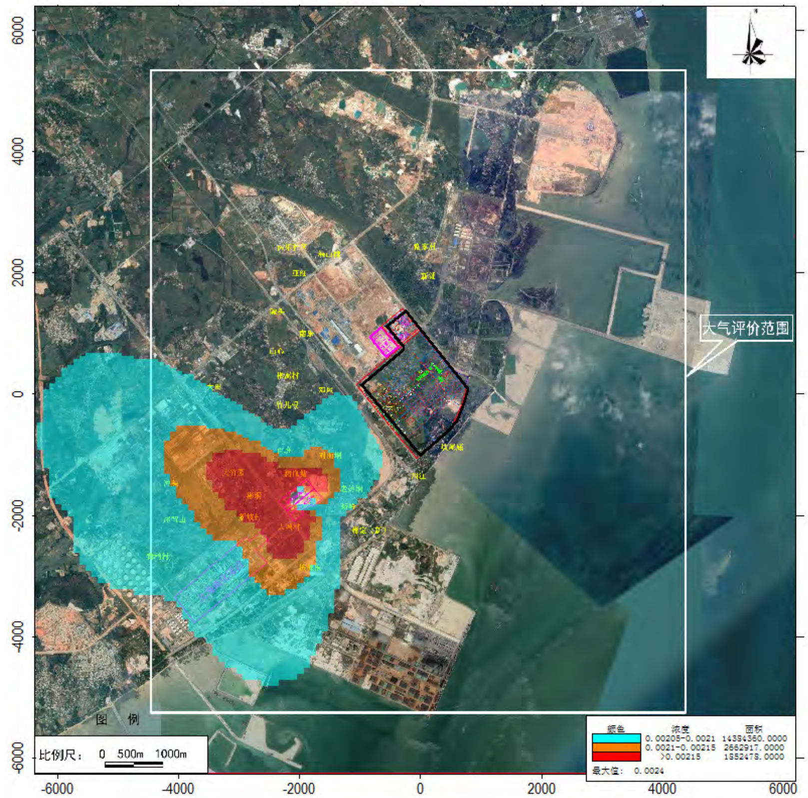


图 4.2-18　正常排放 As 年平均质量浓度分布图（叠加现状浓度，单位：μg/m³）

Figure 4.2-18 Distribution Map of Daily Average Mass Concentration of As at Guarantee Rate under Normal Emission (after Superimposing Current Concentration, in μg/m³)

（10）氨（NH_3）

(10) Ammonia (NH_3)

正常排放情况下，NH_3 叠加环境质量现状浓度预测结果后环境质量浓度预测结果见表 4.2-30、图 4.2-19。

The prediction results of environmental mass concentration of NH_3 after superimposing the predication results of current environmental mass concentration under normal emission conditions are shown in Table 4.2-30 and Figure 4.2-19.

对于环境空气敏感目标而言，叠加环境质量现状浓度后，NH_3 短期浓度（小时浓度）贡献值均满足《环境影响评价技术导则　大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。

In regard to ambient air sensitive targets, the short-term (hourly) concentration contribution values of NH_3 after superimposing current environmental mass concentration all comply with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018)*.

区域最大落地浓度网格点，叠加环境质量现状浓度后，NH_3 短期浓度（小时浓度）贡献值最大值为 76.9653μg/m^3，最大占标率分别为 38.48%，最大浓度占标率均<100%，NH_3 短期浓度贡献值均满足《环境影响评价技术导则　大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。

At the mesh point of regional maximum ground-level concentration, the maximum short-term (hourly) concentration value of H_2S is 76.9653μg/m^3, and the maximum Pi is 38.48% with Pi of maximum concentration <100%. The short-term concentration contribution values of NH_3 all comply with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018)*.

表 4.2-30　正常工况 NH_3 预测结果表

Table 4.2-30 Prediction Results of NH_3 under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
NH_3	猪血塘 Zhuxuetang	1 小时 1 hour	5.25	2.63	40	45.25	22.63	达标 Yes
	百班 Baiban	1 小时 1 hour	4.5258	2.26	40	44.5258	22.26	达标 Yes
	竹儿根 Zhuergen	1 小时 1 hour	3.7103	1.86	40	43.7103	21.86	达标 Yes
	彬崇村 Binchong Village	1 小时 1 hour	3.5541	1.78	40	43.5541	21.78	达标 Yes
	山心 Shanxin	1 小时 1 hour	2.9353	1.47	40	42.9353	21.47	达标 Yes
	邓屋 Dengwu	1 小时 1 hour	7.942	3.97	40	47.942	23.97	达标 Yes
	对面垌 Duimiandong	1 小时 1 hour	9.3825	4.69	40	49.3825	24.69	达标 Yes
	老妗垌 Laojindong	1 小时 1 hour	3.8381	1.92	40	43.8381	21.92	达标 Yes
	坡尾底 Poweidi	1 小时 1 hour	4.7498	2.37	40	44.7498	22.37	达标 Yes
	川江	1 小时	6.5181	3.26	40	46.5181	23.26	达标

	Chuanjiang	1 hour						Yes
	彬定（新） Binding (New village)	1 小时 1 hour	4.1682	2.08	40	44.1682	22.08	达标 Yes
	大塘村 Datang Village	1 小时 1 hour	5.557	2.78	40	45.557	22.78	达标 Yes
	南乐 Nanyue	1 小时 1 hour	7.412	3.71	40	47.412	23.71	达标 Yes
	陂头 Potou	1 小时 1 hour	3.2016	1.60	40	43.2016	21.6	达标 Yes
	亚细 Yaxi	1 小时 1 hour	8.7494	4.37	40	48.7494	24.37	达标 Yes
	南乐社区 Nanyue Community	1 小时 1 hour	4.6625	2.33	40	44.6625	22.33	达标 Yes
	海山排 Haishanpai	1 小时 1 hour	8.0893	4.04	40	48.0893	24.04	达标 Yes
	谢家村 Xiejiacun Village	1 小时 1 hour	8.6501	4.33	40	48.6501	24.33	达标 Yes
	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	4.4929	2.25	40	44.4929	22.25	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	3.7324	1.87	40	43.7324	21.87	达标 Yes
	华南北苑 Huanan Beiyuan	1 小时 1 hour	4.0206	2.01	40	44.0206	22.01	达标 Yes
	新岭 Xinling	1 小时 1 hour	3.5999	1.80	40	43.5999	21.8	达标 Yes
	新铺 Xinpu	1 小时 1 hour	10.5871	5.29	40	50.5871	25.29	达标 Yes
	大田 Datian	1 小时 1 hour	2.2033	1.10	40	42.2033	21.1	达标 Yes
	大竹园	1 小时	3.2429	1.62	40	43.2429	21.62	达标

	Dazhuyuan	1 hour						Yes
	彬垌 Bindong	1 小时 1 hour	4.3642	2.18	40	44.3642	22.18	达标 Yes
	新坡村 Xinpo Village	1 小时 1 hour	4.4426	2.22	40	44.4426	22.22	达标 Yes
	槟榔根 Binlanggen	1 小时 1 hour	2.87	1.44	40	42.87	21.43	达标 Yes
	网格 Mesh	1 小时 1 hour	36.9653	18.48	40	76.9653	38.48	达标 Yes

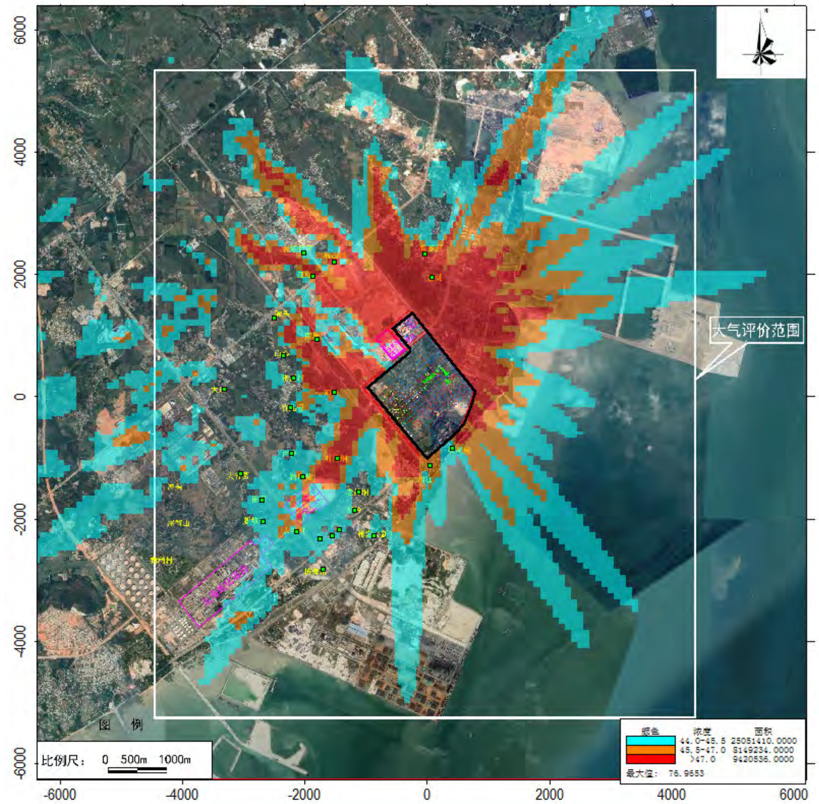


图 4.2-19 正常排放 NH_3 小时平均质量浓度分布图（叠加现状浓度，单位：μg/m³）

Figure 4.2-19 Distribution Map of Hourly Average Mass Concentration of NH_3 at Guarantee Rate under Normal Emission (after Superimposing Current Concentration, in μg/m³)

（11）镉（Cd）

(11) Cadmium (Cd)

正常排放情况下，Cd 叠加环境质量现状浓度预测结果后环境质量浓度预测结果见表 4.2-31，年平均浓度分布见图 4.2-20。

The prediction results of environmental mass concentration of Cd after superimposing the predication results of current environmental mass concentration under normal emission conditions are shown in Table 4.2-31 and distribution of daily average concentration is as shown in Figure 4.2-20.

对于环境空气敏感目标而言，叠加环境质量现状浓度后，Cd 长期浓度（年均值）叠加值满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, after superimposing current environmental mass concentration, the superimposed long-term (annual average) concentration values of Cd comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，叠加环境质量现状浓度后，Cd 长期浓度（年平均浓度）叠加最大值为 0.000486μg/m^3，最大占标率为 9.71%，满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, after superimposing current environmental mass concentration, the maximum superimposed long-term (annual average) concentration value of Cd is 0.000486μg/m3 and the maximum Pi is 9.71%%, which comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-31 正常工况 Cd 预测结果表

Table 4.2-31 Prediction Results of Cd under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standa status
Cd	猪血塘 Zhuxuetang	年平均 Annual average	0.00005	1.00	0.000286	0.000336	6.71	达标 Yes
	百班 Baiban	年平均 Annual average	0.00005	1.00	0.000286	0.000336	6.71	达标 Yes
	竹儿根 Zhuergen	年平均 Annual average	0.00007	1.40	0.000286	0.000356	7.11	达标 Yes
	彬崇村 Binchong Village	年平均 Annual average	0.00008	1.60	0.000286	0.000366	7.31	达标 Yes

	山心 Shanxin	年平均 Annual average	0.00008	1.60	0.000286	0.000366	7.31	达标 Yes
	邓屋 Dengwu	年平均 Annual average	0.0001	2.00	0.000286	0.000386	7.71	达标 Yes
	对面垌 Duimiandong	年平均 Annual average	0.00006	1.20	0.000286	0.000346	6.91	达标 Yes
	老妗垌 Laojindong	年平均 Annual average	0.00006	1.20	0.000286	0.000346	6.91	达标 Yes
	坡尾底 Poweidi	年平均 Annual average	0.0001	2.00	0.000286	0.000386	7.71	达标 Yes
	川江 Chuanjiang	年平均 Annual average	0.0001	2.00	0.000286	0.000386	7.71	达标 Yes
	彬定（新） Binding (New village)	年平均 Annual average	0.00005	1.00	0.000286	0.000336	6.71	达标 Yes
	大塘村 Datang Village	年平均 Annual average	0.00004	0.80	0.000286	0.000326	6.51	达标 Yes
	南乐 Nanyue	年平均 Annual average	0.00011	2.20	0.000286	0.000396	7.91	达标 Yes
	陂头 Potou	年平均 Annual average	0.00009	1.80	0.000286	0.000376	7.51	达标 Yes
	亚细 Yaxi	年平均 Annual average	0.00008	1.60	0.000286	0.000366	7.31	达标 Yes
	南乐社区 Nanyue Community	年平均 Annual average	0.00007	1.40	0.000286	0.000356	7.11	达标 Yes
	海山排 Haishanpai	年平均 Annual average	0.00008	1.60	0.000286	0.000366	7.31	达标 Yes
	谢家村 Xiejiacun Village	年平均 Annual average	0.00005	1.00	0.000286	0.000336	6.71	达标 Yes
	阳光海岸（中	年平均	0.00004	0.80	0.000286	0.000326	6.51	达标

	石化倒班宿舍）Yangguang Coast (SINOPEC shift dormitory)	Annual average						Yes
	东方海岸大酒店 Oriental Coast Hotel	年平均 Annual average	0.00005	1.00	0.000286	0.000336	6.71	达标 Yes
	华南北苑 Huanan Beiyuan	年平均 Annual average	0.00005	1.00	0.000286	0.000336	6.71	达标 Yes
	新岭 Xinling	年平均 Annual average	0.00005	1.00	0.000286	0.000336	6.71	达标 Yes
	新铺 Xinpu	年平均 Annual average	0.00007	1.40	0.000286	0.000356	7.11	达标 Yes
	网格 Mesh	年平均 Annual average	0.0002	4.00	0.000286	0.000486	9.71	达标 Yes

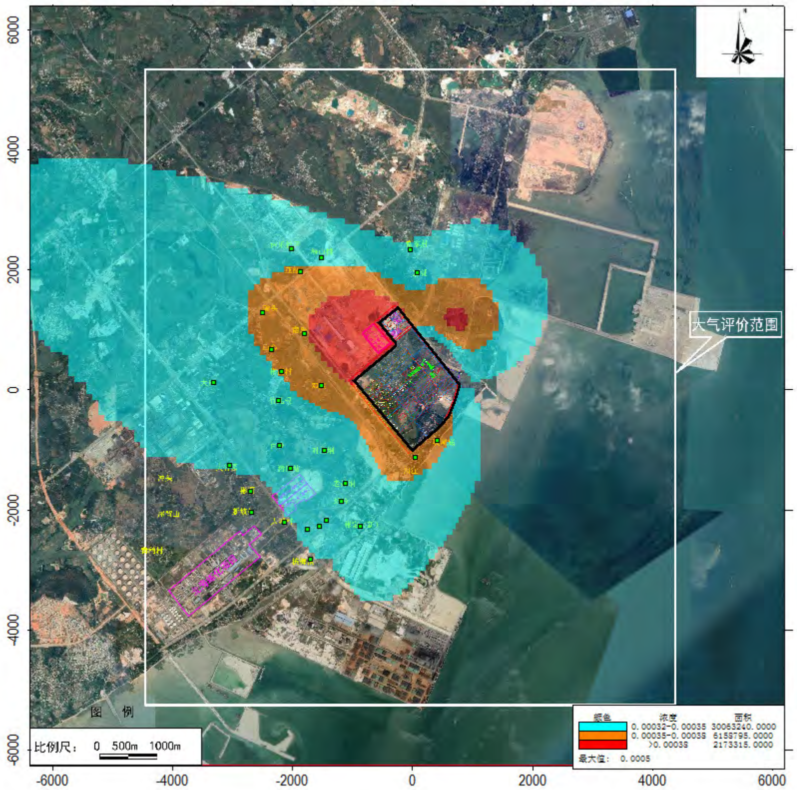


图 4.2-20 正常排放 Cd 年平均质量浓度分布图（叠加现状浓度，单位：μg/m³）

Figure 4.2-20 Distribution Map of Annual Average Mass Concentration of Cd at Guarantee Rate under Normal Emission (after Superimposing Current Concentration, in μg/m³)

（12）氯气（Cl_2）

(12) Chlorine (Cl_2)

正常排放情况下，Cl2 叠加环境质量现状浓度预测结果后环境质量浓度预测结果见表 4.2-55、图 4.2-42~4.2-43。

The prediction results of environmental mass concentration of Cl2 after superimposing the predication results of current environmental mass concentration under normal emission conditions are shown in Table 4.2-55 and Figure 4.2-42 to 4.2-43.

对于环境空气敏感目标而言，叠加环境质量现状浓度后，Cl2 短期浓度（小时、日平均浓度）贡献值均满足《环境影响评价技术导则 大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。

In regard to ambient air sensitive targets, the short-term concentration (hourly and daily Average Concentration) contribution values of Cl_2 after superimposing current environmental mass concentration all comply with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018)*.

区域最大落地浓度网格点，叠加环境质量现状浓度后，Cl2 短期浓度（小时、日均）贡献值最大值分别为 10.2367μg/m³、0.9184μg/m³，最大占标率分别为 25.24%、53.06%，最大浓度占标率均<100%，Cl2 短期浓度（小时、日均）贡献值均满足《环境影响评价技术导则 大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。

At the mesh point of regional maximum ground-level concentration, the maximum short-term concentration (hourly and daily average) contribution value of Cl2 is 10.2367μg/m³ and 0.9184μg/m³ respectively, and the maximum Pi is 25.24% and 53.06% respectively with Pi of maximum concentration both <100%. The short-term (hourly and daily average) concentration contribution values of Cl2 both comply with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018)*.

表 4.2-48 正常工况 Cl2 预测结果表
Table 4.2-48 Prediction Results of C12 under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
Cl2	猪血塘 Zhuxuetang	1 小时 1 hour	3.0076	3.0076	15	18.0076	18.01	达标 Yes
		日平均 Average daily	0.1276	0.425333	15	15.1276	50.43	达标 Yes
	百班 Baiban	1 小时 1 hour	1.7057	1.7057	15	16.7057	16.71	达标 Yes
		日平均 Average daily	0.1569	0.523	15	15.1569	50.52	达标 Yes
	竹儿根 Zhuergen	1 小时 1 hour	1.7333	1.7333	15	16.7333	16.73	达标 Yes
		日平均 Average daily	0.1426	0.475333	15	15.1426	50.48	达标 Yes
	彬崇村 Binchong Village	1 小时 1 hour	2.0096	2.0096	15	17.0096	17.01	达标 Yes
		日平均 Average daily	0.1935	0.645	15	15.1935	50.64	达标 Yes
	山心	1 小时	1.2093	1.2093	15	16.2093	16.21	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
	Shanxin	1 hour						Yes
		日平均 Average daily	0.1168	0.389333	15	15.1168	50.39	达标 Yes
	邓屋 Dengwu	1 小时 1 hour	5.7191	5.7191	15	20.7191	20.72	达标 Yes
		日平均 Average daily	0.3819	1.273	15	15.3819	51.27	达标 Yes
	对面垌 Duimiandong	1 小时 1 hour	2.7966	2.7966	15	17.7966	17.8	达标 Yes
		日平均 Average daily	0.1578	0.526	15	15.1578	50.53	达标 Yes
	老妗垌 Laojindong	1 小时 1 hour	2.864	2.864	15	17.864	17.86	达标 Yes
		日平均 Average daily	0.1359	0.453	15	15.1359	50.45	达标 Yes
	坡尾底 Poweidi	1 小时 1 hour	4.2293	4.2293	15	19.2293	19.23	达标 Yes
		日平均 Average daily	0.436	1.453333	15	15.436	51.45	达标 Yes
	川江 Chuanjiang	1 小时 1 hour	3.9795	3.9795	15	18.9795	18.98	达标 Yes
		日平均 Average daily	0.5094	1.698	15	15.5094	51.7	达标 Yes
	彬定（新）Binding (New village)	1 小时 1 hour	1.9316	1.9316	15	16.9316	16.93	达标 Yes
		日平均 Average daily	0.1325	0.441667	15	15.1325	50.44	达标 Yes
	大塘村	1 小时	1.0038	1.0038	15	16.0038	16	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
	Datang Village	1 hour						Yes
		日平均 Average daily	0.0832	0.277333	15	15.0832	50.28	达标 Yes
	南乐 Nanyue	1 小时 1 hour	3.7255	3.7255	15	18.7255	18.73	达标 Yes
		日平均 Average daily	0.2536	0.845333	15	15.2536	50.85	达标 Yes
	陂头 Potou	1 小时 1 hour	1.6281	1.6281	15	16.6281	16.63	达标 Yes
		日平均 Average daily	0.1329	0.443	15	15.1329	50.44	达标 Yes
	亚细 Yaxi	1 小时 1 hour	3.0547	3.0547	15	18.0547	18.05	达标 Yes
		日平均 Average daily	0.1289	0.429667	15	15.1289	50.43	达标 Yes
	南乐社区 Nanyue Community	1 小时 1 hour	3.0952	3.0952	15	18.0952	18.1	达标 Yes
		日平均 Average daily	0.1373	0.457667	15	15.1373	50.46	达标 Yes
	海山排 Haishanpai	1 小时 1 hour	2.2654	2.2654	15	17.2654	17.27	达标 Yes
		日平均 Average daily	0.1276	0.425333	15	15.1276	50.43	达标 Yes
	谢家村 Xiejiacun Village	1 小时 1 hour	1.9773	1.9773	15	16.9773	16.98	达标 Yes
		日平均 Average daily	0.1241	0.413667	15	15.1241	50.41	达标 Yes

污染物 Polluta nt	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
	阳光海岸（中石化倒班宿舍）Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	1.4052	1.4052	15	16.4052	16.41	达标 Yes
		日平均 Average daily	0.0737	0.245667	15	15.0737	50.25	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	2.145	2.145	15	17.145	17.15	达标 Yes
		日平均 Average daily	0.1026	0.342	15	15.1026	50.34	达标 Yes
	华南北苑 Huanan Beiyuan	1 小时 1 hour	1.8928	1.8928	15	16.8928	16.89	达标 Yes
		日平均 Average daily	0.1108	0.369333	15	15.1108	50.37	达标 Yes
	新岭 Xinling	1 小时 1 hour	2.5051	2.5051	15	17.5051	17.51	达标 Yes
		日平均 Average daily	0.1499	0.499667	15	15.1499	50.5	达标 Yes
	新铺 Xinpu	1 小时 1 hour	2.1916	2.1916	15	17.1916	17.19	达标 Yes
		日平均 Average daily	0.145	0.483333	15	15.145	50.48	达标 Yes
	大田 Datian	1 小时 1 hour	1.6826	1.6826	15	16.6826	16.68	达标 Yes
		日平均 Average daily	0.1656	0.552	15	15.1656	50.55	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
	大竹园 Dazhuyuan	1 小时 1 hour	1.8609	1.8609	15	16.8609	16.86	达标 Yes
		日平均 Average daily	0.1336	0.445333	15	15.1336	50.45	达标 Yes
	彬垌 Bindong	1 小时 1 hour	2.0902	2.0902	15	17.0902	17.09	达标 Yes
		日平均 Average daily	0.0937	0.312333	15	15.0937	50.31	达标 Yes
	新坡村 Xinpo Village	1 小时 1 hour	1.1554	1.1554	15	16.1554	16.16	达标 Yes
		日平均 Average daily	0.0799	0.266333	15	15.0799	50.27	达标 Yes
	槟榔根 Binlanggen	1 小时 1 hour	2.8736	2.8736	15	17.8736	17.87	达标 Yes
		日平均 Average daily	0.1287	0.429	15	15.1287	50.43	达标 Yes
	网格 Mesh	1 小时 1 hour	10.2367	10.2367	15	25.2367	25.24	达标 Yes
		日平均 Average daily	0.9184	3.061333	15	15.9184	53.06	达标 Yes

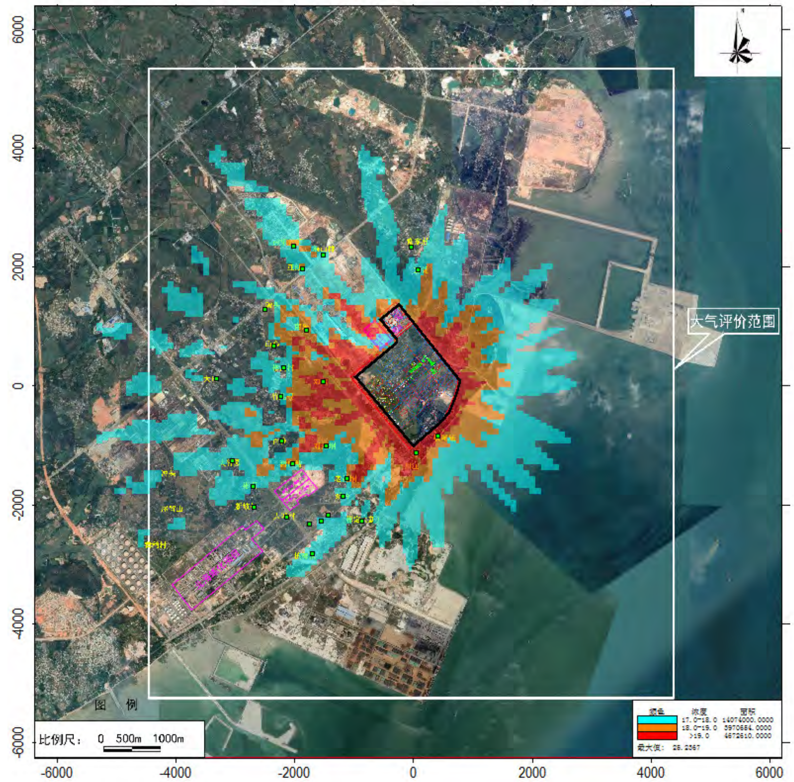


图 4.2-21 正常排放 Cl_2 小时平均质量浓度分布图（叠加区域污染源及现状浓度，单位：μg/m³）

Figure 4.2-21 Distribution Map of Hourly Average Mass Concentration of Cl_2 at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m³)

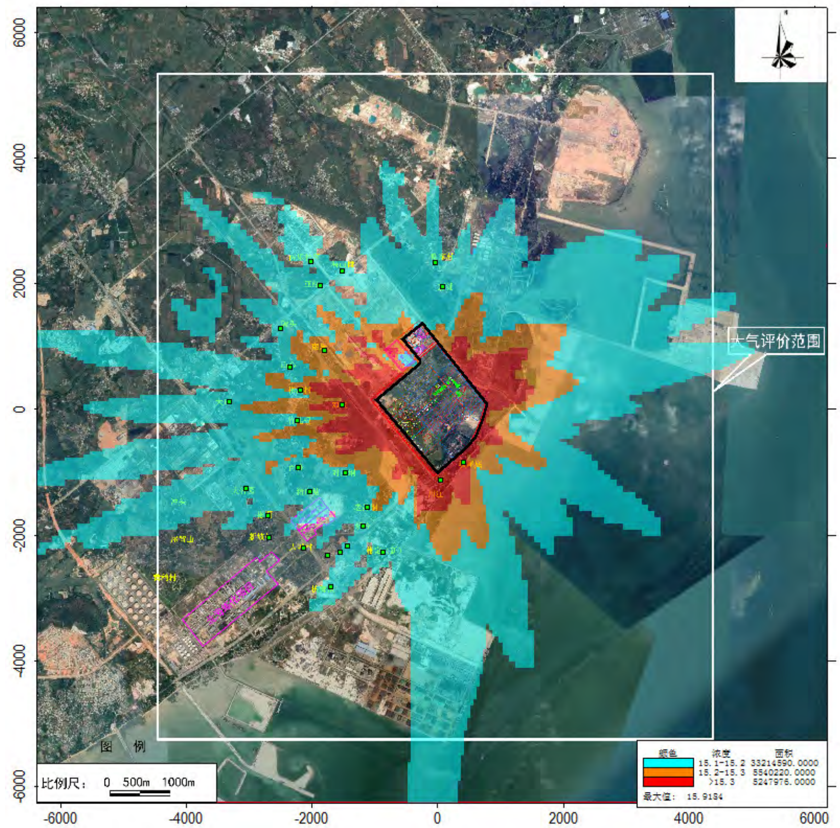


图 4.2-22 正常排放 Cl_2 日平均质量浓度分布图（叠加区域污染源及现状浓度，单位：μg/m³）
Figure 4.2-22 Distribution Map of Daily Average Mass Concentration of Cl2 at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m³)

4.2.6 二期工程预测结果与分析

4.2.6 Prediction results and analysis for Phase Phase II Project

4.2.6.1 新增污染源预测（最大浓度占标率）

4.2.5.1 Prediction of newly added pollution sources (Pi of maximum concentration)

（1）二氧化硫（SO_2）

(1) Sulfur dioxide (SO_2)

正常排放情况下，SO_2 贡献质量浓度预测结果见表 4.2-32。

The prediction results of SO2 contribution mass concentration under normal emission conditions are shown in Table 4.2-32.

对于环境空气敏感目标而言，项目排放的 SO_2 短期浓度（小时、日均）、长期（年均）浓度贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, the short-term concentration (hourly and daily average) and long-term (annual average) concentration contribution values of SO2 emitted by the project all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，SO_2 短期浓度（小时、日均）贡献值最大值分别为 8.8608μg/m^3、2.9460μg/m^3，最大占标率分别为 1.77%、1.96%，最大浓度占标率均<100%；长期浓度贡献值最大值为 0.4795μg/m^3，最大占标率为 0.80%，最大浓度占标率<30%，SO_2 短期浓度、长期浓度贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, the maximum short-term concentration (hourly and daily average) contribution value of SO2 is 7.5197g/m^3 and 2.5823 g/m^3 respectively, and the maximum Pi is 1.77% and 1.96% respectively with Pi of maximum concentration both <100%. The maximum long-term concentration contribution value is 0.4204 g/m3 and the maximum Pi is 0.80% with Pi of maximum concentration <30%. The short-term and long-term concentration contribution value of SO2 both comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-32 正常工况 SO_2 预测结果表
Table 4.2-32 Prediction Results of SO_2 under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值(μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
SO_2	猪血塘 Zhuxuetang	1 小时 1 hour	6.1968	18010608	1.24	达标 Yes
		日平均 Average daily	1.2780	180723	0.85	达标 Yes
		年平均 Annual average	0.1388	平均值 Average value	0.23	达标 Yes
	百班 Baiban	1 小时 1 hour	7.1961	18010608	1.44	达标 Yes
		日平均 Average	1.4334	180716	0.96	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值(μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		daily				
		年平均 Annual average	0.1494	平均值 Average value	0.25	达标 Yes
	竹儿根 Zhuergen	1 小时 1 hour	6.6508	18060208	1.33	达标 Yes
		日平均 Average daily	1.6734	180715	1.12	达标 Yes
		年平均 Annual average	0.1963	平均值 Average value	0.33	达标 Yes
	彬崇村 Binchong Village	1 小时 1 hour	7.7631	18030508	1.55	达标 Yes
		日平均 Average daily	1.8292	180918	1.22	达标 Yes
		年平均 Annual average	0.2334	平均值 Average value	0.39	达标 Yes
	山心 Shanxin	1 小时 1 hour	7.7163	18072608	1.54	达标 Yes
		日平均 Average daily	1.9840	180918	1.32	达标 Yes
		年平均 Annual average	0.2456	平均值 Average value	0.41	达标 Yes
	邓屋 Dengwu	1 小时 1 hour	7.4445	18082812	1.49	达标 Yes
		日平均 Average daily	2.0235	180715	1.35	达标 Yes
		年平均 Annual average	0.2611	平均值 Average value	0.44	达标 Yes
	对面垌	1 小时	5.8789	18091010	1.18	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值(μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
	Duimiandong	1 hour				Yes
		日平均 Average daily	1.5761	180723	1.05	达标 Yes
		年平均 Annual average	0.1669	平均值 Average value	0.28	达标 Yes
	老妗垌 Laojindong	1 小时 1 hour	6.0050	18091010	1.20	达标 Yes
		日平均 Average daily	1.3112	181122	0.87	达标 Yes
		年平均 Annual average	0.1743	平均值 Average value	0.29	达标 Yes
	坡尾底 Poweidi	1 小时 1 hour	7.9734	18082812	1.59	达标 Yes
		日平均 Average daily	1.9459	181101	1.30	达标 Yes
		年平均 Annual average	0.2379	平均值 Average value	0.40	达标 Yes
	川江 Chuanjiang	1 小时 1 hour	8.1177	18022409	1.62	达标 Yes
		日平均 Average daily	1.5572	180929	1.04	达标 Yes
		年平均 Annual average	0.2547	平均值 Average value	0.42	达标 Yes
	彬定（新） Binding (New village)	1 小时 1 hour	5.5175	18022409	1.10	达标 Yes
		日平均 Average daily	1.0457	181011	0.70	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值(μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		年平均 Annual average	0.1586	平均值 Average value	0.26	达标 Yes
	大塘村 Datang Village	1 小时 1 hour	5.6524	18061308	1.13	达标 Yes
		日平均 Average daily	1.2833	180131	0.86	达标 Yes
		年平均 Annual average	0.1228	平均值 Average value	0.20	达标 Yes
	南乐 Nanyue	1 小时 1 hour	6.9347	18030508	1.39	达标 Yes
		日平均 Average daily	1.6822	180307	1.12	达标 Yes
		年平均 Annual average	0.3242	平均值 Average value	0.54	达标 Yes
	陂头 Potou	1 小时 1 hour	6.7558	18080607	1.35	达标 Yes
		日平均 Average daily	1.8847	180125	1.26	达标 Yes
		年平均 Annual average	0.2530	平均值 Average value	0.42	达标 Yes
	亚细 Yaxi	1 小时 1 hour	7.9463	18080607	1.59	达标 Yes
		日平均 Average daily	1.4333	180125	0.96	达标 Yes
		年平均 Annual average	0.2603	平均值 Average value	0.43	达标 Yes
	南乐社区 Nanyue	1 小时 1 hour	7.1299	18080607	1.43	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值(μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
	Community					
		日平均 Average daily	1.2054	180625	0.80	达标 Yes
		年平均 Annual average	0.2133	平均值 Average value	0.36	达标 Yes
	海山排 Haishanpai	1 小时 1 hour	6.5216	18080607	1.30	达标 Yes
		日平均 Average daily	1.6262	180625	1.08	达标 Yes
		年平均 Annual average	0.2404	平均值 Average value	0.40	达标 Yes
	谢家村 Xiejiacun Village	1 小时 1 hour	6.1600	18082409	1.23	达标 Yes
		日平均 Average daily	1.1708	180725	0.78	达标 Yes
		年平均 Annual average	0.1452	平均值 Average value	0.24	达标 Yes
	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	5.5249	18091010	1.10	达标 Yes
		日平均 Average daily	1.1662	180131	0.78	达标 Yes
		年平均 Annual average	0.1312	平均值 Average value	0.22	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	5.3708	18091010	1.07	达标 Yes
		日平均 Average daily	1.0748	181122	0.72	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值(μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		年平均 Annual average	0.1378	平均值 Average value	0.23	达标 Yes
	华南北苑 Huanan Beiyuan	1 小时 1 hour	5.4563	18091010	1.09	达标 Yes
		日平均 Average daily	1.1172	181122	0.74	达标 Yes
		年平均 Annual average	0.1424	平均值 Average value	0.24	达标 Yes
	新岭 Xinling	1 小时 1 hour	5.6939	18091010	1.14	达标 Yes
		日平均 Average daily	1.2383	181122	0.83	达标 Yes
		年平均 Annual average	0.1612	平均值 Average value	0.27	达标 Yes
	新铺 Xinpu	1 小时 1 hour	5.8984	18062311	1.18	达标 Yes
		日平均 Average daily	1.5108	180526	1.01	达标 Yes
		年平均 Annual average	0.1824	平均值 Average value	0.30	达标 Yes
	大田 Datian	1 小时 1 hour	7.1325	18072608	1.43	达标 Yes
		日平均 Average daily	1.3608	180918	0.91	达标 Yes
		年平均 Annual average	0.1657	平均值 Average value	0.28	达标 Yes
	大竹园 Dazhuyuan	1 小时 1 hour	8.5477	18010608	1.71	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值(μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		日平均 Average daily	1.2650	180716	0.84	达标 Yes
		年平均 Annual average	0.1264	平均值 Average value	0.21	达标 Yes
	彬垌 Bindong	1 小时 1 hour	7.8915	18010608	1.58	达标 Yes
		日平均 Average daily	1.0569	180723	0.70	达标 Yes
		年平均 Annual average	0.1182	平均值 Average value	0.20	达标 Yes
	新坡村 Xinpo Village	1 小时 1 hour	6.7698	18010608	1.35	达标 Yes
		日平均 Average daily	1.0663	180723	0.71	达标 Yes
		年平均 Annual average	0.1123	平均值 Average value	0.19	达标 Yes
	槟榔根 Binlanggen	1 小时 1 hour	4.7726	18091010	0.95	达标 Yes
		日平均 Average daily	0.9693	181122	0.65	达标 Yes
		年平均 Annual average	0.1231	平均值 Average value	0.21	达标 Yes
	网格 Mesh	1 小时 1 hour	8.8608	18082812	1.77	达标 Yes
		日平均 Average daily	2.9460	180625	1.96	达标 Yes
		年平均 Annual	0.4795	平均值 Average value	0.80	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值(μg/m^3) Maximum contribution (μg/m^3)	出现时间(YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		average				

（2）二氧化氮（NO_2）

(2) Nitrogen dioxide (NO_2)

正常排放情况下，NO_2 贡献质量浓度预测结果见表 4.2-33。

The prediction results of NO2 contribution mass concentration under normal emission conditions are shown in Table 4.2-33.

对于环境空气敏感目标而言，NO_2 短期浓度（小时、日均）、长期浓度（年均）贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, the short-term concentration (hourly and daily average) and long-term (annual average) concentration contribution values of NO2 all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，NO_2 短期浓度（小时平均浓度、日平均浓度）贡献值最大值分别为 24.1257μg/m^3、6.3739μg/m^3，最大占标率分别为 12.06%、7.97%，最大浓度占标率均<100%；长期浓度贡献值最大值为 1.0986μg/m^3，最大占标率为 2.75%，最大浓度占标率<30%，NO_2 短期浓度、长期浓度贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, the maximum short-term concentration (hourly and daily average) contribution value of NO_2 is 24.1257μg/m^3 and 6.3739μg/m^3 respectively, and the maximum Pi is 12.06% and 7.97% respectively with Pi of maximum concentration both <100%. The maximum long-term concentration contribution value is 1.0986μg/m^3 and the maximum Pi is 2.75% with Pi of maximum concentration <30%. The short-term and long-term concentration contribution value of NO_2 both comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-33 正常工况 NO_2 预测结果表

Table 4.2-33 Prediction Results of SO_2 under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
NO_2	猪血塘 Zhuxuetang	1 小时 1 hour	15.5114	18040908	7.76	达标 Yes
		日平均 Average daily	3.4896	180723	4.36	达标 Yes
		年平均 Annual average	0.3721	平均值 Average value	0.93	达标 Yes
	百班 Baiban	1 小时 1 hour	16.9181	18040908	8.46	达标 Yes
		日平均 Average daily	3.9755	180716	4.97	达标 Yes
		年平均 Annual average	0.3963	平均值 Average value	0.99	达标 Yes
	竹儿根 Zhuergen	1 小时 1 hour	17.9848	18060208	8.99	达标 Yes
		日平均 Average daily	4.5196	180715	5.65	达标 Yes
		年平均 Annual average	0.5211	平均值 Average value	1.30	达标 Yes
	彬崇村 Binchong Village	1 小时 1 hour	18.9429	18030508	9.47	达标 Yes
		日平均 Average daily	4.9248	180918	6.16	达标 Yes
		年平均 Annual average	0.6273	平均值 Average value	1.57	达标 Yes
	山心 Shanxin	1 小时 1 hour	20.8649	18030508	10.43	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		日平均 Average daily	5.2387	180918	6.55	达标 Yes
		年平均 Annual average	0.6694	平均值 Average value	1.67	达标 Yes
	邓屋 Dengwu	1 小时 1 hour	17.1935	18082308	8.60	达标 Yes
		日平均 Average daily	5.0818	180715	6.35	达标 Yes
		年平均 Annual average	0.6693	平均值 Average value	1.67	达标 Yes
	对面垌 Duimiandong	1 小时 1 hour	16.6244	18091010	8.31	达标 Yes
		日平均 Average daily	4.3215	180723	5.40	达标 Yes
		年平均 Annual average	0.4450	平均值 Average value	1.11	达标 Yes
	老妗垌 Laojindong	1 小时 1 hour	17.0716	18091010	8.54	达标 Yes
		日平均 Average daily	3.6793	181122	4.60	达标 Yes
		年平均 Annual average	0.4764	平均值 Average value	1.19	达标 Yes
	坡尾底 Poweidi	1 小时 1 hour	17.2824	18103010	8.64	达标 Yes
		日平均 Average daily	5.3493	181101	6.69	达标 Yes
		年平均 Annual	0.5691	平均值 Average value	1.42	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		average				
	川江 Chuanjiang	1 小时 1 hour	20.1622	18081908	10.08	达标 Yes
		日平均 Average daily	4.2715	180915	5.34	达标 Yes
		年平均 Annual average	0.6598	平均值 Average value	1.65	达标 Yes
	彬定（新） Binding (New village)	1 小时 1 hour	16.1568	18022409	8.08	达标 Yes
		日平均 Average daily	2.9059	181011	3.63	达标 Yes
		年平均 Annual average	0.4410	平均值 Average value	1.10	达标 Yes
	大塘村 Datang Village	1 小时 1 hour	16.0196	18061308	8.01	达标 Yes
		日平均 Average daily	3.5101	180131	4.39	达标 Yes
		年平均 Annual average	0.3370	平均值 Average value	0.84	达标 Yes
	南乐 Nanyue	1 小时 1 hour	18.1354	18081908	9.07	达标 Yes
		日平均 Average daily	4.6702	180307	5.84	达标 Yes
		年平均 Annual average	0.8817	平均值 Average value	2.20	达标 Yes
	陂头 Potou	1 小时 1 hour	17.0726	18052407	8.54	达标 Yes
		日平均	5.1041	180125	6.38	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		Average daily				Yes
		年平均 Annual average	0.6977	平均值 Average value	1.74	达标 Yes
	亚细 Yaxi	1 小时 1 hour	14.4349	18091109	7.22	达标 Yes
		日平均 Average daily	3.9607	180125	4.95	达标 Yes
		年平均 Annual average	0.7271	平均值 Average value	1.82	达标 Yes
	南乐社区 Nanyue Community	1 小时 1 hour	14.9443	18080607	7.47	达标 Yes
		日平均 Average daily	3.4108	180625	4.26	达标 Yes
		年平均 Annual average	0.6012	平均值 Average value	1.50	达标 Yes
	海山排 Haishanpai	1 小时 1 hour	14.6163	18091109	7.31	达标 Yes
		日平均 Average daily	4.6393	180625	5.80	达标 Yes
		年平均 Annual average	0.6743	平均值 Average value	1.69	达标 Yes
	谢家村 Xiejiacun Village	1 小时 1 hour	15.0644	18082409	7.53	达标 Yes
		日平均 Average daily	3.2010	180725	4.00	达标 Yes
		年平均 Annual	0.3967	平均值 Average value	0.99	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		average				
	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	15.6025	18091010	7.80	达标 Yes
		日平均 Average daily	3.1663	180131	3.96	达标 Yes
		年平均 Annual average	0.3628	平均值 Average value	0.91	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	15.4965	18091010	7.75	达标 Yes
		日平均 Average daily	3.0040	181122	3.76	达标 Yes
		年平均 Annual average	0.3813	平均值 Average value	0.95	达标 Yes
	华南北苑 Huanan Beiyuan	1 小时 1 hour	15.7113	18091010	7.86	达标 Yes
		日平均 Average daily	3.1174	181122	3.90	达标 Yes
		年平均 Annual average	0.3943	平均值 Average value	0.99	达标 Yes
	新岭 Xinling	1 小时 1 hour	16.2890	18091010	8.14	达标 Yes
		日平均 Average daily	3.4502	181122	4.31	达标 Yes
		年平均 Annual average	0.4445	平均值 Average value	1.11	达标 Yes
	新铺 Xinpu	1 小时 1 hour	16.5434	18101415	8.27	达标 Yes
		日平均	4.2273	180526	5.28	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		Average daily				Yes
		年平均 Annual average	0.4769	平均值 Average value	1.19	达标 Yes
	大田 Datian	1 小时 1 hour	20.1454	18072608	10.07	达标 Yes
		日平均 Average daily	3.6601	180918	4.58	达标 Yes
		年平均 Annual average	0.4487	平均值 Average value	1.12	达标 Yes
	大竹园 Dazhuyuan	1 小时 1 hour	14.9688	18040908	7.48	达标 Yes
		日平均 Average daily	3.4944	180716	4.37	达标 Yes
		年平均 Annual average	0.3356	平均值 Average value	0.84	达标 Yes
	彬垌 Bindong	1 小时 1 hour	14.5318	18040908	7.27	达标 Yes
		日平均 Average daily	2.9347	180723	3.67	达标 Yes
		年平均 Annual average	0.3176	平均值 Average value	0.79	达标 Yes
	新坡村 Xinpo Village	1 小时 1 hour	13.9777	18091010	6.99	达标 Yes
		日平均 Average daily	2.9919	180723	3.74	达标 Yes
		年平均 Annual average	0.3049	平均值 Average value	0.76	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
	槟榔根 Binlanggen	1 小时 1 hour	13.8372	18091010	6.92	达标 Yes
		日平均 Average daily	2.6984	181122	3.37	达标 Yes
		年平均 Annual average	0.3418	平均值 Average value	0.85	达标 Yes
	网格 Mesh	1 小时 1 hour	24.1257	18081908	12.06	达标 Yes
		日平均 Average daily	6.3739	180625	7.97	达标 Yes
		年平均 Annual average	1.0986	平均值 Average value	2.75	达标 Yes

（3）颗粒物（PM_{10}）

(3) Particulate matter (PM_{10})

正常排放情况下，PM_{10} 的预测计算的结果见表 4.2-34。

The prediction results of PM10 under normal emission conditions are shown in Table 4.2-34.

对于环境空气敏感目标而言，PM_{10} 短期浓度（日均）、长期浓度（年均）贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, the short-term concentration (daily average) and long-term (annual average) concentration contribution values of PM10 all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，PM_{10} 短期浓度（日均）贡献值最大值为 1.3572μg/m^3，最大占标率为 0.9%，最大浓度占标率<100%；长期浓度贡献值最大值为 0.2147μg/m^3，最大占标率为 0.31%，最大浓度占标率<30%，PM_{10} 短期浓度、长期浓度贡献值均满足

《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, the maximum short-term concentration (daily average) contribution value of PM10 is 1.3572μg/m^3, and the maximum Pi is 0.9% with Pi of maximum concentration both <100%. The maximum long-term concentration contribution value is 0.2147μg/m^3 and the maximum Pi is 0.31% with Pi of maximum concentration <30%. The short-term and long-term concentration contribution value of PM10 both comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-34 正常工况 PM_{10} 预测结果表

Table 4.2-34 Prediction Results of SO_{10} under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
PM_{10}	猪血塘 Zhuxuetang	日平均 Average daily	0.5848	180723	0.39	达标 Yes
		年平均 Annual average	0.0639	平均值 Average value	0.09	达标 Yes
	百班 Baiban	日平均 Average daily	0.6633	180716	0.44	达标 Yes
		年平均 Annual average	0.0686	平均值 Average value	0.10	达标 Yes
	竹儿根 Zhuergen	日平均 Average daily	0.7597	180715	0.51	达标 Yes
		年平均 Annual average	0.0900	平均值 Average value	0.13	达标 Yes
	彬崇村 Binchong Village	日平均 Average daily	0.8286	180918	0.55	达标 Yes
		年平均 Annual	0.1075	平均值 Average value	0.15	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		average				
	山心 Shanxin	日平均 Average daily	0.8863	180918	0.59	达标 Yes
		年平均 Annual average	0.1136	平均值 Average value	0.16	达标 Yes
	邓屋 Dengwu	日平均 Average daily	0.9381	180715	0.63	达标 Yes
		年平均 Annual average	0.1184	平均值 Average value	0.17	达标 Yes
	对面垌 Duimiandong	日平均 Average daily	0.7233	180723	0.48	达标 Yes
		年平均 Annual average	0.0763	平均值 Average value	0.11	达标 Yes
	老妗垌 Laojindong	日平均 Average daily	0.6119	181122	0.41	达标 Yes
		年平均 Annual average	0.0804	平均值 Average value	0.11	达标 Yes
	坡尾底 Poweidi	日平均 Average daily	0.9049	181101	0.60	达标 Yes
		年平均 Annual average	0.1062	平均值 Average value	0.15	达标 Yes
	川江 Chuanjiang	日平均 Average daily	0.7204	180929	0.48	达标 Yes
		年平均 Annual average	0.1151	平均值 Average value	0.16	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
	彬定（新） Binding (New village)	日平均 Average daily	0.4846	181011	0.32	达标 Yes
		年平均 Annual average	0.0737	平均值 Average value	0.11	达标 Yes
	大塘村 Datang Village	日平均 Average daily	0.5880	180131	0.39	达标 Yes
		年平均 Annual average	0.0570	平均值 Average value	0.08	达标 Yes
	南乐 Nanyue	日平均 Average daily	0.7790	180307	0.52	达标 Yes
		年平均 Annual average	0.1496	平均值 Average value	0.21	达标 Yes
	陂头 Potou	日平均 Average daily	0.8573	180125	0.57	达标 Yes
		年平均 Annual average	0.1173	平均值 Average value	0.17	达标 Yes
	亚细 Yaxi	日平均 Average daily	0.6615	180125	0.44	达标 Yes
		年平均 Annual average	0.1218	平均值 Average value	0.17	达标 Yes
	南乐社区 Nanyue Community	日平均 Average daily	0.5660	180625	0.38	达标 Yes
		年平均 Annual average	0.1003	平均值 Average value	0.14	达标 Yes
	海山排	日平均	0.7681	180625	0.51	达标

污染物 **Pollutant**	预测点 **Prediction point**	平均时段 **Average period**	最大贡献值 **(μg/m^3) Maximum contribution (μg/m^3)**	出现时间 **(YYMMDDHH) Occurrence time (HHDDMMYY)**	占标率% **Pi %**	达标情况 **Up-to-standard status**
	Haishanpai	Average daily				Yes
		年平均 Annual average	0.1129	平均值 Average value	0.16	达标 Yes
	谢家村 Xiejiacun Village	日平均 Average daily	0.5363	180725	0.36	达标 Yes
		年平均 Annual average	0.0671	平均值 Average value	0.10	达标 Yes
	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	日平均 Average daily	0.5315	180131	0.35	达标 Yes
		年平均 Annual average	0.0610	平均值 Average value	0.09	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	日平均 Average daily	0.5002	181122	0.33	达标 Yes
		年平均 Annual average	0.0640	平均值 Average value	0.09	达标 Yes
	华南北苑 Huanan Beiyuan	日平均 Average daily	0.5193	181122	0.35	达标 Yes
		年平均 Annual average	0.0661	平均值 Average value	0.09	达标 Yes
	新岭 Xinling	日平均 Average daily	0.5749	181122	0.38	达标 Yes
		年平均 Annual average	0.0746	平均值 Average value	0.11	达标 Yes
	新铺 Xinpu	日平均 Average daily	0.7064	180526	0.47	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		年平均 Annual average	0.0832	平均值 Average value	0.12	达标 Yes
	大田 Datian	日平均 Average daily	0.6160	180918	0.41	达标 Yes
		年平均 Annual average	0.0766	平均值 Average value	0.11	达标 Yes
	大竹园 Dazhuyuan	日平均 Average daily	0.5837	180716	0.39	达标 Yes
		年平均 Annual average	0.0583	平均值 Average value	0.08	达标 Yes
	彬垌 Bindong	日平均 Average daily	0.4895	180723	0.33	达标 Yes
		年平均 Annual average	0.0547	平均值 Average value	0.08	达标 Yes
	新坡村 Xinpo Village	日平均 Average daily	0.4976	180723	0.33	达标 Yes
		年平均 Annual average	0.0521	平均值 Average value	0.07	达标 Yes
	槟榔根 Binlanggen	日平均 Average daily	0.4498	181122	0.30	达标 Yes
		年平均 Annual average	0.0573	平均值 Average value	0.08	达标 Yes
	网格 Mesh	日平均 Average daily	1.3572	180625	0.90	达标 Yes
		年平均	0.2147	平均值	0.31	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		Annual average		Average value		Yes

（4）颗粒物（$PM_{2.5}$）（含二次 PM2.5）

(4) Particulate matter (PM2.5) (including secondary $PM_{2.5}$)

由于项目排放的 SO_2 和 NOx 总量大于 500t/a，需进行二次 $PM_{2.5}$ 预测，SO_2、NO_2 的转化系数采取导则推荐的比率，ψso_2 为 0.58、ψno_2 为 0.44。

Total amount of SO_2 and NOx emitted by the project is more than 500t/a, necessitating prediction of secondary $PM_{2.5}$ prediction. The conversion factor of SO_2 and NO_2 shall be the ratio recommended in the guidelines, which shall be 0.58 for ψso2 and 0.44 for ψNO2.

正常排放情况下，$PM_{2.5}$（含二次 PM2.5）的预测计算的结果见表 4.2-35。

The prediction results of PM2.5 (including secondary PM2.5) under normal emission conditions are shown in Table 4.2-35.

对于环境空气敏感目标而言，$PM_{2.5}$（含二次 PM2.5）短期浓度（日平均浓度）、长期浓度（年平均浓度）贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, the short-term concentration (daily average) and long-term (annual average) concentration contribution values of PM2.5 all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，$PM_{2.5}$（含二次 PM2.5）短期浓度（日平均浓度）贡献值最大值为 4.9271μg/m^3，最大占标率为 6.57%，最大浓度占标率<100%；长期浓度贡献值最大值为 0.8457μg/m^3，最大占标率为 2.42%，最大浓度占标率<30%，$PM_{2.5}$（含二次 PM2.5）短期浓度、长期浓度贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, the maximum short-term (daily average) concentration contribution value of PM2.5 (including secondary PM2.5) is 4.9271μg/m^3, and the maximum Pi is 6.57% with Pi of maximum concentration

<100%. The maximum long-term concentration contribution value is 0.8457μg/m^3 and the maximum Pi is 2.42% with Pi of maximum concentration <30%. The short-term and long-term concentration contribution value of PM2.5 (including secondary PM2.5) both comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-35 正常工况 $PM_{2.5}$（含二次 PM2.5）预测结果表

Table 4.2-35 Prediction Results of PM2.5 (including secondary PM2.5) under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
$PM_{2.5}$	猪血塘 Zhuxuetang	日平均 Average daily	2.5690	180723	3.43	达标 Yes
		年平均 Annual average	0.2762	平均值 Average value	0.79	达标 Yes
	百班 Baiban	日平均 Average daily	2.9122	180716	3.88	达标 Yes
		年平均 Annual average	0.2953	平均值 Average value	0.84	达标 Yes
	竹儿根 Zhuergen	日平均 Average daily	3.3389	180715	4.45	达标 Yes
		年平均 Annual average	0.3881	平均值 Average value	1.11	达标 Yes
	彬崇村 Binchong Village	日平均 Average daily	3.6421	180918	4.86	达标 Yes
		年平均 Annual average	0.4651	平均值 Average value	1.33	达标 Yes
	山心	日平均	3.8988	180918	5.20	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
	Shanxin	Average daily				Yes
		年平均 Annual average	0.4938	平均值 Average value	1.41	达标 Yes
	邓屋 Dengwu	日平均 Average daily	3.8786	180715	5.17	达标 Yes
		年平均 Annual average	0.5051	平均值 Average value	1.44	达标 Yes
	对面垌 Duimiandong	日平均 Average daily	3.1772	180723	4.24	达标 Yes
		年平均 Annual average	0.3307	平均值 Average value	0.94	达标 Yes
	老妗垌 Laojindong	日平均 Average daily	2.6853	181122	3.58	达标 Yes
		年平均 Annual average	0.3509	平均值 Average value	1.00	达标 Yes
	坡尾底 Poweidi	日平均 Average daily	3.9347	181101	5.25	达标 Yes
		年平均 Annual average	0.4415	平均值 Average value	1.26	达标 Yes
	川江 Chuanjiang	日平均 Average daily	3.1148	180915	4.15	达标 Yes
		年平均 Annual average	0.4955	平均值 Average value	1.42	达标 Yes
	彬定（新） Binding (New village)	日平均 Average	2.1273	181011	2.84	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		daily				
		年平均 Annual average	0.3229	平均值 Average value	0.92	达标 Yes
	大塘村 Datang Village	日平均 Average daily	2.5827	180131	3.44	达标 Yes
		年平均 Annual average	0.2480	平均值 Average value	0.71	达标 Yes
	南乐 Nanyue	日平均 Average daily	3.4199	180307	4.56	达标 Yes
		年平均 Annual average	0.6508	平均值 Average value	1.86	达标 Yes
	陂头 Potou	日平均 Average daily	3.7675	180125	5.02	达标 Yes
		年平均 Annual average	0.5124	平均值 Average value	1.46	达标 Yes
	亚细 Yaxi	日平均 Average daily	2.9047	180125	3.87	达标 Yes
		年平均 Annual average	0.5318	平均值 Average value	1.52	达标 Yes
	南乐社区 Nanyue Community	日平均 Average daily	2.4828	180625	3.31	达标 Yes
		年平均 Annual average	0.4384	平均值 Average value	1.25	达标 Yes
	海山排 Haishanpai	日平均 Average daily	3.3684	180625	4.49	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		年平均 Annual average	0.4925	平均值 Average value	1.41	达标 Yes
	谢家村 Xiejiacun Village	日平均 Average daily	2.3556	180725	3.14	达标 Yes
		年平均 Annual average	0.2923	平均值 Average value	0.84	达标 Yes
	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	日平均 Average daily	2.3353	180131	3.11	达标 Yes
		年平均 Annual average	0.2662	平均值 Average value	0.76	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	日平均 Average daily	2.1952	181122	2.93	达标 Yes
		年平均 Annual average	0.2797	平均值 Average value	0.80	达标 Yes
	华南北苑 Huanan Beiyuan	日平均 Average daily	2.2792	181122	3.04	达标 Yes
		年平均 Annual average	0.2892	平均值 Average value	0.83	达标 Yes
	新岭 Xinling	日平均 Average daily	2.5237	181122	3.36	达标 Yes
		年平均 Annual average	0.3263	平均值 Average value	0.93	达标 Yes
	新铺 Xinpu	日平均 Average daily	3.0894	180526	4.12	达标 Yes
		年平均	0.3572	平均值	1.02	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		Annual average		Average value		Yes
	大田 Datian	日平均 Average daily	2.7076	180918	3.61	达标 Yes
		年平均 Annual average	0.3318	平均值 Average value	0.95	达标 Yes
	大竹园 Dazhuyuan	日平均 Average daily	2.5630	180716	3.42	达标 Yes
		年平均 Annual average	0.2501	平均值 Average value	0.71	达标 Yes
	彬垌 Bindong	日平均 Average daily	2.1489	180723	2.87	达标 Yes
		年平均 Annual average	0.2356	平均值 Average value	0.67	达标 Yes
	新坡村 Xinpo Village	日平均 Average daily	2.1837	180723	2.91	达标 Yes
		年平均 Annual average	0.2253	平均值 Average value	0.64	达标 Yes
	槟榔根 Binlanggen	日平均 Average daily	1.9743	181122	2.63	达标 Yes
		年平均 Annual average	0.2504	平均值 Average value	0.72	达标 Yes
	网格 Mesh	日平均 Average daily	4.9271	180625	6.57	达标 Yes
		年平均 Annual	0.8457	平均值 Average value	2.42	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		average				

（5）氯化氢（HCl）

(5) Hydrogen chloride (HCl)

正常排放情况下，HCl 的预测计算的结果见表 4.2-36。

The prediction results of HCl under normal emission conditions are shown in Table 4.2-36.

对于环境空气敏感目标而言，HCl 短期浓度（小时、日均）贡献值均满足《环境影响评价技术导则　大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。

In regard to ambient air sensitive targets, the short-term concentration (hourly and daily average) contribution values of HCl all comply with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018)*.

区域最大落地浓度网格点，HCl 短期浓度（小时、日均）贡献值最大值分别为 10.2365μg/m^3、0.9230μg/m^3，最大占标率分别为 20.47%、6.15%，最大浓度占标率均<100%，HCl 短期浓度贡献值均满足《环境影响评价技术导则　大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。

At the mesh point of regional maximum ground-level concentration, the maximum short-term concentration (hourly and daily average) contribution value of HCl is 10.2365μg/m^3 and 0.9230μg/m^3 respectively, and the maximum Pi is 20.47% and 6.15% respectively with Pi of maximum concentration both <100%. The short-term concentration contribution values of HCL both comply with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018)*.

表 4.2-36 正常工况 HCl 预测结果表
Table 4.2-36 Prediction Results of HCL under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
HCl	猪血塘 Zhuxuetang	1 小时 1 hour	3.0037	18091421	6.01	达标 Yes
		日平均 Average daily	0.1489	180818	0.99	达标 Yes
	百班 Baiban	1 小时 1 hour	1.2493	18090605	2.50	达标 Yes
		日平均 Average daily	0.1395	180716	0.93	达标 Yes
	竹儿根 Zhuergen	1 小时 1 hour	1.7313	18121807	3.46	达标 Yes
		日平均 Average daily	0.1638	180715	1.09	达标 Yes
	彬崇村 Binchong Village	1 小时 1 hour	2.0039	18112806	4.01	达标 Yes
		日平均 Average daily	0.1927	180918	1.28	达标 Yes
	山心 Shanxin	1 小时 1 hour	0.8811	18112806	1.76	达标 Yes
		日平均 Average daily	0.1993	180918	1.33	达标 Yes
	邓屋 Dengwu	1 小时 1 hour	5.7191	18022022	11.44	达标 Yes
		日平均 Average daily	0.3703	181001	2.47	达标 Yes
	对面垌 Duimiandong	1 小时 1 hour	2.7958	18091421	5.59	达标 Yes
		日平均 Average daily	0.1702	181006	1.13	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
	老妗垌 Laojindong	1 小时 1 hour	2.8612	18031505	5.72	达标 Yes
		日平均 Average daily	0.1482	181122	0.99	达标 Yes
	坡尾底 Poweidi	1 小时 1 hour	4.2293	18082304	8.46	达标 Yes
		日平均 Average daily	0.5004	180305	3.34	达标 Yes
	川江 Chuanjiang	1 小时 1 hour	3.9795	18022406	7.96	达标 Yes
		日平均 Average daily	0.5731	180224	3.82	达标 Yes
	彬定（新） Binding (New village)	1 小时 1 hour	1.9316	18091206	3.86	达标 Yes
		日平均 Average daily	0.1610	181023	1.07	达标 Yes
	大塘村 Datang Village	1 小时 1 hour	0.9968	18121720	1.99	达标 Yes
		日平均 Average daily	0.1209	180131	0.81	达标 Yes
	南乐 Nanyue	1 小时 1 hour	3.6959	18041301	7.39	达标 Yes
		日平均 Average daily	0.2881	181222	1.92	达标 Yes
	陂头 Potou	1 小时 1 hour	1.5100	18041301	3.02	达标 Yes
		日平均 Average daily	0.1797	180125	1.20	达标 Yes
	亚细 Yaxi	1 小时 1 hour	3.0372	18051401	6.07	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		日平均 Average daily	0.1268	180125	0.85	达标 Yes
	南乐社区 Nanyue Community	1 小时 1 hour	3.0888	18051401	6.18	达标 Yes
		日平均 Average daily	0.1307	180505	0.87	达标 Yes
	海山排 Haishanpai	1 小时 1 hour	2.2497	18051401	4.50	达标 Yes
		日平均 Average daily	0.1358	180625	0.90	达标 Yes
	谢家村 Xiejiacun Village	1 小时 1 hour	1.9772	18061906	3.95	达标 Yes
		日平均 Average daily	0.1457	180619	0.97	达标 Yes
	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	1.3975	18031505	2.79	达标 Yes
		日平均 Average daily	0.1136	180131	0.76	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	2.1372	18031505	4.27	达标 Yes
		日平均 Average daily	0.1097	181122	0.73	达标 Yes
	华南北苑 Huanan Beiyuan	1 小时 1 hour	1.8809	18031505	3.76	达标 Yes
		日平均 Average daily	0.1169	181122	0.78	达标 Yes
	新岭 Xinling	1 小时 1 hour	2.4979	18031505	5.00	达标 Yes
		日平均 Average	0.1577	181120	1.05	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		daily				
	新铺 Xinpu	1 小时 1 hour	2.1915	18111619	4.38	达标 Yes
		日平均 Average daily	0.1938	180619	1.29	达标 Yes
	大田 Datian	1 小时 1 hour	1.6049	18032724	3.21	达标 Yes
		日平均 Average daily	0.1324	180918	0.88	达标 Yes
	大竹园 Dazhuyuan	1 小时 1 hour	1.7887	18100621	3.58	达标 Yes
		日平均 Average daily	0.1369	181006	0.91	达标 Yes
	彬垌 Bindong	1 小时 1 hour	2.0241	18091421	4.05	达标 Yes
		日平均 Average daily	0.1165	180818	0.78	达标 Yes
	新坡村 Xinpo Village	1 小时 1 hour	1.0639	18030421	2.13	达标 Yes
		日平均 Average daily	0.0923	180723	0.61	达标 Yes
	槟榔根 Binlanggen	1 小时 1 hour	2.8701	18031505	5.74	达标 Yes
		日平均 Average daily	0.1348	181120	0.90	达标 Yes
	网格 Mesh	1 小时 1 hour	10.2365	18041301	20.47	达标 Yes
		日平均 Average daily	0.9230	180216	6.15	达标 Yes

（6）硫化氢（H_2S）

(6) Hydrogen chloride (H_2S)

正常排放情况下，H_2S 的预测计算的结果见表 4.2-37。

The prediction results of H2S under normal emission conditions are shown in Table 4.2-37.

对于环境空气敏感目标而言，H_2S 短期浓度（小时）贡献值均满足《环境影响评价技术导则　大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。

In regard to ambient air sensitive targets, the short-term concentration (hourly) contribution values of H2S all comply with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018)*.

区域最大落地浓度网格点，H_2S 短期浓度（小时浓度）贡献值最大值为 1.0723μg/m^3，最大占标率为 10.72%，最大浓度占标率<100%，H_2S 短期浓度贡献值满足《环境影响评价技术导则　大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。

At the mesh point of regional maximum ground-level concentration, the maximum short-term (hourly) concentration value of H2S is 1.0723μg/m3, and the maximum Pi is 10.72% with Pi of maximum concentration <100%. The short-term concentration contribution value of H2S complies with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018)*.

表 4.2-37　正常工况 H_2S 预测结果表

Table 4.2-37 Prediction Results of H2S under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
H_2S	猪血塘 Zhuxuetang	1 小时 1 hour	0.6719	18091010	6.72	达标 Yes
	百班 Baiban	1 小时 1 hour	0.6437	18091010	6.44	达标 Yes
	竹儿根 Zhuergen	1 小时 1 hour	0.7400	18082812	7.40	达标 Yes
	彬崇村 Binchong Village	1 小时 1 hour	0.7900	18082812	7.90	达标 Yes

	山心 Shanxin	1 小时 1 hour	0.8379	18030508	8.38	达标 Yes
	邓屋 Dengwu	1 小时 1 hour	0.9072	18082812	9.07	达标 Yes
	对面垌 Duimiandong	1 小时 1 hour	0.6616	18091010	6.62	达标 Yes
	老妗垌 Laojindong	1 小时 1 hour	0.7123	18022409	7.12	达标 Yes
	坡尾底 Poweidi	1 小时 1 hour	0.8882	18082812	8.88	达标 Yes
	川江 Chuanjiang	1 小时 1 hour	0.9626	18022409	9.63	达标 Yes
	彬定（新） Binding (New village)	1 小时 1 hour	0.7476	18022409	7.48	达标 Yes
	大塘村 Datang Village	1 小时 1 hour	0.6123	18091010	6.12	达标 Yes
	南乐 Nanyue	1 小时 1 hour	0.8787	18081908	8.79	达标 Yes
	陂头 Potou	1 小时 1 hour	0.8401	18030508	8.40	达标 Yes
	亚细 Yaxi	1 小时 1 hour	0.8363	18080607	8.36	达标 Yes
	南乐社区 Nanyue Community	1 小时 1 hour	0.8287	18080607	8.29	达标 Yes
	海山排 Haishanpai	1 小时 1 hour	0.6190	18030410	6.19	达标 Yes
	谢家村 Xiejiacun Village	1 小时 1 hour	0.7164	18051308	7.16	达标 Yes
	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	0.5704	18091010	5.70	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	0.5920	18022409	5.92	达标 Yes
	华南北苑 Huanan Beiyuan	1 小时 1 hour	0.6218	18022409	6.22	达标 Yes
	新岭 Xinling	1 小时 1 hour	0.6978	18022409	6.98	达标 Yes
	新铺 Xinpu	1 小时 1 hour	0.6824	18051308	6.82	达标 Yes
	大田 Datian	1 小时 1 hour	0.7317	18060208	7.32	达标 Yes
	大竹园	1 小时	0.7899	18010608	7.90	达标

	Dazhuyuan	1 hour				Yes
	彬垌 Bindong	1 小时 1 hour	0.6249	18091010	6.25	达标 Yes
	新坡村 Xinpo Village	1 小时 1 hour	0.6190	18091010	6.19	达标 Yes
	槟榔根 Binlanggen	1 小时 1 hour	0.5555	18022409	5.55	达标 Yes
	网格 Mesh	1 小时 1 hour	1.0723	18081908	10.72	达标 Yes

（7）氨（NH_3）

(7) Ammonia (NH_3)

正常排放情况下，NH_3 的预测计算的结果见表 4.2-38。

The prediction results of NH3 under normal emission conditions are shown in Table 4.2-38.

对于环境空气敏感目标而言，NH_3 短期浓度（小时浓度）贡献值均满足《环境影响评价技术导则　大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。

In regard to ambient air sensitive targets, the short-term (hourly) concentration contribution values of NH_3 all comply with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018)*.

区域最大落地浓度网格点，NH_3 短期浓度（小时浓度）贡献值最大值为 36.9653μg/m^3，最大占标率为 18.48%，最大浓度占标率<100%，NH_3 短期浓度贡献值满足《环境影响评价技术导则　大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。

At the mesh point of regional maximum ground-level concentration, the maximum short-term (hourly) concentration contribution value of NH_3 is 36.9653μg/m$_3$, and the maximum Pi is 18.48% with Pi of maximum concentration <100%. The short-term concentration contribution value of NH_3 complies with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018)*.

表 4.2-38　正常工况 NH_3 预测结果表

Table 4.2-38 Prediction Results of NH3 under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution	出现时间 (YYMMDDHH) Occurrence time	占标率% Pi %	达标情况 Up-to-standa

			(μg/m^3)	(HHDDMMYY)		rd status
NH_3	猪血塘 Zhuxuetang	1 小时 1 hour	4.511	18031505	2.26	达标 Yes
	百班 Baiban	1 小时 1 hour	1.5325	18122306	0.77	达标 Yes
	竹儿根 Zhuergen	1 小时 1 hour	3.7103	18022820	1.86	达标 Yes
	彬崇村 Binchong Village	1 小时 1 hour	3.5541	18090605	1.78	达标 Yes
	山心 Shanxin	1 小时 1 hour	2.9353	18032207	1.47	达标 Yes
	邓屋 Dengwu	1 小时 1 hour	7.942	18091421	3.97	达标 Yes
	对面垌 Duimiandong	1 小时 1 hour	9.3825	18031505	4.69	达标 Yes
	老妗垌 Laojindong	1 小时 1 hour	2.6753	18091206	1.34	达标 Yes
	坡尾底 Poweidi	1 小时 1 hour	4.7498	18090403	2.37	达标 Yes
	川江 Chuanjiang	1 小时 1 hour	6.5181	18010621	3.26	达标 Yes
	彬定（新） Binding (New village)	1 小时 1 hour	4.1682	18121803	2.08	达标 Yes
	大塘村 Datang Village	1 小时 1 hour	4.0855	18031505	2.04	达标 Yes
	南乐 Nanyue	1 小时 1 hour	7.412	18032724	3.71	达标 Yes
	陂头 Potou	1 小时 1 hour	3.2016	18112806	1.6	达标 Yes
	亚细 Yaxi	1 小时 1 hour	8.732	18041301	4.37	达标 Yes
	南乐社区 Nanyue Community	1 小时 1 hour	4.641	18041301	2.32	达标 Yes
	海山排 Haishanpai	1 小时 1 hour	8.0462	18051401	4.02	达标 Yes
	谢家村 Xiejiacun Village	1 小时 1 hour	8.565	18111619	4.28	达标 Yes
	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	2.0676	18031505	1.03	达标 Yes
	东方海岸大酒店	1 小时	2.4052	18091206	1.2	达标

	Oriental Coast Hotel	1 hour				Yes
	华南北苑 Huanan Beiyuan	1 小时 1 hour	2.2561	18091206	1.13	达标 Yes
	新岭 Xinling	1 小时 1 hour	2.0478	18091206	1.02	达标 Yes
	新铺 Xinpu	1 小时 1 hour	10.2956	18051802	5.15	达标 Yes
	大田 Datian	1 小时 1 hour	2.2033	18090605	1.1	达标 Yes
	大竹园 Dazhuyuan	1 小时 1 hour	2.391	18030421	1.2	达标 Yes
	彬垌 Bindong	1 小时 1 hour	2.233	18121720	1.12	达标 Yes
	新坡村 Xinpo Village	1 小时 1 hour	1.9391	18121720	0.97	达标 Yes
	槟榔根 Binlanggen	1 小时 1 hour	2.4172	18091206	1.21	达标 Yes
	网格 Mesh	1 小时 1 hour	36.9653	18022022	18.48	达标 Yes

（8）TSP

(8) TSP

正常排放情况下，TSP 的预测计算的结果见表 4.2-39。

The prediction results of TSP under normal emission conditions are shown in Table 4.2-39.

对于环境空气敏感目标而言，TSP 短期浓度（日均）、长期浓度（年均）贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, the short-term concentration (daily average) and long-term (annual average) concentration contribution values of TSP all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，TSP 短期浓度（日均）贡献值最大值为 192.8901μg/m^3，最大占标率为 64.30%，最大浓度占标率<100%；长期浓度贡献值最大值为 49.1509μg/m^3，最大占标率为 24.58%，最大浓度占标率<30%，TSP 短期浓度、长期浓度贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, the maximum short-term (daily average) concentration contribution value of TSP is 192.8901μg/m^3, and the maximum Pi is 64.30% with Pi of maximum concentration <100%. The maximum long-term concentration contribution value is 49.1509μg/m^3 and the maximum Pi is 24.58% with Pi of maximum concentration <30%. The short-term and long-term concentration contribution value of TSP both comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-39 正常工况 TSP 预测结果表
Table 4.2-39 Prediction Results of TSP under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
TSP	猪血塘 Zhuxuetang	日平均 Average daily	11.5735	181006	3.86	达标 Yes
		年平均 Annual average	1.2797	平均值 Average value	0.64	达标 Yes
	百班 Baiban	日平均 Average daily	9.2907	180922	3.1	达标 Yes
		年平均 Annual average	1.3631	平均值 Average value	0.68	达标 Yes
	竹儿根 Zhuergen	日平均 Average daily	14.92	181124	4.97	达标 Yes
		年平均 Annual average	1.6995	平均值 Average value	0.85	达标 Yes
	彬崇村 Binchong Village	日平均 Average daily	9.6239	181004	3.21	达标 Yes
		年平均 Annual average	1.2765	平均值 Average value	0.64	达标 Yes
	山心 Shanxin	日平均 Average daily	8.6393	181222	2.88	达标 Yes
		年平均 Annual average	0.8255	平均值 Average value	0.41	达标 Yes
	邓屋 Dengwu	日平均 Average daily	28.781	181124	9.59	达标 Yes
		年平均	3.9638	平均值	1.98	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		Annual average		Average value		Yes
	对面垌 Duimiandong	日平均 Average daily	20.6037	181006	6.87	达标 Yes
		年平均 Annual average	2.3487	平均值 Average value	1.17	达标 Yes
	老妗垌 Laojindong	日平均 Average daily	10.8847	181120	3.63	达标 Yes
		年平均 Annual average	1.0352	平均值 Average value	0.52	达标 Yes
	坡尾底 Poweidi	日平均 Average daily	29.7613	180413	9.92	达标 Yes
		年平均 Annual average	1.6428	平均值 Average value	0.82	达标 Yes
	川江 Chuanjiang	日平均 Average daily	30.1133	180508	10.04	达标 Yes
		年平均 Annual average	2.1657	平均值 Average value	1.08	达标 Yes
	彬定（新） Binding (New village)	日平均 Average daily	18.0849	180408	6.03	达标 Yes
		年平均 Annual average	1.5608	平均值 Average value	0.78	达标 Yes
	大塘村 Datang Village	日平均 Average daily	6.5397	180805	2.18	达标 Yes
		年平均 Annual average	0.4288	平均值 Average value	0.21	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
	南乐 Nanyue	日平均 Average daily	10.6183	180521	3.54	达标 Yes
		年平均 Annual average	1.1538	平均值 Average value	0.58	达标 Yes
	陂头 Potou	日平均 Average daily	6.6055	180521	2.2	达标 Yes
		年平均 Annual average	0.6498	平均值 Average value	0.32	达标 Yes
	亚细 Yaxi	日平均 Average daily	6.1939	180514	2.06	达标 Yes
		年平均 Annual average	0.376	平均值 Average value	0.19	达标 Yes
	南乐社区 Nanyue Community	日平均 Average daily	4.6818	180201	1.56	达标 Yes
		年平均 Annual average	0.2964	平均值 Average value	0.15	达标 Yes
	海山排 Haishanpai	日平均 Average daily	7.6576	180802	2.55	达标 Yes
		年平均 Annual average	0.2608	平均值 Average value	0.13	达标 Yes
	谢家村 Xiejiacun Village	日平均 Average daily	7.2713	181116	2.42	达标 Yes
		年平均 Annual average	0.3135	平均值 Average value	0.16	达标 Yes
	阳光海岸（中石化倒班宿舍）	日平均 Average	6.9773	180315	2.33	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
	Yangguang Coast (SINOPEC shift dormitory)	daily				
		年平均 Annual average	0.4225	平均值 Average value	0.21	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	日平均 Average daily	8.3239	181120	2.77	达标 Yes
		年平均 Annual average	0.4692	平均值 Average value	0.23	达标 Yes
	华南北苑 Huanan Beiyuan	日平均 Average daily	8.1999	181120	2.73	达标 Yes
		年平均 Annual average	0.4951	平均值 Average value	0.25	达标 Yes
	新岭 Xinling	日平均 Average daily	9.4292	181120	3.14	达标 Yes
		年平均 Annual average	0.7345	平均值 Average value	0.37	达标 Yes
	新铺 Xinpu	日平均 Average daily	7.6929	180518	2.56	达标 Yes
		年平均 Annual average	0.4463	平均值 Average value	0.22	达标 Yes
	大田 Datian	日平均 Average daily	8.6731	181004	2.89	达标 Yes
		年平均 Annual average	0.8074	平均值 Average value	0.4	达标 Yes
	大竹园 Dazhuyuan	日平均 Average daily	8.7587	180922	2.92	达标 Yes
		年平均	0.9137	平均值	0.46	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		Annual average		Average value		Yes
	彬垌 Bindong	日平均 Average daily	5.591	180228	1.86	达标 Yes
		年平均 Annual average	0.6748	平均值 Average value	0.34	达标 Yes
	新坡村 Xinpo Village	日平均 Average daily	5.0519	180304	1.68	达标 Yes
		年平均 Annual average	0.4832	平均值 Average value	0.24	达标 Yes
	槟榔根 Binlanggen	日平均 Average daily	7.9349	181120	2.64	达标 Yes
		年平均 Annual average	0.3782	平均值 Average value	0.19	达标 Yes
	网格 Mesh	日平均 Average daily	192.8901	180106	64.3	达标 Yes
		年平均 Annual average	49.1509	平均值 Average value	24.58	达标 Yes

（9）汞（Hg）

(9) Mercury (Hg)

正常排放情况下，Hg 的预测计算的结果见表 4.2-40。

The prediction results of Hg under normal emission conditions are shown in Table 4.2-40.

对于环境空气敏感目标而言，Hg 短期浓度（日均浓度）贡献值满足《工业企业设计卫生标准》（TJ36-79）居民区有害物质最高允许浓度要求；长期浓度（年均值）贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, the short-term (daily average) concentration contribution values of Hg all comply with maximum allowable concentration requirement for hazardous substances in residential quarters in *Hygienic Standard of Industrial Enterprise Design* (TJ36-79). The long-term (annual average) concentration contribution values thereof all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，Hg 短期浓度（日平均浓度）贡献值最大值为 0.00042μg/m^3，最大占标率为 0.14%，最大浓度占标率<100%；长期浓度贡献值最大值为 0.00002μg/m^3，最大占标率为 0.16%，最大浓度占标率<30%，Hg 短期浓度贡献值满足《工业企业设计卫生标准》（TJ36-79）居民区有害物质最高允许浓度要求；长期浓度（年均值）贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, the maximum short-term concentration (daily average) contribution value of Hg is 0.00042μg/m^3, and the maximum Pi is 0.14% with Pi of maximum concentration <100%. The maximum long-term concentration contribution value is 0.00002μg/m^3 and the maximum Pi is 0.16% with Pi of maximum concentration <30%. The short-term concentration contribution value complies with maximum allowable concentration requirement for hazardous substances in residential quarters in *Hygienic Standard of Industrial Enterprise Design* (TJ36-79). The long-term (annual average) concentration contribution value complies with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-40 正常工况 Hg 预测结果表

Table 4.2-40 Prediction Results of Hg under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率%	达标情况 Up-to-standard status
Hg	猪血塘 Zhuxuetang	日平均 Average daily	0.00019	180723	0.06	达标 Yes
		年平均 Annual average	0.00002	平均值 Average value	0.04	达标 Yes
	百班 Baiban	日平均 Average daily	0.0002	180716	0.07	达标 Yes
		年平均	0.00002	平均值	0.04	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率%	达标情况 Up-to-standard status
		Annual average		Average value		Yes
	竹儿根 Zhuergen	日平均 Average daily	0.00025	180715	0.08	达标 Yes
		年平均 Annual average	0.00003	平均值 Average value	0.06	达标 Yes
	彬崇村 Binchong Village	日平均 Average daily	0.00028	180918	0.09	达标 Yes
		年平均 Annual average	0.00003	平均值 Average value	0.06	达标 Yes
	山心 Shanxin	日平均 Average daily	0.00031	180918	0.10	达标 Yes
		年平均 Annual average	0.00003	平均值 Average value	0.06	达标 Yes
	邓屋 Dengwu	日平均 Average daily	0.00029	180715	0.10	达标 Yes
		年平均 Annual average	0.00004	平均值 Average value	0.08	达标 Yes
	对面垌 Duimiandong	日平均 Average daily	0.00023	180723	0.08	达标 Yes
		年平均 Annual average	0.00002	平均值 Average value	0.04	达标 Yes
	老妗垌 Laojindong	日平均 Average daily	0.00018	181122	0.06	达标 Yes
		年平均 Annual	0.00003	平均值 Average value	0.06	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率%	达标情况 Up-to-standard status
		average				
	坡尾底 Poweidi	日平均 Average daily	0.00027	181101	0.09	达标 Yes
		年平均 Annual average	0.00004	平均值 Average value	0.08	达标 Yes
	川江 Chuanjiang	日平均 Average daily	0.00024	180225	0.08	达标 Yes
		年平均 Annual average	0.00004	平均值 Average value	0.08	达标 Yes
	彬定（新） Binding (New village)	日平均 Average daily	0.00015	180308	0.05	达标 Yes
		年平均 Annual average	0.00002	平均值 Average value	0.04	达标 Yes
	大塘村 Datang Village	日平均 Average daily	0.00019	180131	0.06	达标 Yes
		年平均 Annual average	0.00002	平均值 Average value	0.04	达标 Yes
	南乐 Nanyue	日平均 Average daily	0.00025	180712	0.08	达标 Yes
		年平均 Annual average	0.00005	平均值 Average value	0.10	达标 Yes
	陂头 Potou	日平均 Average daily	0.00028	180125	0.09	达标 Yes
		年平均 Annual average	0.00004	平均值 Average value	0.08	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率%	达标情况 Up-to-standard status
	亚细 Yaxi	日平均 Average daily	0.00021	180125	0.07	达标 Yes
		年平均 Annual average	0.00004	平均值 Average value	0.08	达标 Yes
	南乐社区 Nanyue Community	日平均 Average daily	0.00018	180505	0.06	达标 Yes
		年平均 Annual average	0.00003	平均值 Average value	0.06	达标 Yes
	海山排 Haishanpai	日平均 Average daily	0.00021	180625	0.07	达标 Yes
		年平均 Annual average	0.00003	平均值 Average value	0.06	达标 Yes
	谢家村 Xiejiacun Village	日平均 Average daily	0.00017	180725	0.06	达标 Yes
		年平均 Annual average	0.00002	平均值 Average value	0.04	达标 Yes
	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	日平均 Average daily	0.00017	180131	0.06	达标 Yes
		年平均 Annual average	0.00002	平均值 Average value	0.04	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	日平均 Average daily	0.00016	180131	0.05	达标 Yes
		年平均 Annual average	0.00002	平均值 Average value	0.04	达标 Yes
	华南北苑	日平均	0.00016	181122	0.05	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率%	达标情况 Up-to-standard status
	Huanan Beiyuan	Average daily				Yes
		年平均 Annual average	0.00002	平均值 Average value	0.04	达标 Yes
	新岭 Xinling	日平均 Average daily	0.00017	181122	0.06	达标 Yes
		年平均 Annual average	0.00002	平均值 Average value	0.04	达标 Yes
	新铺 Xinpu	日平均 Average daily	0.00021	180725	0.07	达标 Yes
		年平均 Annual average	0.00003	平均值 Average value	0.06	达标 Yes
	大田 Datian	日平均 Average daily	0.00021	180918	0.07	达标 Yes
		年平均 Annual average	0.00002	平均值 Average value	0.04	达标 Yes
	大竹园 Dazhuyuan	日平均 Average daily	0.00018	180716	0.06	达标 Yes
		年平均 Annual average	0.00002	平均值 Average value	0.04	达标 Yes
	彬垌 Bindong	日平均 Average daily	0.00015	180723	0.05	达标 Yes
		年平均 Annual average	0.00002	平均值 Average value	0.04	达标 Yes
	新坡村 Xinpo Village	日平均 Average	0.00015	180723	0.05	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率%	达标情况 Up-to-standard status
		daily				
		年平均 Annual average	0.00002	平均值 Average value	0.04	达标 Yes
	槟榔根 Binlanggen	日平均 Average daily	0.00014	181122	0.05	达标 Yes
		年平均 Annual average	0.00002	平均值 Average value	0.04	达标 Yes
	网格 Mesh	日平均 Average daily	0.00042	180625	0.14	达标 Yes
		年平均 Annual average	0.00002	平均值 Average value	0.16	达标 Yes

（10）砷（As）

(10) Arsenic (As)

正常排放情况下，As 的预测计算的结果见表 4.2-41。

The prediction results of As under normal emission conditions are shown in Table 4.2-41.

对于环境空气敏感目标而言，As 短期浓度（日均浓度）贡献值满足《工业企业设计卫生标准》（TJ36-79）居民区有害物质最高允许浓度要求；长期浓度（年均值）贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, the short-term (daily average) concentration contribution values of As all comply with maximum allowable concentration requirement for hazardous substances in residential quarters in *Hygienic Standard of Industrial Enterprise Design* (TJ36-79). The long-term (annual average) concentration contribution values thereof all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，As 短期浓度（日平均浓度）贡献值最大值为 0.00011μg/m^3，

最大占标率为 0.01%，最大浓度占标率<100%；长期浓度贡献值最大值为 0.00002μg/m^3，最大占标率为 0.33%，最大浓度占标率<30%，As 短期浓度贡献值满足《工业企业设计卫生标准》（TJ36-79）居民区有害物质最高允许浓度要求；长期浓度（年均值）贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, the maximum short-term concentration (daily average) contribution value of As is 0.00011μg/m^3, and the maximum Pi is 0.01% with Pi of maximum concentration <100%. The maximum long-term concentration contribution value is 0.00002μg/m^3 and the maximum Pi is 0.33% with Pi of maximum concentration <30%. The short-term concentration contribution value complies with maximum allowable concentration requirement for hazardous substances in residential quarters in *Hygienic Standard of Industrial Enterprise Design* (TJ36-79). The long-term (annual average) concentration contribution value complies with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-41 正常工况 As 预测结果表

Table 4.2-41 Prediction Results of As under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率%	达标情况 Up-to-standard status
As	猪血塘 Zhuxuetang	日平均 Average daily	0.00005	180723	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	百班 Baiban	日平均 Average daily	0.00005	180716	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	竹儿根 Zhuergen	日平均 Average daily	0.00007	180715	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	彬崇村	日平均	0.00007	180918	0.00	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率%	达标情况 Up-to-standard status
	Binchong Village	Average daily				Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	山心 Shanxin	日平均 Average daily	0.00008	180918	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	邓屋 Dengwu	日平均 Average daily	0.00008	180715	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	对面垌 Duimiandong	日平均 Average daily	0.00006	180723	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	老妗垌 Laojindong	日平均 Average daily	0.00005	181122	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	坡尾底 Poweidi	日平均 Average daily	0.00007	181101	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	川江 Chuanjiang	日平均 Average	0.00006	180225	0.00	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率%	达标情况 Up-to-standard status
		daily				
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	彬定（新） Binding (New village)	日平均 Average daily	0.00004	180308	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	大塘村 Datang Village	日平均 Average daily	0.00005	180131	0.00	达标 Yes
		年平均 Annual average	0.0	平均值 Average value	0.00	达标 Yes
	南乐 Nanyue	日平均 Average daily	0.00007	180712	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	陂头 Potou	日平均 Average daily	0.00007	180125	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	亚细 Yaxi	日平均 Average daily	0.00005	180125	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	南乐社区 Nanyue Community	日平均 Average daily	0.00005	180505	0.00	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率%	达标情况 Up-to-standard status
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	海山排 Haishanpai	日平均 Average daily	0.00006	180625	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	谢家村 Xiejiacun Village	日平均 Average daily	0.00005	180725	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	日平均 Average daily	0.00005	180131	0.00	达标 Yes
		年平均 Annual average	0.0	平均值 Average value	0.00	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	日平均 Average daily	0.00004	180131	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	华南北苑 Huanan Beiyuan	日平均 Average daily	0.00004	181122	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	新岭 Xinling	日平均 Average daily	0.00005	181122	0.00	达标 Yes
		年平均 Annual	0.00001	平均值 Average value	0.17	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率%	达标情况 Up-to-standard status
		average				
	新铺 Xinpu	日平均 Average daily	0.00006	180725	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	大田 Datian	日平均 Average daily	0.00005	180918	0.00	达标 Yes
		年平均 Annual average	0.00001	平均值 Average value	0.17	达标 Yes
	大竹园 Dazhuyuan	日平均 Average daily	0.00005	180716	0.00	达标 Yes
		年平均 Annual average	0.0	平均值 Average value	0.00	达标 Yes
	彬垌 Bindong	日平均 Average daily	0.00004	180723	0.00	达标 Yes
		年平均 Annual average	0.0	平均值 Average value	0.00	达标 Yes
	新坡村 Xinpo Village	日平均 Average daily	0.00004	180723	0.00	达标 Yes
		年平均 Annual average	0.0	平均值 Average value	0.00	达标 Yes
	槟榔根 Binlanggen	日平均 Average daily	0.00004	181122	0.00	达标 Yes
		年平均 Annual average	0.0	平均值 Average value	0.00	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率%	达标情况 Up-to-standard status
	网格 Mesh	日平均 Average daily	0.00011	180625	0.01	达标 Yes
		年平均 Annual average	0.00002	平均值 Average value	0.33	达标 Yes

（11）镉（Cd）

(11) Cadmium (Cd)

正常排放情况下，Cd 的预测计算的结果见表 4.2-42。

The prediction results of Cd under normal emission conditions are shown in Table 4.2-42.

对于环境空气敏感目标而言，Cd 长期浓度（年均值）贡献值均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, the long-term (annual average) concentration contribution values of Cd all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，Cd 长期浓度贡献值最大值为 0.00017μg/m^3，最大占标率为 3.4%，最大浓度占标率<30%，满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, the maximum long-term concentration contribution value of Cd is 0.00017μg/m3 and the maximum Pi is 3.4% with Pi of maximum concentration <30%, which comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-42 正常工况 Cd 预测结果表

Table 4.2-42 Prediction Results of Cd under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率%	达标情况 Up-to-standard status
Cd	猪血塘 Zhuxuetang	年平均 Annual average	0.00004	平均值 Average value	0.80	达标 Yes
	百班 Baiban	年平均 Annual average	0.00005	平均值 Average value	1.00	达标 Yes
	竹儿根 Zhuergen	年平均 Annual average	0.00006	平均值 Average value	1.20	达标 Yes
	彬崇村 Binchong Village	年平均 Annual average	0.00007	平均值 Average value	1.40	达标 Yes
	山心 Shanxin	年平均 Annual average	0.00008	平均值 Average value	1.60	达标 Yes
	邓屋 Dengwu	年平均 Annual average	0.00009	平均值 Average value	1.80	达标 Yes
	对面垌 Duimiandong	年平均 Annual average	0.00005	平均值 Average value	1.00	达标 Yes
	老妗垌 Laojindong	年平均 Annual average	0.00005	平均值 Average value	1.00	达标 Yes
	坡尾底 Poweidi	年平均 Annual average	0.00008	平均值 Average value	1.60	达标 Yes
	川江 Chuanjiang	年平均 Annual average	0.00008	平均值 Average value	1.60	达标 Yes
	彬定（新） Binding (New village)	年平均 Annual average	0.00005	平均值 Average value	1.00	达标 Yes
	大塘村	年平均	0.00004	平均值	0.80	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率%	达标情况 Up-to-standard status
	Datang Village	Annual average		Average value		Yes
	南乐 Nanyue	年平均 Annual average	0.0001	平均值 Average value	2.00	达标 Yes
	陂头 Potou	年平均 Annual average	0.00008	平均值 Average value	1.60	达标 Yes
	亚细 Yaxi	年平均 Annual average	0.00008	平均值 Average value	1.60	达标 Yes
	南乐社区 Nanyue Community	年平均 Annual average	0.00006	平均值 Average value	1.20	达标 Yes
	海山排 Haishanpai	年平均 Annual average	0.00007	平均值 Average value	1.40	达标 Yes
	谢家村 Xiejiacun Village	年平均 Annual average	0.00005	平均值 Average value	1.00	达标 Yes
	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	年平均 Annual average	0.00004	平均值 Average value	0.80	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	年平均 Annual average	0.00004	平均值 Average value	0.80	达标 Yes
	华南北苑 Huanan Beiyuan	年平均 Annual average	0.00004	平均值 Average value	0.80	达标 Yes
	新岭 Xinling	年平均 Annual average	0.00005	平均值 Average value	1.00	达标 Yes
	新铺 Xinpu	年平均 Annual average	0.00006	平均值 Average value	1.20	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率%	达标情况 Up-to-standard status
	大田 Datian	年平均 Annual average	0.00005	平均值 Average value	1.00	达标 Yes
	大竹园 Dazhuyuan	年平均 Annual average	0.00004	平均值 Average value	0.80	达标 Yes
	彬垌 Bindong	年平均 Annual average	0.00004	平均值 Average value	0.80	达标 Yes
	新坡村 Xinpo Village	年平均 Annual average	0.00003	平均值 Average value	0.60	达标 Yes
	槟榔根 Binlanggen	年平均 Annual average	0.00004	平均值 Average value	0.80	达标 Yes
	网格 Mesh	年平均 Annual average	0.00017	平均值 Average value	3.40	达标 Yes

（12）氯气（Cl_2）

(12) Chlorine (Cl_2)

正常排放情况下，Cl_2 的预测计算的结果见表 4.2-43。

The prediction results of Cl2 under normal emission conditions are shown in Table 4.2-43.

对于环境空气敏感目标而言，Cl_2 短期浓度（小时、日均浓度）贡献值均满足《环境影响评价技术导则 大气环境》（HJ 2.2-2018）附录 D 其他污染物空气质量浓度参考限值。区域最大落地浓度网格点，Cl_2 短期浓度（小时、日平均浓度）贡献值最大值分别为 10.2367μg/m^3、0.9184μg/m^3，最大占标率分别为 10.24%、3.06%，最大浓度占标率 <100%。

In regard to ambient air sensitive targets, the short-term concentration (hourly and daily) contribution values of Cl2 all comply with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment -*

Atmosphere Environment (HJ2.2-2018). At the mesh point of regional maximum ground-level concentration, the maximum short-term concentration (hourly and daily average) value of Cl2 is 10.2367μgμg/m3 and 0.9184μg/m3 respectively, and the maximum Pi is 10.24% and 3.06% respectively with Pi of maximum concentration both <100%.

表 4.2-43 正常工况 HCl 预测结果表
Table 4.2-43 Prediction Results of HCL under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
Cl_2	猪血塘	1 小时	3.0076	18091421	3.01	达标
		日平均	0.1276	180914	0.43	达标
	百班	1 小时	1.7057	18090605	1.71	达标
		日平均	0.1565	180922	0.52	达标
	竹儿根	1 小时	1.7332	18121807	1.73	达标
		日平均	0.1303	181003	0.43	达标
	彬崇村	1 小时	2.0096	18112806	2.01	达标
		日平均	0.1766	181004	0.59	达标
	山心	1 小时	1.2093	18092224	1.21	达标
		日平均	0.0692	181004	0.23	达标
	邓屋	1 小时	5.7191	18022022	5.72	达标
		日平均	0.3787	181001	1.26	达标
	对面垌	1 小时	2.7966	18091421	2.8	达标
		日平均	0.1571	180304	0.52	达标
	老妗垌	1 小时	2.8628	18031505	2.86	达标
		日平均	0.1356	181120	0.45	达标
	坡尾底	1 小时	4.2293	18082304	4.23	达标
		日平均	0.4301	180305	1.43	达标
	川江	1 小时	3.9794	18022406	3.98	达标
		日平均	0.5039	180224	1.68	达标
	彬定（新）	1 小时	1.9316	18091206	1.93	达标
		日平均	0.1299	180809	0.43	达标
	大塘村	1 小时	1.0017	18121720	1	达标
		日平均	0.0726	180426	0.24	达标
	南乐	1 小时	3.7255	18041301	3.73	达标
		日平均	0.2224	181222	0.74	达标
	陂头	1 小时	1.6281	18041301	1.63	达标
		日平均	0.1147	181222	0.38	达标
	亚细	1 小时	3.0547	18051401	3.05	达标
		日平均	0.1276	180514	0.43	达标
	南乐社区	1 小时	3.0952	18051401	3.1	达标
		日平均	0.1313	180514	0.44	达标
	海山排	1 小时	2.2654	18051401	2.27	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	最大贡献值 (μg/m^3) Maximum contribution (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	占标率% Pi %	达标情况 Up-to-standard status
		日平均	0.1249	180514	0.42	达标
	谢家村	1 小时	1.9773	18061906	1.98	达标
		日平均	0.1055	180514	0.35	达标
	阳光海岸（中石化倒	1 小时	1.4022	18031505	1.4	达标
	班宿舍）	日平均	0.0735	180315	0.25	达标
	东方海岸大酒店	1 小时	2.1418	18031505	2.14	达标
	Oriental Coast Hotel	日平均	0.1012	181120	0.34	达标
	华南北苑	1 小时	1.8891	18031505	1.89	达标
		日平均	0.1102	181120	0.37	达标
	新岭	1 小时	2.5027	18031505	2.5	达标
		日平均	0.1496	181120	0.5	达标
	新铺	1 小时	2.1916	18111619	2.19	达标
		日平均	0.1212	180619	0.4	达标
	大田	1 小时	1.6823	18051706	1.68	达标
		日平均	0.1473	181001	0.49	达标
	大竹园	1 小时	1.8605	18100621	1.86	达标
		日平均	0.1168	181006	0.39	达标
	彬垌	1 小时	2.0896	18091421	2.09	达标
		日平均	0.0927	180818	0.31	达标
	新坡村	1 小时	1.155	18091002	1.15	达标
		日平均	0.0798	180304	0.27	达标
	槟榔根	1 小时	2.8704	18031505	2.87	达标
		日平均	0.1275	181120	0.42	达标
	网格	1 小时	10.2367	18041301	10.24	达标
		日平均	0.9184	180216	3.06	达标

4.2.6.2 叠加环境质量现状浓度及区域拟建（在建）项目正常排放预测结果

4.2.5.2 Predication results after superimposing current environmental mass concentration and normal emission of regional proposed projects (projects under construction)

（1）二氧化硫（SO_2）

(1) Sulfur dioxide (SO_2)

正常排放情况下，SO_2 叠加环境质量现状浓度及区域拟建（在建）项目，正常排放预测结果后环境质量浓度预测结果见表 4.2-44、图 4.2-23~4.2-24。

4.2.5.2 The prediction results of environmental ,ass concentration of SO_2 after superimposing the predication results of current environmental mass concentration and normal emission of regional proposed projects (projects under construction) under normal emission conditions are shown in Table 4.2-44 and Figure 4.2-23 to 4.2-24.

对于环境空气敏感目标而言，叠加环境质量现状浓度及区域拟建（在建）项目后，SO_2 保证率日平均、年平均质量浓度均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, the daily and annual average mass concentration of SO_2 at guarantee rate after superimposing current environmental mass concentration and regional proposed projects (projects under construction) all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，叠加环境质量现状浓度后，SO_2 保证率日平均、年平均质量浓度分别为 19.6055μg/m^3、11.2393μg/m^3，最大占标率分别为 13.07%、18.73%，均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, the daily and annual average mass concentration of SO_2 at guarantee rate after superimposing current environmental mass concentration is 19.6055μg/m3 and 11.2393μg/m3 respectively, and the maximum Pi is 13.07% and 18.73% respectively, which all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-44 SO_2 叠加后保证率日平均及年平均环境质量浓度预测结果表

Table 4.2-44 Prediction Results of Daily and Annual Average Mass Concentration of SO2 at Guarantee Rate after Superimposition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
SO_2	猪血塘 Zhuxuetang	日平均 Average daily	2.0018	1.33	15.00	17.0018	11.33	达标 Yes
		年平均 Annual	0.8524	1.42	9.15	10.0058	16.68	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		average						
	百班 Baiban	日平均 Average daily	1.975	1.32	15.00	16.975	11.32	达标 Yes
		年平均 Annual average	0.7826	1.30	9.15	9.9361	16.56	达标 Yes
	竹儿根 Zhuergen	日平均 Average daily	2.5153	1.68	14.00	16.5153	11.01	达标 Yes
		年平均 Annual average	0.8515	1.42	9.15	10.0049	16.67	达标 Yes
	彬崇村 Binchong Village	日平均 Average daily	4.9199	3.28	12.00	16.9199	11.28	达标 Yes
		年平均 Annual average	0.9575	1.60	9.15	10.1109	16.85	达标 Yes
	山心 Shanxin	日平均	5.7146	3.81	11.00	16.7146	11.14	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		Average daily						
		年平均 Annual average	1.0476	1.75	9.15	10.201	17	达标 Yes
	邓屋 Dengwu	日平均 Average daily	4.2507	2.83	14.00	18.2507	12.17	达标 Yes
		年平均 Annual average	1.1563	1.93	9.15	10.3097	17.18	达标 Yes
	对面垌 Duimiandong	日平均 Average daily	3.9449	2.63	14.00	17.9449	11.96	达标 Yes
		年平均 Annual average	0.931	1.55	9.15	10.0844	16.81	达标 Yes
	老妗垌 Laojindong	日平均 Average daily	3.3657	2.24	14.00	17.3657	11.58	达标 Yes
		年平	0.8417	1.40	9.15	9.9951	16.6	达标

污染物 **Pollutant**	预测点 **Prediction point**	平均时段 **Average period**	贡献值 **Contribution value (μg/m^3)**	占标率% **Pi %**	现状浓度 **(μg/m^3) Current concentration (μg/m^3)**	叠加后浓度 **(μg/m^3) Concentration after superimposition (μg/m^3)**	占标率% **Pi %**	达标情况 **Up-to-standard status**
		均 Annual average					6	Yes
	坡尾底 Poweidi	日平均 Average daily	1.9371	1.29	15.00	16.9371	11.29	达标 Yes
		年平均 Annual average	0.7598	1.27	9.15	9.9132	16.52	达标 Yes
	川江 Chuanjiang	日平均 Average daily	1.9637	1.31	15.00	16.9637	11.31	达标 Yes
		年平均 Annual average	0.8156	1.36	9.15	9.969	16.61	达标 Yes
	彬定（新）Binding (New village)	日平均 Average daily	3.0297	2.02	14.00	17.0297	11.35	达标 Yes
		年平均 Annual avera	0.7076	1.18	9.15	9.861	16.43	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		ge						
	大塘村 Datang Village	日平均 Average daily	4.0432	2.70	14.00	18.0432	12.03	达标 Yes
		年平均 Annual average	0.8461	1.41	9.15	9.9995	16.67	达标 Yes
	南乐 Nanyue	日平均 Average daily	0.0933	0.06	17.00	17.0933	11.4	达标 Yes
		年平均 Annual average	1.3706	2.28	9.15	10.5241	17.54	达标 Yes
	陂头 Potou	日平均 Average daily	0.1124	0.07	17.00	17.1124	11.41	达标 Yes
		年平均 Annual average	1.2574	2.10	9.15	10.4109	17.35	达标 Yes
	亚细 Yaxi	日平均 Avera	0	0.00	18.00	18	12	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		ge daily						
		年平均 Annual average	1.7488	2.91	9.15	10.9022	18.17	达标 Yes
	南乐社区 Nanyue Community	日平均 Average daily	4.6677	3.11	13.00	17.6677	11.78	达标 Yes
		年平均 Annual average	1.4417	2.40	9.15	10.5951	17.66	达标 Yes
	海山排 Haishanpai	日平均 Average daily	0	0.00	18.00	18	12	达标 Yes
		年平均 Annual average	1.637	2.73	9.15	10.7904	17.98	达标 Yes
	谢家村 Xiejiacun Village	日平均 Average daily	3.3509	2.23	14.00	17.3509	11.57	达标 Yes
		年平均	1.2105	2.02	9.15	10.3639	17.27	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		Annual average						
	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	日平均 Average daily	3.262	2.17	14.00	17.262	11.51	达标 Yes
		年平均 Annual average	0.7607	1.27	9.15	9.9141	16.52	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	日平均 Average daily	3.1434	2.10	14.00	17.1434	11.43	达标 Yes
		年平均 Annual average	0.7362	1.23	9.15	9.8896	16.48	达标 Yes
	华南北苑 Huanan Beiyuan	日平均 Average daily	3.1588	2.11	14.00	17.1588	11.44	达标 Yes
		年平	0.7357	1.23	9.15	9.8891	16.4	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		均 Annual average					8	Yes
	新岭 Xinling	日平均 Average daily	3.2431	2.16	14.00	17.2431	11.5	达标 Yes
		年平均 Annual average	0.7799	1.30	9.15	9.9333	16.56	达标 Yes
	新铺 Xinpu	日平均 Average daily	3.8866	2.59	14.00	17.8866	11.92	达标 Yes
		年平均 Annual average	1.2691	2.12	9.15	10.4225	17.37	达标 Yes
	大田 Datian	日平均 Average daily	1.2871	0.86	15.00	16.2871	10.86	达标 Yes
		年平均 Annual avera	0.7516	1.25	9.15	9.905	16.51	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		ge						
	大竹园 Dazhuyuan	日平均 Average daily	0.3398	0.23	16.00	16.3398	10.89	达标 Yes
		年平均 Annual average	0.7582	1.26	9.15	9.9116	16.52	达标 Yes
	彬垌 Bindong	日平均 Average daily	1.7401	1.16	15.00	16.7401	11.16	达标 Yes
		年平均 Annual average	0.8204	1.37	9.15	9.9739	16.62	达标 Yes
	新坡村 Xinpo Village	日平均 Average daily	1.7616	1.17	15.00	16.7616	11.17	达标 Yes
		年平均 Annual average	0.7375	1.23	9.15	9.8909	16.48	达标 Yes
	槟榔根 Binlanggen	日平均 Avera	3.2013	2.13	14.00	17.2013	11.47	达标 Yes

污染物 **Pollutant**	预测点 **Prediction point**	平均时段 **Average period**	贡献值 **Contribution value (μg/m^3)**	占标率% **Pi %**	现状浓度 **(μg/m^3) Current concentration (μg/m^3)**	叠加后浓度 **(μg/m^3) Concentration after superimposition (μg/m^3)**	占标率% **Pi %**	达标情况 **Up-to-standard status**
		ge daily						
		年平均 Annual average	0.6928	1.15	9.15	9.8462	16.41	达标 Yes
	网格 Mesh	日平均 Average daily	4.6055	3.07	15.00	19.6055	13.07	达标 Yes
		年平均 Annual average	2.0859	3.48	9.15	11.2393	18.73	达标 Yes

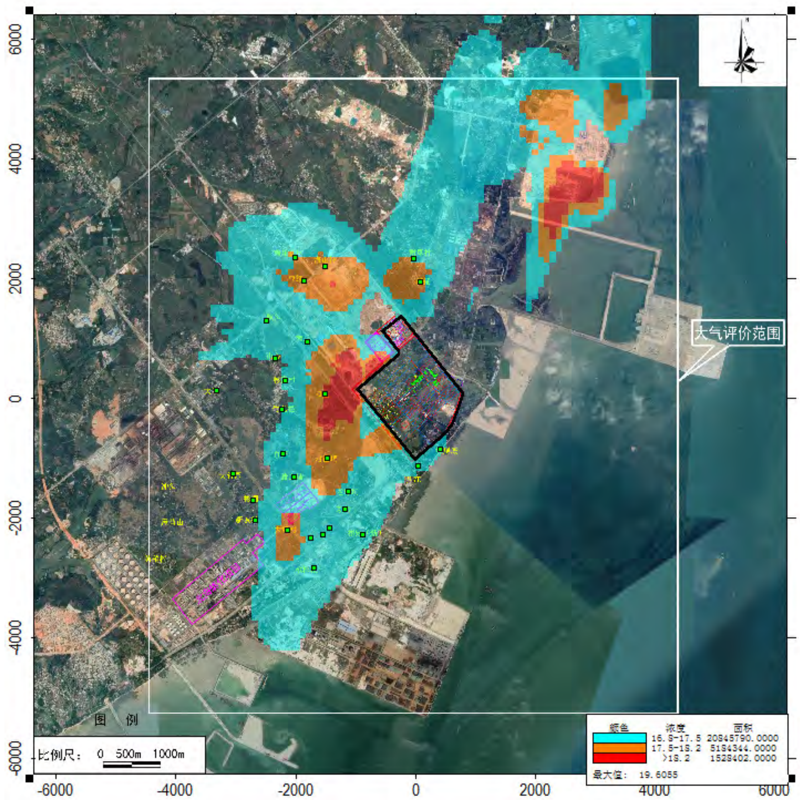


图 4.2-23 正常排放 SO_2 保证率日平均质量浓度分布图（叠加现状浓度及区域污染源，单位：μg/m³）

Figure 4.2-23 Distribution Map of Daily Average Mass Concentration of SO_2 at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m³)

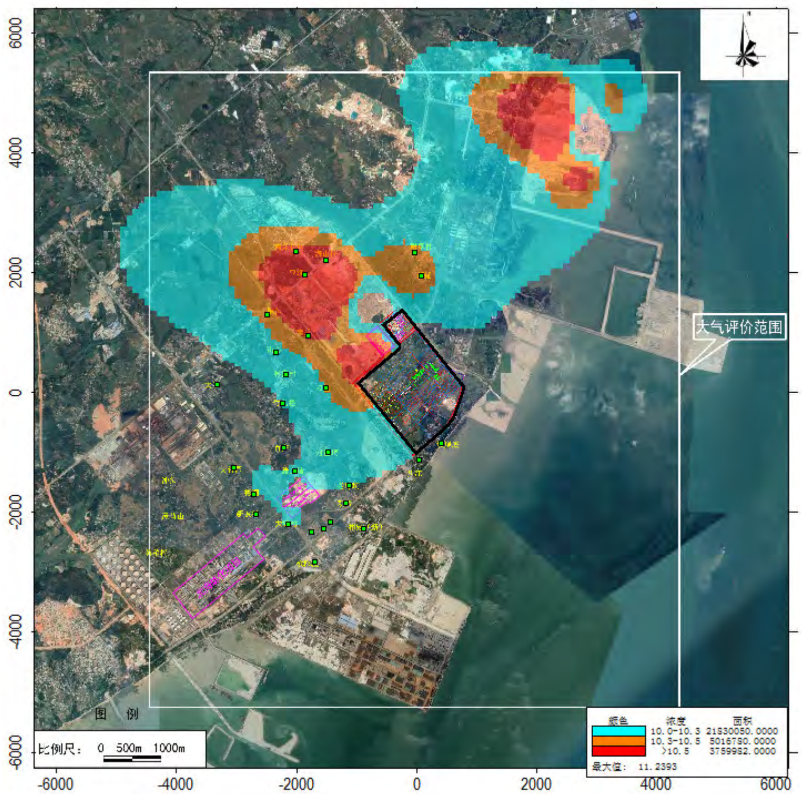


图 4.2-24　正常排放 SO2 年平均质量浓度分布图（叠加现状浓度及区域污染源，单位：μg/m3）
Figure 4.2-24 Distribution Map of Annual Average Mass Concentration of SO2 at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m3)

（2）二氧化氮（NO_2）

(2) Nitrogen dioxide (NO_2)

正常排放情况下，NO_2 叠加环境质量现状浓度及区域拟建（在建）项目正常排放预测结果后环境质量浓度预测结果见表 4.2-45、图 4.2-25~4.2-26。

4.2.5.2 The prediction results of environmental ,ass concentration of NO_2 after superimposing the predication results of current environmental mass concentration and normal emission of regional proposed projects (projects under construction) under normal emission conditions are shown in Table 4.2-45 and Figure 4.2-25 to 4.2-26.

对于环境空气敏感目标而言，叠加环境质量现状浓度及区域拟建（在建）项目后，NO_2 保证率日平均、年平均质量浓度均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, the daily and annual average mass concentration of NO_2 at guarantee rate after superimposing current environmental mass concentration and regional proposed projects (projects under construction) all comply with

the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，叠加环境质量现状浓度后，NO_2 保证率日平均、年平均质量浓度分别为 31.6310μg/m^3、16.1580μg/m^3，最大占标率分别为 39.54%、40.39%，均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, the daily and annual average mass concentration of NO_2 at guarantee rate after superimposing current environmental mass concentration is 31.6310μg/m3 and 16.1580μg/m3 respectively, and the maximum Pi is 39.54% and 40.39% respectively, which all comply with the Level II standard requirements in Ambient Air Quality Standard (GB3095-2012) and revision sheet thereof.

表 4.2-45 NO_2 叠加后保证率日平均及年平均环境质量浓度预测结果表

Table 4.2-45 Prediction Results of Daily and Annual Average Mass Concentration of NO_2 at Guarantee Rate after Superimposition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
NO_2	猪血塘 Zhuxuetang	日平均 Average daily	7.1288	8.911	20	27.1288	33.91	达标 Yes
		年平均 Annual average	1.3589	3.39725	13.3438	14.7027	36.76	达标 Yes
	百班 Baiban	日平均 Average daily	1.669	2.08625	25	26.669	33.34	达标 Yes
		年平均 Annual average	1.2291	3.07275	13.3438	14.5729	36.43	达标 Yes
	竹儿根 Zhuergen	日平均 Average daily	1.8384	2.298	25	26.8384	33.55	达标 Yes
		年平均 Annual average	1.3398	3.3495	13.3438	14.6836	36.71	达标 Yes
	彬崇村 Binchong Village	日平均 Average daily	2.1274	2.65925	25	27.1274	33.91	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		年平均 Annual average	1.5153	3.78825	13.3438	14.8591	37.15	达标 Yes
	山心 Shanxin	日平均 Average daily	3.13	3.9125	24	27.13	33.91	达标 Yes
		年平均 Annual average	1.6296	4.074	13.3438	14.9735	37.43	达标 Yes
	邓屋 Dengwu	日平均 Average daily	0.9503	1.187875	26	26.9503	33.69	达标 Yes
		年平均 Annual average	1.7145	4.28625	13.3438	15.0583	37.65	达标 Yes
	对面垌 Duimiandong	日平均 Average daily	1.662	2.0775	26	27.662	34.58	达标 Yes
		年平均 Annual average	1.4463	3.61575	13.3438	14.7902	36.98	达标 Yes
	老妗垌 Laojindong	日平均 Average daily	0.0057	0.007125	27	27.0057	33.76	达标 Yes
		年平均 Annual average	1.3655	3.41375	13.3438	14.7094	36.77	达标 Yes
	坡尾底 Poweidi	日平均 Average daily	2.7709	3.463625	25	27.7709	34.71	达标 Yes
		年平均 Annual average	1.3279	3.31975	13.3438	14.6717	36.68	达标 Yes
	川江 Chuanjiang	日平均 Average daily	5.7893	7.236625	22	27.7893	34.74	达标 Yes
		年平均 Annual	1.4581	3.64525	13.3438	14.8019	37	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		average						
	彬定（新） Binding (New village)	日平均 Average daily	0.0004	0.0005	27	27.0004	33.75	达标 Yes
		年平均 Annual average	1.1862	2.9655	13.3438	14.53	36.32	达标 Yes
	大塘村 Datang Village	日平均 Average daily	0.0218	0.02725	27	27.0218	33.78	达标 Yes
		年平均 Annual average	1.4076	3.519	13.3438	14.7515	36.88	达标 Yes
	南乐 Nanyue	日平均 Average daily	4.5086	5.63575	24	28.5086	35.64	达标 Yes
		年平均 Annual average	2.0312	5.078	13.3438	15.3751	38.44	达标 Yes
	陂头 Potou	日平均 Average daily	0.7049	0.881125	28	28.7049	35.88	达标 Yes
		年平均 Annual average	1.8691	4.67275	13.3438	15.2129	38.03	达标 Yes
	亚细 Yaxi	日平均 Average daily	0.0412	0.0515	28	28.0412	35.05	达标 Yes
		年平均 Annual average	2.3201	5.80025	13.3438	15.664	39.16	达标 Yes
	南乐社区 Nanyue Community	日平均 Average daily	4.9141	6.142625	22	26.9141	33.64	达标 Yes
		年平均 Annual	2.0292	5.073	13.3438	15.3731	38.43	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		average						
	海山排 Haishanpai	日平均 Average daily	0.071	0.08875	28	28.071	35.09	达标 Yes
		年平均 Annual average	2.1758	5.4395	13.3438	15.5196	38.8	达标 Yes
	谢家村 Xiejiacun Village	日平均 Average daily	1.1646	1.45575	25	26.1646	32.71	达标 Yes
		年平均 Annual average	1.6452	4.113	13.3438	14.989	37.47	达标 Yes
	阳光海岸（中石化倒班宿舍）Yangguang Coast (SINOPEC shift dormitory)	日平均 Average daily	0.0066	0.00825	27	27.0066	33.76	达标 Yes
		年平均 Annual average	1.2418	3.1045	13.3438	14.5856	36.46	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	日平均 Average daily	0.004	0.005	27	27.004	33.76	达标 Yes
		年平均 Annual average	1.1927	2.98175	13.3438	14.5365	36.34	达标 Yes
	华南北苑 Huanan Beiyuan	日平均 Average daily	0.0039	0.004875	27	27.0039	33.75	达标 Yes
		年平均 Annual average	1.1893	2.97325	13.3438	14.5332	36.33	达标 Yes
	新岭 Xinling	日平均 Average daily	0.0035	0.004375	27	27.0035	33.75	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		年平均 Annual average	1.2688	3.172	13.3438	14.6126	36.53	达标 Yes
	新铺 Xinpu	日平均 Average daily	0.051	0.06375	26	26.051	32.56	达标 Yes
		年平均 Annual average	1.6997	4.24925	13.3438	15.0435	37.61	达标 Yes
	大田 Datian	日平均 Average daily	2.4332	3.0415	25	27.4332	34.29	达标 Yes
		年平均 Annual average	1.2111	3.02775	13.3438	14.555	36.39	达标 Yes
	大竹园 Dazhuyuan	日平均 Average daily	2.2344	2.793	25	27.2344	34.04	达标 Yes
		年平均 Annual average	1.2478	3.1195	13.3438	14.5916	36.48	达标 Yes
	彬垌 Bindong	日平均 Average daily	1.9085	2.385625	25	26.9085	33.64	达标 Yes
		年平均 Annual average	1.3622	3.4055	13.3438	14.706	36.77	达标 Yes
	新坡村 Xinpo Village	日平均 Average daily	0.5703	0.712875	26	26.5703	33.21	达标 Yes
		年平均 Annual average	1.2244	3.061	13.3438	14.5682	36.42	达标 Yes
	槟榔根 Binlanggen	日平均 Average daily	0	0	27	27	33.75	达标 Yes
		年平均 Annual	1.1244	2.811	13.3438	14.4682	36.17	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		average						
	网格 Mesh	日平均 Average daily	7.631	9.53875	24	31.631	39.54	达标 Yes
		年平均 Annual average	2.8141	7.03525	13.3438	16.158	40.39	达标 Yes

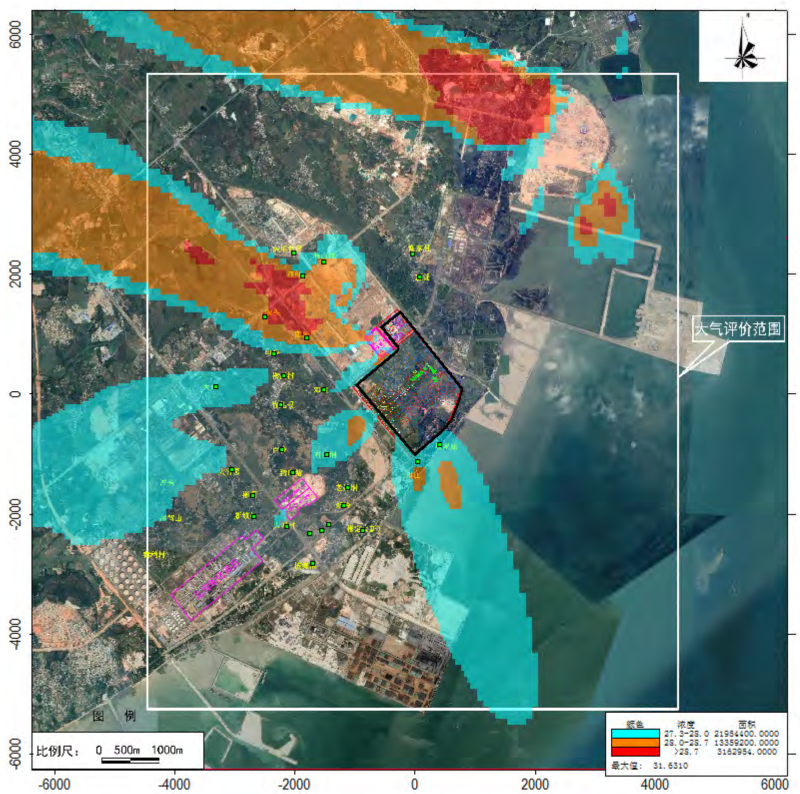


图 4.2-25 正常排放 NO_2 保证率日平均质量浓度分布图(叠加现状浓度及区域污染源，单位：μg/m³)

Figure 4.2-25 Distribution Map of Daily Average Mass Concentration of NO2 at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m³)

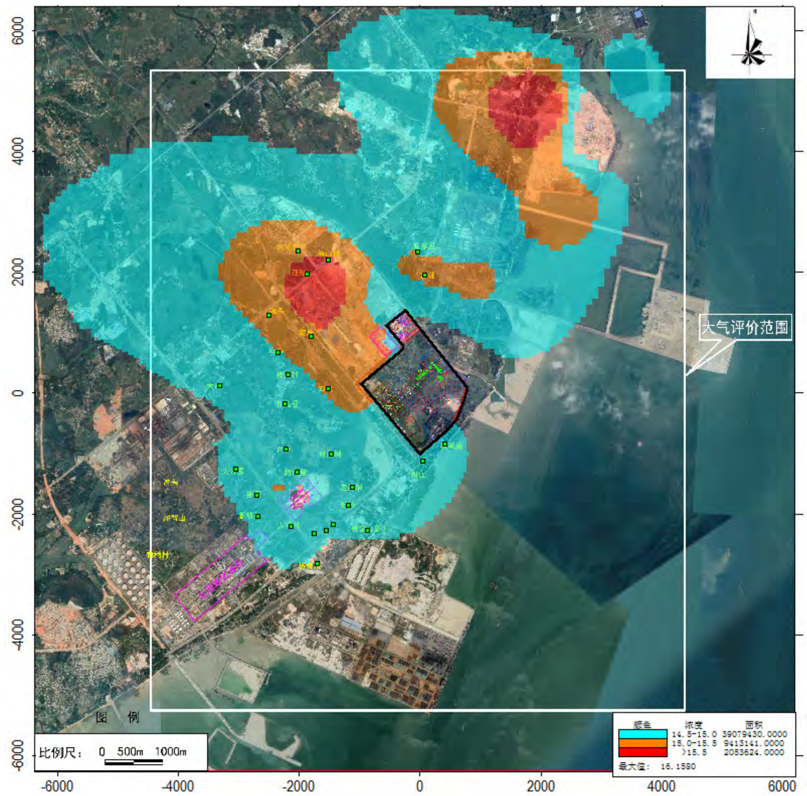


图 4.2-26 正常排放 NO_2 年平均质量浓度分布图（叠加现状浓度及区域污染源，单位：μg/m³）
Figure 4.2-26 Distribution Map of Annual Average Mass Concentration of NO2 at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m³)

（3）颗粒物（PM10）

(3) Particulate matter (PM10)

正常排放情况下，PM_{10} 叠加环境质量现状浓度及区域拟建（在建）项目正常排放预测结果后环境质量浓度预测结果见表 4.2-46、图 4.2-27~4.2-28。

4.2.5.2 The prediction results of environmental ,ass concentration of PM_{10} after superimposing the predication results of current environmental mass concentration and normal emission of regional proposed projects (projects under construction) under normal emission conditions are shown in Table 4.2-46 and Figure 4.2-27 to 4.2-28.

对于环境空气敏感目标而言，叠加环境质量现状浓度及区域拟建（在建）项目后，PM_{10} 保证率日平均、年平均质量浓度均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, the daily and annual average mass concentration of PM_{10} at guarantee rate after superimposing current environmental mass concentration and regional proposed projects (projects under construction) all comply with

the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，叠加环境质量现状浓度后，PM_{10}保证率日平均、年平均质量浓度分别为 89.0142μg/m³、45.9594μg/m³，最大占标率分别为 59.34%、65.66%，均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, the daily and annual average mass concentration of PM_{10} at guarantee rate after superimposing current environmental mass concentration is 89.0142μg/m3 and 45.9594μg/m3 respectively, and the maximum Pi is 59.34% and 65.66% respectively, which all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-46 PM_{10}叠加后保证率日平均及年平均环境质量浓度预测结果表

Table 4.2-46 Prediction Results of Daily and Annual Average Mass Concentration of PM_{10} at Guarantee Rate after Superimposition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
PM_{10}	猪血塘 Zhuxuetang	日平均 Average daily	0.3907	0.26	87	87.3907	58.26	达标 Yes
		年平均 Annual average	0.4538	0.65	43.5644	44.0182	62.88	达标 Yes
	百班 Baiban	日平均 Average daily	0.0805	0.05	87	87.0805	58.05	达标 Yes
		年平均 Annual average	0.2807	0.40	43.5644	43.8451	62.64	达标 Yes
	竹儿根 Zhuergen	日平均 Average daily	0.0599	0.04	87	87.0599	58.04	达标 Yes
		年平均 Annual average	0.2544	0.36	43.5644	43.8187	62.6	达标 Yes
	彬崇村 Binchong Village	日平均 Average daily	0.104	0.07	87	87.104	58.07	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		年平均 Annual average	0.272	0.39	43.5644	43.8364	62.62	达标 Yes
	山心 Shanxin	日平均 Average daily	0.1266	0.08	87	87.1266	58.08	达标 Yes
		年平均 Annual average	0.2877	0.41	43.5644	43.8521	62.65	达标 Yes
	邓屋 Dengwu	日平均 Average daily	0.1921	0.13	87	87.1921	58.13	达标 Yes
		年平均 Annual average	0.3337	0.48	43.5644	43.8981	62.71	达标 Yes
	对面垌 Duimiandong	日平均 Average daily	0.1413	0.09	87	87.1413	58.09	达标 Yes
		年平均 Annual average	0.3743	0.53	43.5644	43.9387	62.77	达标 Yes
	老妗垌 Laojindong	日平均 Average daily	0.3719	0.25	87	87.3719	58.25	达标 Yes
		年平均 Annual average	0.361	0.52	43.5644	43.9253	62.75	达标 Yes
	坡尾底 Poweidi	日平均 Average daily	0.5117	0.34	87	87.5117	58.34	达标 Yes
		年平均 Annual average	0.2686	0.38	43.5644	43.8329	62.62	达标 Yes
	川江 Chuanjiang	日平均 Average daily	0.4593	0.31	87	87.4593	58.31	达标 Yes
		年平均 Annual	0.2915	0.42	43.5644	43.8558	62.65	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		average						
	彬定（新）Binding (New village)	日平均 Average daily	0.1842	0.12	87	87.1843	58.12	达标 Yes
		年平均 Annual average	0.244	0.35	43.5644	43.8084	62.58	达标 Yes
	大塘村 Datang Village	日平均 Average daily	0.4866	0.32	87	87.4866	58.32	达标 Yes
		年平均 Annual average	0.5136	0.73	43.5644	44.078	62.97	达标 Yes
	南乐 Nanyue	日平均 Average daily	0.3311	0.22	87	87.3312	58.22	达标 Yes
		年平均 Annual average	0.3621	0.52	43.5644	43.9265	62.75	达标 Yes
	陂头 Potou	日平均 Average daily	0.3266	0.22	87	87.3266	58.22	达标 Yes
		年平均 Annual average	0.3265	0.47	43.5644	43.8909	62.7	达标 Yes
	亚细 Yaxi	日平均 Average daily	0.7877	0.53	87	87.7877	58.53	达标 Yes
		年平均 Annual average	0.4206	0.60	43.5644	43.9849	62.84	达标 Yes
	南乐社区 Nanyue Community	日平均 Average daily	0.5722	0.38	87	87.5722	58.38	达标 Yes
		年平均 Annual	0.3576	0.51	43.5644	43.922	62.75	达标 Yes

污染物 **Pollutant**	预测点 **Prediction point**	平均时段 **Average period**	贡献值 **Contribution value (μg/m^3)**	占标率% **Pi %**	现状浓度 **(μg/m^3) Current concentration (μg/m^3)**	叠加后浓度 **(μg/m^3) Concentration after superimposition (μg/m^3)**	占标率% **Pi %**	达标情况 **Up-to-standard status**
		average						
	海山排 Haishanpai	日平均 Average daily	0.5713	0.38	87	87.5713	58.38	达标 Yes
		年平均 Annual average	0.3975	0.57	43.5644	43.9618	62.8	达标 Yes
	谢家村 Xiejiacun Village	日平均 Average daily	0.1445	0.10	87	87.1445	58.1	达标 Yes
		年平均 Annual average	0.2948	0.42	43.5644	43.8592	62.66	达标 Yes
	阳光海岸（中石化倒班宿舍）Yangguang Coast (SINOPEC shift dormitory)	日平均 Average daily	0.481	0.32	87	87.481	58.32	达标 Yes
		年平均 Annual average	0.3787	0.54	43.5644	43.9431	62.78	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	日平均 Average daily	0.3931	0.26	87	87.3931	58.26	达标 Yes
		年平均 Annual average	0.3119	0.45	43.5644	43.8763	62.68	达标 Yes
	华南北苑 Huanan Beiyuan	日平均 Average daily	0.2214	0.15	87	87.2214	58.15	达标 Yes
		年平均 Annual average	0.2874	0.41	43.5644	43.8518	62.65	达标 Yes
	新岭 Xinling	日平均 Average daily	0.1288	0.09	87	87.1288	58.09	达标 Yes
		年平均 Annual	0.2881	0.41	43.5644	43.8525	62.65	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		average						
	新铺 Xinpu	日平均 Average daily	0.2571	0.17	87	87.2571	58.17	达标 Yes
		年平均 Annual average	0.3145	0.45	43.5644	43.8789	62.68	达标 Yes
	大田 Datian	日平均 Average daily	0.0683	0.05	87	87.0683	58.05	达标 Yes
		年平均 Annual average	0.229	0.33	43.5644	43.7934	62.56	达标 Yes
	大竹园 Dazhuyuan	日平均 Average daily	0.3315	0.22	87	87.3315	58.22	达标 Yes
		年平均 Annual average	0.3452	0.49	43.5644	43.9096	62.73	达标 Yes
	彬垌 Bindong	日平均 Average daily	0.2716	0.18	87	87.2716	58.18	达标 Yes
		年平均 Annual average	0.5708	0.82	43.5644	44.1352	63.05	达标 Yes
	新坡村 Xinpo Village	日平均 Average daily	0.54	0.36	87	87.54	58.36	达标 Yes
		年平均 Annual average	0.5292	0.76	43.5644	44.0936	62.99	达标 Yes
	槟榔根 Binianggen	日平均 Average daily	0.4995	0.33	87	87.4995	58.33	达标 Yes
		年平均 Annual average	0.2792	0.40	43.5644	43.8436	62.63	达标 Yes
	网格	日平均	0.0142	0.01	89	89.0142	59.34	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
	Mesh	Average daily						Yes
		年平均 Annual average	2.395	3.42	43.5644	45.9594	65.66	达标 Yes

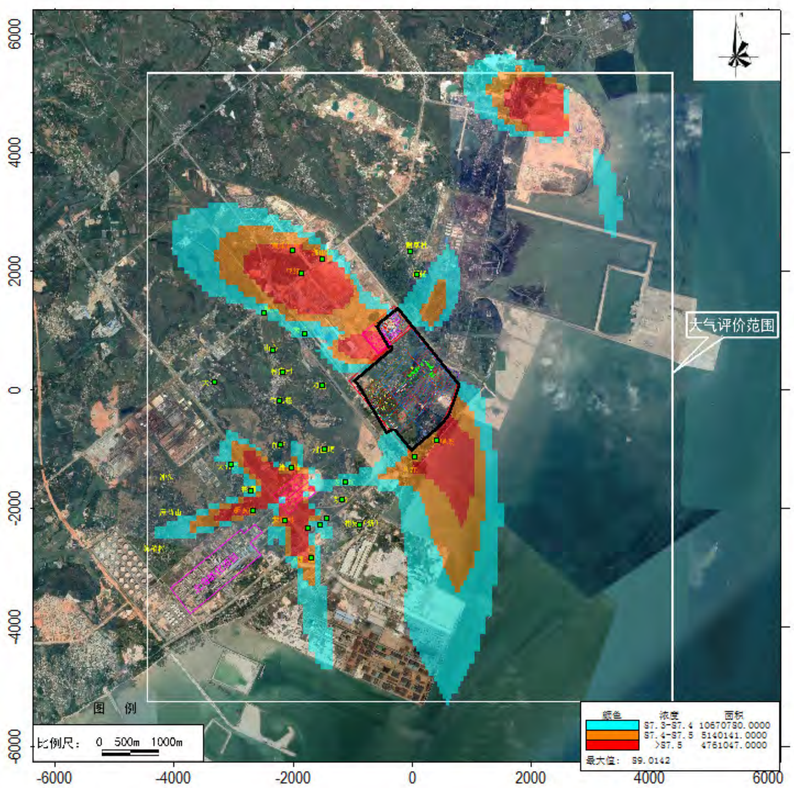


图 4.2-27 正常排放 PM_{10} 保证率日平均质量浓度分布图（叠加现状浓度及区域污染源，单位：μg/m^3）

Figure 4.2-27 Distribution Map of Daily Average Mass Concentration of PM_{10} at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m^3)

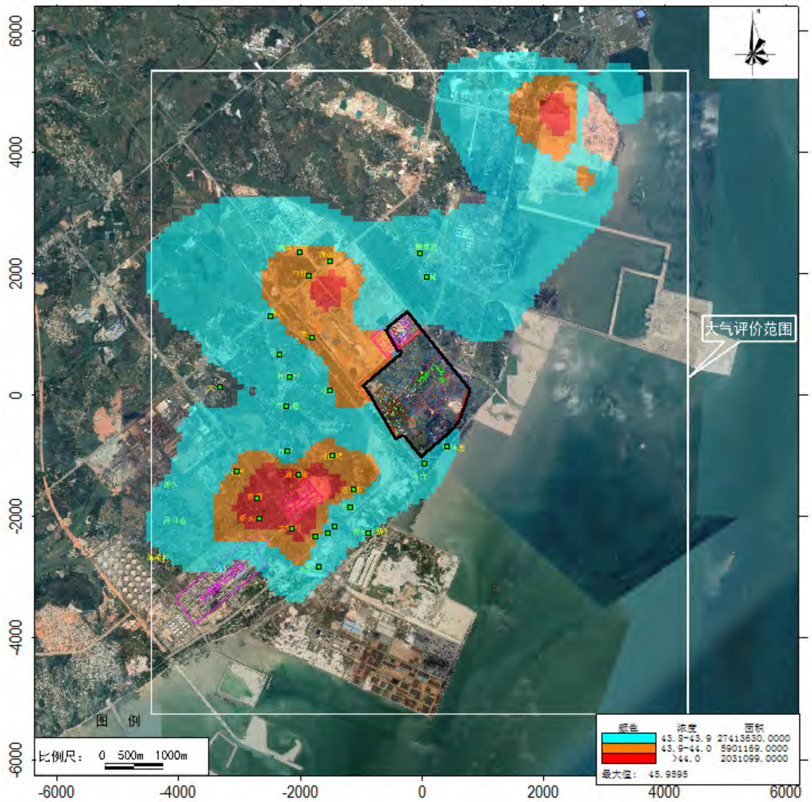


图 4.2-28 正常排放 PM_{10} 年平均质量浓度分布图（叠加现状浓度及区域污染源，单位：μg/m³）
Figure 4.2-28 Distribution Map of Annual Average Mass Concentration of NO2 at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m³)

（4）颗粒物（$PM_{2.5}$）

(4) Particulate matter ($PM_{2.5}$)

正常排放情况下，$PM_{2.5}$ 叠加环境质量现状浓度及区域拟建（在建）项目正常排放预测结果后环境质量浓度预测结果见表 4.2-47、图 4.2-29~4.2-30。

4.2.5.2 The prediction results of environmental ,ass concentration of $PM_{2.5}$ after superimposing the predication results of current environmental mass concentration and normal emission of regional proposed projects (projects under construction) under normal emission conditions are shown in Table 4.2-47 and Figure 4.2-29 to 4.2-30.

对于环境空气敏感目标而言，叠加环境质量现状浓度及区域拟建（在建）项目后，$PM_{2.5}$ 保证率日平均、年平均质量浓度均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, the daily and annual average mass concentration of $PM_{2.5}$ at guarantee rate after superimposing current environmental mass concentration and regional proposed projects (projects under construction) all comply with

the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，叠加环境质量现状浓度后，$PM_{2.5}$ 保证率日平均、年平均质量浓度分别为 70.5583μg/m³、32.1808μg/m³，最大占标率分别为 94.08%、92.64%，均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, the daily and annual average mass concentration of $PM_{2.5}$ at guarantee rate after superimposing current environmental mass concentration is 70.5583μg/m3 and 32.1808μg/m3 respectively, and the maximum Pi is 94.08% and 92.64% respectively, which all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-47 $PM_{2.5}$ 叠加后保证率日平均及年平均环境质量浓度预测结果表

Table 4.2-47 Prediction Results of Daily and Annual Average Mass Concentration of $PM_{2.5}$ at Guarantee Rate after Superimposition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率%	是否超标 Whether exceeding the standard
$PM_{2.5}$	猪血塘 Zhuxuetang	日平均 Average daily	0.0674	70	0.09	70.0674	93.42	达标 Yes
		年平均 Annual average	0.111	32.1808	0.32	32.2918	92.26	达标 Yes
	百班 Baiban	日平均 Average daily	0.0739	70	0.10	70.0739	93.43	达标 Yes
		年平均 Annual average	0.1011	32.1808	0.29	32.2819	92.23	达标 Yes
	竹儿根 Zhuergen	日平均 Average daily	0.185	70	0.25	70.185	93.58	达标 Yes
		年平均 Annual average	0.1105	32.1808	0.32	32.2913	92.26	达标 Yes
	彬崇村	日平均	0.2316	70	0.31	70.2316	93.64	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率%	是否超标 Whether exceeding the standard
	Binchong Village	Average daily						Yes
		年平均 Annual average	0.1241	32.1808	0.35	32.3049	92.3	达标 Yes
	山心 Shanxin	日平均 Average daily	0.3129	70	0.42	70.3129	93.75	达标 Yes
		年平均 Annual average	0.1342	32.1808	0.38	32.315	92.33	达标 Yes
	邓屋 Dengwu	日平均 Average daily	0.2962	70	0.39	70.2962	93.73	达标 Yes
		年平均 Annual average	0.1451	32.1808	0.41	32.326	92.36	达标 Yes
	对面垌 Duimiandong	日平均 Average daily	0.0991	70	0.13	70.0991	93.47	达标 Yes
		年平均 Annual average	0.1182	32.1808	0.34	32.2991	92.28	达标 Yes
	老妗垌 Laojindong	日平均 Average daily	0.1344	70	0.18	70.1344	93.51	达标 Yes
		年平均 Annual average	0.1104	32.1808	0.32	32.2913	92.26	达标 Yes
	坡尾底 Poweidi	日平均 Average daily	0.2251	70	0.30	70.2251	93.63	达标 Yes
		年平均 Annual average	0.1096	32.1808	0.31	32.2904	92.26	达标 Yes
	川江	日平均	0.1946	70	0.26	70.1946	93.59	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率%	是否超标 Whether exceeding the standard
	Chuanjiang	Average daily						Yes
		年平均 Annual average	0.1175	32.1808	0.34	32.2983	92.28	达标 Yes
	彬定（新） Binding (New village)	日平均 Average daily	0.1514	70	0.20	70.1514	93.54	达标 Yes
		年平均 Annual average	0.0948	32.1808	0.27	32.2756	92.22	达标 Yes
	大塘村 Datang Village	日平均 Average daily	0.118	70	0.16	70.118	93.49	达标 Yes
		年平均 Annual average	0.1141	32.1808	0.33	32.295	92.27	达标 Yes
	南乐 Nanyue	日平均 Average daily	0.317	70	0.42	70.317	93.76	达标 Yes
		年平均 Annual average	0.1712	32.1808	0.49	32.352	92.43	达标 Yes
	陂头 Potou	日平均 Average daily	0.3363	70	0.45	70.3363	93.78	达标 Yes
		年平均 Annual average	0.1561	32.1808	0.45	32.3369	92.39	达标 Yes
	亚细 Yaxi	日平均 Average daily	0.419	70	0.56	70.419	93.89	达标 Yes
		年平均 Annual average	0.2033	32.1808	0.58	32.3841	92.53	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率%	是否超标 Whether exceeding the standard
	南乐社区 Nanyue Community	日平均 Average daily	0.2826	70	0.38	70.2826	93.71	达标 Yes
		年平均 Annual average	0.1725	32.1808	0.49	32.3533	92.44	达标 Yes
	海山排 Haishanpai	日平均 Average daily	0.2811	70	0.37	70.2811	93.71	达标 Yes
		年平均 Annual average	0.1918	32.1808	0.55	32.3726	92.49	达标 Yes
	谢家村 Xiejiacun Village	日平均 Average daily	0.021	70	0.03	70.021	93.36	达标 Yes
		年平均 Annual average	0.1394	32.1808	0.40	32.3202	92.34	达标 Yes
	阳光海岸（中石化倒班宿舍）Yangguang Coast (SINOPEC shift dormitory)	日平均 Average daily	0.1188	70	0.16	70.1188	93.49	达标 Yes
		年平均 Annual average	0.1005	32.1808	0.29	32.2813	92.23	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	日平均 Average daily	0.1144	70	0.15	70.1144	93.49	达标 Yes
		年平均 Annual average	0.0965	32.1808	0.28	32.2774	92.22	达标 Yes
	华南北苑 Huanan Beiyuan	日平均 Average daily	0.1157	70	0.15	70.1157	93.49	达标 Yes
		年平均	0.0962	32.1808	0.27	32.2771	92.22	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率%	是否超标 Whether exceeding the standard
		Annual average						Yes
	新岭 Xinling	日平均 Average daily	0.1316	70	0.18	70.1316	93.51	达标 Yes
		年平均 Annual average	0.1025	32.1808	0.29	32.2833	92.24	达标 Yes
	新铺 Xinpu	日平均 Average daily	0.0208	70	0.03	70.0208	93.36	达标 Yes
		年平均 Annual average	0.1478	32.1808	0.42	32.3286	92.37	达标 Yes
	大田 Datian	日平均 Average daily	0.208	70	0.28	70.208	93.61	达标 Yes
		年平均 Annual average	0.098	32.1808	0.28	32.2788	92.23	达标 Yes
	大竹园 Dazhuyuan	日平均 Average daily	0.0917	70	0.12	70.0917	93.46	达标 Yes
		年平均 Annual average	0.1016	32.1808	0.29	32.2824	92.24	达标 Yes
	彬垌 Bindong	日平均 Average daily	0.1477	70	0.20	70.1477	93.53	达标 Yes
		年平均 Annual average	0.1101	32.1808	0.31	32.291	92.26	达标 Yes
	新坡村 Xinpo Village	日平均 Average daily	0.0738	70	0.10	70.0738	93.43	达标 Yes
		年平均	0.0988	32.1808	0.28	32.2797	92.23	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率%	是否超标 Whether exceeding the standard
		Annual average						Yes
	槟榔根 Binlanggen	日平均 Average daily	0.1201	70	0.16	70.1201	93.49	达标 Yes
		年平均 Annual average	0.0908	32.1808	0.26	32.2716	92.2	达标 Yes
	网格 Mesh	日平均 Average daily	0.5482	70	0.73	70.5482	94.06	达标 Yes
		年平均 Annual average	0.2421	32.1808	0.69	32.4229	92.64	达标 Yes

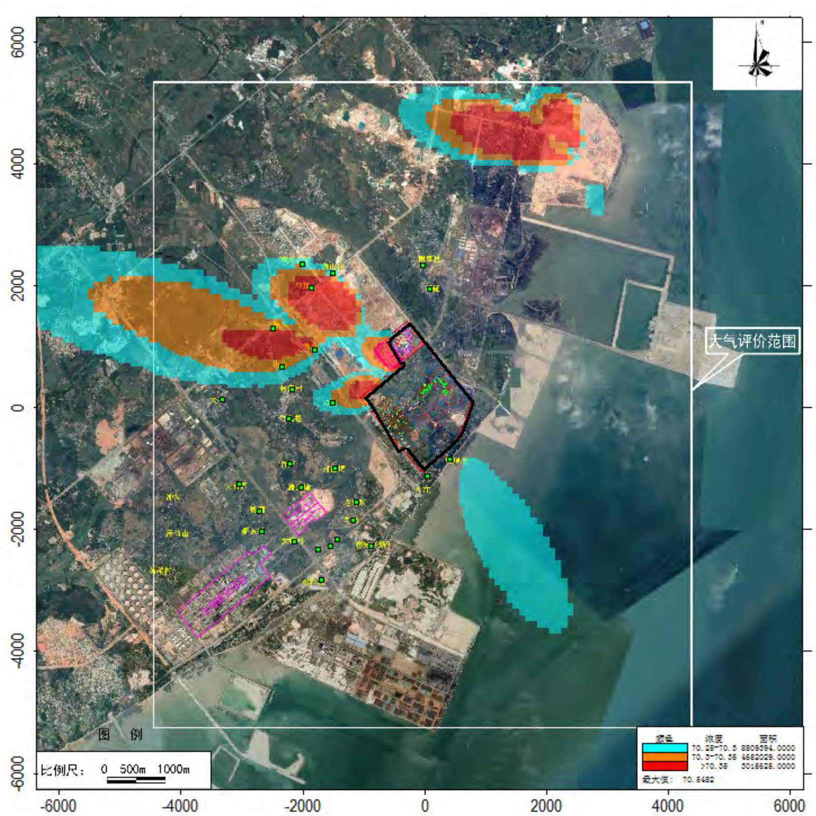


图 4.2-29 正常排放 PM2.5 日平均质量浓度分布图（叠加现状浓度及区域污染源，单位：μg/m3）
Figure 4.2-29 Distribution Map of Daily Average Mass Concentration of PM2.5 at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m3)

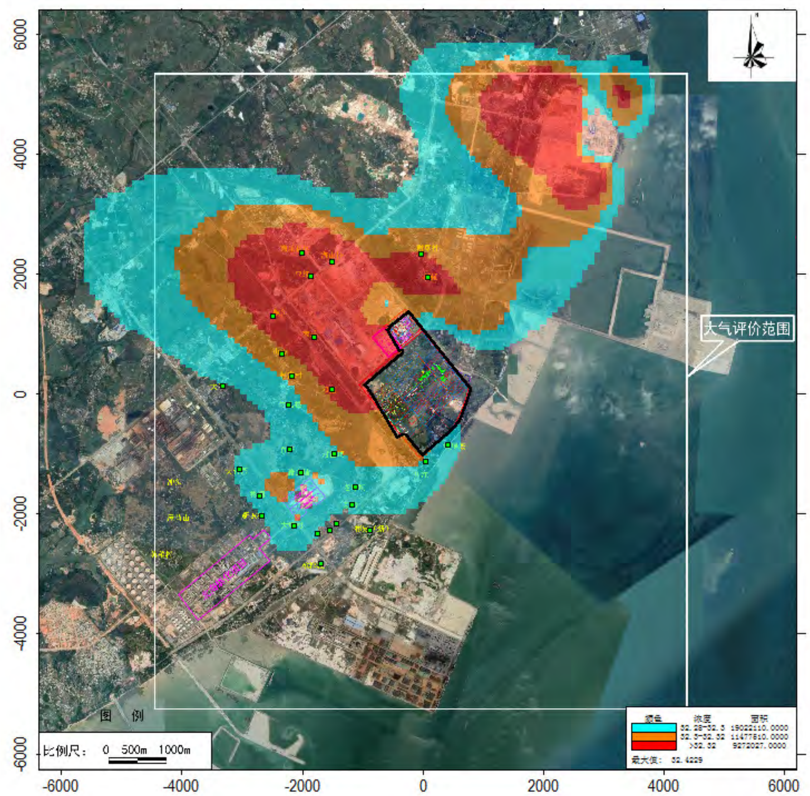


图 4.2-30 正常排放 PM2.5 年平均质量浓度分布图（叠加现状浓度及区域污染源，单位：μg/m3
Figure 4.2-30 Distribution Map of Annual Average Mass Concentration of PM2.5 at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m3)

（5）氯化氢（HCl）

(5) Hydrogen chloride (HCl)

正常排放情况下，HCl 叠加环境质量现状浓度预测结果后环境质量浓度预测结果见表 4.2-48、图 4.2-31~4.2-32。

The prediction results of environmental mass concentration of HCl after superimposing the predication results of current environmental mass concentration under normal emission conditions are shown in Table 4.2-48 and Figure 4.2-31 to 4.2-32.

对于环境空气敏感目标而言，叠加环境质量现状浓度后，HCl 短期浓度（小时、日平均浓度）贡献值均满足《环境影响评价技术导则 大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。

In regard to ambient air sensitive targets, the short-term concentration (hourly and daily average concentration) contribution values of HCl after superimposing current environmental mass concentration all comply with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018)*.

区域最大落地浓度网格点，叠加环境质量现状浓度后，HCl 短期浓度（小时、日均）贡献值最大值分别为 20.2365μg/m^3、11.5451μg/m^3，最大占标率分别为 40.47%、76.97%，最大浓度占标率均<100%，HCl 短期浓度（小时、日均）贡献值均满足《环境影响评价技术导则　大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。

At the mesh point of regional maximum ground-level concentration, the maximum short-term concentration (hourly and daily average) contribution value of Cl2 is 20.2365μg/m^3 and 11.5451μg/m^3 respectively, and the maximum Pi is 40.47% and 76.97% respectively with Pi of maximum concentration both <100%. The short-term (hourly and daily average) concentration contribution values of Cl2 both comply with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018)*.

表 4.2-48　正常工况 HCl 预测结果表
Table 4.2-48 Prediction Results of HCL under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
HCl	猪血塘 Zhuxuetang	1 小时 1 hour	2.0018	1.334533	15.00	17.0018	11.33	达标 Yes
		日平均 Average daily	0.8524	1.420667	9.15	10.0058	16.68	达标 Yes
	百班 Baiban	1 小时 1 hour	1.975	1.316667	15.00	16.975	11.32	达标 Yes
		日平均 Average daily	0.7826	1.304333	9.15	9.9361	16.56	达标 Yes
	竹儿根 Zhuergen	1 小时 1 hour	2.5153	1.676867	14.00	16.5153	11.01	达标 Yes
		日平均 Average daily	0.8515	1.419167	9.15	10.0049	16.67	达标 Yes
	彬崇村 Binchong	1 小时 1 hour	4.9199	3.279933	12.00	16.9199	11.28	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
	Village							
		日平均 Average daily	0.9575	1.595833	9.15	10.1109	16.85	达标 Yes
	山心 Shanxin	1 小时 1 hour	5.7146	3.809733	11.00	16.7146	11.14	达标 Yes
		日平均 Average daily	1.0476	1.746	9.15	10.201	17	达标 Yes
	邓屋 Dengwu	1 小时 1 hour	4.2507	2.8338	14.00	18.2507	12.17	达标 Yes
		日平均 Average daily	1.1563	1.927167	9.15	10.3097	17.18	达标 Yes
	对面垌 Duimiandong	1 小时 1 hour	3.9449	2.629933	14.00	17.9449	11.96	达标 Yes
		日平均 Average daily	0.931	1.551667	9.15	10.0844	16.81	达标 Yes
	老妗垌 Laojindong	1 小时 1 hour	3.3657	2.2438	14.00	17.3657	11.58	达标 Yes
		日平均 Average daily	0.8417	1.402833	9.15	9.9951	16.66	达标 Yes
	坡尾底 Poweidi	1 小时 1 hour	1.9371	1.2914	15.00	16.9371	11.29	达标 Yes
		日平均 Average daily	0.7598	1.266333	9.15	9.9132	16.52	达标 Yes
	川江 Chuanjiang	1 小时 1 hour	1.9637	1.309133	15.00	16.9637	11.31	达标 Yes
		日平均 Average daily	0.8156	1.359333	9.15	9.969	16.61	达标 Yes
	彬定（新） Binding (New	1 小时 1 hour	3.0297	2.0198	14.00	17.0297	11.35	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
	village)							
		日平均 Average daily	0.7076	1.179333	9.15	9.861	16.43	达标 Yes
	大塘村 Datang Village	1 小时 1 hour	4.0432	2.695467	14.00	18.0432	12.03	达标 Yes
		日平均 Average daily	0.8461	1.410167	9.15	9.9995	16.67	达标 Yes
	南乐 Nanyue	1 小时 1 hour	0.0933	0.0622	17.00	17.0933	11.4	达标 Yes
		日平均 Average daily	1.3706	2.284333	9.15	10.5241	17.54	达标 Yes
	陂头 Potou	1 小时 1 hour	0.1124	0.074933	17.00	17.1124	11.41	达标 Yes
		日平均 Average daily	1.2574	2.095667	9.15	10.4109	17.35	达标 Yes
	亚细 Yaxi	1 小时 1 hour	0	0	18.00	18	12	达标 Yes
		日平均 Average daily	1.7488	2.914667	9.15	10.9022	18.17	达标 Yes
	南乐社区 Nanyue Community	1 小时 1 hour	4.6677	3.1118	13.00	17.6677	11.78	达标 Yes
		日平均 Average daily	1.4417	2.402833	9.15	10.5951	17.66	达标 Yes
	海山排 Haishanpai	1 小时 1 hour	0	0	18.00	18	12	达标 Yes
		日平均 Average daily	1.637	2.728333	9.15	10.7904	17.98	达标 Yes
	谢家村	1 小时	3.3509	2.23393	14.00	17.3509	11.57	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
	Xiejiacun Village	1 hour		3				Yes
		日平均 Average daily	1.2105	2.0175	9.15	10.3639	17.27	达标 Yes
	阳光海岸（中石化倒班宿舍）Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	3.262	2.174667	14.00	17.262	11.51	达标 Yes
		日平均 Average daily	0.7607	1.267833	9.15	9.9141	16.52	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	3.1434	2.0956	14.00	17.1434	11.43	达标 Yes
		日平均 Average daily	0.7362	1.227	9.15	9.8896	16.48	达标 Yes
	华南北苑 Huanan Beiyuan	1 小时 1 hour	3.1588	2.105867	14.00	17.1588	11.44	达标 Yes
		日平均 Average daily	0.7357	1.226167	9.15	9.8891	16.48	达标 Yes
	新岭 Xinling	1 小时 1 hour	3.2431	2.162067	14.00	17.2431	11.5	达标 Yes
		日平均 Average daily	0.7799	1.299833	9.15	9.9333	16.56	达标 Yes
	新铺 Xinpu	1 小时 1 hour	3.8866	2.591067	14.00	17.8866	11.92	达标 Yes
		日平均 Average daily	1.2691	2.115167	9.15	10.4225	17.37	达标 Yes
	大田	1 小时	1.2871	0.85806	15.00	16.2871	10.86	达标

污染物 **Pollutant**	预测点 **Prediction point**	平均时段 **Average period**	贡献值 **Contribution value (μg/m^3)**	占标率% **Pi %**	现状浓度 **(μg/m^3) Current concentration (μg/m^3)**	叠加后浓度 **(μg/m^3) Concentration after superimposition (μg/m^3)**	占标率% **Pi %**	达标情况 **Up-to-standard status**
	Datian	1 hour		7				Yes
		日平均 Average daily	0.7516	1.252667	9.15	9.905	16.51	达标 Yes
	大竹园 Dazhuyuan	1 小时 1 hour	0.3398	0.226533	16.00	16.3398	10.89	达标 Yes
		日平均 Average daily	0.7582	1.263667	9.15	9.9116	16.52	达标 Yes
	彬垌 Bindong	1 小时 1 hour	1.7401	1.160067	15.00	16.7401	11.16	达标 Yes
		日平均 Average daily	0.8204	1.367333	9.15	9.9739	16.62	达标 Yes
	新坡村 Xinpo Village	1 小时 1 hour	1.7616	1.1744	15.00	16.7616	11.17	达标 Yes
		日平均 Average daily	0.7375	1.229167	9.15	9.8909	16.48	达标 Yes
	槟榔根 Binlanggen	1 小时 1 hour	3.2013	2.1342	14.00	17.2013	11.47	达标 Yes
		日平均 Average daily	0.6928	1.154667	9.15	9.8462	16.41	达标 Yes
	网格 Mesh	1 小时 1 hour	4.6055	3.070333	15.00	19.6055	13.07	达标 Yes
		日平均 Average daily	2.0859	3.4765	9.15	11.2393	18.73	达标 Yes

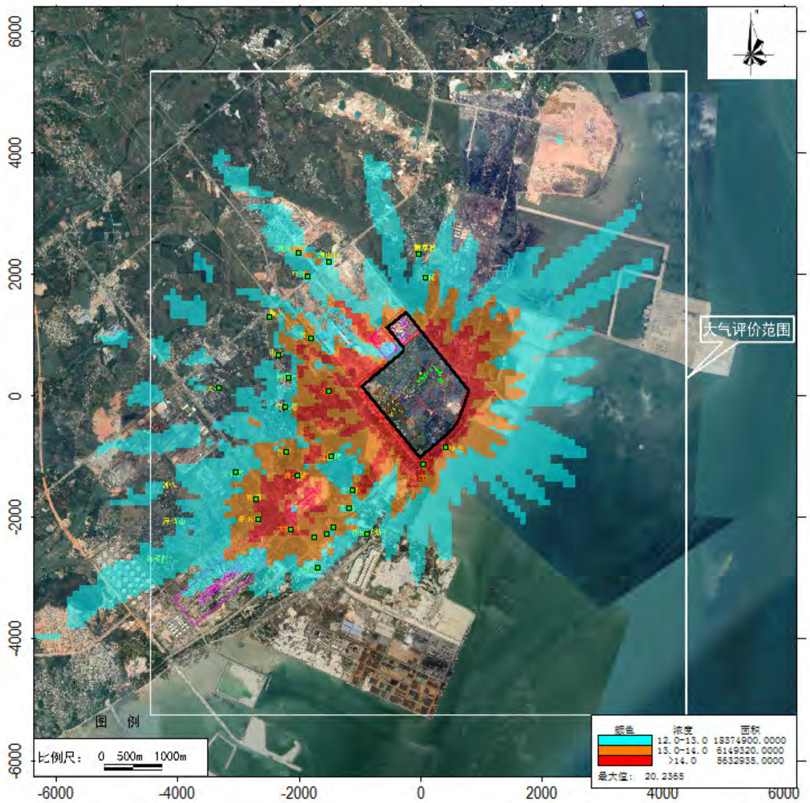


图 4.2-31 正常排放 HCl 小时平均质量浓度分布图（叠加区域污染源及现状浓度，单位：μg/m³）
Figure 4.2-31 Distribution Map of Hourly Average Mass Concentration of HCl at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m³)

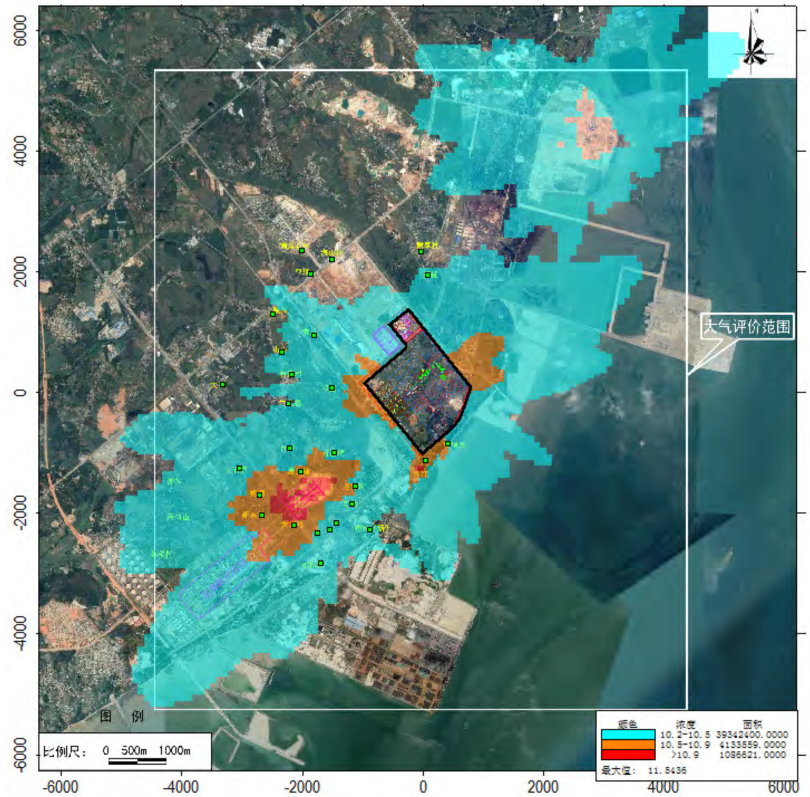


图 4.2-32 正常排放 HCl 日平均质量浓度分布图（叠加区域污染源及现状浓度，单位：μg/m³）
Figure 4.2-32 Distribution Map of Daily Average Mass Concentration of PM10 at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m³)

（6）硫化氢（H_2S）

(6) Hydrogen chloride (H_2S)

正常排放情况下，H_2S 叠加环境质量现状浓度及区域拟建（在建）项目预测结果后环境质量浓度预测结果见表 4.2-49、图 4.2-33。

4.2.5.2 The prediction results of environmental ,ass concentration of H_2S after superimposing the predication results of current environmental mass concentration and normal emission of regional proposed projects (projects under construction) under normal emission conditions are shown in Table 4.2-49 and Figure 4.2-33.

对于环境空气敏感目标而言，叠加环境质量现状浓度后，H_2S 短期浓度（小时浓度）贡献值均满足《环境影响评价技术导则 大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。区域最大落地浓度网格点，叠加环境质量现状浓度后，H_2S 短期浓度（小时浓度）贡献值最大值为 1.9229μg/m³，最大占标率分别为 19.23%，最大浓度占标率均<100%，H_2S 短期浓度贡献值均满足《环境影响评价技术导则 大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。

In regard to ambient air sensitive targets, the short-term (hourly) concentration contribution values of H_2S after superimposing current environmental mass concentration all comply with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018)*. At the mesh point of regional maximum ground-level concentration, the maximum short-term (hourly) concentration value of H_2S is 1.9229μg/m^3, and the maximum Pi is 19.23% with Pi of maximum concentration <100%. The short-term concentration contribution values of H2S all comply with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018)*.

表 4.2-49 正常工况 H_2S 预测结果表

Table 4.2-49 Prediction Results of H_2S under Normal Working Conditions

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
H_2S	猪血塘 Zhuxuetang	1 小时 1 hour	0.4155	4.16	1.25	1.6655	16.65	达标 Yes
	百班 Baiban	1 小时 1 hour	0.4003	4.00	1.25	1.6503	16.5	达标 Yes
	竹儿根 Zhuergen	1 小时 1 hour	0.4284	4.28	1.25	1.6784	16.78	达标 Yes
	彬崇村 Binchong Village	1 小时 1 hour	0.5087	5.09	1.25	1.7587	17.59	达标 Yes
	山心 Shanxin	1 小时 1 hour	0.5015	5.02	1.25	1.7515	17.52	达标 Yes
	邓屋 Dengwu	1 小时 1 hour	0.4739	4.74	1.25	1.7239	17.24	达标 Yes
	对面垌 Duimiandong	1 小时 1 hour	0.3917	3.92	1.25	1.6417	16.42	达标 Yes
	老妗垌 Laojindong	1 小时 1 hour	0.3997	4.00	1.25	1.6497	16.5	达标 Yes
	坡尾底 Poweidi	1 小时 1 hour	0.5281	5.28	1.25	1.7781	17.78	达标 Yes

	川江 Chuanjiang	1 小时 1 hour	0.5638	5.64	1.25	1.8138	18.14	达标 Yes
	彬定（新）Binding (New village)	1 小时 1 hour	0.39	3.90	1.25	1.64	16.4	达标 Yes
	大塘村 Datang Village	1 小时 1 hour	0.3992	3.99	1.25	1.6492	16.49	达标 Yes
	南乐 Nanyue	1 小时 1 hour	0.4461	4.46	1.25	1.6961	16.96	达标 Yes
	陂头 Potou	1 小时 1 hour	0.4329	4.33	1.25	1.6829	16.83	达标 Yes
	亚细 Yaxi	1 小时 1 hour	0.5114	5.11	1.25	1.7614	17.61	达标 Yes
	南乐社区 Nanyue Community	1 小时 1 hour	0.4685	4.69	1.25	1.7185	17.19	达标 Yes
	海山排 Haishanpai	1 小时 1 hour	0.4092	4.09	1.25	1.6592	16.59	达标 Yes
	谢家村 Xiejiacun Village	1 小时 1 hour	0.3838	3.84	1.25	1.6338	16.34	达标 Yes
	阳光海岸（中石化倒班宿舍）Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	0.3669	3.67	1.25	1.6169	16.17	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	0.367	3.67	1.25	1.617	16.17	达标 Yes
	华南北苑 Huanan Beiyuan	1 小时 1 hour	0.3709	3.71	1.25	1.6209	16.21	达标 Yes
	新岭	1 小时	0.3823	3.82	1.25	1.6323	16.32	达标

	Xinling	1 hour						Yes
	新铺 Xinpu	1 小时 1 hour	0.3995	4.00	1.25	1.6495	16.49	达标 Yes
	大田 Datian	1 小时 1 hour	0.4657	4.66	1.25	1.7157	17.16	达标 Yes
	大竹园 Dazhuyuan	1 小时 1 hour	0.5314	5.31	1.25	1.7814	17.81	达标 Yes
	彬垌 Bindong	1 小时 1 hour	0.4863	4.86	1.25	1.7363	17.36	达标 Yes
	新坡村 Xinpo Village	1 小时 1 hour	0.43	4.30	1.25	1.68	16.8	达标 Yes
	槟榔根 Binlanggen	1 小时 1 hour	0.3308	3.31	1.25	1.5808	15.81	达标 Yes
	网格 Mesh	1 小时 1 hour	0.6729	6.73	1.25	1.9229	19.23	达标 Yes

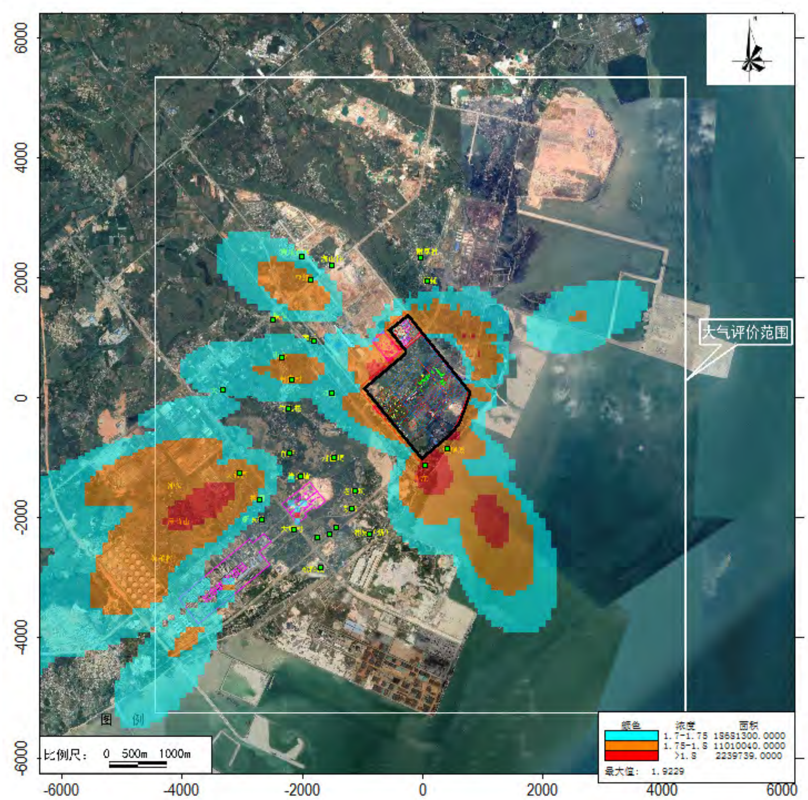


图 4.2-33　正常排放 H_2S 小时平均质量浓度分布图（叠加区域污染源及现状浓度，单位：μg/m³）

Figure 4.2-33 Distribution Map of Hourly Average Mass Concentration of H_2S at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m³)

（7）TSP

(7) TSP

正常排放情况下，TSP 叠加环境质量现状浓度及区域拟建（在建）项目正常排放预测结果后环境质量浓度预测结果见表 4.2-50、图 4.2-34~4.2-35。

4.2.5.2 The prediction results of environmental ,ass concentration of TSP after superimposing the predication results of current environmental mass concentration and normal emission of regional proposed projects (projects under construction) under normal emission conditions are shown in Table 4.2-50 and Figure 4.2-34 to 4.2-35.

对于环境空气敏感目标而言，叠加环境质量现状浓度及区域拟建（在建）项目后，TSP 日平均、年平均质量浓度均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, the daily and annual average mass concentration of TSP at guarantee rate after superimposing current environmental mass concentration and regional proposed projects (projects under construction) all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，叠加环境质量现状浓度后，TSP 日平均、年平均质量浓度分别为 298.3901μg/m^3、145.508μg/m^3，最大占标率分别为 99.46%、72.75%，均满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, the daily and annual average mass concentration of TSP at guarantee rate after superimposing current environmental mass concentration is 298.3901μg/m3 and 145.508μg/m3 respectively, and the maximum Pi is 99.46% and 72.75% respectively, which all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-50 TSP 叠加后日平均及年平均环境质量浓度预测结果表
Table 4.2-50 Prediction Results of Daily and Annual Average Mass Concentration of TSP at Guarantee Rate after Superimposition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
TSP	猪血塘 Zhuxuetang	日平均 Average	11.5735	3.86	105.5	117.0735	39.02	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		daily						
		年平均 Annual average	1.2797	0.64	96.3572	97.6369	48.82	达标 Yes
	百班 Baiban	日平均 Average daily	9.2907	3.10	105.5	114.7907	38.26	达标 Yes
		年平均 Annual average	1.3631	0.68	96.3572	97.7203	48.86	达标 Yes
	竹儿根 Zhuergen	日平均 Average daily	14.92	4.97	105.5	120.42	40.14	达标 Yes
		年平均 Annual average	1.6995	0.85	96.3572	98.0566	49.03	达标 Yes
	彬崇村 Binchong Village	日平均 Average daily	9.6239	3.21	105.5	115.1239	38.37	达标 Yes
		年平均 Annual average	1.2765	0.64	96.3572	97.6337	48.82	达标 Yes
	山心 Shanxin	日平均 Average daily	8.6393	2.88	105.5	114.1393	38.05	达标 Yes
		年平均 Annual average	0.8255	0.41	96.3572	97.1826	48.59	达标 Yes
	邓屋 Dengwu	日平均 Average daily	28.781	9.59	105.5	134.281	44.76	达标 Yes
		年平均 Annual average	3.9638	1.98	96.3572	100.321	50.16	达标 Yes
	对面垌 Duimiandong	日平均 Average daily	20.6037	6.87	105.5	126.1037	42.03	达标 Yes
		年平均	2.3487	1.17	96.3572	98.7059	49.35	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		Annual average						Yes
	老妗垌 Laojindong	日平均 Average daily	10.8847	3.63	105.5	116.3847	38.79	达标 Yes
		年平均 Annual average	1.0352	0.52	96.3572	97.3923	48.7	达标 Yes
	坡尾底 Poweidi	日平均 Average daily	29.7613	9.92	105.5	135.2613	45.09	达标 Yes
		年平均 Annual average	1.6428	0.82	96.3572	97.9999	49	达标 Yes
	川江 Chuanjiang	日平均 Average daily	30.1133	10.04	105.5	135.6133	45.2	达标 Yes
		年平均 Annual average	2.1657	1.08	96.3572	98.5229	49.26	达标 Yes
	彬定（新） Binding (New village)	日平均 Average daily	18.0849	6.03	105.5	123.5849	41.19	达标 Yes
		年平均 Annual average	1.5608	0.78	96.3572	97.918	48.96	达标 Yes
	大塘村 Datang Village	日平均 Average daily	6.5397	2.18	105.5	112.0397	37.35	达标 Yes
		年平均 Annual average	0.4288	0.21	96.3572	96.7859	48.39	达标 Yes
	南乐 Nanyue	日平均 Average daily	10.6183	3.54	105.5	116.1183	38.71	达标 Yes
		年平均 Annual	1.1538	0.58	96.3572	97.5109	48.76	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		average						
	陂头 Potou	日平均 Average daily	6.6055	2.20	105.5	112.1055	37.37	达标 Yes
		年平均 Annual average	0.6498	0.32	96.3572	97.007	48.5	达标 Yes
	亚细 Yaxi	日平均 Average daily	6.1939	2.06	105.5	111.6939	37.23	达标 Yes
		年平均 Annual average	0.376	0.19	96.3572	96.7332	48.37	达标 Yes
	南乐社区 Nanyue Community	日平均 Average daily	4.6818	1.56	105.5	110.1818	36.73	达标 Yes
		年平均 Annual average	0.2964	0.15	96.3572	96.6536	48.33	达标 Yes
	海山排 Haishanpai	日平均 Average daily	7.6576	2.55	105.5	113.1575	37.72	达标 Yes
		年平均 Annual average	0.2608	0.13	96.3572	96.6179	48.31	达标 Yes
	谢家村 Xiejiacun Village	日平均 Average daily	7.2713	2.42	105.5	112.7713	37.59	达标 Yes
		年平均 Annual average	0.3135	0.16	96.3572	96.6706	48.34	达标 Yes
	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift	日平均 Average daily	6.9773	2.33	105.5	112.4773	37.49	达标 Yes
		年平均 Annual average	0.4225	0.21	96.3572	96.7796	48.39	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
	dormitory)							
	东方海岸大酒店 Oriental Coast Hotel	日平均 Average daily	8.3239	2.77	105.5	113.8239	37.94	达标 Yes
		年平均 Annual average	0.4692	0.23	96.3572	96.8263	48.41	达标 Yes
	华南北苑 Huanan Beiyuan	日平均 Average daily	8.1999	2.73	105.5	113.6999	37.9	达标 Yes
		年平均 Annual average	0.4951	0.25	96.3572	96.8522	48.43	达标 Yes
	新岭 Xinling	日平均 Average daily	9.4292	3.14	105.5	114.9292	38.31	达标 Yes
		年平均 Annual average	0.7345	0.37	96.3572	97.0917	48.55	达标 Yes
	新铺 Xinpu	日平均 Average daily	7.6929	2.56	105.5	113.1929	37.73	达标 Yes
		年平均 Annual average	0.4463	0.22	96.3572	96.8034	48.4	达标 Yes
	大田 Datian	日平均 Average daily	8.6731	2.89	105.5	114.1731	38.06	达标 Yes
		年平均 Annual average	0.8074	0.40	96.3572	97.1646	48.58	达标 Yes
	大竹园 Dazhuyuan	日平均 Average daily	8.7587	2.92	105.5	114.2587	38.09	达标 Yes
		年平均 Annual average	0.9137	0.46	96.3572	97.2709	48.64	达标 Yes
	彬垌	日平均	5.591	1.86	105.5	111.091	37.03	达标

污染物 **Pollutant**	预测点 **Prediction point**	平均时段 **Average period**	贡献值 **Contribution value (μg/m^3)**	占标率% **Pi %**	现状浓度 **(μg/m^3) Current concentration (μg/m^3)**	叠加后浓度 **(μg/m^3) Concentration after superimposition (μg/m^3)**	占标率% **Pi %**	达标情况 **Up-to-standard status**
	Bindong	Average daily						Yes
		年平均 Annual average	0.6748	0.34	96.3572	97.032	48.52	达标 Yes
	新坡村 Xinpo Village	日平均 Average daily	5.0519	1.68	105.5	110.5519	36.85	达标 Yes
		年平均 Annual average	0.4832	0.24	96.3572	96.8404	48.42	达标 Yes
	槟榔根 Binlanggen	日平均 Average daily	7.9349	2.64	105.5	113.4349	37.81	达标 Yes
		年平均 Annual average	0.3782	0.19	96.3572	96.7354	48.37	达标 Yes
	网格 Mesh	日平均 Average daily	192.8901	64.30	105.5	298.3901	99.46	达标 Yes
		年平均 Annual average	49.1509	24.58	96.3572	145.508	72.75	达标 Yes

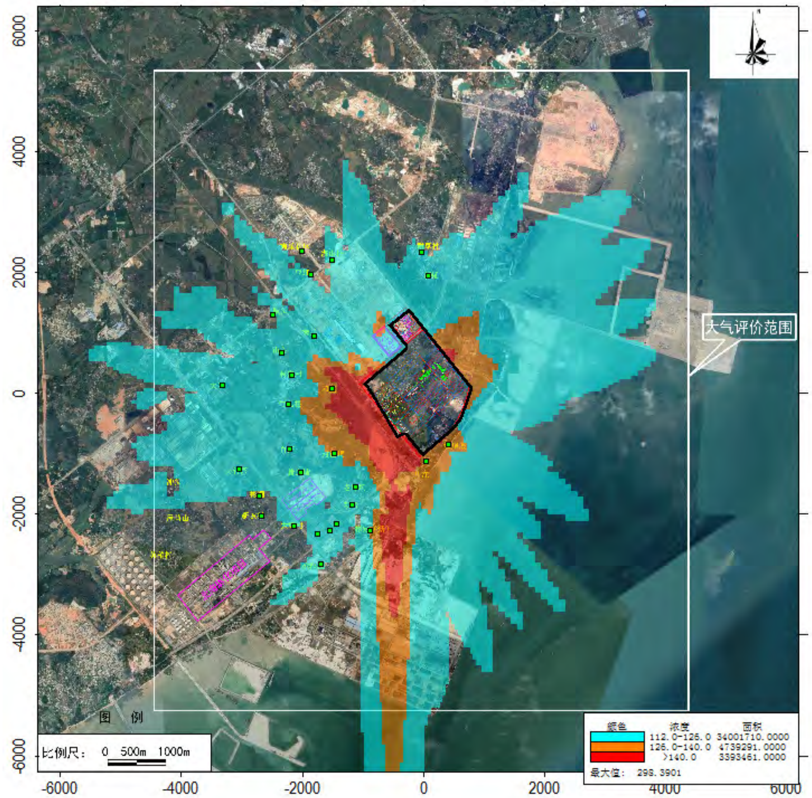


图 4.2-34　正常排放 TSP 日平均质量浓度分布图（叠加区域污染源及现状浓度，单位：μg/m³）

Figure 4.2-34 Distribution Map of Daily Average Mass Concentration of TSP at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m³)

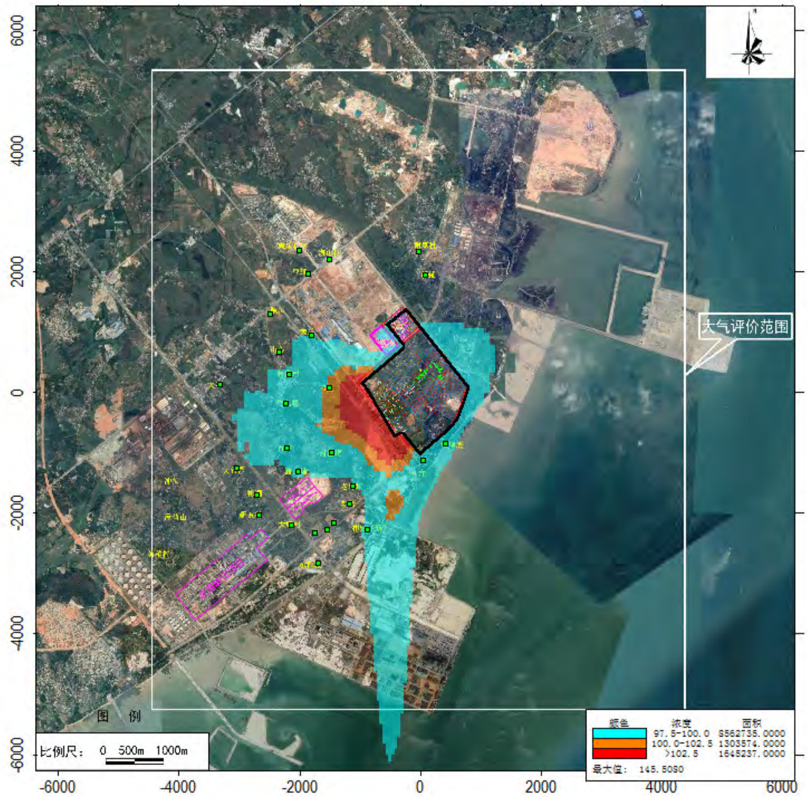


图 4.2-35　正常排放 TSP 年平均质量浓度分布图（叠加区域污染源及现状浓度，单位：μg/m³）
Figure 4.2-35 Distribution Map of Daily Average Mass Concentration of TSP at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m³)

（8）汞（Hg）

(8) Mercury (Hg)

正常排放情况下，Hg 叠加环境质量现状浓度预测结果后环境质量浓度预测结果见表 4.2-51，日平均浓度分布见图 4.2-36~4.2-37。

The prediction results of environmental mass concentration of Hg after superimposing the predication results of current environmental mass concentration under normal emission conditions are shown in Table 4.2-51 and distribution of daily average concentration is as shown in Figure 4.2-36 to 4.2-37.

对于环境空气敏感目标而言，叠加环境质量现状浓度后，Hg 短期浓度（日均浓度）满足《工业企业设计卫生标准》（TJ36-79）居民区有害物质最高允许浓度要求；长期浓度（年均值）贡献值满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, after superimposing current environmental mass concentration, the short-term (daily average) concentration of Hg all comply with maximum allowable concentration requirement for hazardous substances in residential quarters in *Hygienic Standard of Industrial Enterprise Design* (TJ36-79). The long-term (annual average) contribution values thereof all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，叠加环境质量现状浓度后，Hg 短期浓度（日平均浓度）叠加最大值为 0.00364μg/m^3，最大占标率为 1.21%，满足《工业企业设计卫生标准》（TJ36-79）居民区有害物质最高允许浓度要求；Hg 长期浓度（年平均浓度）叠加最大值为 0.00336μg/m^3，最大占标率为 6.72%，能满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, after superimposing current environmental mass concentration, the maximum superimposed short-term (daily average) concentration value of Hg is 0.00364μg/m^3, and the maximum Pi is 1.21%, which comply with maximum allowable concentration requirement for hazardous substances in residential quarters in *Hygienic Standard of Industrial Enterprise Design* (TJ36-79). The maximum superimposed long-term (annual average) concentration of Hg is 0.00336μg/m^3, and the maximum Pi is 6.72%, which may comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-51 正常工况 Hg 预测结果表

Table 4.2-51 Prediction Results of Hg under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
Hg	猪血塘 Zhuxuetang	日平均 Average daily	0.00013	0.04	0.0033	0.00343	1.14	达标 Yes
		年平均 Annual average	0.00003	0.06	0.0033	0.00333	6.66	达标 Yes
	百班 Baiban	日平均 Average	0.00008	0.03	0.0033	0.00338	1.13	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		daily						
		年平均 Annual average	0.00001	0.02	0.0033	0.00331	6.62	达标 Yes
	竹儿根 Zhuergen	日平均 Average daily	0.00008	0.03	0.0033	0.00338	1.13	达标 Yes
		年平均 Annual average	0.00001	0.02	0.0033	0.00331	6.62	达标 Yes
	彬崇村 Binchong Village	日平均 Average daily	0.00008	0.03	0.0033	0.00338	1.13	达标 Yes
		年平均 Annual average	0.00001	0.02	0.0033	0.00331	6.62	达标 Yes
	山心 Shanxin	日平均 Average daily	0.00009	0.03	0.0033	0.00339	1.13	达标 Yes
		年平均 Annual average	0.00001	0.02	0.0033	0.00331	6.62	达标 Yes
	邓屋 Dengwu	日平均 Average daily	0.00009	0.03	0.0033	0.00339	1.13	达标 Yes
		年平均 Annual average	0.00002	0.04	0.0033	0.00332	6.64	达标 Yes
	对面垌 Duimiandong	日平均 Average daily	0.00014	0.05	0.0033	0.00344	1.15	达标 Yes
		年平均 Annual average	0.00002	0.04	0.0033	0.00332	6.64	达标 Yes
	老妗垌 Laojindong	日平均 Average	0.00012	0.04	0.0033	0.00342	1.14	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		daily						
		年平均 Annual average	0.00001	0.02	0.0033	0.00331	6.62	达标 Yes
	坡尾底 Poweidi	日平均 Average daily	0.00009	0.03	0.0033	0.00339	1.13	达标 Yes
		年平均 Annual average	0.00001	0.02	0.0033	0.00331	6.62	达标 Yes
	川江 Chuanjiang	日平均 Average daily	0.00007	0.02	0.0033	0.00337	1.12	达标 Yes
		年平均 Annual average	0.00001	0.02	0.0033	0.00331	6.62	达标 Yes
	彬定（新） Binding (New village)	日平均 Average daily	0.00008	0.03	0.0033	0.00338	1.13	达标 Yes
		年平均 Annual average	0.00001	0.02	0.0033	0.00331	6.62	达标 Yes
	大塘村 Datang Village	日平均 Average daily	0.00022	0.07	0.0033	0.00352	1.17	达标 Yes
		年平均 Annual average	0.00004	0.08	0.0033	0.00334	6.68	达标 Yes
	南乐 Nanyue	日平均 Average daily	0.00008	0.03	0.0033	0.00338	1.13	达标 Yes
		年平均 Annual average	0.00002	0.04	0.0033	0.00332	6.64	达标 Yes
	陂头 Potou	日平均 Average	0.00008	0.03	0.0033	0.00338	1.13	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		daily						
		年平均 Annual average	0.00001	0.02	0.0033	0.00331	6.62	达标 Yes
	亚细 Yaxi	日平均 Average daily	0.00006	0.02	0.0033	0.00336	1.12	达标 Yes
		年平均 Annual average	0.00001	0.02	0.0033	0.00331	6.62	达标 Yes
	南乐社区 Nanyue Community	日平均 Average daily	0.00006	0.02	0.0033	0.00336	1.12	达标 Yes
		年平均 Annual average	0.00001	0.02	0.0033	0.00331	6.62	达标 Yes
	海山排 Haishanpai	日平均 Average daily	0.00007	0.02	0.0033	0.00337	1.12	达标 Yes
		年平均 Annual average	0.00001	0.02	0.0033	0.00331	6.62	达标 Yes
	谢家村 Xiejiacun Village	日平均 Average daily	0.00006	0.02	0.0033	0.00336	1.12	达标 Yes
		年平均 Annual average	0.00001	0.02	0.0033	0.00331	6.62	达标 Yes
	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	日平均 Average daily	0.00011	0.04	0.0033	0.00341	1.14	达标 Yes
		年平均 Annual average	0.00002	0.04	0.0033	0.00332	6.64	达标 Yes
	东方海岸大酒店	日平均 Average	0.00011	0.04	0.0033	0.00341	1.14	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度(μg/m^3) Current concentration (μg/m^3)	叠加后浓度(μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
	Oriental Coast Hotel	daily						
		年平均 Annual average	0.00001	0.02	0.0033	0.00331	6.62	达标 Yes
	华南北苑 Huanan Beiyuan	日平均 Average daily	0.00010	0.03	0.0033	0.00340	1.13	达标 Yes
		年平均 Annual average	0.00001	0.02	0.0033	0.00331	6.62	达标 Yes
	新岭 Xinling	日平均 Average daily	0.00011	0.04	0.0033	0.00341	1.14	达标 Yes
		年平均 Annual average	0.00001	0.02	0.0033	0.00331	6.62	达标 Yes
	新铺 Xinpu	日平均 Average daily	0.00007	0.02	0.0033	0.00337	1.12	达标 Yes
		年平均 Annual average	0.00001	0.02	0.0033	0.00331	6.62	达标 Yes
	大田 Datian	日平均 Average daily	0.00006	0.02	0.0033	0.00336	1.12	达标 Yes
		年平均 Annual average	0.00001	0.02	0.0033	0.00331	6.62	达标 Yes
	大竹园 Dazhuyuan	日平均 Average daily	0.00014	0.05	0.0033	0.00344	1.15	达标 Yes
		年平均 Annual average	0.00003	0.06	0.0033	0.00333	6.66	达标 Yes
	彬垌 Bindong	日平均 Average	0.00024	0.08	0.0033	0.00354	1.18	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
		daily						
		年平均 Annual average	0.00004	0.08	0.0033	0.00334	6.68	达标 Yes
	新坡村 Xinpo Village	日平均 Average daily	0.00023	0.08	0.0033	0.00353	1.18	达标 Yes
		年平均 Annual average	0.00002	0.04	0.0033	0.00332	6.64	达标 Yes
	槟榔根 Binlanggen	日平均 Average daily	0.00010	0.03	0.0033	0.00340	1.13	达标 Yes
		年平均 Annual average	0.00001	0.02	0.0033	0.00331	6.62	达标 Yes
	网格 Mesh	日平均 Average daily	0.00034	0.11	0.0033	0.00364	1.21	达标 Yes
		年平均 Annual average	0.00006	0.12	0.0033	0.00336	6.72	达标 Yes

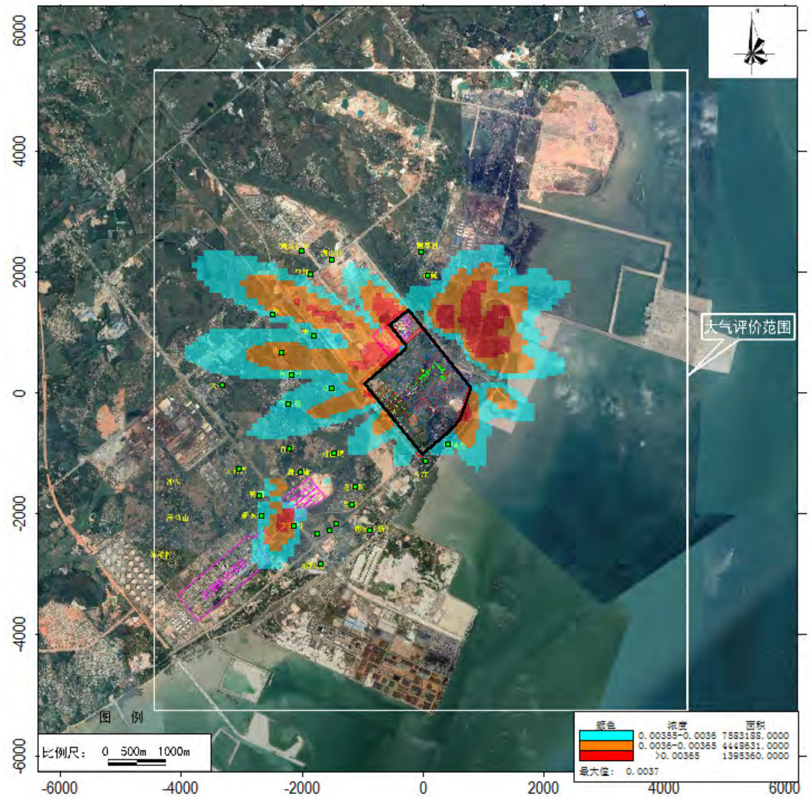


图 4.2-36　正常排放 Hg 日平均质量浓度分布图（叠加现状浓度及区域污染源，单位：μg/m³）

Figure 4.2-36 Distribution Map of Daily Average Mass Concentration of Hg at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m³)

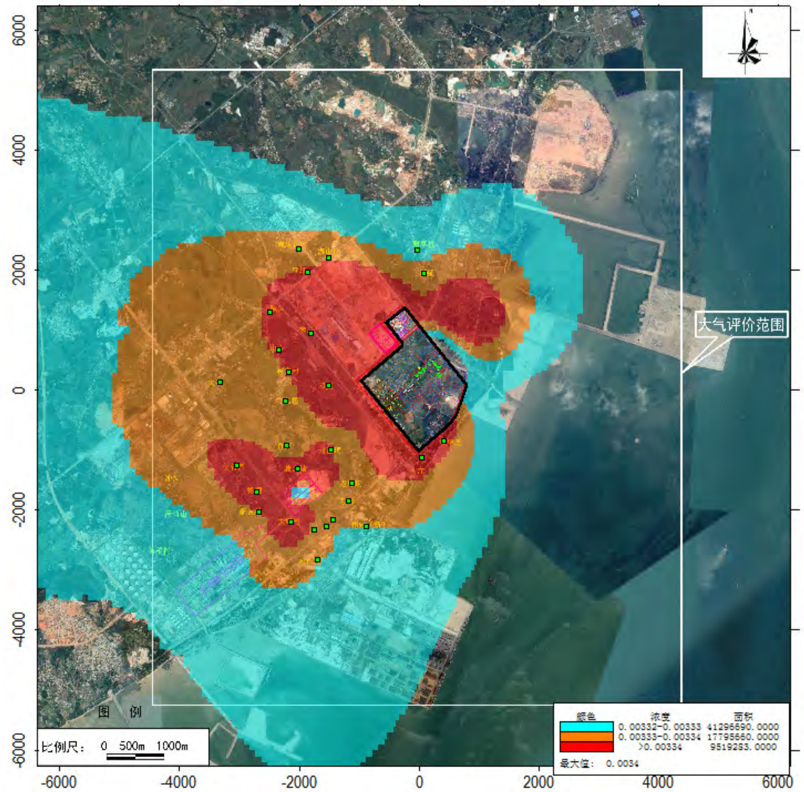


图 4.2-37 正常排放 Hg 年平均质量浓度分布图（叠加现状浓度及区域污染源，单位：μg/m³）
Figure 4.2-37 Distribution Map of Annual Average Mass Concentration of Hg at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m³)

（9）砷（As）

(9) Arsenic (As)

正常排放情况下，As 叠加环境质量现状浓度预测结果后环境质量浓度预测结果见表 4.2-52，日平均浓度分布见图 4.2-38~4.2-39。

The prediction results of environmental mass concentration of As after superimposing the predication results of current environmental mass concentration under normal emission conditions are shown in Table 4.2-52 and distribution of daily average concentration is as shown in Figure 4.2-38 to 4.2-39.

对于环境空气敏感目标而言，叠加环境质量现状浓度后，As 短期浓度（日均浓度）满足《工业企业设计卫生标准》（TJ36-79）居民区有害物质最高允许浓度要求；长期浓度（年均值）叠加值满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, after superimposing current environmental mass concentration, the short-term (daily average) concentration of As all comply with maximum allowable concentration requirement for hazardous substances in residential quarters in *Hygienic Standard of Industrial Enterprise Design* (TJ36-79). The superimposed long-term (annual average) concentration values thereof all comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，叠加环境质量现状浓度后，As 短期浓度（日平均浓度）叠加最大值为 0.00778μg/m^3，最大占标率为 0.26%，满足《工业企业设计卫生标准》（TJ36-79）居民区有害物质最高允许浓度要求；As 长期浓度（年平均浓度）叠加最大值为 0.00243μg/m^3，最大占标率为 40.50%，满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, after superimposing current environmental mass concentration, the maximum superimposed short-term (daily average) concentration value of As is 0.00778μg/m^3, and the maximum Pi is 0.26%, which comply with maximum allowable concentration requirement for hazardous substances in residential quarters in *Hygienic Standard of Industrial Enterprise Design* (TJ36-79). The maximum superimposed long-term (annual average) concentration of As is 0.00243μg/m^3, and the maximum Pi is 40.50%, which comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-52 正常工况 As 预测结果表

Table 4.2-52 Prediction Results of As under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情 Up-to-sta stat
As	猪血塘 Zhuxuetang	日平均 Average daily	0.00108	0.04	0.0050	0.00608	0.2	达标 Ye
		年平均 Annual average	0.00017	2.83	0.0020	0.00217	36.17	达标 Ye
	百班 Baiban	日平均 Average daily	0.00064	0.02	0.0050	0.00564	0.19	达标 Ye
		年平均	0.00008	1.33	0.0020	0.00208	34.67	达标

污染物 **Pollutant**	预测点 **Prediction point**	平均时段 **Average period**	贡献值 **Contribution value (μg/m^3)**	占标率% **Pi %**	现状浓度 **(μg/m^3) Current concentration (μg/m^3)**	叠加后浓度 **(μg/m^3) Concentration after superimposition (μg/m^3)**	占标率% **Pi %**	达标情 **Up-to-sta stat**
		Annual average						Ye
	竹儿根 Zhuergen	日平均 Average daily	0.00042	0.01	0.0050	0.00542	0.18	达标 Ye
		年平均 Annual average	0.00003	0.50	0.0020	0.00203	33.83	达标 Ye
	彬崇村 Binchong Village	日平均 Average daily	0.00035	0.01	0.0050	0.00535	0.18	达标 Ye
		年平均 Annual average	0.00003	0.50	0.0020	0.00203	33.83	达标 Ye
	山心 Shanxin	日平均 Average daily	0.00027	0.01	0.0050	0.00527	0.18	达标 Ye
		年平均 Annual average	0.00002	0.33	0.0020	0.00202	33.67	达标 Ye
	邓屋 Dengwu	日平均 Average daily	0.00058	0.02	0.0050	0.00558	0.19	达标 Ye
		年平均 Annual average	0.00004	0.67	0.0020	0.00204	34	达标 Ye
	对面垌 Duimiandong	日平均 Average daily	0.00112	0.04	0.0050	0.00612	0.2	达标 Ye
		年平均 Annual average	0.00010	1.67	0.0020	0.00210	35	达标 Ye
	老妗垌 Laojindong	日平均 Average daily	0.00099	0.03	0.0050	0.00599	0.2	达标 Ye
		年平均 Annual average	0.00007	1.17	0.0020	0.00207	34.5	达标 Ye

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情 Up-to-sta stat
	坡尾底 Poweidi	日平均 Average daily	0.00036	0.01	0.0050	0.00536	0.18	达标 Ye
		年平均 Annual average	0.00003	0.50	0.0020	0.00203	33.83	达标 Ye
	川江 Chuanjiang	日平均 Average daily	0.00036	0.01	0.0050	0.00536	0.18	达标 Ye
		年平均 Annual average	0.00003	0.50	0.0020	0.00203	33.83	达标 Ye
	彬定（新） Binding (New village)	日平均 Average daily	0.00063	0.02	0.0050	0.00563	0.19	达标 Ye
		年平均 Annual average	0.00003	0.50	0.0020	0.00203	33.83	达标 Ye
	大塘村 Datang Village	日平均 Average daily	0.00182	0.06	0.0050	0.00682	0.23	达标 Ye
		年平均 Annual average	0.00025	4.17	0.0020	0.00225	37.5	达标 Ye
	南乐 Nanyue	日平均 Average daily	0.00028	0.01	0.0050	0.00528	0.18	达标 Ye
		年平均 Annual average	0.00003	0.50	0.0020	0.00203	33.83	达标 Ye
	陂头 Potou	日平均 Average daily	0.00021	0.01	0.0050	0.00521	0.17	达标 Ye
		年平均 Annual average	0.00002	0.33	0.0020	0.00202	33.67	达标 Ye
	亚细	日平均	0.00018	0.01	0.0050	0.00518	0.17	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情 Up-to-sta stat
	Yaxi	Average daily						Ye
		年平均 Annual average	0.00002	0.33	0.0020	0.00202	33.67	达标 Ye
	南乐社区 Nanyue Community	日平均 Average daily	0.00016	0.01	0.0050	0.00516	0.17	达标 Ye
		年平均 Annual average	0.00002	0.33	0.0020	0.00202	33.67	达标 Ye
	海山排 Haishanpai	日平均 Average daily	0.00017	0.01	0.0050	0.00517	0.17	达标 Ye
		年平均 Annual average	0.00002	0.33	0.0020	0.00202	33.67	达标 Ye
	谢家村 Xiejiacun Village	日平均 Average daily	0.00019	0.01	0.0050	0.00519	0.17	达标 Ye
		年平均 Annual average	0.00002	0.33	0.0020	0.00202	33.67	达标 Ye
	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	日平均 Average daily	0.00091	0.03	0.0050	0.00591	0.2	达标 Ye
		年平均 Annual average	0.00012	2.00	0.0020	0.00212	35.33	达标 Ye
	东方海岸大酒店 Oriental Coast Hotel	日平均 Average daily	0.00090	0.03	0.0050	0.00590	0.2	达标 Ye
		年平均 Annual average	0.00007	1.17	0.0020	0.00207	34.5	达标 Ye
	华南北苑	日平均	0.00084	0.03	0.0050	0.00584	0.19	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情 Up-to-sta stat
	Huanan Beiyuan	Average daily						Ye
		年平均 Annual average	0.00006	1.00	0.0020	0.00206	34.33	达标 Ye
	新岭 Xinling	日平均 Average daily	0.00091	0.03	0.0050	0.00591	0.2	达标 Ye
		年平均 Annual average	0.00005	0.83	0.0020	0.00205	34.17	达标 Ye
	新铺 Xinpu	日平均 Average daily	0.00019	0.01	0.0050	0.00519	0.17	达标 Ye
		年平均 Annual average	0.00002	0.33	0.0020	0.00202	33.67	达标 Ye
	大田 Datian	日平均 Average daily	0.00027	0.01	0.0050	0.00527	0.18	达标 Ye
		年平均 Annual average	0.00004	0.67	0.0020	0.00204	34	达标 Ye
	大竹园 Dazhuyuan	日平均 Average daily	0.00114	0.04	0.0050	0.00614	0.2	达标 Ye
		年平均 Annual average	0.00020	3.33	0.0020	0.00220	36.67	达标 Ye
	彬垌 Bindong	日平均 Average daily	0.00195	0.07	0.0050	0.00695	0.23	达标 Ye
		年平均 Annual average	0.00026	4.33	0.0020	0.00226	37.67	达标 Ye
	新坡村 Xinpo Village	日平均 Average daily	0.00177	0.06	0.0050	0.00677	0.23	达标 Ye

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情 Up-to-sta stat
		年平均 Annual average	0.00017	2.83	0.0020	0.00217	36.17	达标 Ye
	槟榔根 Binlanggen	日平均 Average daily	0.00074	0.02	0.0050	0.00574	0.19	达标 Ye
		年平均 Annual average	0.00008	1.33	0.0020	0.00208	34.67	达标 Ye
	网格 Mesh	日平均 Average daily	0.00278	0.09	0.0050	0.00778	0.26	达标 Ye
		年平均 Annual average	0.00043	7.17	0.0020	0.00243	40.5	达标 Ye

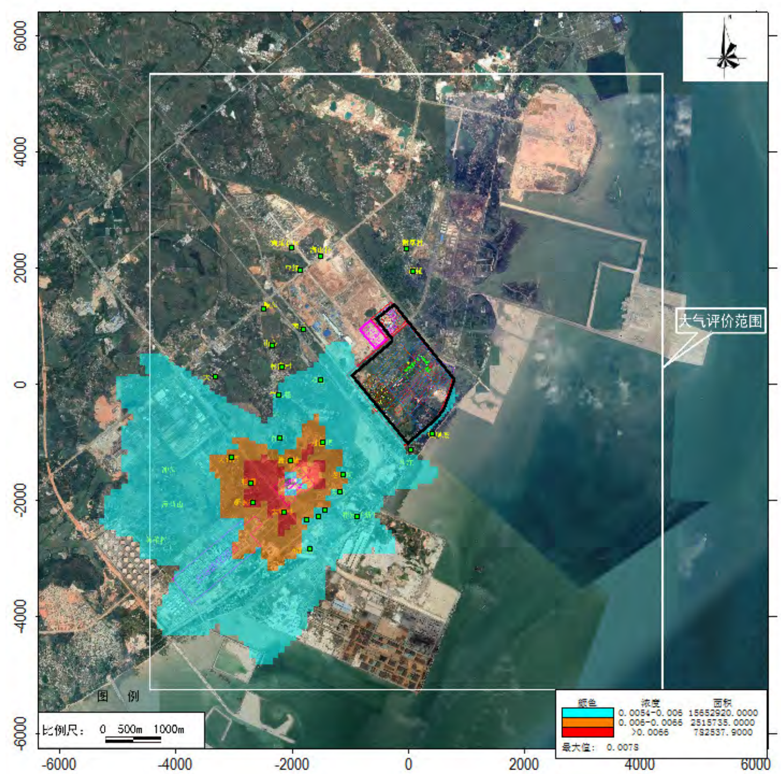


图 4.2-38 正常排放 As 日平均质量浓度分布图（叠加现状浓度，单位：μg/m³）
Figure 4.2-38 Distribution Map of Daily Average Mass Concentration of As at Guarantee Rate under Normal Emission (after Superimposing Current Concentration, in μg/m³)

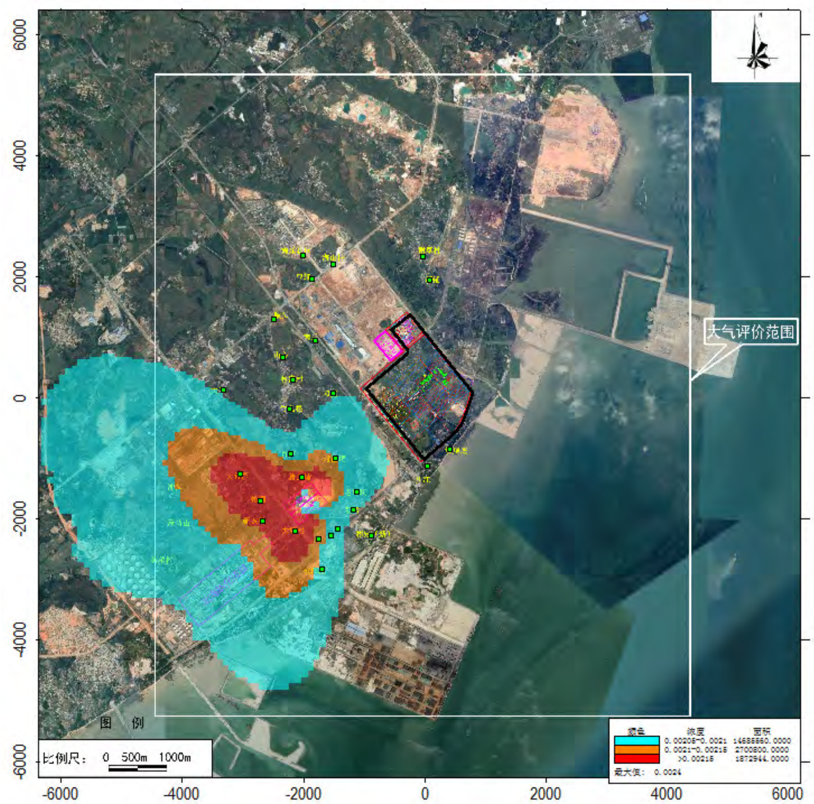


图 4.2-39 正常排放 As 年平均质量浓度分布图（叠加现状浓度，单位：μg/m³）

Figure 4.2-39 Distribution Map of Daily Average Mass Concentration of As at Guarantee Rate under Normal Emission (after Superimposing Current Concentration, in μg/m³)

（10）氨（NH_3）

(10) Ammonia (NH_3)

正常排放情况下，NH_3 叠加环境质量现状浓度预测结果后环境质量浓度预测结果见表 4.2-53、图 4.2-40。

The prediction results of environmental mass concentration of NH_3 after superimposing the predication results of current environmental mass concentration under normal emission conditions are shown in Table 4.2-53 and Figure 4.2-40.

对于环境空气敏感目标而言，叠加环境质量现状浓度后，NH_3 短期浓度（小时浓度）贡献值均满足《环境影响评价技术导则 大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。

In regard to ambient air sensitive targets, the short-term (hourly) concentration contribution values of NH_3 after superimposing current environmental mass concentration all comply with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment*

(HJ2.2-2018).

区域最大落地浓度网格点，叠加环境质量现状浓度后，NH_3 短期浓度（小时浓度）贡献值最大值为 76.9653μg/m³，最大占标率分别为 38.48%，最大浓度占标率均<100%，NH_3 短期浓度贡献值均满足《环境影响评价技术导则　大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。

At the mesh point of regional maximum ground-level concentration, the maximum short-term (hourly) concentration value of H_2S is 76.9653μg/m³, and the maximum Pi is 38.48% with Pi of maximum concentration <100%. The short-term concentration contribution values of NH_3 all comply with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018)*.

表 4.2-53　正常工况 NH_3 预测结果表

Table 4.2-53 Prediction Results of NH_3 under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
NH_3	猪血塘 Zhuxuetang	1 小时 1 hour	5.25	2.63	40	45.25	22.63	达标 Yes
	百班 Baiban	1 小时 1 hour	4.5258	2.26	40	44.5258	22.26	达标 Yes
	竹儿根 Zhuergen	1 小时 1 hour	3.7103	1.86	40	43.7103	21.86	达标 Yes
	彬崇村 Binchong Village	1 小时 1 hour	3.5541	1.78	40	43.5541	21.78	达标 Yes
	山心 Shanxin	1 小时 1 hour	2.9353	1.47	40	42.9353	21.47	达标 Yes
	邓屋 Dengwu	1 小时 1 hour	7.942	3.97	40	47.942	23.97	达标 Yes
	对面垌 Duimiandong	1 小时 1 hour	9.3825	4.69	40	49.3825	24.69	达标 Yes
	老妗垌 Laojindong	1 小时 1 hour	3.8381	1.92	40	43.8381	21.92	达标 Yes
	坡尾底 Poweidi	1 小时 1 hour	4.7498	2.37	40	44.7498	22.37	达标 Yes
	川江 Chuanjiang	1 小时 1 hour	6.5181	3.26	40	46.5181	23.26	达标 Yes

	彬定（新）Binding (New village)	1 小时 1 hour	4.1682	2.08	40	44.1682	22.08	达标 Yes
	大塘村 Datang Village	1 小时 1 hour	5.557	2.78	40	45.557	22.78	达标 Yes
	南乐 Nanyue	1 小时 1 hour	7.412	3.71	40	47.412	23.71	达标 Yes
	陂头 Potou	1 小时 1 hour	3.2016	1.60	40	43.2016	21.6	达标 Yes
	亚细 Yaxi	1 小时 1 hour	8.7494	4.37	40	48.7494	24.37	达标 Yes
	南乐社区 Nanyue Community	1 小时 1 hour	4.6625	2.33	40	44.6625	22.33	达标 Yes
	海山排 Haishanpai	1 小时 1 hour	8.0893	4.04	40	48.0893	24.04	达标 Yes
	谢家村 Xiejiacun Village	1 小时 1 hour	8.6501	4.33	40	48.6501	24.33	达标 Yes
	阳光海岸（中石化倒班宿舍）Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	4.4929	2.25	40	44.4929	22.25	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	3.7324	1.87	40	43.7324	21.87	达标 Yes
	华南北苑 Huanan Beiyuan	1 小时 1 hour	4.0206	2.01	40	44.0206	22.01	达标 Yes
	新岭 Xinling	1 小时 1 hour	3.5999	1.80	40	43.5999	21.8	达标 Yes
	新铺 Xinpu	1 小时 1 hour	10.5871	5.29	40	50.5871	25.29	达标 Yes
	大田 Datian	1 小时 1 hour	2.2033	1.10	40	42.2033	21.1	达标 Yes
	大竹园 Dazhuyuan	1 小时 1 hour	3.2429	1.62	40	43.2429	21.62	达标 Yes

	彬垌 Bindong	1 小时 1 hour	4.3642	2.18	40	44.3642	22.18	达标 Yes
	新坡村 Xinpo Village	1 小时 1 hour	4.4426	2.22	40	44.4426	22.22	达标 Yes
	槟榔根 Binlanggen	1 小时 1 hour	2.87	1.44	40	42.87	21.43	达标 Yes
	网格 Mesh	1 小时 1 hour	36.9653	18.48	40	76.9653	38.48	达标 Yes

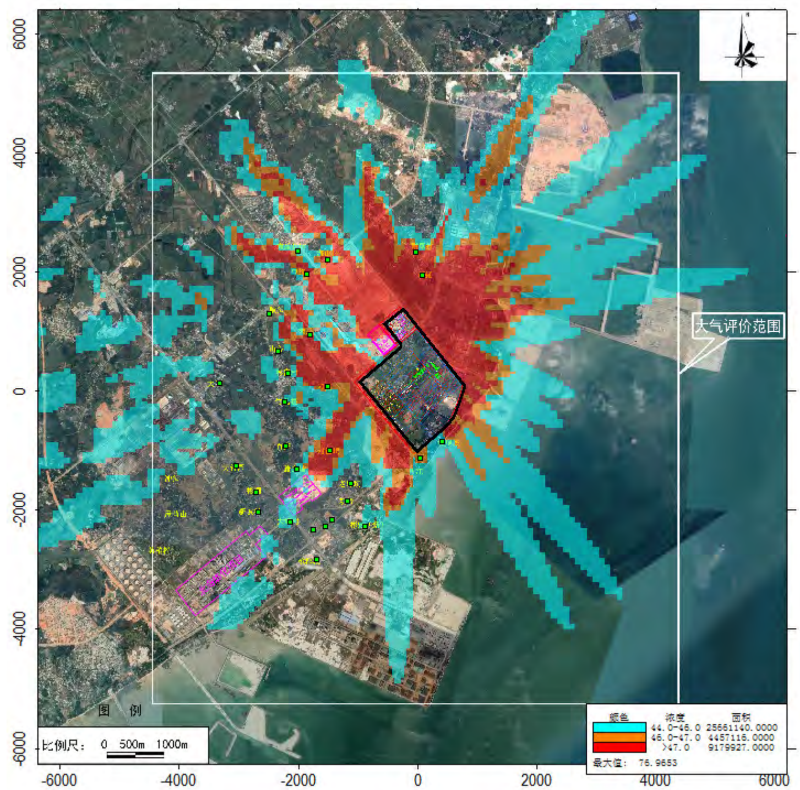


图 4.2-40　正常排放 NH_3 小时平均质量浓度分布图（叠加现状浓度，单位：μg/m³）
Figure 4.2-40 Distribution Map of Hourly Average Mass Concentration of NH_3 at Guarantee Rate under Normal Emission (after Superimposing Current Concentration, in μg/m³)

（11）镉（Cd）

(11) Cadmium (Cd)

正常排放情况下，Cd 叠加环境质量现状浓度预测结果后环境质量浓度预测结果见表 4.2-54，年平均浓度分布见图 4.2-41。

The prediction results of environmental mass concentration of Cd after superimposing the predication results of current environmental mass concentration under normal emission conditions are shown in Table 4.2-54 and distribution of daily average concentration is as shown in Figure 4.2-41.

对于环境空气敏感目标而言，叠加环境质量现状浓度后，Cd 长期浓度（年均值）叠加值满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

In regard to ambient air sensitive targets, after superimposing current environmental mass concentration, the superimposed long-term (annual average) concentration values of Cd comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

区域最大落地浓度网格点，叠加环境质量现状浓度后，Cd 长期浓度（年平均浓度）叠加最大值为 0.00049μg/m^3，最大占标率为 9.71%，满足《环境空气质量标准》（GB3095-2012）及修改单二级标准要求。

At the mesh point of regional maximum ground-level concentration, after superimposing current environmental mass concentration, the maximum superimposed long-term (annual average) concentration value of Cd is 0.00049μg/m3 and the maximum Pi is 9.71%%, which comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012) and revision sheet thereof.

表 4.2-54 正常工况 Cd 预测结果表

Table 4.2-54 Prediction Results of Cd under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standa status
Cd	猪血塘 Zhuxuetang	年平均 Annual average	0.00005	1.00	0.0003	0.00034	6.71	达标 Yes
	百班 Baiban	年平均 Annual average	0.00006	1.20	0.0003	0.00035	6.91	达标 Yes
	竹儿根 Zhuergen	年平均 Annual average	0.00007	1.40	0.0003	0.00036	7.11	达标 Yes
	彬崇村 Binchong Village	年平均 Annual average	0.00009	1.80	0.0003	0.00038	7.51	达标 Yes
	山心 Shanxin	年平均 Annual average	0.00009	1.80	0.0003	0.00038	7.51	达标 Yes

	邓屋 Dengwu	年平均 Annual average	0.00010	2.00	0.0003	0.00039	7.71	达标 Yes
	对面垌 Duimiandong	年平均 Annual average	0.00006	1.20	0.0003	0.00035	6.91	达标 Yes
	老妗垌 Laojindong	年平均 Annual average	0.00006	1.20	0.0003	0.00035	6.91	达标 Yes
	坡尾底 Poweidi	年平均 Annual average	0.00010	2.00	0.0003	0.00039	7.71	达标 Yes
	川江 Chuanjiang	年平均 Annual average	0.00010	2.00	0.0003	0.00039	7.71	达标 Yes
	彬定（新） Binding (New village)	年平均 Annual average	0.00006	1.20	0.0003	0.00035	6.91	达标 Yes
	大塘村 Datang Village	年平均 Annual average	0.00004	0.80	0.0003	0.00033	6.51	达标 Yes
	南乐 Nanyue	年平均 Annual average	0.00012	2.40	0.0003	0.00041	8.11	达标 Yes
	陂头 Potou	年平均 Annual average	0.00009	1.80	0.0003	0.00038	7.51	达标 Yes
	亚细 Yaxi	年平均 Annual average	0.00010	2.00	0.0003	0.00039	7.71	达标 Yes
	南乐社区 Nanyue Community	年平均 Annual average	0.00008	1.60	0.0003	0.00037	7.31	达标 Yes
	海山排 Haishanpai	年平均 Annual average	0.00009	1.80	0.0003	0.00038	7.51	达标 Yes
	谢家村 Xiejiacun Village	年平均 Annual average	0.00006	1.20	0.0003	0.00035	6.91	达标 Yes
	阳光海岸（中石化倒班宿舍） Yangguang	年平均 Annual average	0.00005	1.00	0.0003	0.00034	6.71	达标 Yes

	Coast (SINOPEC shift dormitory)							
	东方海岸大酒店 Oriental Coast Hotel	年平均 Annual average	0.00005	1.00	0.0003	0.00034	6.71	达标 Yes
	华南北苑 Huanan Beiyuan	年平均 Annual average	0.00005	1.00	0.0003	0.00034	6.71	达标 Yes
	新岭 Xinling	年平均 Annual average	0.00006	1.20	0.0003	0.00035	6.91	达标 Yes
	新铺 Xinpu	年平均 Annual average	0.00007	1.40	0.0003	0.00036	7.11	达标 Yes
	大田 Datian	年平均 Annual average	0.00006	1.20	0.0003	0.00035	6.91	达标 Yes
	大竹园 Dazhuyuan	年平均 Annual average	0.00005	1.00	0.0003	0.00034	6.71	达标 Yes
	彬垌 Bindong	年平均 Annual average	0.00004	0.80	0.0003	0.00033	6.51	达标 Yes
	新坡村 Xinpo Village	年平均 Annual average	0.00004	0.80	0.0003	0.00033	6.51	达标 Yes
	槟榔根 Binlanggen	年平均 Annual average	0.00005	1.00	0.0003	0.00034	6.71	达标 Yes
	网格 Mesh	年平均 Annual average	0.00020	4.00	0.0003	0.00049	9.71	达标 Yes

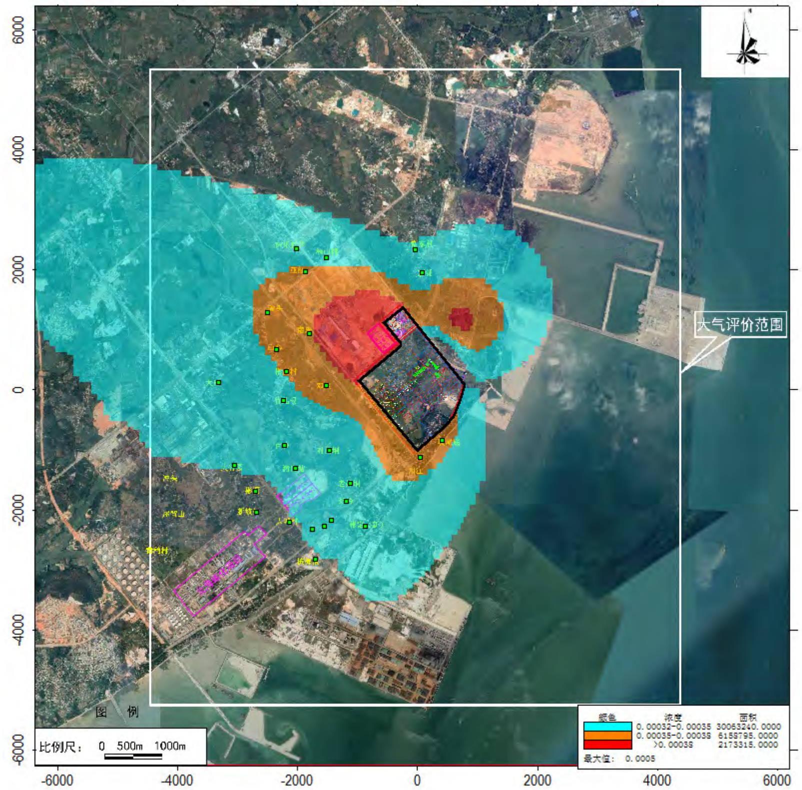


图 4.2-41 正常排放 Cd 年平均质量浓度分布图（叠加现状浓度，单位：μg/m³）
Figure 4.2-41 Distribution Map of Annual Average Mass Concentration of Cd at Guarantee Rate under Normal Emission (after Superimposing Current Concentration, in μg/m³)

（12）氯气（Cl_2）

(12) Chlorine (Cl_2)

正常排放情况下，Cl_2 叠加环境质量现状浓度预测结果后环境质量浓度预测结果见表 4.2-55、图 4.2-42~4.2-43。

The prediction results of environmental mass concentration of Cl_2 after superimposing the predication results of current environmental mass concentration under normal emission conditions are shown in Table 4.2-55 and Figure 4.2-42 to 4.2-43.

对于环境空气敏感目标而言，叠加环境质量现状浓度后，Cl2 短期浓度（小时、日平均浓度）贡献值均满足《环境影响评价技术导则 大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。

In regard to ambient air sensitive targets, the short-term concentration (hourly and daily Average Concentration) contribution values of Cl2 after superimposing current environmental mass concentration all comply with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018)*.

区域最大落地浓度网格点，叠加环境质量现状浓度后，Cl_2 短期浓度（小时、日均）贡献值最大值分别为 10.2367μg/m³、0.9184μg/m³，最大占标率分别为 25.24%、53.06%，最大浓度占标率均<100%，Cl2 短期浓度（小时、日均）贡献值均满足《环境影响评价技术导则 大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值。

At the mesh point of regional maximum ground-level concentration, the maximum short-term concentration (hourly and daily average) contribution value of Cl2 is 10.2367μg/m³ and 0.9184μg/m³ respectively, and the maximum Pi is 25.24% and 53.06% respectively with Pi of maximum concentration both <100%. The short-term (hourly and daily average) concentration contribution values of Cl2 both comply with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018)*.

表 4.2-48 正常工况 Cl2 预测结果表
Table 4.2-48 Prediction Results of C12 under Normal Working Condition

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
Cl2	猪血塘 Zhuxuetang	1 小时 1 hour	3.0076	3.0076	15	18.0076	18.01	达标 Yes
		日平均 Average daily	0.1276	0.425333	15	15.1276	50.43	达标 Yes
	百班 Baiban	1 小时 1 hour	1.7057	1.7057	15	16.7057	16.71	达标 Yes
		日平均 Average daily	0.1569	0.523	15	15.1569	50.52	达标 Yes
	竹儿根 Zhuergen	1 小时 1 hour	1.7333	1.7333	15	16.7333	16.73	达标 Yes
		日平均 Average daily	0.1426	0.475333	15	15.1426	50.48	达标 Yes
	彬崇村 Binchong Village	1 小时 1 hour	2.0096	2.0096	15	17.0096	17.01	达标 Yes
		日平均 Average daily	0.1935	0.645	15	15.1935	50.64	达标 Yes
	山心	1 小时	1.2093	1.2093	15	16.2093	16.21	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
	Shanxin	1 hour						Yes
		日平均 Average daily	0.1168	0.389333	15	15.1168	50.39	达标 Yes
	邓屋 Dengwu	1 小时 1 hour	5.7191	5.7191	15	20.7191	20.72	达标 Yes
		日平均 Average daily	0.3819	1.273	15	15.3819	51.27	达标 Yes
	对面垌 Duimiandong	1 小时 1 hour	2.7966	2.7966	15	17.7966	17.8	达标 Yes
		日平均 Average daily	0.1578	0.526	15	15.1578	50.53	达标 Yes
	老妗垌 Laojindong	1 小时 1 hour	2.864	2.864	15	17.864	17.86	达标 Yes
		日平均 Average daily	0.1359	0.453	15	15.1359	50.45	达标 Yes
	坡尾底 Poweidi	1 小时 1 hour	4.2293	4.2293	15	19.2293	19.23	达标 Yes
		日平均 Average daily	0.436	1.453333	15	15.436	51.45	达标 Yes
	川江 Chuanjiang	1 小时 1 hour	3.9795	3.9795	15	18.9795	18.98	达标 Yes
		日平均 Average daily	0.5094	1.698	15	15.5094	51.7	达标 Yes
	彬定（新） Binding (New village)	1 小时 1 hour	1.9316	1.9316	15	16.9316	16.93	达标 Yes
		日平均 Average daily	0.1325	0.441667	15	15.1325	50.44	达标 Yes
	大塘村	1 小时	1.0038	1.0038	15	16.0038	16	达标

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
	Datang Village	1 hour						Yes
		日平均 Average daily	0.0832	0.277333	15	15.0832	50.28	达标 Yes
	南乐 Nanyue	1 小时 1 hour	3.7255	3.7255	15	18.7255	18.73	达标 Yes
		日平均 Average daily	0.2536	0.845333	15	15.2536	50.85	达标 Yes
	陂头 Potou	1 小时 1 hour	1.6281	1.6281	15	16.6281	16.63	达标 Yes
		日平均 Average daily	0.1329	0.443	15	15.1329	50.44	达标 Yes
	亚细 Yaxi	1 小时 1 hour	3.0547	3.0547	15	18.0547	18.05	达标 Yes
		日平均 Average daily	0.1289	0.429667	15	15.1289	50.43	达标 Yes
	南乐社区 Nanyue Community	1 小时 1 hour	3.0952	3.0952	15	18.0952	18.1	达标 Yes
		日平均 Average daily	0.1373	0.457667	15	15.1373	50.46	达标 Yes
	海山排 Haishanpai	1 小时 1 hour	2.2654	2.2654	15	17.2654	17.27	达标 Yes
		日平均 Average daily	0.1276	0.425333	15	15.1276	50.43	达标 Yes
	谢家村 Xiejiacun Village	1 小时 1 hour	1.9773	1.9773	15	16.9773	16.98	达标 Yes
		日平均 Average daily	0.1241	0.413667	15	15.1241	50.41	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
	阳光海岸（中石化倒班宿舍）Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	1.4052	1.4052	15	16.4052	16.41	达标 Yes
		日平均 Average daily	0.0737	0.245667	15	15.0737	50.25	达标 Yes
	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	2.145	2.145	15	17.145	17.15	达标 Yes
		日平均 Average daily	0.1026	0.342	15	15.1026	50.34	达标 Yes
	华南北苑 Huanan Beiyuan	1 小时 1 hour	1.8928	1.8928	15	16.8928	16.89	达标 Yes
		日平均 Average daily	0.1108	0.369333	15	15.1108	50.37	达标 Yes
	新岭 Xinling	1 小时 1 hour	2.5051	2.5051	15	17.5051	17.51	达标 Yes
		日平均 Average daily	0.1499	0.499667	15	15.1499	50.5	达标 Yes
	新铺 Xinpu	1 小时 1 hour	2.1916	2.1916	15	17.1916	17.19	达标 Yes
		日平均 Average daily	0.145	0.483333	15	15.145	50.48	达标 Yes
	大田 Datian	1 小时 1 hour	1.6826	1.6826	15	16.6826	16.68	达标 Yes
		日平均 Average daily	0.1656	0.552	15	15.1656	50.55	达标 Yes

污染物 Pollutant	预测点 Prediction point	平均时段 Average period	贡献值 Contribution value (μg/m^3)	占标率% Pi %	现状浓度 (μg/m^3) Current concentration (μg/m^3)	叠加后浓度 (μg/m^3) Concentration after superimposition (μg/m^3)	占标率% Pi %	达标情况 Up-to-standard status
	大竹园 Dazhuyuan	1 小时 1 hour	1.8609	1.8609	15	16.8609	16.86	达标 Yes
		日平均 Average daily	0.1336	0.445333	15	15.1336	50.45	达标 Yes
	彬垌 Bindong	1 小时 1 hour	2.0902	2.0902	15	17.0902	17.09	达标 Yes
		日平均 Average daily	0.0937	0.312333	15	15.0937	50.31	达标 Yes
	新坡村 Xinpo Village	1 小时 1 hour	1.1554	1.1554	15	16.1554	16.16	达标 Yes
		日平均 Average daily	0.0799	0.266333	15	15.0799	50.27	达标 Yes
	槟榔根 Binlanggen	1 小时 1 hour	2.8736	2.8736	15	17.8736	17.87	达标 Yes
		日平均 Average daily	0.1287	0.429	15	15.1287	50.43	达标 Yes
	网格 Mesh	1 小时 1 hour	10.2367	10.2367	15	25.2367	25.24	达标 Yes
		日平均 Average daily	0.9184	3.061333	15	15.9184	53.06	达标 Yes

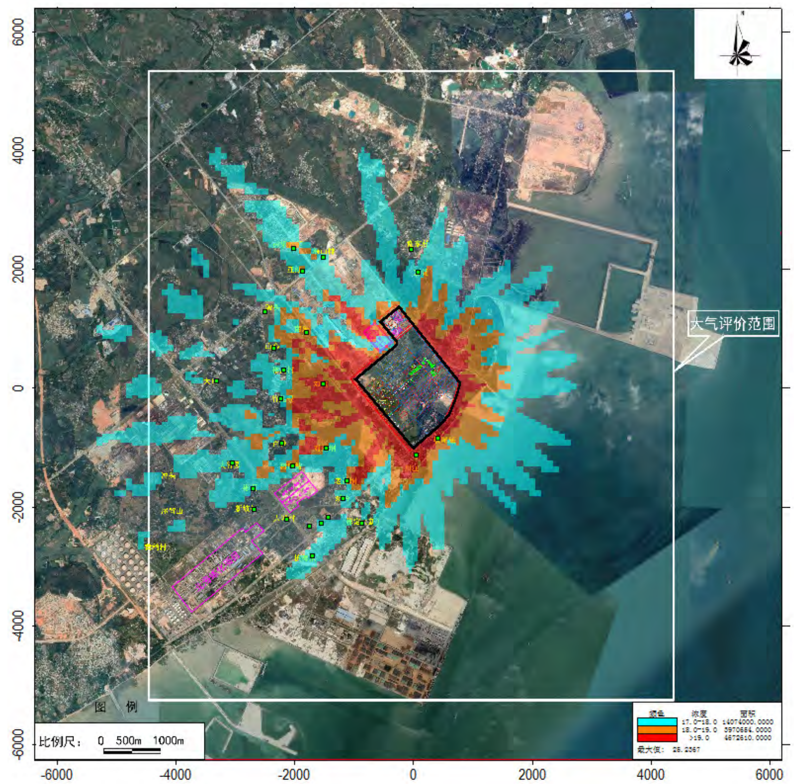


图 4.2-42 正常排放 Cl_2 小时平均质量浓度分布图（叠加区域污染源及现状浓度，单位：μg/m³）

Figure 4.2-42 Distribution Map of Hourly Average Mass Concentration of Cl_2 at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m³)

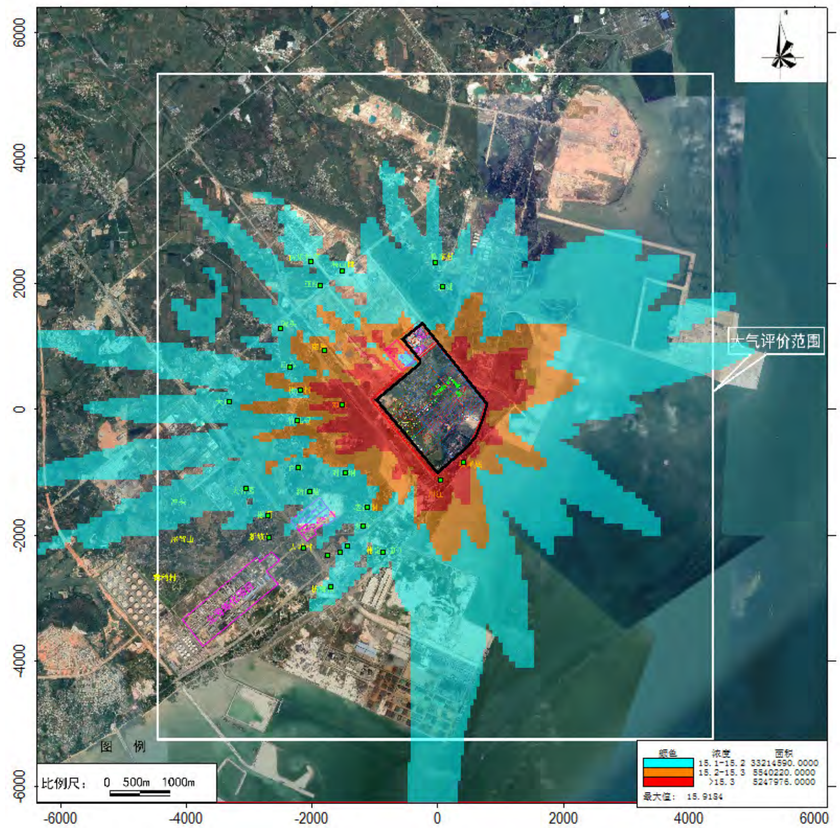


图 4.2-43　正常排放 Cl_2 日平均质量浓度分布图（叠加区域污染源及现状浓度，单位：μg/m³）
Figure 4.2-43 Distribution Map of Daily Average Mass Concentration of Cl2 at Guarantee Rate under Normal Emission (after Superimposing Current Concentration and Regional Pollution Sources, in μg/m³)

4.2.7 非正常工况预测结果

4.27 Prediction results under abnormal working condition

（1）碱炉、石灰窑开停车阶段，添加助燃剂时污染物排放。

(1) Discharge of pollutants at the time of adding combustion improver in the period of startup and shutdown of the alkali furnace and lime kiln.

预测结果见表 4.2-55。由预测结果可知，在碱炉、石灰窑开停车阶段非正常工况下，SO_2、NO_2 小时落地浓度贡献值在网格点及各敏感点均达到《环境空气质量标准》（GB3096-2012）二级标准。

The prediction results are as shown in Table 4.2-55. As revealed by the prediction results, under abnormal working condition at starting and shutdown stages of alkali furnace and lime kiln, hourly ground-level concentration contribution values of SO_2 and NO_2 at individual mesh and sensitive points all reach Level II standard in Ambient Air Quality Standard (GB3095-2012).

表 4.2-55 非正常工况：碱炉、石灰窑开停车阶段预测结果表

Table 4.2-55 Abnormal Working Condition: Prediction Results of Starting and Shutdown Stages of Alkali Furnace and Lime Kiln

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
4600tds/d碱炉开停车-SO2 Starting and shutdown of 4,600 tds/d alkali furnace-SO2	1	猪血塘 Zhuxuetang	1 小时 1 hour	4.1282	18040908	500	0.83	达标 Yes
	2	百班 Baiban	1 小时 1 hour	4.4666	18040908	500	0.89	达标 Yes
	3	竹儿根 Zhuergen	1 小时 1 hour	4.7127	18030508	500	0.94	达标 Yes
	4	彬崇村 Binchong Village	1 小时 1 hour	5.5906	18030508	500	1.12	达标 Yes
	5	山心 Shanxin	1 小时 1 hour	5.5572	18030508	500	1.11	达标 Yes
	6	邓屋 Dengwu	1 小时 1 hour	4.9437	18082812	500	0.99	达标 Yes
	7	对面垌 Duimiandong	1 小时 1 hour	4.3599	18091010	500	0.87	达标 Yes
	8	老妗垌 Laojindong	1 小时 1 hour	4.4718	18091010	500	0.89	达标 Yes
	9	坡尾底 Poweidi	1 小时 1 hour	5.6662	18081908	500	1.13	达标 Yes
	10	川江 Chuanjiang	1 小时 1 hour	6.1205	18022409	500	1.22	达标 Yes
	11	彬定（新） Binding (New village)	1 小时 1 hour	4.4159	18022409	500	0.88	达标 Yes
	12	大塘村 Datang Village	1 小时 1 hour	4.1503	18091010	500	0.83	达标 Yes
	13	南乐 Nanyue	1 小时 1 hour	4.8811	18081908	500	0.98	达标 Yes
	14	陂头 Potou	1 小时 1 hour	4.6565	18080607	500	0.93	达标 Yes
	15	亚细 Yaxi	1 小时 1 hour	5.4482	18080607	500	1.09	达标 Yes
	16	南乐社区 Nanyue	1 小时 1 hour	5.0846	18080607	500	1.02	达标 Yes

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量(μg/m^3) Concentration incremental (μg/m^3)	出现时间(YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准(μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
		Community						
	17	海山排 Haishanpai	1 小时 1 hour	4.2871	18080607	500	0.86	达标 Yes
	18	谢家村 Xiejiacun Village	1 小时 1 hour	4.0595	18082409	500	0.81	达标 Yes
	19	阳光海岸（中石化倒班宿舍）Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	4.1699	18091010	500	0.83	达标 Yes
	20	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	4.1682	18091010	500	0.83	达标 Yes
	21	华南北苑 Huanan Beiyuan	1 小时 1 hour	4.2055	18091010	500	0.84	达标 Yes
	22	新岭 Xinling	1 小时 1 hour	4.3065	18091010	500	0.86	达标 Yes
	23	新铺 Xinpu	1 小时 1 hour	4.5033	18070614	500	0.9	达标 Yes
	24	大田 Datian	1 小时 1 hour	5.171	18072608	500	1.03	达标 Yes
	25	大竹园 Dazhuyuan	1 小时 1 hour	5.2804	18010608	500	1.06	达标 Yes
	26	彬垌 Bindong	1 小时 1 hour	4.7652	18010608	500	0.95	达标 Yes
	27	新坡村 Xinpo Village	1 小时 1 hour	4.1913	18010608	500	0.84	达标 Yes
	28	槟榔根 Binlanggen	1 小时 1 hour	3.7755	18091010	500	0.76	达标 Yes
	29	网格 Mesh	1 小时 1 hour	6.4783	18081908	500	1.3	达标 Yes
4600tds/d 碱炉开停车 -NO2 Starti	1	猪血塘 Zhuxuetang	1 小时 1 hour	17.3787	18040908	200	8.69	达标 Yes
	2	百班 Baiban	1 小时 1 hour	18.8031	18040908	200	9.4	达标 Yes
	3	竹儿根 Zhuergen	1 小时 1 hour	16.7925	18010611	200	8.4	达标 Yes

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
ng and shutdown of 4,600 tds/d alkali furnace-NO2	4	彬崇村 Binchong Village	1 小时 1 hour	18.2615	18082308	200	9.13	达标 Yes
	5	山心 Shanxin	1 小时 1 hour	19.2841	18082308	200	9.64	达标 Yes
	6	邓屋 Dengwu	1 小时 1 hour	19.6733	18081908	200	9.84	达标 Yes
	7	对面垌 Duimiandong	1 小时 1 hour	15.5603	18022608	200	7.78	达标 Yes
	8	老妗垌 Laojindong	1 小时 1 hour	16.1621	18091010	200	8.08	达标 Yes
	9	坡尾底 Poweidi	1 小时 1 hour	16.6119	18100510	200	8.31	达标 Yes
	10	川江 Chuanjiang	1 小时 1 hour	19.7707	18081908	200	9.89	达标 Yes
	11	彬定（新） Binding (New village)	1 小时 1 hour	15.5724	18012709	200	7.79	达标 Yes
	12	大塘村 Datang Village	1 小时 1 hour	17.4716	18091010	200	8.74	达标 Yes
	13	南乐 Nanyue	1 小时 1 hour	19.5475	18081908	200	9.77	达标 Yes
	14	陂头 Potou	1 小时 1 hour	16.8547	18081908	200	8.43	达标 Yes
	15	亚细 Yaxi	1 小时 1 hour	16.3682	18091109	200	8.18	达标 Yes
	16	南乐社区 Nanyue Community	1 小时 1 hour	16.1266	18091109	200	8.06	达标 Yes
	17	海山排 Haishanpai	1 小时 1 hour	16.4841	18091109	200	8.24	达标 Yes
	18	谢家村 Xiejiacun Village	1 小时 1 hour	15.1988	18072613	200	7.6	达标 Yes
	19	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	17.5543	18091010	200	8.78	达标 Yes

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
	20	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	17.5472	18091010	200	8.77	达标 Yes
	21	华南北苑 Huanan Beiyuan	1 小时 1 hour	17.704	18091010	200	8.85	达标 Yes
	22	新岭 Xinling	1 小时 1 hour	17.986	18091010	200	8.99	达标 Yes
	23	新铺 Xinpu	1 小时 1 hour	15.4407	18061911	200	7.72	达标 Yes
	24	大田 Datian	1 小时 1 hour	19.3958	18030508	200	9.7	达标 Yes
	25	大竹园 Dazhuyuan	1 小时 1 hour	17.0319	18040908	200	8.52	达标 Yes
	26	彬垌 Bindong	1 小时 1 hour	16.4468	18040908	200	8.22	达标 Yes
	27	新坡村 Xinpo Village	1 小时 1 hour	15.9369	18091010	200	7.97	达标 Yes
	28	槟榔根 Binlanggen	1 小时 1 hour	15.8937	18091010	200	7.95	达标 Yes
	29	网格 Mesh	1 小时 1 hour	23.2558	18081908	200	11.63	达标 Yes
850t/d 石灰窑开停车-SO2 Starting and shutdown of 850t/d lime kiln-SO2	1	猪血塘 Zhuxuetang	1 小时 1 hour	4.7462	18010608	500	0.95	达标 Yes
	2	百班 Baiban	1 小时 1 hour	5.3844	18010608	500	1.08	达标 Yes
	3	竹儿根 Zhuergen	1 小时 1 hour	4.7548	18022408	500	0.95	达标 Yes
	4	彬崇村 Binchong Village	1 小时 1 hour	5.1074	18072608	500	1.02	达标 Yes
	5	山心 Shanxin	1 小时 1 hour	5.0835	18072608	500	1.02	达标 Yes
	6	邓屋 Dengwu	1 小时 1 hour	5.1366	18082812	500	1.03	达标 Yes
	7	对面垌 Duimiandong	1 小时 1 hour	4.2525	18021708	500	0.85	达标 Yes
	8	老妗垌 Laojindong	1 小时 1 hour	3.8891	18091010	500	0.78	达标 Yes

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
	9	坡尾底 Poweidi	1 小时 1 hour	5.7024	18022409	500	1.14	达标 Yes
	10	川江 Chuanjiang	1 小时 1 hour	5.7493	18022409	500	1.15	达标 Yes
	11	彬定（新） Binding (New village)	1 小时 1 hour	3.7174	18022409	500	0.74	达标 Yes
	12	大塘村 Datang Village	1 小时 1 hour	3.599	18061308	500	0.72	达标 Yes
	13	南乐 Nanyue	1 小时 1 hour	4.6633	18030508	500	0.93	达标 Yes
	14	陂头 Potou	1 小时 1 hour	4.4909	18080607	500	0.9	达标 Yes
	15	亚细 Yaxi	1 小时 1 hour	5.3744	18080607	500	1.07	达标 Yes
	16	南乐社区 Nanyue Community	1 小时 1 hour	4.7897	18080607	500	0.96	达标 Yes
	17	海山排 Haishanpai	1 小时 1 hour	4.4103	18080607	500	0.88	达标 Yes
	18	谢家村 Xiejiacun Village	1 小时 1 hour	4.0234	18082409	500	0.8	达标 Yes
	19	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	3.4986	18061308	500	0.7	达标 Yes
	20	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	3.4789	18091010	500	0.7	达标 Yes
	21	华南北苑 Huanan Beiyuan	1 小时 1 hour	3.527	18091010	500	0.71	达标 Yes
	22	新岭 Xinling	1 小时 1 hour	3.6773	18091010	500	0.74	达标 Yes
	23	新铺 Xinpu	1 小时 1 hour	4.0301	18072513	500	0.81	达标 Yes
	24	大田	1 小时	4.5922	18072608	500	0.92	达标

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
		Datian	1 hour					Yes
	25	大竹园 Dazhuyuan	1 小时 1 hour	6.1469	18010608	500	1.23	达标 Yes
	26	彬垌 Bindong	1 小时 1 hour	5.6776	18010608	500	1.14	达标 Yes
	27	新坡村 Xinpo Village	1 小时 1 hour	4.8267	18010608	500	0.97	达标 Yes
	28	槟榔根 Binlanggen	1 小时 1 hour	3.1045	18091010	500	0.62	达标 Yes
	29	网格 Mesh	1 小时 1 hour	6.4365	18022408	500	1.29	达标 Yes
850t/d 石灰窑开停车-NO2 Starting and shutdown of 850t/d lime kiln-NO2	1	猪血塘 Zhuxuetang	1 小时 1 hour	15.1515	18040908	200	7.58	达标 Yes
	2	百班 Baiban	1 小时 1 hour	16.4724	18040908	200	8.24	达标 Yes
	3	竹儿根 Zhuergen	1 小时 1 hour	16.2718	18060208	200	8.14	达标 Yes
	4	彬崇村 Binchong Village	1 小时 1 hour	18.5225	18030508	200	9.26	达标 Yes
	5	山心 Shanxin	1 小时 1 hour	19.8442	18030508	200	9.92	达标 Yes
	6	邓屋 Dengwu	1 小时 1 hour	15.9061	18010611	200	7.95	达标 Yes
	7	对面垌 Duimiandong	1 小时 1 hour	16.1706	18091010	200	8.09	达标 Yes
	8	老妗垌 Laojindong	1 小时 1 hour	16.3722	18091010	200	8.19	达标 Yes
	9	坡尾底 Poweidi	1 小时 1 hour	17.348	18112113	200	8.67	达标 Yes
	10	川江 Chuanjiang	1 小时 1 hour	18.7004	18081908	200	9.35	达标 Yes
	11	彬定（新） Binding (New village)	1 小时 1 hour	15.6495	18022409	200	7.82	达标 Yes
	12	大塘村 Datang Village	1 小时 1 hour	15.151	18061308	200	7.58	达标 Yes
	13	南乐	1 小时	16.37	18081908	200	8.18	达标

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
		Nanyue	1 hour					Yes
	14	陂头 Potou	1 小时 1 hour	16.3441	18052407	200	8.17	达标 Yes
	15	亚细 Yaxi	1 小时 1 hour	15.4044	18072909	200	7.7	达标 Yes
	16	南乐社区 Nanyue Community	1 小时 1 hour	15.4282	18080607	200	7.71	达标 Yes
	17	海山排 Haishanpai	1 小时 1 hour	16.4877	18072909	200	8.24	达标 Yes
	18	谢家村 Xiejiacun Village	1 小时 1 hour	14.3022	18072513	200	7.15	达标 Yes
	19	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	14.7284	18061308	200	7.36	达标 Yes
	20	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	14.6453	18091010	200	7.32	达标 Yes
	21	华南北苑 Huanan Beiyuan	1 小时 1 hour	14.8476	18091010	200	7.42	达标 Yes
	22	新岭 Xinling	1 小时 1 hour	15.4804	18091010	200	7.74	达标 Yes
	23	新铺 Xinpu	1 小时 1 hour	15.9313	18080512	200	7.97	达标 Yes
	24	大田 Datian	1 小时 1 hour	19.3319	18072608	200	9.67	达标 Yes
	25	大竹园 Dazhuyuan	1 小时 1 hour	16.8237	18050310	200	8.41	达标 Yes
	26	彬垌 Bindong	1 小时 1 hour	13.8625	18040908	200	6.93	达标 Yes
	27	新坡村 Xinpo Village	1 小时 1 hour	13.0956	18091010	200	6.55	达标 Yes
	28	槟榔根 Binlanggen	1 小时 1 hour	13.069	18091010	200	6.53	达标 Yes
	29	网格	1 小时	23.8746	18010608	200	11.9	达标

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
		Mesh	1 hour				4	Yes

（2）项目生产过程中，由于人为原因操作不当或废气治理设施故障，导致废气处理效率下降。

(2) During the production process, the exhaust gas treatment efficiency decreases due to improper manual operation or malfunction of exhaust gas treatment facilities.

①4600tds/d 碱炉除尘效率下降至 95%；②850t/d 石灰窑除尘效率下降至 95%；③220t/h 固废锅炉除尘效率按降低至 95%，脱硫、脱硝效率下降至 50%；④280 t/h 燃煤锅炉除尘效率按降低至 95%，脱硫、脱硝效率下降至 50%；⑤二氧化氯制备尾气去除效率下降至 0%。

① Dust removal efficiency of 4600tds/d alkali furnace decreases to 95%; ② Dust removal efficiency of 850t/d lime kiln decreases to 95%; ③ Dust removal efficiency of 220t/h solid waste boiler decreases to 95%, and the desulfurization and denitration efficiency thereof decreases to 50%; ④ Dust removal efficiency of 280 t/h coal-fired boiler decreases to 95%, and the desulfurization and denitration efficiency thereof decreases to 50%; ⑤ Removal efficiency of tail gas from chlorine dioxide preparation decreased to 0%.

预测结果见表 4.2-56。由预测结果可知，在废气治理设施故障非正常工况下，PM10、SO_2、NO_2 小时落地浓度贡献值在网格点及各敏感点均达到《环境空气质量标准》（GB3096-2012）二级标准；氯气满足《环境影响评价技术导则 大气环境》（HJ2.2-2018）附录 D 标准要求。

The prediction results are as shown in Table 4.2-56. According to the prediction results, under the abnormal working condition with failure of waste gas treatment facilities, hourly ground-level concentration contribution values of PM10, SO_2 and NO_2 at individual mesh and sensitive points all reach Level II standard in Ambient Air Quality Standard (GB3095-2012); those of chlorine comply with standard requirements in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment* (HJ2.2-2018).

表 4.2-56 非正常工况：废气治理设施故障预测结果表

Table 4.2-56 Abnormal Working Condition: Prediction Results of Failure of Waste Gas Treatment Facilities

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
4600tds/d碱炉治理设施故障-PM10 Failure of waste gas treatment facilities for 4,600 tds/d alkali furnace-PM10	1	猪血塘 Zhuxuetang	1 小时 1 hour	87.0928	18040908	450	19.35	达标 Yes
	2	百班 Baiban	1 小时 1 hour	94.2436	18040908	450	20.94	达标 Yes
	3	竹儿根 Zhuergen	1 小时 1 hour	99.4339	18030508	450	22.1	达标 Yes
	4	彬崇村 Binchong Village	1 小时 1 hour	117.9711	18030508	450	26.22	达标 Yes
	5	山心 Shanxin	1 小时 1 hour	117.2646	18030508	450	26.06	达标 Yes
	6	邓屋 Dengwu	1 小时 1 hour	104.3195	18082812	450	23.18	达标 Yes
	7	对面垌 Duimiandong	1 小时 1 hour	92.0076	18091010	450	20.45	达标 Yes
	8	老妗垌 Laojindong	1 小时 1 hour	94.3706	18091010	450	20.97	达标 Yes
	9	坡尾底 Poweidi	1 小时 1 hour	119.3425	18081908	450	26.52	达标 Yes
	10	川江 Chuanjiang	1 小时 1 hour	129.1839	18022409	450	28.71	达标 Yes
	11	彬定（新） Binding (New village)	1 小时 1 hour	93.1519	18022409	450	20.7	达标 Yes
	12	大塘村 Datang Village	1 小时 1 hour	87.6026	18091010	450	19.47	达标 Yes
	13	南乐 Nanyue	1 小时 1 hour	102.9404	18081908	450	22.88	达标 Yes
	14	陂头 Potou	1 小时 1 hour	98.2557	18080607	450	21.83	达标 Yes
	15	亚细 Yaxi	1 小时 1 hour	114.9657	18080607	450	25.55	达标 Yes
	16	南乐社区 Nanyue	1 小时 1 hour	107.2858	18080607	450	23.84	达标 Yes

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
		Community						
	17	海山排 Haishanpai	1 小时 1 hour	90.4585	18080607	450	20.1	达标 Yes
	18	谢家村 Xiejiacun Village	1 小时 1 hour	85.6282	18082409	450	19.03	达标 Yes
	19	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	88.0131	18091010	450	19.56	达标 Yes
	20	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	87.9716	18091010	450	19.55	达标 Yes
	21	华南北苑 Huanan Beiyuan	1 小时 1 hour	88.7513	18091010	450	19.72	达标 Yes
	22	新岭 Xinling	1 小时 1 hour	90.8784	18091010	450	20.2	达标 Yes
	23	新铺 Xinpu	1 小时 1 hour	94.9311	18070614	450	21.1	达标 Yes
	24	大田 Datian	1 小时 1 hour	109.1071	18072608	450	24.25	达标 Yes
	25	大竹园 Dazhuyuan	1 小时 1 hour	111.4505	18010608	450	24.77	达标 Yes
	26	彬垌 Bindong	1 小时 1 hour	100.578	18010608	450	22.35	达标 Yes
	27	新坡村 Xinpo Village	1 小时 1 hour	88.4609	18010608	450	19.66	达标 Yes
	28	槟榔根 Binlanggen	1 小时 1 hour	79.6889	18091010	450	17.71	达标 Yes
	29	网格 Mesh	1 小时 1 hour	136.6362	18081908	450	30.36	达标 Yes
850t/d 石灰窑治理设施故障-PM1	1	猪血塘 Zhuxuetang	1 小时 1 hour	11.7952	18010608	450	2.62	达标 Yes
	2	百班 Baiban	1 小时 1 hour	13.3811	18010608	450	2.97	达标 Yes
	3	竹儿根 Zhuergen	1 小时 1 hour	11.8166	18022408	450	2.63	达标 Yes

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量(μg/m^3) Concentration incremental (μg/m^3)	出现时间(YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准(μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
0 Failure of waste gas treatment facilities for 850t/d lime kiln-PM10	4	彬崇村 Binchong Village	1 小时 1 hour	12.6929	18072608	450	2.82	达标 Yes
	5	山心 Shanxin	1 小时 1 hour	12.6334	18072608	450	2.81	达标 Yes
	6	邓屋 Dengwu	1 小时 1 hour	12.7655	18082812	450	2.84	达标 Yes
	7	对面垌 Duimiandong	1 小时 1 hour	10.5683	18021708	450	2.35	达标 Yes
	8	老妗垌 Laojindong	1 小时 1 hour	9.6651	18091010	450	2.15	达标 Yes
	9	坡尾底 Poweidi	1 小时 1 hour	14.1715	18022409	450	3.15	达标 Yes
	10	川江 Chuanjiang	1 小时 1 hour	14.288	18022409	450	3.18	达标 Yes
	11	彬定（新） Binding (New village)	1 小时 1 hour	9.2385	18022409	450	2.05	达标 Yes
	12	大塘村 Datang Village	1 小时 1 hour	8.9442	18061308	450	1.99	达标 Yes
	13	南乐 Nanyue	1 小时 1 hour	11.5892	18030508	450	2.58	达标 Yes
	14	陂头 Potou	1 小时 1 hour	11.1607	18080607	450	2.48	达标 Yes
	15	亚细 Yaxi	1 小时 1 hour	13.3563	18080607	450	2.97	达标 Yes
	16	南乐社区 Nanyue Community	1 小时 1 hour	11.9033	18080607	450	2.65	达标 Yes
	17	海山排 Haishanpai	1 小时 1 hour	10.9603	18080607	450	2.44	达标 Yes
	18	谢家村 Xiejiacun Village	1 小时 1 hour	9.9989	18082409	450	2.22	达标 Yes
	19	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	8.6947	18061308	450	1.93	达标 Yes

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
	20	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	8.6457	18091010	450	1.92	达标 Yes
	21	华南北苑 Huanan Beiyuan	1 小时 1 hour	8.7651	18091010	450	1.95	达标 Yes
	22	新岭 Xinling	1 小时 1 hour	9.1387	18091010	450	2.03	达标 Yes
	23	新铺 Xinpu	1 小时 1 hour	10.0154	18072513	450	2.23	达标 Yes
	24	大田 Datian	1 小时 1 hour	11.4124	18072608	450	2.54	达标 Yes
	25	大竹园 Dazhuyuan	1 小时 1 hour	15.276	18010608	450	3.39	达标 Yes
	26	彬垌 Bindong	1 小时 1 hour	14.1098	18010608	450	3.14	达标 Yes
	27	新坡村 Xinpo Village	1 小时 1 hour	11.9952	18010608	450	2.67	达标 Yes
	28	槟榔根 Binlanggen	1 小时 1 hour	7.7151	18091010	450	1.71	达标 Yes
	29	网格 Mesh	1 小时 1 hour	15.9959	18022408	450	3.55	达标 Yes
220t/h 锅炉治理设施故障-PM10 Failure of waste gas treatment facilities for 220t/h boiler	1	猪血塘 Zhuxuetang	1 小时 1 hour	19.0238	18010608	450	4.23	达标 Yes
	2	百班 Baiban	1 小时 1 hour	20.9672	18010608	450	4.66	达标 Yes
	3	竹儿根 Zhuergen	1 小时 1 hour	17.9739	18022408	450	3.99	达标 Yes
	4	彬崇村 Binchong Village	1 小时 1 hour	18.6493	18072608	450	4.14	达标 Yes
	5	山心 Shanxin	1 小时 1 hour	16.9308	18072608	450	3.76	达标 Yes
	6	邓屋 Dengwu	1 小时 1 hour	18.1461	18072608	450	4.03	达标 Yes
	7	对面垌 Duimiandong	1 小时 1 hour	15.8356	18010608	450	3.52	达标 Yes
	8	老妗垌 Laojindong	1 小时 1 hour	17.5874	18060207	450	3.91	达标 Yes

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
-PM10	9	坡尾底 Poweidi	1 小时 1 hour	18.5401	18022409	450	4.12	达标 Yes
	10	川江 Chuanjiang	1 小时 1 hour	17.8407	18022409	450	3.96	达标 Yes
	11	彬定（新） Binding (New village)	1 小时 1 hour	12.8837	18060207	450	2.86	达标 Yes
	12	大塘村 Datang Village	1 小时 1 hour	20.342	18060207	450	4.52	达标 Yes
	13	南乐 Nanyue	1 小时 1 hour	16.4667	18080508	450	3.66	达标 Yes
	14	陂头 Potou	1 小时 1 hour	14.6681	18080607	450	3.26	达标 Yes
	15	亚细 Yaxi	1 小时 1 hour	16.641	18080607	450	3.7	达标 Yes
	16	南乐社区 Nanyue Community	1 小时 1 hour	14.4168	18080907	450	3.2	达标 Yes
	17	海山排 Haishanpai	1 小时 1 hour	17.4393	18080907	450	3.88	达标 Yes
	18	谢家村 Xiejiacun Village	1 小时 1 hour	21.5089	18080907	450	4.78	达标 Yes
	19	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	20.255	18060207	450	4.5	达标 Yes
	20	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	19.7233	18060207	450	4.38	达标 Yes
	21	华南北苑 Huanan Beiyuan	1 小时 1 hour	19.4857	18060207	450	4.33	达标 Yes
	22	新岭 Xinling	1 小时 1 hour	18.2691	18060207	450	4.06	达标 Yes
	23	新铺 Xinpu	1 小时 1 hour	20.5041	18080907	450	4.56	达标 Yes
	24	大田	1 小时	14.6696	18072608	450	3.26	达标

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
		Datian	1 hour					Yes
	25	大竹园 Dazhuyuan	1 小时 1 hour	19.146	18010608	450	4.25	达标 Yes
	26	彬垌 Bindong	1 小时 1 hour	18.5305	18010608	450	4.12	达标 Yes
	27	新坡村 Xinpo Village	1 小时 1 hour	17.3424	18060207	450	3.85	达标 Yes
	28	槟榔根 Binlanggen	1 小时 1 hour	17.7146	18060207	450	3.94	达标 Yes
	29	网格 Mesh	1 小时 1 hour	24.7118	18092411	450	5.49	达标 Yes
220t/h 锅炉治理设施故障-SO2 Failure of waste gas treatment facilities for 220t/h boiler-SO2	1	猪血塘 Zhuxuetang	1 小时 1 hour	11.7538	18010608	500	2.35	达标 Yes
	2	百班 Baiban	1 小时 1 hour	12.9545	18010608	500	2.59	达标 Yes
	3	竹儿根 Zhuergen	1 小时 1 hour	11.1051	18022408	500	2.22	达标 Yes
	4	彬崇村 Binchong Village	1 小时 1 hour	11.5224	18072608	500	2.3	达标 Yes
	5	山心 Shanxin	1 小时 1 hour	10.4607	18072608	500	2.09	达标 Yes
	6	邓屋 Dengwu	1 小时 1 hour	11.2115	18072608	500	2.24	达标 Yes
	7	对面垌 Duimiandong	1 小时 1 hour	9.784	18010608	500	1.96	达标 Yes
	8	老妗垌 Laojindong	1 小时 1 hour	10.8663	18060207	500	2.17	达标 Yes
	9	坡尾底 Poweidi	1 小时 1 hour	11.4549	18022409	500	2.29	达标 Yes
	10	川江 Chuanjiang	1 小时 1 hour	11.0228	18022409	500	2.2	达标 Yes
	11	彬定（新） Binding (New village)	1 小时 1 hour	7.9601	18060207	500	1.59	达标 Yes
	12	大塘村 Datang Village	1 小时 1 hour	12.5682	18060207	500	2.51	达标 Yes
	13	南乐	1 小时	10.1739	18080508	500	2.03	达标

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
		Nanyue	1 hour					Yes
	14	陂头 Potou	1 小时 1 hour	9.0626	18080607	500	1.81	达标 Yes
	15	亚细 Yaxi	1 小时 1 hour	10.2816	18080607	500	2.06	达标 Yes
	16	南乐社区 Nanyue Community	1 小时 1 hour	8.9074	18080907	500	1.78	达标 Yes
	17	海山排 Haishanpai	1 小时 1 hour	10.7748	18080907	500	2.15	达标 Yes
	18	谢家村 Xiejiacun Village	1 小时 1 hour	13.2892	18080907	500	2.66	达标 Yes
	19	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	12.5145	18060207	500	2.5	达标 Yes
	20	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	12.186	18060207	500	2.44	达标 Yes
	21	华南北苑 Huanan Beiyuan	1 小时 1 hour	12.0392	18060207	500	2.41	达标 Yes
	22	新岭 Xinling	1 小时 1 hour	11.2875	18060207	500	2.26	达标 Yes
	23	新铺 Xinpu	1 小时 1 hour	12.6684	18080907	500	2.53	达标 Yes
	24	大田 Datian	1 小时 1 hour	9.0636	18072608	500	1.81	达标 Yes
	25	大竹园 Dazhuyuan	1 小时 1 hour	11.8293	18010608	500	2.37	达标 Yes
	26	彬垌 Bindong	1 小时 1 hour	11.449	18010608	500	2.29	达标 Yes
	27	新坡村 Xinpo Village	1 小时 1 hour	10.7149	18060207	500	2.14	达标 Yes
	28	槟榔根 Binlanggen	1 小时 1 hour	10.9449	18060207	500	2.19	达标 Yes
	29	网格	1 小时	15.2681	18092411	500	3.05	达标

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
		Mesh	1 hour					Yes
220t/h 锅炉治理设施故障-NO2 Failure of waste gas treatment facilities for 220t/h boiler-NO2	1	猪血塘 Zhuxuetang	1 小时 1 hour	6.616	18010608	200	3.31	达标 Yes
	2	百班 Baiban	1 小时 1 hour	7.2918	18010608	200	3.65	达标 Yes
	3	竹儿根 Zhuergen	1 小时 1 hour	5.7581	18112108	200	2.88	达标 Yes
	4	彬崇村 Binchong Village	1 小时 1 hour	6.4857	18072608	200	3.24	达标 Yes
	5	山心 Shanxin	1 小时 1 hour	5.8881	18072608	200	2.94	达标 Yes
	6	邓屋 Dengwu	1 小时 1 hour	6.3107	18072608	200	3.16	达标 Yes
	7	对面垌 Duimiandong	1 小时 1 hour	5.5072	18010608	200	2.75	达标 Yes
	8	老妗垌 Laojindong	1 小时 1 hour	4.7211	18061308	200	2.36	达标 Yes
	9	坡尾底 Poweidi	1 小时 1 hour	6.4478	18022409	200	3.22	达标 Yes
	10	川江 Chuanjiang	1 小时 1 hour	6.2045	18022409	200	3.1	达标 Yes
	11	彬定（新） Binding (New village)	1 小时 1 hour	4.3558	18060207	200	2.18	达标 Yes
	12	大塘村 Datang Village	1 小时 1 hour	7.0744	18060207	200	3.54	达标 Yes
	13	南乐 Nanyue	1 小时 1 hour	5.7267	18080508	200	2.86	达标 Yes
	14	陂头 Potou	1 小时 1 hour	5.1012	18080607	200	2.55	达标 Yes
	15	亚细 Yaxi	1 小时 1 hour	5.7873	18080607	200	2.89	达标 Yes
	16	南乐社区 Nanyue Community	1 小时 1 hour	5.0138	18080907	200	2.51	达标 Yes
	17	海山排 Haishanpai	1 小时 1 hour	6.0649	18080907	200	3.03	达标 Yes

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
	18	谢家村 Xiejiacun Village	1 小时 1 hour	7.4802	18080907	200	3.74	达标 Yes
	19	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	7.0442	18060207	200	3.52	达标 Yes
	20	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	6.8592	18060207	200	3.43	达标 Yes
	21	华南北苑 Huanan Beiyuan	1 小时 1 hour	6.7766	18060207	200	3.39	达标 Yes
	22	新岭 Xinling	1 小时 1 hour	5.4876	18060207	200	2.74	达标 Yes
	23	新铺 Xinpu	1 小时 1 hour	5.7983	18082409	200	2.9	达标 Yes
	24	大田 Datian	1 小时 1 hour	5.1017	18072608	200	2.55	达标 Yes
	25	大竹园 Dazhuyuan	1 小时 1 hour	6.6585	18010608	200	3.33	达标 Yes
	26	彬垌 Bindong	1 小时 1 hour	6.4444	18010608	200	3.22	达标 Yes
	27	新坡村 Xinpo Village	1 小时 1 hour	6.0312	18060207	200	3.02	达标 Yes
	28	槟榔根 Binlanggen	1 小时 1 hour	6.1607	18060207	200	3.08	达标 Yes
	29	网格 Mesh	1 小时 1 hour	8.2116	18092411	200	4.11	达标 Yes
2×280t/h 锅炉治理设施故障-PM10 Failure of waste	1	猪血塘 Zhuxuetang	1 小时 1 hour	19.7579	18010608	450	4.39	达标 Yes
	2	百班 Baiban	1 小时 1 hour	21.6973	18010608	450	4.82	达标 Yes
	3	竹儿根 Zhuergen	1 小时 1 hour	19.8776	18050310	450	4.42	达标 Yes
	4	彬崇村 Binchong Village	1 小时 1 hour	23.3812	18072608	450	5.2	达标 Yes
	5	山心	1 小时	21.5421	18072608	450	4.79	达标

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
gas treatment facilities for 2×280t/h boilers-PM10		Shanxin	1 hour					Yes
	6	邓屋 Dengwu	1 小时 1 hour	21.6094	18082812	450	4.8	达标 Yes
	7	对面垌 Duimiandong	1 小时 1 hour	18.4222	18021708	450	4.09	达标 Yes
	8	老妗垌 Laojindong	1 小时 1 hour	16.914	18091010	450	3.76	达标 Yes
	9	坡尾底 Poweidi	1 小时 1 hour	23.7025	18082812	450	5.27	达标 Yes
	10	川江 Chuanjiang	1 小时 1 hour	22.8187	18022409	450	5.07	达标 Yes
	11	彬定（新） Binding (New village)	1 小时 1 hour	13.9157	18022409	450	3.09	达标 Yes
	12	大塘村 Datang Village	1 小时 1 hour	16.7636	18060207	450	3.73	达标 Yes
	13	南乐 Nanyue	1 小时 1 hour	20.0043	18080607	450	4.45	达标 Yes
	14	陂头 Potou	1 小时 1 hour	19.2217	18080607	450	4.27	达标 Yes
	15	亚细 Yaxi	1 小时 1 hour	21.5362	18080607	450	4.79	达标 Yes
	16	南乐社区 Nanyue Community	1 小时 1 hour	18.4414	18080607	450	4.1	达标 Yes
	17	海山排 Haishanpai	1 小时 1 hour	17.1712	18080607	450	3.82	达标 Yes
	18	谢家村 Xiejiacun Village	1 小时 1 hour	19.1312	18082409	450	4.25	达标 Yes
	19	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	15.4236	18060207	450	3.43	达标 Yes
	20	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	14.7851	18061308	450	3.29	达标 Yes

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
	21	华南北苑 Huanan Beiyuan	1 小时 1 hour	14.7119	18061308	450	3.27	达标 Yes
	22	新岭 Xinling	1 小时 1 hour	15.675	18091010	450	3.48	达标 Yes
	23	新铺 Xinpu	1 小时 1 hour	19.4595	18082409	450	4.32	达标 Yes
	24	大田 Datian	1 小时 1 hour	19.3112	18072608	450	4.29	达标 Yes
	25	大竹园 Dazhuyuan	1 小时 1 hour	23.4735	18010608	450	5.22	达标 Yes
	26	彬垌 Bindong	1 小时 1 hour	22.5011	18010608	450	5	达标 Yes
	27	新坡村 Xinpo Village	1 小时 1 hour	19.2104	18010608	450	4.27	达标 Yes
	28	槟榔根 Binlanggen	1 小时 1 hour	15.7613	18060207	450	3.5	达标 Yes
	29	网格 Mesh	1 小时 1 hour	28.4133	18082812	450	6.31	达标 Yes
2×280t/h 锅炉治理设施故障-SO2 Failure of waste gas treatment facilities for 2×280t/h boilers-SO2	1	猪血塘 Zhuxuetang	1 小时 1 hour	27.5377	18010608	500	5.51	达标 Yes
	2	百班 Baiban	1 小时 1 hour	30.2407	18010608	500	6.05	达标 Yes
	3	竹儿根 Zhuergen	1 小时 1 hour	27.7045	18050310	500	5.54	达标 Yes
	4	彬崇村 Binchong Village	1 小时 1 hour	32.5877	18072608	500	6.52	达标 Yes
	5	山心 Shanxin	1 小时 1 hour	30.0246	18072608	500	6	达标 Yes
	6	邓屋 Dengwu	1 小时 1 hour	30.1183	18082812	500	6.02	达标 Yes
	7	对面垌 Duimiandong	1 小时 1 hour	25.6761	18021708	500	5.14	达标 Yes
	8	老妗垌 Laojindong	1 小时 1 hour	23.5741	18091010	500	4.71	达标 Yes
	9	坡尾底 Poweidi	1 小时 1 hour	33.0356	18082812	500	6.61	达标 Yes
	10	川江	1 小时	31.8038	18022409	500	6.36	达标

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
		Chuanjiang	1 hour					Yes
	11	彬定（新） Binding (New village)	1 小时 1 hour	19.3952	18022409	500	3.88	达标 Yes
	12	大塘村 Datang Village	1 小时 1 hour	23.3645	18060207	500	4.67	达标 Yes
	13	南乐 Nanyue	1 小时 1 hour	27.8812	18080607	500	5.58	达标 Yes
	14	陂头 Potou	1 小时 1 hour	26.7905	18080607	500	5.36	达标 Yes
	15	亚细 Yaxi	1 小时 1 hour	30.0162	18080607	500	6	达标 Yes
	16	南乐社区 Nanyue Community	1 小时 1 hour	25.7028	18080607	500	5.14	达标 Yes
	17	海山排 Haishanpai	1 小时 1 hour	23.9325	18080607	500	4.79	达标 Yes
	18	谢家村 Xiejiacun Village	1 小时 1 hour	26.6643	18082409	500	5.33	达标 Yes
	19	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	21.4969	18060207	500	4.3	达标 Yes
	20	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	20.6069	18061308	500	4.12	达标 Yes
	21	华南北苑 Huanan Beiyuan	1 小时 1 hour	20.5049	18061308	500	4.1	达标 Yes
	22	新岭 Xinling	1 小时 1 hour	21.8471	18091010	500	4.37	达标 Yes
	23	新铺 Xinpu	1 小时 1 hour	27.1219	18082409	500	5.42	达标 Yes
	24	大田 Datian	1 小时 1 hour	26.9152	18072608	500	5.38	达标 Yes
	25	大竹园 Dazhuyuan	1 小时 1 hour	32.7165	18010608	500	6.54	达标 Yes

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
	26	彬垌 Bindong	1 小时 1 hour	31.3612	18010608	500	6.27	达标 Yes
	27	新坡村 Xinpo Village	1 小时 1 hour	26.7747	18010608	500	5.35	达标 Yes
	28	槟榔根 Binlanggen	1 小时 1 hour	21.9674	18060207	500	4.39	达标 Yes
	29	网格 Mesh	1 小时 1 hour	39.6013	18082812	500	7.92	达标 Yes
2×280t/h 锅炉治理设施故障-NO2 Failure of waste gas treatment facilities for 2×280t/h boilers-NO2	1	猪血塘 Zhuxuetang	1 小时 1 hour	7.5645	18021708	200	3.78	达标 Yes
	2	百班 Baiban	1 小时 1 hour	9.6546	18050310	200	4.83	达标 Yes
	3	竹儿根 Zhuergen	1 小时 1 hour	9.8945	18050310	200	4.95	达标 Yes
	4	彬崇村 Binchong Village	1 小时 1 hour	11.6385	18072608	200	5.82	达标 Yes
	5	山心 Shanxin	1 小时 1 hour	10.7231	18072608	200	5.36	达标 Yes
	6	邓屋 Dengwu	1 小时 1 hour	10.7112	18030508	200	5.36	达标 Yes
	7	对面垌 Duimiandong	1 小时 1 hour	8.2815	18091010	200	4.14	达标 Yes
	8	老妗垌 Laojindong	1 小时 1 hour	8.4193	18091010	200	4.21	达标 Yes
	9	坡尾底 Poweidi	1 小时 1 hour	11.7985	18082812	200	5.9	达标 Yes
	10	川江 Chuanjiang	1 小时 1 hour	11.3585	18022409	200	5.68	达标 Yes
	11	彬定（新） Binding (New village)	1 小时 1 hour	6.9269	18022409	200	3.46	达标 Yes
	12	大塘村 Datang Village	1 小时 1 hour	7.6983	18061308	200	3.85	达标 Yes
	13	南乐 Nanyue	1 小时 1 hour	9.9576	18080607	200	4.98	达标 Yes
	14	陂头 Potou	1 小时 1 hour	9.5681	18080607	200	4.78	达标 Yes

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
	15	亚细 Yaxi	1 小时 1 hour	10.7201	18080607	200	5.36	达标 Yes
	16	南乐社区 Nanyue Community	1 小时 1 hour	9.1796	18080607	200	4.59	达标 Yes
	17	海山排 Haishanpai	1 小时 1 hour	8.5473	18080607	200	4.27	达标 Yes
	18	谢家村 Xiejiacun Village	1 小时 1 hour	9.523	18082409	200	4.76	达标 Yes
	19	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	7.6294	18061308	200	3.81	达标 Yes
	20	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	7.3596	18061308	200	3.68	达标 Yes
	21	华南北苑 Huanan Beiyuan	1 小时 1 hour	7.3232	18061308	200	3.66	达标 Yes
	22	新岭 Xinling	1 小时 1 hour	7.8026	18091010	200	3.9	达标 Yes
	23	新铺 Xinpu	1 小时 1 hour	9.6864	18082409	200	4.84	达标 Yes
	24	大田 Datian	1 小时 1 hour	9.6126	18072608	200	4.81	达标 Yes
	25	大竹园 Dazhuyuan	1 小时 1 hour	11.6845	18010608	200	5.84	达标 Yes
	26	彬垌 Bindong	1 小时 1 hour	11.2005	18010608	200	5.6	达标 Yes
	27	新坡村 Xinpo Village	1 小时 1 hour	9.5624	18010608	200	4.78	达标 Yes
	28	槟榔根 Binlanggen	1 小时 1 hour	6.3924	18052808	200	3.2	达标 Yes
	29	网格 Mesh	1 小时 1 hour	12.8467	18082812	200	6.42	达标 Yes
二氧化氯	1	猪血塘 Zhuxuetang	1 小时 1 hour	0.2694	18051220	100	0.27	达标 Yes

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
车间过量氢气排空尾气治理设施故障-Cl2 Failure of treatment facilities for excessive hydrogen tail gas in chlorine dioxide workshop-Cl2	2	百班 Baiban	1 小时 1 hour	1.1059	18092222	100	1.11	达标 Yes
	3	竹儿根 Zhuergen	1 小时 1 hour	0.6765	18082705	100	0.68	达标 Yes
	4	彬崇村 Binchong Village	1 小时 1 hour	0.9582	18092224	100	0.96	达标 Yes
	5	山心 Shanxin	1 小时 1 hour	0.9761	18092224	100	0.98	达标 Yes
	6	邓屋 Dengwu	1 小时 1 hour	0.4741	18061706	100	0.47	达标 Yes
	7	对面垌 Duimiandong	1 小时 1 hour	0.3778	18061023	100	0.38	达标 Yes
	8	老妗垌 Laojindong	1 小时 1 hour	0.4402	18091019	100	0.44	达标 Yes
	9	坡尾底 Poweidi	1 小时 1 hour	0.5908	18082606	100	0.59	达标 Yes
	10	川江 Chuanjiang	1 小时 1 hour	0.4368	18082404	100	0.44	达标 Yes
	11	彬定（新） Binding (New village)	1 小时 1 hour	0.385	18080921	100	0.39	达标 Yes
	12	大塘村 Datang Village	1 小时 1 hour	0.3487	18100603	100	0.35	达标 Yes
	13	南乐 Nanyue	1 小时 1 hour	0.4307	18040322	100	0.43	达标 Yes
	14	陂头 Potou	1 小时 1 hour	0.4235	18100319	100	0.42	达标 Yes
	15	亚细 Yaxi	1 小时 1 hour	0.3039	18051323	100	0.3	达标 Yes
	16	南乐社区 Nanyue Community	1 小时 1 hour	0.3322	18051323	100	0.33	达标 Yes
	17	海山排 Haishanpai	1 小时 1 hour	0.2916	18051402	100	0.29	达标 Yes
	18	谢家村 Xiejiacun Village	1 小时 1 hour	0.3825	18051406	100	0.38	达标 Yes
	19	阳光海岸（中石	1 小时	0.2651	18080520	100	0.27	达标

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
		化倒班宿舍）Yangguang Coast (SINOPEC shift dormitory)	1 hour					Yes
	20	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	0.3524	18091019	100	0.35	达标 Yes
	21	华南北苑 Huanan Beiyuan	1 小时 1 hour	0.4022	18091019	100	0.4	达标 Yes
	22	新岭 Xinling	1 小时 1 hour	0.4663	18091019	100	0.47	达标 Yes
	23	新铺 Xinpu	1 小时 1 hour	0.3367	18090119	100	0.34	达标 Yes
	24	大田 Datian	1 小时 1 hour	0.8754	18092006	100	0.88	达标 Yes
	25	大竹园 Dazhuyuan	1 小时 1 hour	0.4003	18090605	100	0.4	达标 Yes
	26	彬垌 Bindong	1 小时 1 hour	0.4264	18081824	100	0.43	达标 Yes
	27	新坡村 Xinpo Village	1 小时 1 hour	0.4269	18091002	100	0.43	达标 Yes
	28	槟榔根 Binlanggen	1 小时 1 hour	0.3372	18091019	100	0.34	达标 Yes
	29	网格 Mesh	1 小时 1 hour	3.5432	18080201	100	3.54	达标 Yes
二氧化氯车间盐酸合成尾气治理措施故障-Cl2 Failure of treatment	1	猪血塘 Zhuxuetang	1 小时 1 hour	0.0782	18083105	100	0.08	达标 Yes
	2	百班 Baiban	1 小时 1 hour	0.084	18090607	100	0.08	达标 Yes
	3	竹儿根 Zhuergen	1 小时 1 hour	0.154	18091107	100	0.15	达标 Yes
	4	彬崇村 Binchong Village	1 小时 1 hour	0.218	18091107	100	0.22	达标 Yes
	5	山心 Shanxin	1 小时 1 hour	0.2251	18091107	100	0.23	达标 Yes
	6	邓屋 Dengwu	1 小时 1 hour	0.2646	18091107	100	0.26	达标 Yes

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
facilities for tail gas from hydrochloric acid synthesis in chlorine dioxide workshop-Cl2	7	对面垌 Duimiandong	1 小时 1 hour	0.1056	18102222	100	0.11	达标 Yes
	8	老妗垌 Laojindong	1 小时 1 hour	0.112	18081907	100	0.11	达标 Yes
	9	坡尾底 Poweidi	1 小时 1 hour	0.2679	18081807	100	0.27	达标 Yes
	10	川江 Chuanjiang	1 小时 1 hour	0.2297	18081807	100	0.23	达标 Yes
	11	彬定（新） Binding (New village)	1 小时 1 hour	0.0914	18030904	100	0.09	达标 Yes
	12	大塘村 Datang Village	1 小时 1 hour	0.0759	18071803	100	0.08	达标 Yes
	13	南乐 Nanyue	1 小时 1 hour	0.2436	18091107	100	0.24	达标 Yes
	14	陂头 Potou	1 小时 1 hour	0.193	18091107	100	0.19	达标 Yes
	15	亚细 Yaxi	1 小时 1 hour	0.1297	18091107	100	0.13	达标 Yes
	16	南乐社区 Nanyue Community	1 小时 1 hour	0.1049	18091107	100	0.1	达标 Yes
	17	海山排 Haishanpai	1 小时 1 hour	0.09	18091107	100	0.09	达标 Yes
	18	谢家村 Xiejiacun Village	1 小时 1 hour	0.0861	18092618	100	0.09	达标 Yes
	19	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	0.0725	18081907	100	0.07	达标 Yes
	20	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	0.0804	18081907	100	0.08	达标 Yes
	21	华南北苑 Huanan Beiyuan	1 小时 1 hour	0.0862	18081907	100	0.09	达标 Yes
	22	新岭	1 小时	0.1029	18081907	100	0.1	达标

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量(μg/m^3) Concentration incremental (μg/m^3)	出现时间(YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准(μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
		Xinling	1 hour					Yes
	23	新铺 Xinpu	1 小时 1 hour	0.0915	18092618	100	0.09	达标 Yes
	24	大田 Datian	1 小时 1 hour	0.1328	18091107	100	0.13	达标 Yes
	25	大竹园 Dazhuyuan	1 小时 1 hour	0.0633	18090607	100	0.06	达标 Yes
	26	彬垌 Bindong	1 小时 1 hour	0.0682	18090219	100	0.07	达标 Yes
	27	新坡村 Xinpo Village	1 小时 1 hour	0.0775	18081721	100	0.08	达标 Yes
	28	槟榔根 Binlanggen	1 小时 1 hour	0.0786	18112005	100	0.08	达标 Yes
	29	网格 Mesh	1 小时 1 hour	0.5046	18091107	100	0.5	达标 Yes
二氧化氯车间盐酸合成尾气治理措施故障-HCl Failure of treatment facilities for tail gas from hydrochloric acid synthesis in	1	猪血塘 Zhuxuetang	1 小时 1 hour	0.2033	18083105	50	0.41	达标 Yes
	2	百班 Baiban	1 小时 1 hour	0.2183	18090607	50	0.44	达标 Yes
	3	竹儿根 Zhuergen	1 小时 1 hour	0.4004	18091107	50	0.8	达标 Yes
	4	彬崇村 Binchong Village	1 小时 1 hour	0.5669	18091107	50	1.13	达标 Yes
	5	山心 Shanxin	1 小时 1 hour	0.5852	18091107	50	1.17	达标 Yes
	6	邓屋 Dengwu	1 小时 1 hour	0.6879	18091107	50	1.38	达标 Yes
	7	对面垌 Duimiandong	1 小时 1 hour	0.2744	18102222	50	0.55	达标 Yes
	8	老妗垌 Laojindong	1 小时 1 hour	0.2912	18081907	50	0.58	达标 Yes
	9	坡尾底 Poweidi	1 小时 1 hour	0.6966	18081807	50	1.39	达标 Yes
	10	川江 Chuanjiang	1 小时 1 hour	0.5973	18081807	50	1.19	达标 Yes
	11	彬定（新） Binding (New	1 小时 1 hour	0.2376	18030904	50	0.48	达标 Yes

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
chlorine dioxide workshop-HCl		village)						
	12	大塘村 Datang Village	1 小时 1 hour	0.1973	18071803	50	0.39	达标 Yes
	13	南乐 Nanyue	1 小时 1 hour	0.6334	18091107	50	1.27	达标 Yes
	14	陂头 Potou	1 小时 1 hour	0.5018	18091107	50	1	达标 Yes
	15	亚细 Yaxi	1 小时 1 hour	0.3371	18091107	50	0.67	达标 Yes
	16	南乐社区 Nanyue Community	1 小时 1 hour	0.2727	18091107	50	0.55	达标 Yes
	17	海山排 Haishanpai	1 小时 1 hour	0.234	18091107	50	0.47	达标 Yes
	18	谢家村 Xiejiacun Village	1 小时 1 hour	0.2239	18092618	50	0.45	达标 Yes
	19	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	0.1884	18081907	50	0.38	达标 Yes
	20	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	0.2091	18081907	50	0.42	达标 Yes
	21	华南北苑 Huanan Beiyuan	1 小时 1 hour	0.224	18081907	50	0.45	达标 Yes
	22	新岭 Xinling	1 小时 1 hour	0.2676	18081907	50	0.54	达标 Yes
	23	新铺 Xinpu	1 小时 1 hour	0.2378	18092618	50	0.48	达标 Yes
	24	大田 Datian	1 小时 1 hour	0.3452	18091107	50	0.69	达标 Yes
	25	大竹园 Dazhuyuan	1 小时 1 hour	0.1647	18090607	50	0.33	达标 Yes
	26	彬垌 Bindong	1 小时 1 hour	0.1774	18090219	50	0.35	达标 Yes
	27	新坡村	1 小时	0.2014	18081721	50	0.4	达标

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
		Xinpo Village	1 hour					Yes
	28	槟榔根 Binlanggen	1 小时 1 hour	0.2044	18112005	50	0.41	达标 Yes
	29	网格 Mesh	1 小时 1 hour	1.3119	18091107	50	2.62	达标 Yes
二氧化氯车间槽罐尾气治理措施故障-Cl2 Failure of treatment facilities for tail gas from tank in chlorine dioxide workshop-Cl2	1	猪血塘 Zhuxuetang	1 小时 1 hour	0.4195	18061023	100	0.42	达标 Yes
	2	百班 Baiban	1 小时 1 hour	0.9971	18090605	100	1	达标 Yes
	3	竹儿根 Zhuergen	1 小时 1 hour	0.7466	18061506	100	0.75	达标 Yes
	4	彬崇村 Binchong Village	1 小时 1 hour	0.6493	18092322	100	0.65	达标 Yes
	5	山心 Shanxin	1 小时 1 hour	1.2863	18092224	100	1.29	达标 Yes
	6	邓屋 Dengwu	1 小时 1 hour	0.7223	18072006	100	0.72	达标 Yes
	7	对面垌 Duimiandong	1 小时 1 hour	0.538	18081721	100	0.54	达标 Yes
	8	老妗垌 Laojindong	1 小时 1 hour	0.608	18091019	100	0.61	达标 Yes
	9	坡尾底 Poweidi	1 小时 1 hour	0.7894	18110919	100	0.79	达标 Yes
	10	川江 Chuanjiang	1 小时 1 hour	1.1084	18111217	100	1.11	达标 Yes
	11	彬定（新） Binding (New village)	1 小时 1 hour	0.6867	18080921	100	0.69	达标 Yes
	12	大塘村 Datang Village	1 小时 1 hour	0.5242	18073006	100	0.52	达标 Yes
	13	南乐 Nanyue	1 小时 1 hour	0.6897	18091107	100	0.69	达标 Yes
	14	陂头 Potou	1 小时 1 hour	0.6761	18110419	100	0.68	达标 Yes
	15	亚细 Yaxi	1 小时 1 hour	0.4376	18100719	100	0.44	达标 Yes
	16	南乐社区	1 小时	0.5597	18092323	100	0.56	达标

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
		Nanyue Community	1 hour					Yes
	17	海山排 Haishanpai	1 小时 1 hour	0.3607	18100719	100	0.36	达标 Yes
	18	谢家村 Xiejiacun Village	1 小时 1 hour	0.6207	18052222	100	0.62	达标 Yes
	19	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	0.48	18080520	100	0.48	达标 Yes
	20	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	0.5735	18091019	100	0.57	达标 Yes
	21	华南北苑 Huanan Beiyuan	1 小时 1 hour	0.693	18091019	100	0.69	达标 Yes
	22	新岭 Xinling	1 小时 1 hour	0.7861	18091019	100	0.79	达标 Yes
	23	新铺 Xinpu	1 小时 1 hour	0.4924	18052423	100	0.49	达标 Yes
	24	大田 Datian	1 小时 1 hour	0.8255	18062722	100	0.83	达标 Yes
	25	大竹园 Dazhuyuan	1 小时 1 hour	0.4015	18080503	100	0.4	达标 Yes
	26	彬垌 Bindong	1 小时 1 hour	0.4425	18051220	100	0.44	达标 Yes
	27	新坡村 Xinpo Village	1 小时 1 hour	0.6002	18061606	100	0.6	达标 Yes
	28	槟榔根 Binlanggen	1 小时 1 hour	0.5812	18091019	100	0.58	达标 Yes
	29	网格 Mesh	1 小时 1 hour	1.8543	18080621	100	1.85	达标 Yes

（3）碱炉停机或事故情况下，臭气收集系统收集的臭气送到臭气焚烧炉燃烧后排放。预测结果见表 4.2-57。由预测结果可知，氯化氢各敏感点及网格点均满足《环境影响评价技术导则 大气环境》（HJ2.2-2018）附录 D 标准要求。

(3) In case of shutdown or accident of alkali furnace, the odor collected by the odor collection system will be delivered to the odor incinerator for discharge upon incineration. The prediction results are as shown in Table 4.2-57. As revealed by the prediction results, all mesh and sensitive points of HCl comply with standard requirements in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment* (HJ2.2-2018).

表 4.2-57 非正常工况：碱炉停机或事故情况下臭气单独焚烧排放预测结果表

Table 4.2-57 Abnormal Working Condition: Prediction Results of in Case of Shutdown or Accident of Alkali Furnace

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
碱炉停机或事故情况下，臭气单独焚烧排放-H_2S In case of shutdown or accident of alkali furnace, the odor is separately incinerated	1	猪血塘 Zhuxuetang	1 小时 1 hour	1.0172	18021608	10	10.17	达标 Yes
	2	百班 Baiban	1 小时 1 hour	1.1167	18010608	10	11.17	达标 Yes
	3	竹儿根 Zhuergen	1 小时 1 hour	1.1308	18022408	10	11.31	达标 Yes
	4	彬崇村 Binchong Village	1 小时 1 hour	0.8801	18072608	10	8.8	达标 Yes
	5	山心 Shanxin	1 小时 1 hour	0.8368	18072608	10	8.37	达标 Yes
	6	邓屋 Dengwu	1 小时 1 hour	1.1422	18022408	10	11.42	达标 Yes
	7	对面垌 Duimiandong	1 小时 1 hour	1.3137	18060207	10	13.14	达标 Yes
	8	老妗垌 Laojindong	1 小时 1 hour	1.296	18060207	10	12.96	达标 Yes
	9	坡尾底 Poweidi	1 小时 1 hour	1.105	18021308	10	11.05	达标 Yes
	10	川江 Chuanjiang	1 小时 1 hour	0.8719	18081809	10	8.72	达标 Yes
	11	彬定（新） Binding (New village)	1 小时 1 hour	0.8614	18082507	10	8.61	达标 Yes
	12	大塘村 Datang Village	1 小时 1 hour	0.9712	18060207	10	9.71	达标 Yes
	13	南乐	1 小时	0.8606	18080508	10	8.61	达标

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
and discharged-H_2S		Nanyue	1 hour					Yes
	14	陂头 Potou	1 小时 1 hour	0.8243	18091108	10	8.24	达标 Yes
	15	亚细 Yaxi	1 小时 1 hour	1.0012	18082809	10	10.01	达标 Yes
	16	南乐社区 Nanyue Community	1 小时 1 hour	1.0071	18082809	10	10.07	达标 Yes
	17	海山排 Haishanpai	1 小时 1 hour	1.2089	18082809	10	12.09	达标 Yes
	18	谢家村 Xiejiacun Village	1 小时 1 hour	1.074	18080907	10	10.74	达标 Yes
	19	阳光海岸（中石化倒班宿舍） Yangguang Coast (SINOPEC shift dormitory)	1 小时 1 hour	0.9893	18060207	10	9.89	达标 Yes
	20	东方海岸大酒店 Oriental Coast Hotel	1 小时 1 hour	1.0015	18060207	10	10.01	达标 Yes
	21	华南北苑 Huanan Beiyuan	1 小时 1 hour	1.0312	18060207	10	10.31	达标 Yes
	22	新岭 Xinling	1 小时 1 hour	1.141	18060207	10	11.41	达标 Yes
	23	新铺 Xinpu	1 小时 1 hour	1.2954	18080907	10	12.95	达标 Yes
	24	大田 Datian	1 小时 1 hour	0.7659	18061507	10	7.66	达标 Yes
	25	大竹园 Dazhuyuan	1 小时 1 hour	1.0245	18100107	10	10.24	达标 Yes
	26	彬垌 Bindong	1 小时 1 hour	0.9147	18100107	10	9.15	达标 Yes
	27	新坡村 Xinpo Village	1 小时 1 hour	0.8285	18021608	10	8.28	达标 Yes
	28	槟榔根 Binlanggen	1 小时 1 hour	0.8515	18082507	10	8.51	达标 Yes
	29	网格	1 小时	1.8728	18092411	10	18.73	达标

预测情景 Prediction background	序号 S.N.	点名称 Point name	浓度类型 Type of concentration	浓度增量 (μg/m^3) Concentration incremental (μg/m^3)	出现时间 (YYMMDDHH) Occurrence time (HHDDMMYY)	评价标准 (μg/m^3) Assessment standard (μg/m^3)	占标率% Pi %	是否超标 Whether exceeding the standard
		Mesh	1 hour					Yes

4.2.8 恶臭影响分析

4.2.8 Analysis of odor impact

（1）臭气来源及性质

(1) Source and nature of odor

本项目异味来源主要在污水处理站臭气，主要臭气成分为 H_2S、NH_3 等。

The odor of this project is mainly sourced from the odor of the sewage treatment station, and the major odor components are H2S, NH3 and so on.

人们凭嗅觉可闻到的异味物质有 4000 多种，其中涉及生态环境和人体健康的有 40 余种。异味不仅给人的感觉器官以刺激，使人感到不愉快和厌恶，而且某些组分如硫化氢、硫醇、胺类、氨等可直接对呼吸系统、内分泌系统、循环系统、神经系统产生严重危害。长期受到一种或几种低浓度异味物质的刺激，会引起嗅觉疲劳、嗅觉丧失等障碍，甚至导致在大脑皮层兴奋和抑制的调节功能失调。

There are more than 4,000 kinds of odor substances that people can sense by smell, of which more than 40 kinds involve ecological environment and human health. Odor not only irritates people's sensory organs and makes people feel unhappy and disgusted, but also some odor components such as hydrogen sulfide, mercaptan, amines, ammonia, etc. may directly cause serious harm to respiratory, endocrine, circulatory and nerve system. Long-term irritation by one or more low-concentration odor substances will cause olfactory fatigue, olfactory loss and other disorders, and even lead to regulatory dysfunction of excitation and inhibition in cerebral cortex.

（2）恶臭影响分析

(2) Analysis of odor impact

污水处理站布设在厂区北面，与斯道拉恩索（广西）浆纸有限公司相邻。项目对污水处理站产生臭气的构筑物进行加盖密封，并配置一套碱洗除臭系统，臭气经抽风管送至除臭系统，经喷淋洗涤后，送至生产区碱炉内燃烧分解后，经过碱炉烟囱排放。当碱

炉停机或事故情况下，臭气收集系统收集的臭气送到臭气焚烧炉燃烧后单独排放。

The sewage treatment station is located to the north of plant area, adjacent to Stora Enso (Guangxi) Pulp Paper Co., Ltd. The Project covers and seals the structures of the sewage treatment plant that may produce odor, and arranges a alkali washing deodorization system; the odor is sent to the deodorization system through the exhaust column, and then to the alkali furnace for combustion in the production area after spray washing; finally, it will be emitted through the alkali furnace chimney. In case of shutdown or accident of alkali furnace, the odor collected by the odor collection system will be delivered to the odor incinerator for separate discharge upon incineration.

经预测，正常情况下，臭气送碱炉焚烧后，在与氧气充分接触的下高温分解为 SO_2、NO_2，经碱炉配套的烟气脱硫脱硝系统处理后排放，臭气对环境的影响不大；非正常情况下，臭气经收集后单独进行焚烧处理，外排的硫化氢网格点最大贡献值为 1.8728μg/m^3，占标率仅为 18.73%。

According to prediction, under normal circumstances, the odor will be decomposed into SO2 and NO2 at high temperature under full contact with oxygen after being delivered to the alkali furnace for incineration, which then will be discharged after being treated by the flue gas desulfurization and denitration system associated with the alkali furnace, imposing limited impact on the environment. Under abnormal conditions, odor will be collected and incinerated separately. The maximum contribution value of discharged hydrogen sulfide at mesh points is 1.8728μg/m^3 with Pi of merely 18.73%.

项目周边最近的敏感点为项目用地西面 650m 的老妗垌，经大气预测结果表明，项目运营后各个敏感点、区域网网格点的硫化氢、氨气预测值能达到《环境影响评价技术导则 大气环境》（HJ 2.2-2018）附录 D 其他污染物空气质量浓度参考限值，未出现超标现象。综合上述，本工程臭气对周围环境影响较小。

The nearest sensitive point around the project is Laojindong, 650m west of the project land. The atmospheric prediction results show that the predicted values of hydrogen sulfide and ammonia at individual sensitive points and regional mesh points can reach the air mass concentration reference limits of other pollutants in Annex D of Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment (HJ2.2-2018) after the project is commissioned with no standard being exceeded. To sum up, this project will impose limited impact on surrounding environment.

4.2.9 二噁英影响分析

4.2.9 Analysis of dioxin impact

项目设有一台 220t/h 固废锅炉，燃料为项目产生的木屑、浆渣和污水处理站污泥，同时掺烧 20%原煤，固废锅炉作为焚烧炉考虑，废气中会有极少量的二噁英产生。根据工程分析，固废锅炉二噁英排放量为 0.0102mg/h，排放浓度为 0.033ngTEG/m^3。经《环境影响评价技术导则—大气环境》（HJ2.2-2018）中推荐估算模型 AERSCREEN 计算，二噁英最大落地 0.0015pg/m^3，占标率为 0.04%。由此可知，项目排放的二噁英对周边环境影响极小。

The project is provided with a 220t/h solid waste boiler operating on sawdust, slurry and sludge from the sewage treatment station generated by the project, of which 20% is supplemented by raw coal. The solid waste boiler is considered as an incinerator and an extremely small amount of dioxin will be generated in the waste gas therefrom. According to engineering analysis, the emission of dioxin from solid waste boiler is 0.0102mg/h with emission concentration of 0.033 ngTEG/m^3. Through calculation by using AERSCREEN, the recommended estimation model in *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment* (HJ2.2-2018), the maximum ground-level concentration of dioxin is 0.0015pg/m^3 with Pi of 0.04%. From this, it can be seen that the dioxin emitted by the project will impose little impact on surrounding environment.

4.2.10 大气防护距离

4.2.10 Atmospheric protection distance

根据《环境影响评价技术导则　大气环境》（HJ2.2-2018）：“对于项目厂界浓度满足大气污染物厂界浓度限值，但厂界外大气污染物短期贡献值浓度超过环境质量浓度限值的，可以自厂界向外设置一定范围的大气环境防护区域，以确保大气环境防护区域外的污染物贡献浓度满足环境质量标准。”采用进一步预测模型模拟评价基准年内，项目所有污染源（改建、扩建项目应包括全厂现有污染源）对厂界外主要污染物的短期贡献浓度分布。厂界外预测网格分辨率不应超过为 50m，本次预测取 50m。

As stipulated in *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment* (HJ2.2-2018): *If the plant boundary concentration of the project* *meets the plant boundary concentration limit of air pollutants while the short-term contribution value concentration of air pollutants outside the plant boundary exceeds the environmental quality concentration limit, a certain atmospheric environmental protection areas can be set out from the plant boundary to ensure that the contribution concentration of pollutants outside the atmospheric environmental protection area meets the environmental quality standard.* Further prediction model is used to simulate and assess the distribution of all pollution sources of the project (reconstruction and expansion projects shall include the existing pollution sources of the whole plant) over the short-term contribution concentration of major pollutants outside plant boundary within the base year. The resolution of the prediction mesh outside the factory boundary shall not exceed 50m and be taken as 50m for this prediction.

经预测，厂界外无超标区域，无需设置大气环境防护距离。

Through prediction, no out-of-standard area is available in plant boundary so that no atmospheric environmental protection distance is necessary.

4.2.11 环境防护距离

4.2.11 Environment protection distance

项目在正常运行过程中制浆生产线产生的臭气可能对周边环境产生一定的影响，为了使影响降至最低，本次环评参考《造纸及纸制品业卫生防护距离 第 1 部分：纸浆制造业》（GB/T 11654.1-2012）设置一定的防护距离。

Odor generated by the pulping production line during normal operation of the project may impose certain impact on surrounding environment. In order to minimize the impact, a certain protection distance is set up in this EIA by reference to *Health Protection Zone of Paper and Paper Products Industry Part 1: Pulp and Paper Industry* (GB/T 11654.1-2012).

本项目制浆生产规模为 120 万 t/a＞30 万 t/a，所在地区近 5 年平均风速在 2~4m/s，因此卫生防护距离设置 800m，即以化学浆车间为边界，外延 800m 范围作为本项目的环境防护距离。防护距离超出东厂界最远距离为 400m；超出北厂界外 170m，落在广西宏大化工有限公司双氧水项目用地范围内；超出南厂界最远距离为 135m；未超出西厂界边线。根据现场调查，超出厂界部分均无环境敏感目标，不涉及居民搬迁问题。厂界外防护距离范围均为规划的工业用地和防护绿地，不涉及规划的居住用地、行政办公、

商业用地等。园区后续发展不应在防护距离范围内规划建设居民区、学校、医院、行政办公和科研等敏感目标。环境防护距离包络线范围详见图 4.2-42。

The pulping production scale of this project is 1,200,000t/a which is > 300,000 t/a, and the average wind speed in the project area in recent 5 years is 2-4m/s. As such, the health protection distance is set at 800m, i.e. the chemical pulp workshop is taken as the boundary and shall be extended by 800m as the environmental protection distance of this project. The maximum protection distance beyond the east plant boundary is 400m, which is 170m beyond the boundary of the north plant boundary and lies within the land area of Hydrogen Peroxide Project of Guangxi Hongda Chemical Engineering Co., Ltd; the maximum protection distance beyond the south plant boundary is 135m and is not beyond the west plant boundary line. According to field investigation, no environmentally sensitive target is available beyond the plant boundary with no relocation of residents involved. The range of protection distance outside the plant boundary is the planned industrial land and protective green space with no planned residential, administrative office and commercial land, etc. involved. In further development of the park, sensitive targets such as residential areas, schools, hospitals, administrative offices and scientific research, etc. shall not be planned within the range of protective distance. Envelope line range of environmental protection distance is detailed in Figure 4.2-42.

图 4.2-42　环境防护距离包络线图

Figure 4.2-42 Envelope Line Chart of Environmental Protection Distance

4.2.12 污染物排放量核算

4.2.12 Accounting of pollutant emission

本项目污染物排放量核算主要是新增污染源，包括无组织、有组织、年排放量、非正常排放量核算。

Accounting of pollutant emission in this project is mainly the accounting of newly added pollution sources, including fugitive and intentional emission, annual emission and abnormal emission.

（1）有组织排放量核算

1) Accounting of intentional emission

表 4.2-58 大气污染物有组织排放量核算表（一二期建成后）

Table 4.2-58 Accounting of Intentional Emission of Air Pollutants (upon Completion of Phase I and II)

<table>
<tr><th>序号 S.N.</th><th colspan="2">排放口编号 No. of emission outlet</th><th>污染物 Pollutant</th><th>核算排放浓度/（mg/m³） Accounted emission concentration/(mg/m³)</th><th>核算排放速率/（kg/h） Accounted emission rate/(kg/h)</th><th>核算年排放速率/（t/a） Accounted annual emission rate/(t/a)</th></tr>
<tr><td colspan="7">主要排放口
Major emission outlets</td></tr>
<tr><td rowspan="15">1</td><td rowspan="15">1#多管集束烟囱 #1 multi-tube cluster chimney</td><td rowspan="4">4600tds/d 碱炉（1#烟囱）4600tds/d alkali furnace (#1 chimney)</td><td>烟尘
Smoke dust</td><td>27.6</td><td>27.01</td><td>220.41</td></tr>
<tr><td>二氧化硫
Sulfur dioxide</td><td>45.8</td><td>44.83</td><td>365.84</td></tr>
<tr><td>氮氧化物
Oxynitride</td><td>200.0</td><td>195.98</td><td>1599.23</td></tr>
<tr><td>硫化氢
Hydrogen sulfide</td><td>4.6</td><td>4.49</td><td>36.6</td></tr>
<tr><td rowspan="4">850t/d 石灰窑（2#烟囱）850t/d lime kiln (#2 chimney)</td><td>烟尘
Smoke dust</td><td>58.4</td><td>9.28</td><td>75.72</td></tr>
<tr><td>二氧化硫
Sulfur dioxide</td><td>99.7</td><td>15.83</td><td>129.20</td></tr>
<tr><td>氮氧化物
Oxynitride</td><td>419.9</td><td>66.67</td><td>544.00</td></tr>
<tr><td>硫化氢
Hydrogen sulfide</td><td>13.5</td><td>2.14</td><td>17.5</td></tr>
<tr><td rowspan="7">220t/h 固废锅炉（3#烟囱）220t/h solid waste boiler (#3 chimney)</td><td>烟尘
Smoke dust</td><td>9.88</td><td>2.28</td><td>18.57</td></tr>
<tr><td>二氧化硫
Sulfur dioxide</td><td>34.73</td><td>8.00</td><td>65.29</td></tr>
<tr><td>氮氧化物
Oxynitride</td><td>49.95</td><td>11.51</td><td>93.90</td></tr>
<tr><td>氯化氢
Hydrogen chloride</td><td>25</td><td>5.76</td><td>47.00</td></tr>
<tr><td>一氧化碳
Carbon monoxide</td><td>100</td><td>23.04</td><td>187.99</td></tr>
<tr><td>汞
Mercury</td><td>0.0121</td><td>0.00279</td><td>0.0227</td></tr>
<tr><td>镉+铊
Cadmium +thallium</td><td>0.0975</td><td>0.0225</td><td>0.1833</td></tr>
</table>

序号 S.N.	排放口编号 No. of emission outlet		污染物 Pollutant	核算排放浓度/（mg/m³） Accounted emission concentration/(mg/m³)	核算排放速率/（kg/h） Accounted emission rate/(kg/h)	核算年排放速率/（t/a） Accounted annual emission rate/(t/a)
			锑+砷+铅+铬+钴+铜+锰+镍 Antimony+arsenic+lead+chromium +cobalt+copper+manganese+nickel	0.9677	0.2229	1.8193
			二噁英 Dioxin	0.0330 ng TEG/m³	0.0076 mg/h	0.0620 mg/a
		2×280t/h 燃煤锅炉（3#烟囱） 2×280t/h coal-fired boilers (#3 chimney)	烟尘 Smoke dust	9.87	5.83	47.59
			二氧化硫 Sulfur dioxide	34.90	20.62	168.25
			氮氧化物 Oxynitride	49.80	29.42	240.11
			汞及其化合物 Mercury and its compounds	0.011	0.006	0.055
		漂白塔（4#烟囱） Bleaching tower (#4 chimney)	Cl_2	4	0.065	0.530
主要排放口合计 Total of major emission outlets			烟尘 Smoke dust	--	--	362.28
			二氧化硫 Sulfur dioxide	--	--	728.58
			氮氧化物 Oxynitride	--	--	2477.24
			氯化氢 Hydrogen chloride	--	--	47
			一氧化碳 Carbon monoxide	--	--	187.99
			汞 Mercury	--	--	0.0777
			镉+铊 Cadmium +thallium	--	--	0.1833

序号 S.N.	排放口编号 No. of emission outlet	污染物 Pollutant	核算排放浓度/（mg/m³）Accounted emission concentration/(mg/m³)	核算排放速率/（kg/h）Accounted emission rate/(kg/h)	核算年排放速率/（t/a）Accounted annual emission rate/(t/a)
		锑+砷+铅+铬+钴+铜+锰+镍 Antimony+arsenic+lead+chromium +cobalt+copper+manganese+nickel	--	--	1.8193
		二噁英 Dioxin	--	--	0.062mg/a
		硫化氢 Hydrogen sulfide	--	--	54.1
		氯气 Chlorine	--	--	0.53
一般排放口 General emission outlets					
2	二氧化氯车间过量氢气排空尾气（6#排气筒）Excessive hydrogen tail gas from chlorine dioxide workshop (#6 exhaust funnel)	Cl_2	6.3	0.013	0.102
3	二氧化氯车间盐酸合成尾气（7#排气筒）Hydrochloric acid synthesis tail gas from chlorine dioxide workshop (#7 exhaust funnel)	Cl_2	6.4	0.016	0.131
		HCl	15.2	0.038	0.310
4	二氧化氯车间槽罐尾气（8#排气筒）Tank tail gas from chlorine dioxide workshop (#8 exhaust funnel)	Cl_2	7.3	0.033	0.269
一般排放口合计 Total of general emission outlets		氯化氢 Hydrogen chloride			0.31
		氯气 Chlorine			0.502

序号 S.N.	排放口编号 No. of emission outlet	污染物 Pollutant	核算排放浓度/（mg/m^3） Accounted emission concentration/(mg/m^3)	核算排放速率/（kg/h） Accounted emission rate/(kg/h)	核算年排放速率/（t/a） Accounted annual emission rate/(t/a)
有组织排放总计 Total of intentional emission					
有组织排放总计 Total amount of intentional emission		烟尘 Smoke dust			362.28
		二氧化硫 Sulfur dioxide			728.58
		氮氧化物 Oxynitride			2477.24
		氯化氢 Hydrogen chloride			47.31
		一氧化碳 Carbon monoxide			187.99
		汞 Mercury			0.0777
		镉+铊 Cadmium +thallium			0.1833
		锑+砷+铅+铬+钴+铜+锰+镍 Antimony+arsenic+lead+chromium +cobalt+copper+manganese+nickel			1.8193
		二噁英 Dioxin			0.062mg/a
		硫化氢 Hydrogen sulfide			54.1
		氯气 Chlorine			1.032

（2）无组织排放量核算

2) Accounting of fugitive emission

表 4.2-59 大气污染物无组织排放量核算**表**

Table 4.2-59 Accounting of Fugitive Emission of Air pollutants

序号 S.N.	排放口编号 No. of emission outlet	产污环节 Pollutant generation process	污染物 Pollutant	主要污染防治措施 Main pollution prevention	国家污染物排放标准 National pollutant emission standards		年排放量/（t/a） Annual emission/(t/a)
					标准名称 Name of standards	标准限值 Standard limits	

				measures			
1	干煤棚粉尘 Dust of the dry coal shed	干煤棚 Dry coal shed	TSP	大气扩散 Atmospheric diffusion	《大气污染物综合排放标准》（GB16297-1996） Comprehensive Emission Standards for Air Pollutants (GB16297-1996)	周界外浓度最高点 1.0mg/m^3 Maximum concentration outside the perimeter 1.0mg/m^3	4.57
2	二氧化氯车间 Chlorine dioxide workshop	二氧化氯生产、贮存过程 Production and storage process of chlorine dioxide	Cl_2	大气扩散 Atmospheric diffusion	《无机化学工业污染物排放标准》（GB31573-2015） *Emission Standard of Pollutants for Synthetic Resin Industry* (GB31573-2015)	0.1	0.459
			HCl			0.05	0.459
3	污水处理站恶臭 Odor of sewage treatment station	污水处理站 Sewage treatment plant	硫化氢 Hydrogen sulfide	大气扩散 Atmospheric diffusion	《恶臭污染物排放标准》（二级标准）GB14554-93 *Emission Standards for Odor Pollutants* (Level II standard) (GB14554-93)	厂界浓度：$NH_3$1.5mg/m^3、H_2S0.06 mg/m^3 Plant boundary concentration: NH_3 1.5mg/m^3, H_2S 0.06 mg/m^3	0.0049
			氨 Ammonia				1.05
4	加油站有机废气 Organic waste gas of petrol station	加油站 Gas station	非甲烷总烃 Non-methane hydrocarbon	大气扩散 Atmospheric diffusion	《大气污染物综合排放标准》（GB16297-1996） Comprehensive Emission Standards for Air Pollutants (GB16297-1996)	周界外浓度最高点 4.0mg/m^3 Maximum concentration outside the perimeter 4.0mg/m^3	0.106
无组织排放总计 Total of fugitive emission							
无组织排放总计 Total amount of fugitive emission				TSP			41.13
				Cl_2			0.46
				HCl			0.46
				硫化氢 Hydrogen sulfide			0.005
				氨 Ammonia			1.053
				非甲烷总烃 Non-methane hydrocarbon			0.106

（3）项目大气污染物年排放量核算

(3) Accounting of annual emission of air pollutants in the project

表 4.2-60 项目大气污染物年排放量核算表

Table 4.2-60 Accounting of Annual Emission of Air Pollutants for the Project

序号 S.N.	污染物 Pollutant	年排放量/（t/a） Annual discharge (t/a)
1	烟尘 Smoke dust	362.28
2	二氧化硫 Sulfur dioxide	728.58
3	氮氧化物 Oxynitride	2477.24
4	氯化氢 Hydrogen chloride	47.77
5	一氧化碳 Carbon monoxide	187.99
6	汞 Mercury	0.0777
7	镉+铊 Cadmium +thallium	0.1833
8	锑+砷+铅+铬+钴+铜+锰+镍 Antimony+arsenic+lead+chromium +cobalt+copper+manganese+nickel	1.8193
9	二噁英 Dioxin	0.062mg/a
10	硫化氢 Hydrogen sulfide	54.1
11	氯气 Chlorine	1.492
12	粉尘（TSP） Dust (TSP)	41.13
13	氨 Ammonia	1.053
14	非甲烷总烃 Non-methane hydrocarbon	0.106

（4）非正常排放量核算

(4) Accounting of abnormal emission

表 4.2-61 项目大气污染物非正常排放量核算表

Table 4.2-61 Accounting of Abnormal Emission of Air Pollutants for the Project

序号 S.N.	污染源 Source of pollution	非正常排放情景 Unusual emission situation	非正常排放速率(kg/h) Unusual emission rate (kg/h)					
			烟尘 Smoke dust	SO_2	NO_x	Cl_2	HCl	H_2S
1	4600tds/d 碱炉 4,600tds/d alkali furnace	开停车阶段，添加天然气助燃 Add natural gas for supporting combustion in the startup and	/	80	374.2	/	/	/
2	850t/d 石灰窑 850t/d lime kiln		/	56	261.94	/	/	/

序号 S.N.	**污染源 Source of pollution**	**非正常排放情景 Unusual emission situation**	**非正常排放速率(kg/h) Unusual emission rate (kg/h)**					
			烟尘 Smoke dust	**SO_2**	**NO_x**	**Cl_2**	**HCl**	**H_2S**
		shutdown period						
3	4600tds/d 碱炉 4,600tds/d alkali furnace	废气治理设施故障导致除尘效率降至 95% Exhaust gas treatment facility failure makes the dust removal efficiency drop to 95%	1688.16	/	/	/	/	/
4	850t/d 石灰窑 850t/d lime kiln	废气治理设施故障导致除尘效率降至 95% Exhaust gas treatment facility failure makes the dust removal efficiency drop to 95%	139.17	/	/	/	/	/
5	220t/h 锅炉 220t/h boiler	废气治理设施故障导致除尘效率降至 95%，脱硫、脱硝效率下降至 50% Exhaust gas treatment facility failure makes the dust removal efficiency drop to 95%, and desulfurization and denitration efficiency drop to 50%	172.69	90.4	34.56	/	/	/
6	2×280t/h 锅炉 2×280t/h boiler	废气治理设施故障导致除尘效率降至 95%，脱硫、脱硝效率下降至 50% Exhaust gas treatment facility failure makes the dust removal efficiency drop to 95%, and desulfurization and denitration efficiency drop to 50%	275.76	201.66	44.32	/	/	/
7	二氧化氯车间过量氢气排空尾气 Excessive hydrogen tail gas of chlorine dioxide workshop	废气治理设施故障导致去除率降至 0% Exhaust gas treatment facility failure makes the removal efficiency drop to 0%	/	/	/	0.05	/	/
8	二氧化氯车间盐酸合成尾气 Tail gas from hydrochloric acid synthesis in chlorine dioxide workshop		/	/	/	0.05	0.13	/
9	二氧化氯车间槽罐尾气		/	/	/	0.13	/	/

序号 S.N.	污染源 Source of pollution	非正常排放情景 Unusual emission situation	非正常排放速率(kg/h) Unusual emission rate (kg/h)					
			烟尘 Smoke dust	SO_2	NO_x	Cl_2	HCl	H_2S
	Tail gas from tank of chlorine dioxide workshop							
10	焚烧器 Incinerator	碱炉停机或事故情况下 In case of alkali furnace shutdown or accident	/	/	/	/	/	4.4

4.2.13 小结

4.2.13 Summary

（1）大气环境影响评价结论

(1) Conclusion of atmospheric environment impact assessment

①项目新增污染源正常排放下 SO_2、NO_2、PM_{10}、$PM_{2.5}$、HCl、H_2S、NH_3、As、Hg、Cd、TSP、Cl_2 短期浓度贡献值的最大浓度占标率≤100%。

① Under normal emission of newly added pollution sources in the project, Pi of maximum concentration of short-term concentration contribution value of SO_2, NO_2, PM_{10}, $PM_{2.5}$, HCl, H_2S, NH_3, As, Hg, Cd, TSP and Cl_2 is ≤100%.

②项目新增污染源正常排放下 SO_2、NO_2、PM_{10}、$PM_{2.5}$、HCl、As、Hg、Cd、TSP、Cl_2 年均浓度贡献值的最大浓度占标率≤30%。

② Under normal emission of newly added pollution sources in the project, Pi of maximum concentration of annual concentration contribution value of SO_2, NO_2, PM_{10}, $PM_{2.5}$, HCl, H_2S, NH_3, As, Hg, Cd, TSP and Cl_2 is ≤30%.

达标区环境影响接受条件判别详见表 4.2-35。

Determination of environmental impact acceptance conditions in up-to-standard area is detailed in Table 4.2-35.

表 4.2-62 达标区环境影响接受条件判别表
Table 4.2-35 Determination of Environmental Impact Acceptance Conditions in Up-to-standard Area

新增污染源正常排放下污染物短期/长期浓度贡献值最大浓度占标率判定 Determination of Pi of maximum concentration of short-term/long-term concentration contribution value under normal emission of newly added pollution sources					
序号 S.N.	污染因子 Pollution factor	平均时段 Average period	贡献值最大浓度占标率% Pi of maximum concentration of contribution value %	判别标准 Determination standard	是否满足 Compliance with standard
1	SO_2	1 小时 1 hour	1.77	≤100%	是 Yes

新增污染源正常排放下污染物短期/长期浓度贡献值最大浓度占标率判定 **Determination of Pi of maximum concentration of short-term/long-term concentration contribution value under normal emission of newly added pollution sources**					
序号 **S.N.**	污染因子 **Pollution factor**	平均时段 **Average period**	贡献值最大浓度占标率% **Pi of maximum concentration of contribution value %**	判别标准 **Determination standard**	是否满足 **Compliance with standard**
		日平均 Average daily	1.96	≤100%	是 Yes
		年平均 Annual average	0.8	≤30%	是 Yes
2	NO_2	1 小时 1 hour	12.06	≤100%	是 Yes
		日平均 Average daily	7.97	≤100%	是 Yes
		年平均 Annual average	2.75	≤30%	是 Yes
3	PM_{10}	日平均 Average daily	0.9	≤100%	是 Yes
		年平均 Annual average	0.31	≤30%	是 Yes
4	$PM_{2.5}$（含二次PM2.5）$PM_{2.5}$ (including secondary $PM_{2.5}$)	日平均 Average daily	6.57	≤100%	是 Yes
		年平均 Annual average	2.42	≤30%	是 Yes
5	TSP	日平均 Average daily	20.47	≤100%	是 Yes
		年平均 Annual average	6.15	≤30%	是 Yes
6	HCl	1 小时 1 hour	20.47	≤100%	是 Yes
		日平均 Average daily	6.16	≤100%	是 Yes
7	H_2S	1 小时 1 hour	10.72	≤100%	是 Yes
8	NH_3	1 小时 1 hour	18.48	≤100%	是 Yes
9	Hg	日平均 Average daily	0.14	≤100%	是 Yes

新增污染源正常排放下污染物短期/长期浓度贡献值最大浓度占标率判定 **Determination of Pi of maximum concentration of short-term/long-term concentration contribution value under normal emission of newly added pollution sources**					
序号 **S.N.**	污染因子 **Pollution factor**	平均时段 **Average period**	贡献值最大浓度占标率% **Pi of maximum concentration of contribution value %**	判别标准 **Determination standard**	是否满足 **Compliance with standard**
		年平均 Annual average	0.16	≤30%	是 Yes
10	As	日平均 Average daily	0.01	≤100%	是 Yes
		年平均 Annual average	0.33	≤30%	是 Yes
11	Cd	年平均 Annual average	3.4	≤30%	是 Yes

③叠加现状浓度、区域拟建（在建）项目后，SO_2、NO_2、PM_{10}、$PM_{2.5}$的保证率日平均、年平均质量浓度满足《环境空气质量标准》（GB3095-2012）中二级标准；HCl（小时、日均）、H_2S（小时）短期浓度满足《环境影响评价技术导则 大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值；Hg（日均）、A_S（日均）短期浓度满足《工业企业设计卫生标准》（TJ36-79）居民区有害物质最高允许浓度要求，Hg、A_S、Cd 年均浓度满足《环境空气质量标准》（GB3095-2012）中二级标准。

③ After superimposing current environmental mass concentration and regional proposed projects (projects under construction), the daily and annual average mass concentration of SO_2, NO_2, PM_{10} and $PM_{2.5}$ at guarantee rate all comply with the Level II standard requirements in Ambient Air Quality Standard (GB3095-2012); the short-term concentration (hourly and daily average concentration) contribution values of HCl and that (hourly) of H_2S comply with air mass concentration reference limits of other pollutants in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment* (HJ2.2-2018); the short-term (daily) concentration of Hg and A_S comply with maximum allowable concentration requirement for hazardous substances in residential quarters in *Hygienic Standard of Industrial Enterprise Design* (TJ36-79). The annual average concentration of Hg, A_S and Cd comply with the Level II standard requirements in *Ambient Air Quality Standard* (GB3095-2012).

（2）大气环境防护距离

(2) Atmospheric environmental protection distance

项目采用进一步预测模型模拟评价基准年内，对本项目所有污染源对厂界外主要污染物的短期贡献浓度分布，厂界外短期贡献浓度均能达到《环境空气质量标准》（GB3095-2012）二级标准、《环境影响技术评价导则 大气环境》（HJ2.2-2018）附录 D 和《工业企业设计卫生标准》（TJ36-79）标准要求，厂界外无超标区域，无需设置大气环境防护距离。

In this project, a further prediction model is used to simulate and assess the distribution of all pollution sources of the project over the short-term contribution concentration of major pollutants outside plant boundary within the base year. Short-term contribution concentrations outside plant boundary all can reach Level II standard in *Ambient Air Quality Standard* (GB3095-2012) as well as standard requirements in Annex D of *Technical Guidelines for Environmental Impact Assessment - Atmosphere Environment* (HJ2.2-2018) and *Hygienic Standard of Industrial Enterprise Design* (TJ36-79). No out-of-standard area is available outside plant boundary so that no atmospheric environmental protection distance is necessary.

（3）环境防护距离

(3) Environmental protection distance

本次环评参考《造纸及纸制品业卫生防护距离 第 1 部分：纸浆制造业》（GB/T 11654.1-2012）设置一定的防护距离。项目制浆生产规模为 120 万 t/a＞30 万 t/a，所在地区近 5 年平均风速在 2~4m/s，因此卫生防护距离设置 800m，即以化学浆车间为边界，外延 800m 范围作为本项目的环境防护距离。防护距离超出东厂界最远距离为 400m；超出北厂界外 170m，落在广西宏大化工有限公司双氧水项目用地范围内；超出南厂界最远距离为 135m；未超出西厂界边线。根据现场调查，超出厂界部分均无环境敏感目标，不涉及居民搬迁问题。厂界外防护距离范围均为规划的工业用地和防护绿地，不涉及规划的居住用地、行政办公、商业用地等。园区后续发展不应在防护距离范围内规划建设居民区、学校、医院、行政办公和科研等敏感目标。

A certain protection distance is set up in this EIA by reference to *Health Protection Zone of Paper and Paper Products Industry Part 1: Pulp and Paper Industry* (GB/T 11654.1-2012). The pulping production scale of the project is 1,200,000t/a which is > 300,000 t/a, and the average wind speed in the project area in recent 5 years is 2-4m/s. As such, the health protection distance is set at 800m, i.e. the chemical pulp workshop is taken as the boundary and shall be extended by 800m as the environmental protection distance of this project. The maximum protection distance beyond the east plant boundary is 400m, which is 170m beyond the boundary of the north plant boundary and lies within the land area of Hydrogen Peroxide Project of Guangxi Hongda Chemical Engineering Co., Ltd; the maximum protection distance beyond the south plant boundary is 135m and is not beyond the west plant boundary line. According to field investigation, no environmentally sensitive target is available beyond the plant boundary with no relocation of residents involved. The range of protection distance outside the plant boundary is the planned industrial land and protective green space with no planned residential, administrative office and commercial land, etc. involved. In further development of the park, sensitive targets such as residential areas, schools, hospitals, administrative offices and scientific research, etc. shall not be planned within the range of protective distance.

4.3 运营期海洋环境影响分析

4.3 Analysis of Marine Environmental Impact in Operation Period

在潮流预测模型的选取方面，平面二维数学模型主要针对大范围、长周期的污染物扩散分析；三维数学模型能够反映污染物的垂直分布，与三维水流结构密切相关，这就要求排水仓口与受纳区环境水体的三维运动都要相似，数模模型要求能够精细刻画排水构筑物、渗流等掺混扩散参数，这样概化典型特征的三维数学模型可用于排水口近区分析研究，但一般不用于大范围长周期的计算。目前数学模型在近区应用并没有得到广泛认可，一般采用物理模型。本研究关注的重点为污染物在大范围海域的输运扩散情况，本评价拟采用平面二维数学模型进行预测分析。

In terms of selection of tide prediction model, the planar 2D mathematical model mainly focuses on large-range and long-period pollutant diffusion analysis. The 3D mathematical model can reflect the vertical distribution of pollutants, which is closely related to the 3D water flow structure. This requires that the 3D motion of the drainage outlet be similar to environmental water bodies in the receiving area and that the mathematical model be able to elaborate seepage and diffusion parameters of drainage structures and seepage flow, etc. Thus, the 3D mathematical model generalizing typical characteristics will be able to be used for analysis and research in the near region of drainage outlet, but generally will not be used for large-range and long-period calculation. Presently the application of mathematical models in the near region has not been widely recognized, and physical models are generally applied. The focus of this study is the transport and diffusion of pollutants in a large range of sea areas. For the purpose of this assessment, a planar two-dimensional mathematical model is planned to be used for prediction and analysis.

4.3.1 潮流数学模型的方程及算法

4.3.1 Equation and algorithm of tide mathematical model

4.3.1.1 基本方程

4.3.1.1 Basic equation

正交曲线坐标系下的水流基本方程如下：

The basic equation of water flow in orthogonal curvilinear coordinate system is as follows:

连续方程：

Continuity equation:

$$\frac{\partial \zeta}{\partial t}+\frac{1}{C_\xi C_\eta}\left[\frac{\partial}{\partial \xi}\left(DuC_\eta\right)+\frac{\partial}{\partial \eta}\left(DvC_\xi\right)\right]=q \tag{4-1}$$

动量方程：

Momentum equation:

$$\frac{\partial u}{\partial t}+\frac{u}{C_\xi}\frac{\partial u}{\partial \xi}+\frac{v}{C_\eta}\frac{\partial u}{\partial \eta}+\frac{uv}{C_\xi C_\eta}\frac{\partial C_\xi}{\partial \eta}-\frac{v^2}{C_\xi C_\eta}\frac{\partial C_\eta}{\partial \xi}=$$

$$fv-\frac{g}{C_\xi}\frac{\partial \zeta}{\partial \xi}+E_\xi\left(\frac{1}{C_\xi}\frac{\partial A}{\partial \xi}-\frac{1}{C_\eta}\frac{\partial B}{\partial \eta}\right)-\frac{gu}{C^2 D}\sqrt{u^2+v^2}+\frac{qu_*}{D} \tag{4-2}$$

$$\frac{\partial v}{\partial t}+\frac{u}{C_\xi}\frac{\partial v}{\partial \xi}+\frac{v}{C_\eta}\frac{\partial v}{\partial \eta}+\frac{uv}{C_\xi C_\eta}\frac{\partial C_\eta}{\partial \xi}-\frac{u^2}{C_\xi C_\eta}\frac{\partial C_\xi}{\partial \eta}=$$

$$-fu-\frac{g}{C_\eta}\frac{\partial \zeta}{\partial \eta}+E_\eta\left(\frac{1}{C_\xi}\frac{\partial B}{\partial \xi}+\frac{1}{C_\eta}\frac{\partial A}{\partial \eta}\right)-\frac{gv}{C^2 D}\sqrt{u^2+v^2}+\frac{qv_*}{D} \tag{4-3}$$

式中：

Where:

$$A=\frac{1}{C_\xi C_\eta}\left[\frac{\partial}{\partial \xi}\left(C_\eta u\right)+\frac{\partial}{\partial \eta}\left(C_\xi v\right)\right]$$

$$B=\frac{1}{C_\xi C_\eta}\left[\frac{\partial}{\partial \xi}\left(C_\eta v\right)-\frac{\partial}{\partial \eta}\left(C_\xi u\right)\right]$$

D 为总水深，$D=\zeta+h$；ζ 为水位，h 为水深；ξ、η 分别为正交贴体坐标的纵横向计算网格方向；u、v 分别为沿 ξ、η 的水流速度分量；C_ξ、C_η 为拉梅系数；$f=2\omega\sin\varphi$ 为科

氏力系数(ω为地球自转角速度)；E_ξ、E_η为水平涡粘扩散系数；C为谢才系数，$C=(h+\zeta)^{1/6}/n$，n为曼宁系数；g为重力加速度。

D is the total water depth, $D=\zeta+h$; ζ is water level and h is water depth; ξ and η are respectively the vertical and horizontal calculation mesh directions of orthogonal body-fitted coordinates; u and v are the flow velocity components along ξ and η, respectively; C_ξ and C_η are Lame coefficient; f=2ωsinφ is Coriolis force coefficient (ω is the angular velocity of the earth's rotation); E_ξ and E_η is horizontal eddy viscosity diffusion coefficient; C is Chezy coefficient, $C=(h+\zeta)^{1/6}/n$, n is Manning coefficient; g is the acceleration of gravity.

q 为单位面积上的源汇强度，u_*、v_*为源汇节点周边 ξ、η 方向流速。

q is the source-sink intensity per unit area, u_* and v_* are the flow velocity around the source-sink node in the direction of ξ and η.

4.3.1.2 定解条件

4.3.1.2 Definite condition

（1） 初始条件

(1) Initial condition

$$\begin{cases} u(t,\xi,\eta)\big|_{t=t_0} = u_0(\xi,\eta) \\ v(t,\xi,\eta)\big|_{t=t_0} = v_0(\xi,\eta) \\ \zeta(t,\xi,\eta)\big|_{t=t_0} = \zeta_0(\xi,\eta) \end{cases}$$

其中：u_0，v_0，ζ_0、分别为初始流速和潮位，潮位、流速初始值通常取常数，t_0为起始计算时间。

Where, u_0, v_0 and ζ_0 are the initial flow velocity and tide level respectively. The initial values of tide level and flow velocity are usually constants, and t_0 is the starting time of calculation.

（2） 边界条件

(2) Boundary conditions

开边界Γ_0采用流速边界：$u\big|_{\Gamma_0} = u(t,\xi,\eta)$

Flow velocity boundary $u\big|_{\Gamma_0} = u(t,\xi,\eta)$ is used as open boundary Γ_0:

$$v|_{\Gamma_0} = v(t,\xi,\eta)$$

或采用水位边界：$\zeta|_{\Gamma_0} = \zeta(t,\xi,\eta)$

Or water level boundary is used: $\zeta|_{\Gamma_0} = \zeta(t,\xi,\eta)$

式中，u、v、ζ 均为根据现场观测资料确定的已知量，分别用流速过程或潮位过程控制。

Where, u, v and ζ are all known quantities determined based on field observation data and are controlled by flow velocity process or tide level process respectively.

闭边界 Γ_c 采用不可入条件，即 V_n=0，法向流速为 0，n 为边界的外法向。

For closed boundary Γ_c, the inadmissibility condition is used, i.e. V_n=0, the normal velocity is 0, and n is the outer normal direction of the boundary.

4.3.1.3 数值计算方法

4.3.1.3 Numerical calculation method

二维数值计算采用ADI法，该方法的网格剖分、差分格式及算法已被录入《海岸与河口潮流泥沙模拟技术规程》。微分方程离散时，时间采用前差分格式，空间采用交错网格的中心差分格式。一个时间步长分成两步进行，前半步隐式计算ξ方向流速分量及潮位，显式计算η方向流速分量；后半步隐式计算η方向流速分量及潮位，显式计算ξ方向流速分量。该方法理论成熟、计算效率高、稳定性好，在工程数值模拟计算中得到了广泛应用。

ADI method is used for 2D numerical calculation, of which the mesh generation, difference scheme and algorithm have been entered into *Technical Regulations of Modelling for Tidal Current and Sediment on Coast and Estuary*. When the differential equation is discretized, the front difference scheme will be used for time and staggered mesh center difference scheme be used for space. A time step is divided into two steps. At the first half step ξ, the directional velocity component and tide level are implicitly calculate, and the directional velocity component is explicitly calculated. In the second half η, the directional velocity component and tide level are implicitly calculated, and the directional velocity component is explicitly calculated. The method is proven in theory with high calculation efficiency and good stability and therefore has found wide application in engineering numerical simulation and calculation.

4.3.2 污染物扩散数学模型的方程及算法

4.3.2 Equation and algorithm of pollutant diffusion mathematical model

4.3.2.1 基本方程

4.3.2.1 Basic equation

依托所建立的潮流数学模型，建立污染物扩散数学模型。污染物代表量输运方程如下：

The pollutant diffusion mathematical model is established based on the established tide mathematical model. The transport equation of pollutant representative quantity is as follows:

$$\frac{\partial(DS)}{\partial t}+\frac{1}{C_\xi C_\eta}\left[\frac{\partial}{\partial\xi}\left(DSuC_\eta\right)+\frac{\partial}{\partial\eta}\left(DSvC_\xi\right)\right]=$$

$$\frac{1}{C_\xi C_\eta}\left[\frac{\partial}{\partial\xi}\left(\frac{C_\eta}{C_\xi}D\varepsilon_\xi\frac{\partial S}{\partial\xi}\right)+\frac{\partial}{\partial\eta}\left(\frac{C_\xi}{C_\eta}D\varepsilon_\eta\frac{\partial S}{\partial\eta}\right)\right]-K_sDS+Q \qquad (4\text{-}4)$$

式中，S 为单位体积内的污染物含量；Ks 为污染物降解系数，保守计算时可不考虑降解，不同污染物的降解参数取值有所区别；Q 为源项，为单位时间单位面积上的内污染物排放量；ε_ξ、ε_η 分别为 ξ、η 方向扩散系数。

Where, S is the pollutant content per unit volume; Ks is the degradation coefficient of pollutants and degradation is negligible in conservative calculation. Degradation parameter values vary with different pollutants. Q is the source term, which is the internal pollutant emission per unit area per unit time; ε_ξ and ε_η are the directional diffusion coefficient in the direction of ξ and η respectively.

4.3.2.2 定解条件

4.3.2.2 Definite condition

（a）固边界

(a) Fixed boundary

$\frac{\partial S}{\partial n}=0$（不可入条件） 即污染物扩散法向浓度梯度为 0。

$\frac{\partial S}{\partial n}=0$ (Non-entry condition) i.e. the normal concentration gradient of pollutant diffusion is 0.

（b）开边界

(b) Open boundary

边界出流时：

In case of boundary outflow:

$$\frac{\partial(DS)}{\partial t}+\frac{1}{C_\xi C_\eta}\left[\frac{\partial}{\partial \xi}\left(DSuC_\eta\right)+\frac{\partial}{\partial \eta}\left(DSvC_\xi\right)\right]=0 \tag{4-5}$$

边界入流，已知入流的污染物浓度过程时：

In case of boundary inflow and where known pollutant concentration process in the inflow is known:

$$S\big|_{\Gamma_0}=S_a(t,\xi,\eta) \tag{4-6}$$

边界入流，污染物梯度一致边界条件：

In case of boundary inflow and consistent boundary conditions for pollutant gradient:

$$\frac{\partial^2}{\partial \xi^2}\left(DSuC_\eta\right)=0; \qquad \frac{\partial^2}{\partial \eta^2}\left(DSuC_\xi\right)=0 \tag{4-7}$$

一般选取计算范围足够大，使开边界在污染物扩散范围外，这样可认为入流污染物为零。当已知开边界布置在有污染物明显进出输送时，应考虑流出边界的污染物随潮流转换重新入流的回归问题，目前还没有很好的解决办法，如果能够根据计算域外的信息给出污染物入流期浓度过程，采用式（4-6）控制边界；入流污染物浓度过程不能给出时，假定边界入的污染物浓度梯度与边界内侧一致，采用式（4-7）控制，这种概化处理需要边界布置在污染物变化缓慢的区域，边界设定时，应充分考虑这一因素。

Generally the selected calculation scope shall be large enough to allow the open boundary to be outside the diffusion area of pollutants, so that the inflow pollutants can be considered as zero. If the known open boundary is arranged where pollutants are apparently transported in and out, the regression problem that pollutants flowing out of the boundary inflow back along with shifting of tidal current shall be taken into account, for which no desirable solution is available at present. If the concentration process of pollutants in the inflow period can be given based on the information outside calculation domain, the boundary will be controlled by Equation (4-6); if not so, the pollutant concentration gradient at the boundary will be assumed to be consistent with that at inner side of the boundary and

Equation (4-7) will be used for control. Such generalized processing requires the boundary to be arranged in the area where the pollutant changes slowly, which shall fully be taken into account when setting the boundary.

4.3.2.3 数值计算方法

4.3.2.3 Numerical calculation method

方程的离散格式与 ADI 法类似，计算时也同样把一个时间步长分为两步，前半步在 ξ 方向隐式扫描，后半步在 η 方向隐式扫描。只是对流项的离散格式改为迎风格式。

The discrete scheme of the equation is similar to ADI method, and a time step is also divided into two steps during calculation. In the first half step, implicit scanning is carried out in the direction of ξ; in the second half step, implicit scanning is carried out in the direction of η , save that discrete scheme of convection term is changed to upwind scheme.

4.3.3 数学模型范围及参数处理

4.3.3 Scope of mathematical model and parameter processing

4.3.3.1 计算范围确定及网格剖分

4.3.3.1 Determination of calculation scope and mesh generation

为确保模型能够考虑铁山港近、远期规划工况，模型开边界需取到 20m 等深线附近，铁山湾外 20m 等深线在涠洲岛附近，自涠洲岛向北、向东分别取南北向、东西向开边界，如图 4.3.3-1 所示(仅绘出行列号为 5 的整数倍的网格线及网格边界，每个大网格含 25 个计算网格单元)，两条开边界内的水域均为模拟计算水域。计算水域东西向有效长度 86.5km，南北向有效长度 81.2km，覆盖了整个铁山湾水域、安铺港水域。剖分网格空间步长最大为 1126m，最小为 16m，工程区网格尺度大部分在 50m~100m 左右，剖分网格数为 594×496。

In order to allow the model to consider the short-term and long-term planning conditions of Tieshan Port, the open boundary of the model shall be taken as near the 20m isobath. The 20m isobath outside Tieshan Bay is near Weizhou Island. From Weizhou Island to the north and east, the north-south and east-west open boundaries are taken respectively, as shown in Figure 4.3.3-1 (with only mesh lines and boundaries with row and column no. of 5 plotted and each large mesh containing 25 calculation mesh units). The waters within such two open boundaries is the waters for simulation and calculation. Waters for calculation has an effective east-west length of 86.5km and an effective north-south length of 81.2km, covering the whole waters of Tieshan Bay and of Anpu Port. The maximum and minimum space step size of mesh generation is 1126m and 16m respectively. The mesh scale in the project area is mostly around 50-100m, and the number of mesh generation is 594 × 496.

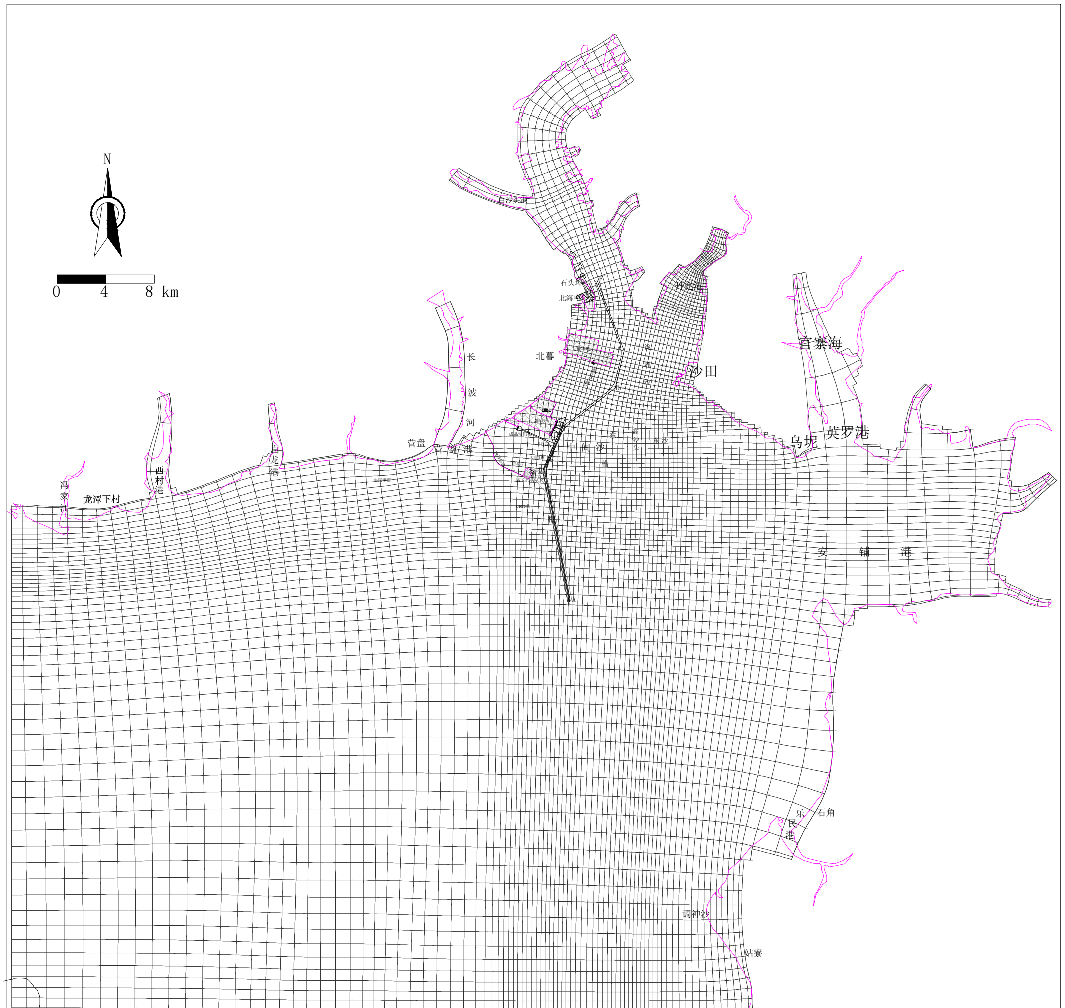


图 4.3.3-1 整体模型计算范围及网格示意图

Figure 4.3.3-1 Schematic Drawing of Overall Model Calculation Scope and Mesh

4.3.3.2 动边界处理

4.3.3.2 Processing of moving boundary

工程海域有大片浅滩高潮位时淹没，低潮位时出露，计算过程中要求正确反映潮滩的干湿特征，需要采用适当的动边界处理技术。

A large area of shoal in the sea area of the project will be submerged at high tide level and will expose at low tide level. During calculation, the dry and wet characteristics of tidal flat shall be accurately reflected, necessitating use of appropriate processing technique of moving boundary.

动边界处理方法有多种，本项研究中采用冻结法，根据节点水深判断是否露滩，当水深小于某一控制水深时，节点潮位“冻结”不变，要进行下一时刻计算前，被冻结的节点水深由周边节点水深修正，如水深大于控制水深则参与计算。为避免水量和动量的过分“冻结”引起失真，动边界控制水深采用5cm。

A large number of processing methods are available for moving boundary. In this study, the freezing method is used to assess whether the shoal will expose or not depending upon water depth of the node. In case of the water depth less than a certain controlling depth , tide level of the node is "frozen" unchanged. Prior to the calculation at next moment, the frozen node water depth is corrected by the water depth of surrounding nodes. In case of the water depth more than the controlling depth, such water depth will be involved in the calculation. In order to avoid distortion caused by excessive "freezing" of water quantity and momentum, the controlling depth of moving boundary shall be 5cm.

4.3.3.3 糙率选取

4.3.3.3 Selection of roughness

糙率是潮流计算的主要参数之一，反映了潮流运动过程中的阻力特性，糙率选取正确与否对计算结果有直接影响。糙率在潮流计算中是一个综合参数，与床面泥沙特性、水深及地形形态都有一定的关系，本项研究中根据经验选用以下公式[1] 计算：

Roughness is one of the major parameters in tide calculation, which reflects the resistance characteristics in the course of tidal movement. Whether the roughness is selected correctly or not has a direct impact on the calculation results. Roughness is a comprehensive parameter in tidal current calculation and is somehow related to bed sediment characteristics, water depth and land form. In this study, the following equation [2] is selected for calculation based on experiences:

$$n = n_0 + n' / H \qquad （4\text{-}8）$$

$$n = n_0 + n' / H \qquad (4\text{-}8)$$

式中，n_0 为基础糙率，经验证计算取 0.014；n'/H 为糙率修正项，n'取 0.012。当水深 H

小于 1.0m 时，个别点的 n 最大值取 0.026，水深大于 1.0m 按上式计算值修正。

Where, n_0 is the basic roughness and is taken as 0.014 through verification calculation; n'/H is the roughness correction term and n' is taken as 0.012. In case of the water depth H less than 1.0 m, the maximum value of n at individual points shall be taken as 0.026; in case of the water depth more than 1.0 m, it shall be corrected depending upon the calculated value from the above equation.

4.3.3.4 水动力模型其它参数

4.3.3.4 Other parameters of hydrodynamic model

紊动粘性系数，该参数取值在一定范围内均可以获得良好结果，与网格步长及当地潮流特性有关，采用 Smagorinsky 公式[3]计算，使其随网格尺度及水流动力强弱自动调整，避免紊动扩散项过大引起流场失真，又能增强模型稳定性。模型主要计算参数见表 4.3.3-1。

The turbulent viscosity coefficient, which allows for good results within a certain range, is related to the mesh step size and local tidal current characteristics. Smagorinsky equation [4] is used to calculate the turbulent viscosity coefficient to allow it to be automatically adjusted with the mesh size and the strength of flow dynamics, thereby avoiding the distortion of flow field caused by excessive turbulent diffusion term and enhancing the stability of the model. Major calculation parameters of the model is as shown in Table 4.3.3-1.

表 4.3.3-1 模型参数采用表

Table 4.3.3-1 List of Parameters used for the Model

参数名称 Designation	参数取值 Values taken
网格单元数 Number of mesh units	594×496
空间步长 Space step	16m~1126m
时间步长 Time step	10s
动边界控制水深 Controlling depth of moving boundary	0.05 m
糙率 Roughness	$n=n_0+n_k(h)$

涡动扩散系数[3] Eddy diffusion coefficient [3]	$0.1\Delta x\Delta y\sqrt{\left(\frac{\partial u}{\partial x}\right)^2+\left(\frac{\partial v}{\partial y}\right)^2+\frac{1}{2}\left(\frac{\partial u}{\partial y}+\frac{\partial v}{\partial x}\right)^2}$

4.3.4 数学模型验证

4.3.4 Verification of mathematical model

4.3.4.1 现场水文测验

4.3.4.1 Field hydrological measurement & verification

（1）验证资料

(1) Verification data

铁山港海域近年来的观测资料主要有三组，2005 年 5 月 11 日~15 日同步 4 条垂线的大、中潮海流观测；2008 年 4 月 11 日~21 日同步 10 条垂线的大、中、小潮海流观测；2010 年 11 月 24 日~25 日同步 6 条垂线的大潮观测（见图 4.3.4-1）。前两组资料的潮流模拟验证情况分别见文献[5]和文献[6]。这三次水文测验资料都曾用于数学模型参数率定，但各次资料都已超过 5 年，模型参数需在新岸形条件下进行验证，为此开展了现场专项水文测验，布置了 3 条垂线和同步 3 个潮位站（站位布置参见图 4.3.4-2）。

There are mainly three groups of observation data in sea area of Tieshan Port in recent years: observations of ocean current under mid and spring tide along 4 synchronized vertical lines from May 11 to 15, 2005; observations of ocean current under neap, mid and spring tide along 10 synchronized vertical lines from April 11 to 21, 2008; observations of spring tide along 6 synchronized vertical lines from November 24 to 25, 2010 (refer to Figure 4.3. 4-1). For the verification of tidal current simulation of the first two groups of data, refer to reference document [7] and [8] respectively. The data of these three hydrological measurements & verifications all were used to calibrate the parameters of the mathematical model. However, each group data has been used for more than 5 years so that the model parameters are required to be verified under the condition of new shoreline shape. To this end, a special field hydrological measurement & verification was conducted, with 3 vertical lines and 3 synchronous tide level stations arranged (refer to Figure 4.3. 4-2 for the station layout).

本次水文测验于 2019 年 8 月 28 日~9 月 11 日开展，测量队首次于 8 月 28 日上午进场准备，原计划观测 8 月 30 日大潮，考虑到预报有 12 号台风于 27 日生成于西北太平洋洋面，担心三天后可能影响本区域，临时计划抢测 28-29 日较大潮，于 15:00 开始部

分水位观测，19:00 开始流速站观测。测验期间 12 号台风（杨柳）生成后快速移动，速度之快超出预计，8 月 29 日 9 时已接近海南岛东缘（图 4.3.4-3），观测水域风浪增大，11 时后现场测船被迫撤离，流速垂线观测时间未满 25 小时，撤离时 V1、V2 数据丢失。水位观测采用自记水位仪，每 10 分种记录一组潮位数据，因组织仓促，起如测时石头埠站已错过高潮位，后段涨潮潮差为 4.61m，观测资料详情见后文数模验证部分。12 号台风过后，很快又形成了 13 号台风（玲玲，9 月 2 日生成）、14 号台风（剑鱼，9 月 3 日生成），工程测区持续多日 5 级以上大风，并伴随大雨。第二次现场测验于 2019 年 9 月 10-11 日完成，石头埠站涨潮潮差 4.37m。

This hydrological measurement & verification was carried out from August 28 to September 11, 2019. The survey team accessed the site for the first time in the morning of August 28 for preparation. The original plan was to observe the spring tide on August 30. Considering that No.12 Typhoon was forecast to be formed at the surface of Northwest Pacific Ocean on August 27 and fearing that it might affect the area in three days, it was temporarily planned to urgently observe the spring tide on August 28-29, starting part of water level observations at 15:00 and velocity station observation at 19:00. During the measurement & verification, No.12 Typhoon (Yangliu), after being formed, moved rapidly at such high speed that exceeds expectations. It approached the eastern edge of Hainan Island at 9:00 on August 29 (Figure 4.3.4-3). The wind and waves in the observation waters increased. After 11: 00, the field observation boat was compelled to evacuate. The observation duration of the vertical line for flow velocity was less than 25 hours, and V1 and V2 data were lost during the evacuation. An automatic water level recorder was adopted for the water level observation, capable of recording a group of tide level data every 10 minutes. Due to hasty organization, Shitoubu Station missed the high tide level at the time of starting the observation, and the tide range of flood tide at later stage was 4.61m. For details of observation data, refer to the mathematical model verification section below. In the aftermath of No.12 Typhoon, No.13 Typhoon (Lingling, formed on September 2) and No.14 Typhoon (Swordfish, formed on September 3) were formed soon. A gale above fresh breeze sustained for many days in the observation area of the project and was accompanied by heavy rain. The second field measurement & verification was completed from September 10 to 11, 2019, during which the tide range of flood tide at Shitoubu Station was 4.37m.

考虑到污染物扩散计算目前常用两种边界控制模式：典型潮模式和半月潮模式。典型潮模式又分为典型大潮、中潮、小潮三种动力，各典型潮分别循环控制、连续计算多个典型潮过程，直到计算域内的污染扩散状态达到动态平衡为止。典型潮要达到动态平衡，需要较精确地处理开边界污染物回归和计算域内的降解；加上典型潮循环控制与实际潮汐过程不符，因此，该方法主要用于工程方案的比选与优化研究。本次计算采用与实际情况更符合的半月潮控制法，两次测验资料都尽量采纳。

Currently two boundary control modes are used taking into account calculation of pollutant diffusion: typical tide mode and fortnightly tide mode. The typical tide mode is classified as such three dynamics as typical neap, mid and spring tide. Each typical tide is used to cyclically controlled and continuously calculate multiple typical tide processes until the pollution diffusion state within the calculation domain reaches dynamic balance. In order to achieve dynamic balance of typical tides, it is necessary to process the regression of pollutants at the open boundary and degradation in the calculation domain more precisely. Plus the cycle control of typical tide is inconsistent with actual tidal process. So this method is mainly used for comparison and optimization of engineering schemes. In this calculation, the fortnightly tide control method, which is more in line with the actual condition, is adopted, for which the data of both measurement & verification shall be adopted as much as possible.

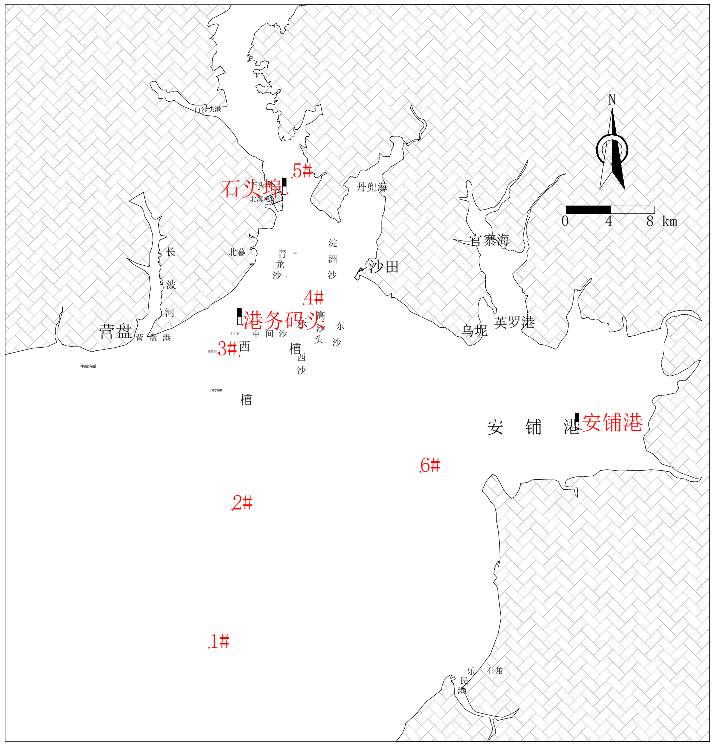


图 4.3.4-1　2010 年 11 月测站布置图

Figure 4.3.4-1 Layout of Observation Station in November, 2010

图 4.3.4-2　2019 年 8~9 月测站布置图

Figure 4.3.4-2 Layout of Observation Station from August to September, 2019

图 4.3.4-3　2019 年 12 号台风路径示意图

Figure 4.3.4-3 Schematic Drawing of Track of No. 12 Typhoon in December, 2019

4.3.4.2 代表潮型选取

4.3.4.2 Selection of representative tide type

半月潮理论上是包括了大、中、小潮的完整潮型，选取潮型内的最大潮差受潮汐长周期影响，当对潮位具体高度、保证率不甚关注时，可以根据实测资料情况选取有验证的半月潮作为代表潮型。

Theoretically, the fortnightly tide is a complete tide type covering neap, mid and spring tide. The maximum tide range in the selected tide type is affected by the long tidal period. In case of limited concern about the specific height and guarantee rate of the tide level, the verified fortnightly tide can be selected as the representative tide type depending upon actual measurements data.

以 2019 年 8 月 27 日 17:00~9 月 11 日 18:00 潮位过程为基础构建半月潮潮型，在开边界以天文潮为基础，对潮差和基面适当调整，通过验证计算确定边界潮型。本次验证确定的石头埠潮型如图 4.3.4-4 所示，由中大潮落潮开始，至中大潮落潮结束，潮型的起止潮位是相等的，并可以循环衔接，满足污染物扩散潮型要求。数学模型设置有起始计算时间调节参数，可以从 0~362 时序任意时刻开始计算，如 0 时开始计算即为从中大潮落潮起算，192 时则是从小潮落憩开始起算。不同的起算时刻对污染物初期的扩散分布状态有影响，但对污染物浓度增量的包络场不影响。

Based on the tide level process from 17: 00 on August 27 to 18: 00 on September 11, 2019, a fortnightly tide type is established. Based on astronomical tides, the tide range and base surface are appropriately adjusted at the open boundary and the boundary tided type is determined through verification calculation. As shown in Figure 4.3. 4-4 is the tide type of Shitoubu as determined by this verification, starting from ebb tide of the mid and spring tide and ending at ebb tide of the same. The starting and ending tide levels of the tide type are equal and can be connected in a cycled manner to meet the requirements of the tide type of pollutant diffusion. The mathematical model is set with adjustment parameters for the starting time of calculation, which can be started from any moment in the time series of 0-362. For example, the calculation started at 0 means the calculation is started at the ebb tide of mid and spring tide while the calculation started at 192 means the calculation is started at ebb slack of neap tide. Different starting times may impose impact the initial diffusion distribution of pollutants with no impact on the envelope field of pollutant concentration increment instead.

图 4.3.4-4 2019年8-9月实测半月潮型

Figure 4.3.4-4 Actual Measurements of Tide Type from August to September, 2019

4.3.4.3 水流验证

4.3.4.3 Water flow verification

铁山湾水域，滩宽槽窄、涨、落憩时间长、潮波传播相对复杂，传播特征的模拟相似是工程方案比选研究的重要基础。

With wide shoal, narrow trough, long flood and edd slack time and relatively complex propagation of tidal wave in waters of Tieshan Bay, the analogue simulation of propagation characteristics serves as an important basis for comparison and selection of engineering schemes.

实测资料设有三站潮位（参图 4.3.4-1），铁山港内湾一站（石头埠站）和湾口东、西侧各一站（港务码头、沙田码头）。流速、流向站位也设有三站，考虑到拟研究的两个排污口位置有一定特殊性，B3排矿口位于东西槽交汇的区附近，A1位于西槽口门附近，因此两排污口附近各设一站；另一站布置在东槽拦门沙附近的5m等深线内。这样布置虽然站位不多，但能够基本把握住潮波和潮流的主要特征，为水流模型验证、确保模拟水流相似提供依据基础数据。

For actual measurement data, three stations of tide level are arranged (refer to Figure 4.3.4-1) with one station arranged at inner bay of Tieshan Port (Shitoubu Station) and one station each on the east and west side of the port (Port Group Terminal and Shatian Terminal). Also three stations are arranged as station sites for flow velocity and direction. Considering the particularity of the locations of two sewage outlets to be studied, B3 throat is located in the vicinity of the intersection area of east and west trough while A1 throat is located in the vicinity of the gate of west trough outlet. As such, one station is arranged in the vicinity of each of the two sewage outlets and the other station arranged in the 5m isobath adjacent to the entrance bar of east trough. Although station sites are limited in such arrangement, the main characteristics of tidal wave and current are basically obtainable so as to provide basic data as basis for verifying water flow model and ensuring analogy of simulated water flow.

（1）潮位验证

(1) Verification of tide level

水文测验一般都在天气条件相对较好的时期开展，在本海域的历史潮流模型验证经验表明，适当调整潮差系数和基面即可获得良好的验证效果，但本次测验期间遇有台风活动，第一次观测还被迫中断，因此本次资料是受到了一定强天气条件干扰，验证时需注意取舍气象因素引起的变化。考虑到验证确定的代表潮主要用于污染物的扩散计算，并且是半月潮型，因此，模型参数在计算潮型内提维持确定的值或确定的表达关系式，偏重天气条件较好的第二测次验证、适当放松强扰动天气条件下的第一测次验证。

Generally hydrological measurement & verification is carried out in the period with relatively good weather conditions. The verification experience of historical tide model in this sea area shows that good verification effect is achievable by properly adjusting tide range coefficient and base surface. Unfortunately given the typhoon activity during this measurement & verification, the first observation was compelled to be interrupted. Therefore, the data in this observation were disturbed by certain strong weather conditions so that care should be taken to adoption/abandonment of the changes caused by meteorological factors during verification. The verified representative tide is mainly used for calculation of pollutant diffusion calculation and is a fortnightly tide type. In view of this, the model parameters shall be maintained at determined values or determined relational expressions in the calculated tide type, with priority given to the verification in the second measurement & verification under better weather conditions and appropriate relaxation given to the verification in first measurement & verification under strong disturbing weather conditions.

为更清晰比对两测次计算与实测的差别，分别截取相应时段绘制对比图（计算时为整体半月潮）。图 4.3.4-5 为三站潮位过程实测与计算的对比，其中上幅为第一测次、下幅为第二测次。先看第二测次的比对过程，高、低潮位极值，计算值与实测值较贴近，没有明显偏差，最大偏差小于 0.06m，满足规范要求；潮波相位，计算过程线比实测过程线相比较，低潮位出现时刻基本吻合，高潮位稍滞后，相位稍有偏差但幅度很小；潮位过程线的形态，计算与实测大致相符，涨潮期的滞涨段，计算线稍陡，实测值更平缓。

In order to more clearly compare comparison of the difference between calculations and actual measurements in the two measurement & verifications, their respective time periods are intercepted to develop comparison diagram (with overall fortnightly tide considered in calculation). Figure 4.3.4-5 shows the comparison between calculations and actual measurements in tidal level process at the three stations, with the upper diagram showing the first measurement & verification and the lower showing the second. Firstly, let's take a look at the comparison process of the second test. The calculated extreme values of high and low tide levels are close to actual measurements with no apparent deviation and maximum deviation is less than 0.06 m, which complies with the specification requirements. Low tide level in calculated hydrograph occurred at a time substantially consistent with that in actual measurements while high tide level in the former slightly lagged behind that in the latter, rendering a slight deviation of tidal wave phases in significantly limited amplitude. The profile of calculated hydrograph is substantially consistent with actual measurements. The deadlock section of flood tide period in calculated hydrograph is steeper than actual measurements which is smoother.

第一测次，计算与实测符合程明较第二测次差，主要原因是模型中没有考虑气压、风应力及边界条件的台风影响，仍是主要考虑天文要素。计算高潮位均较实测高潮位偏高，特别是第二高潮位偏高相对更为显著。其中石头埠站、港务码头两站最大偏高均约 0.60m，而沙田站偏高辐度约 0.30m。可能是因为本次台风影响的观测期间，高潮位阶段减水特征明显。由台风路径可知，在达到第二高潮位前，台风中心自东南往正南位直移动，北半球台风呈逆时针方向旋转，观测区先后经历西北风、北风、东北风，都是离岸风，因此高潮位有所减水属于正常现象，沙田观测站位布置在码头后方堆场的北侧，即观测站后方陆域有局部小范围顶托北风风吹流作用，该站的减水值小于其他两站也可以理解。第一测次低潮位的偏差小，各站均在 0.10m 以内，符合规范精度要求；高潮位由于模型没有考虑台风减水效应，计算值偏高；由于持续偏北大风影响，实测潮位过程高潮提前、低潮滞后，落潮期延长，模拟计算因未考虑相应气象条件，也与实测过程存在偏差。作为代表潮型控制，舍弃这种异常天气扰动更符合实际需要。

In the first measurement, consistency between calculations and actual measurements is worse than that in the second measurement & verification, mainly because astronomical factors are still major considerations with no air pressure, wind stress and impact of typhoon under boundary condition taken into account. The calculated high tide level is higher than actual measurements, especially in the second high where such deviation is more significant. Maximum deviation in high tide level at Shitoubu Station and Port Group Terminal Station is approx. 0.60m, while that at Shatain Station is in the amplitude of approx. 0.30m. The reason for that may be during the observation period affected by this typhoon, the high tide level stage is characterized by significant water reduction. As revealed by the track of typhoon track, the typhoon center was moving straightly from southeast to due south before the second highest tide level is reached. Typhoons in the Northern Hemisphere rotated counterclockwise. The observation area successively experienced northwest wind, north wind and northeast wind, which all were offshore winds so that water reduction at high tide level is normal. The Shatian Observation Station is arranged to the north of the storage yard at rear of the terminal. That is to say, the land area at rear of the observation station has a local lifting effect on north wind blowing in small scale. So it is understandable that the water reduction value of this station is smaller than that of the other two stations. In the first measurement, the deviation in low tide level is limited and is within 0.10m at each station, which complies with the precision requirements in specifications. The calculated values of high tide levels are higher as water-reducing effect of typhoon was not taken into account in the model. With the impact of continuous northerly gale, in actual measurement process of tide level, high tide advanced while low tide lagged behind with prolonged ebb tide period. The simulation calculations also deviates from the actual measurement process as relevant meteorological conditions were not taken into account. When controlling as a representative tide, abandonment of such abnormal weather disturbance is more in line with the actual requirements.

表 4.3.4-1 统计了极值潮位及潮差的模拟偏差情况，极值模拟绝对偏差第二测次模拟精度符合规程要求，第一测次模拟计算没有考虑强扰动气象因素，与实测偏差大。整体半月潮型基本满足工程海域一般性天气条件，数学模型复演的工程水域潮波传播相似性良好。

Table 4.3. 4-1 shows the statistics of the deviations in extreme value simulations of tide level and tide range. In the second measurement, the absolute deviations in extreme value simulations comply with simulation precision requirements of the specifications. In the first measurement, the simulations significantly deviate from actual measurements as strong disturbing meteorological factors were not taken into account. Overall fortnightly tide substantially complies with general weather conditions in sea area of the project, and analogue of the tidal wave propagation in waters of the project recapitulated by the mathematical model is desirable.

表 4.3.4-1 各站极值潮位及潮差验证成果统计（单位：m ）

Table 4.3.4-1 Statistics of Verification Results of Extreme Values of Tide Level and Range at Individual Stations (in m)

图 4.3.4-5　2019 年 8-9 月实测潮位过程验证（左三幅为第一测次；右三幅为第二测次）

Figure 4.3.4-5 Verification of Actual Measurements of Tide Level Process from August to September in 2019 (First measurement shown in Left Three Figures; Second Measurement shown in Right Three Figures)

（3）流速流向验证

(3) Verification of flow velocity and direction

流速流向第一次测量时，因急忙撤回损坏了V1、V2两站数据，两次测量共有4站流速流向资料可供验证。图4.3.4-6给出了各站流速流向过程计算与实测对比过程线。

During the first measurement of flow velocity and direction, the data of station V1 and V2 were damaged due to hasty evacuation. In the two measurements, a total of 4 stations have flow velocity and direction data available for verification. Comparison between calculated hydrograph and actual measurements of flow velocity and direction from individual stations are given in Figure 4.3.4-6

图4.3.4-6 2019年8-9月实测流速流向过程验证

Figure 4.3.4-6 Verification of Actual Measurements of flow velocity and Direction Process from August to September in 2019

流速过程线中涨潮流速取为负值，按流向区分涨、落潮流速。第一次测量V3在8月29日6:00-8:00时段，流向识别为常态下的落潮流向，核对水位过程，虽为滞涨阶段，但水位并没有回落，计算的同时段流速仍为涨潮流向，只是流速值降低。该站流向过程整体呈现以往复流为主，转流期旋转特征明显，至撤退前流向稍散乱，这在港务集团站的潮位过程线也能看出水面波动特征，说明该时段的观测受到了天气条件的干扰，可能观测精度受影响，实测的涨急流速为撤退前的最后一个数据，计算值明显小于该实测值。该站前半段落潮计算与实测吻合还是良好的，后半段涨潮期计算与实测的偏差有所增大。

In the hydrograph of flow velocity process, the flood tide velocity is taken as negative value, and the raising and ebb tide velocity are distinguished according to the flow direction. The first measurement at V3 was conducted from 6:00 to 8:00 on August 29. The flow direction was identified as ebb tide flow direction under normal condition. The water level process was checked. Despite deadlock stage, the water level was not fallen back and the calculated flow velocity for the same period was still in the flood tide direction, save for the flow velocity value which decreased. The flow direction of the station is dominated by reciprocal flow with apparent rotation characteristics during turning period, and the flow direction is slightly disperse prior to ebbing. This can also be seen in the tide level hydrograph of the Port Group Station, indicating that the observation during this period is disturbed by weather conditions and the observation precision may be affected. Actual measurement of surge velocity is the last data prior to ebbing and the calculated values thereof is significantly lower than actual measurements. The calculations of ebb tide during the first half of the period at the station is in good coincidence with the measured data whilst the deviation between the calculations and actual measurements during the second half increases.

第二次测验期间，各观测站数据完整。从流速过程线的形态看，计算与实测均基本一致，但峰谷贴合不够好，实测流速有先涨、先落特点，计算则略有滞后；一般落急流速计算略偏大，而涨急流速计算略偏小；滞涨段前后，计算呈现前大后小均为涨潮流态，而实测呈现前小后大，且在滞涨区有局部落潮流态出现。流向过程，实测各站由岸向海有较明显的旋转特性增强现象，计算则差别不如实测明显；特别是 3#站位，第二次测量的流向较第一次更为散乱，计算则仍变化相对较小。

During the second measurement & verification, the data of each observation station were complete. As seen from the profile of velocity hydrograph, the calculations are substantially consistent with actual measurements, provided that the peak-valley fit is not good enough. The actual measurements of velocity are featured by flood first and ebbing first, while the calculations thereof lags behind slightly. Generally, the calculations of rapid ebbing velocity is slightly higher while those of rapid flood velocity is slightly lower. Prior to and upon the deadlock section, the calculations show that the former is higher and the latter is lower with both of them being flood current pattern whilst actual measurements show that the former is lower and the latter is higher with local ebb flow pattern present in the deadlock area. In the flow direction process, actual measurements of all stations show an apparent enhancement of rotation characteristics from shoal to sea, whereas the calculation difference is not as significant as actual measurement difference. Particularly at #3 station site, the flow direction of the second measurement is more disperse than that of the first measurement, whereas change in calculations is still relatively limited.

按规范精度控制要求统计涨、落潮段平均流速和流向，列于表 4.3.4-2。统计表明，除了 1#站位涨潮平均流向计算与实测偏差 19 度外，其他潮段平均流向偏差均小于 15 度，基本满足规范精度要求。流速特征值与规范要求的符合性略差，规范要求偏差不超过 10%，4 个站次中涨潮平均有 3 个站次满足要求，1#站的偏差达 15.9%。不过比对流速数值，计算与实测相差仅约 0.06m/s，偏差并不显著，偏差百分比大是因为涨潮动力相对较弱。落潮平均流速同样，虽然偏差绝对值不大，但统计百分比仅 1 站小于 10%，2 站接近 10%，1 站偏差达 18%，偏差最大站的绝对值也仅约 0.066m/s。对于这种动力不强的海域，虽然偏差百分比统计不能完全达到规范要求，考虑到验证潮型呈全潮分潮主控，涨、落潮时间相对较长，动力又弱，观测期天气干扰大，能达到现在的验证精度已属不易。综合参考潮流验证过程给和形态、峰谷值偏差，可以认为验证潮型基本复演了工程区的潮流运动特征，该半月潮型能够较好反映天文潮主控状态下的涨、落动力，可以作为本项目计算评价污染物扩散规律的代表潮型。

In accordance with precision control requirements in the specifications, the average flow velocity and direction in the flood and ebb tides are listed in Table 4.3.4-2. As revealed by statistics, except for the deviation of 19 degrees between the calculations and actual measurements of average flow direction at #1 Station site, the deviation of the average flow direction at other tidal sections is less than 15 degrees, which substantially complies with the precision requirements of the specifications. Compliance of velocity characteristic values with the specification requirements is slightly poor and the deviation thereof shall not exceed 10% as required in the specifications. Out of the 4 stations, 3 stations comply the requirements on average during ebb tide while the deviation at #1 Station is high up to 15.9%. However, compared with the velocity value, the difference between calculations and actual measurements is merely around 0.06m/s with insignificant deviation. Increase in deviation percentage is attributable to the relatively weak flood tide dynamics. Similarly, despite limited absolute value of average velocity during ebb tide, only one station has statistical deviation percentage statistics less than 10% while two stations has the deviation percentage close to 10%

and one station has the the deviation percentage high up to 18%, of which the absolute value is merely around 0.066m/s. As for such sea area with weak dynamics, although the statistical deviation percentage cannot fully comply with the specification requirements, it is really not easy to reach the current verification precision taking into account the verified tide type dominated by diurnal tide and partial tide, relatively long flood and ebbing tide duration, weak dynamics and significant weather disturbance during the observation period. Based on the comprehensive reference of tide verification process and pattern as well as peak-valley value deviation, the verified tide type is deemed as to substantially recapitulate the tidal movement characteristics in the project area. This fortnightly tide type can better reflect the flood and ebbing dynamics under the dominant state of astronomical tide and can be used as the representative tide type for calculating and assessing the regular pattern of pollutant diffusion in this project.

表 4.3.4-2 各站极值流速验证成果统计（流速单位： m/s ）

Table 4.3.4-2 Statistics of Verification Results of Extreme Values of flow velocity at Individual Stations (in m/s)

综合潮位过程和流速流向过程的验证，潮位验证点位在平面形态上较好地控制了潮波传播的平面形态，且舍弃了强天气干扰的增减水特征，重点验证与平常天气条件更相符的第二测次，验证精度满足规范要求，说明潮波传播特性数学模型与天然基本相似；潮流验证点位控制住了主要水槽动力，除了个点别位受天气干扰略有偏差个，大部分点位的计算过程与实测基本一致，说明模拟的流场特征与天然流场也是基本相似的。半月潮验证潮型可作为代表潮型开展本项目的计算研究。

Based on the verification of tide level process as well as flow velocity and direction process, the planar shape of tidal wave propagation is better controlled by tide level verification points in plane shape with water adding and reducing characteristics of strong weather interference abandoned and with focus on the verification of the second measurement which is more consistent with normal weather conditions. The verification precision complies with the specification requirements, which indicates that the mathematical model of tidal wave propagation characteristics is substantially similar to natural characteristics. The main water trough dynamics are controlled by tidal current verification points. Except for slight deviations at a few points due to weather disturbance, the calculation process of most points is basically consistent with actual measurement, which indicates that the simulated current field characteristics are basically similar to the natural current field. The verified fortnightly tide type can be used as a representative tide type for calculations and study of this project.

4.3.4.3 污染物扩散验证

4.3.4.3 Verification of pollutant diffusion

污染物的扩散验证，原则上要求有配套动力过程、准确的初始浓度场、污染物排放过程、现场观测浓度过程相组合才可以实现。若开展计算域的初始浓度场观测、周边点源和面源的收集观测及计算域内代表点同步的水动力和污染物浓度过程验证资料观测，需要大量的经费和时间。由于本底污染源十分复杂、初始污染状的确定也难度很大，实际应用过程中，污染物扩散验证主要是确认污染物的扩散参数和降解参数。本底污染状态拟采用历史监测资料综合反映为各代表点位的本底值中，数学模型只对两个拟研究排污区的排污口和规划的龙港排污口做组合影响条件下的增量浓度贡献值进行模拟计算，增量浓度场与本底值相结合评价各种源强组合条件的污染状况评价和排污口允许排放量（环境容量）计算。

In principle, verification of diffusion pollutants may not be possible without a combination of associated dynamic process, accurate initial concentration field, pollutant emission process and field observation concentration process. Significant costs and time are required to conduct initial concentration field observations in the calculation domain, collection and observations of surrounding point and area sources, and hydrodynamic and pollutant concentration process verification data observations synchronized at representative points in the calculation domain. With considerable complexity of background pollution sources and significant difficulty in determining the initial pollution form, pollutant diffusion verification mainly serves to confirm the diffusion and degradation parameters of pollutants during actual application. The background pollution state is proposed to be reflected as the background value of each representative point using historical monitoring data. The mathematical model only simulates the incremental concentration contribution under the combined impact conditions of the sewage outlets in the two proposed study areas and the planned sewage outlet at Longgang Port.

本项目研究过程中，拟采用业内基本认可的污染物扩散参数和降解参数。参考前期在钦州湾内的相关研究成果[9]，其中 COD 降解参数取值为 0.04/d，无机氮降解参数为 0.15/d，活性磷酸盐为 0.08/d、石油类为 0.013/d。钦州湾计算时历时两年，基本摸清了计算域的污染物来源，虽然缺乏同步的动力过程与污染过程相匹配的严格验证，但实现了半月潮条件下，最大值、最小值、平均值的计算与实测比对验证，确定的参数得到专家组的评审认可，认为参数取值符合钦州湾降解特性，适用于污染扩散模型评价计算。本项目研究海域的潮汐潮流、海水物质组成、物理化学特性、生物影响等均与钦州湾有相似之处，移用钦州湾的污染物降解参数是可行的。

In the course of the study of this project, the diffusion and degradation parameters of pollutants which are generally accepted in the industry are proposed to be used. Results of relevant studies in Qinzhou Bay [10] are referenced, of which the degradation parameter of COD inorganic nitrogen active phosphate and petroleum is taken as 0.04/d, 0.15/d, 0.08/d and 0.013/d respectively. The calculation of Qinzhou Bay took two years, and the sources of pollutants in the calculation domain were basically established. Despite a lack of rigorous verification where the synchronized dynamical process is matched with pollution process, the calculations of maximum, minimum and average values under the fortnightly tide conditions were compared and verified against actual measurements, and the identified parameters were evaluated and approved by the expert team, which considers the parameter values as consistent with the degradation characteristics of Qinzhou Bay and suitable for the assessment and calculation of pollution diffusion model. The tidal currents, composition and physicochemical property of seawater substances and biological impacts in the sea area studied in this project are similar to those of Qinzhou Bay so that transfer and use of the pollutant degradation parameters of Qinzhou Bay are feasible.

扩散参数敏感性相对较弱，采用常数值或流速关系表达式均可，本次计算纵向取值 5.0m^2/s，横向取值 0.5m^2/s。

The sensitivity of the diffusion parameters is relatively weak so that either constant values or velocity relation expressions are used therefor. Such parameters are taken as 5.0m^2/s longitudinally and 0.5m^2/s latitudinally in this calculation.

4.3.5 水动力特征分析

4.3.5 Hydrodynamic characteristic analysis

在验证计算基础上，按近期工况和远期工况岸形条件，分别计算分析验证确定的代表潮型条件下流场特征。本次计算污染物扩散和环境容量考虑近、远期两种岸线形态，见图 4.3.5-1。近期工况为现状岸线形态，远期工况采用 2018 年 5 月广西壮族自治区人民政府批复的《北部湾港总体规划修编》中的铁山港规划岸型，见图 4.3.5-2。

Based on the verification calculations, the flow field characteristics under representative tide type conditions as determined by the analysis & verification are calculated respectively as per near- and long-term working conditions of shoreline shape. Pollutant diffusion and environmental capacity are calculated taking into account both near- and long-term shoreline shape, as shown in Figure 4.3.5-1. Near-term working conditions are the current conditions of shoreline shape while long-term working conditions are the planned shoreline shape of Tieshan Port in the *Revised Master Plan of Northern Bays and Ports* as approved by the People's Government of Guangxi Zhuang Autonomous Region in May 2018, as shown in Figure 4.3.5-2.

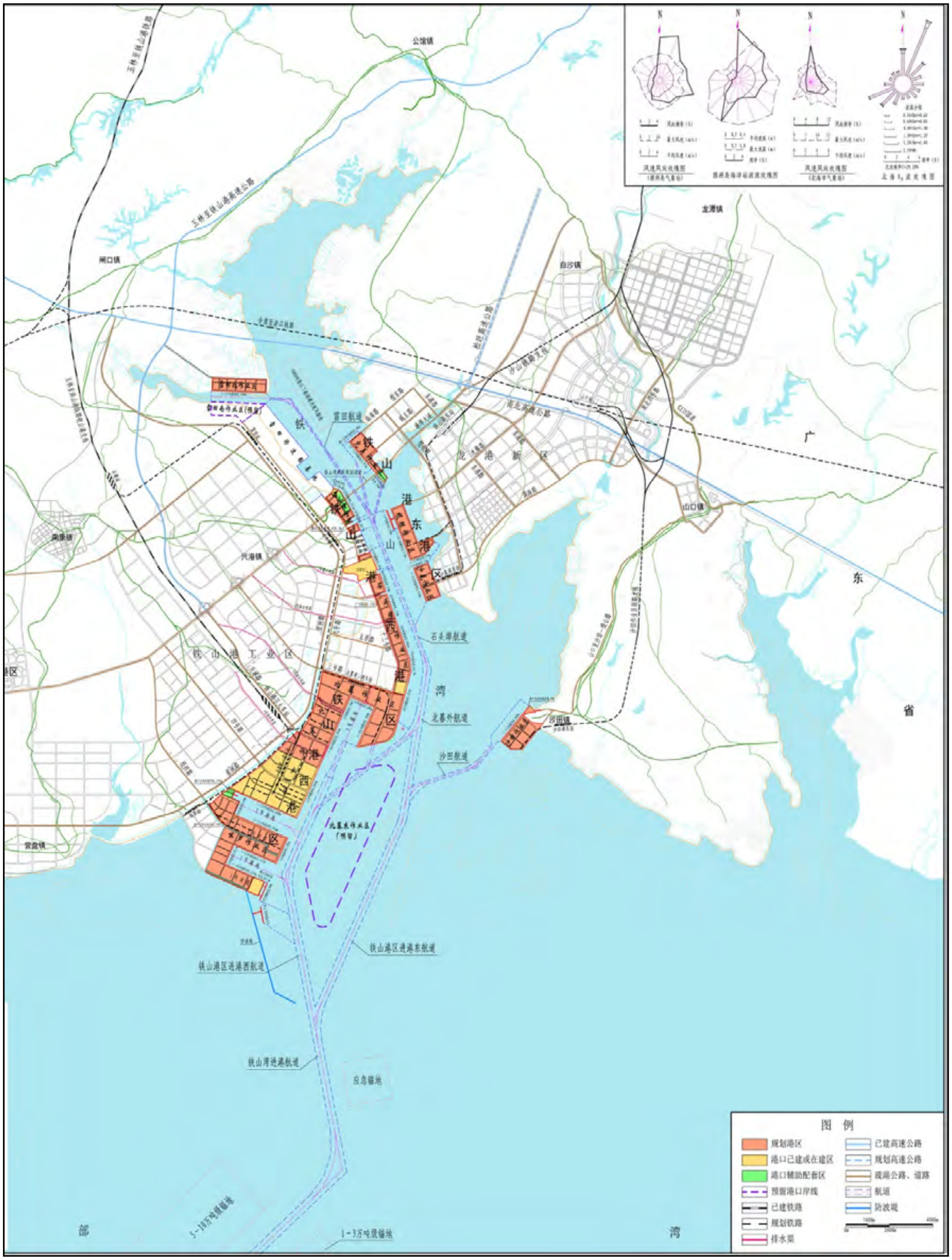
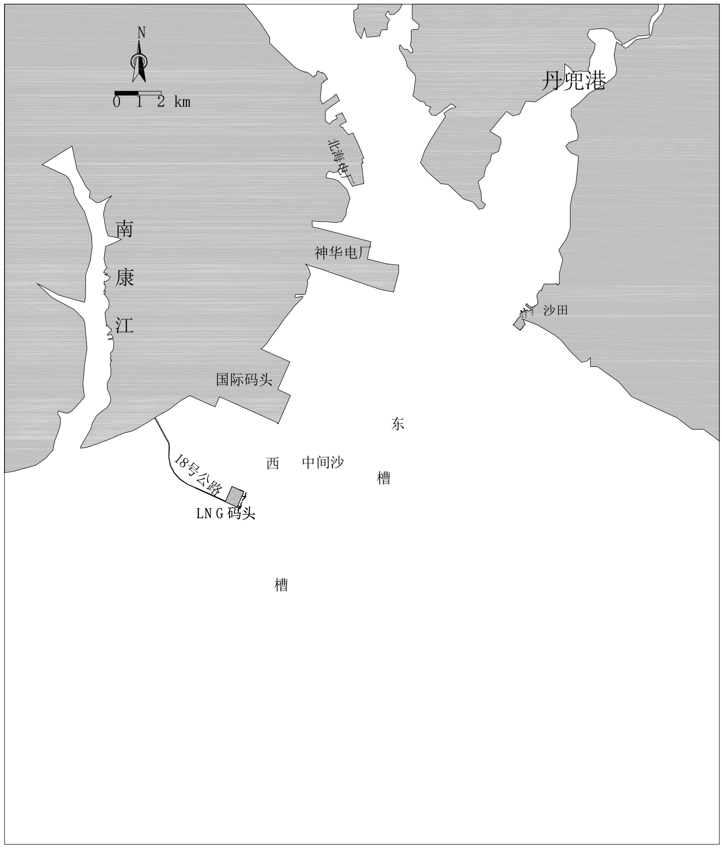


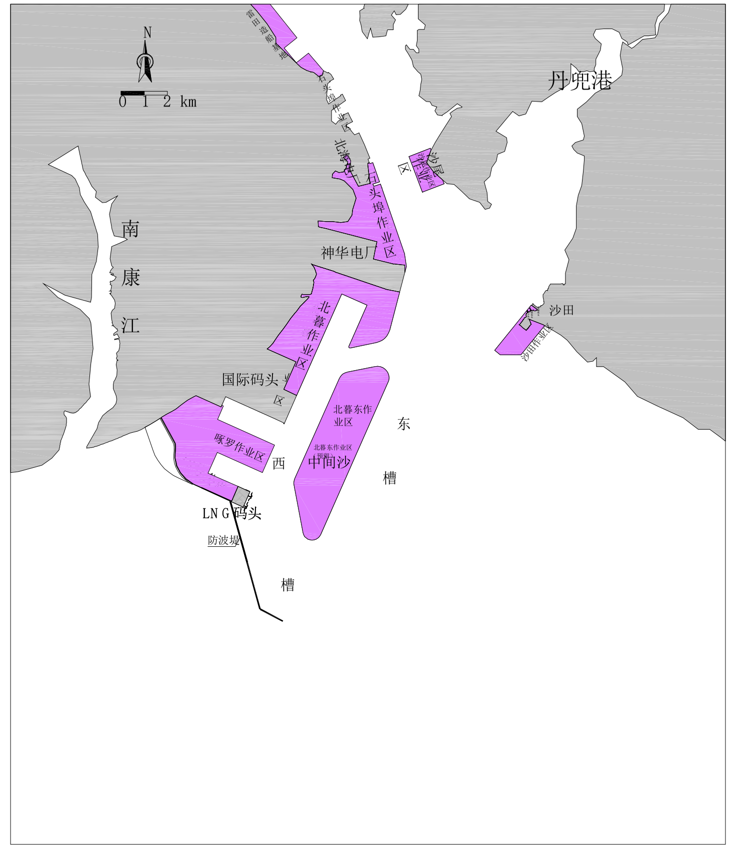
图 4.3.5-2　北部湾港总体规划修编（2018）铁山港区规划图

Figure 4.3.5-2　Planning Map of Tieshan Port Area in Master Plan of Northern Bays and Ports (2018)



近期工况

Near-term working conditions



远期工况

Long-term working conditions

图 **4.3.5-1** 计算岸线工况

Figure 4.3.5-1 Calculated Working Conditions of Shoreline

4.3.5.1 铁山湾深槽纳潮量特征分析

4.3.5.1 Characteristic analysis for deep trough tidal prism of Tieshan Port

B3 排污口位于东、西槽交汇处北侧深槽内，其所在深槽和东、西槽内的纳潮量是评判 B3 排污口布置的重要依据，反映了 B3 排污口附近的过境水量大小，是初步评判污水稀释能力的基础数据。如图 4.3.5-3 取三个采样断面，其中 1#断面位于湾内主槽内，宽度 2.91km，断面两端位于 0m 线以浅附近水域；2#、3#断面分别位于铁山湾湾口的西、东槽内，宽度分别为 3.07km、3.55km，2#断面西端位于已有陆地上，3#断面东端位于 0m 等深线以浅附近水域，两断面交点位于中间沙中部。各水道内的水流以往复流特征位置。1#断面的潮流量过程能够反映 B3 排污口附近的水量信息。

Sewage outlet B3 is located in the deep trough to the north of the junction of the east and west trough. The tidal prism in the deep trough and the east and west trough is an important basis for assessment of the layout of B3, which reflects the amount of water passing through the vicinity of B3 and is the basic data for preliminarily assessment of the dilution capacity of sewage. As shown in Figure 4.3.5-3, three sampling sections are taken, of which #1 Section is located in the main trough in the bay with a width of 2.91km with both ends thereof located in the waters near the 0m line while #2 and #3 Section are located in the west and east troughs at baymouth of Tieshan Bay respectively with widths of 3.07km and 3.55km respectively. The west end of #2 Section is located on the existing land and the east end of #3 Section is located in the waters near the 0m isobath, between which the intersection point is located in the center of the middle sand. The characteristic position of the water flow in each waterway is the reciprocal flow. The tidal flow process of #1 Section can reflect the water quantity information near B3.

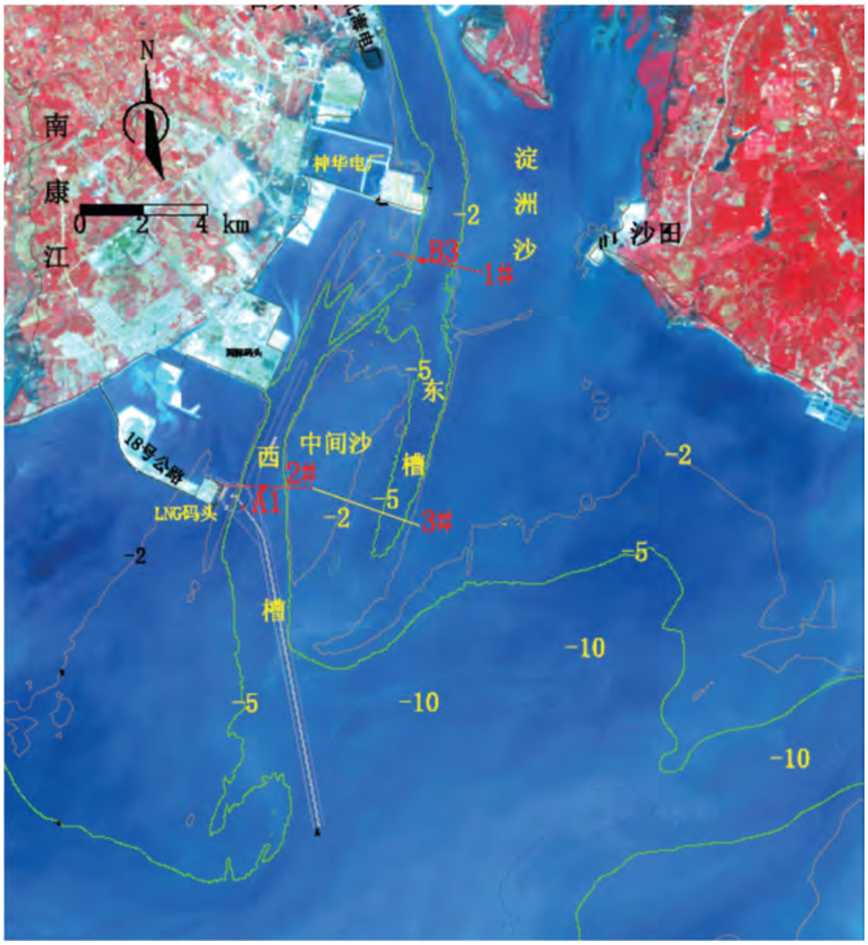


图 4.3.5-3 工程水域潮量分析断面位置示意

Figure 4.3.5-3 Location Schematics of Analysis Sections for Tidal Prism in the Waters of the Project

提取半月潮逐时潮流量，分涨、落大致统计纳潮量，特征信息统计见表 4.3.5-1。表中负值为涨潮通量，正值为落潮通量。其中潮通量的最小值出现在半日分潮为主期间，一般涨、落潮潮期长约 4~5 小时。

The hourly tidal flow of fortnightly tide is taken to carry out rough statistics of the tidal prism during flood and ebb tide. Statistics of characteristic information are as shown in Table 4.3.5-1. The negative value in the table is the flood tide flux and the positive value is the ebb tide flux. The minimum value of tidal flux occurs during the period dominated by semidiurnal partial tide. Generally the flood and ebb tide period is roughly 4-5 hours .

表 4.3.5-1 断面潮通量特征值统计表（单位：亿方）

Table 4.3.5-1 Statistics of Characteristic Values of Tidal Flux of the Sections (in hundred million cubic meters)

断面 Section / 潮段工况 Working conditions of tidal section		1#（内湾深槽）(Inner bay deep trough)	2#（西槽）(West trough)	3#（东槽）(East trough)
近期 Near-term	涨最大 Flood maximum	-4.8993	-4.9143	-3.4381
	涨最小 Flood minimum	-0.1990	-0.2182	-0.1372
	落最大 Ebb maximum	5.1843	5.1733	3.8833
	落最小 Ebb minimum	0.3857	0.3611	0.2631
远期 Long-term	涨最大 Flood maximum	-4.9377	-1.8931	-4.2615
	涨最小 Flood minimum	-0.2065	-0.1105	-0.1416
	落最大 Ebb maximum	4.7505	1.9392	5.0727
	落最小 Ebb minimum	0.3530	0.1423	0.3166

取 26 万吨/天的废水排放量，按表中潮通量数据计算落潮最快和最慢稀释倍数，B3 排污口近期分别为 4825、898 倍；远期分别为 4422、821 倍。远期最快、最慢稀释倍数有所减小是因为北暮东预留作业区阻挡了进出西槽的潮流，使得污染物进入西槽稀释的能力大幅度减弱，但东槽内落潮期间稀释能力明显增强，说明东槽外段扩散能力增加。所以整体上来看 B3 排污口最快、最慢稀释能力在远期虽然有所减小，但其东槽外段扩散能力增强，B3 排污口排出的污染物扩散能力并不一定减弱。

With the wastewater discharge taken as 260,000t/d, the dilution multiple for fastest and slowest flood tide are calculated as per the tidal flux data in the table, which are 4,825 and 898 times respectively at sewage outlet B3 in near term and 4,422 and 821 times in long term respectively. The long-term fastest and slowest dilution multiples have been reduced as the Beimudong reserved work area blocked the tidal flow from and to the west trough, making dilution capacity of the pollutants entering into west trough greatly weakened. However, the dilution capacity in the east trough during ebb tide is significantly enhanced, indicating that the diffusion capacity of the outer section of east trough is enhanced. As such, in general, although the fastest and slowest dilution capacity of B3 will be reduced in long term, the diffusion capacity of the outer section of the east trough will be enhanced, and that of pollutants emitted from B3 will not necessarily be reduced.

框算的稀释倍数只能作为参考，实际排放过程中的浓度变化是不均匀的，在涨、落憩流阶段的稀释能力相对较弱，特别是落憩阶段。潮动力强弱交替，不同动力情况下的稀释能力也是有所差异的，排污口污染物浓度更精确的变化特征详见4.3.6节。

The dilution multiplier from frame calculation is for reference only. Change in concentration during actual emission process is not uniform with dilution capacity in at flood and ebb slack stages being relatively weak, especially at ebb slack stage. The tidal dynamics alternate and dilution capacity varies under different dynamics conditions. More precise characteristics of the variation in pollutant concentrations at the sewage outlet are detailed in Section 4.3.6.

4.3.5.2 工程水域流场分布特征

4.3.5.2 Characteristics of flow field distribution in the waters of the project

（1）近期工况

(1) Near-term working condition

近期工况岸线情况下，铁山湾外海海域涨、落潮主流为东北-西南向，外海潮流有一定旋转性。近岸区主要往复流为主。铁山湾湾口西槽内（LNG 码头附近段），由于湾口附近滩、槽相间，岸滩宽广，涨、落潮流的局部流态各具特点。西槽东侧有中间沙，再往东为东槽。东、西槽是铁山湾内湾的主要潮汐通道，中间被中间沙分隔，东槽以东为广阔浅水域。东槽5m先不能贯通，以落潮动力为主，属落潮沟；西槽以涨潮动力为主，为涨潮沟。

Under the near-term working conditions of shoreline, the mainstream of flood and ebbing tides in the sea area off Tieshan Bay is in the direction of northeast-southwest, and the tidal current in the sea area off Tieshan Bay has certain rotation. The near-shore area is dominated by reciprocating flow. In the west trough of Tieshan Bay mouth (near LNG terminal), due to the alternate beaches and troughs near the mouth, the beaches are broad, and the local flow patterns of flood and ebb tide have their own characteristics. There is middle sand on the east side of the west trough, and the east trough is the east trough to the east. The east and west troughs are the main tidal troughs in the inner bay of Tieshan Bay, separated by middle sand, and the east of the east trough is a vast shallow water area. The 5m of east trough cannot be penetrated at first, which is dominated by ebb tide dynamics and falls under ebb tide trough. The west trough is dominated by flood tide dynamics and falls under a flood tide trough.

图 4.3.5-4 为涨、落急时刻研究海域的潮流场分布。涨急时，在 LNG 接岸公路南侧形成涨分流点，分流点位置位于公路中部偏岸测，分流西侧涨潮流流向岸侧，东侧涨潮流顺偏向东偏北方向，至西槽水域。涨潮期，西槽涨潮动力强于东槽。从外海进入西槽内的涨潮流，流过 LNG 码头泊位区后，首先在国际港务集团 1#码头南护岸中部附近分流，分流后的主流继续沿西槽上溯，受神华电厂陆域阻挡，西槽内涨潮主流东偏进入铁山湾老航道内，与东槽内涨潮流汇聚（B3 排污口附近）。汇聚后的涨潮主流受东侧淀洲沙阻挡北向进入铁山湾内湾。淀洲沙滩面有明显涨潮漫滩流。

Figure 4.3.5-4 shows the distribution of tidal current field in the sea area under study at the time of rapid flood and ebb tide. In case of rapid flood tide, a flood tide diversion point is formed on the south side of the LNG shore-connecting highway. The diversion point is located on the middle side of the highway. The flood tidal current on the west side flows to the shore side, and that on the east side flows to the west trough water area in the east by north direction. During the flood tide period, the flood tide dynamics of the west trough is stronger than that of the east trough. After the flood tide entering the west trough from the open sea flows through the berth area of LNG terminal, it is first diverted near the middle of the south bank protection for #1 terminal of International Port Group. The diverted mainstream continues to go up along the west trough and is blocked by the land area of Shenhua Power Plant. The flood tide mainstream in the west trough enters the existing trough of Tieshan Bay to the east and converges with the flood tide in the east trough (near B3 sewage outlet). The converged flood tide mainstream is blocked by Dianzhousha on the east side and enters inner bay of Tieshan Bay in the north. There is apparent flood tide overflow on the shoal surface of Dianzhousha.

落潮时，铁山湾内湾落潮主流顺老航道外泄（B3 排污口位于该水域），中间沙对落潮主流形成分隔，落潮流顺东槽外泄更为顺畅，东槽落潮动力强于西槽。东、西槽落潮主流在中间沙沙尾汇合后沿南向偏西方向进入铁山湾 10m 等深线水域，进一步与安铺港落潮流汇合，向西南方向外泄。另外西槽内落潮流越过 LNG 后方陆域东南角点后，继续向西南方向行进。

During the ebb tide, the main ebb tide in Tieshan Bay leaks along the existing trough (B3 sewage outlet is located in this water area). The middle sand separates the main ebb tide, the ebb tide leaks more smoothly along the east trough, and the ebb tide dynamics in the east trough is stronger than that in the west trough. The main ebb tides of the east and west troughs converge at the tail of middle sand and then enter the 10m isobath waters of Tieshan Bay along the south-west direction to further converge with the ebb tides of Anpu Port and leak out to the southwest. In addition, the ebb tide in the west trough continues to travel southwest after crossing the southeast corner of the land area behind LNG.

整体来看，B3 排污口在近期工况条件下均位于铁山湾主通道的潮流主流区。

On the whole, B3 sewage outlet is located in the tidal current mainstream area of main passage of Tieshan Bay under near-term working conditions.

（2）远期工况

(2) Long-term working condition

远期工况与近期相比较，岸形方面有较大变化。对排污口影响较大的主要有三方面：一是西槽西侧浅滩都被规划为陆域；二是中间沙浅滩也被开发利用，填筑陆域纵深约 8km，形成北暮东作业区，这样进入西槽内的潮流只能通过该作业区北侧 1km 左右的通道进入内湾；三是湾口西侧（LNG 码头西南侧）布置一个西北-东南走向的防波堤，长度约 5.9km。

Compared with the near-term conditions, shore shape will significantly change under the long-term working conditions. There are three main aspects imposing significant impact on the sewage outlet: first, the shoals on the west side of the west trough are all planned as land areas; Second, the middle sand shoal has also been developed and utilized, filling the land area with a depth of about 8km to form the Beimudong operation area, so that the tidal current entering the west trough can only enter the inner bay through a passage about 1km north of the operation area. Third, a breakwater running from northwest to southeast is arranged on the west side of the bay mouth (southwest side of LNG terminal), with a length of about 5.9km.

远期工况条件下，涨急时（图 4.3.5-5），啄罗作业区与防波堤南侧大片水域涨潮动力极缓慢，成为弱流区。外海侧涨流需绕过防波堤后才能够进入西槽水域，进入西槽内涨潮流，受两侧规划岸线约束水流平顺，但水流动力较近期工况明显减缓。西槽内涨潮流绕过北暮东作业区北侧通道后，与东槽内潮流汇聚，继续向内湾行进。

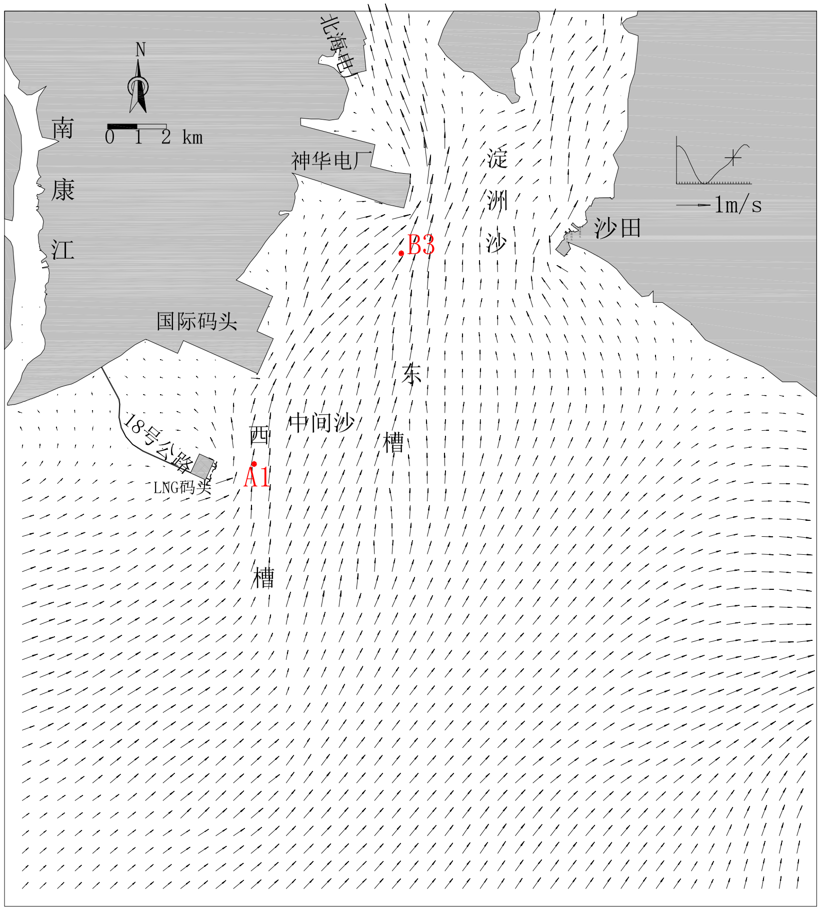
Under long-term working conditions, in case of rapid flood tide (Figure 4.3. 5-5), the flood dynamics in the Zhuoluo operation area and the large-area waters on the south side of the breakwater is extremely slow and becomes a weak flow area. The flood tidal current on the open sea side needs to bypass the breakwater before it can enter the waters of the west trough and enter the rising current in the west trough. The flow is smooth due to the constraints of the planned shoreline on both sides, but the flow dynamics is significantly slower than the near-term working conditions. After bypassing the passage on the north side of Beimudong operation area, the flood tidal current in the west trough converges with the tidal current in the east trough and continues to travel towards the inner bay.

远期工况条件下，落急时（图 4.3.5-5），铁山湾内湾落潮流受两岸自然岸形及规划陆域岸形约束，流态相对平顺，B3 排污口仍位于潮流主流区。东槽成为铁山湾内湾潮量的主要通道。内湾下泄的落潮流在北暮东作业区北护岸分流，大部分落潮流速进入东槽内，其中在东槽南段落潮流有部分从东侧滩面漫向东南，在东槽南端落潮流有向东、西两侧发散之势；另外一部分落潮流通过北暮东作业区北侧通道进入西槽内，西槽内落潮动力明显弱于近期工况。受防波堤约束，西槽内落潮流过了 LNG 码头后需继续向东南方向行进，在防波堤东南端与东槽内落潮流汇聚，然后向西南流向外海。

Under long-term working conditions, in case of rapid ebb tide (Figure 4.3. 5-5), the ebb tide in Tieshan Bay is constrained by the natural shore shape on both sides of the river and the planned land shore shape, and the flow pattern is relatively smooth. B3 sewage outlet is still located in the mainstream area of the tide. The eastern trough becomes the main trough of tidal prism in Tieshan Bay. The ebb tide discharged from the inner bay is diverged in the north revetment of the Beimudong operation area, and most of the ebb tide velocity enters the east trough. In the south section of the east trough, some of the ebb tide overflows from the east beach surface to the southeast, and in the south end of the east trough, the ebb tide diverges from the east and west sides. Another part of the ebb tide enters the west trough through the passage on the north side of the Beimudong operation area, and the ebb tide force in the west trough is obviously weaker than the near-term working conditions. Constrained by the breakwater, the ebb tidal current in the west trough needs to continue to travel southeast after passing through the LNG terminal, converge with the ebb current in the east trough at the southeast end of the breakwater, and then flow southwest to the open sea.

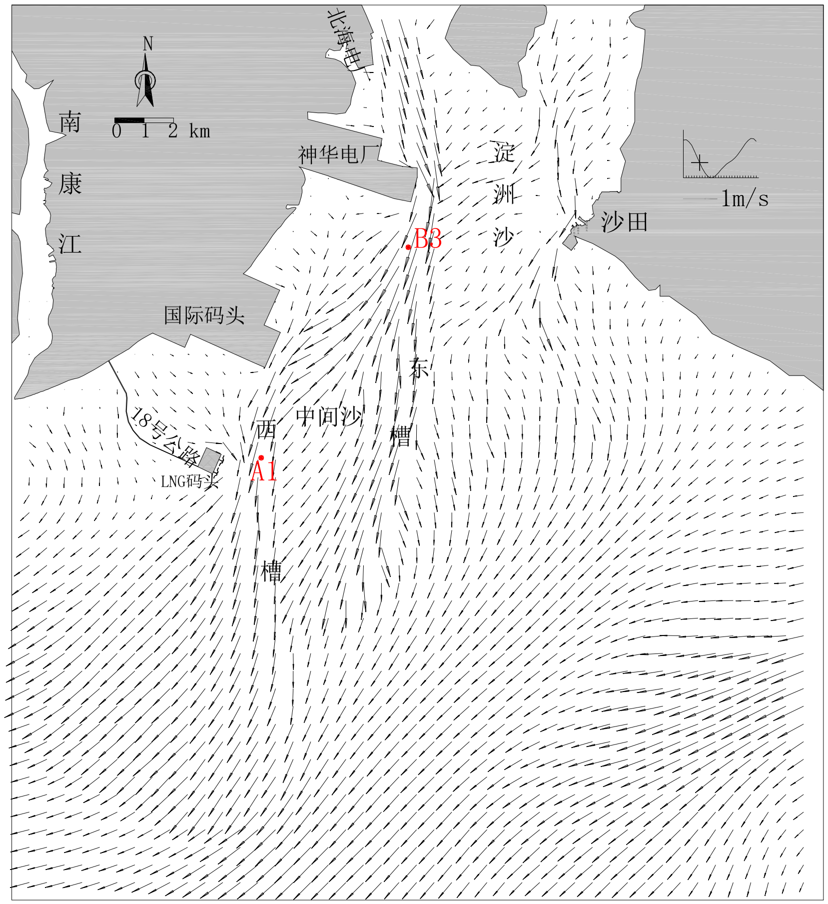
远期工况条件下，B3 排污口位于内湾潮流主流区。近、远期工况条件下，东、西槽内过流量分配变化可参见从 4.3.5.1 节中潮量分析成果。

Under long-term working conditions, B3 sewage outlet is located in the mainstream area of inner bay tidal current. Under the near-term and long-term working conditions, the change of over-flow distribution in the east and west troughs can be found in the analysis results of tidal prism in Section 4.3. 5.1.



涨急时刻

Time of rapid flood tide

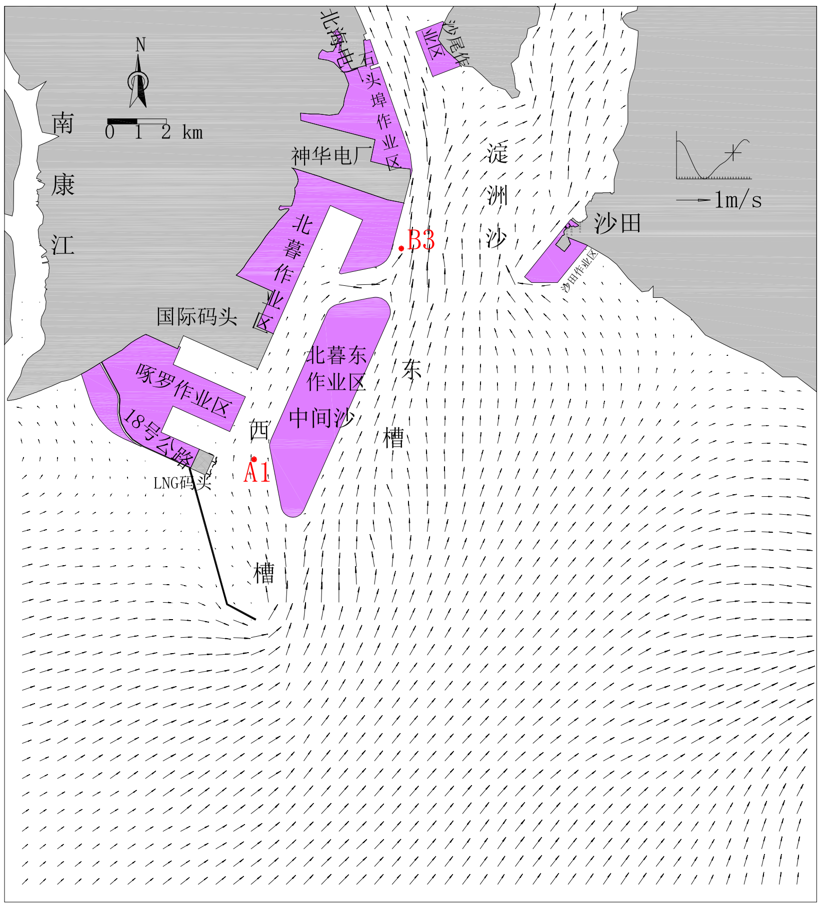


落急时刻

Time of rapid ebb tide

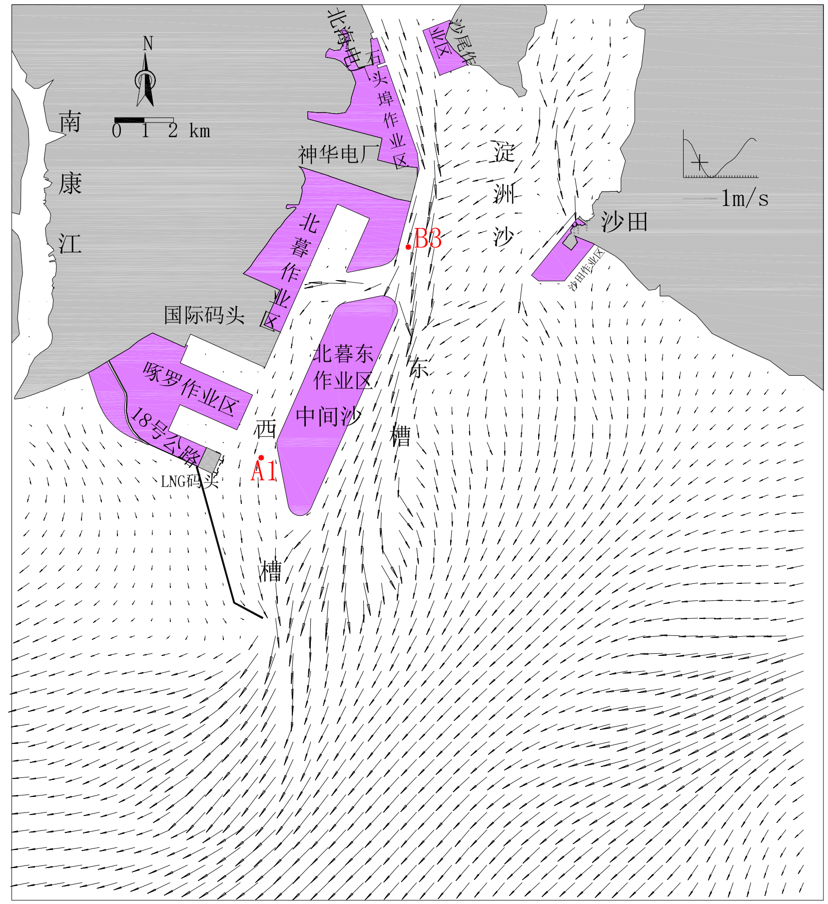
图 4.3.5-4　近期工况下研究海域大范围流态图

Figure 4.3.5-4 Diagram of Large-scale Flow Pattern of the Sea Area in Question under Near-term Working Conditions



涨急时刻

Time of rapid flood tide



落急时刻

Time of rapid ebb tide

图 4.3.5-5　远期工况下研究海域大范围涨急流态图

Figure 4.3.5-5 Diagram of Large-scale Flow Pattern of the Sea Area in Question under Long-term Working Conditions

4.3.5.3 拉格朗日标识点追踪

4.3.5.3 Lagrange Marker Tracking

拉格朗日标识质点追踪，是在潮流场的基础上，利用计算得到的欧拉流场，计算标识质点每一时刻的拉格朗日流速，进而得到下一时刻质点的位置，连续计算得到质点运动轨迹。可研究污染物排放后，质点随潮流运动的最终去向。不同时刻投放的质点运动轨迹是不一样的，分别选取大潮高潮位和低潮位时刻作为质点投放时刻，模拟计算一个落潮和涨潮过程中质点的运动轨迹。

Lagrangian marker particle tracking is based on the tidal current field, using the calculated Euler flow field to calculate the Lagrangian velocity of the marker particle at each moment, then obtain the position of the particle at the next moment, and continuously calculate the particle motion trajectory. The final destination of particle movement with tide upon pollutant emission can be studied. The motion trajectory of particles released at different times is different. The high tide level and low tide level of spring tide are selected as the particle release time respectively, and the motion trajectory of particles during a ebb tide and a flood tide is simulated and calculated.

（1）近期工况

(1) Near-term working condition

在 B3 排污口取断面，在断面上布置 5 个质点，均位于深槽内（-5m 等深线以深水域），追踪 5 个质点在一个全潮周期内涨、落潮过程中的运动轨迹。

The section of B3 sewage outlet is taken, and five particles are arranged on the section, all of which are located in the deep trough (deep waters below -5m isobath), and the motion trajectorys of the five particles during the rising and falling tides in a full tidal period are traced.

图 4.3.5-6 拉格朗日标识质点追踪，是在潮流场的基础上，利用计算得到的欧拉流场，计算标识质点每一时刻的拉格朗日流速，进而得到下一时刻质点的位置，连续计算得到质点运动轨迹。可研究污染物排放后，质点随潮流运动的最终去向。不同时刻投放的质点运动轨迹是不一样的，分别选取大潮高潮位和低潮位时刻作为质点投放时刻，模拟计算一个落潮和涨潮过程中质点的运动轨迹。

Lagrange marker particle tracking as shown Figure 4.3. 5-6 is based on the tidal current field, using the calculated Euler flow field to calculate the Lagrange velocity of the

Marker Particle at each moment, then obtain the position of the Particle at the next moment, and continuously calculate the particle motion trajectory. The final destination of particle movement with tide upon pollutant emission can be studied. The motion trajectory of particles released at different times is different. The high tide level and low tide level of spring tide are selected as the particle release time respectively, and the motion trajectory of particles during a ebb tide and a flood tide is simulated and calculated.

（2）远期工况

(2) Long-term working condition

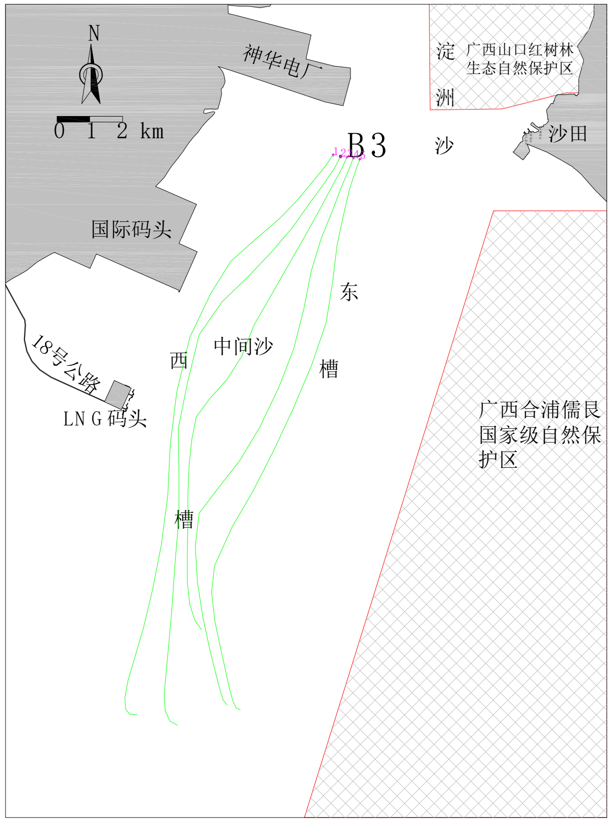
采用与近期工况相同的 5 个质点，在铁山港总体规划全部形成后，追踪质点在涨、落潮过程中的运动轨迹。图 4.3.5-7 绘制了远期工况条件下一个全潮周期里涨、落潮过程质点运动轨迹。涨潮期，B3 排污口附近污染物排放后，质点运动轨迹与近期工况基本相同，主要随涨潮流沿深槽进入内湾。落潮期，北暮东作业区围填了中间沙水域，使得 B3 排污口附近质点随落潮流分别进入东、西槽内，沿其深槽向外海侧运动，其中进入东槽的质点向外海运动速率快于西槽内的质点运动速率，说明落潮期东槽内污染物向外海扩散速率大于西槽。

The five particles same as near-term working conditions are used to track the motion trajectory of the particles in the process of flood and ebb tides after the master plan on Tieshan Port is completely formed. Figure 4.3. 5-7 illustrates the particle motion trajectory in the process of flood and ebb tides in a full tide cycle under long-term working conditions. During flood tide period, after the pollutants near the B3 sewage outlet are emitted, the particle motion trajectory is basically the same as the near-term working condition, and mainly enters the inner bay along the deep trough with the flood tide. During the ebb tide period, the waters of middle sand was enclosed in the Beimudong operation area, so that the particles near the B3 sewage outlet entered the east and west troughs respectively with the ebb tide and moved to the open sea side along their deep troughs. The particle movement rate entering the east troughs was faster than that in the west troughs, indicating that the diffusion rate of pollutants in the east troughs to the open sea was higher than that in the west troughs during the ebb tide period.

另外通过落潮期近、远期工况条件下东西槽内污染物质点运动轨迹看出，远期工况实施后，污染物随落潮流通过西槽向外海输移速率明显减缓，而通过东槽向外海扩散速率整体增加。

In addition, through the motion trajectory of pollutants in the east and west troughs under the short-term and long-term working conditions during the ebb tide period, it can be seen that after the implementation of the long-term working conditions, the transfer rate of pollutants through the west trough to the open sea is significantly decelerated along with the ebb tide, while the diffusion rate through the east trough to the open sea increases as a whole.

涨潮过程
Flood tide process



落潮过程

Ebb tide process

图 4.3.5-6 近期工况条件下涨、落潮过程质点运动轨迹

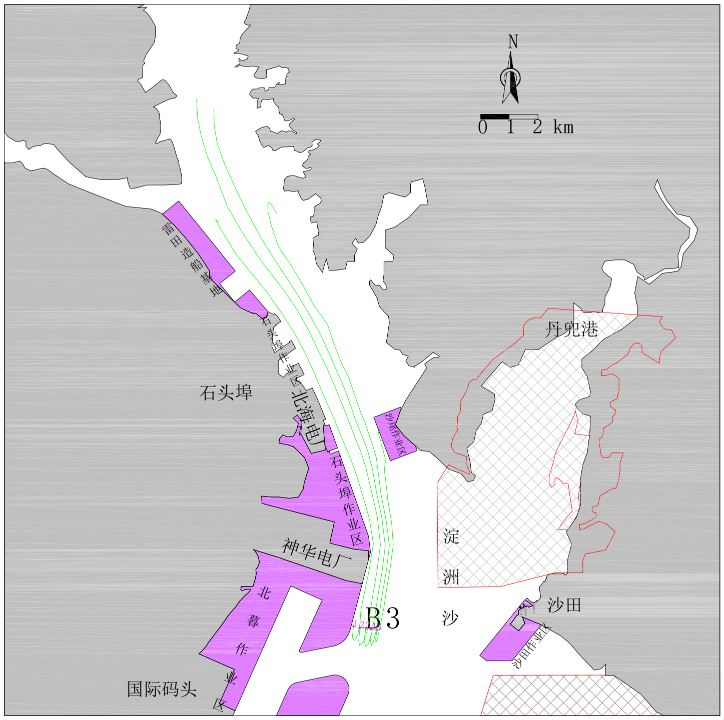
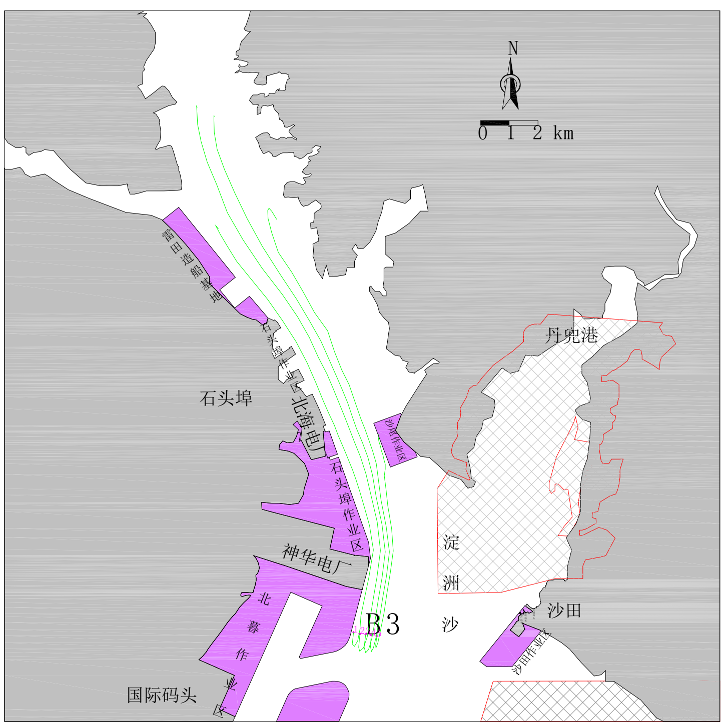
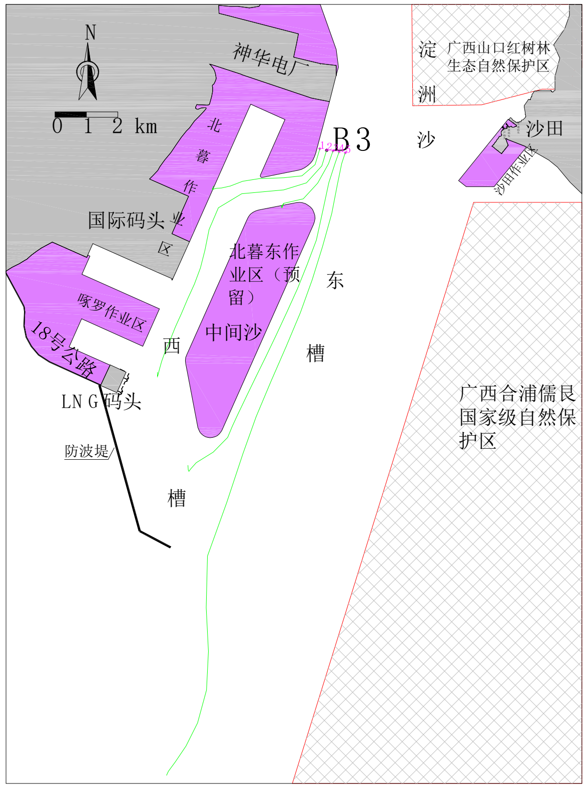


Figure 4.3. 5-6 Particle Motion Trajectory in the Process of Flood and Ebb Tides in a Full Tide Cycle under Near-term Working Conditions



涨潮过程

Flood tide process



落潮过程

Ebb tide process

图 **4.3.5-7** 远期工况条件下涨、落潮过程质点运动轨迹

Figure 4.3. 5-7 Particle Motion Trajectory in the Process of Flood and Ebb Tides in a Full Tide Cycle under Long-term Working Conditions

4.3.6 项目废水排放海域环境影响预测与分析

4.3. 6 Predication and analysis of environmental impact of project wastewater discharge on sea area

4.3.6.1 排污口情况

4.3.6.1 Conditions of sewage outlet

项目废水拟在铁山港西岸排污区 1（B3 排污口）排放，B3 排污口坐标为 E109°35′48″，N21°30′54″，位于铁山湾内东、西槽交汇处（中间沙北侧），地形高程约-9.8m（当地理论深度基准面，下同）。

Project wastewater is proposed to be discharged in the sewage discharge area 1 (B3 sewage discharge outlet) on the west bank of Tieshan Port. The coordinates of B3 sewage discharge outlet are 109°35'48"E and 21°30' 54"N. It is located at the intersection of the east and west troughs in Tieshan Bay (north side of the middle sand), and the topographic elevation is about -9.8 m (local theoretical depth datum level, the same below).

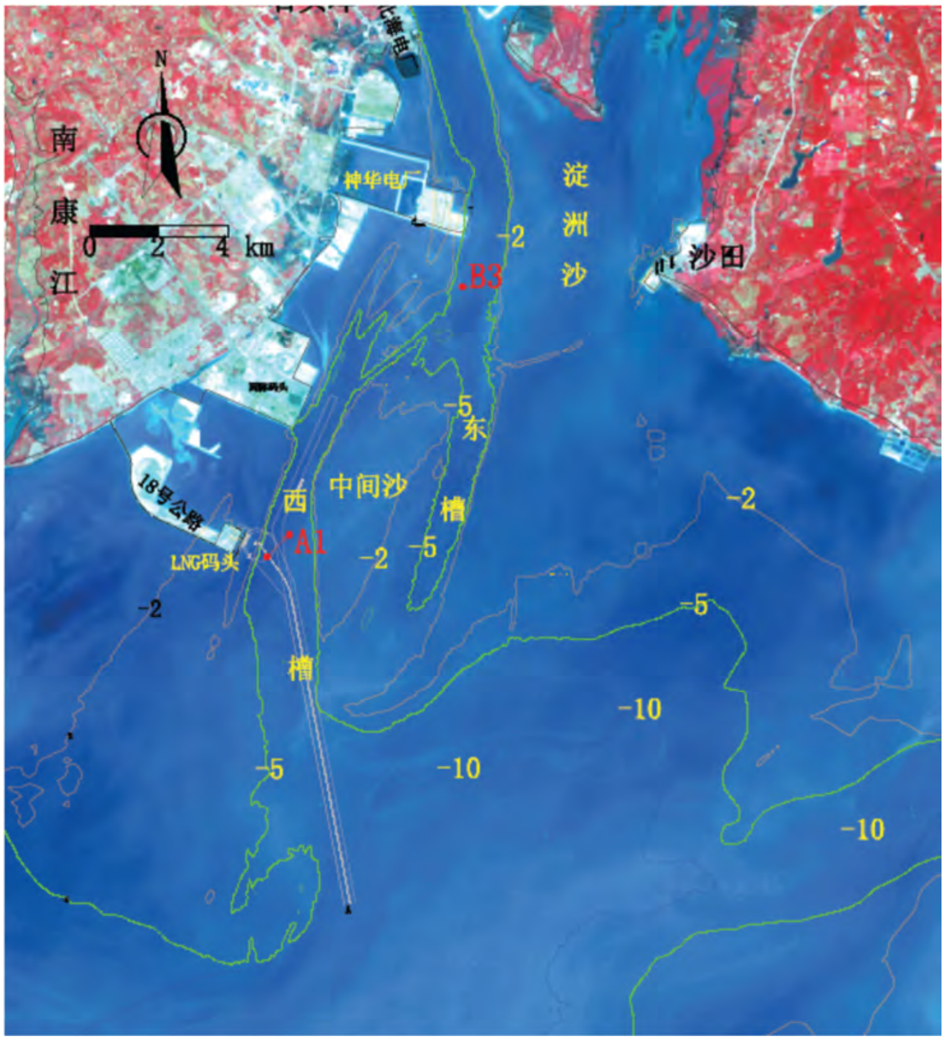


图 4.3.6-1 排污口位置示意图

Figure 4.3.6-1 Schematic Drawing of Sewage Outlet Location

4.3.6.2 预测情景与源项分析

4.3.6.2 Predicated scenarios and analysis of source item

项目生产废水经厂内处理达到《制浆造纸工业水污染物排放标准》（GB3544-2008）

接入铁山港深海排放管网在 B3 排污口深海排放。本评价通过对海洋环境影响预测，分析项目及铁山港区废水通过 B3 排污口排放的环境影响。

The production wastewater of the project is treated in the plant to reach the *Discharge Standards for Water Pollutants of Pulp- and Papermaking Industry* (GB3544-2008) and connected to Tieshan Port Deep Sea Discharge Pipe Network for Deep Sea Discharge at B3 Sewage Outlet. This assessment analyzes the environmental impact of the project and the wastewater discharged from Tieshan Port through B3 sewage outlet through the prediction of the marine environmental impact.

根据项目废水特点，预测因子考虑选取项目废水常规污染因子及特征污染物中毒性较大的因子，选取 CODmn、无机氮、总磷、SS、AOX，进行预测分析项目废水外排对铁山港海域海水水质的影响。本评价根据项目分期建设方案及铁山港海域岸线规划，对废水正常排放和事故排放情景对纳污海域的环境影响进行预测，预测情景见表 4.3.6-1。

Depending upon the characteristics of the project wastewater, the prediction factors consider selecting the conventional pollution factors of the project wastewater and the factors with greater toxicity of the characteristic pollutants, and selecting CODmn, inorganic nitrogen, total phosphorus, SS and AOX to predict and analyze the impact of the project wastewater discharge on the seawater quality in the sea area of Tieshan Port. According to the phased construction plan of the project and the shoreline planning of Tieshan Port sea area, this assessment predicts the environmental impact of normal wastewater discharge and emergency discharge scenarios on the polluted sea area. Prediction scenarios are as shown in Table 4.3.6-1.

表 4.3.6-1 项目废水排放海洋环境影响预测情景

Table 4.3.6-1 Predication Scenarios of Impacts of Project Wastewater Discharger on Marine Environment

排污口 **Sewage outlet**	预测情景 **Prediction background**		预测因子 **Forecast factor**
B3 排污口 B2 sewage	一期（现状岸线、规划岸线） Phase I (current and planned	二期（现状岸线、规划岸线） Phase II (current and planned	COD_{Mn}、无机氮、活性磷酸盐、SS、AOX

outlet	shoreline)	shoreline)	COD_{Mn}, inorganic nitrogen, reactive phosphate, SS, AOX
	正常排放、非正常排放 Normal and abnormal emission	正常排放、非正常排放 Normal and abnormal emission	

排污海域附近铁山港西岸排污区 2（GX013DⅣ）和铁山港东岸排污区（GX009DⅣ）均未有排污口建成，海域叠加污染源主要考虑 B3 口排放的废水污染源。项目废水源强及叠加污染源源强情况见表 4.3.6-2 和表 4.3.6-3。

No sewage outlet has been built in the West Bank Sewage Area 2 (GX013D IV) and the East Bank Sewage Area (GX009D IV) of Tieshan Port near the sewage discharge sea area so that the wastewater pollution sources discharged from B3 outlet will mainly be taken into account in the superimposed pollution sources in the sea area. The source intensity of wastewater and superimposed pollution sources of the project is as shown in Table 4.3. 6-2 and 4.3. 6-3.

表 4.3.6-2　　项目海洋环境影响预测废水源强情况

Table 4.3.6-2 Predicated Wastewater Source Intensity Condition of Marine Environment Impact of the Project

情景 Scenarios		预测水量 Predicated water quantity	CODcr	无机氮 Inorganic nitrogen	SS	总磷 Total phosphorus	AOX
		m^3/d	mg/L	mg/L	mg/L	mg/L	mg/L
项目废水（一期） Project wastewater (Phase I)	正常排放 Normal emission	72130	73.4	7.5	23.6	0.7	3.4
项目废水（二期） Project wastewater (Phase II)		95023	73.0	7.5	25.1	0.7	2.6
项目废水（一期） Project wastewater (Phase I)	非正常排放 Abnormal emission	72130	748.5	15	—	17	—
项目废水（二期） Project wastewater		95023	828	15	—	17	—

(Phase II)							

①非正常排放预测情景保守考虑选取综合废水未经处理直接排放作为源强；②一个预测周期内持续6h，其他时段仍为正常排放。
① The untreated direct discharge of comprehensive wastewater is conservatively considered as the source intensity in the abnormal emission prediction scenario; ② abnormal emission will sustain for 6 hours in one prediction period while normal discharge will be maintained for the rest of the period.

表 4.3.6-3 B3 排污口叠加污染源情况（已批复）

Table 4.3.6-3 Condition of Superimposed Pollution Sources at B3 Sewage Outlet (Approved)

污染源 Source of pollution	**废水量** m^3/d Wastewater volume m^3/d	**CODcr** mg/L	**无机氮** mg/L Inorganic nitrogen mg/L	**SS** mg/L	**总磷** mg/L Total phosphorus mg/L	AOX mg/L	**执行标准 Implementation standards**
铁山港区污水处理厂 Sewage treatment plant of Tieshangang District	40000	50	5	10	0.5	—	《城镇污水处理厂污染物排放标准》（GB18918-2002）一级 A 标准 Class IA Standard for *Pollutant Discharge Standard for Urban Sewage Treatment Plants* (GB18918-2002)
斯道拉恩索项目 Stora Enso Project	90352	90	8	30	0.8	3.01	《制浆造纸工业水污染物排放标准》（GB3544-2008）表 2 Table 2 of Discharge Standards for Water Pollutants of Pulp- and Papermaking Industry (GB3544-2008)
北海炼化项目 Beihai Refinery Project	2340	60	10	35	1	—	GB 31570-2015《石油炼制工业污染物排放标准》中表 1 标准 Standards in Table 1 of *Pollutant Discharge Standards for Petrochemical Industry* (GB31570-2015)
北部湾表面处理中心	2750	80	15	15	1	—	《电镀污染物排放标准》（GB21900 -2008）表 2

污染源 Source of pollution	**废水量 m^3/d** Wastewater volume m^3/d	**CODcr** mg/L	**无机氮** mg/L Inorganic nitrogen mg/L	**SS** mg/L	**总磷** mg/L Total phosphorus mg/L	AOX mg/L	**执行标准 Implementation standards**
Beibu Gulf Surface Treatment Center							Table 2 in *Emission Standard of Pollutants for Electroplating* (GB21900)
注：②为保守起见，计算中 CODcr 与 CODMn 的换算关系考虑为 2.5；预测废水以工业废水为主取无机氮=总氮，生活污水取无机氮=氨氮；活性磷酸盐/总磷的比值取 0.444。 Note:② For conservative reasons, the conversion relationship between CODcr and CODMn in the calculation is considered to be 2.5; wastewater is predicated to mainly be industrial wastewater. Inorganic nitrogen is taken as = total nitrogen; inorganic nitrogen is taken as = ammonia nitrogen for domestic sewage; the ratio of active phosphate to total phosphorus is taken as 0.444.							

表 4.3.6-4 B3 排污口合计排放量（本项目+已批复）

Table 4.3.6-4 Total Emission from B3 Sewage Outlet (This Project + Approved)

污染源 Source of pollution	废水量 m^3/d Wastewater volume m^3/d	CODcr mg/L CODcr (mg/L)	SS mg/L	无机氮 mg/L Inorganic nitrogen mg/L	总磷 mg/L Total phosphorus (mg/L)	AOX
正常排放 Normal emission						
一期建成后 Upon completion of Phase I	207572	76.01	23.82	7.35	0.71	2.49
一二期建成后 Upon completion of Phase II	232000	75.42	24.32	7.35	0.71	2.23
非正常排放 Abnormal emission						
一期建成后 Upon completion of Phase I	207572	310.61	—	9.97	6.34	—
一二期建成后 Upon completion of Phase II	232000	384.65	—	10.42	7.39	—

4.3.6.3 预测本底值取值

4.3.6.3 Background values taken for prediction

海域水质春季本底值取引用的园区跟踪环评海水水质监测各海洋环境功能区的最大日均值；秋季本底值取本次评价监测各海洋环境功能区的最大值。主要环境功能区控制点本底浓度取值见表 4.3.6-5。

The spring background value of sea water quality is taken as the maximum daily average value of sea water quality for each marine environmental functional zone monitored in the tracking EIA referenced for the park; the background value in autumn is the maximum value of each marine environmental functional zone monitored in this assessment. Background concentration values of control points in major environmental functional zones are as shown in Table 4.3. 6-5.

4.3.6.4 预测结果分析

4.3.6.4 Analysis of prediction results

本项目海洋环境影响预测，按照各工况源强设定，以代表半月潮为动力，本底浓度为零、边界入流浓度为零，循环计算 500 小时，每小时提取一幅瞬时污染状态增量浓度场数据，一个计算周期内共计提取 362 个场文件数据。考虑到数据量巨大，统计分析时仅提取半月潮期内的最大污染物浓度分布场，最大污染物浓度场不是瞬时场，而是记录欧拉场内各点出现过的最大浓度值，可表示污染最恶劣的出现痕迹，适用于规划保护区目标水质评价。给出在各种排放条件下的最大污染范围和污染强度，以便于结合不同本底水质状态评价 B3 排污口各排污工况与近岸水域水质保护目标的相符性。

The marine environmental impact prediction of this project is set according to the source intensity of each working condition, with the representative fortnightly tide as the driving force, the background concentration is zero, and the boundary inflow concentration is zero. The cycle calculation is carried out for 500 hours, and an incremental concentration field data of instantaneous pollution state is extracted every hour. A total of 362 field file data are extracted in one calculation cycle. In view of the huge amount of data, only the maximum pollutant concentration distribution field in the half-month tidal period is extracted during statistical analysis. The maximum pollutant concentration field is not an instantaneous field, but records the maximum concentration value at each point in Euler field, which can represent the occurrence trace of the worst pollution and is suitable for the target water quality assessment of planned protected areas. The maximum pollution range and pollution intensity under various discharge conditions are given, so as to assess the conformity between various discharge conditions of B3 sewage outlet and the water quality protection objectives of coastal waters depeng upon different background water quality conditions.

模拟计算B3排污口非正常排放时，是在一个预测周期内持续排放6个小时，其余时间段仍为正常排放。水动力直接影响污染物扩散范围，非正常排放时段的潮动力不同，对应污染物扩散范围也会随之发生变化。本研究分别选取典型大潮（潮差4.58m）、典型小潮（潮差2m）的中潮位时刻作为非正常排放的起始时刻，持续释放6小时，通过模拟计算得出：非正常排放时段为小潮动力时，污染物扩散影响包络范围明显大于典型大潮。故预测非正常排放影响范围时选取最不利条件，即选取典型小潮作为非正常排放的潮动力，来研究各影响因子对周边水质的影响情况。

During simulation and calculation of abnormal emission from B3 sewage outlet, abnormal emission will sustain for 6 hours in one prediction period while normal discharge will be maintained for the rest of the period. Hydrodynamics directly will affect the diffusion range of pollutants. Different tidal dynamics during abnormal emission periods will differ, so the diffusion range of pollutants will change accordingly. In this study, the mid-tide time of typical spring tide (with tidal range of 4.58m) and typical neap tide (with tidal range of 2m) are selected as the initial time of abnormal emission, which sustains for 6 hours. Through simulation & calculation, it is concluded that when the abnormal emission period is neap tide, the envelope range of pollutant diffusion is significantly larger than that of typical spring tide. Therefore, during prediction of the impact area of abnormal emission, the most unfavorable condition shall be selected, that is, the typical neap tide shall be selected as the tidal dynamics of abnormal emission so as to study the impact of each impact factor on surrounding water quality.

一、近期工况（现状岸线）

I. Near-term working condition (current shoreline)

（1）COD

(1) COD

①正常排放

① Normal emission

项目一期建成后 B3 排污口日排水量 20.76 万吨，正常排放工况下排污口 COD_{Mn}（以下简写为“COD”）排放浓度 30.504mg/L，在模拟计算的半月潮过程中，排污口中心 COD 浓度最大约 2.1mg/L。最大增量浓度等值线分布见图 4.3.6-2，其中 0.1mg/L 的增量分布范围约 9.19 km^2，向北延伸到神华电厂北侧海域，向西南沿落潮流方向到达中间沙北侧 -2m 等深线附近水域，未达广西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区。浓度增量为 0.05mg/L 等值线面积约 37.51km^2，也未达广西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区边界。叠加各海洋环境功能区本底浓度后，均能达标，未降低排海口附近海域海水环境功能级别，对东北部山口红树林保护区、东南部儒艮自然保护区等敏感海域影响较小。

Upon completion of Phase I of the project, the daily sewage discharge of B3 sewage outlet is 207,600 tons. Under normal emission conditions, the emission concentration of COD_{Mn} (hereinafter referred to as "COD") in the sewage outlet is 30.504mg/L, and the COD concentration in the center of the sewage outlet is about 2.1mg/L as maximum. Distribution of the maximum incremental concentration isoline is as shown in Figure 4.3.6-2, in which the incremental distribution range of 0.1mg/L is about 9.19km^2, extending northward to the sea on the north side of Shenhua power plant and southwestward along the ebb current direction to the waters near the -2m isobath on the north side of the middle sand, not reaching the Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve. The isoline area of the concentration increment of 0.05mg/L is about 37.51km^2, not reaching the boundary between Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve as well. After superimposing the background concentration of each marine environmental functional zone, all can reach the standard without reducing the seawater environmental functional level of the sea area near the outlet, imposing little impact on sensitive sea areas such as the Shankou Mangrove Ecological Nature Reserve to the northeast and the Dugong Nature Reserve to the south.

项目两期建成后 B3 排污口日排水量 23.2 万吨，正常排放工况下排污口 COD_{Mn}（以下简写为“COD”）排放浓度 30.372mg/L，在模拟计算的半月潮过程中，排污口中心 COD 浓度最大约 2.3mg/L。最大增量浓度等值线分布见图 4.3.6-3，其中 0.1mg/L 的增量分布范围约 12.51 km^2，向北延伸到北海电厂南侧附近水域，向西南沿落潮流方向到达国际港务集团 1#码头东侧水域，未达广西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区。浓度增量为 0.05mg/L 等值线面积月 43.09km^2，未到达广西山口红树林生态保护区和广西合浦儒艮国家级自然保护区。叠加各海洋环境功能区本底浓度后，均能达标，未降低排海口附近海域海水环境功能级别，对东北部山口红树林保护区、东南部儒艮自然保护区等敏感海域影响较小。

Upon completion of both phases of the project, the daily sewage discharge of B3 sewage outlet is 232,000 tons. Under normal emission conditions, the emission concentration of COD_{Mn} (hereinafter abbreviated as "COD") in the sewage outlet is 30.372mg/L, and the COD concentration in the center of the sewage outlet is about 2.1mg/L as maximum. Distribution of the maximum incremental concentration isoline is as shown in Figure 4.3.6-3, in which the incremental distribution range of 0.1mg/L is about 9.19km2, extending northward to the waters on the south side of Beihai power plant and southwestward along the ebb current direction to the waters on the east side of #1 terminal of International Port Group, not reaching the Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve. The isoline area of the concentration increment of 0.05mg/L is about 43.09km^2, not reaching the Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve. After superimposing the background concentration of each marine environmental functional zone, all can reach the standard without reducing the seawater environmental functional level of the sea area near the outlet, imposing little impact on sensitive sea areas such as the Shankou Mangrove Ecological Nature Reserve to the northeast and the Dugong Nature Reserve to the south.

②非正常排放

② Abnormal emission

一期非排放情况下，COD 排放浓度 135.6 mg/L，在小潮期持续排放 6 小时，其余时间正常排放（正常排放浓度 30.504mg/L）。在模拟计算的半月潮过程中，排污口中心 COD 浓度最大约 2.1 mg/L。增量浓度等值线分布见图 4.3.6-4，其中 0.5 mg/L 的增量分布范围约 0.06 km^2，主要集中在混合区内；0.25mg/L 的增量分布范围约 0.64 km^2，向北延伸距离 1.41 km，顺落潮流向西南延伸最远距离约 734m。0.1mg/L、0.05mg/L 的增量等值线面积分别为 13.51 km^2、45.22 km^2，均未影响到广西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区。

Under the condition of abnormal emission in Phase I, the COD emission concentration is 135.6mg/L, for which abnormal emission will sustain for 6 hours during the neap tide period while normal emission will be maintained for the rest of the period (with normal emission concentration of 30.504 mg/L). The COD concentration in the center of the sewage outlet is about 2.1mg/L as maximum in the simulated and calculated fortnightly tide process. Distribution of the isoline of incremental concentration is as shown in Figure 4.3.6-4, in which the incremental distribution range of 0.5mg/L is about 0.06km^2 and mainly concentrated in the mixed area; the incremental distribution range of 0.25mg/L is about 0.64km^2, extending northward to a distance of 1.41km and southwestward along the ebb current direction to the longest distance of about 734m. The incremental isoline area of 0.1mg/L and 0.05mg/L is 13.51km^2 and 45.22km^2 respectively, both of which imposes no impact on Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve.

二期非排放情况下，，B3 排污口 COD 排放浓度 155.2 mg/L，在小潮期持续排放 6 小时，其余时间正常排放（正常排放浓度 33.32 mg/L）。模拟计算的半月潮过程中，排污口中心 COD 浓度最大约 2.3 mg/L，增量浓度等值线分布见图 4.3.6-5，其中 0.5mg/L 的增量分布范围约 0.11 km^2，集中在混合区内；0.25mg/L 的增量分布范围 0.97 km^2，向

北延伸距离 1.86 km，顺落潮流向西南延伸距离约 1.02 km。0.1mg/L、0.05 mg/L 的增量等值线面积分别为 19.37 km^2、51.72 km^2，均未影响到广西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区。根据表 4.3.6-7，叠加各海洋环境功能区本底浓度后，均能达标，未降低排海口附近海域海水环境功能级别。

Under the condition of abnormal emission in Phase I, the COD emission concentration of B3 sewage outlet is 155.2mg/L, for which abnormal emission will sustain for 6 hours during the neap tide period while normal emission will be maintained for the rest of the period (with normal emission concentration of 33.32mg/L). The COD concentration in the center of the sewage outlet is about 2.1 mg/L as maximum in the simulated and calculated fortnightly tide process. Distribution of the isoline of incremental concentration is as shown in Figure 4.3.6-5, in which the incremental distribution range of 0.5mg/L is about 0.11km^2 and concentrated in the mixed area; the incremental distribution range of 0.25mg/L is about 0.64km^2, extending northward to a distance of 1.86km and southwestward along the ebb current direction to a distance of about 1.02km. The incremental isoline area of 0.1mg/L and 0.05mg/L is 19.37km^2 and 51.72km^2 respectively, both of which imposes no impact on Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve. According to Table 4.3. 6-7, after superimposing the background concentration of each marine environmental functional zone, all can reach the standard without reducing the seawater environmental functional level of the sea area near the outlet.

表 4.3.6-6 不同工况条件下 COD 最大包络面积和排污口中心浓度最大值统计（单位:km^2）

Table 4.3.6-6 Statistics of Maximum Envelope Area and Maximum Concentration Values of COD in the Center of Sewage Outlet under Different Working Conditions (in km^2)

目标浓度 Target concentration / 排放情景 Emission scenario	>3 mg/L	>2 mg/L	>1 mg/L	>0.5 mg/L	>0.25 mg/L	>0.10 mg/L	>0.05 mg/L	排污口中心浓度/mg/L Concentration in the center of sewage outelt/mg/L
正常排放 Normal emission								
一期建成后 Upon	0	0.000016	0.006955	0.034	0.385	9.190	37.510	2.051

completion of Phase I								
二期建成后 Upon completion of Phase II	0	0.000406	0.008346	0.046	0.595	12.507	43.093	2.283
非正常排放 Abnormal emission								
一期建成后 Upon completion of Phase I	0	0.000017	0.007395	0.060	0.641	13.510	45.215	2.051
二期建成后 Upon completion of Phase II	0	0.000453	0.010424	0.114	0.971	19.368	51.724	2.283

表 4.3.6-7 COD排放浓度预测结果

Table 4.3.6-7 Predication Results of COD Emission Concentration

	海洋环境功能区预测浓度（mg/L） Predicted concentration in marine environmental functional zone (mg/L)					
海洋功能区 Marine functional zone	铁山港西岸排污区 GX012 DIV West Bank Sewage Area at Tieshan Port GX012 D Ⅳ	北海港铁山港作业区 GX011DIV Operation Area at Tieshan Port of Beihai Port GX011DIV	山口红树林生态自然保护区 GX002AI Shankou Mangrove Ecological Nature Reserve GX002AI	合浦儒艮国家级自然保护区 GX001AI Hepu Dugong National Nature Reserve GX001AI	英罗港养殖区 GX005BII Breeding Area of Yingluo Port GX005BII	营盘海产品养殖、增值区（GX024BII、GX025BII） Yingpan Seafood Breeding and Proliferation Area (GX024BII, GX025BII)
水质类别 Water quality category	四类 Class IV	四类 Class IV	一类 Class I	一类 Class I	二类 Category II	二类 Category II
春季本底值 Background value of spring	2.9	2.6	1.55	1.6	2.5	1
秋季本底值 Background value of autumn	1.8	1.76	1.76	1.67	1.51	0.91
正常排放（一、二期） Normal emission (Phase I and II)						
贡献值 Contribution value	0.5	0.25	＜0.05	＜0.05	＜0.1	＜0.05

春季预测值 Predicted value of spring （贡献值+本底值） (contribution value + background value)	3.4	2.85	＜1.60	＜1.65	＜2.6	＜1.05
秋季预测值 Predicted value of autumn （贡献值+本底值） (contribution value + background value)	2.3	2.01.	＜1.81	＜1.72	＜1.61	＜0.96
非正常排放（一、二期） **Abnormal emission (Phase I and II)**						
贡献值 Contribution value	0.5	0.25	＜0.05	＜0.05	＜0.1	＜0.05
春季预测值 Predicted value of spring （贡献值+本底值） (contribution value + background value)	3.4	2.85	＜1.60	＜1.65	＜2.6	＜1.05
秋季预测值 Predicted value of autumn （贡献值+本底值） (contribution value + background value)	2.3	2.01.	＜1.81	＜1.72	＜1.61	＜0.96
《海水水质标准》 Sea Water Quality Standard	≤5	≤5	≤2	≤2	≤3	≤3

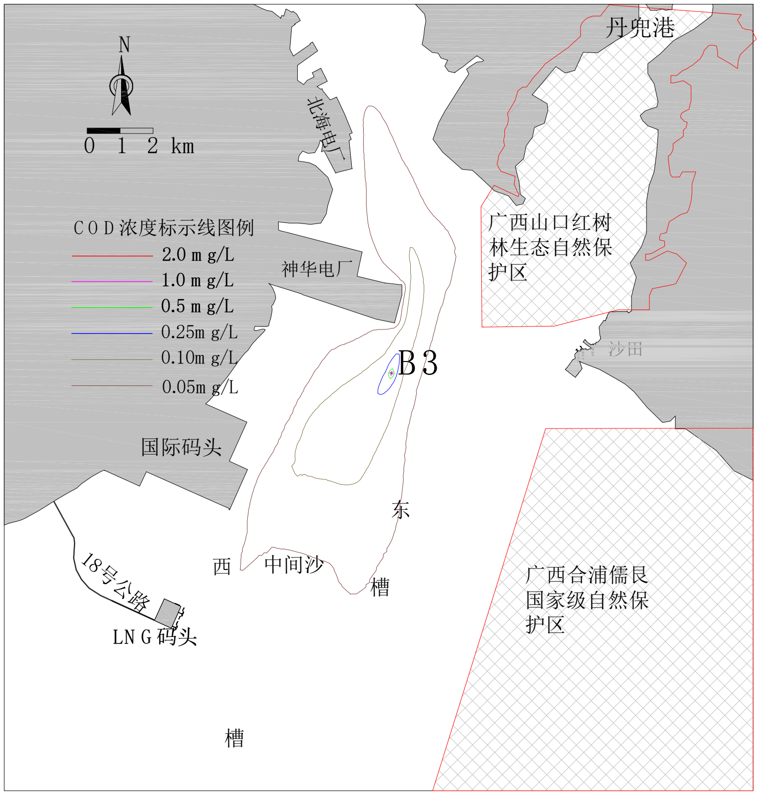


图 4.3.6-2 B3 排污口现状岸线正常工况 COD 增量浓度等值线分布（一期）

Figure 4.3. 6-2 Distribution of COD Incremental Concentration Isoline under Normal Working Conditions of Current Shoreline at B3 Sewage Outlet (Phase I)

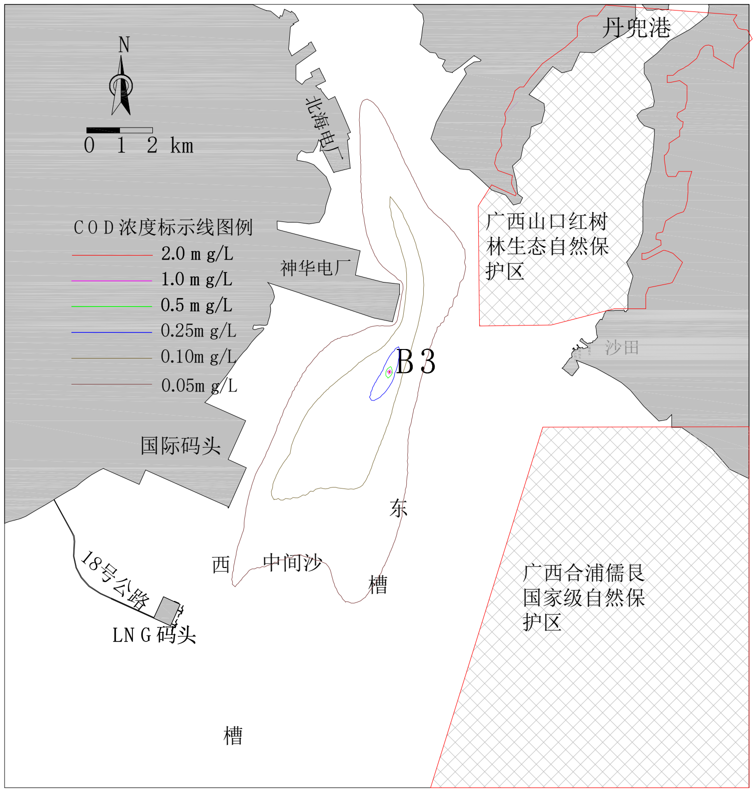


图 4.3.6-3　B3 排污口现状岸线正常工况 COD 增量浓度等值线分布（二期）

Figure 4.3. 6-3 Distribution of COD Incremental Concentration Isoline under Normal Working Conditions of Current Shoreline at B3 Sewage Outlet (Phase II)

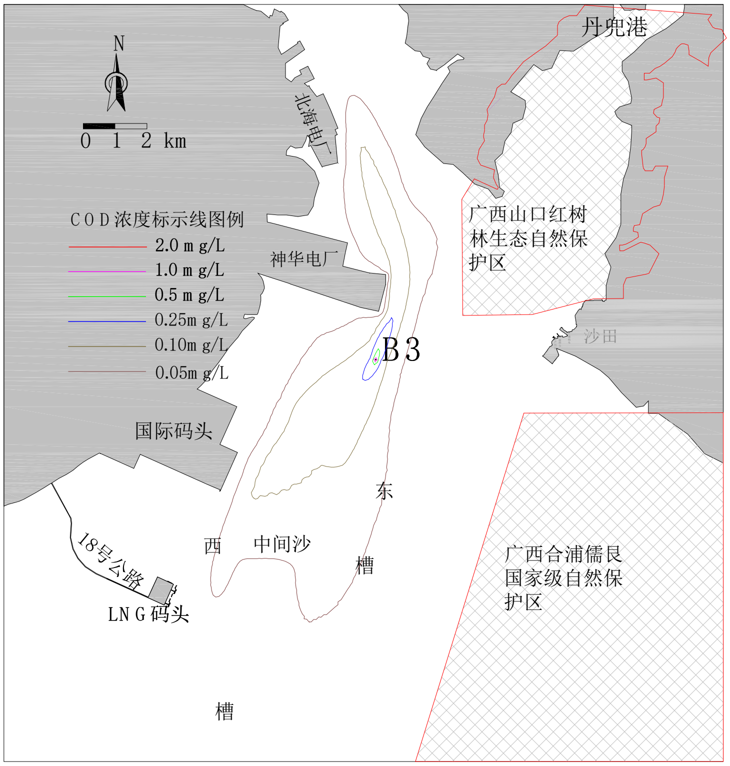


图 4.3.6-4　B3 排污口现状岸线非正常工况 COD 增量浓度等值线分布（一期）

Figure 4.3.6-4　Distribution of COD Incremental Concentration Isoline under Abnormal Working Conditions of Current Shoreline at B3 Sewage Outlet (Phase I)

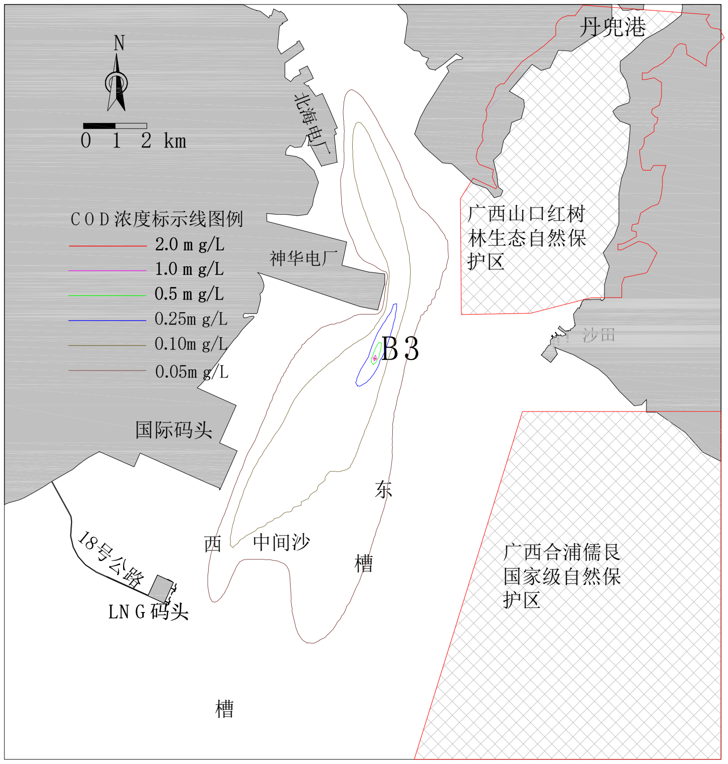


图 4.3.6-5 B3 排污口现状岸线非正常工况 COD 增量浓度等值线分布（二期）

Figure 4.3.6-5 Distribution of COD Incremental Concentration Isoline under Abnormal Working Conditions of Current Shoreline at B3 Sewage Outlet (Phase II)

（2）无机氮

(2) Inorganic nitrogen

①正常排放

① Normal emission

项目一期建成后 B3 排污口日排水量 20.76 万吨，无机氮（以下简写为“DIN”）排放浓度 7.36mg/L。在模拟计算的半月潮过程中，排污口中心 DIN 浓度最大约 0.49 mg/L，增量浓度等值线分布见图 4.3.6-6，其中，浓度增量值为 0.3 mg/L 的范围约 4004 m^2，集中在排污口 49m 范围内。浓度增量值为 0.2 mg/L 的范围约 9412 m^2，集中在排污口 76 m 范围内。0.05mg/L 的增量分布范围约 0.72 km^2，向北延伸最远约 867m，顺落潮流方向向西南延伸距离约 1.13 km。0.01mg/L 的浓度增量等值线分布范围约 39.27 km^2，向北延伸到北海电厂附近水域，向南延伸到 LNG 码头东北侧水域，未达广西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区。叠加各环境功能区本底值后，均能达标，

未降低排海口附近海域海水环境功能级别，对东北部山口红树林保护区、东南部儒艮自然保护区等敏感海域影响不大。

Upon completion of Phase I of the project, the daily sewage discharge of B3 sewage outlet is 207,600 tons. The emission concentration of inorganic nitrogen (hereinafter referred to as "DIN") is 7.36mg/L. The DIN concentration in the center of the sewage outlet is about 0.49mg/L as maximum in the simulated and calculated fortnightly tide process. Distribution of the isoline of incremental concentration is as shown in Figure 4.3.6-6, in which the concentration increment range of 0.3mg/L is about 4,004m^2 and concentrated within 49m from the sewage outlet. The concentration increment range of 0.2mg/L is about 9,412m^2 and concentrated within 76m from the sewage outlet. The incremental distribution range of 0.05mg/L is about 0.72km^2, extending northward to a distance of 867m and southwestward along the ebb current direction to the longest distance of about 1.13km. The concentration increment isoline of 0.01mg/L is about 39.27km^2, extending northward to the waters near Beihai Power Plant and southward to the waters northeast of LNG Terminal, not reaching Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve. After superimposing the background concentration of each marine environmental functional zone, all can reach the standard without reducing the seawater environmental functional level of the sea area near the outlet, imposing limited impact on sensitive sea areas such as the Shankou Mangrove Ecological Nature Reserve to the northeast and the Dugong Nature Reserve to the south.

项目两期建成后 B3 排污口日排水量 23.2 万吨，DIN 排放浓度 7.39 mg/L。在模拟计算的半月潮过程中，排污口中心 DIN 浓度最大约 0.55 mg/L，增量浓度等值线分布见图 4.3.6-7，其中，浓度增量值为 0.3 mg/L 的范围约 5479 m^2，集中在排污口 65 m 范围内。浓度增量值为 0.2 mg/L 的范围约 12369 m^2，集中在排污口 116 m 范围内。0.05mg/L 的增量分布范围约 1.11 km^2，向北扩展到神华电厂东南护岸附近，向西南（沿进入西槽落潮流）延伸距离约 1.56 km。0.01mg/L 的浓度增量等值线分布范围约 44.88 km^2，向北延伸到北海电厂北侧水域，向南延伸到 LNG 码头东北侧附近水域，均未进入广西山口

红树林生态自然保护区和广西合浦儒艮国家级自然保护区。叠加各环境功能区本底值后，均能达标，未降低排海口附近海域海水环境功能级别，对东北部山口红树林保护区、东南部儒艮自然保护区等敏感海域影响不大。

Upon completion of both phases of the project, the daily sewage discharge of B3 sewage outlet is 232,000 tons. The emission concentration of DIN is 7.39mg/L. The DIN concentration in the center of the sewage outlet is about 0.55mg/L as maximum in the simulated and calculated fortnightly tide process. Distribution of the isoline of incremental concentration is as shown in Figure 4.3.6-7, in which the concentration increment range of 0.3mg/L is about 5,479m^2 and concentrated within 65m from the sewage outlet. The concentration increment range of 0.2mg/L is about 12369 m^2 and concentrated within 116 m from the sewage outlet. The incremental distribution range of 0.05mg/L is about 1.11km^2, extending northward to the vicinity of the southeast bank protection of Shenhua Power Plant and southward (along the ebb current entering the west trough) to a distance of about 1.56km. The concentration increment isoline of 0.01mg/L is about 44.88 km2, extending northward to the waters on north side of Beihai Power Plant and southward to the waters near northeast side of LNG Terminal, not reaching Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve. After superimposing the background concentration of each marine environmental functional zone, all can reach the standard without reducing the seawater environmental functional level of the sea area near the outlet, imposing limited impact on sensitive sea areas such as the Shankou Mangrove Ecological Nature Reserve to the northeast and the Dugong Nature Reserve to the south.

②非正常排放

② Abnormal emission

一期非正常排放情况下，日排水量约20.76万吨，DIN排放浓度9.97 mg/L，在小潮期持续排放6小时，其余时间正常排放（正常排放浓度7.36mg/L）。在模拟计算的半月潮过程中，排污口中心DIN浓度最大约0.49 mg/L。增量浓度等值线分布见图4.3.6-8。由于非正常排放与正常排放两情景下的污染物源强相差不大，且非正常排放时间仅持续

6 小时，所以两种情景下的无机氮扩散范围相差较小，非正常排放情景下无机氮影响范围略大于正常排放。非正常排放情景下，浓度增量值为 0.3 mg/L 的范围约 4014 m^2，集中在排污口 51 m 范围内。0.01mg/L 的浓度增量等值线分布范围约 40.04 km^2，均未达广西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区。叠加各环境功能区本底值后，均能达标，未降低排海口附近海域海水环境功能级别，对东北部山口红树林保护区、东南部儒艮自然保护区等敏感海域影响不大。

Under the condition of abnormal emission in Phase I, the daily sewage discharge of B3 sewage outlet is about 207,600 tons and the DIN emission concentration is 9.97mg/L, for which abnormal emission will sustain for 6 hours during the neap tide period while normal emission will be maintained for the rest of the period (with normal emission concentration of 7.36mg/L). The DIN concentration in the center of the sewage outlet is about 0.49mg/L as maximum in the simulated and calculated fortnightly tide process. Distribution of the isoline of incremental concentration is as shown in Figure 4.3.6-8. With limited difference between the source intensity of pollutants in the abnormal and normal emission scenarios and the abnormal emission duration of only 6 hours, the difference in the diffusion range of inorganic nitrogen in the two scenarios is limited and the impact range of inorganic nitrogen in the abnormal emission scenario is slightly larger than the normal emission. Under the abnormal emission scenario, the concentration increment range of 0.3mg/L is about 4,014m2 and concentrated within 51m from the sewage outlet. The isoline area of the concentration increment of 0.01mg/L is about 40.04km2, not reaching Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve. After superimposing the background concentration of each marine environmental functional zone, all can reach the standard without reducing the seawater environmental functional level of the sea area near the outlet, imposing limited impact on sensitive sea areas such as the Shankou Mangrove Ecological Nature Reserve to the northeast and the Dugong Nature Reserve to the south.

二期非正常排放情况下，日排水量约 23.2 万吨，DIN 排放浓度 10.47 mg/L，在小潮

期持续排放 6 小时，其余时间正常排放（正常排放浓度 7.39 mg/L）。在模拟计算的半月潮过程中，排污口中心 DIN 浓度最大约 0.56 mg/L。增量浓度等值线分布见图 4.3.6-9。非正常排放情景下，浓度增量值为 0.3 mg/L 的范围约 5514 m^2，集中在排污口 68 m 范围内。0.01mg/L 的浓度增量等值线分布范围约 45.68 km^2，均未达广西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区。叠加各环境功能区本底值后，均能达标，未降低排海口附近海域海水环境功能级别，对东北部山口红树林保护区、东南部儒艮自然保护区等敏感海域影响不大。

Under the condition of abnormal emission in Phase II, the daily sewage discharge of B3 sewage outlet is about 232,000 tons and the DIN emission concentration is 10.47mg/L, for which abnormal emission will sustain for 6 hours during the neap tide period while normal emission will be maintained for the rest of the period (with normal emission concentration of 7.39 mg/L). The DIN concentration in the center of the sewage outlet is about 0.56 mg/L as maximum in the simulated and calculated fortnightly tide process. Distribution of the isoline of incremental concentration is as shown in Figure 4.3.6-9. Under the abnormal emission scenario, the concentration increment range of 0.3mg/L is about 4,014m2 and concentrated within 68 m from the sewage outlet. The isoline area of the concentration increment of 0.01mg/L is about 40.04km2, not reaching Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve. After superimposing the background concentration of each marine environmental functional zone, all can reach the standard without reducing the seawater environmental functional level of the sea area near the outlet, imposing limited impact on sensitive sea areas such as the Shankou Mangrove Ecological Nature Reserve to the northeast and the Dugong Nature Reserve to the south.

表 4.3.6-8 不同工况条件下 DIN 最大包络面积和排污口中心浓度最大值统计（单位:km^2）

Table 4.3.6-8 Statistics of Maximum Envelope Area and Maximum Concentration Values of DIN in the Center of Sewage Outlet under Different Working Conditions (in km^2)

目标浓度 **Target concentration** 排放情景 **Emission**	>0.5 mg/L	>0.4 mg/L	>0.3 mg/L	>0.2 mg/L	>0.1 mg/L	>0.05 mg/L	>0.01 mg/L	**排污口中心浓度/mg/L Concentration in the center of sewage**

scenario								**outelt/mg/L**
正常排放 Normal emission								
一期建成后 Upon completion of Phase I	0	0.000919	0.00400	0.00941	0.05673	0.694	39.267	0.492
二期建成后 Upon completion of Phase II	0.000233	0.001993	0.00548	0.01237	0.08367	1.107	44.877	0.554
非正常排放 Abnormal emission								
一期建成后 Upon completion of Phase I	0	0.000923	0.00401	0.00943	0.05749	0.719	40.044	0.493
二期建成后 Upon completion of Phase II	0.000249	0.002027	0.00551	0.01241	0.08596	1.128	45.676	0.555

表 4.3.6-9 DIN 排放浓度预测结果

Table 4.3.6-9 Prediction Results of DIN Emission Concentration

	海洋环境功能区预测浓度（mg/L） Predicted concentration in marine environmental functional zone (mg/L)					
海洋功能区 Marine functional zone	铁山港西岸排污区 GX012 DIV West Bank Sewage Area at Tieshan Port GX012 D Ⅳ	北海港铁山港作业区 GX011DIV Operation Area at Tieshan Port of Beihai Port GX011DIV	山口红树林生态自然保护区 GX002AI Shankou Mangrove Ecological Nature Reserve GX002AI	合浦儒艮国家级自然保护区 GX001AI Hepu Dugong National Nature Reserve GX001AI	英罗港养殖区 GX005BII Breeding Area of Yingluo Port GX005BII	营盘海产品养殖、增值区（GX024BII、GX025BII）Yingpan Seafood Breeding and Proliferation Area (GX024BII, GX025BII)
水质类别 Water quality category	四类 Class IV	四类 Class IV	一类 Class I	一类 Class I	二类 Category II	二类 Category II

	海洋环境功能区预测浓度（mg/L） Predicted concentration in marine environmental functional zone (mg/L)					
春季本底值 Background value of spring	0.204	0.17	0.167	0.149	0.17	0.173
秋季本底值 Background value of autumn	0.285	0.325	0.183	0.186	0.279	0.236
正常排放（一、二期） Normal emission (Phase I and II)						
贡献值 Contribution value	0.1	0.05	＜0.01	＜0.01	0.01	＜0.01
春季预测值 Predicted value of spring	0.304	0.22	＜0.177	＜0.159	0.18	＜0.183
秋季预测值 Predicted value of autumn	0.385	0.376	＜0.193	＜0.196	0.289	＜0.246
非正常排放（一、二期） Abnormal emission (Phase I and II)						
贡献值 Contribution value	0.1	0.05	＜0.01	＜0.01	0.01	＜0.01
春季预测值 Predicted value of spring	0.304	0.22	＜0.177	＜0.159	0.18	＜0.183
秋季预测值 Predicted value of autumn	0.385	0.376	＜0.193	＜0.196	0.289	＜0.246
《海水水质标准》 Sea Water Quality Standard	≤0.5	≤0.5	≤0.2	≤0.2	≤0.3	≤0.3

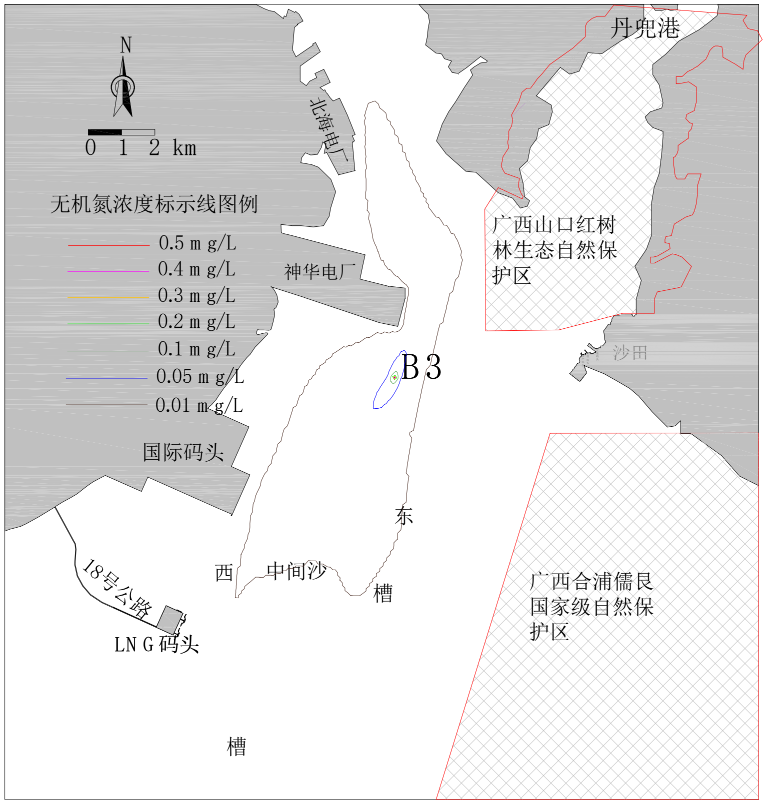


图 4.3.6-6 B3 排污口现状岸线正常工况 DIN 增量浓度等值线分布（一期）

Figure 4.3. 6-6 Distribution of DIN Incremental Concentration Isoline under Normal Working Conditions of Current Shoreline at B3 Sewage Outlet (Phase I)

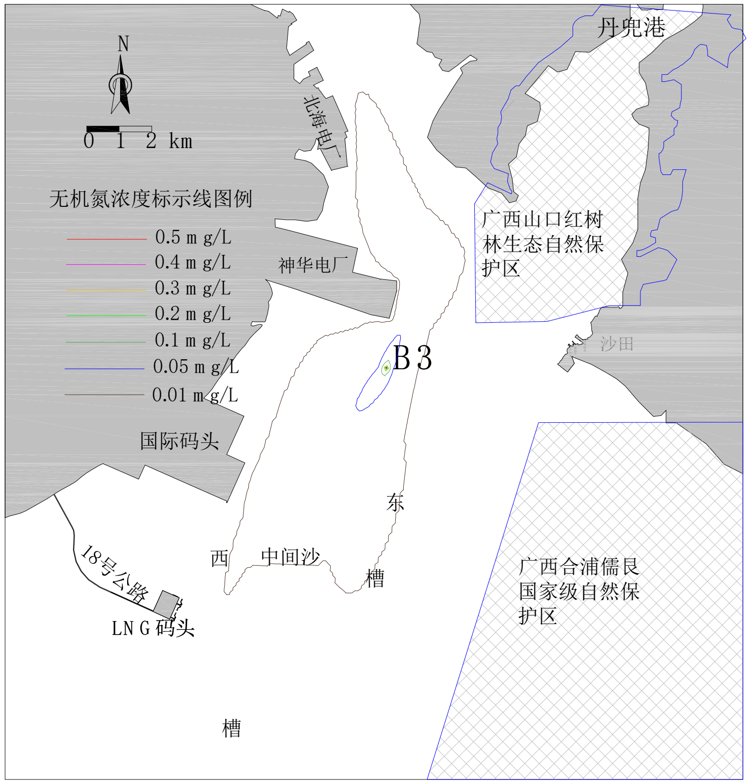


图 4.3.6-7 B3 排污口现状岸线正常工况 DIN 增量浓度等值线分布（二期）

Figure 4.3. 6-7 Distribution of DIN Incremental Concentration Isoline under Normal Working Conditions of Current Shoreline at B3 Sewage Outlet (Phase II)

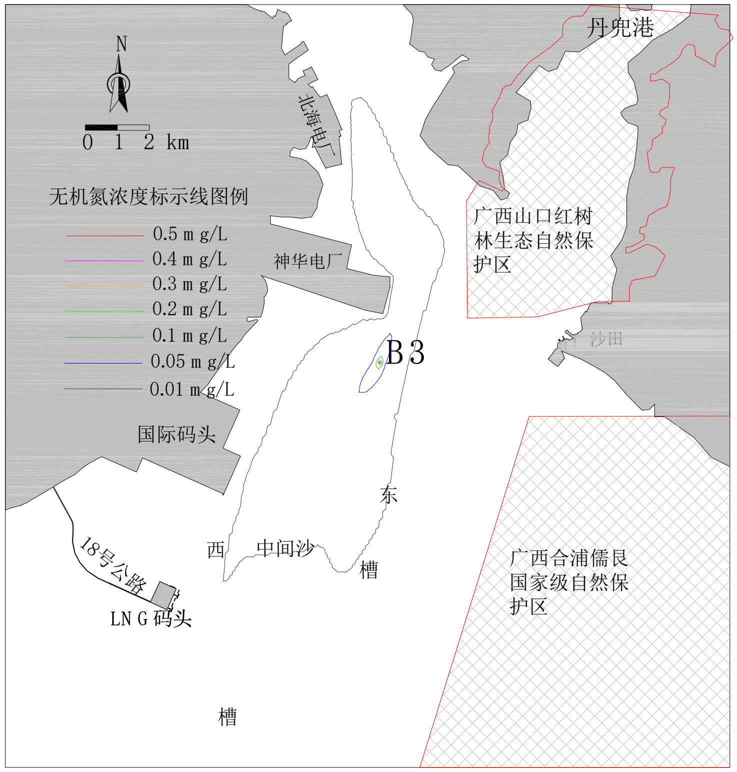


图 4.3.6-8　B3 排污口现状岸线非正常工况 DIN 增量浓度等值线分布（一期）

Figure 4.3. 6-6 Distribution of DIN Incremental Concentration Isoline under Abnormal Working Conditions of　Current Shoreline at B3 Sewage Outlet (Phase I)

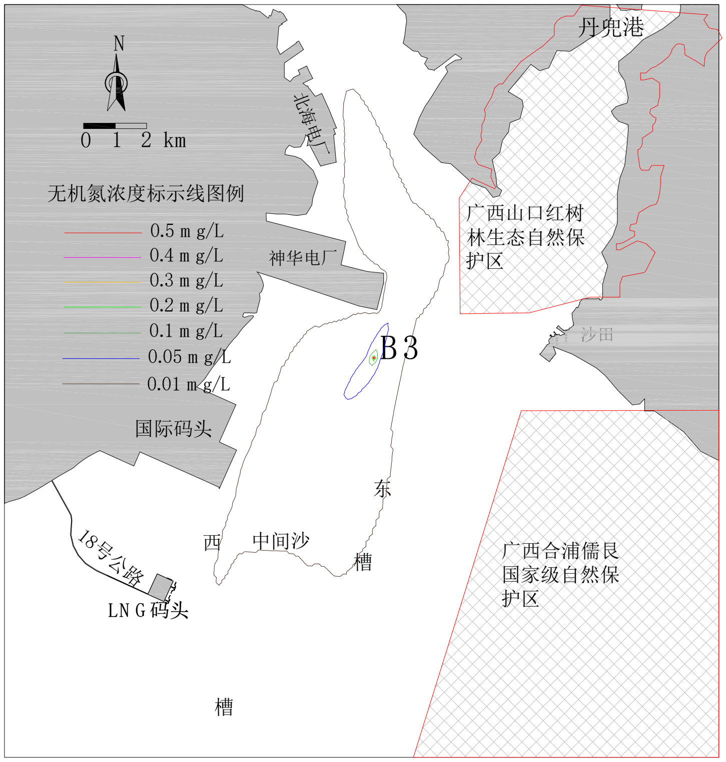


图 4.3.6-9 B3 排污口现状岸线非正常工况 DIN 增量浓度等值线分布（二期）

Figure 4.3. 6-7 Distribution of DIN Incremental Concentration Isoline under Abnormal Working Conditions of Current Shoreline at B3 Sewage Outlet (Phase II)

（3）活性磷酸盐

(3) Reactive phosphate

①正常排放

① Normal emission

项目一期建成后 B3 排污口日排水量 20.76 万吨，正常排放工况下排污口活性磷酸盐（以下简写为“DIP”）排放浓度 0.333mg/L。在模拟计算的半月潮过程中，排污口中心 DIP 浓度最大约 0.022 mg/L，正常排放时增量浓度等值线分布见图 4.3.6-10。正常排放时，DIP 在排水口附近快速稀释，排污口附近浓度增加均不超过 0.03mg/L；浓度增量值 0.004mg/L 的范围仅约 0.095 km^2，分布在排水口 303 m 范围附近；浓度增量值 0.001mg/L 的范围约 37.12km^2，均未达广西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区。叠加各海洋环境功能区本底浓度后，均能达标，未降低排海口附近海域海水环境功能级别，对东北部山口红树林保护区、东南部儒艮自然保护区等敏感海域无明显影

响。

Upon completion of Phase I of the project, the daily sewage discharge of B3 sewage outlet is 207,600 tons. Under normal emission conditions, the emission concentration of reactive phosphate (hereinafter referred to as "DIP") in the sewage outlet is 0.333mgmg/L. The DIP concentration in the center of the sewage outlet is about 0.022mg/L as maximum in the simulated and calculated fortnightly tide process. Distribution of the isoline of incremental concentration during normal emission is as shown in Figure 4.3.6-10. During normal emission, DIP is rapidly diluted near the sewage outlet, with increase in concentration all no more than 0.03mg/L near the outlet; the concentration increment range of 0.004mg/L is limited to roughly 0.095km^2 and distributed around 303m from sewage outlet; the concentration increment range of 0.001mg/L is about 37.12km^2, both not reaching Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve. After superimposing the background concentration of each marine environmental functional zone, all can reach the standard without reducing the seawater environmental functional level of the sea area near the outlet, imposing no significant impact on sensitive sea areas such as the Shankou Mangrove Ecological Nature Reserve to the northeast and the Dugong Nature Reserve to the southwest.

项目二期建成后B3排污口日排水量23.2万吨，正常排放工况下排污口活性磷酸盐排放浓度0.333mg/L。在模拟计算的半月潮过程中，排污口中心DIP浓度最大约0.025 mg/L，最大增量浓度等值线分布见图4.3.6-11。正常排放时，DIP在排水口附近快速稀释，排污口附近浓度增加均不超过0.03mg/L；浓度增量值0.004mg/L的范围仅约0.17 km^2，分布在排水口448 m范围附近；浓度增量值0.001mg/L的范围约42.59 km^2，均未达广西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区。叠加各海洋环境功能区本底浓度后，均能达标，未降低排海口附近海域海水环境功能级别，对东北部山口红树林保护区、东南部儒艮自然保护区等敏感海域无明显影响。

Upon completion of Phase II of the project, the daily sewage discharge of B3 sewage outlet is 232,000 tons. Under normal emission conditions, the emission concentration of reactive phosphate in the sewage outlet is 0.333mgmg/L. The DIP concentration in the center of the sewage outlet is about 0.025mg/L as maximum in the simulated and calculated fortnightly tide process. Distribution of the isoline of incremental concentration is as shown in Figure 4.3.6-11. During normal emission, DIP is rapidly diluted near the sewage outlet, with increase in concentration all no more than 0.03mg/L near the outlet; the concentration increment range of 0.004mg/L is limited to roughly 0.17km2 and distributed around 448m from sewage outlet; the concentration increment range of 0.001mg/L is about 42.59 km2, both not reaching Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve. After superimposing the background concentration of each marine environmental functional zone, all can reach the standard without reducing the seawater environmental functional level of the sea area near the outlet, imposing no significant impact on sensitive sea areas such as the Shankou Mangrove Ecological Nature Reserve to the northeast and the Dugong Nature Reserve to the southwest.

②非正常排放

② Abnormal emission

一期非正常排放情况下，日排水量约 20.76 万吨，排放浓度 2.815 mg/L，在小潮期持续排放 6 小时，其余时间正常排放（正常排放浓度 0.333 mg/L）。在模拟计算的半月潮过程中，排污口中心 DIP 浓度最大约 0.022 mg/L。增量浓度等值线分布见图 4.3.6-12。浓度增量值 0.007 mg/L 的范围约 0.095 km^2，北侧进入附近过渡区内；浓度增量值 0.004mg/L 的范围约 0.538 km^2，向北穿过混合区进入过渡区内，沿落潮流向西南方向延伸 610 m，未达广西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区。叠加各海洋环境功能区本底浓度后，均能达标，未降低排海口附近海域海水环境功能级别，对东北部山口红树林保护区、东南部儒艮自然保护区等敏感海域无明显影响。

Under the condition of abnormal emission in Phase I, the daily sewage discharge of B3 sewage outlet is about 207,600 tons and the emission concentration is 2.815mg/L, for which abnormal emission will sustain for 6 hours during the neap tide period while normal emission will be maintained for the rest of the period (with normal emission concentration of

0.333mg/L). The DIN concentration in the center of the sewage outlet is about 0.022 mg/L as maximum in the simulated and calculated fortnightly tide process. Distribution of the isoline of incremental concentration is as shown in Figure 4.3.6-12. The concentration increment range of 0.007mg/L is about 0.095km2 with the north side entering the adjacent transition area; the concentration increment range of 0.004mg/L is about 0.538km2, extending northward through the mixing area into the transition area and southwestward along the ebb current direction to 610 m, not reaching the Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve. After superimposing the background concentration of each marine environmental functional zone, all can reach the standard without reducing the seawater environmental functional level of the sea area near the outlet, imposing no significant impact on sensitive sea areas such as the Shankou Mangrove Ecological Nature Reserve to the northeast and the Dugong Nature Reserve to the southwest.

二期非正常排放情况下，日排水量约 23.2 万吨，排放浓度 3.281 mg/L，在小潮期持续排放 6 小时，其余时间正常排放（正常排放浓度 0.333 mg/L）。在模拟计算的半月潮过程中，排污口中心 DIP 浓度最大约 0.029 mg/L。增量浓度等值线分布见图 4.3.6-13。浓度增量值 0.007 mg/L 的范围约 0.195 km^2，北侧进入附近过渡区内；浓度增量值 0.004mg/L 的范围约 1.063 km^2，穿过过渡区后向北抵达神华电厂附近水域，沿落潮流向西南方向延伸 1.38 km，未达广西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区。叠加各海洋环境功能区本底浓度后，均能达标，未降低排海口附近海域海水环境功能级别，对东北部山口红树林保护区、东南部儒艮自然保护区等敏感海域无明显影响。

Under the condition of abnormal emission in Phase II, the daily sewage discharge of B3 sewage outlet is about 232,000 tons and the emission concentration is 3.281mg/L, for which abnormal emission will sustain for 6 hours during the neap tide period while normal emission will be maintained for the rest of the period (with normal emission concentration of 0.333 mg/L). The DIN concentration in the center of the sewage outlet is about 0.029 mg/L as maximum in the simulated and calculated fortnightly tide process. Distribution of the isoline of incremental concentration is as shown in Figure 4.3.6-13. The concentration increment range of 0.007mg/L is about 0.195km2 with the north side entering the adjacent transition area; the concentration increment range of 0.004mg/L is about 1.063km2, extending northward through the transition area into the waters near Shenhua Power Plant and southwestward along the ebb current direction to 1.38km, not reaching the Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve. After superimposing the background concentration of each marine environmental functional zone, all can reach the standard without reducing the seawater environmental functional level of the sea area near the outlet, imposing no significant impact on sensitive sea areas such as the Shankou Mangrove Ecological Nature Reserve to the northeast and the Dugong Nature Reserve to the southwest.

表 4.3.6-10 不同工况条件下 DIP 最大包络面积和排污口中心浓度最大值统计（单位:km²）

Table 4.3. 6-10 Statistics of Maximum Envelope Area and Maximum Concentration Values of DIP in the Center of Sewage Outlet under Different Working Conditions (in km2)

目标 Target 浓度 Concentration / 排放情景 Emission scenario	>0.030 mg/L	>0.015 mg/L	>0.007 mg/L	>0.004 mg/L	>0.001 mg/L	排污口中心浓度 Concentration in the center of sewage outelt /mg/L
正常排放 Normal emission						
一期建成后 Upon completion of Phase I	0	0.00265	0.019	0.095	37.210	0.022
二期建成后 Upon completion of Phase II	0	0.00422	0.024	0.168	42.585	0.025
非正常排放 Abnormal emission						
一期建成后 Upon completion of Phase I	0	0.00511	0.095	0.538	52.095	0.022
二期建成后 Upon completion of Phase II	0	0.01614	0.195	1.063	57.405	0.029

表 4.3.6-11 DIP 排放浓度预测结果

Table 4.3.6-11 Prediction Results of DIP Emission Concentration

	海洋环境功能区预测浓度（mg/L） Predicted concentration in marine environmental functional zone (mg/L)					
海洋功能区 Marine functional zone	铁山港西岸排污区 GX012 DIV West Bank Sewage Area at Tieshan Port GX012	北海港铁山港作业区 GX011DIV Operation Area at Tieshan Port of Beihai	山口红树林生态自然保护区 GX002AI Shankou Mangrove Ecological	合浦儒艮国家级自然保护区 GX001AI Hepu Dugong National	英罗港养殖区 GX005BII Breeding Area of Yingluo Port	营盘海产品养殖、增值区（GX024BII、GX025BII） Yingpan Seafood Breeding and

	D Ⅳ	Port GX011DIV	Nature Reserve GX002AI	Nature Reserve GX001AI	GX005BII	Proliferation Area (GX024BII, GX025BII)
水质类别 Water quality category	四类 Class IV	四类 Class IV	一类 Class I	一类 Class I	二类 Category II	二类 Category II
春季本底值 Background value of spring	0.035	0.01	0.01	0.01	0.01	0.01
秋季本底值 Background value of autumn	0.033	0.041	0.012	0.013	0.028	0.021
正常排放（一、二期）**Normal emission (Phase I and II)**						
贡献值 Contribution value	0.007	＜0.004	＜0.001	＜0.001	0.001	＜0.001
春季预测值 Predicted value of spring	0.042	＜0.014	＜0.011	＜0.011	0.011	＜0.011
秋季预测值 Predicted value of autumn	0.04	＜0.045	＜0.013	＜0.014	0.029	＜0.022
非正常排放（一、二期）**Abnormal emission (Phase I and II)**						
贡献值 Contribution value	0.007	＜0.004	＜0.001	＜0.001	0.001	＜0.001
春季预测值 Predicted value of spring	0.042	＜0.014	＜0.011	＜0.011	0.011	＜0.011
秋季预测值 Predicted value of autumn	0.04	＜0.045	＜0.013	＜0.014	0.029	＜0.022
《海水水质标准》Sea Water Quality Standard	≤0.045	≤0.045	≤0.015	≤0.015	≤0.03	≤0.03

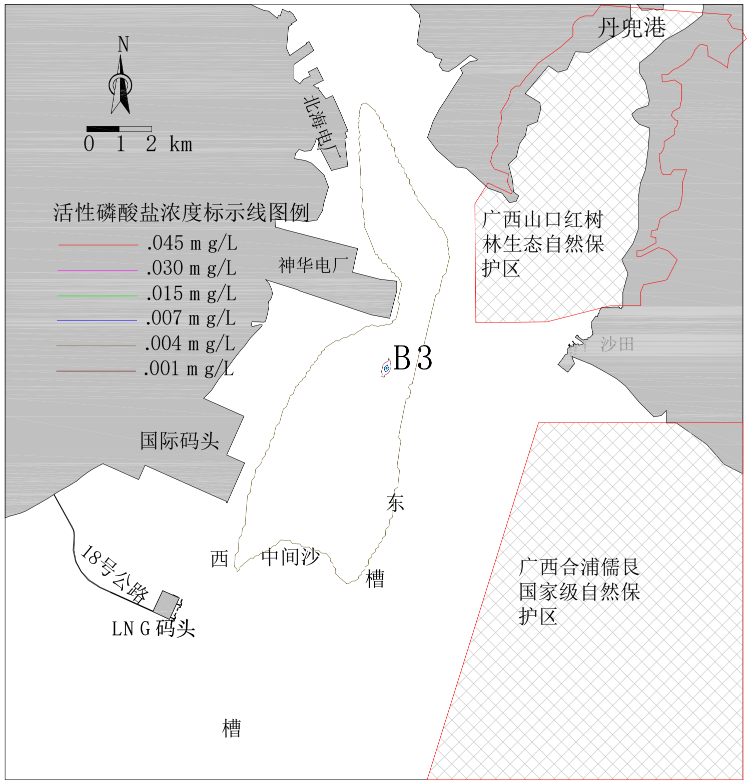


图 4.3.6-10　B3 排污口现状岸线正常工况 DIP 增量浓度等值线分布（一期）

Figure 4.3. 6-10 Distribution of DIP Incremental Concentration Isoline under Normal Working Conditions of Current Shoreline at B3 Sewage Outlet (Phase I)

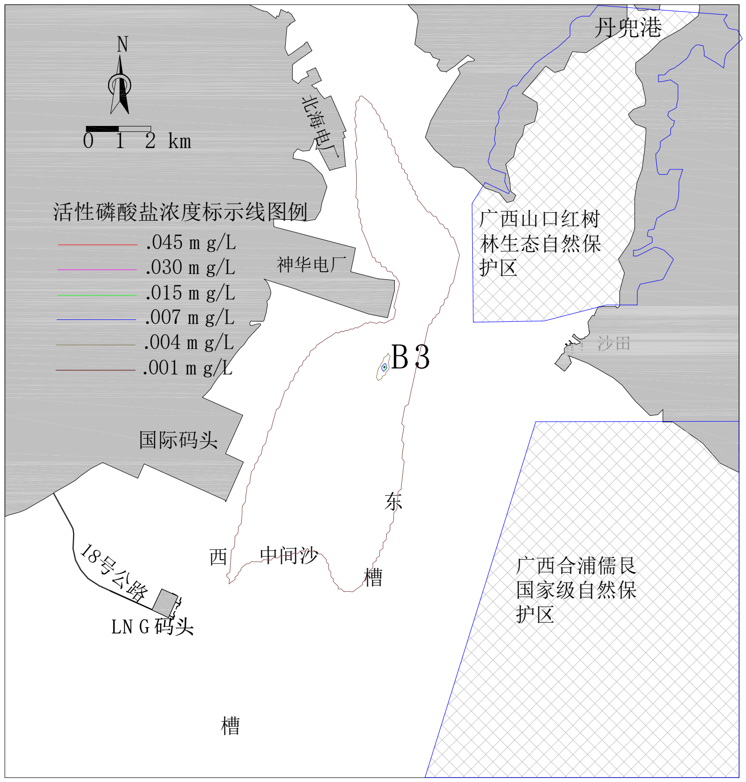


图 4.3.6-11 B3 排污口现状岸线正常工况 DIP 增量浓度等值线分布（二期）

Figure 4.3. 6-11 Distribution of DIP Incremental Concentration Isoline under Normal Working Conditions of Current Shoreline at B3 Sewage Outlet (Phase II)

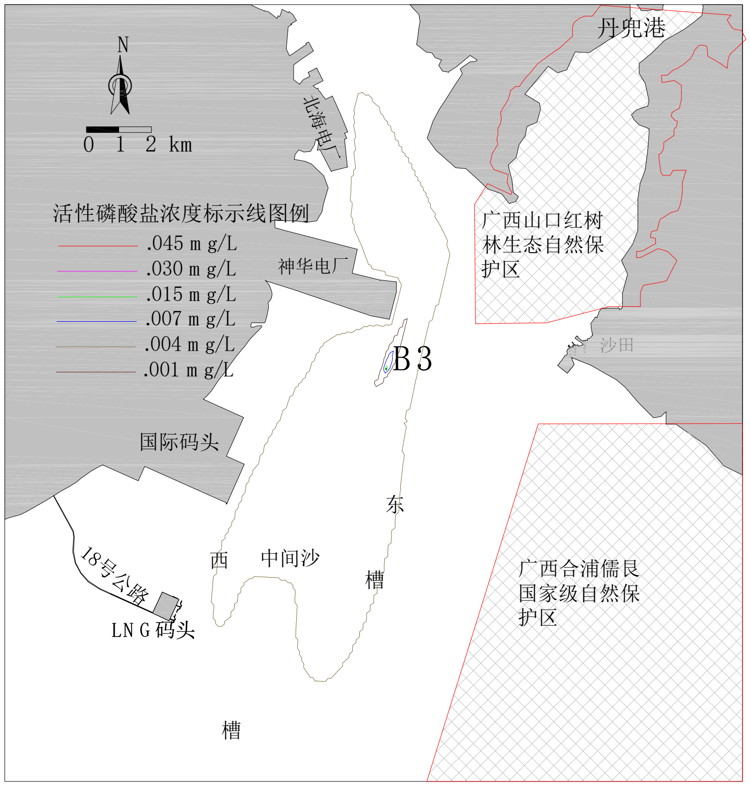


图 4.3.6-12　B3 排污口现状岸线非正常工况 DIP 增量浓度等值线分布（一期）

Figure 4.3. 6-12 Distribution of DIP Incremental Concentration Isoline under Abnormal Working Conditions of Current Shoreline at B3 Sewage Outlet (Phase I)

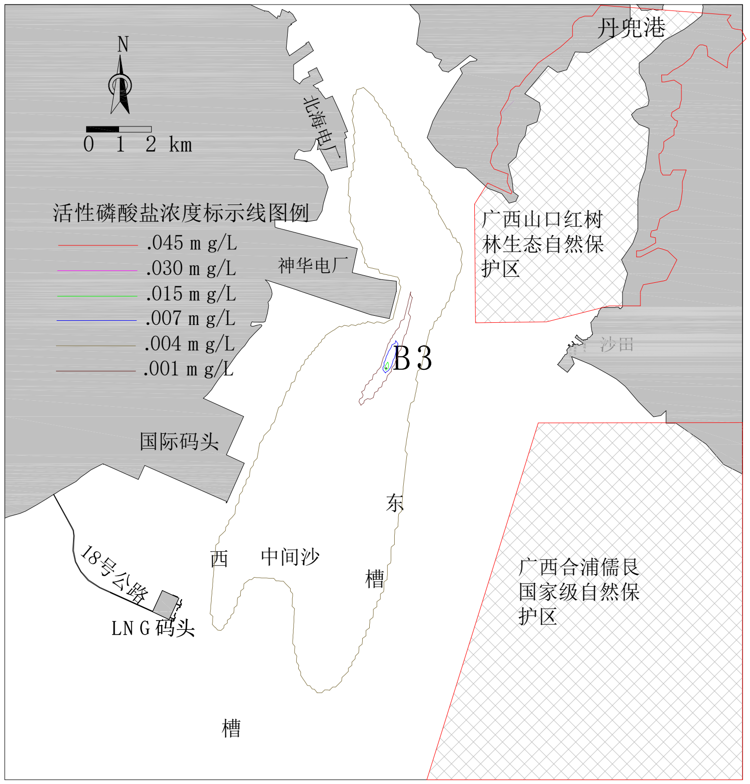


图 4.3.6-13 B3 排污口现状岸线非正常工况 DIP 增量浓度等值线分布（二期）

Figure 4.3. 6-12 Distribution of DIP Incremental Concentration Isoline under Abnormal Working Conditions of Current Shoreline at B3 Sewage Outlet (Phase II)

（4）悬浮物质（SS）

(4) Suspended substance (SS)

项目一期建成后 B3 排污口日排水量 20.76 万吨，悬浮物质（以下简写为“SS”）排放浓度 26.0mg/L。正常排放时，在模拟计算的半月潮过程中，排污口中心 SS 浓度最大约 1.753 mg/L。浓度增量值 1.0 mg/L 的范围仅约 4931 m^2，集中在排水口 54m 范围附近，影响范围较小不再汇出浓度增值等值线分布。排污口废水排放增加悬浮物的量均≤10mg/L，未降低排海口附近海域海水环境功能级别。

Upon completion of Phase I of the project, the daily sewage discharge of B3 sewage outlet is 207,600 tons. The emission concentration of suspended substance (hereinafter referred to as "SS") is 26.0mg/L. Under normal emission, the SS concentration in the center of the sewage outlet is about 1.753mg/L as maximum in the simulated and calculated fortnightly tide process. The concentration increment range of 1.0mg/L is limited to roughly

4931m2 and concentrated around 54m from sewage outlet, of which the impact area is limited so that no distribution of concentration increment isoline is developed. The amount of all suspended solids increased by wastewater discharge from sewage outlet is ≤ 10 mg/L, without reducing the seawater environmental functional level of the sea area near the outlet.

项目二期建成后 B3 排污口日排水量 23.2 万吨，排放浓度 26.46mg/L。在模拟计算的半月潮过程中，排污口中心 SS 浓度最大约 1.969 mg/L。浓度增量值 1.0 mg/L 的范围仅约 6450 m^2，集中在排水口 63m 范围附近，影响范围较小不再汇出浓度增值等值线分布。排污口废水排放增加悬浮物的量均≤10mg/L，未降低排海口附近海域海水环境功能级别。

Upon completion of Phase II of the project, the daily sewage discharge of B3 sewage outlet is 232,000 tons. The emission concentration of is 26.46mg/L. The SS concentration in the center of the sewage outlet is about 1.969mg/L as maximum in the simulated and calculated fortnightly tide process. The concentration increment range of 1.0mg/L is limited to roughly 4931m2 and concentrated around 63m from sewage outlet, of which the impact area is limited so that no distribution of concentration increment isoline is developed. The amount of all suspended solids increased by wastewater discharge from sewage outlet is ≤ 10 mg/L, without reducing the seawater environmental functional level of the sea area near the outlet.

表 4.3.6-12 不同工况条件下 SS 最大包络面积和排污口中心浓度最大值统计（单位:km^2）
Table 4.3. 6-12 Statistics of Maximum Envelope Area and Maximum Concentration Values of SS in the Center of Sewage Outlet under Different Working Conditions (in km2)

目标浓度 Target concentration / **排放情景 Emission scenario**	>2mg/L	>1mg/L	>0.50mg/L	>0.25mg/L	**排污口中心浓度 Concentration in the center of sewage outelt /mg/L**
正常排放 Normal emission					
一期建成后 Upon completion of Phase I	0	0.00493	0.024	0.226	1.753
二期建成后 Upon completion of Phase II	0	0.00645	0.031	0.356	1.969

（5）AOX

(5) AOX

项目一期建成后B3排污口日排水量20.76万吨，AOX排放浓度2.49 mg/L。在模拟计算的半月潮过程中，排污口中心AOX浓度最大约0.168 mg/L，增量浓度等值线分布见图4.3.6-14。一期建成后，浓度增量值为0.05 mg/L的范围约21953m^2，集中在排水口129 m范围内。浓度增量值为0.01 mg/L等值线面积约6.63km^2，向北延伸到神华电厂附近水域，向西南延伸距离约3.61km，均未达广西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区。

Upon completion of both phases of the project, the daily sewage discharge of B3 sewage outlet is 207,600 tons. The emission concentration of AOX is 2.49mg/L. The AOX concentration in the center of the sewage outlet is about 0.168 mg/L as maximum in the simulated and calculated fortnightly tide process. Distribution of the isoline of incremental concentration is as shown in Figure 4.3.6-14. Upon completion of Phase I, the concentration increment range of 0.05mg/L is about 21,953m2 and concentrated within 129 m from the sewage outlet. The isoline area of the concentration increment of 0.01 mg/L is about 6.63km2, extending northward to the waters near Beihai Power Plant and southward to a distance of 3.61km, not reaching Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve.

项目二期建成后B3排污口日排水量约23.2万吨，AOX排放浓度2.23mg/L。在模拟计算的半月潮过程中，排污口中心AOX浓度最大约0.168 mg/L。增量浓度等值线分布见图4.3.6-15。浓度增量值为0.05mg/L的范围约21973m^2，集中在排水口130m范围内。浓度增量值为0.01mg/L等值线面积约6.68 km^2，均未达广西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区。

Upon completion of both phases of the project, the daily sewage discharge of B3 sewage outlet is 232,000 tons. The emission concentration of AOX is 2.23mg/L. The AOX concentration in the center of the sewage outlet is about 0.168 mg/L as maximum in the simulated and calculated fortnightly tide process. Distribution of the isoline of incremental concentration is as shown in Figure 4.3.6-15. The concentration increment range of 0.05mg/L is about 21973m2 and concentrated within 130m from the sewage outlet. The isoline area of the concentration increment of 0.01 mg/L is about 6.63km2, both not reaching Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve.

表 4.3.6-13 不同工况条件下 AOX 最大包络面积和排污口中心浓度最大值统计（单位:km²）

Table 4.3. 6-13 Statistics of Maximum Envelope Area and Maximum Concentration Values of AOX in the Center of Sewage Outlet under Different Working Conditions (in km2)

目标浓度 **Target concentration** 排放情景 **Emission scenario**	>0.2mg/L	>0.1mg/L	>0.05mg/L	>0.01mg/L	排污口中心浓度 **Concentration in the center of sewage outelt /mg/L**
正常排放 Normal emission					
一期建成后 Upon completion of Phase I	0	0.004354	0.021953	6.626	0.168
二期建成后 Upon completion of Phase II	0	0.004364	0.021973	6.682	0.168

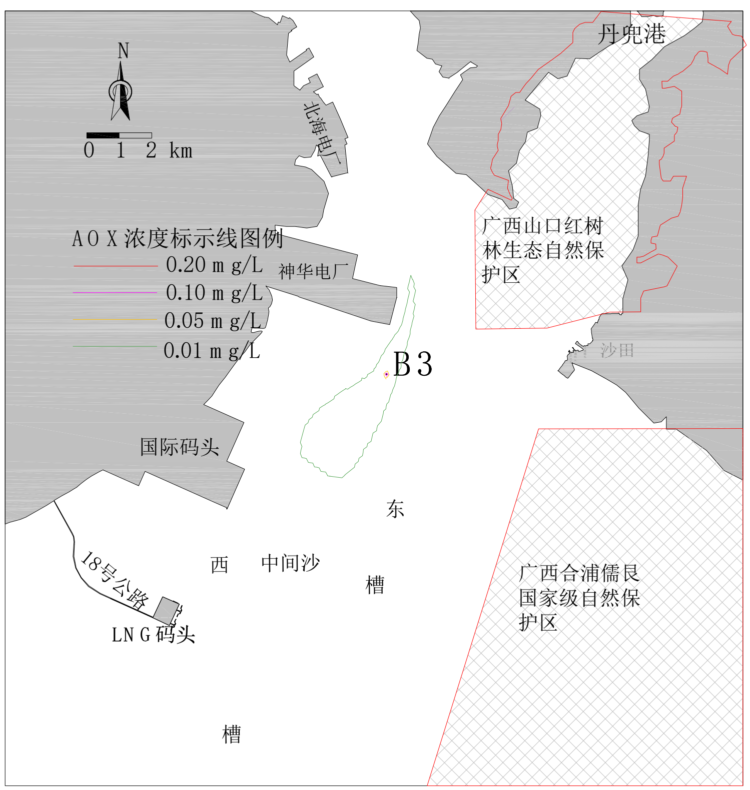


图 4.3.6-14 B3 排污口现状岸线 AOX 增量浓度等值线分布（一期）

Figure 4.3.6-14 Distribution of AOX Incremental Concentration Isoline of Current Shoreline at B3 Sewage Outlet (Phase I)

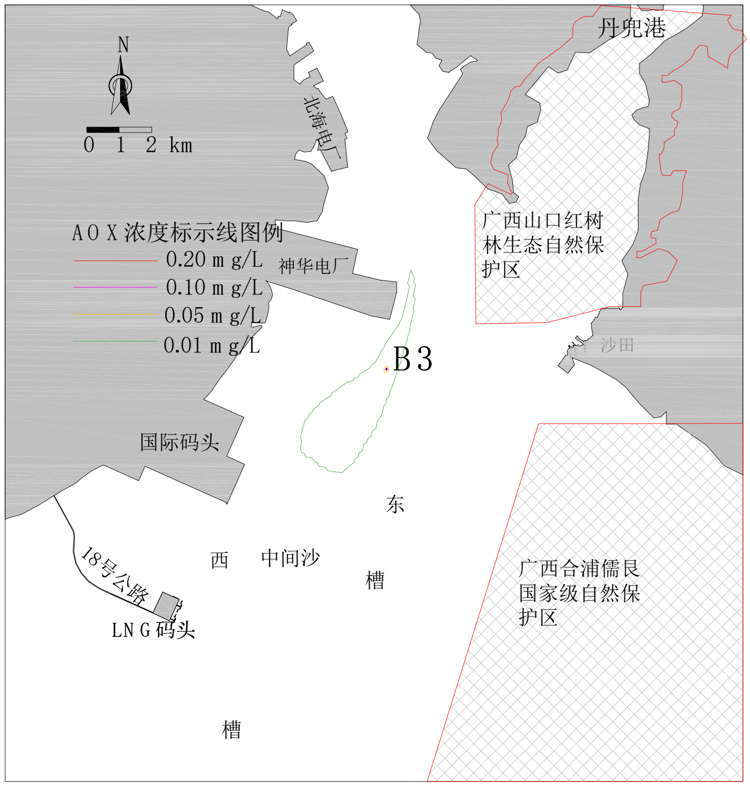


图 4.3.6-15 B3 排污口现状岸线 AOX 增量浓度等值线分布（二期）

Figure 4.3.6-15 Distribution of AOX Incremental Concentration Isoline of Current Shoreline at B3 Sewage Outlet (Phase II)

二、远期工况（规划岸线）

II. Long-term working condition (planned shoreline)

（1）COD

(1) COD

①正常排放

① Normal emission

项目一期建成后 B3 排污口日排水量 20.76 万吨，正常排放工况下排污口 COD_{Mn}（以下简写为“COD”）排放浓度 30.504mg/L，在模拟计算的半月潮过程中，排污口中心 COD 浓度最大约 1.81mg/L。最大增量浓度等值线分布见图 4.3.6-16，其中 0.1mg/L 的增量分布范围约 1.52 km²，向北延伸到神华电厂北侧海域，向西南沿落潮流方向到达中间沙北侧-2m 等深线附近水域，未达广西山口红树林生态自然保护区和广西合浦儒艮国家级自

然保护区。浓度增量为0.05mg/L等值线面积约5.38km^2，也未达广西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区边界。叠加各海洋环境功能区本底浓度后，均能达标，未降低排海口附近海域海水环境功能级别，对东北部山口红树林保护区、东南部儒艮自然保护区等敏感海域影响较小。

Upon completion of Phase I of the project, the daily sewage discharge of B3 sewage outlet is 207,600 tons. Under normal emission conditions, the emission concentration of COD_{Mn} (hereinafter referred to as "COD") in the sewage outlet is 30.504mg/L, and the COD concentration in the center of the sewage outlet is about 1.81mg/L as maximum. Distribution of the maximum incremental concentration isoline is as shown in Figure 4.3.6-16, in which the incremental distribution range of 0.1mg/L is about 1.52 km^2, extending northward to the sea on the north side of Shenhua power plant and southwestward along the ebb current direction to the waters near the -2m isobath on the north side of the middle sand, not reaching the Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve. The isoline area of the concentration increment of 0.05mg/L is about 5.38km^2, not reaching the boundary between Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve as well. After superimposing the background concentration of each marine environmental functional zone, all can reach the standard without reducing the seawater environmental functional level of the sea area near the outlet, imposing little impact on sensitive sea areas such as the Shankou Mangrove Ecological Nature Reserve to the northeast and the Dugong Nature Reserve to the south.

项目两期建成后B3排污口日排水量23.2万吨，正常排放工况下排污口COD_{Mn}（以下简写为“COD”）排放浓度30.372mg/L，在模拟计算的半月潮过程中，排污口中心COD浓度最大约2.01mg/L。最大增量浓度等值线分布见图4.3.6-17，其中0.1mg/L的增量分布范围约1.86 km^2，向北延伸到神华电厂东南侧水域，向西南延伸到北暮东作业区北端附近水域；浓度增量为0.05mg/L等值线面积约6.50 km^2，不会影响到广西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区。叠加各海洋环境功能区本底浓度后，均能达标，未降低排海口附近海域海水环境功能级别，对东北部山口红树林保护区、东

南部儒艮自然保护区等敏感海域影响较小。

Upon completion of both phases of the project, the daily sewage discharge of B3 sewage outlet is 232,000 tons. Under normal emission conditions, the emission concentration of COD_{Mn} (hereinafter abbreviated as "COD") in the sewage outlet is 30.372mg/L, and the COD concentration in the center of the sewage outlet is about 2.1mg/L as maximum. Distribution of the maximum incremental concentration isoline is as shown in Figure 4.3.6-17, in which the incremental distribution range of 0.1mg/L is about 1.86km^2, extending northward to the waters on the southeast side of Shenhua Power Plant and southwestward to the waters near north end of Beimudong operation area; the isoline area of the concentration increment of 0.05mg/L is about 6.50km2, which will impose no impact on the Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve. After superimposing the background concentration of each marine environmental functional zone, all can reach the standard without reducing the seawater environmental functional level of the sea area near the outlet, imposing little impact on sensitive sea areas such as the Shankou Mangrove Ecological Nature Reserve to the northeast and the Dugong Nature Reserve to the south.

②非正常排放

② Abnormal emission

一期非排放情况下，COD 排放浓度 135.6 mg/L，在小潮期持续排放 6 小时，其余时间正常排放（正常排放浓度 30.504mg/L）。在模拟计算的半月潮过程中，排污口中心 COD 浓度最大约 1.81mg/L。增量浓度等值线分布见图 4.3.6-17，其中 0.5 mg/L 的增量分布范围约 0.037 km^2，主要集中在混合区内；0.25mg/L 的增量分布范围约 0.246 km^2，向北延伸距离 660m，顺落潮流向西南延伸最远距离约 481m。0.1mg/L、0.05mg/L 的增量等值线面积分别为 2.08 km^2、6.47 km^2，均未影响到广西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区。

Under the condition of abnormal emission in Phase I, the COD emission concentration is 135.6mg/L, for which abnormal emission will sustain for 6 hours during the neap tide period while normal emission will be maintained for the rest of the period (with normal emission concentration of 30.504 mg/L). The COD concentration in the center of the sewage outlet is about 1.81/L as maximum in the simulated and calculated fortnightly tide process. Distribution of the isoline of incremental concentration is as shown in Figure 4.3.6-17, in which the incremental distribution range of 0.5mg/L is about 0.037 km2 and mainly concentrated in the mixed area; the incremental distribution range of 0.25mg/L is about 0.246km2, extending northward to a distance of 660m and southwestward along the ebb current direction to the longest distance of about 481m. The incremental isoline area of 0.1mg/L and 0.05mg/L is 2.08 km^2 and 6.47 km^2 respectively, both of which imposes no impact on Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve.

二期非排放情况下，，B3 排污口 COD 排放浓度 155.2 mg/L，在小潮期持续排放 6 小时，其余时间正常排放（正常排放浓度 33.32 mg/L）。模拟计算的半月潮过程中，排污口中心 COD 浓度最大约 2.17 mg/L，增量浓度等值线分布见图 4.3.6-18，其中 0.5mg/L 的增量分布范围约 0.064 km^2，集中在混合区内；0.25mg/L 的增量分布范围 0.369 km^2，向北延伸距离 910 m，顺落潮流向西南延伸距离约 628 m。0.1mg/L、0.05 mg/L 的增量等值线面积分别为 2.92 km^2、8.10 km^2，均未影响到广西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区。根据表 4.3.6-15，叠加各海洋环境功能区本底浓度后，均能达标，未降低排海口附近海域海水环境功能级别。

Under the condition of abnormal emission in Phase I, the COD emission concentration of B3 sewage outlet is 155.2mg/L, for which abnormal emission will sustain for 6 hours during the neap tide period while normal emission will be maintained for the rest of the period (with normal emission concentration of 33.32mg/L). The COD concentration in the center of the sewage outlet is about 2.17 mg/L as maximum in the simulated and calculated fortnightly tide process. Distribution of the isoline of incremental concentration is as shown in Figure 4.3.6-18, of which the incremental distribution range of 0.5mg/L is about 0.064km2 and concentrated in the mixed area; the incremental distribution range of 0.25mg/L is about 0.369km2, extending northward to a distance of 910 m and southwestward along the ebb current direction to a distance of about 628 m. The incremental isoline area of 0.1mg/L and 0.05mg/L is 2.92 km^2 and 8.10 km^2 respectively, both of which imposes no impact on

Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve. According to Table 4.3. 6-15, after superimposing the background concentration of each marine environmental functional zone, all can reach the standard without reducing the seawater environmental functional level of the sea area near the outlet.

表 4.3.6-14 不同工况条件下 COD 最大包络面积和排污口中心浓度最大值统计（单位:km²）

Table 4.3.6-14 Statistics of Maximum Envelope Area and Maximum Concentration Values of COD in the Center of Sewage Outlet under Different Working Conditions (in km²)

目标浓度 Target concentration / 排放情景 Emission scenario	>3 mg/L	>2 mg/L	>1 mg/L	>0.50 mg/L	>0.25 mg/L	>0.10 mg/L	>0.05 mg/L	排污口中心浓度/mg/L Concentration in the center of sewage outelt/mg/L
正常排放 Normal emission								
一期建成后 Upon completion of Phase I	0	0	0.005615	0.027	0.143	1.516	5.379	1.809
二期建成后 Upon completion of Phase II	0	0.000001	0.00712	0.034	0.184	1.856	6.498	2.014
非正常排放 Abnormal emission								
一期建成后 Upon completion of Phase I	0	0	0.006125	0.037	0.246	2.077	6.471	1.809
二期建成后 Upon completion of Phase II	0	0.000185	0.008765	0.064	0.369	2.916	8.098	2.170

表 4.3.6-15 COD 排放浓度预测结果

Table 4.3.6-15 Predication Results of COD Emission Concentration

	海洋环境功能区预测浓度（mg/L）

	Predicted concentration in marine environmental functional zone (mg/L)					
海洋功能区 Marine functional zone	铁山港西岸排污区 GX012 DIV West Bank Sewage Area at Tieshan Port GX012 D Ⅳ	北海港铁山港作业区 GX011DIV Operation Area at Tieshan Port of Beihai Port GX011DIV	山口红树林生态自然保护区 GX002AI Shankou Mangrove Ecological Nature Reserve GX002AI	合浦儒艮国家级自然保护区 GX001AI Hepu Dugong National Nature Reserve GX001AI	英罗港养殖区 GX005BII Breeding Area of Yingluo Port GX005BII	营盘海产品养殖、增值区（GX024BII、GX025BII）Yingpan Seafood Breeding and Proliferation Area (GX024BII, GX025BII)
水质类别 Water quality category	四类 Class IV	四类 Class IV	一类 Class I	一类 Class I	二类 Category II	二类 Category II
春季本底值 Background value of spring	2.9	2.6	1.55	1.6	2.5	1
秋季本底值 Background value of autumn	1.8	1.76	1.76	1.67	1.51	0.91
正常排放（一、二期）**Normal emission (Phase I and II)**						
贡献值 Contribution value	0.5	0.25	＜0.05	＜0.05	0.05	＜0.05
春季预测值 Predicted value of spring（贡献值+本底值）(contribution value + background value)	3.4	2.85	＜1.60	＜1.65	2.55	＜1.05
秋季预测值 Predicted value of autumn（贡献值+本底值）(contribution value + background value)	2.3	2.01.	＜1.81	＜1.72	1.56	＜0.96
非正常排放（一、二期）**Abnormal emission (Phase I and II)**						
贡献值 Contribution value	0.5	0.25	＜0.05	＜0.05	0.05	＜0.05
春季预测值 Predicted value of spring（贡献值+本底值）(contribution value + background value)	3.4	2.85	＜1.60	＜1.65	2.55	＜1.05

秋季预测值 Predicted value of autumn （贡献值+本底值）(contribution value + background value)	2.3	2.01.	＜1.81	＜1.72	1.56	＜0.96
《海水水质标准》Sea Water Quality Standard	≤5	≤5	≤2	≤2	≤3	≤3

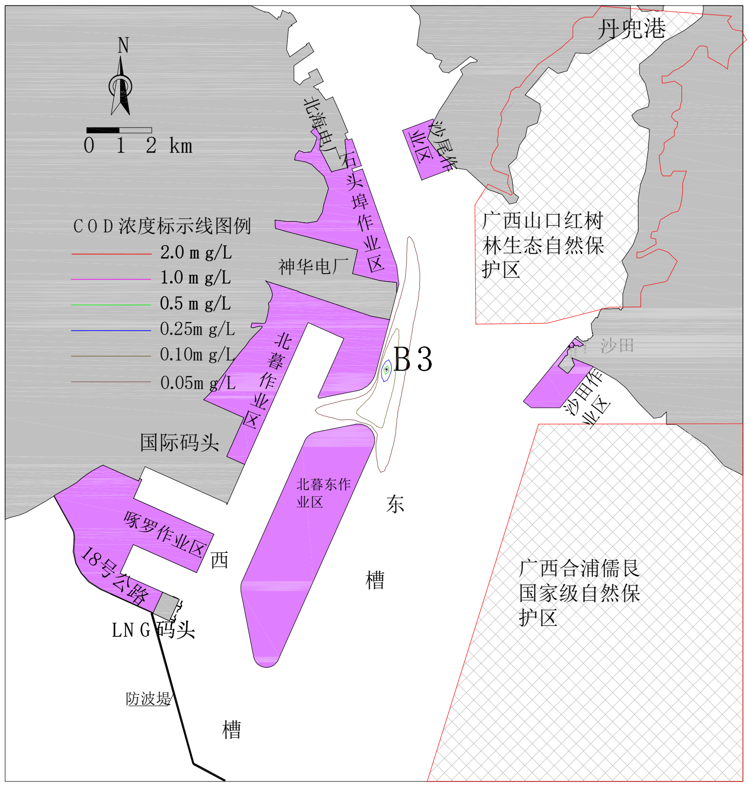


图 4.3.6-16 B3 排污口规划岸线正常工况 COD 增量浓度等值线分布（一期）

Figure 4.3. 6-16 Distribution of COD Incremental Concentration Isoline under Normal Working Conditions of Planned Shoreline at B3 Sewage Outlet (Phase I)

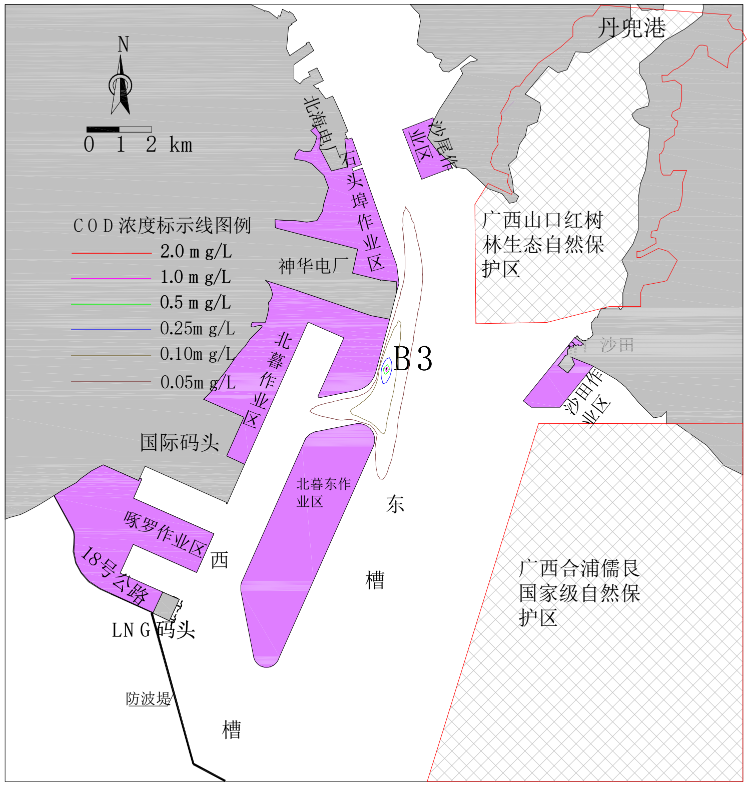


图 4.3.6-17 B3 排污口规划岸线正常工况 COD 增量浓度等值线分布（二期）

Figure 4.3. 6-17 Distribution of COD Incremental Concentration Isoline under Normal Working Conditions of Planned Shoreline at B3 Sewage Outlet (Phase II)

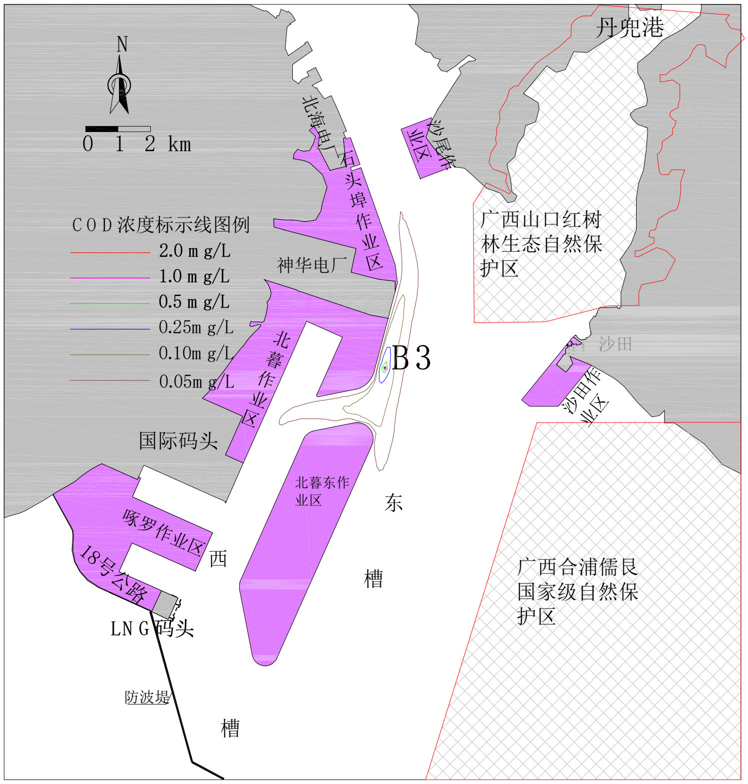


图 4.3.6-18 B3 排污口规划岸线非正常工况 COD 增量浓度等值线分布（一期）

Figure 4.3. 6-18 Distribution of COD Incremental Concentration Isoline under Abnormal Working Conditions of Planned Shoreline at B3 Sewage Outlet (Phase I)

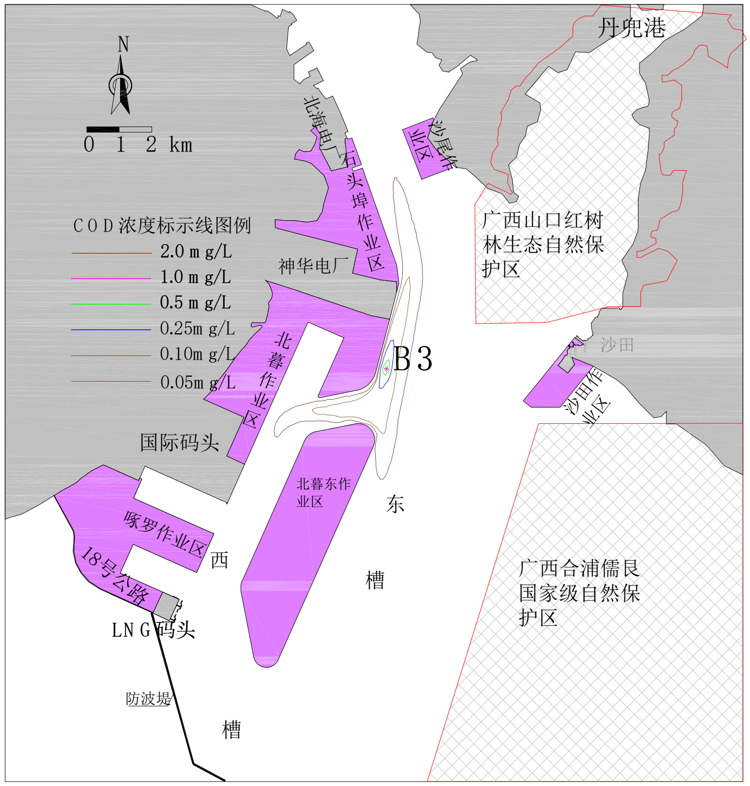


图 4.3.6-19　B3 排污口规划岸线非正常工况 COD 增量浓度等值线分布（二期）

Figure 4.3. 6-19 Distribution of COD Incremental Concentration Isoline under Abnormal Working Conditions of Planned Shoreline at B3 Sewage Outlet (Phase II)

（2）无机氮

(2) Inorganic nitrogen

①正常排放

① Normal emission

项目一期建成后 B3 排污口日排水量 20.76 万吨，无机氮（以下简写为“DIN”）排放浓度 7.36mg/L。在模拟计算的半月潮过程中，排污口中心 DIN 浓度最大约 0.435 mg/L，增量浓度等值线分布见图 4.3.6-20，其中，浓度增量值为 0.3 mg/L 的范围约 2699 m^2，集中在排污口 45m 范围内。浓度增量值为 0.2 mg/L 的范围约 8177 m^2，集中在排污口 72 m 范围内。0.05mg/L 的增量分布范围约 0.21 km^2，向北延伸最远约 412m，顺落潮流方向向南延伸距离约 512 m。0.01mg/L 的浓度增量等值线分布范围约 6.79 km^2，向北延伸到神华电厂北侧水域，向南延伸到东、西槽内，未达广西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区。叠加各环境功能区本底值后，均能达标，未降低排

海口附近海域海水环境功能级别，对东北部山口红树林保护区、东南部儒艮自然保护区等敏感海域影响不大。

Upon completion of Phase I of the project, the daily sewage discharge of B3 sewage outlet is 207,600 tons. The emission concentration of inorganic nitrogen (hereinafter referred to as "DIN") is 7.36mg/L. The DIN concentration in the center of the sewage outlet is about 0.435mg/L as maximum in the simulated and calculated fortnightly tide process. Distribution of the isoline of incremental concentration is as shown in Figure 4.3.6-20, in which the concentration increment range of 0.3mg/L is about 2699 m^2 and concentrated within 45m from the sewage outlet. The concentration increment range of 0.2mg/L is about 8177 m^2 and concentrated within 72 m from the sewage outlet. The incremental distribution range of 0.05mg/L is about 0.21km2, extending northward to the longest distance of about 412m and southwestward along the ebb current direction to a distance of about 512m. The concentration increment isoline of 0.01mg/L is about 6.79 km2, extending northward to the waters near Beihai Power Plant and southward into east and west trough, not reaching Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve. After superimposing the background concentration of each marine environmental functional zone, all can reach the standard without reducing the seawater environmental functional level of the sea area near the outlet, imposing limited impact on sensitive sea areas such as the Shankou Mangrove Ecological Nature Reserve to the northeast and the Dugong Nature Reserve to the south.

项目两期建成后B3排污口日排水量23.2万吨，DIN排放浓度7.39 mg/L。在模拟计算的半月潮过程中，排污口中心DIN浓度最大约0.488 mg/L，增量浓度等值线分布见图4.3.6-21，其中，浓度增量值为0.3 mg/L的范围约4209.9 m^2，集中在排污口52 m范围内。浓度增量值为0.2 mg/L的范围约10842.1 m^2，主要集中在排污口91 m范围内。0.05 mg/L的增量分布范围约0.28 km^2，向北扩展距离约491 m，往南偏西方向（顺落潮流方向）扩展约624 m；0.01mg/L的增量分布范围约8.30 km^2，向北延伸到北海电厂附近，向南延伸到东、西槽内，均未进入广西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区。叠加各环境功能区本底值后，均能达标，未降低排海口附近海域海

水环境功能级别，对东北部山口红树林保护区、东南部儒艮自然保护区等敏感海域影响不大。

Upon completion of both phases of the project, the daily sewage discharge of B3 sewage outlet is 232,000 tons. The emission concentration of DIN is 7.39mg/L. The DIN concentration in the center of the sewage outlet is about 0.488 mg/L as maximum in the simulated and calculated fortnightly tide process. Distribution of the isoline of incremental concentration is as shown in Figure 4.3.6-21, in which the concentration increment range of 0.3mg/L is about 4209.9 m^2 and concentrated within 52 m from the sewage outlet. The concentration increment range of 0.2mg/L is about 10842.1m2 and concentrated within 91m from the sewage outlet. The concentration increment isoline of 0.05 mg/L is about 0.28km2, extending northward to a distance of about 491m and southward (along the ebb current direction) to a distance of about 624 m; the concentration increment isoline of 0.01mg/L is about 8.30km2, extending northward to the vicinity of Beihai Power Plant and southward into east and west trough, both not reaching Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve. After superimposing the background concentration of each marine environmental functional zone, all can reach the standard without reducing the seawater environmental functional level of the sea area near the outlet, imposing limited impact on sensitive sea areas such as the Shankou Mangrove Ecological Nature Reserve to the northeast and the Dugong Nature Reserve to the south.

②非正常排放

② Abnormal emission

一期非正常排放情况下，日排水量约 20.76 万吨，DIN 排放浓度 9.97 mg/L，在小潮期持续排放 6 小时，其余时间正常排放（正常排放浓度 7.36mg/L）。在模拟计算的半月潮过程中，排污口中心 DIN 浓度最大约 0.436 mg/L。增量浓度等值线分布见图 4.3.6-22。由于非正常排放与正常排放两情景下的污染物源强相差不大，且非正常排放时间仅持续 6 小时，所以两种情景下的无机氮扩散范围相差较小，非正常排放情景下无机氮影响范围略大于正常排放。非正常排放情景下，浓度增量值为 0.3 mg/L 的范围约 2700 m^2，集中在排污口 42 m 范围内。0.01mg/L 的浓度增量等值线分布范围约 6.86 km^2，均未达广

西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区。叠加各环境功能区本底值后，均能达标，未降低排海口附近海域海水环境功能级别，对东北部山口红树林保护区、东南部儒艮自然保护区等敏感海域影响不大。

Under the condition of abnormal emission in Phase I, the daily sewage discharge of B3 sewage outlet is about 207,600 tons and the DIN emission concentration is 9.97mg/L, for which abnormal emission will sustain for 6 hours during the neap tide period while normal emission will be maintained for the rest of the period (with normal emission concentration of 7.36mg/L). The DIN concentration in the center of the sewage outlet is about 0.436 mg/L as maximum in the simulated and calculated fortnightly tide process. Distribution of the isoline of incremental concentration is as shown in Figure 4.3.6-22. With limited difference between the source intensity of pollutants in the abnormal and normal emission scenarios and the abnormal emission duration of only 6 hours, the difference in the diffusion range of inorganic nitrogen in the two scenarios is limited and the impact range of inorganic nitrogen in the abnormal emission scenario is slightly larger than the normal emission. Under the abnormal emission scenario, the concentration increment range of 0.3mg/L is about 4,014m2 and concentrated within 42 m from the sewage outlet. The isoline area of the concentration increment of 0.01mg/L is about 40.04km2, not reaching Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve. After superimposing the background concentration of each marine environmental functional zone, all can reach the standard without reducing the seawater environmental functional level of the sea area near the outlet, imposing limited impact on sensitive sea areas such as the Shankou Mangrove Ecological Nature Reserve to the northeast and the Dugong Nature Reserve to the south.

二期非正常排放情况下，日排水量约 23.2 万吨，DIN 排放浓度 10.47 mg/L，在小潮期持续排放 6 小时，其余时间正常排放（正常排放浓度 7.39 mg/L）。在模拟计算的半月潮过程中，排污口中心 DIN 浓度最大约 0.49 mg/L。增量浓度等值线分布见图 4.3.6-23。非正常排放情景下，浓度增量值为 0.3 mg/L 的范围约 4210 m^2，集中在排污口 51 m 范围内。0.01mg/L 的浓度增量等值线分布范围约 8.36 km^2，均未达广西山口红树林生态自

然保护区和广西合浦儒艮国家级自然保护区。叠加各环境功能区本底值后，均能达标，未降低排海口附近海域海水环境功能级别，对东北部山口红树林保护区、东南部儒艮自然保护区等敏感海域影响不大。

Under the condition of abnormal emission in Phase II, the daily sewage discharge of B3 sewage outlet is about 232,000 tons and the DIN emission concentration is 10.47mg/L, for which abnormal emission will sustain for 6 hours during the neap tide period while normal emission will be maintained for the rest of the period (with normal emission concentration of 7.39 mg/L). The DIN concentration in the center of the sewage outlet is about 0.49mg/L as maximum in the simulated and calculated fortnightly tide process. Distribution of the isoline of incremental concentration is as shown in Figure 4.3.6-23. Under the abnormal emission scenario, the concentration increment range of 0.3mg/L is about 4,014m2 and concentrated within 51m from the sewage outlet. The isoline area of the concentration increment of 0.01mg/L is about 40.04km2, not reaching Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve. After superimposing the background concentration of each marine environmental functional zone, all can reach the standard without reducing the seawater environmental functional level of the sea area near the outlet, imposing limited impact on sensitive sea areas such as the Shankou Mangrove Ecological Nature Reserve to the northeast and the Dugong Nature Reserve to the south.

表 4.3.6-16 不同工况条件下 DIN 最大包络面积和排污口中心浓度最大值统计（单位:km^2）
Table 4.3.6-16 Statistics of Maximum Envelope Area and Maximum Concentration Values of DIN in the Center of Sewage Outlet under Different Working Conditions (in km^2)

目标浓度 Target concentration 排放情景 Emission scenario	>0.5 mg/L	>0.4 mg/L	>0.3 mg/L	>0.2 mg/L	>0.1 mg/L	>0.05 mg/L	>0.01 mg/L	排污口中心浓度/mg/L Concentration in the center of sewage outelt/mg/L
正常排放 Normal emission								
一期建成后	0	0.000181	0.00270	0.00818	0.04015	0.213	6.794	0.435

Upon completion of Phase I								
二期建成后 Upon completion of Phase II	0	0.000912	0.00416	0.01079	0.05367	0.280	8.303	0.488
非正常排放 Abnormal emission								
一期建成后 Upon completion of Phase I	0	0.000185	0.00270	0.00819	0.04035	0.217	6.862	0.436
二期建成后 Upon completion of Phase II	0	0.000945	0.00421	0.01084	0.05413	0.284	8.364	0.490

表 4.3.6-17 DIN 排放浓度预测结果

Table 4.3.6-17 Prediction Results of DIN Emission Concentration

	海洋环境功能区预测浓度（mg/L） Predicted concentration in marine environmental functional zone (mg/L)					
海洋功能区 Marine functional zone	铁山港西岸排污区 GX012 DIV West Bank Sewage Area at Tieshan Port GX012 D Ⅳ	北海港铁山港作业区 GX011DIV Operation Area at Tieshan Port of Beihai Port GX011DIV	山口红树林生态自然保护区 GX002AI Shankou Mangrove Ecological Nature Reserve GX002AI	合浦儒艮国家级自然保护区 GX001AI Hepu Dugong National Nature Reserve GX001AI	英罗港养殖区 GX005BII Breeding Area of Yingluo Port GX005BII	营盘海产品养殖、增值区（GX024BII、GX025BII） Yingpan Seafood Breeding and Proliferation Area (GX024BII, GX025BII)
水质类别 Water quality category	四类 Class IV	四类 Class IV	一类 Class I	一类 Class I	二类 Category II	二类 Category II
春季本底值 Background value of spring	0.204	0.17	0.167	0.149	0.17	0.173
秋季本底值 Background value of autumn	0.285	0.325	0.183	0.186	0.279	0.236

	海洋环境功能区预测浓度（mg/L） Predicted concentration in marine environmental functional zone (mg/L)					
正常排放（一、二期） Normal emission (Phase I and II)						
贡献值 Contribution value	0.1	0.05	＜0.01	＜0.01	0.01	＜0.01
春季预测值 Predicted value of spring	0.304	0.22	＜0.177	＜0.159	0.18	＜0.183
秋季预测值 Predicted value of autumn	0.385	0.376	＜0.193	＜0.196	0.289	＜0.246
非正常排放（一、二期） Abnormal emission (Phase I and II)						
贡献值 Contribution value	0.1	0.05	＜0.01	＜0.01	0.01	＜0.01
春季预测值 Predicted value of spring	0.304	0.22	＜0.177	＜0.159	0.18	＜0.183
秋季预测值 Predicted value of autumn	0.385	0.376	＜0.193	＜0.196	0.289	＜0.246
《海水水质标准》 Sea Water Quality Standard	≤0.5	≤0.5	≤0.2	≤0.2	≤0.3	≤0.3

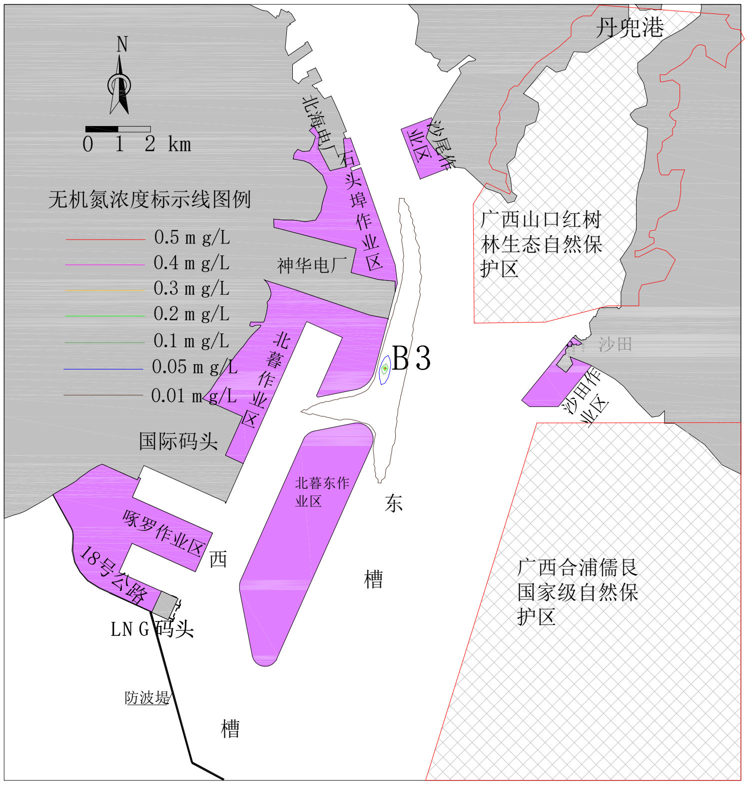


图 4.3.6-20 B3 排污口规划岸线正常工况 DIN 增量浓度等值线分布（一期）

Figure 4.3. 6-20 Distribution of DIN Incremental Concentration Isoline under Normal Working Conditions of Planned Shoreline at B3 Sewage Outlet (Phase I)

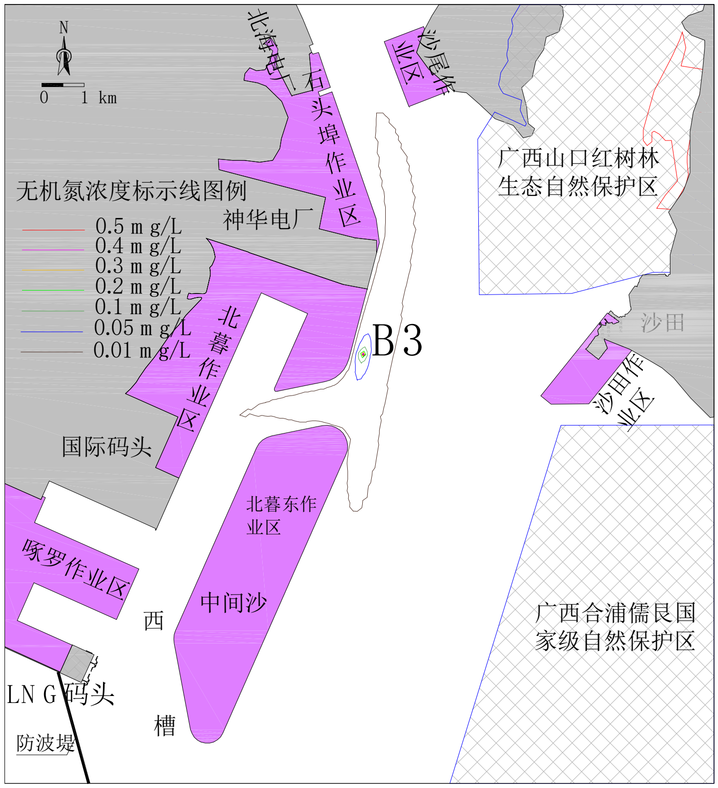


图 4.3.6-21 B3 排污口规划岸线正常工况 DIN 增量浓度等值线分布（二期）

Figure 4.3. 6-21 Distribution of DIN Incremental Concentration Isoline under Normal Working Conditions of Planned Shoreline at B3 Sewage Outlet (Phase II)

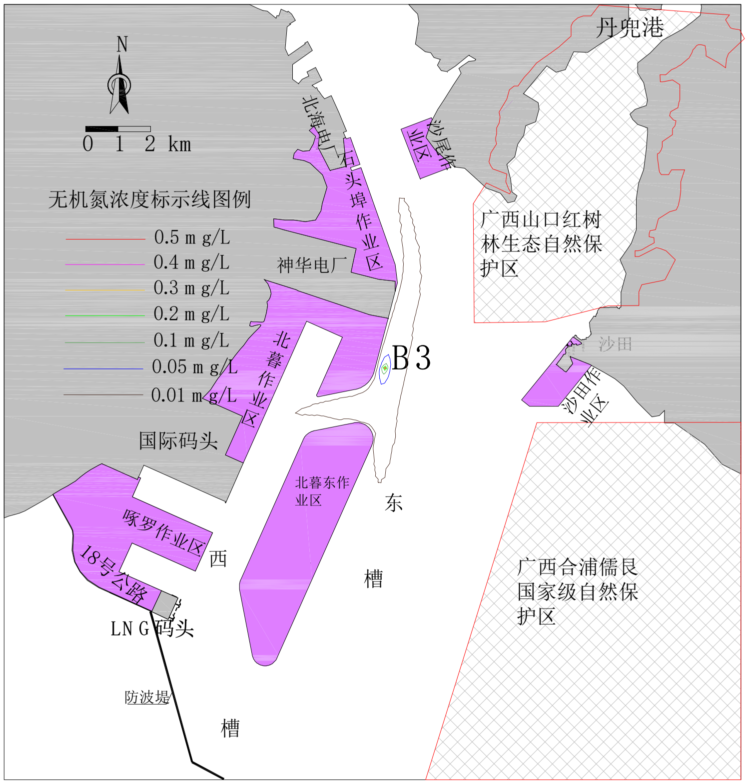


图 4.3.6-22 B3 排污口规划岸线非正常工况 DIN 增量浓度等值线分布（一期）

Figure 4.3. 6-22 Distribution of DIN Incremental Concentration Isoline under Abnormal Working Conditions of Planned Shoreline at B3 Sewage Outlet (Phase I)

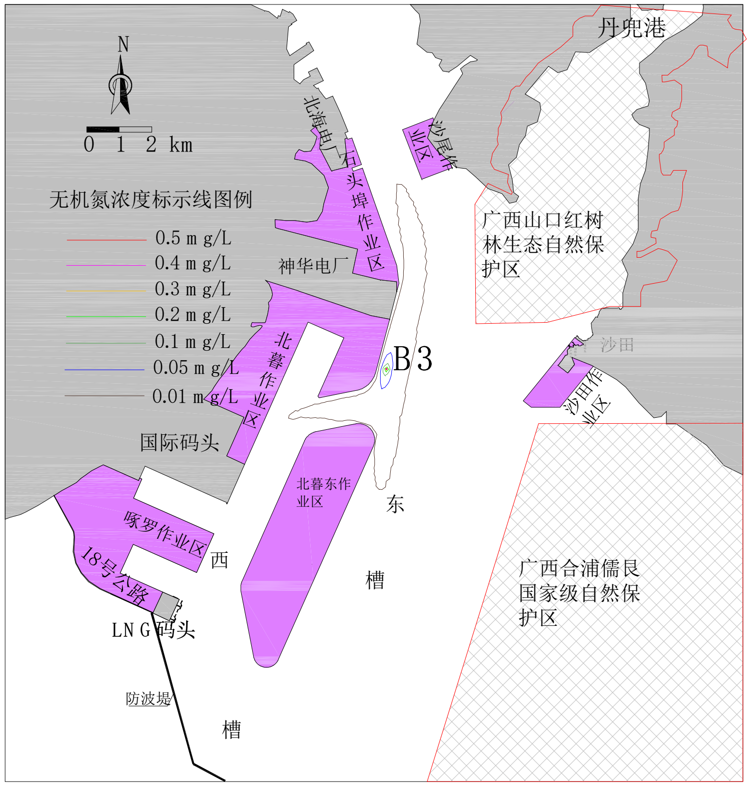


图 4.3.6-23　B3 排污口规划岸线非正常工况 DIN 增量浓度等值线分布（二期）

Figure 4.3. 6-23 Distribution of DIN Incremental Concentration Isoline under Abnormal Working Conditions of Planned Shoreline at B3 Sewage Outlet (Phase II)

（3）活性磷酸盐

(3) Reactive phosphate

①正常排放

① Normal emission

项目一期建成后 B3 排污口日排水量 20.76 万吨，正常排放工况下排污口活性磷酸盐（以下简写为“DIP”）排放浓度 0.333mg/L。在模拟计算的半月潮过程中，排污口中心 DIP 浓度最大约 0.020mg/L，正常排放时增量浓度等值线分布见图 4.3.6-24。正常排放时，DIP 在排水口附近快速稀释，排污口附近浓度增加均不超过 0.03mg/L；浓度增量值 0.004mg/L 的范围仅约 0.056 km^2，分布在排水口 218 m 范围附近；浓度增量值 0.001mg/L 的范围约 5.25 km^2，均未达广西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区。叠加各海洋环境功能区本底浓度后，均能达标，未降低排海口附近海域海水环境功能级别，对东北部山口红树林保护区、东南部儒艮自然保护区等敏感海域无明显影

响。

Upon completion of Phase I of the project, the daily sewage discharge of B3 sewage outlet is 207,600 tons. Under normal emission conditions, the emission concentration of reactive phosphate (hereinafter referred to as "DIP") in the sewage outlet is 0.333mgmg/L. The DIP concentration in the center of the sewage outlet is about 0.020mg/L as maximum in the simulated and calculated fortnightly tide process. Distribution of the isoline of incremental concentration during normal emission is as shown in Figure 4.3.6-24. During normal emission, DIP is rapidly diluted near the sewage outlet, with increase in concentration all no more than 0.03mg/L near the outlet; the concentration increment range of 0.004mg/L is limited to roughly 0.056 km^2 and distributed around 218 m from sewage outlet; the concentration increment range of 0.001mg/L is about 5.25 km^2, both not reaching Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve. After superimposing the background concentration of each marine environmental functional zone, all can reach the standard without reducing the seawater environmental functional level of the sea area near the outlet, imposing no significant impact on sensitive sea areas such as the Shankou Mangrove Ecological Nature Reserve to the northeast and the Dugong Nature Reserve to the southwest.

项目二期建成后 B3 排污口日排水量 23.2 万吨，正常排放工况下排污口活性磷酸盐排放浓度 0.333mg/L。在模拟计算的半月潮过程中，排污口中心 DIP 浓度最大约 0.022 mg/L，最大增量浓度等值线分布见图 4.3.6-25。正常排放时，DIP 在排水口附近快速稀释，排污口附近浓度增加均不超过 0.03mg/L；浓度增量值 0.004mg/L 的范围仅约 0.078 km^2，分布在排水口 292m 范围内；浓度增量值 0.001mg/L 的范围约 6.42 km^2，向北延伸到北海电厂东南侧水域，向南随落潮流分别进入东、西槽内，均未达广西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区。叠加各海洋环境功能区本底浓度后，均能达标，未降低排海口附近海域海水环境功能级别，对东北部山口红树林保护区、东南部儒艮自然保护区等敏感海域无明显影响。

Upon completion of Phase II of the project, the daily sewage discharge of B3 sewage outlet is 232,000 tons. Under normal emission conditions, the emission concentration of reactive phosphate in the sewage outlet is 0.333mgmg/L. The DIP concentration in the center of the sewage outlet is about 0.022 mg/L as maximum in the simulated and calculated fortnightly tide process. Distribution of the isoline of incremental concentration is as shown in Figure 4.3.6-25. During normal emission, DIP is rapidly diluted near the sewage outlet, with increase in concentration all no more than 0.03mg/L near the outlet; the concentration increment range of 0.004mg/L is limited to roughly 0.078 km2 and distributed around 292m from sewage outlet; the concentration increment range of 0.001mg/L is about 6.42km2, extending northward to the waters on southeast side of Beihai Power Plant and southward along with ebb tide respectively into east and west trough, both not reaching Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve. After superimposing the background concentration of each marine environmental functional zone, all can reach the standard without reducing the seawater environmental functional level of the sea area near the outlet, imposing no significant impact on sensitive sea areas such as the Shankou Mangrove Ecological Nature Reserve to the northeast and the Dugong Nature Reserve to the southwest.

②非正常排放

② Abnormal emission

一期非正常排放情况下，日排水量约 20.76 万吨，排放浓度 2.815 mg/L，在小潮期持续排放 6 小时，其余时间正常排放（正常排放浓度 0.333 mg/L）。在模拟计算的半月潮过程中，排污口中心 DIP 浓度最大约 0.03 mg/L。增量浓度等值线分布见图 4.3.6-26。浓度增量值 0.007mg/L 的范围约 0.078 km^2，集中在混合区内；浓度增量值 0.004mg/L 的范围约 0.292 km^2，向北穿过混合区进入过渡区内，沿落潮流向西南方向延伸 590 m，未达广西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区。叠加各海洋环境功能区本底浓度后，均能达标，未降低排海口附近海域海水环境功能级别，对东北部山口红树林保护区、东南部儒艮自然保护区等敏感海域无明显影响。

Under the condition of abnormal emission in Phase I, the daily sewage discharge of B3 sewage outlet is about 207,600 tons and the emission concentration is 2.815mg/L, for which abnormal emission will sustain for 6 hours during the neap tide period while normal emission will be maintained for the rest of the period (with normal emission concentration of 0.333mg/L). The DIN concentration in the center of the sewage outlet is about 0.03 mg/L as maximum in the simulated and calculated fortnightly tide process. Distribution of the isoline of incremental concentration is as shown in Figure 4.3.6-26. The concentration increment range of 0.007mg/L is about 0.078km2 and concentrated in the mixed area; the concentration increment range of 0.004mg/L is about 0.292km2, extending northward through the mixing area into the transition area and southwestward along the ebb current direction to 590 m, not reaching the Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve. After superimposing the background concentration of each marine environmental functional zone, all can reach the standard without reducing the seawater environmental functional level of the sea area near the outlet, imposing no significant impact on sensitive sea areas such as the Shankou Mangrove Ecological Nature Reserve to the northeast and the Dugong Nature Reserve to the southwest.

二期非正常排放情况下，日排水量约 23.2 万吨，排放浓度 3.281 mg/L，在小潮期持续排放 6 小时，其余时间正常排放（正常排放浓度 0.333 mg/L）。在模拟计算的半月潮过程中，排污口中心 DIP 浓度最大约 0.037 mg/L。增量浓度等值线分布见图 4.3.6-27。浓度增量值 0.007mg/L 的范围约 0.134km^2，集中在混合区内；浓度增量值 0.004mg/L 的范围约 0.455 km^2，向北延伸到神华电厂东南侧水域，沿落潮流向西南方向延伸 818m，未达广西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区。叠加各海洋环境功能区本底浓度后，均能达标，未降低排海口附近海域海水环境功能级别，对东北部山口红树林保护区、东南部儒艮自然保护区等敏感海域无明显影响。

Under the condition of abnormal emission in Phase II, the daily sewage discharge of B3 sewage outlet is about 232,000 tons and the emission concentration is 3.281mg/L, for which abnormal emission will sustain for 6 hours during the neap tide period while normal emission will be maintained for the rest of the period (with normal emission concentration of 0.333 mg/L). The DIN concentration in the center of the sewage outlet is about 0.037 mg/L as maximum in the simulated and calculated fortnightly tide process. Distribution of the isoline of incremental concentration is as shown in Figure 4.3.6-27. The concentration increment range of 0.007mg/L is about 0.134km2 and concentrated in the mixed area; the concentration increment range of 0.004mg/L is about 0.455km2, extending extending northward to the waters on southeast side of Beihai Power Plant and southwestward along the ebb current direction to 818m, not reaching the Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve. After superimposing the background concentration of each marine environmental functional zone, all can reach the standard without reducing the seawater environmental functional level of the sea area near the outlet, imposing no significant impact on sensitive sea areas such as the Shankou Mangrove Ecological Nature Reserve to the northeast and the Dugong Nature Reserve to the southwest.

表 4.3.6-18 不同工况条件下 DIP 最大包络面积和排污口中心浓度最大值统计（单位:km^2）

Table 4.3. 6-18 Statistics of Maximum Envelope Area and Maximum Concentration Values of DIP in the Center of Sewage Outlet under Different Working Conditions (in km2)

目标浓度 Target concentration / 排放情景 Emission scenario	>0.030 mg/L	>0.015 mg/L	>0.007 mg/L	>0.004 mg/L	>0.001 mg/L	排污口中心浓度/mg/L Concentration in the center of sewage outelt/mg/L
正常排放						
一期建成后	0	0.00174	0.015	0.056	5.254	0.020
二期建成后	0	0.00286	0.020	0.078	6.422	0.022
非正常排放						
一期建成后	0	0.00806	0.078	0.292	8.327	0.030
二期建成后	0.001179	0.01613	0.134	0.455	10.199	0.037

表 4.3.6-19 DIP 排放浓度预测结果

Table 4.3.6-19 Prediction Results of DIP Emission Concentration

	海洋环境功能区预测浓度（mg/L） Predicted concentration in marine environmental functional zone (mg/L)					
海洋功能区 Marine functional zone	铁山港西岸排污区 GX012 DIV West Bank Sewage Area at Tieshan	北海港铁山港作业区 GX011DIV Operation Area at Tieshan Port	山口红树林生态自然保护区 GX002AI Shankou Mangrove	合浦儒艮国家级自然保护区 GX001AI Hepu Dugong	英罗港养殖区 GX005BII Breeding Area of Yingluo	营盘海产品养殖、增值区（GX024BII、GX025BII） Yingpan Seafood

	Port GX012 D Ⅳ	of Beihai Port GX011DIV	Ecological Nature Reserve GX002AI	National Nature Reserve GX001AI	Port GX005BII	Breeding and Proliferation Area (GX024BII, GX025BII)
水质类别 Water quality category	四类 Class IV	四类 Class IV	一类 Class I	一类 Class I	二类 Category II	二类 Category II
春季本底值 Background value of spring	0.035	0.01	0.01	0.01	0.01	0.01
秋季本底值 Background value of autumn	0.033	0.041	0.012	0.013	0.028	0.021
正常排放（一、二期） Normal emission (Phase I and II)						
贡献值 Contribution value	0.007	＜0.004	＜0.001	＜0.001	0.001	＜0.001
春季预测值 Predicted value of spring	0.042	＜0.014	＜0.011	＜0.011	0.011	＜0.011
秋季预测值 Predicted value of autumn	0.04	＜0.045	＜0.013	＜0.014	0.029	＜0.022
非正常排放（一、二期） Abnormal emission (Phase I and II)						
贡献值 Contribution value	0.007	＜0.004	＜0.001	＜0.001	0.001	＜0.001
春季预测值 Predicted value of spring	0.042	＜0.014	＜0.011	＜0.011	0.011	＜0.011
秋季预测值 Predicted value of autumn	0.04	＜0.045	＜0.013	＜0.014	0.029	＜0.022
《海水水质标准》 Sea Water Quality Standard	≤0.045	≤0.045	≤0.015	≤0.015	≤0.03	≤0.03

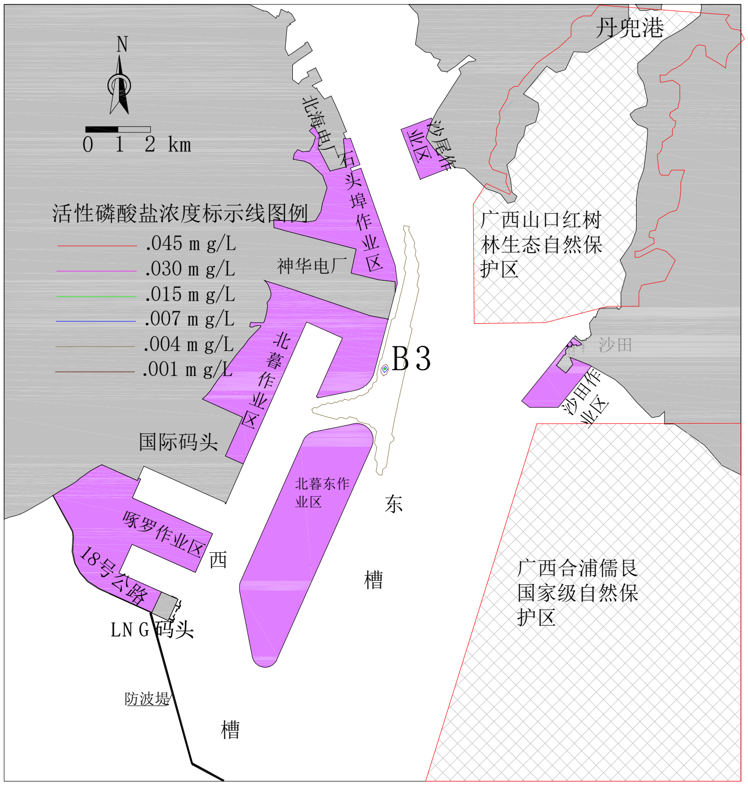


图 4.3.6-24 B3 排污口规划岸线正常工况 DIP 增量浓度等值线分布（一期）

Figure 4.3. 6-24 Distribution of DIP Incremental Concentration Isoline under Normal Working Conditions of Planned Shoreline at B3 Sewage Outlet (Phase I)

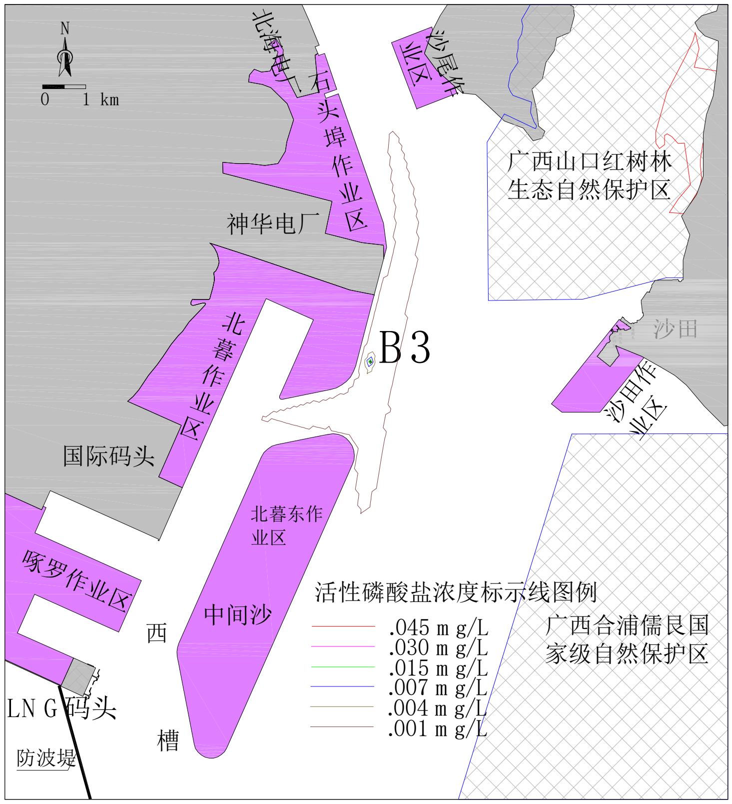


图 4.3.6-25 B3 排污口规划岸线正常工况 DIP 增量浓度等值线分布（二期）

Figure 4.3. 6-25 Distribution of DIP Incremental Concentration Isoline under Normal Working Conditions of Planned Shoreline at B3 Sewage Outlet (Phase II)

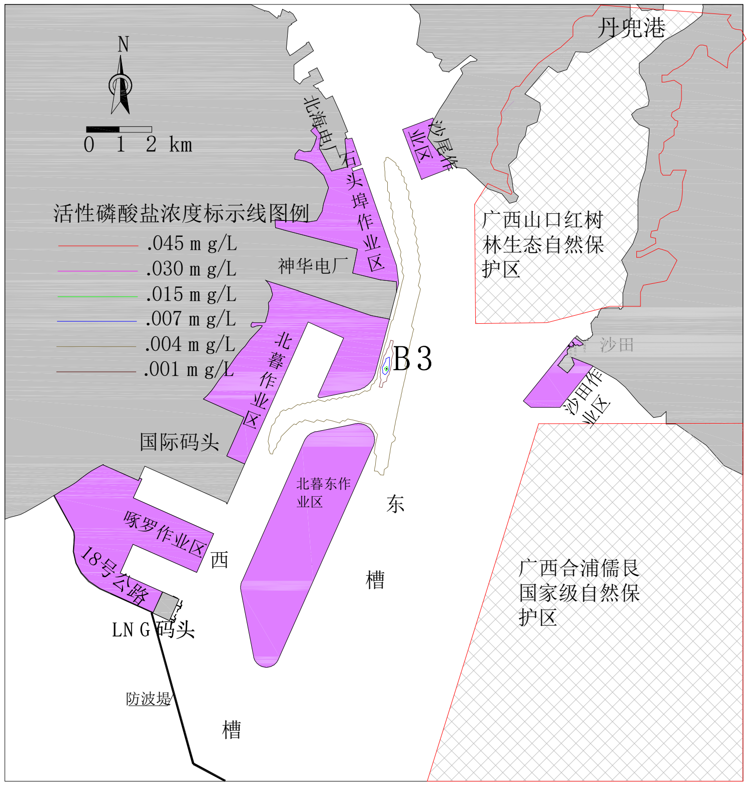


图 4.3.6-26 B3 排污口规划岸线非正常工况 DIP 增量浓度等值线分布（一期）

Figure 4.3. 6-26 Distribution of DIP Incremental Concentration Isoline under Abnormal Working Conditions of Planned Shoreline at B3 Sewage Outlet (Phase I)

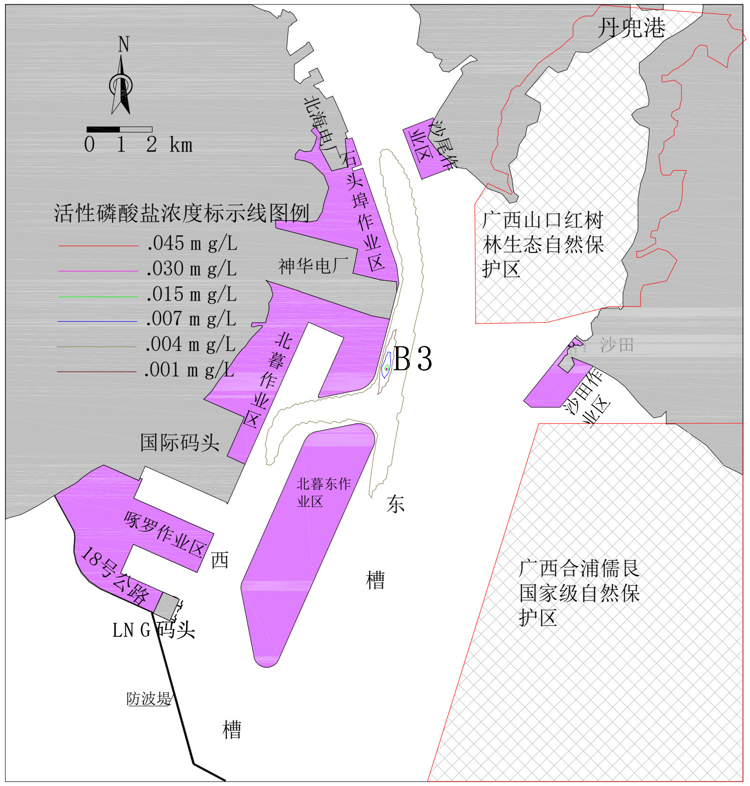


图 4.3.6-27　B3 排污口规划岸线非正常工况 DIP 增量浓度等值线分布（二期）

Figure 4.3. 6-27 Distribution of DIP Incremental Concentration Isoline under Abnormal Working Conditions of Planned Shoreline at B3 Sewage Outlet (Phase I)

（4）悬浮物质（SS）

(4) Suspended substance (SS)

项目一期建成后 B3 排污口日排水量 20.76 万吨，悬浮物质（以下简写为“SS”）排放浓度 26.0mg/L。正常排放时，在模拟计算的半月潮过程中，排污口中心 SS 浓度最大约 1.544 mg/L。浓度增量值 1.0 mg/L 的范围仅约 3486 m^2，集中在排水口 47m 范围附近，影响范围较小不再汇出浓度增值等值线分布。排污口废水排放增加悬浮物的量均≤10mg/L，未降低排海口附近海域海水环境功能级别。

Upon completion of Phase I of the project, the daily sewage discharge of B3 sewage outlet is 207,600 tons. The emission concentration of suspended substance (hereinafter referred to as "SS") is 26.0mg/L. Under normal emission, the SS concentration in the center of the sewage outlet is about 1.544 mg/L as maximum in the simulated and calculated fortnightly tide process. The concentration increment range of 1.0mg/L is limited to roughly

4931m2 and concentrated around 47m from sewage outlet, of which the impact area is limited so that no distribution of concentration increment isoline is developed. The amount of all suspended solids increased by wastewater discharge from sewage outlet is ≤ 10 mg/L, without reducing the seawater environmental functional level of the sea area near the outlet.

项目二期建成后 B3 排污口日排水量 23.2 万吨，排放浓度 26.46mg/L。在模拟计算的半月潮过程中，排污口中心 SS 浓度最大约 1.735 mg/L。二期建成后，浓度增量值为 1.0 mg/L 的范围仅约 5046 m^2，分布在排水口 55m 范围附近，影响范围较小不再汇出浓度增值等值线分布。排污口废水排放增加悬浮物的量均≤10mg/L，未降低排海口附近海域海水环境功能级别。

Upon completion of Phase II of the project, the daily sewage discharge of B3 sewage outlet is 232,000 tons. The emission concentration of is 26.46mg/L. The SS concentration in the center of the sewage outlet is about 1.735 mg/L as maximum in the simulated and calculated fortnightly tide process. Upon completion of Phase II, The concentration increment range of 1.0mg/L is limited to roughly 5,046m2 and distributed around 55m from sewage outlet, of which the impact area is limited so that no distribution of concentration increment isoline is developed. The amount of all suspended solids increased by wastewater discharge from sewage outlet is ≤ 10 mg/L, without reducing the seawater environmental functional level of the sea area near the outlet.

表 4.3.6-20 不同工况条件下 SS 最大包络面积和排污口中心浓度最大值统计（单位:km^2）

Table 4.3. 6-20 Statistics of Maximum Envelope Area and Maximum Concentration Values of SS in the Center of Sewage Outlet under Different Working Conditions (in km2)

目标浓度 **Target concentration** 排放情景 **Emission scenario**	>2mg/L	>1mg/L	>0.50mg/L	>0.25mg/L	**排污口中心浓度 Concentration in the center of sewage outelt /mg/L**
正常排放 Normal emission					
一期建成后 Upon completion of Phase I	0	0.00349	0.019	0.099	1.544
二期建成后 Upon completion	0	0.00505	0.025	0.131	1.735

of Phase II					

（5）AOX

(5) AOX

项目一期建成后 B3 排污口日排水量 20.76 万吨，AOX 排放浓度 2.49 mg/L。在模拟计算的半月潮过程中，排污口中心 AOX 浓度最大约 0.148 mg/L，增量浓度等值线分布见图 4.3.6-28。一期建成后，浓度增量值为 0.05 mg/L 的范围约 21953m^2，集中在排水口 129 m 范围内。浓度增量值为 0.01 mg/L 等值线面积约 6.63km^2，向北延伸到神华电厂附近水域，向西南延伸距离约 3.61km，均未达广西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区。

Upon completion of both phases of the project, the daily sewage discharge of B3 sewage outlet is 207,600 tons. The emission concentration of AOX is 2.49mg/L. The AOX concentration in the center of the sewage outlet is about 0.148 mg/L as maximum in the simulated and calculated fortnightly tide process. Distribution of the isoline of incremental concentration is as shown in Figure 4.3.6-28. Upon completion of Phase I, the concentration increment range of 0.05mg/L is about 21,953m2 and concentrated within 129 m from the sewage outlet. The isoline area of the concentration increment of 0.01 mg/L is about 6.63km2, extending northward to the waters near Beihai Power Plant and southward to a distance of 3.61km, not reaching Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve.

项目二期建成后 B3 排污口日排水量约 23.2 万吨，AOX 排放浓度 2.23mg/L。在模拟计算的半月潮过程中，排污口中心 AOX 浓度最大约 0.148 mg/L。增量浓度等值线分布见图 4.3.6-29。浓度增量值为 0.05mg/L 的范围约 17246 m^2，集中在排水口 121m 范围内。浓度增量值为 0.01 mg/L 等值线面积约 0.998 km^2，均未达广西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区。

Upon completion of both phases of the project, the daily sewage discharge of B3 sewage outlet is 232,000 tons. The emission concentration of AOX is 2.23mg/L. The AOX concentration in the center of the sewage outlet is about 0.148 mg/L as maximum in the simulated and calculated fortnightly tide process. Distribution of the isoline of incremental concentration is as shown in Figure 4.3.6-29. The concentration increment range of 0.05mg/L is about 17,246m2 and concentrated within 121m from the sewage outlet. The isoline area of the concentration increment of 0.01 mg/L is about 0.998km2, both not reaching Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve.

表 4.3.6-21 不同工况条件下 AOX 最大包络面积和排污口中心浓度最大值统计（单位:km²）

Table 4.3. 6-21 Statistics of Maximum Envelope Area and Maximum Concentration Values of AOX in the Center of Sewage Outlet under Different Working Conditions (in km2)

目标浓度 **Target concentration** / 排放情景 **Emission scenario**	>0.2mg/L	>0.1mg/L	>0.05mg/L	>0.01mg/L	排污口中心浓度 **Concentration in the center of sewage outelt /mg/L**
正常排放 Normal emission					
一期建成后 Upon completion of Phase I	0	0.002952	0.017236	0.978	0.148
二期建成后 Upon completion of Phase II	0	0.002962	0.017246	0.998	0.148

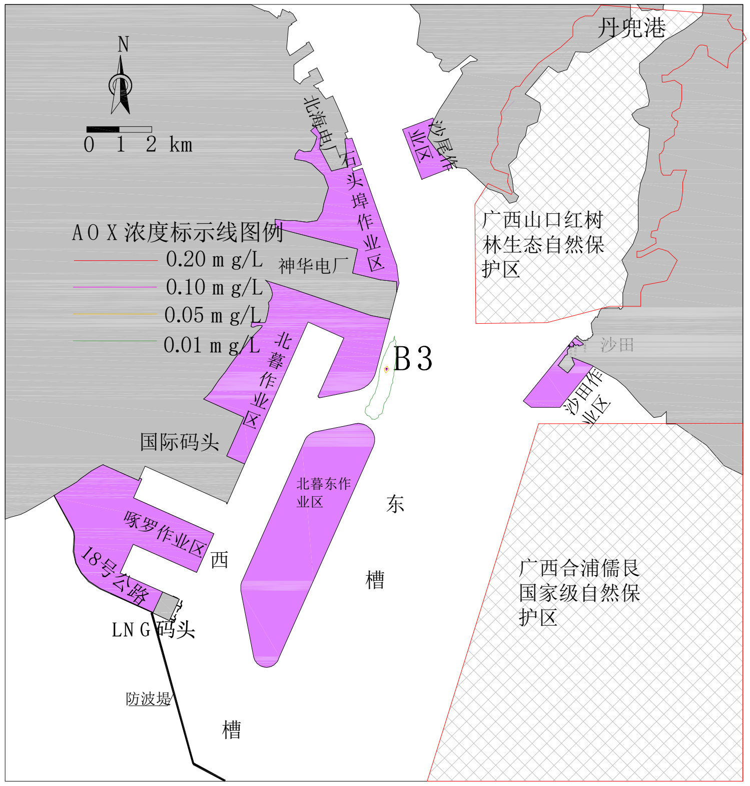


图 4.3.6-28 B3 排污口现状岸线 AOX 增量浓度等值线分布（一期）

Figure 4.3.6-28 Distribution of AOX Incremental Concentration Isoline of Current Shoreline at B3 Sewage Outlet (Phase I)

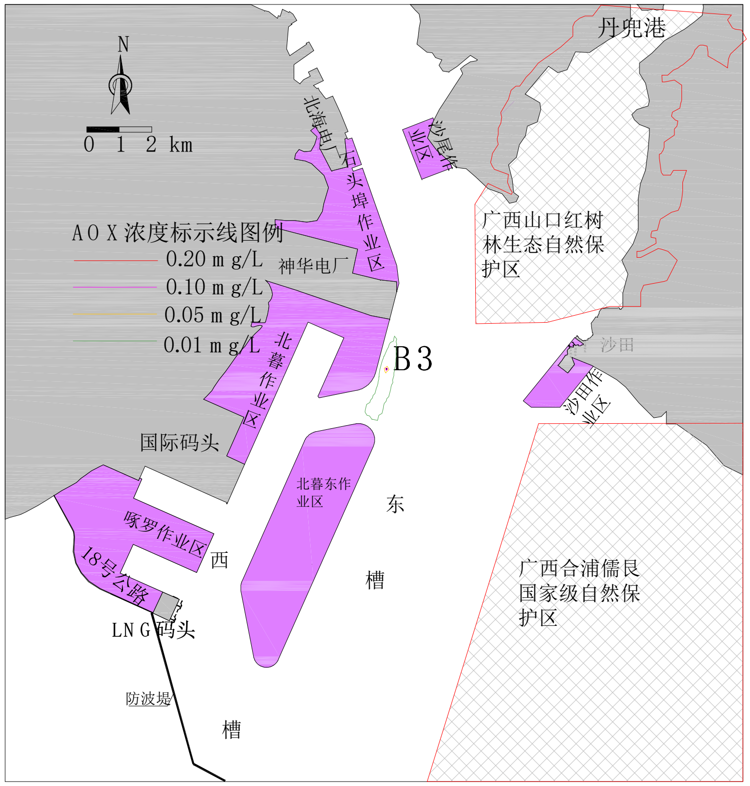


图 4.3.6-29 B3 排污口现状岸线 AOX 增量浓度等值线分布（二期）

Figure 4.3.6-29 Distribution of AOX Incremental Concentration Isoline of Current Shoreline at B3 Sewage Outlet (Phase II)

三、小结

III. Summary

由以上预测结果可见，在考虑排污口叠加污染源的情况下，项目废水正常排放，污染物浓度增量影响主要集中在排污口附近区域，随着向外扩散浓度增量逐渐减小，叠加各海洋环境功能区水质本底浓度后，均未超过相应海洋环境功能区海水水质指标要求。

As can be seen from the above prediction results, considering the pollution sources superimposed on the sewage outlet, the project wastewater is discharged normally, and the impacts of pollutant concentration increment is mainly concentrated in the area near the outlet. As the outward diffusion concentration increment gradually decreases, after superimposing the background concentration of water quality in each marine environmental functional zone, the requirements of seawater quality indicator for the corresponding marine environmental functional zone are all not exceeded.

项目废水非正常排放时海域浓度增量扩散范围有所增加，但叠加各海洋环境功能区水质本底浓度后，仍能达到相应海洋环境功能区海水水质指标要求。故项目废水排放，不降低排海口周边海域海水环境功能级别，对东北部山口红树林保护区、东南部儒艮自然保护区等敏感海域水质影响不大。

During abnormal discharge of the project wastewater, the diffusion range of sea area concentration increment increases. Despite that, after superimposing the background concentration of water quality in each marine environmental functional zone, the requirements of seawater quality indicator for the corresponding marine environmental functional zone are still satisfied. Therefore, the discharge of wastewater from the project will not reduce the seawater environmental functional level of the sea area near the outlet, and will impose limited impact on the water quality of sensitive sea areas such as the Shankou Mangrove Ecological Nature Reserve to the northeast and the Dugong Nature Reserve to the south.

4.3.7 污水排放对周边海域海洋生态环境影响分析

4.3.7 Analysis for impact of sewage discharge on marine ecological environment in surrounding sea area

根据《建设项目对海洋生物资源影响评价技术规程》（SC/T 9110-2007）中关于污染物扩散范围内的海洋生物资源损害评估：

In accordance with provisions with respect to damage assessment of marine living resources within pollutant diffusion range in the Technical Regulations for Impact Assessment of Construction Projects on Marine Living Resources (SC/T9410-2007):

①一次性平均受损量评估

① One-time average damage assessment

某种污染物浓度增量超过 GB11607 或 GB3097 中 II 类标准值（GB11607 或 GB3097 中未列入的污染物，其标准值按照毒性试验结果类推）对海洋生物资源损害，按公式计算：

If the concentration increment of a certain pollutant exceeds the Class II standard value in GB11607 or GB3097 (for pollutants not included in GB11607 or GB3097, the standard value shall be analogized according to toxicity test results), the damage to marine living resources shall be calculated as follows:

$$W_i = \sum_{j=1}^{n} D_{ij} \times S_j \times K_{ij}$$

式中：

Where:

Wi——第 i 种类生物资源一次性平均损失量，单位为（尾）、个（个）、千克(kg)；

Wi - the one-time average loss of the ith species of biological resources, in fish, nos. and kg;

Dij——某一污染物第 j 类浓度增量区第 i 种类生物资源密度，单位为尾平方千米（尾/km²）、个平方千米（个/km²）、千克平方千米（kg/km²）；

Dij - the density of biological resources of the ith class in the concentration increment area of the jth class of a pollutant, in piece square kilometer (fish/km²), nos. square kilometer (nos./km²) and kilogram square kilometer (kg/km²);

Sj——某一污染物第 j 类浓度增量区面积，单位为平方千米（km²）；

Sj - area of the Jth class concentration increment area for a pollutant in square kilometers (km²);

Kij——某一污染物第 j 类浓度增量区第 i 种类生物资源损失率，单位为百分之（%）；生物资源损失率取值参见表 4.3.7-1；

Kij - loss rate of the ith class biological resources in the jth class concentration increment area of a certain pollutant, in percent (%); for values of loss rate of biological resources, refer to Figure 4.3.7-1;

n——某一污染物浓度增量分区总数。

n - total number of concentration increment zones for a certain pollutant.

表 4.3.7-1 污染物对各类生物损失率

Table 4.3.7-1 Loss Rate of Various Livings caused by Pollutants

污染物 *i* 的超标 Overstandard of pollutant *i* 倍数（B_i） Multiple (B_i)	各类生物损失率（%） Loss rate of various livings			
	鱼卵和仔稚鱼 Fish eggs and prelarva &	成体 Adult	浮游动物 Zooplankton	浮游植物 Phytoplankton

	postlarva			
B_i≤1 倍 B_i≤1 time	5	＜1	5	5
1＜B_i≤4 倍 1＜B_i≤4 times	5～30	1～10	10～30	10～30
4＜B_i ≤9 倍 4＜B_i ≤9 times	30～50	10～20	30～50	30～50
B_i ≥9 倍 B_i ≥9 times	≥50	≥20	≥50	≥50

注：

Note:

1、本表列出污染物 i 的超标倍数(Bi)，指超《渔业水质标准》或超 II 类《海水水质标准》的倍数，对标准中未列的污染物，可参考相关标准或按实际污染物种类的毒性试验数据确定；当多种污染物同时存在，以超标准倍数最大的污染物为评价依据。

1. The over-standard multiple (Bi) of pollutant i listed in this table refers to the multiple exceeding the *Water Quality Standard for Fisheries* or Class II standards of *Sea Water Quality Standard*. For pollutants not listed in the standard, it can be determined by referring to relevant standards or toxicity test data of actual pollutant types. When multiple pollutants exist at the same time, the pollutant with the largest exceeding standard multiple is taken as the assessment basis.

2、损失率是指考虑污染物对生物繁殖、生长或造成死亡，以及生物质量下降等影响因素的综合系数。

2. Loss rate refers to the comprehensive coefficient taking into account the impact factors of pollutants such as biological reproduction, growth or death, and biological quality decline.

3、本表列出的对各类生物损失率作为工程对海洋生物损害评估的参考值。工程产生各类污染物对海洋生物的损失率可按实际污染物种类，毒性试验数据作相应调整。

3. The loss rates of various organisms listed in this table are used as reference values for the assessment of marine biological damage by the project. The loss rate of various pollutants generated by the project to marine livings is adjustable depending upon actual pollutant types and toxicity test data.

4、本表对 pH、溶解氧参数不适用。

4. This table is not applicable to pH and dissolved oxygen parameters.

②持续性损害受损量评估

② Assessment of amount of sustained damage

当污染物浓度增量区域存在时间超过 15 天时，应计算生物资源的累计损害量。计算以年为单位的生物资源的累计损害量按以下公式计算：

When the pollutant concentration increment area exists for more than 15 days, the cumulative damage amount of biological resources shall be calculated. The cumulative amount of damage to biological resources expressed in year is calculated as follows:

$$M_i = W_i \times T$$

式中：

Where:

Mi——第i种类生物资源累计损害量，单位为尾（尾）、个（个）、千克（kg）；

Mi - cumulative damage amount of the ith species of biological resources, in fish, nos. and kg;

Wi——第i种类生物资源一次平均损害量，单位为尾（尾）、个（个）、千克（kg）；

Wi - average one-time amount of damage to the ith species of biological resources in fish, nos. and kg;

T——污染物浓度增量影响的持续周期数（以年实际影响天数除以15），单位为个（个）。

T - the number of continuous cycles of pollutant concentration increment impact (divided by the annual actual impact days by 15), in nos.

综合近三年现状调查资料的高值，调查海域鱼卵平均密度为7.19粒/m^3，仔稚鱼平均密度4.38尾/m^3，浮游植物细胞密度1.18×10^7个/m^3，浮游动物个体密度为227个/m^3；调查海域渔业资源资源密度为187.66 kg/km^2。受工程施工影响的鱼类的产卵期约为90天，故污染物浓度增量影响的持续周期数为6个；浮游植物、浮游动物及渔业成体影响周期按24个/年计算；影响水深按10m。

Based on the high value of the investigation data in the past three years, the average density of fish eggs in the investigated sea area is 7.19 eggs/m3, the average density of larvae and juveniles is 4.38 eggs/m3, the density of phytoplankton cells is 1.18×10^7 nos./m3, and the density of zooplankton individuals is 227 eggs/m3. The density of fishery resources in the investigated sea area is 187.66kg/km2. The spawning period of fish affected by engineering construction is about 90 days, so the number of continuous periods affected by pollutant concentration increment is 6. The impact periods of phytoplankton, zooplankton and fishery adults are calculated as 24 nos./year. The affected water depth shall be taken as 10m.

4.3.7.1 COD排放对海洋生态环境影响分析

4.3.7.1 Analysis for impact of COD emission on marine ecological environment

COD对海洋生物的影响主要由于其含有大量的溶解性有机物，它们在水体中消耗

大量的氧，降低水中的溶解氧，危及水生生物的生存。

The impact of COD on marine livings is mainly due to its large amount of dissolved organic matter, which consumes a large amount of oxygen in water, reduces dissolved oxygen in water and endangers the survival of aquatic organisms.

本项目两期建设完成后正常工况下，B3 排污口排放的废水 COD 叠加本底浓度后，在铁山港西岸排污区局部区域超过 3mg/L 浓度（超《海水水质标准》II 类），范围主要集中在排污区。但 COD 浓度增量没有超出二类海水水质标准（＞3mg/L）的影响范围，对周边海洋生态环境影响不大，因此不再进行生态损失计算。

Under normal working conditions upon completion of both phases of this project, after the COD of wastewater discharged from B3 sewage outlet is superimposed with background concentration, the concentration will exceeds 3mg/L (exceeding Class II of Seawater Quality Standard) in local sewage discharge area on the west bank of Tieshan Port, of which the range is mainly concentrated in the sewage discharge area. However, the concentration increment of COD will not exceed the impact area of Class II seawater quality standard (> 3mg/L) and will impose limited impact on the surrounding marine ecological environment, so ecological loss calculation is no longer carried out.

4.3.7.2 悬浮物排放对海洋生态环境影响分析

4.3.7.2 Analysis for impact of SS emission on marine ecological environment

（1）对浮游植物的影响

(1) Impact on phytoplankton

悬浮物对浮游植物最主要的影响是水体中增加的悬浮物质影响了水体的透光性，进而影响了浮游植物的光合作用。一般而言，悬浮物的浓度增加在 10mg/L 以下时，水体中的浮游植物不会受到影响，而当悬浮物浓度增加 50mg/L 以上时，浮游植物会受到较大的影响，特别是中心区域，悬浮物含量极高，海水透光性极差，浮游植物基本上无法生存。当悬浮物的浓度增加量在 10～50mg/L 时，浮游植物将会受到轻微的影响。

The major impact of SS on phytoplankton is that the increased suspended matter in the water body affects the light transmittance of the water body, thus affecting the photosynthesis of phytoplankton. Generally speaking, if concentration of SS is increased by less than 10mg/L, phytoplankton in the water body will not be affected. However, if the concentration of SS is increased by more than 50mg/L, phytoplankton will be greatly affected, especially in the central area, where the content of SS is extremely high, the light transmittance of seawater is extremely poor, and phytoplankton basically cannot survive. If concentration of SS is increased by 10-50mg/L, phytoplankton will be slightly affected.

（2）对浮游动物的影响

(2) Impact on zooplankter

悬浮物对浮游动物的影响与悬浮物的粒径、浓度等有关。具体影响反应在浮游动物的生长率、存活率、摄食率、丰度、生产量及群落结构等方面。浮游动物受影响程度和范围与浮游植物的相似。

Impact of SS on zooplankton is related to the particle size and concentration of suspended solids. The specific impacts are reflected in the growth rate, survival rate, feeding rate, abundance, production and community structure of zooplankton. Zooplankton is affected to a degree and extent similar to that of phytoplankton. Impact on zooplankton is at the degree and to the extent similar to phytoplankton.

（3）对渔业资源的影响分析

(3) Analysis of impact on fishery resources

悬浮物对鱼类的影响分为三类，即致死效应、亚致死效应和行为影响。这些影响主要表现为直接杀死鱼类个体；降低其生长率及其对疾病的抵抗力；干扰其产卵、降低孵化率和仔鱼成活率；改变其洄游习性；降低其饵料生物的丰度；降低其捕食效率等。

The impact of suspended solids on fish can be classified as three categories, namely lethal effect, sublethal effect and behavioral effect. These impacts are mainly manifested in: direct killing of individual fishes; reduction of its growth rate and its resistance to diseases; interference with its spawning and reduction of hatching rate and survival rate of larvae; change in their migration habits; reduction of the abundance of their bait organisms; and reduction of its predation efficiency, etc.

悬浮物对鱼类的影响，国外学者曾做过大量实验，其中 Biosson 等人研究了鱼类在混浊水域表现出的回避反应，研究结果表明当水体悬浮物浓度达到 70mg/L 时，鱼类在

5min 内迅速表现出回避反应。实验表明，成鱼在混浊水域内会做出回避反应，迅速逃离施工地带。

Foreign academicians have done a lot of experiments on the impact of SS on fish, among which Biosson et al. have researched the avoidance response of fishes in turbid waters. The research results show that when the concentration of suspended solids in water reaches 70mg/L, fishes will quickly show avoidance response within 5min. Experiments show that adult fish will make avoidance response in turbid waters and quickly escape from the construction area.

不同种类的水生生物对悬浮物浓度的忍受限度不同，一般来说，仔幼体对悬浮物浓度的忍受限度比成体低很多。以长江口疏浚泥悬沙对中华绒毛蟹早期发育的试验结果为例，类比分析悬浮泥沙对鱼类的影响。当悬沙浓度为 8g/L 时，中华绒毛蟹胚胎发育在原肠期以前，胚胎成活率几乎为 100%，但当胚胎发育至色素形成期产生一定程度的影响，试验三组数据最大死亡率为 60～70%，最小为 5～10%，平均 30%。不同的悬沙浓度不影响中华绒毛蟹蚤状幼体的成活率，但当悬沙浓度达到 16g/L 时，对蚤状幼体的变态影响极为显著。高浓度悬沙可推迟蚤的变态；当悬沙浓度达到 32g/L 以上时，可降低蚤状幼体对轮虫的摄食和吸收。

Different species of aquatic organisms tolerate different concentrations of suspended matter and, in general, young larvae tolerate much lower concentrations of suspended matter than adults. Taking the experimental results of suspended sediment from dredging in the Yangtze Estuary on the early development of Chinese villous crab as an example, the impacts of suspended sediment on fish are analyzed by analogy. In case of suspended sediment concentration of 8g/L, the embryo survival rate of Chinese villus crab is almost 100% prior to the gastro-intestinal stage, provided, however, that if the embryo develops to the pigment formation stage, there will be a certain degree of impact. The maximum mortality rate of the three groups of test data is 60-70%, the minimum mortality rate is 5-10%, and the average mortality rate is 30%. Different concentrations of suspended sand will not affect the viability of the flea-like larvae of the Chinese downy crab, provided, however, that if the suspended sediment concentration reaches 16 g/L, the impact on metamorphosis of the flea-like larvae is extremely significant. High concentration of suspended sediment can delay the metamorphosis of fleas. If the suspended sediment concentration reaches more than 32g/L, the feeding and absorption of rotifers by flea larvae may be reduced.

本项目排污口污水排放造成的悬浮物增量在各工况下均对水环境无明显影响，无超一、二类海水水质标准的范围，对周边海域的海洋生态环境影响较小。

The increment of suspended solids caused by sewage discharge from the sewage outlet of this project has no obvious impact on the water environment under various working conditions, will not exceed the scope of Class I and Class II seawater quality standards, and will impose limited impact on the marine ecological environment of the surrounding sea areas.

（4）生态损失计算

(4) Calculation of ecological loss

正常工况条件下污水排放浓度没有超出一、二类海水水质标准（＞10mg/L）的影响范围，因此不再进行生态损失计算。

Under normal working conditions, the sewage discharge concentration will not exceed the impact area of Class I and Class II seawater quality standards (> 10mg/L), so ecological loss calculation is no longer carried out.

4.3.7.3 无机氮、活性磷酸盐排放对海洋生态环境影响分析

4.3. 7.3 Analysis for impact of inorganic nitrogen and active phosphate emission on marine ecological environment

1、氮、磷营养盐排放对海洋生态影响

1. Impact of nitrogen and phosphorus nutrient emission on marine ecology

人类对近岸生态系统氮、磷营养盐输入引起环境中 N、P 营养盐水平和结构的变化对浮游植物的细胞密度和种类组成有显著影响。如有研究渤海 N：P 的升高和硅酸盐与溶解无机氮比值（SiO_3^{-2}:DIN）的下降很可能是引起该海区甲藻逐渐代替硅藻成为优势种的主要因素。近年来由于人类活动（如网箱养殖、污水排放）等因素影响，铁山港海区富营养化程度有上升趋势。氮、磷营养盐输入引起浮游植物的细胞密度和种类组成的同时势必会引起其摄食者浮游动物的生物量及种类组成的变化，进而影响到游泳生物的

变化。

Changes in the level and structure of N and P nutrients in the environment caused by human input of N and P nutrients to coastal ecosystems will impose a significant impact on the cell density and species composition of phytoplankton. For example, there is research on the increase of N: P and the decrease of silicate to dissolved inorganic nitrogen ratio (SiO3-2: DIN) in Bohai Sea, it is likely that dinoflagellates will gradually replace diatoms as the dominant species in this sea area. In recent years, due to human activities (such as cage culture, sewage discharge) and other factors, the degree of eutrophication in Tieshan Port sea area has shown an upward trend. The input of nitrogen and phosphorus nutrients will cause changes in the cell density and species composition of phytoplankton, and will inevitably cause changes in the biomass and species composition of zooplankton, thus affecting changes in swimming organisms.

2、生态损失计算

2. Calculation of ecological loss

根据数模预测结果，项目两期建成投产后，正常排放下所有工况无机氮浓度增量大于 0.3mg/L 的范围为 0.005km^2，活性磷酸盐浓度增量未大于 0.03mg/L，以无机氮影响范围计算生态损失。

According to the prediction results of the mathematical model, after the two phases of the project are completed and put into operation, the range of inorganic nitrogen concentration increment greater than 0.3 mg/L under normal emission is 0.005 km2, and the active phosphate concentration increment is not greater than 0.03 mg/L, and the ecological loss is calculated according to the impact area of inorganic nitrogen.

表 4.3.7-2 B3 排污口污染物排放造成的各类生物资源损失量

Table 4.3.7-2 Loss of Various Biological Resources caused by Pollutant Emission from B3 Sewage Outlet

COD 影响范围 COD impact area	渔业资源 Fishery resources	资源密度 Resource concentration	损失率 Loss rate	影响水深 Affected water depth	影响周期 Impact period	损害量 Loss

$0.005km^2$（浓度增量＞0. 3mg/L）0.005 km2 (concentration increment > 0.3mg/L)	鱼卵 Fish egg	7.19 粒/m^3 7.19nos./m^3	30%	10m	6	0.65×10^6 粒 0.65×10^6nos.
	仔鱼 Larvae	4.38 尾/m^3 4.38pcs./m^3	30%	10m	6	0.4×10^6 尾 0.4×10^6nos.
	成体 Adult	$187.66kg/km^2$	10%	/	24	2.25 kg
	浮游植物 Phytoplankton	1.18×10^7 个/m^3 1.18×10^7nos./m^3	30%	10m	24	0.45×10^{14} 个 0.45×10^{14}nos.
	浮游动物 Zooplankton	227 个/m^3 227nos./m^3	30%	10m	24	0.82×10^8 个 0.82×10^8nos.

4.3.7.4 AOX 排放对海洋生态环境影响预测

4.3. 7.3 Prediction of impact of inorganic nitrogen and active phosphate emission on marine ecological environment

1、AOX 的生物毒性

1. Biotoxicity of AOX

由于 AOX 含有生物无法降解的含氯有机化合物，在生物体中容易累积，从而对人类、生物体造成伤害一般来说，生物体暴露于污染环境中，毒物通过各种途径进入生物体后，首先经一系列生化反应造成酶活性诱导或抑制、细胞膜破坏、蛋白质合成受阻等，最后引起一系列病理、生理的继发反应，表现为整个机体的可观察毒性反应。

Since AOX contains chlorine-containing organic compounds that cannot be biodegraded, It is easy to accumulate in organisms, Thus causing harm to human beings and organisms. Generally speaking, Organisms are exposed to polluted environment. After toxicants enter organisms through various ways, they first cause enzyme activity induction or inhibition, cell membrane destruction, protein synthesis obstruction, etc. through a series of biochemical reactions, and finally cause a series of pathological and physiological secondary reactions, which are manifested as observable toxic reactions of the whole body.

国内学者沈新强、蒋玫、王霞等研究结果表明，黑鲷仔鱼、日本鳗鲡幼体、斑马鱼、脊尾白虾、三疣梭子蟹、中华绒螯蟹、缢蛏 96h-LC_{50} AOX 值为 0.345~11.242mg/L。国外有报道，在急性毒性实验中 AOX 含量为 2.0～6.0 mg/L 时，鲑鱼的存活率仍然可以保

持在 95～100%，与空白对照组无显著性差异。根据本评价废水扩散环境影响数值模拟预测结果，近期岸线下 AOX 在排污口中心浓度为 0.168mg/L，浓度增量值为 0.01mg/L 等值线最大影响面积约 6.68 km^2，主要分布于铁山港西岸排污区和北海港铁山港作业区，海水水质目标类别为四类水，影响范围未达广西山口红树林生态自然保护区和广西合浦儒艮国家级自然保护区。AOX 增量浓度均低于上述研究中海洋生物的急性致死浓度，不会造成水生生物急性致死。

Results of the research by such Chinese academicians as Shen Xinqiang, Jiang Mei, Wang Xia et al. show that the AOX values of 96h-LC50 are 0.345-11.242mg/L for larvae of Sparus macrocephalus, larvae of Japanese eel, zebrafish, white shrimp, Portunus trituberculatus, Eriocheir sinensis and Sinonovacula constricta. According foreign reports, in case of AOX content of 2.0-6.0 mg/L in acute toxicity test, the survival rate of salmon can still be maintained at 95-100%, which is not significantly different from that of the blank control group. According to the result of the numerical simulation and prediction of the environmental impact of wastewater diffusion in this assessment, in near term, the concentration of AOX in the center of the sewage outlet under the shoreline is 0.168 mg/L, The concentration increment value is 0.01 mg/L, and the maximum impact area of the isoline is about 6.68 km2, which is mainly distributed in the sewage discharge area on the west bank of Tieshan Port and the operation area of Tieshan Port in Beihai Port. The target category of seawater quality is Class IV water, and the impact area will not reach to Guangxi Shankou Mangrove Ecological Nature Reserve and Guangxi Hepu Dugong National Nature Reserve. The incremental concentration of AOX is lower than the acute lethal concentration of marine livings in the above study, which will not cause acute death of aquatic organisms.

AOX 属于持久性的有机污染物，除了急性毒性影响，还可能通过累积效应对海洋生物造成长期潜在影响。目前国内外相关 AOX 对海洋生物的长期毒性影响较少，对于采用 ECF 漂白的现代化硫酸盐桉木浆厂废水的标准测试并没有显示废水在排放点经扩散器扩散和稀释后有毒性影响，暂无数据表明会对生态资源产生明显的影响。

AOX is a persistent organic pollutant. In addition to acute toxic effects, AOX may also cause long-term potential impact on marine livings through cumulative effects. Presently, research on the long-term toxicity of AOX on marine livings at home and abroad is relatively limited. No standard test for the wastewater from the modern sulfate eucalyptus pulp plant bleached by ECF shows that the wastewater has toxic effect after diffusion and dilution by the diffuser at the discharge point, and no data is available to show that it will impose significant impact on ecological resources.

目前与本项目经同一排放口排污的斯道拉恩索（广西）90 万吨化学浆项目还未开工建设，铁山港海域目前暂无 AOX 污染物的排放；为避免废水 AOX 排放对海域生物造成长期潜在影响，本项目及斯道拉恩索（广西）90 万吨化学浆项目建成投入生产前应分别对排污口海域及敏感保护目标进行 AOX 本底监测，项目建成后也应定期对纳污海域和敏感保护目标进行 AOX 跟踪监测调查，调查内容包括海水水质、海洋沉积物及海洋生物。根据跟踪监测结果，对于不良影响应采取控制排污、生态损失补充等措施减缓对海洋生物的毒性影响。

Presently, the 900,000-ton chemical pulp project of Storaenso (Guangxi), which discharges pollutants through the same sewage outlet as this project, has yet to be commenced, and now there is no AOX pollutant emission in the sea area of Tieshan Port. In order to avoid the long-term potential impact of wastewater AOX emission on marine livings, prior to completion and commissioning of this project and 900,000-ton chemical pulp project of Storaenso (Guangxi), AOX background monitoring shall be carried out on the sea area at sewage outlet and sensitive protection targets respectively. Upon completion of both projects, AOX tracking monitoring and investigation shall also be carried out on the sewage receiving sea area and sensitive protection targets on a regular basis, including seawater quality, marine sediments and marine livings. According to the tracking monitoring results, measures such as pollution control and ecological loss supplement shall be taken to mitigate the toxic impact on marine livings.

2、生态损失计算

2. Calculation of ecological loss

由于《海水水质标准》中没有 AOX 对应标准，毒性污染物排放对海洋生态和渔业资源损失的评价方法和技术暂无规范要求，本评价暂不对 AOX 排放造成的生态损失进

行定量计算。

In the absence of AOX-related standard in the Seawater Quality Standard, the assessment method and technology for the loss of marine ecology and fishery resources caused by toxic pollutant discharge have no specification requirements for the time being, and the ecological loss caused by AOX discharge will not be quantitatively calculated in this assessment for the time being.

4.3.7.5 小结

4.3.7.5 Summary

（1）生态损失

(1) Ecological loss

综上本项目污染排放造成的各类生物资源损失汇总见表 4.3.7-3。

To sum up, loss of various biological resources caused by pollutant emission from this project is as shown in Table 4.3.7-3.

表 4.3.7-3　B3 排污口排放造成的各类生物资源损失汇总表

Table 4.3.7-3 Summary of Various Biological Resources caused by Pollutant Emission from B3 Sewage Outlet

COD 影响范围 COD impact area	渔业资源 Fishery resources	资源密度 Resource concentration	损失率 Loss rate	影响水深 Affected water depth	影响周期 Impact period	损害量 Loss
0.005km^2（浓度增量＞0. 3mg/L）0.005 km2 (concentration increment > 0.3mg/L)	鱼卵 Fish egg	7.19 粒/m^3 7.19nos./m^3	30%	10m	6	0.65×10^6 粒 0.65×10^{6}nos.
	仔鱼 Larvae	4.38 尾/m^3 4.38pcs./m^3	30%	10m	6	0.4×10^6 尾 0.4×10^{6}nos.
	成体 Adult	187.66kg/km^2	10%	/	24	2.25 kg
	浮游植物 Phytoplankton	1.18×10^7 个/m^3 1.18×10^{7}nos./m^3	30%	10m	24	0.43×10^{14} 个 0.43×10^{14}nos.
	浮游动物 Zooplankton	227 个/m^3 227nos./m^3	30%	10m	24	0.82×10^8 个 0.82×10^{8}nos.

根据《建设项目对海洋生物资源影响评价技术规程》（SC/T 9110-2007），鱼卵生

长到商品鱼苗按 1%成活率计算，仔稚鱼生长到商品鱼苗按 5%成活率计算，则 B3 排污口排污共造成鱼卵仔鱼折算为商品育苗的损失量为 2.62×10^5 尾。综上，B3 排污口排污共造成鱼苗损失 2.62×10^5 尾、渔业资源成体损失 2.25kg，浮游植物损失 0.43×10^{14} 个、浮游动物损失 0.82×10^8 个。

In accordance with *Technical Regulations for Impact Assessment of Construction Projects on Marine Living Resources* (SC/T 9110-2007), the survival rate of fish eggs growing to commercial fry shall be calculated at 1%, and the survival rate of larvae and juveniles growing to commercial fry shall be calculated at 5%, then the total loss of fish eggs and larvae converted into commercial fry caused by sewage discharge from B3 sewage outlet shall be 2.62×10^5 fishes. To sum up, B3 sewage outlet causes of fish fry loss totaling 2.62×10^5 fishes, adult fishery resources loss totaling 2.25 kg, phytoplankton loss totaling 0.43×10^{14} nos. and zooplankton loss totaling 0.82×10^8.

（2）生态放流计划及补偿金额

(2) Ecological release plan and compensation amount

根据广西壮族自治区渔业资源市场价格，鱼苗按 1 元/尾计算，则 B3 排污口排放造成鱼卵仔鱼折算为商品育苗损失计 26.2 万元，渔业资源损失计 0.0025 万元，以上损失共计 26.3 万元。

According to the market price of fishery resources in Guangxi Zhuang Autonomous Region, if the fish fry is calculated on the basis of RMB 1/fish, then the fish eggs and larvae caused by discharge from B3 sewage outlet shall be converted into commercial seedling loss of RMB 262,000 and fishery resources loss of RMB 25, wiht all of the above totaling RMB 263,000.

根据《全国生态环境保护纲要》，为了缓解和减轻工程对所在的海区生态环境水生生物的不利影响，建议由园区管委会协调各排污单位按照《水生生物增殖放流管理规定》（中华人民共和国农业部令第 20 号，2009.3.26）的要求实施人工增殖放流。

In accordance with the *National Ecological Environment Protection Outline*, in order to mitigate and mitigate the adverse effects of the project on aquatic organisms in the ecological environment of the sea area where the project is located, it is recommended that the

Administration Committee of the Park coordinate all entities with sewage discharge to implement artificial proliferation and release in accordance with the requirements of the *Regulations on the Administration of Proliferation and Release of Aquatic Organisms* (Decree No.20 of the Ministry of Agriculture of the People's Republic of China, March 26, 2009).

4.3.8 污水排放对自然保护区的影响分析

4.3.8 Analysis for impact of sewage discharge on natural reserve

4.3.8.1 污水排放对广西山口国家级红树林生态自然保护区的影响分析

4.3.8.1 Analysis for impact of sewage discharge on Guangxi Shankou National Mangrove Nature Reserve

红树林是一种滩涂型湿地，与珊瑚礁、盐沼、上升流并称为地球上生产力最高的海洋四大自然生态系统。红树林生态系统生物资源量非常丰富，红树以掉落物的方式，通过食物链转化，为海洋动物提供良好的生长发育环境，同时，由于红树林区内潮沟发达，吸引深水区的动物来到红树林区内觅食栖息，生产繁殖。红树林区是候鸟的越冬场和迁徙中转站，更是各种海鸟的觅食栖息场所。同时红树林也是天然的污水处理厂，每年能吸收大量污水中废气有机物，减少了被鱼、虾吸收的数量，也减少了经过食物链进入人体的毒素，与人类息息相关，是人类拥有的宝贵资源，被称为“地球之肾”。然而污水排放对对红树林造成的影响是正面的还是负面的，一直存在争议。杨琼[11]、章金鸿[12]、陈桂珠[13、14]、郑文教[15]、Sansanayuth [16]等学者研究表明红树林生态系统对有机物、N、P、石油类、重金属等多种污染物均有一定的分解、转化或吸收能力，并维持自身正常运转。目前暂未查到与红树林生态系统的污染耐受力的相关文献或报道，但可以确定的是，当海水中污染物浓度高到超出红树林所能承受的阈值，会直接导致生态系统失去平衡，并使红树植物死亡。

Mangrove is a kind of mudflat wetland, which, together with coral reefs, salt marshes and upwelling, is called the four most productive marine natural ecosystems on earth. Mangrove ecosystem is very rich in biological resources. Mangroves provide a good growth and development environment for marine animals through food chain transformation in the form of falling objects. Also, due to the developed tidal creeks in mangrove areas, animals from deep water areas are attracted to the mangrove areas for foraging, habitat, production and reproduction. Mangrove Reserve is the wintering ground and migration transfer station for migratory birds, and it is also the foraging habitat for various seabirds. Furthermore, mangrove is also a natural sewage treatment plant, which can absorb a large amount of waste gas and organic matter in sewage every year, reducing the amount absorbed by fish and shrimp, and also reducing toxins entering the human body through the food chain. Mangrove forest is closely related to human beings and is a precious resource owned by human beings. It is called "kidney of the earth". However, there has always been argument as to whether the impact of sewage discharge on mangroves is positive or negative . Researches by Yang Qiong [17], Zhang Jinhong [18], Chen Guizhu [19,20], Zheng Wenjiao [21], Sansanayuth [22] and other academician show that mangrove ecosystems have certain decomposition, transformation or absorption capacity for organic matter, N, P, petroleum, heavy metals and other pollutants, and maintain their normal operation. At present, no relevant literature or reports on the pollution tolerance of mangrove ecosystems have been found, but what is certain is that when the concentration of pollutants in seawater is high enough to exceed the threshold that mangrove ecosystems can bear, it will directly lead to the imbalance of ecosystems and the death of mangrove plants.

“广西山口国家级红树林生态自然保护区”位于 B3 排污口东南面，实验区边界距离本项目排污口最近约 3km，核心区红树林生长带距离本项目排污口最近约 7.5km。山口红树林保护区保护的对象主要为红树林及其生境、中国鲎、海马、珍稀鸟类等，本项目对山口红树林保护区的环境影响主要为废水排放 COD、无机氮、活性磷酸盐、AOX 等污染物对保护区海水水质和红树林及其生境的影响。

Guangxi Shankou National Mangrove Nature Reserve is located in the southeast of B3 sewage outlet. The boundary of the experimental area is about 3km from the sewage outlet of this project, and the mangrove growth zone in the core area is about 7.5 km from the sewage outlet of this project. The protected objects of Shankou Mangrove Reserve are mainly mangroves and their habitats, Chinese horseshoe crab, hippocampus, rare birds, etc. The environmental impact of this project on Shankou Mangrove Reserve is mainly the impact of COD, inorganic nitrogen, active phosphate, AOX and other pollutants discharged from wastewater on the seawater quality of the reserve and mangroves and their habitats.

根据项目对 B3 排污口进行质点追踪模拟分析结果，在 B3 排污口混合区内投放的 5 个质点的运动轨迹，说明 B3 排污口排放的污染物在涨潮时主要随潮流沿深槽进入铁山港内湾，落潮时随落潮流分别进入东、西槽内，沿其深槽向外海侧运动，主要的运动轨迹未向山口国家级红树林保护区运动，B3 排污口排放的污染物向山口红树林保护区扩散较少。结合本次评价污染物扩散数值模拟结果，本项目排污口各种工况条件下排放的 COD、SS、无机氮、活性磷酸盐扩散浓度等值线范围未到达保护区，叠加本底浓度后，保护区海水水质能满足一类海水水质标准的要求；本项目废水未排放重金属污染物对海域海洋沉积物质量和海洋生物质量影响不大，能确保广西山口红树林保护区海水水质、海洋沉积物质量和海洋生物质量均不劣于一类标准，满足保护区生态红线管控要求。

According to the results of particle tracking simulation analysis of B3 sewage outlet, the movement trajectory of 5 particles put into the mixing area of B3 sewage outlet shows that the pollutants discharged from B3 sewage outlet mainly enter the inner bay of Tieshan Port along the deep trough with the tidal current at high tide, and enter the east trough and the west trough with the ebb tidal current respectively, moving along the deep trough to the open sea side. The main movement track does not move to Shankou National Mangrove Reserve, and the pollutants discharged from B3 sewage outlet diffuse less to Shankou Mangrove Reserve. Based on the numerical simulation results of pollutant diffusion in this assessment, the contour range of COD, SS, inorganic nitrogen and active phosphate diffusion concentrations discharged from the sewage outlet of this project under various working conditions has not reached the protected area. After superimposing the background concentration, the seawater quality in the protected area can meet the requirements of Class I seawater quality standards. The non-discharge of heavy metal pollutants from the wastewater of this project has little impact on the quality of marine sediments and marine livings in the sea area, which can ensure that the seawater quality, marine sediment quality and marine livings quality in Guangxi Shankou Mangrove Reserve are not inferior to Class I standards and meet the requirements of ecological red line control in the reserve.

4.3.8.2 污水排放对广西合浦儒艮国家级自然自然保护区影响分析

4.3.8.2 Analysis for impact of sewage discharge on Guangxi Hepu Dugong National Nature Reserve

1）污水排放对广西儒艮国家级自然保护区海水环境和海洋生态影响分析

1) Analysis for impact of sewage discharge on marine environment and marine ecology in Guangxi Dugong National Nature Reserve

“广西合浦儒艮国家级自然保护区”位于排污口东南方约5km，生态保护目标为海草生态系统及其生境、中华白海豚、中国鲎、海马等；本项目对合浦儒艮保护区的环境影响主要为废水排放COD、无机氮、活性磷酸盐、AOX等污染物对保护区海水水质和红树林及其生境的影响。

Guangxi Hepu Dugong National Nature Reserve is located about 5km southeast of the sewage outlet. The ecological protection targets are seaweed ecosystem and its habitat, Chinese white dolphin, Chinese horseshoe crab, seahorse, etc. The environmental impact of this project on Hepu Dugong Reserve is mainly the impact of COD, inorganic nitrogen, active phosphate, AOX and other pollutants discharged from wastewater on seawater quality, mangroves and their habitats in the reserve.

根据项目对B3排污口进行质点追踪模拟分析结果，在B3排污口混合区内投放的5个质点的运动轨迹，说明B3排污口排放的污染物在涨潮时主要随潮流沿深槽进入铁山港内湾，落潮时随落潮流分别进入东、西槽内，沿其深槽向外海侧运动，主要的运动轨迹未向合浦儒艮保护区运动，B3 排污口排放的污染物向合浦儒艮保护区扩散较少。结合本次评价污染物扩散数值模拟结果，本项目排污口各种工况条件下排放的 COD、SS、无机氮、活性磷酸盐扩散浓度等值线范围未到达保护区，叠加本底浓度后，保护区海水水质能满足一类海水水质标准的要求；本项目废水未排放重金属污染物对海域海洋沉积物质量和海洋生物质量影响不大，能确保广西合浦儒艮保护区海水水质、海洋沉积物质量和海洋生物质量均不劣于一类标准，满足保护区生态红线管控要求。

According to the results of particle tracking simulation analysis of B3 sewage outlet, motion trajectory of the five particles put into the mixing area of B3 sewage outlet shows that the pollutants discharged from B3 sewage outlet mainly enter the inner bay of Tieshan Port along the deep trough with the tidal current at high tide, and enter the east trough and the west trough with the ebb tide respectively, moving along the deep trough to the open sea side. The main motion trajectory is not oriented to Hepu Dugong Reserve, and the pollutants discharged from B3 sewage outlet diffuse less to Hepu Dugong Reserve. Based on the numerical simulation results of pollutant diffusion in this assessment, the contour range of COD, SS, inorganic nitrogen and active phosphate diffusion concentrations discharged from the sewage outlet of this project under various working conditions has not reached the protected area. After superimposing the background concentration, the seawater quality in the protected area can meet the requirements of Class I seawater quality standards. The non-discharge of heavy metal pollutants from the wastewater of this project has little impact on the quality of marine sediments and marine livings in the sea area, which can ensure that the seawater quality, marine sediment quality and marine livings quality of Hepu Dugong Reserve in Guangxi are not inferior to Class I standards and meet the requirements of ecological red line control in the reserve.

2）污水排放对评价海域海草资源影响分析

2) Analysis for impact of sewage discharge on seagrass resources in the sea area under assessment

①主要环境因子对海草的生态作用

① Ecological effects of main environmental factors on seaweed

光因子对海草的生态作用：海草的极限生长水深取决于到达海底的光线强度是否能满足海草的生长所需，水色和光周期也影响着海草的极限生长水深。在同一海区，海草生长所需的最小光照强度普遍大于其他海洋植物（Duarte 1991）。处于最小光照强度之下时，海草将会死亡、在一定范围内光照强度越大海草的生长速度也越快（Short et a1，1995）。

Ecological effect of photo factors on seaweed: the limit growth water depth of seaweed depends on whether the illumination intensity reaching the seabed can meet the growth requirements of seaweed, and water color and photoperiod also affect the limit growth water depth of seaweed. In the same sea area, the minimum illumination intensity required for seaweed growth is generally greater than that of other marine plants (Duarte, 1991). Under the minimum illumination intensity, seaweed will die, and within a certain range, the higher the light intensity, the faster the growth rate of seaweed (Short et al, 1995).

温度因子对海草的生态作用：温度影响海草的耐热性以及海草光合作用、呼吸和生长时的最适温度，另外温度还通过影响开花和种子萌芽来影响海草的分布，是决定海草季节性繁殖和生长的首要驱动因素（Lee and Dunton， 1996；Me-ling-Lopez and Ibarra-Obando，2000）。

Ecological effects of temperature factors on seaweed: Temperature affects the heat tolerance of seaweed and the optimum temperature for photosynthesis, respiration and growth of seaweed. In addition, temperature also affects the distribution of seaweed by affecting flowering and seed germination, which is the primary driving factor for seasonal reproduction and growth of seaweed (Lee and Dunton, 1996; Me-ling-Lopez and Ibarra-Obando, 2000).

水深因子对海草的生态作用：水深导致水压的变化，当水压超过一定程度，海草将会停止光合作用（beer and waiscl，1982）。

Ecological effect of water depth factor on seaweed: water depth causes water pressure to change. When the water pressure exceeds a certain level, seaweed will stop photosynthesis (Beer and Waiscl, 1982).

盐度因子对海草的生态作用：盐度扰动能够影响海草的有性生殖和植物传播从而进一步影响海草的分布，另外盐度与海草的渗透压以及海草的患病机率有很大关系（Biebl and McRoy，1971）。

Ecological effect of salinity factor on seaweed: Salinity disturbance can affect the sexual reproduction and plant transmission of seaweed, thus further affecting the distribution of seaweed. In addition, salinity is closely related to the osmotic pressure of seaweed and the disease probability of seaweed (Biebl and McRoy, 1971).

②评价海域主要优势种喜盐草和二药藻生态特性

Ecological characteristics of the major dominant species, halophila ovalis and halodule uninervis, in the sea area under assessment

喜盐草和二药藻有不同生长特性。喜盐草生长没有明显季节性，全年均能生长，它的匍匐根状茎埋在沙中，一年四季均能发芽和生长，长得最茂盛时间是 3~4 月；从以往历史调查中发现，在每年喜盐草长得最茂盛时间 3~4 月时，在滩涂上可见见其两片叶子长出沙面，而在其他时间里，绝大部分喜盐草都被埋在沙中。而二药藻每年的 11 月至翌年的 2 月是它的发芽期。3~6 月是该海草的生长茂盛期，此时可观测到二药藻的形状，7 月以后由于二药藻的枯黄脱落，在滩涂上难寻其踪影，7~10 月则逐渐苍老变黄，埋在土里的根状茎到了 11 月便开始慢慢发芽、生长。

Halophila ovalis and halodule uninervis have different growth characteristics. Halophila ovalis has no obvious seasonal growth and can grow all year round. Its creeping rhizomes are buried in sand and can germinate and grow all the year round. The most luxuriant period is March to April. From previous historical investigations, it is found that during March to April, when the salt-loving grass grows most luxuriantly every year, two leaves of the salt-loving grass can be seen growing on the beach, while at other times, the vast majority of the salt-loving grass are buried in the sand. To the contrary, the germination period of halodule uninervis is from November to February in the following year. March to June is the luxuriant period of such seaweed, when the shape of the second-drug algae can be observed. After July, due to the withering and yellow shedding of the second-drug algae, it is difficult to find it on the beach. From July to October, it gradually grows old and yellow, and the rhizomes buried in the soil begin to germinate and grow slowly in November.

③污水排放对评价海域海草资源影响分析

③ Analysis for impact of sewage discharge on seagrass resources in the sea area under assessment

根据评价海域海草生长的主要受限环境因子和主要优势种喜盐草和二药藻生态特性分析，结合本项目工程特点，分析认为本项目建设对评价海域海草资源的影响可能主要来源于：污水排放造成评价海域海水浑浊，降低海水光照强度，从而对邻近海域海草资源造成影响；污水排放对邻近海域海草资源影响。

Based on the analysis of the major limited environmental factors for the growth of seaweed and the ecological characteristics of the major dominant species, halophila ovalis and halodule uninervis, in the sea area under assessment, it is analyzed that the impact of this project construction on seaweed resources in the evaluated sea area may be mostly sourced from the followings depending upon features of this project: sewage discharge which causes seawater turbidity in the sea area under assessment and reduces the illumination intensity of seawater, thus affecting seaweed resources in adjacent sea area; impact of sewage discharge on seagrass resources in adjacent sea area.

根据数值模拟结果，现状港口岸线条件和规划港口岸线条件下的各种工况 COD、SS、无机氮、活性磷酸盐、AOX 主要扩散范围均不会到达广西合浦儒艮国家级自然保护区，对其影响较小，不会影响到保护区内的海草资源。

According to the numerical simulation results, the main diffusion ranges of COD, SS, inorganic nitrogen, active phosphate and AOX under various working conditions under the current port shoreline conditions and the planned port shoreline conditions will not reach Hepu Dugong National Nature Reserve in Guangxi, which will impose limited impact on it with no impact on seaweed resources in the reserve.

3）污水排放对评价海域儒艮和中华白海豚资源影响分析

3) Analysis for impact of sewage discharge on dugong and Indo-Pacific humpback dolphin in the sea area under assessment

近些年来，为了保护海洋哺乳动物，世界各地学者对海洋污染对鲸豚的影响进行了一些研究，主要集中在重金属和 POPs（持久性有机污染物）等方面。以 POPs 为例，其一旦进入到鲸豚体内后，就会在脂肪、肝脏等器官或组织中累积下来，然后又通过时间和食物链的放大效应，浓度到了一定程度就会扰乱其内分泌系统的功能；抑制免疫系统的正常反应，影响巨噬细胞的活性，降低其对病原体的抵抗能力；通过胚盘和哺乳影响胚胎发育，导致畸形，死胎，发育迟缓等现象；还能够通过代谢在其体内产生氧化压力引起基因突变，促进肿瘤的发生；最近的研究发现，有机氯农药能够在海豚的脑髓液以及脑灰质中积累，很可能会影响海豚神经系统的正常功能，从而导致行为的异常。

In recent years, in order to protect marine mammals, academicians around the world have conducted some studies on the impact of marine pollution on whales and dolphins, mainly focusing on heavy metals and POPs (persistent organic pollutants). Taking POPs as example, once they enter whales and dolphins, they will accumulate in organs or tissues such as fat and liver, and then through the amplification effect of time and food chain, the concentration will disturb the function of its endocrine system to a certain extent. Inhibit the normal response of the immune system, affect the activity of macrophages and reduce their resistance to pathogens; through blastoderm and lactation, embryo development is affected, resulting in malformation, stillbirth, growth retardation and other phenomena; It can also cause gene mutation through oxidative pressure generated in its body through metabolism, thus promoting the occurrence of tumors. Recent studies have found that organochlorine pesticides can accumulate in dolphin's brain marrow fluid and gray matter, which is likely to affect the normal function of dolphin's nervous system, thus leading to behavioral abnormalities.

营养盐的污染虽然不会对鲸豚造成直接影响，但是间接影响也非常之大。富营养化会导致赤潮的爆发，特别是一些有毒赤潮。最近，美国的科学家发现墨西哥湾附近的多起宽吻海豚死亡事件都与赤潮藻毒素相关。例如，在 1999-2000 年、2004-2006 年间的大规模海豚死亡正是在墨西哥湾腰鞭毛藻赤潮爆发后，时间上非常吻合，该藻产生大量的软骨藻酸毒素可能是主因。另外，富营养化会对渔业资源造成影响，从而影响鲸豚的食物资源。

Nutrient pollution, although will impact no direct impact on whales and dolphins, will impact considerable indirect impact thereon. Eutrophication will lead to the outbreak of red tides, especially some toxic red tides. Recently, American scientists have found that many bottlenose dolphin deaths near the Gulf of Mexico were all related to red tide algal toxins. For example, the large-scale dolphin deaths in 1999-2000 and 2004-2006 coincided with the outbreak of dinoflagellate red tide in the Gulf of Mexico, which may be the main cause of the large amount of domoic acid toxin produced by the algae. In addition, eutrophication will affect fishery resources, thus affecting the food resources of whales and dolphins.

根据现状调查，近十年未发现儒艮踪迹，儒艮在排污口污染物扩散范围运动的可能性较小，对其影响不大。2018 年~2019 调查，在广西儒艮国家级自然保护区及附近海域中华白海豚数量保守估算约为 106 头，白海豚出现区域与本项目主要污染物扩散最大范

围位置关系见图 4.3.8-1，由图可知，排污口污染物扩散范围未到达白海豚活动区域，对其影响较小。

According to the current investigation, no trace of dugongs has been found in the past ten years. The possibility of dugongs moving in the diffusion range of pollutants in sewage outlets is small and imposes limited impact on them. According to the investigation from 2018 to 2019, the number of Indo-Pacific humpback dolphins in Guangxi Dugong National Nature Reserve and its adjacent sea area is conservatively estimated to be about 106. The positional relationship between the activity area of the humpback dolphins and the maximum diffusion range of major pollutants in this project as shown in Figure 4.3.8-1, from which it can be seen that the diffusion range of pollutants in the sewage outlet has not reached the activity area of white dolphins, which has little impact on them.

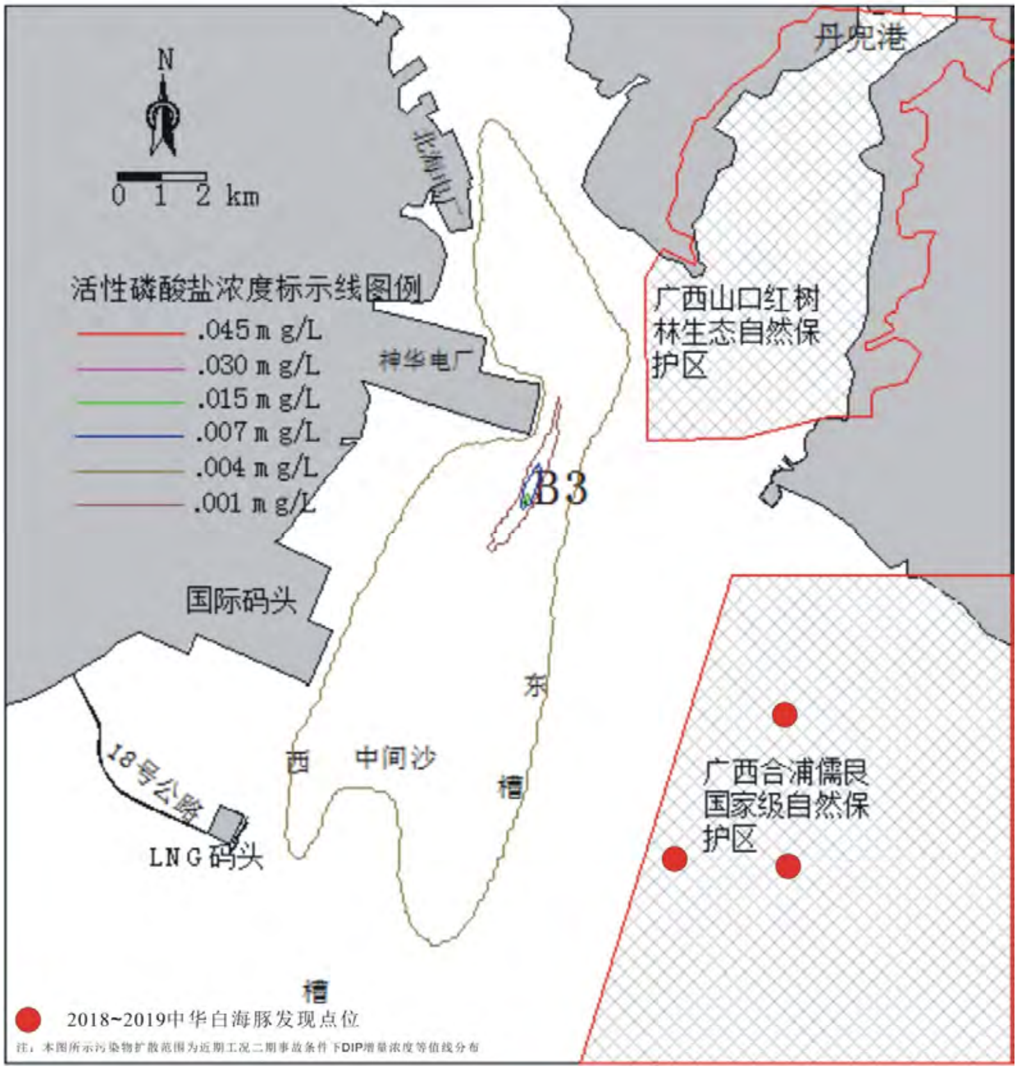


图 4.3.8-1 项目污染物扩散范围与白海豚活动区域位置关系示意图

Figure 4.3.8-1 Schematics of Positional Relationship between the Activity Area of Humpback Dolphins and Diffusion Range of Pollutants in the Project

4.3.8.3 污水排放对北部湾二长棘鲷长毛对虾国家级水产种质资源保护区的影响分析

4.3.8.3 Analysis for Impact of sewage discharge on Beibu Gulf Parargyrops Edita and Penaeus Penicillatus National Aquatic Germplasm Resource Nature Reserve

"北部湾二长棘鲷长毛对虾国家级水产种质资源保护区"主要保护对象为二长棘犁齿鲷和长毛对虾，其他保护物种包括蓝圆鲹等海洋渔业资源以及其生存环境；海水水质执行《海水水质标准》（GB3097-1997）第一类标准要求。B3 排污口距离该

保护区实验区和核心区最近距离分别为 16.5km 和 36.0km；东南距离北部湾二长棘犁齿鲷、蓝圆鲹“三场一通”的最近距离约 60km 和 39km。

The main protected objects of the Beibu Gulf Parargyrops Edita and Penaeus Penicillatus National Aquatic Germplasm Resource Nature Reserve are parargyrops edita and penaeus penicillatus. Other protected species include marine fishery resources such as decapterus maruadsi and their living environment. The seawater quality shall comply with the requirements of Class I water quality standard in *Sea Water Quality Standard* (GB3097-1997)

The nearest distance between B3 sewage outlet and the experimental area and the core area of the reserve is 16.5km and 36.0km respectively. The nearest distance from the southeast side of the outlet to “three grounds and one passage” for parargyrops edita and decapterus maruadsi in Beibu Gulf is 60km and 39km respectively.

根据数值模拟结果，现状港口岸线条件和规划港口岸线条件下的各种工况 COD、SS、无机氮、活性磷酸盐、AOX 主要扩散范围均不会到北部湾二长棘鲷长毛对虾国家级水产种质资源保护区，种质资源保护区距离排污口较远，污染物经过长距离广海域的扩散，通过累计对海水水质、海洋生物的影响很小。

According to the numerical simulation results, the main diffusion ranges of COD, SS, inorganic nitrogen, active phosphate and AOX under various working conditions under the current port shoreline conditions and the planned port shoreline conditions will not reach Beibu Gulf Parargyrops Edita and Penaeus Penicillatus National Aquatic Germplasm Resource Nature Reserve, and pollutants spread through a long distance and a wide sea area, which has little impact on seawater quality and marine livings through accumulation, which will impose little impact on sea water quality and marine livings through accumulation.

4.3.9 海洋环境质量底线要求相符性分析

Analysis of compliance with bottom line requirements for marine environmental quality

由于园区规划环评于 2007 年完成以来，已超过 10 年，铁山港沿海岸线及海域环境功能区划也发生了较大变化，园区跟踪环评（2019 年）依据最新的铁山港现状岸线和规

划岸线，结合近年海域海水水质本底情况，对排污口环境容量进行重新数模测算分析，提出考虑海洋排污冲击负荷及不可预见性，排污区海域环境容量按 80%控制使用， B3 排污口近期环境容量化学需氧量、无机氮、活性磷酸盐分别为 10918t/a 1002t/a 和 54t/a，远期分别为 15434t/a 和 1336t/a、68t/a（见附件 4）。环境容量变化主要受排污区环境功能类别由三类调整为四类，铁山港海域海水水质本底值变化，周边红树林保护区范围调整等多方项边界条件变化影响。

Given that the EIA has been completed for more than 10 years since 2007, great changes have also taken place in the environmental function zoning along the shoreline and sea area of Tieshan Harbor. According to the latest situations of Tieshan Harbor existing and planned shoreline, and based on the background situation of seawater quality in recent years, the environmental capacity of sewage outlet is calculated and analyzed with mathematical model again in park tracking EIA (2019). Considering the impact load and unpredictability of marine sewage discharge, the environmental capacity of the sea area in the sewage discharge area shall be controlled and used at 80%. the short-term environmental capacity of sewage outlet B3 is 10918t/a, 1002t/a and 54t/a respectively for chemical oxygen demand, inorganic nitrogen and active phosphate, and the long-term environmental capacity is 15434t/a, 1336t/a and 68 t/a respectively for the same (refer to Appendix 4). The change of environmental capacity is mainly caused by the change of multiple boundary conditions such as the adjustment of environmental function categories from Category III to Category IV in the sewage discharge area, the change of seawater quality background value in the sea area of Tieshan Harbor, and the adjustment of the scope of surrounding mangrove protection areas.

根据《环境影响评价技术导则　地表水环境》（HJ2.3-2018）的规定，主要污染物排放需预留必要的安全余量。本项目两期建成投运后，B3 排污口排放的主要污染物总量与控制要求的比较见表 4.3.9-1。

In accordance with Technical Guidelines for Environmental Impact Assessment-Surface Water Environment (HJ2.3-2018), necessary safety margins shall be allowed for the emission of major pollutants. Comparison between the total emission of major pollutants from B3 sewage outlet and the control requirements upon completion and commissioning of both phases of this project is as shown in Table 4.3.9-1.

表 4.3.9-1　纳污海域主要污染物可利用环境容量

Table 4.3.9-1　Available Environmental Capacity of Major Pollutants from Receiving Sea Area

指　标 Indicator		化学需氧量	无机氮	活性磷酸盐
		B3 排污口	B3 排污口	B3 排污口
近期可利用环境容量(t/a)		10918	1002	54
远期可利用环境容量(t/a)		15434	1336	68
本项目一期后 B3 排放量	t/a	5526.6	533.7	22.98
	近期占比%	50.62	53.26	42.56
	远期占比%	35.81	39.95	33.79
本项目二期后 B3 排放量	t/a	6113	594.9	25.53
	近期占比%	55.99	59.37	47.28
	远期占比%	39.61	44.53	37.54

由表 4.3.9-1，本项目建成投运后 B3 排污口排放的主要污染物均在控制环境容量范围内，能够满足海域海水水质安全余量的要求。根据数模预测结果，项目各污染物排放浓度增量叠加本底浓度后，超标的范围均未超出排污区混合区范围（排污口周边 1km^2），符合《污水海洋处置工程污染控制标准》（GB 18486-2001）的要求。

As revealed by Table 4.3.9-1, major pollutants emitted from B3 sewage outlet upon completion and commissioning of this project are within the control environmental capacity, which can meet the requirements of seawater quality safety allowance in the sea area. According to the prediction results of the mathematical model, after the increment of the pollutant emission concentration of the project is superimposed on the background concentration, the range exceeding the standard does not exceed the range of the mixed area of the sewage discharge area (1km^2 around the sewage discharge outlet), which meets the requirements of the *Pollution Control Standard for Marine Sewage Disposal Project* (GB 18486-2001).

4.3.10 北海港规划修编对项目排污的影响分析

4.3.10 Analysis for impact of Revision of Master Plan on Beihai Port of Guangxi on pollutant emission of the project

本项目海洋影响数模预测分析远期工况选用采用 2018 年 5 月广西壮族自治区人民政府批复的《北部湾港总体规划修编》中的铁山港规划岸型作为边界进行数模分析。由于目前正在进行的《北海港总体规划修编》在《北部湾港总体规划修编》岸线的基础上对铁山港岸线进行调整，为避免岸线变化改变项目排污口的污染扩散条件，加重对周边海域环境的影响，本小节对岸线变化的项目排污的影响进行分析。

The long-term working conditions of the marine impact mathematical model prediction and analysis of this project are selected as the boundary for mathematical model analysis by using the planned shore type of Tieshan Port in the *Revision of Master Plan on Beibu Gulf Port of Guangxi* approved by People's Government of Guangxi Zhuang Autonomous Region in May of 2018. As the currently ongoing *Revision of Master Plan on Beihai Port of Guangxi* adjusts the shoreline of Tieshan Port on the basis of the *Master Plan on Beibu Gulf Port of Guangxi* shoreline, in order to prevent the shoreline change from changing the pollution diffusion conditions of the sewage outlet of the project and aggravating the impact on the surrounding sea environment, this section analyzes the impact of the project sewage discharge due to the shoreline change.

正在进行的《北海港总体规划修编》变化较明显的位置有两处：①北暮东作业区北侧切角，使得北暮东作业区与北侧北暮作业区之间潮汐通道由 1km 拓宽到 1.4km 左右，使得西槽与内湾深槽之间的潮汐通道过渡段较为平顺；②取消 LNG 西南侧防波堤的折线段，详见图 4.3.10-1。

There are two significant changes in the ongoing revision of the master plan of Beihai Port: ① the northern corner of the Beimudong operation area widens the tidal trough between the Beimudong operation area and the northern Beimu operation area from 1km to about 1.4 km, making the transition section of the tidal trough between the west trough and the inner bay deep trough smoother; (2) Cancel the broken line section of the breakwater on the southwest side of LNG, as shown in Figure 4.3. 10-1 for details.

本评价对岸线调整前后潮流流态进行数模分析，结果见图 4.3.10-2、图 4.3.10-3。由图 4.3.10-2 可见，铁山港总体规划调整前（批复规划），涨急时刻，外海涨潮流绕过 LNG 西南防波堤堤头后，在防波堤折线段附近水域形成逆时针回流区，进入西槽内的涨潮流沿两侧规划岸线流向东北，行进到北暮东作业区北侧通道附近水域，由于该通道与西槽通道夹角较大，使得涨潮流由西槽进入内湾深槽并不顺畅。铁山港总体规划调整后，外海涨潮流绕过防波堤堤头后，会在防波堤南段背水侧形成回流区，但动力明显弱于规划调整前。另外由于北暮东作业区切角，使得西槽内涨潮流较为平顺的进入内湾深槽内。

In this assessment, the tidal flow pattern before and after shoreline adjustment is analyzed by mathematical model, and the results are shown in Figure 4.3.10-2 and Figure 4.3.10-3. As can be seen from Figure 4.3.10-2, before the adjustment of the master plan on Tieshan Port (approved plan), after the flood tide in the open sea bypasses the head of LNG Southwest Breakwater during rapid flood tide period, A counterclockwise backflow area is formed in the waters near the breakwater fold line section, and the flood tide entering the west trough flows to the northeast along the planned shoreline on both sides, and travels to the waters near the trough on the north side of the Beimudong operation area. Due to the large included angle between this trough and the west trough, the flood tide will not smoothly enter the inner bay deep trough from the west trough. Upon adjustment of master plan on Tieshan Port, the flood tide in the open sea will form a backflow area on the back water side of the southern section of the breakwater after bypassing the breakwater head, but the power is obviously weaker than that before the planning adjustment. In addition, thanks to the tangential angle of Beimudong operation area, the flood tide in the west trough enters the inner bay deep trough more smoothly.

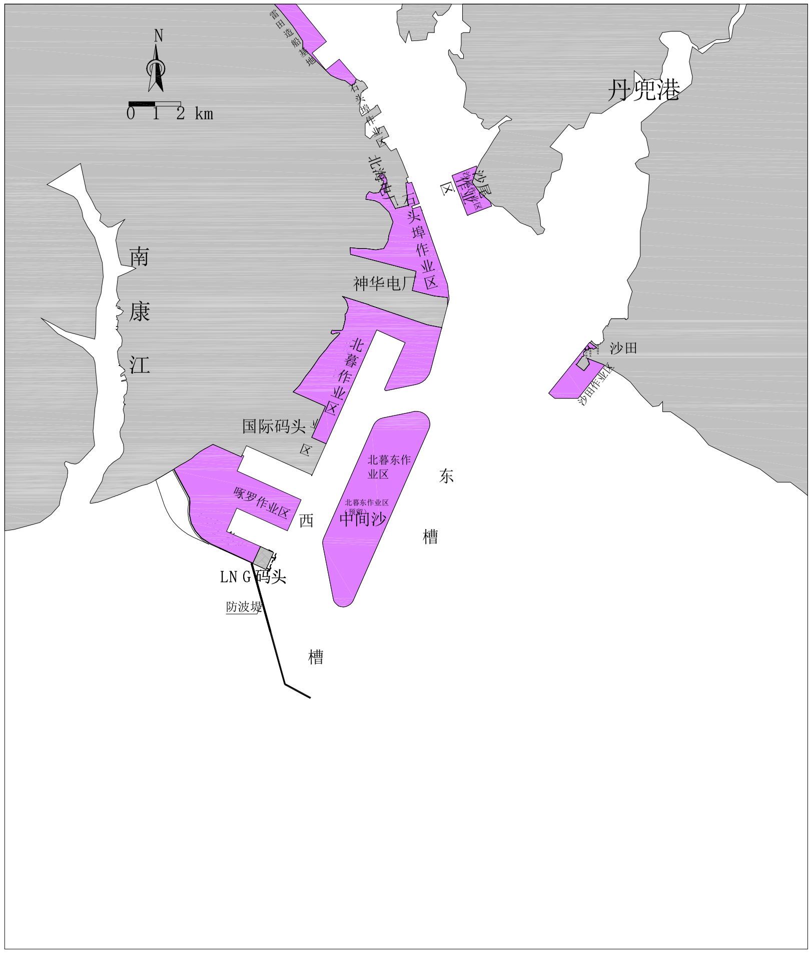
图 4.3.10-3 给出了铁山港总体规划调整前、后落急时刻流态图。由图可见，铁山港总体规划调整前（批复规划），落急时刻，内湾落潮流在北暮东作业区北端分流后，西股落潮流通过其北暮东作业区北侧潮汐通道进入西槽，由于两通道之间夹角较大，在北暮东作业西北角点附近形成逆时针回流区，若污染物随落潮流扩散到该回流区时，容易在此打转，不宜往外扩散。西槽内落潮流绕过防波堤堤头后向南偏西方向流向外海。铁

山港总体规划调整后，内湾落潮流较为平顺的进入西槽内，西槽主通道内不存回流区，水流较为平顺的沿规划岸线流向湾外；落潮流绕过 LNG 码头后，沿防波堤走向流向东南，绕过防波堤堤头后向西南流向外海，与总体规划调整前相比，防波堤折线段取消后，缩短了西槽进入外海的路径，西槽进入外海的落潮流更为顺畅，有助于加快污染物向外海扩散的速率。

Diagram of flow pattern at time of rapid ebb tide before and after adjustment of the master plan on Tieshan Port are given in Figure 4.3.10-3. As can be seen from from the diagram, before the adjustment of the master plan on Tieshan Port (approved plan), at the moment of emergency, After the Neiwan ebb tidal current was diverted at the northern end of Beimudong operation area, The west ebb current enters the west trough through the tidal trough on the north side of the Beimudong operation area. Due to the large included angle between the two troughs, a counterclockwise backflow area is formed near the northwest corner of the Beimudong operation. If pollutants diffuse to the backflow area along with the ebb current, they are easy to revolve here and are not suitable for outward diffusion. The ebb current in the west trough bypasses the breakwater head and then flows to the open sea from south to west. Upon adjustment of master plan on Tieshan Port, the ebb tide in the inner bay flows smoothly into the west trough, there is no return area in the main trough of the west trough, and the water flow flows smoothly to the outside of the bay along the planned shoreline. After bypassing the LNG terminal, the ebb current flows southeast along the breakwater direction and southwest to the open sea after bypassing the breakwater head. Compared with before the overall planning adjustment, the cancellation of the breakwater broken line section shortens the path of the west trough entering the open sea, and the ebb current of the west trough entering the open sea is smoother, which helps to speed up the diffusion rate of pollutants to the open sea.

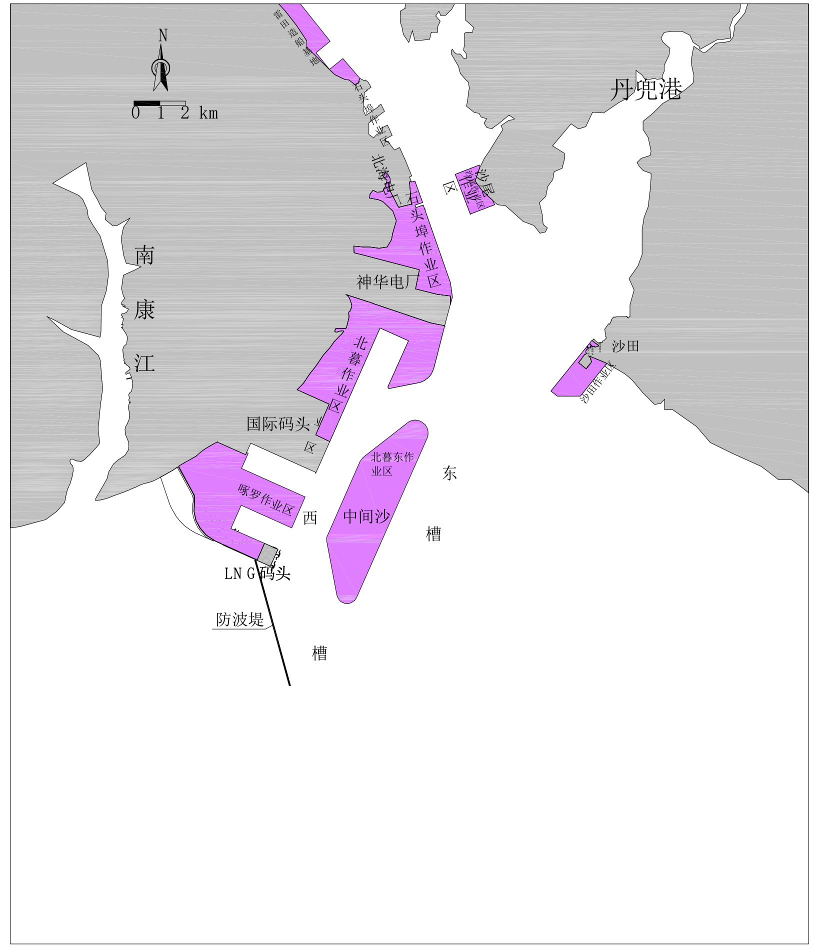
整体来看，铁山港总体规划调整后，涨落潮流更为顺畅的通过西槽进出内湾。落潮期，西槽主通道内回流区消失，水流较为平顺的流向外海，再加上 LNG 西南侧防波堤折线段的取消，缩短了西槽内落潮流进入外海的路径，这些都有助于加快污染物向外海扩散的速率，故岸线调整未增加本项目排污对周边海域的影响。

On the whole, upon adjustment of the master plan on Tieshan Port, the fluctuation tide will enter and leave the inner bay more smoothly through the west trough. During the ebb tide period, the backflow area in the main trough of the west trough disappeared, and the water flow flowed smoothly to the open sea. In addition, the cancellation of the broken line section of the breakwater on the southwest side of LNG shortened the path of the ebb tide in the west trough entering the open sea, which helped to speed up the diffusion rate of pollutants to the open sea. Therefore, the shoreline adjustment did not increase the impact of the project's sewage discharge on the surrounding sea areas.



2018 年 5 月批复总体规划

The master plan approved in May of 2018

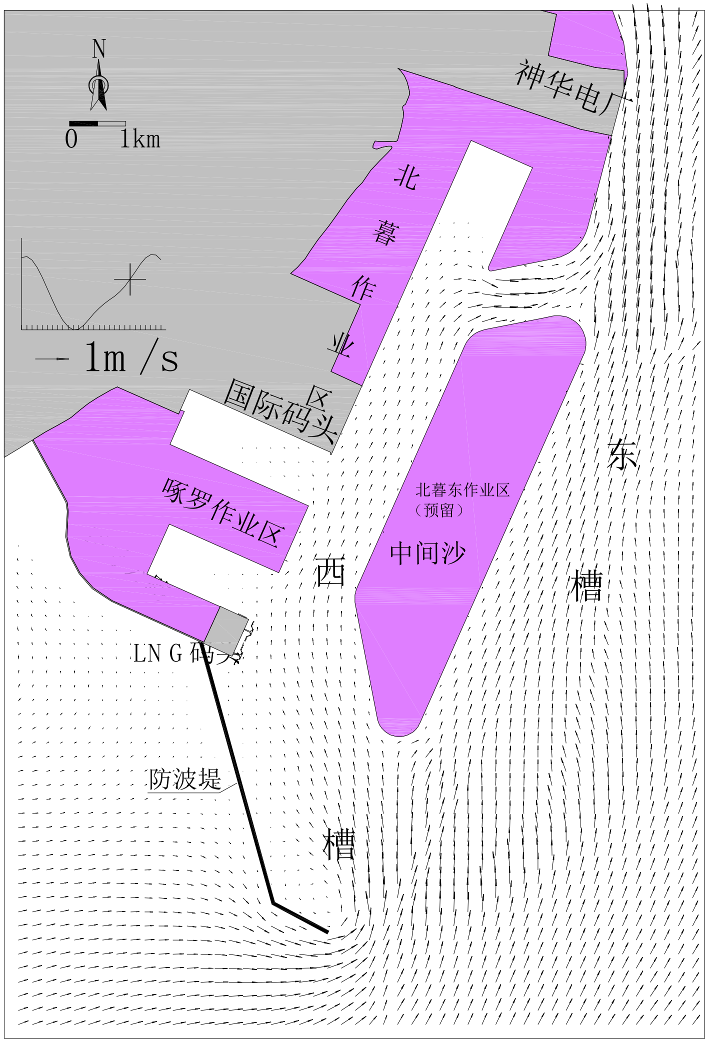


调整后总体规划

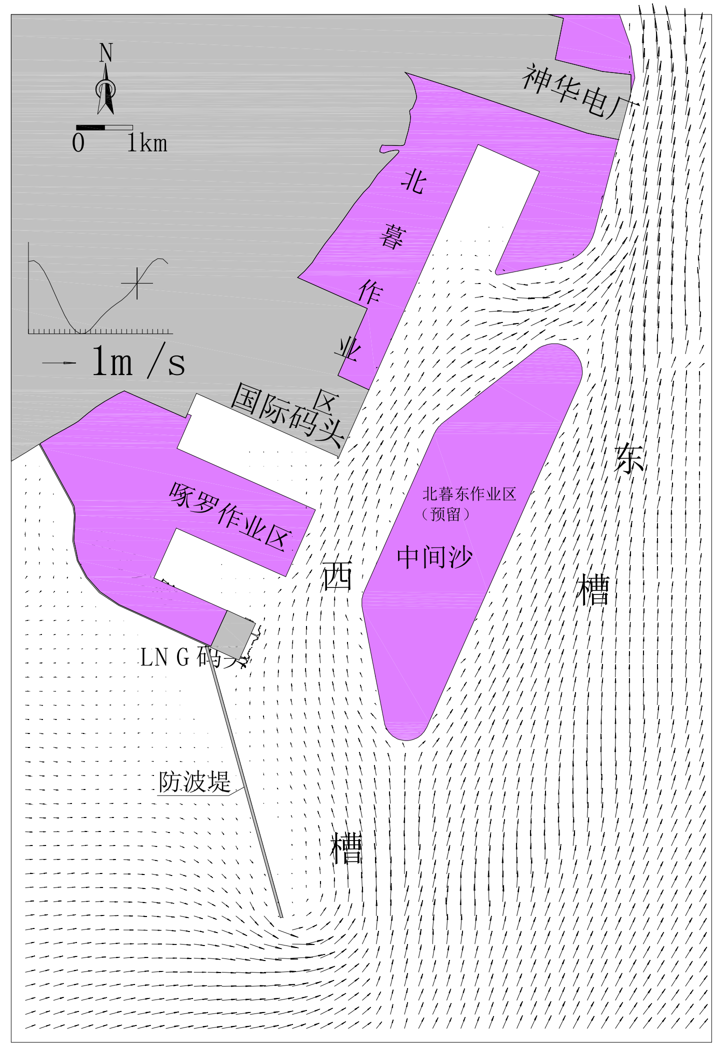
Adjusted master plan

图 4.3.10-1　铁山港总体规划调整前后平面布置图

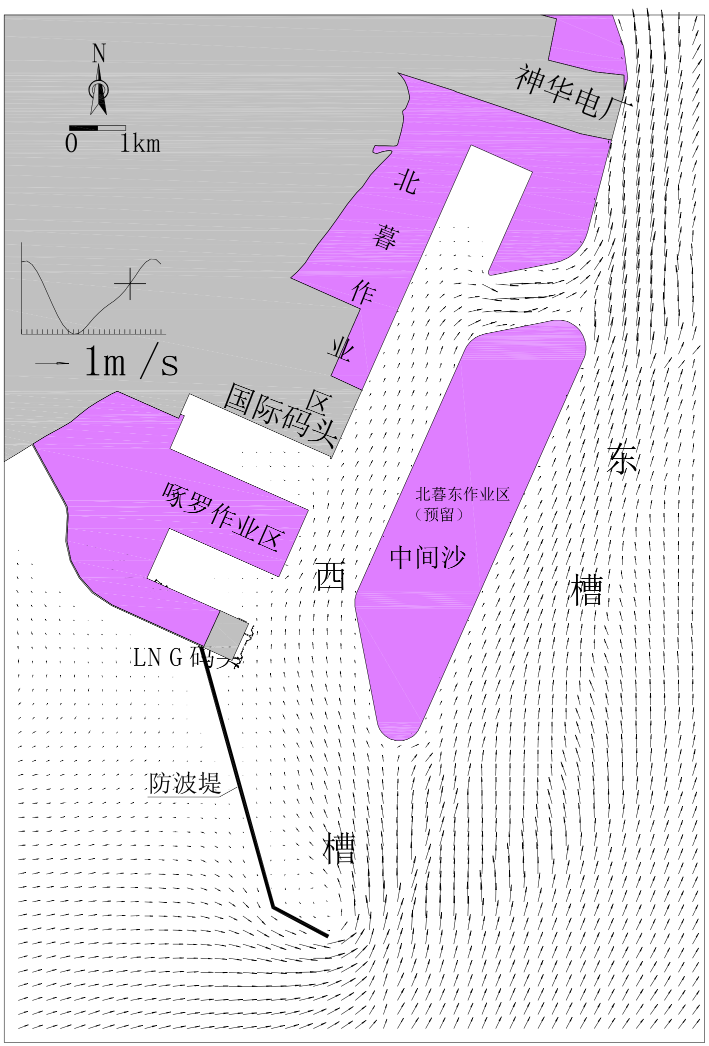
Figure 4.3.10-1 Plan Layout of Tieshan Port before and after Adjustment of Master Plan



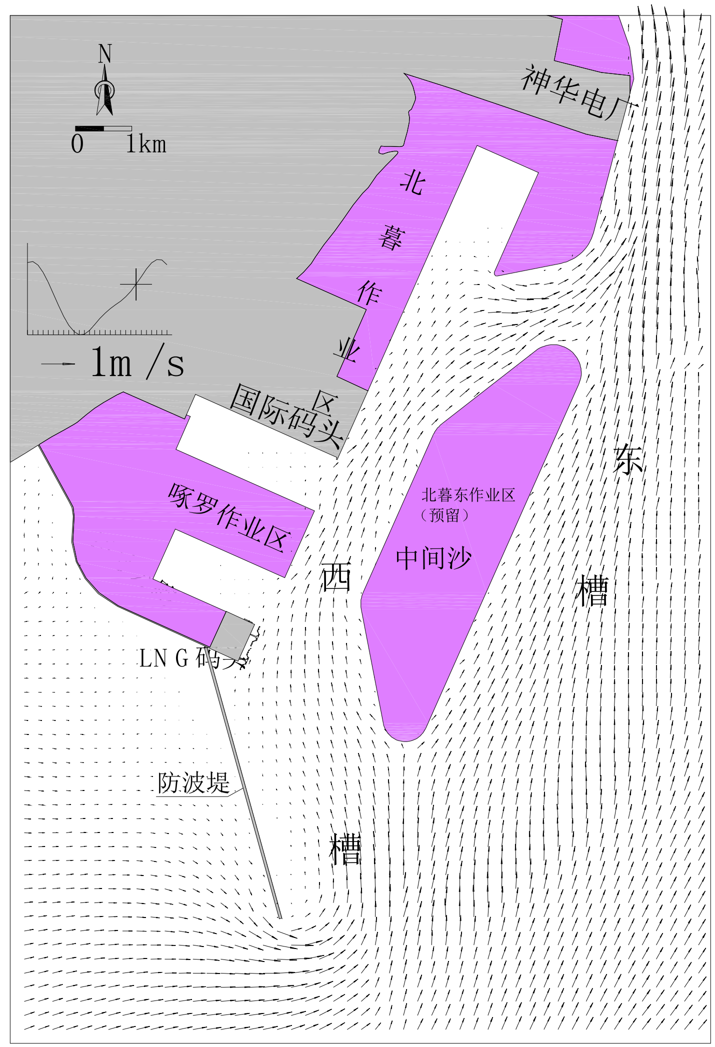
总体规划调整前（批复规划）



总体规划调整后



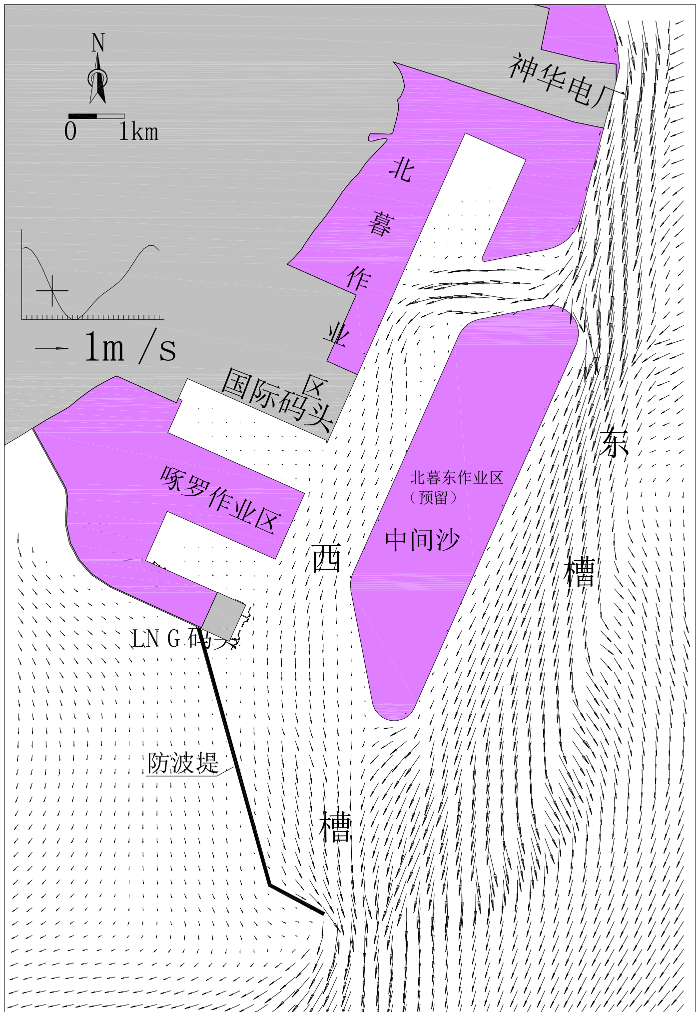
Before adjustment of master plan (approved plan)



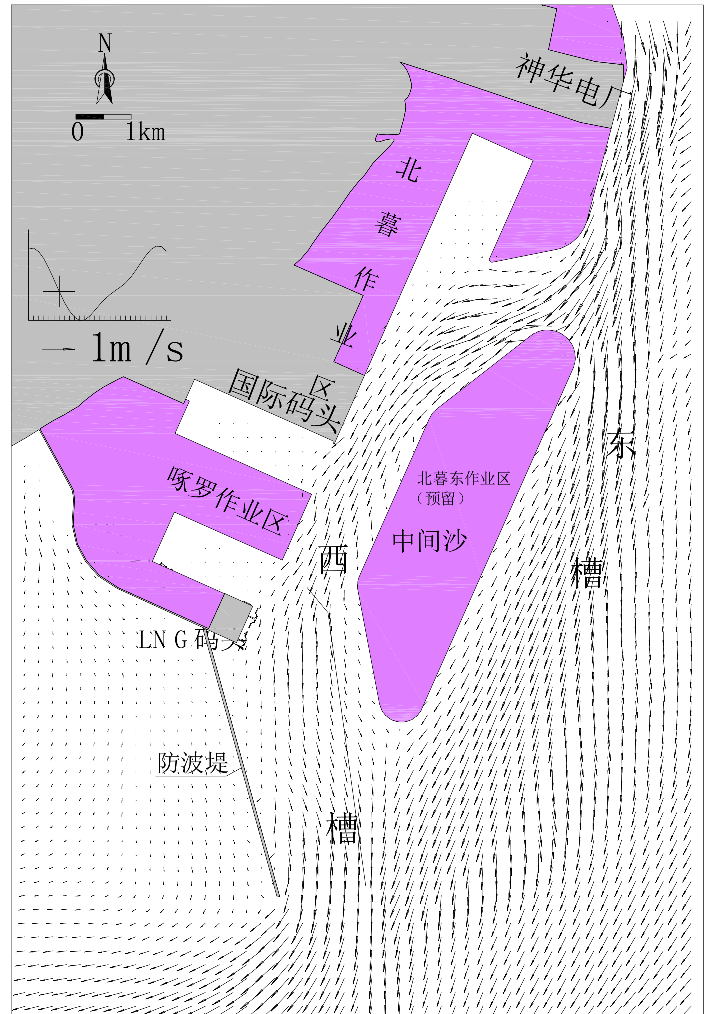
After adjustment of master plan

图 4.3.10-2　铁山港总体规划调整前、后涨急时刻流态图

Figure 4.3.10-2 Flow Pattern Diagram at Rapid Flood Tide of Tieshan Port before and after Adjustment of Master Plan



总体规划调整前（批复规划）



总体规划调整后

Before adjustment of master plan (approved plan) **After adjustment of master plan**

图 4.3.10-3 铁山港总体规划调整前、后落急时刻流态

Figure 4.3.10-3 Flow Pattern Diagram at Rapid Ebb Tide of Tieshan Port before and after Adjustment of Master Plan

4.3.11 小结

4.3.11 Summary

项目采用无元素氯漂白工艺，制浆车间废水排放口排放的二噁英、可吸收有机卤化物（AOX）可以满足《制浆造纸工业污染物排放标准》（GB3544-2008）表 2 标准；项目污水处理站建设处理规模为 10 万立方/天，采用 “初沉池+厌氧反应器+生物选择池+卡鲁塞尔氧化沟+高级氧化池”处理工艺，属《制浆造纸工业污染防治可行技术指南》可行工艺，废水可稳定达到《制浆造纸工业污染物排放标准》（GB3544-2008）要求。项目废水处理达标后排入铁山港区深海排放管网，在铁山港 B3 排污口深海排放，排污口位于铁山港西岸排污区 1（GX012DⅣ），属四类海水环境功能区。根据环境质量现状调查和监测，纳污海域环境质量现状均能达到《海水水质标准》（GB3097-1997）中的相应功能区标准限值要求。

ECF (elemental chlorine-free) bleaching process is adopted in this project, so that the dioxin and absorbable organic halide (AOX) emitted from the sewage outlet of the pulp workshop can meet the standards in Table 2 of *Discharge Standard of Water Pollutants for Pulp and Paper Industry* (GB3544-2008); the sewage treatment station of the project is constructed with a treatment scale of 100,000 cubic meters per day, for which the treatment process of "primary settling tank + anaerobic reactor + biological selector + Carrousel oxidation ditch + advanced oxidation tank" and is a feasible process as specified in *Guideline for Available Techniques of Pollution Prevention and Control for Pulp and Paper Industry*. Therefore, the wastewater can steadily comply with the requirements in *Discharge Standard of Water Pollutants for Pulp and Paper Industry* (GB3544-2008). After treatment, wastewater from the project is discharged into the deep sea at B3 sewage outlet through the deep-sea discharge pipe network of Tieshan Port area, which outlet is located in the Sewage Discharge Zone 1 (GX012D IV) on the west bank of Tieshan Port and falls under the Class IV seawater environmental functional zone. According to the investigation and monitoring of current conditions of environmental quality, current conditions of environmental quality in the receiving sea area can comply with the requirements of the standard limits of the corresponding functional zones in the Seawater Quality Standard (GB3097-1997).

评价选取化学需氧量、SS、无机氮、活性磷酸盐、AOX 五个污染因子在不同排放量情况下进行了预测分析，考虑到排污口所在海域岸线的变化性，为了充分考虑污染物的最不利影响，按照现状岸线和规划实施后港口岸线分别进行了预测分析，预测结果表明：

The five pollution factors of COD, SS, inorganic nitrogen, active phosphate and AOX are selected for prediction and analysis under different emission conditions. Considering the variability of the shoreline of the sea area where the sewage outlet is located, in order to fully consider the most adverse effects of pollutants, the current shoreline and the port shoreline upon implementation of the plan are predicted and analyzed respectively. The prediction results show that:

①总体而言，现状岸线与规划岸线情况下污染物的扩散趋势基本相同，影响范围与影响程度略有差别，其对周边环境敏感目标的影响基本相近。B3 排污口位于铁山湾内湾主槽内，潮流动力强劲，落潮流速大于涨潮流速，有利于污染物向外输送，规划岸线下，东槽内落潮潮量大幅增加，再加上周边港池航道的开挖，B3 排污口周边海域扩散能力有所增加，排污影响范围有所减小。

① Generally speaking, the diffusion trend of pollutants under the current and planned shoreline is basically the same, the impact area and degree are slightly different, and impact thereof on the sensitive targets of the surrounding environment is basically similar. B3 sewage outlet is located in the main trough of Tieshan Bay Inner Bay. The tidal dynamics is strong, and the ebb tide velocity is greater than the flood tide velocity, which is conducive to the outward transportation of pollutants. Under the planned shoreline, the ebb tide volume in the east trough increases greatly. Coupled with the excavation of the surrounding harbor basin trough, the diffusion capacity of the sea area around B3 sewage outlet increases and the impact area of sewage discharge decreases.

②通过质点追踪模拟分析表明，B3 排污口排放的污染物在涨潮时主要随潮流沿深槽进入铁山港内湾，落潮时随落潮流分别进入东、西槽内，沿其深槽向外海侧运动，主要的运动轨迹未向山口国家级红树林保护区和广西合浦儒艮保护区运动。

② Through particle tracking simulation analysis, it is shown that the pollutants discharged from B3 sewage outlet mainly enter the inner bay of Tieshan Port along the deep trough along the tidal current at high tide, and enter the east trough and the west trough along the ebb tidal current respectively, moving to the open sea side along the deep trough. The main movement track does not move to Shankou National Mangrove Reserve and Hepu Dugong Reserve in Guangxi.

③在考虑排污口叠加污染源的情况下，项目废水正常排放，污染物浓度增量影响主要集中在排污口附近区域，随着向外扩散浓度增量逐渐减小，叠加各海洋环境功能区水质本底浓度后，均未超过相应海洋环境功能区海水水质指标要求。

③ Considering the superposition of pollution sources at the sewage outlet, the project wastewater is normally discharged, and the influence of pollutant concentration increment is mainly concentrated in the area near the sewage outlet. With the gradual decrease of outward diffusion concentration increment, the superposition of water quality background concentration in each marine environmental functional area does not exceed the seawater quality index requirements of the corresponding marine environmental functional area.

项目废水非正常排放时海域浓度增量扩散范围有所增加，但叠加各海洋环境功能区水质本底浓度后，仍能达到相应海洋环境功能区海水水质指标要求。故项目废水排放，不降低排海口周边海域海水环境功能级别。

When the project wastewater is discharged abnormally, the diffusion range of sea area concentration increment increases, but after the background concentration of water quality in each marine environment functional zone is superimposed, it can still meet the requirements of seawater quality index for corresponding marine environment functional zone. Therefore, the discharge of wastewater from the project will not reduce the functional level of seawater environment in the sea area around the outlet.

④B3 排污口排污共造成鱼苗损失 2.62×10^5 尾、渔业资源成体损失 2.25kg，浮游植物损失 0.43×10^{14} 个、浮游动物损失 0.82×10^8 个。根据广西壮族自治区渔业资源市场价格，鱼苗按 1 元/尾计算，则 B3 排污口排放造成鱼卵仔鱼折算为商品育苗损失计 26.2 万元，渔业资源损失计 0.0025 万元，以上损失共计 26.3 万元。

④ B3 sewage outlet causes of fish fry loss totaling 2.62×10^5 fishes, adult fishery resources loss totaling 2.25 kg, phytoplankton loss totaling 0.43×10^{14} nos. and zooplankton loss totaling 0.82×10^8. According to the market price of fishery resources in Guangxi Zhuang

Autonomous Region, the fish fry is calculated at RMB 1 per fish fry, then the spawn and larva fish discharged from sewage outlet B3 are converted into commercial seedling losses of RMB 262,000, fishery resources losses of RMB 25, and the above losses total RMB 263,000.

⑤现状岸线条件和规划岸线条件下的各种工况 COD、SS、无机氮、活性磷酸盐、AOX 主要扩散范围均不会到达山口红树林生态自然保护区、广西合浦儒艮国家级自然保护区、北部湾二长棘鲷长毛对虾国家级水产种质资源保护区；叠加保护区本底浓度后，水质仍能达标，广西山口红树林保护区和广西合浦儒艮国家级自然保护区海水水质、海洋沉积物质量和海洋生物质量均不劣于一类标准，满足保护区生态红线管控要求。北部湾二长棘鲷长毛对虾国家级水产种质资源保护区距离排污口较远，污染物经过长距离广海域的扩散，通过累积对海水水质、海洋生物的影响很小。

The main diffusion ranges of COD, SS, inorganic nitrogen, active phosphate and AOX under various working conditions under the current shoreline conditions and the planned shoreline conditions will not reach Shankou Mangrove Ecological Nature Reserve, Hepu Dugong National Nature Reserve in Guangxi, and Beibu Gulf National Aquatic Germplasm Conservation Zone for Penaeus longicornis; after superimposing the background concentration of the reserve, the water quality can still reach the standard. The seawater quality, marine sediment quality and marine biological quality of Guangxi Shankou Mangrove Reserve and Guangxi Hepu Dugong National Nature Reserve are not inferior to the first-class standard, meeting the ecological red line control requirements of the reserve. The Beibu Gulf Parargyrops Edita Penaeus Penicillatus National Germplasm Resource Nature Reserve is far away from the pollutant discharge outlet. The pollutants spread through a long distance and a wide sea area, and have little impact on seawater quality and marine organisms.

4.4 运营期地下水环境影响分析

4.4 Analysis of impact on surface water environment in operation period

根据《环境影响评价技术导则 地下水环境》（HJ610-2016）要求，二级评价建议优先采用数值法。因此，本次地下水环境影响预测采用数值法模拟。采用 GMS7.1 软件进行模拟分析，基于 MODFLOW 和 MT3DMS 模块对厂区附近地下水的溶质迁移问题进行模拟。

In accordance with the requirements of *Technical Guidelines for Environmental Impact Assessment - Groundwater Environment* (HJ610-2016), it is recommended that priority be given to the numerical method in Class II assessment. Therefore, the groundwater environmental impact prediction is simulated by using numerical method. GMS7.1 software is used for simulation analysis, and solute migration in groundwater near the plant area is simulated based on MODFLOW and MT3DMS modules.

GMS 是地下水模拟系统（Groundwater Modeling System）的英文缩写。GMS 由 Brigham Yong University 的环境模型实验室和美国军工水道实验站合作开发。具有功能强大的图形界面、综合化的地下水模型构建和数值模拟环境的软件包。

GMS is the abbreviation of Groundwater Modeling System. GMS is developed by Brigham Yong University's Environmental Modeling Laboratory in cooperation with the US Military Waterway Experimental Station, with a powerful graphical interface, a comprehensive groundwater model construction and a software package for numerical simulation of the environment.

4.4.1 正常工况下项目运营对地下水环境影响分析

4.4. Analysis for impact of project operation on the groundwater environment under normal working conditions.

根据《环境影响评价技术导则 地下水环境》（HJ610-2016）中 9.4.2 的规定，已采取防渗措施的建设项目，可不进行正常状况情境下的预测，因此项目主要对项目运营期地下水非正常排放情况进行预测，仅对正常工况下项目运用对地下水环境影响做简要定性分析。

In accordance with the provisions of 9.4.2 in the Technical Guidelines for Environmental Impact Assessment - Groundwater Environment (HJ610-2016), construction projects with anti-seepage measures already taken may not necessarily be predicted under normal conditions. As such, the project mainly predicts the abnormal discharge of groundwater during the operation period of the project, and only makes a brief qualitative analysis on the impact of project application on groundwater environment under normal conditions.

污水处理站、各生产车间及各类贮存池及废水管道严格按照现行的国家规范要求采

取防渗措施，通过分区防渗，设置重点防渗区、一般防渗区和简单防渗区，各防渗区均能达到相应的渗透系数要求，防止生产废水渗入地下水而造成地下水污染。在防渗措施工况良好的情况下，项目正常运营对地下水环境影响不大。

sewage treatment stations, production workshops, various storage tanks and waste water pipelines shall take anti-seepage measures in strict accordance with the current national standards. Through zoning of anti-seepage and setting up of key anti-seepage, general anti-seepage and simple anti-seepage zones, all anti-seepage zones shall be able to comply with relevant permeability coefficient requirements to prevent production wastewater from infiltrating into groundwater and causing groundwater pollution. Under good working conditions of anti-seepage measures, project operation will impose limited impact on the groundwater environment.

4.4.2 非正常工况下项目运营对地下水环境影响分析

4.4.2 Analysis for impact of project operation on the groundwater environment under abnormal working conditions.

非正常工况下若发生泄漏事故，污水沿上部土层裂隙缓慢入渗，经下伏松散岩类孔隙潜水下渗至地下水。主要可能污染方向和范围是项目区下游地段地下水，从而引起下游地下水水质恶化。渗流污染方向与地下水水流方向一致。

In the event of leakage accident under abnormal working conditions, sewage slowly infiltrates along the cracks in the upper soil layer and infiltrates to groundwater through the phreatic water in the underlying loose rock pores. Main possible pollution direction and scope is the groundwater in the downstream section of the project area, thus causing the deterioration of the groundwater quality in the downstream. The direction of seepage pollution is consistent with the direction of groundwater flow.

4.4.2.1 水文地质概念模型

4.4.2.1 Conceptual hydrogeological model

（1）模拟范围

(1) Simulation range

拟建项目厂址位于大江口单元之中，大江口单元以北部湾海域为最低排泄基准面，

该单元的地下水亦主要靠大气降水的渗入补给，大气降水大部分以地表径流方式排泄于北部湾海域。该单元的地下水亦处在相对独立的地下水系统之中，地下水运移于松散岩类孔隙中，大体上由北西向南东径流，地下水流程较短，以渗流的方式排泄。

The proposed plant site is located in Dajiangkou Unit. Dajiangkou Unit takes Beibu Gulf sea as the minimum drainage base level. Groundwater of the unit is mainly recharged by infiltration of atmospheric precipitation. Most atmospheric precipitation will be discharged into Beibu Gulf sea in the form of surface runoff. Groundwater of the unit is also a relatively independent groundwater system. Groundwater is transported between loose rock pores and running from northeast to southwest. The groundwater flow is relatively short. Groundwater will be discharged in the form of seepage.

本次预测范围拟设置于项目所处大江口水文地质单元中。西至老妗垌、竹儿根一带，北至亚细、海山排一带，东至新铺、谢家一带，南部以北部湾海域为最低排泄基准面作为排泄边界。其中西、北、东设定为定流量边界，南部北部湾海域设定为定水头边界。预测面积约为 16.1km^2

Range of this prediction is proposed to be set in the Dajiangkou Hydrogeological Unit where the project is located. To the west, it reaches Laojindong and Zhuergen; to the north, it reaches Yaxi and Haishanpai; to the east, it reaches Xinpu and Xiejia; to the south, the sea area of Beibu Gulf is the lowest discharge datum level as the discharge boundary. of which, the west, north and east are set as the fixed flow boundary, and the southern Beibu Gulf sea area is set as the fixed water head boundary. Prediction area is around 16.1km^2

垂直层面上，主要预测对象含水层为赋存于第四系砂层中的第四系松散孔隙水。以第四系潜水面为上边界，下边界划分至基岩面。

On the vertical level, the main predicted aquifer is Quaternary loose pore water occurring in Quaternary sand layer. The Quaternary phreatic surface is taken as the upper boundary and the lower boundary is divided into bedrock surface.

重点预测非正常工况下，污染物泄露对厂区地下水环境及周围敏感点的影响程度。

The impact degree of pollutant leakage on groundwater environment and surrounding sensitive points in the plant area under abnormal working conditions is mainly predicted.

（1）含水层结构

（1）Aquifer structure

模拟范围内为潜水含水层，地下水埋深较浅，含水层岩性为含黏性土中粗砂、中粗砂，含水层中夹杂粘土等，但粘土层分布不连续，因此将潜水含水层划分成一层。

The simulation range is phreatic aquifer, the groundwater depth is relatively shallow, the lithology of aquifer is coarse sand, medium coarse sand, clay mixed in aquifer, etc., but the distribution of clay layer is discontinuous, so the phreatic aquifer is divided into one layer.

（2）源汇项

（2）Source sink term

模型范围内潜水的主要补给源有侧向地下水径流、大气降水入渗等。排泄项主要有人工开采、侧向地下水径流等。人工开采主要用于农村生活用水，灌溉井，地下水开采对局部地下水流场造成影响。

The main recharge sources of phreatic water within the model range are lateral groundwater runoff, atmospheric precipitation infiltration, etc. Discharge items mainly include artificial mining, lateral groundwater runoff, etc. Manual exploitation is mainly used for rural domestic water and irrigation wells. Groundwater exploitation affects local groundwater flow field.

根据本次评价所能获得资料以及该区域含水层的结构，模拟区内含水层的参数随空间变化，体现出非均质性；随方向没有明显变化，体现出各向同性；模型考虑水井的开采，地下水流为非稳定流。因此，将模拟区地下水流概化成非均质各向同性非稳定二维地下水流系统。

According to the data available from this assessment and the structure of the aquifer in the region, the parameters of the aquifer in the simulated region change with space, reflecting heterogeneity. There is no obvious change with the direction, showing isotropy. The model considers the exploitation of wells, and the groundwater flow is unstable. As such, the groundwater flow in the research area is generalized into heterogeneous isotropic and unstable 2D groundwater flow system.

4.4.2.2 预测时段

4.4.2.2 Prediction period

根据《环境影响评价技术导则 地下水环境》（HJ610-2016）要求，本次预测时段

定为非正常工况开始后的第 100 天、第 1000 天。

In accordance with the requirements of *Technical Guidelines for Environmental Impact Assessment - Groundwater Environment* (HJ610-2016), this prediction period is set at the 100th and 1000th days after the start of abnormal working conditions.

4.4.2.3 情景设置

4.4.2.3 Scenario setting

考虑厂区可能出现的污染事故点对地下水造成污染的因素较复杂，在设计可能出现的污染情景时，重点考虑发生污染危险可能性较大、因子超标倍数较高的的工况。

Considering that the factors of groundwater pollution caused by possible pollution accident points in the plant area are relatively complex, when designing possible pollution scenarios, the working conditions with high possibility of pollution danger and high multiple of factors exceeding the standard shall be mainly considered.

为了选择技术可行、经济合理的污染源防渗措施，本项目拟对厂区的典型污染源按照以下情景来进行污染源运移预测：污水处理站初沉池池底发生破裂，防渗设置失效，污水泄露导致地下水环境遭受污染。拟于污水处理站南部厂界，即初沉池南部 20m 处设置污染监测井。不考虑污染物在包气带中的运移时。使用解析法进行简单计算，预测污染物泄露后第 5 天将运移至污染监测井中。根据场地实际情况考虑污染物在场地中的包气带运移所需时间及建设单位作出应急反应所需时间，拟设初沉池连续泄露时间为 30 天，30 天后泄露事故得到控制，停止泄露。

In order to select technically feasible, economical and reasonable anti-seepage measures for pollution sources, this project plans to predict the migration of typical pollution sources in the plant area according to the following scenarios: the bottom of the primary sedimentation tank of the sewage treatment station is cracked, the anti-seepage setting is invalid, and the groundwater environment is polluted due to sewage leakage. A pollution monitoring well is proposed at the plant boundary in the south of the sewage treatment station, i.e. 20m south of the primary sedimentation tank. When the transport of pollutants in the aeration zone is not considered. Simple calculation is carried out by using analytical method, and it is predicted that the pollutants will be transported to the pollution monitoring well on the 5th day after leakage. Depending upon actual site conditions, considering the time required for pollutants to move in the aeration zone in the site and the time required for the construction unit to make emergency response, it is proposed to set up a continuous leakage time of 30 days for the primary sedimentation tank, after which the leakage accident will be controlled and the leakage will be terminated.

4.4.2.4 预测因子及预测源强

4.4.2.4 Prediction factor and predicted source intensity

（1）预测因子选取

(1) Selection of prediction factors

拟定泄露事故发生点位污水处理站初沉池。根据工程分析可知，初沉池中主要污染物为 COD、NH_3-N、SS、TN、BOD_5、TP。初沉池中污染物浓度见下表 4.4-1。

The primary sedimentation tank of the sewage treatment station at the point where the leakage accident occurred is proposed. According to engineering analysis, major pollutants in the primary sedimentation tank are COD, NH_3-N, SS, TN, BOD_5 and TP. The concentration of pollutants in the primary sedimentation tank is as shown in Table 4.4-1 below.

表 4.4-1 初沉池污染物浓度 单位： mg/L

Table 4.4-1 4.4 Concentration of Pollutants in Primary Sedimentation Tank in mg/L

污染因子 Pollution factor	COD	NH_3-N	SS	TN	BOD_5	TP
浓度 Concentration	1638	14	1255	15	581	17
《地下水环境质量标准》三类水质要求 Category III water quality requirements in *Standard for Groundwater Quality*	≤3.0	≤0.5	/	/	/	/

根据本项目特征因子及有无相应环境质量标准选取预测因子，拟定预测因子为 COD 及 NH_3-N。

Depending upon the characteristic factors of this project and availability relevant environmental quality standards, the prediction factors are selected and proposed to be COD and NH_3-N.

（2）预测源强

(2) Predicted source intensity

场地包气带岩层岩性是第四系中更新统北海组砂层、亚粘土。初沉池泄露事故发生后，废水将会通过包气带持续下渗至潜水面，随后污染物于地下水中运移。污水处理站处地下水埋深约为 3~5m，拟设污水在包气带中下渗距离为 4m。考虑实际情况，废水通过包气带下渗至潜水面浓度根据《环境影响评价技术导则 土壤环境》（HJ964-2018）附录 E 方法二进行计算。计算过程如下：

Stratum in the aeration zone includes Quaternary Middle Pleistocene Series Beihai Fm sand layer and loam. In the aftermath of leakage accident in the primary sedimentation tank, the wastewater will continuously infiltrate to the water table through the aeration zone, and then pollutants will be transported in the groundwater. The groundwater depth at the sewage treatment station is about 3- 5m, and the infiltration distance of sewage in the aeration zone is proposed to be 4m. In view of actual conditions, the concentration of wastewater infiltrating to the water table through the aeration zone shall be calculated according to Method 2 in Annex E of *Technical Guidelines for Environmental Impact Assessment - Soil Environment* (HJ964-2018). The calculation process is as follows:

1）一维非饱和溶质垂向运移控制方程：

1) one-dimensional control equation of vertical transport of unsaturated solute:

$$\frac{\partial(\theta c)}{\partial t}=\frac{\partial}{\partial z}\left(\theta D\frac{\partial c}{\partial z}\right)-\frac{\partial}{\partial z}(qc)$$

式中：c——污染物介质中的浓度，mg/L；

Where, c - concentration in pollutant medium, mg/L;

D ——弥散系数，m^2/d；

D - dispersion coefficient, m^2/d;

q——渗流速率，m/d；

q - seepage rate, m/d;

z——沿 z 轴的距离，m；

z - the distance along the z axis, m;

t——时间变量，d；

t - time variable, d;

θ ——土壤含水率，%；

θ - soil moisture content, %;

b）初始条件

b) Initial condition:

$$c（z，t）=0 \qquad t=0，L \leqslant z < 0$$

$$c(z,t)=0 \qquad t=0, L \leq z<0$$

c）边界条件

c) Boundary condition

第一类 Dirichlet 边界条件：

The first type, Dirichlet boundary condition:

$$c（z，t）=c_0 \qquad t>0，z=0$$

$$c(z,t)=c_0 \qquad t>0, z=0$$

第二类 Neumann 零梯度边界：

The second type, Neumann zero gradient boundary:

$$-\theta D\frac{\partial c}{\partial z}=0 \qquad t>0，z=L$$

$$-\theta D\frac{\partial c}{\partial z}=0 \qquad t>0, z=L$$

2）参数选择

2) Parameter selection

参数选择见下表 4.4-2。

Parameter selection is as shown in Table 4.4-2 below.

表 4.4-2 计算参数

Table 4.4-2 Calculation Parameters

包气带性质 **Nature of aeration zone**	垂向弥散系数 **Vertical dispersion coefficient**	渗流速率 **Seepage rate**	预测深度 **Predicted depth**	泄露时长 **Leakage duration**	土壤含水率 **Soil moisture content**	备注 **Remarks**
/	**m^2/d**	**m/d**	**m**	**d**	**%**	/

砂层、亚粘土 Sand layer and loam	0.05	0.0896	4	30	20	①土壤含水率查找经验值获得；②垂向弥散系数取纵向弥散系数的 0.1 ①Soil moisture content is obtained by searching empirical values. ② The vertical dispersion coefficient is taken as 0.1 of the longitudinal dispersion coefficient

3）计算结果及地下水预测源强选取

3) Calculation results and selection of predicted source intensity of ground water

污染物泄露初始浓度见下表 4.4-3。

Initial leakage concentration of pollutants is as shown in Table 4.4-3 below.

表 4.4-3 污染物泄露初始浓度

Table 4.4-3 Initial Leakage Concentration of Pollutants

污染物 Pollutant	COD	NH_3-N
初始浓度（mg/L） Initial concentration (mg/L)	1638	14

污染物通过包气带泄露至潜水面时浓度见下表 4.4-4。

The concentration of pollutants when leaking to the water table surface through the aeration zone is as shown in Table 4.4-4 below.

表 4.4-4 污染物泄露至潜水面时浓度

Table 4.4-4 Concentration of Pollutants when Leaking to the Water Table

泄露时间（d） Leakage duration (d)	到达潜水面时 COD 浓度（mg/L） COD concentration (mg/L) when reaching the water table	到达潜水面时 NH_3-N 浓度（mg/L） NH_3-N concentration (mg/L) when reaching the water table
30	316.00	2.64

经上述计算，污染物经过包气带下渗至潜水面的浓度见下表 4.4-5，并选取下表参数作为本次地下水环境影响预测结果。

Through the above calculation, the concentration of pollutants infiltrating to the water table through the aeration zone is shown in Table 4.4-5 below, and the parameters in the table below are selected as the prediction results of groundwater environmental impact.

表 4.4-5 地下水模拟预测源强

Table 4.4-5 Simulated Source Intensity of Groundwater

污染物 **Pollutant**	**COD**	**NH_3-N**
浓度（mg/L） **Concentration (mg/L)**	316.00	2.64

4.4.2.5 预测参数选取

4.4.2.5 Selection of prediction parameters

为了较准确地刻画评价区水文地质条件，模型中参数的确定主要依据本项目的野外抽水试验结果和历史数据，结合常用各种参数的经验值，得到初步含水层参数。

In order to accurately describe the hydrogeological conditions in the assessment area, the parameters in the model are mainly determined according to the field pumping test results and historical data of this project, combined with the empirical values of various commonly used parameters, and the preliminary aquifer parameters are obtained.

本次模拟预测参数通过收集调查区域范围内水文地质资料获取。计算过程中含水层渗透系数初值取 4m/d。降雨入渗系数取 0.12。地下水溶质运移模型参数主要包括弥散系数、有效孔隙度和岩土密度。有效孔隙度根据勘察的实测的孔隙率数据确定，岩土密度根据勘察的实测数据确定。弥散系数的确定相对比较困难。

The simulation prediction parameters are obtained by collecting hydrogeological data within the investigation area. In the calculation process, the initial value of aquifer permeability coefficient is taken as 4m/d. Rainfall infiltration coefficient is taken as 0.12. The parameters of groundwater solute transport model mainly include dispersion coefficient, effective porosity and rock and soil density. The effective porosity is determined according to the measured porosity data of the survey, and the rock and soil density is determined according to the measured data of the survey. The dispersion coefficient is relatively difficult to be determined.

通常空隙介质中的弥散度随着溶质运移距离的增加而加大，这种现象称之为水动力弥散尺度效应。其具体表现为：野外弥散试验所求出的弥散度远远大于在实验室所测出的值，相差可达 4~5 个数量级；即使是同一含水层，溶质运移距离越大，所计算出的弥散度也越大。因此，即使是进行野外或室内弥散试验也难以获得准确的弥散系数。根据

宋树林、林泉及孙向阳所著《地下水弥散系数的测定》（海岸工程，1998年9月）给出的弥散系数参考值为：细砂纵向弥散系数 0.05~0.5，中粗砂纵向弥散系数 0.2~1，砂砾纵向弥散系数 1~5。项目场地主要含水层岩性为中粗砂，因此项目场地纵向弥散系数取值 $0.5m^2/d$。

Generally, the dispersion in porous media increases with the increase of solute transport distance. This phenomenon is called hydrodynamic dispersion scale effect , which is specifically manifested by: the dispersion calculated by field dispersion test is far greater than that measured in laboratory, and the difference can reach 4-5 orders of magnitude; even in the same aquifer, the larger the solute transport distance is, the greater the calculated dispersion will be. As such, it is difficult to obtain accurate dispersion coefficient even if field or indoor dispersion tests are carried out. Based on the *Determination of Groundwater Dispersion Coefficient* (Coastal Engineering, September 1998) authored by Song Shulin, Lin Quan and Sun Xiangyang, the given reference values of dispersion coefficients are: 0.05-0.5 for fine sand, 0.2-1 for medium coarse sand and 1-5 for gravel (all being longitudinal dispersion coefficients). The lithology of the main aquifer in the project site is medium coarse sand, so the longitudinal dispersion coefficient of the project site is $0.5m^2/d$.

预测参数见下表 4.4-6。

Prediction parameters are as shown in Table 4.4-6 below.

表 4.4-6 模型预测参数

Table 4.4-6 Model Prediction Parameters

岩性 Lithology	渗透系数（m/d） Permeability coefficient (m/d)	弥散系数（m^2/d） Dispersion coefficient (m^2/d)	降雨入渗系数 Rainfall infiltration coefficient	孔隙度 Porosity
中粗砂 Medium and coarse sand	4.0	0.5	0.12	0.30

4.4.2.6 模型识别与校检

4.4.2.6 Model identification and verification

模型的识别与检验过程是整个模拟中极为重要的一步工作，模型识别检验是一个调

节水文地质参数参数的过程,使模型结果尽可能与水位动态观测资料相吻合。通过检验 MODFLOW 模拟水位与实测水位的拟合程度来校检模型的精度。下图 4.1-1 为模拟水位与观测水位的拟合程度，观测水位越接近 45°线表明拟合程度越好。

The process of model identification and verification is an extremely important step in the whole simulation. Model identification and verification is a process of adjusting hydrogeological parameters so that the model results are consistent with the dynamic observation data of water level as much as possible. The accuracy of the model is checked by checking the fitting degree between MODFLOW simulated water level and measured water level. Figure 4.1-1 below shows the fitting degree between the simulated and the observed water level. The closer the observed water level is to the 45 line, the better the fitting degree will be.

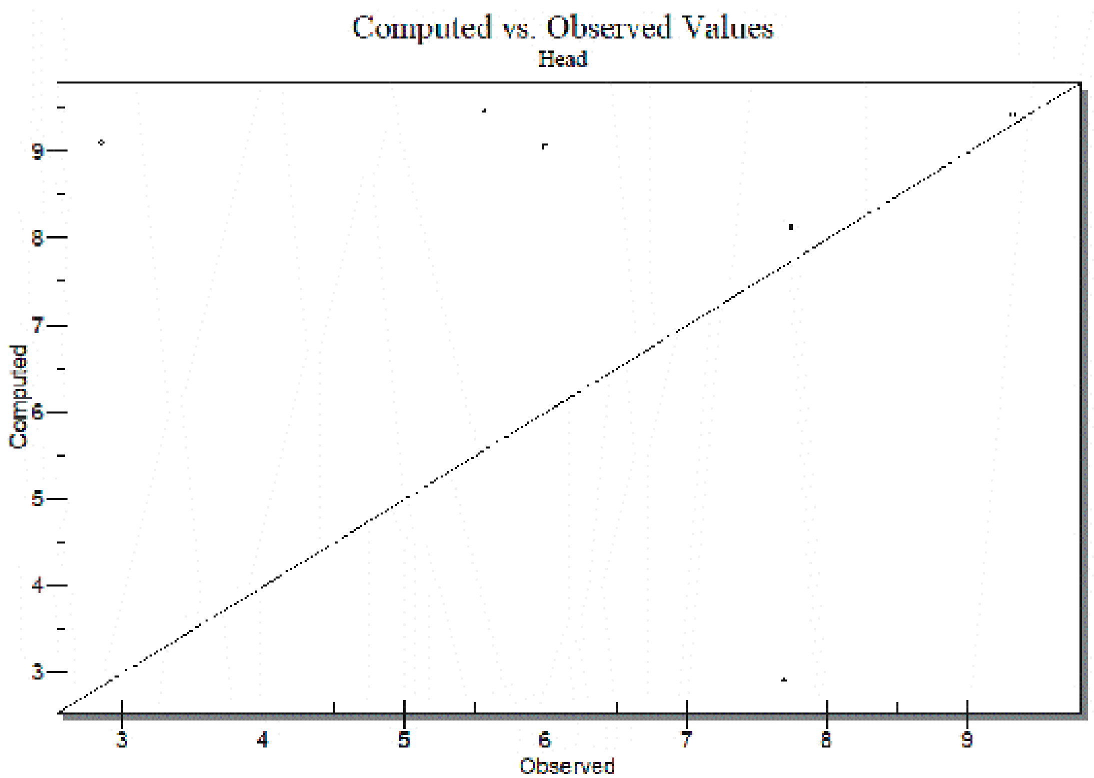


图 **4.4-1** 观测水位与模拟水位拟合程度

Figure 4.4-1 Fitting Degree between the Simulated and Observed Water Level

4.4.2.7 预测结果

4.4.2.7 Prediction results

（1）污染物 COD 预测结果

(1) Prediction results of pollutant COD

1）泄露后 100 天

1) 100 days from leakage

泄露事故发生后 100 天，污染物 COD 最大运移距离为 1508m，污染晕浓度超标面积约为 0.16km^2。在污染晕超标影响范围内无饮用地下水的敏感点分布。COD 污染晕分布范围及周围敏感点情况见下图 4.4-2。

In 100 days from leakage accident, maximum transportation distance of pollutant COD will be 1508m and the area where the concentration of pollution halo exceeds the standard will be around 0.16km^2. There will be no distribution of sensitive points of drinking groundwater within the impact area of pollution halo exceeding the standard. Distribution range of COD pollution halo and the surrounding sensitive points are as shown in Figure 4.4-2 below.

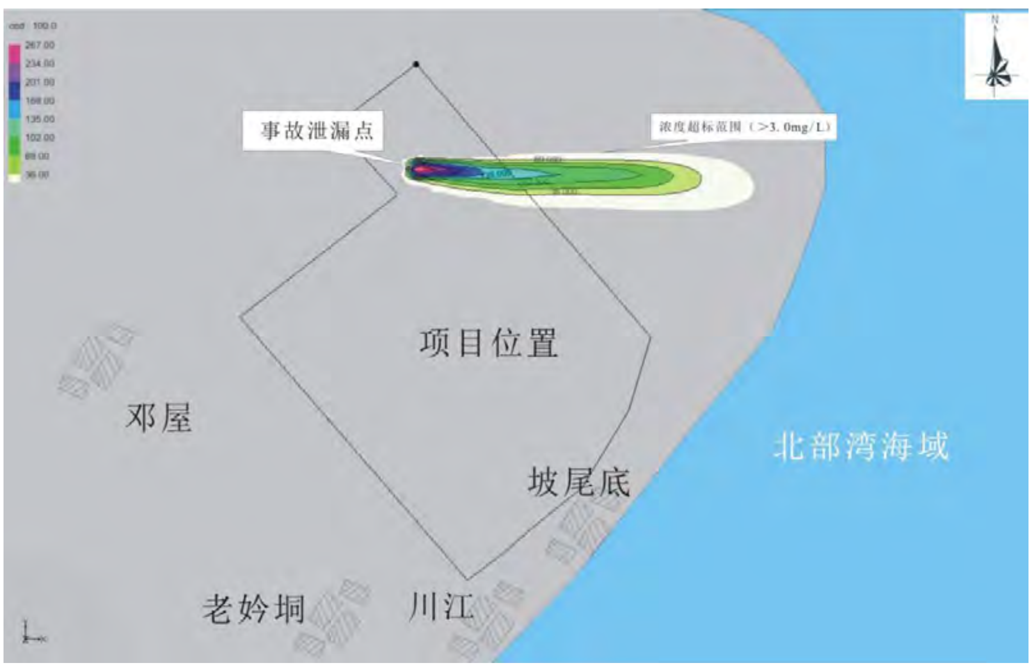


图 4.4-2　100 天时 COD 影响范围

Figure 4.4-2 Impact Area of COD in 100 Days

2）泄露后 1000 天

2) 1000 days from leakage

泄露事故发生后 1000 天，污染物 COD 最大运移距离为 1750m，并排泄进北部湾海

域，陆上污染晕浓度超标面积约为 0.24km^2。在污染晕超标影响范围内无饮用地下水的敏感点分布。COD 污染晕分布范围及周围敏感点情况见下图 4.4-3。

Maximum transportation distance of pollutant COD will be 1750m in 1000 days from the leakage accident, and the area where the concentration of pollution halo exceeds the standard will be around 0.24km^2. There will be no distribution of sensitive points of drinking groundwater within the impact area of pollution halo exceeding the standard. Distribution range of COD pollution halo and the surrounding sensitive points are as shown in Figure 4.4-3 below.

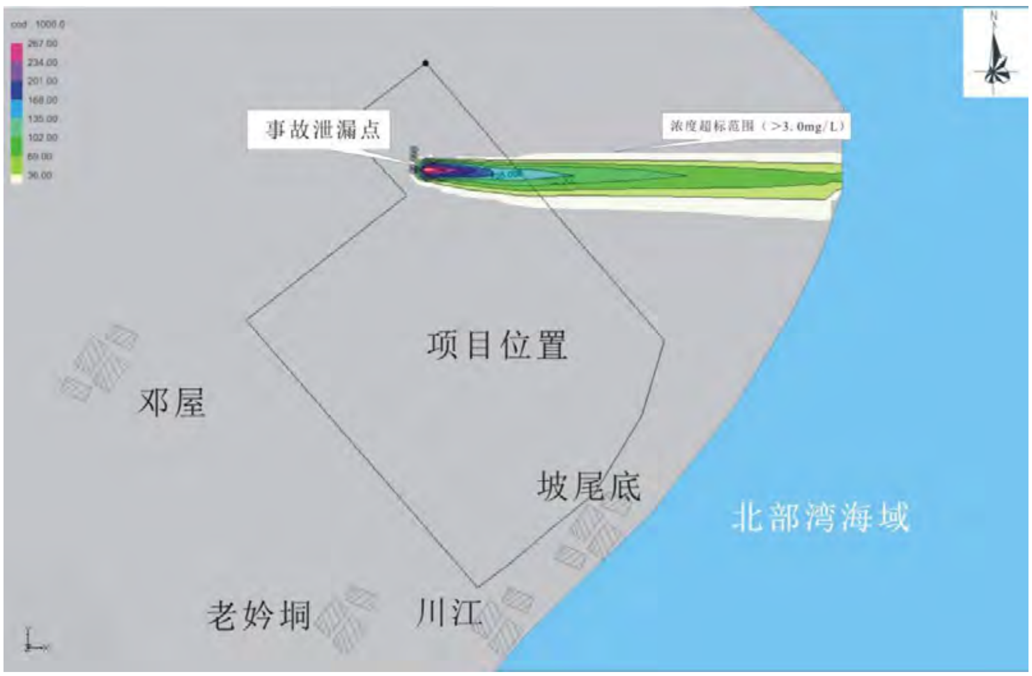


图 4.4-3　1000 天时 COD 影响范围

Figure 4.4-3 Impact Area of COD in 1000 Days

（2）污染物 NH_3-N 预测结果

(2) Prediction results of pollutant NH_3-N

1）泄露后 100 天

1) 100 days from leakage

泄露事故发生后 100 天，污染物 NH_3-N 最大运移距离为 1189m，污染晕浓度超标面积约为 0.08km^2。在污染晕超标影响范围内无饮用地下水的敏感点分布。NH_3-N 污染晕分布范围及周围敏感点情况见下图 4.4-4。

In 100 days from leakage accident, maximum transportation distance of pollutant NH_3-N will be 1189m and the area where the concentration of pollution halo exceeds the standard will be around 0.08km^2. There will be no distribution of sensitive points of drinking groundwater within the impact area of pollution halo exceeding the standard. Distribution range of NH_3-N pollution halo and the surrounding sensitive points are as shown in Figure 4.4-4 below.

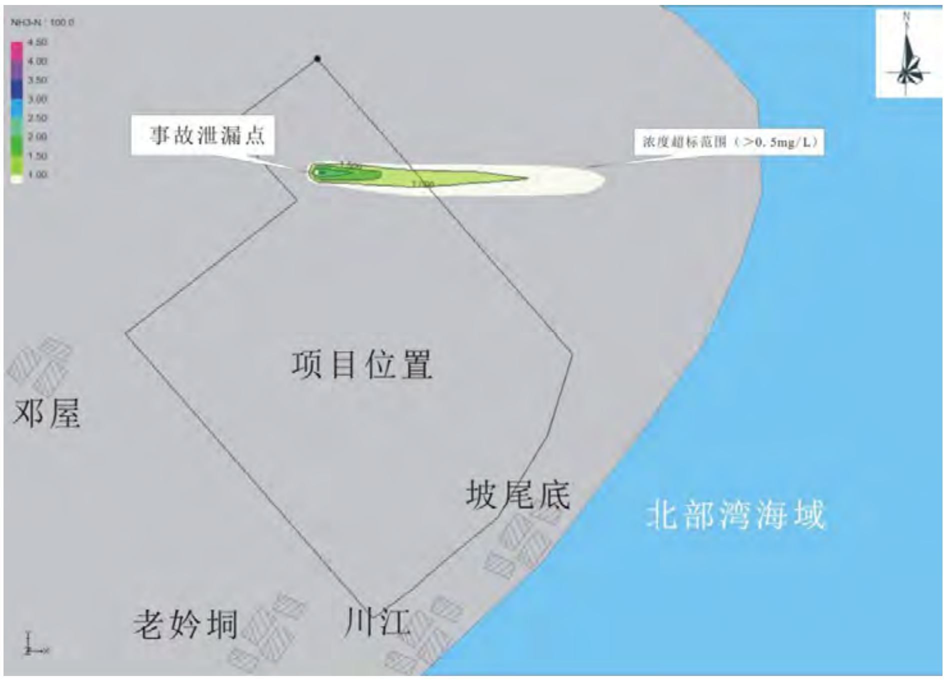


图 4.4-4 100 天时 NH_3-N 影响范围

Figure 4.4-4 Impact Area of NH_3-N in 100 Days

2）泄露后 1000 天

2) 1000 days from leakage

泄露事故发生后 1000 天，污染物 NH_3-N 最大运移距离为 1750m，并排泄进北部湾海域，陆上污染晕浓度超标面积约为 0.12km^2。在污染晕超标影响范围内无饮用地下水的敏感点分布。NH_3-N 污染晕分布范围及周围敏感点情况见下图 4.4-5。

Maximum transportation distance of pollutant NH3-N will be 1750m in 1000 days from the leakage accident, and the area where the concentration of pollution halo exceeds the standard will be around 0.12km^2. There will be no distribution of sensitive points of drinking groundwater within the impact area of pollution halo exceeding the standard. Distribution range of NH_3-N pollution halo and the surrounding sensitive points are as shown in Figure 4.4-5 below.

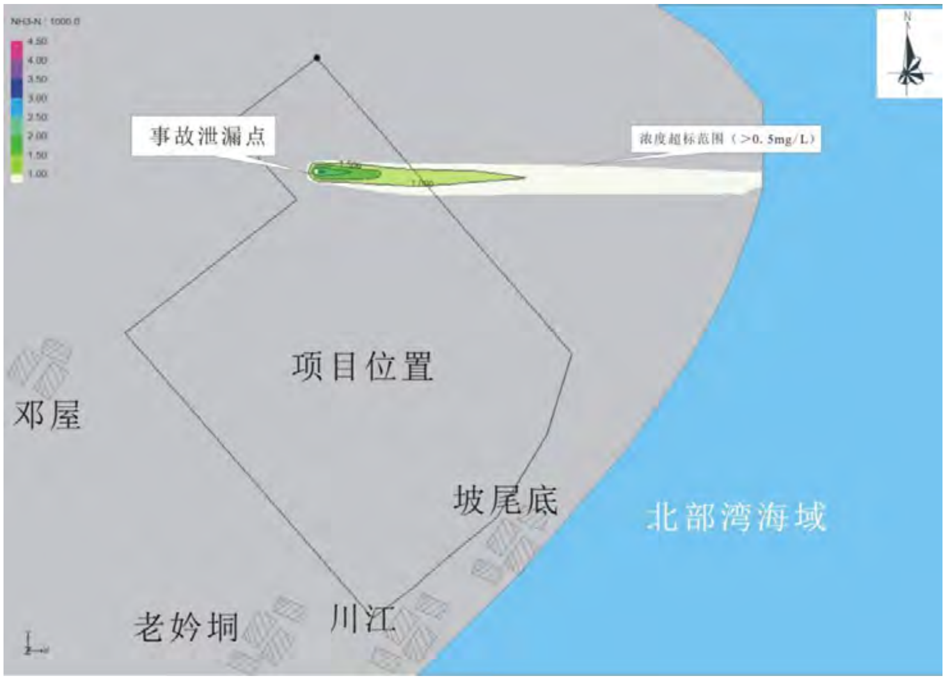


图 4.4-5 1000 天时 NH_3-N 影响范围

Figure 4.4-5 Impact Area of NH_3-N in 1000 Days

4.4.2.7 非正常工况下项目对周边敏感点的影响分析

4.4.2.7 Analysis of project impact on surrounding sensitive points under abnormal working conditions.

非正常工况下，污水处理站初沉池池底发生破损，防渗层失效，污水持续泄露对地下水环境造成影响。在预测时段中，污染物 COD 污染晕浓度超标面积为 0.24km^2，最远影响距离为 1750m；污染物 NH_3-N 最大运移距离为 1750m，污染晕浓度超标面积约为 0.12km^2。泄露事故主要对厂区地下水下游方向造成影响，污染物最终将会排泄至北部湾海域。

Under abnormal working conditions, the bottom of the primary sedimentation tank of the sewage treatment station is damaged; the anti-seepage layer fails; and the continuous leakage of sewage affects the groundwater environment. In the prediction period, the area where the concentration of pollutant COD pollution halo exceeds the standard is 0.24km^2, and the farthest influence distance is 1750m; The maximum transport distance of pollutant NH_3-N is

1750m, and the area where the concentration of pollution halo exceeds the standard is about 0.12km^2. The leakage accident mainly affects the downstream direction of groundwater in the plant area, and pollutants will eventually be discharged to the sea area of Beibu Gulf.

发生污水泄露事故时，受到影响的主要含水层为浅层第四系孔隙水。泄露事故发生后，污染物将主要沿地下水流方向运移，在垂向上的扩散主要以分子弥散为主，垂向方向上的污染物运移较为缓慢。厂区附近敏感点主要为邓屋、老妗垌、川江及坡尾底，其中位于厂区地下水下游方向的村屯为川江及坡尾底。根据现场走访调查，项目周围村屯目前大部分饮用地下水。因本项目下游的川江及坡尾底均位于海水入侵区，浅层地下水无法饮用，村民的机井出水层均为较深层的第四系孔隙水。且饮用水井均为机井，大部分井深均达到 40m。若发生污染事故，在短时间内对侧下游的川江及坡尾底影响不大。且由预测结果可知，在污水处理站发生泄露事故的情况下，污染物并未对川江及坡尾底造成影响。

In the event of a sewage leakage accident, the main aquifer affected is shallow Quaternary pore water. Upon the leakage accident, the pollutants will mainly move along the direction of groundwater flow, the vertical diffusion is mainly molecular dispersion, and the vertical diffusion of pollutants is relatively slow. The sensitive points near the plant area are mainly Dengwu, Laojindong, Chuanjiang and Poweidi, of which the villages located downstream of the groundwater in the plant area are Chuanjiang and Poweidi. According to field visit and investigation, drinking water in most villages around the project now is sourced from groundwater. As the Chuanjiang and Poweidi downstream of the project are both located in the seawater intrusion area, the shallow groundwater is not drinkable, and the water outlet layer of the villagers' motor-pumped wells is the deeper Quaternary pore water. The drinking water wells are all motor-pumped wells, most of which are 40m deep. In the event of a pollution accident, it will impose limited impact on Chuanjiang and Poweidi at the downstream in a short period of time. Moreover, as revealed by the prediction results, the pollutants have not imposed impact on Chuanjiang and Poweidi with leakage accident being occurred in the sewage treatment station.

因此项目非正常工况下，对周边的敏感点影响不大。

Therefore, under abnormal working conditions of the project, it will impose limited impact on the surrounding sensitive points.

4.4.3化学库及储罐区对地下水环境影响分析

4.4 Analysis for impact of chemical warehouse and storage tank farm on groundwater environment

项目拟于化学库设置硫酸储罐及盐酸储罐。化学库为项目重点防渗区，场地地下水防渗措施按等效黏土防渗层厚度≥6m，渗透系数小于 1.0×10^{-7}cm/s，或参照 GB GB18598-2001《危险废物填埋污染控制标准》进行设计。且储罐周围设有围堰，储罐底部均位于地上，泄漏事故较易被发现。泄漏液体将会被收集在围堰中，泄漏事故能得到较为妥善的处置。化学库及储罐区对地下水环境的影响不大。

The project is proposed to be provided with sulfuric acid and hydrochloric acid storage tanks in the chemical warehouse, which shall be the key anti-seepage area of the project. The anti-seepage measures for groundwater in the site shall be designed according to the equivalent clay seepage prevention layer thickness ≥ 6 m, permeability coefficient less than 1.0 × 10-7cm/s, or according to the *Standard for Pollution Control on the Security Landfill Site for Hazardous Wastes* (GB18598-2001). Also cofferdams shall be provided around the storage tanks, of which the bases shall be located on the ground for easy identification of leakage accidents. The leaked liquid will be collected in the cofferdam such that the leakage accident can be properly disposed of. Chemical warehouse and storage tank farm will impose limited impact on groundwater environment.

4.4.4项目污水管网布设对地下水环境影响分析

4.4 Analysis for impact of laying of sewage pipe network on surface water environment in the project

项目各生产车间废水通过厂内污水收集管道收集后统一进入厂区污水处理站处理，废水处理工艺采用“初沉池+厌氧反应器+生物选择池+卡鲁塞尔氧化沟+高级氧化池”，废水处理达标后排入铁山港区深海排放管网，污水管道设置两道 DN1200 螺旋碳钢管道（内外防腐），污水最后在铁山港 B3 排污口深海排放。

The wastewater from each production workshop of the project will be collected through the sewage collection pipeline in the plant and then is uniformly delivered into the sewage treatment station in the plant area for treatment. The wastewater treatment process will be "primary sedimentation tank + anaerobic reactor + biological selection tank + Carrousel oxidation ditch + advanced oxidation tank". The wastewater treated up to standard will be discharged into the deep sea discharge pipe network in Tieshan Port area. The sewage pipe will be equipped with two DN1200 spiral carbon steel pipes (with both internal and external corrosion prevention). The sewage will be finally discharged into the deep sea at the B3 sewage outlet of Tieshan Port.

项目占地规模较大，污水管网分布较广，存在可能的破损风险导致污水泄露，从而对地下水环境造成影响。项目各主要生产车间均按分区进行了防渗，各主要生产车间防渗级别最低为“一般防渗区”，部分车间为“重点防渗区”。且在地面上布设的污水管线泄露能及时发现，防渗措施能阻止泄露事态的进一步扩展。

The project covers a large area and the sewage pipe network is widely distributed. There is a possible risk of damage that leads to sewage leakage, thus affecting the groundwater environment. All the major production workshops of the project have carried out seepage prevention according to different zones. The lowest seepage prevention level of each major production workshop is "general anti-seepage zone" and some workshops are "key anti-seepage zone". Moreover, the leakage of sewage pipelines laid on the ground can be found in time, and anti-seepage measures can prevent the further expansion of the leakage situation.

埋于地下的部分管线的泄漏事故比较隐蔽，难以发现。一旦发生此类管线泄露事故，将会对厂区内地下水环境造成一定的影响。污水管线破损的原因一般为：①防腐漆出现脱落，管道遭遇腐蚀，出现裂缝漏水；②管道受到施工破坏：管道标识不明，巡查力度低，外协施工人员未被告知情况下盲目施工造成损坏。管道破损造成污水泄露后，若长时间未发现则污水会通过包气带下渗至地下水环境中。管道遭遇腐蚀造成的破损裂缝一般较小，泄露的污水量较小，但长时间的泄露仍然会通过包气带下渗造成土壤及地下水环境的污染。场地内地下水流向总体为西北向东南，污染物进入地下水含水层后将会随着地下水水流方向扩散，最终排泄至铁山港海域。厂区周围敏感点川江及坡尾底位于厂区地下水流场的侧下游方向，造成村屯地下水污染的影响较小，且本环评拟于坡尾底处

设置地下水环境质量后期跟踪监测点，能发现地下水环境污染事态。因此，若污水管道遭到腐蚀从而破损泄露污水，对周边村民的地下水饮用水安全影响不大。

Leakage accidents of some pipelines buried underground are relatively hidden and difficult to find. Once such a pipeline leakage accident occurs, it will have a certain impact on the groundwater environment in the plant area. The reasons for the damage of sewage pipelines are generally as follows: ① peeled off anticorrosive paint, corroded pipelines, and presence of cracks and water leakage; ② the pipelines are damaged by construction: unknown pipeline identifications, low inspection intensity and the damage which is caused by blind construction without being informed by outsourced construction personnel. After the pipeline is damaged and the sewage leaks, if it is not found for a long time, the sewage will seep down into the groundwater environment through the aeration zone. The damaged cracks caused by corrosion of pipelines are generally small and the amount of sewage leaked is small, but long-term leakage will still cause soil and groundwater environment pollution through infiltration of vadose zone. The groundwater flow direction in the site is generally from northwest to southeast. After pollutants enter the groundwater aquifer, they will diffuse along the direction of groundwater flow and eventually discharge to Tieshan Port sea area. The sensitive points around the plant area, Chuanjiang and Poweidi, are located in the downstream direction of the groundwater flow field in the plant area, which has little impact on the groundwater pollution in Cuntun. In addition, the EIA plans to set up a monitoring point for the later stage of groundwater environmental quality at the bottom of the slope tail to find the groundwater environmental pollution situation. Therefore, if the sewage pipeline is corroded and thus damaged and leaked, it will impose limited impact on the safety of groundwater and drinking water of the surrounding villagers.

4.4.4.1 管道破裂应急措施

4.4.4.1 Emergency measures for rupture of pipes

为防止污水管道遭到施工破坏及腐蚀破坏，建设单位拟成立管道泄漏事故应急救援“指挥小组”，由水处理负责人任指挥组长，下设应急救援办公室，日常工作由安全科管理。负责 “管道泄漏应急预案”的制定，修订；组建应急救援队伍，并组织应急救

援的实施与演练，检查督促做好重大事故的预防和应急救援的各项准备工作。发生事故时，组织救援小组实施救援活动；向上级领导汇报事故情况，必要时向有关单位发出救援请求；组织事故调查，总结应急救援经验教训。成立管道泄漏事故救援小组，由水处理设备负责人、电仪负责人、设备人员、电气人员及当班班组成员组成。救援小组是管道泄漏应急救援的骨干力量，担负事故的救援的具体实施任务。

A “command team” for emergency rescue of pipe leakage accidents shall be established in order to prevent sewage pipes from being damaged by construction and corrosion, with the head of water treatment sector as the command team leader, under which the emergency rescue office is set. The daily work shall be managed by the Safety Division, which shall be responsible to formulate and revise the Emergency Plan for Pipeline Leakage, set up an emergency rescue team, organize the implementation and drills of emergency rescue, inspect and urge the prevention of major accidents and various preparations for emergency rescue. In the event of an accident, organize rescue teams to carry out rescue activities; report the accident to the superior leadership and send out rescue requests to relevant entities when necessary; organize accident investigation and sum up emergency rescue experiences and lessons. A pipeline leakage accident rescue team shall be set up, which shall be composed of the person in charge of water treatment equipment, the person in charge of electrical instruments, equipment personnel, electrical personnel and members of the team on duty. The rescue team is the backbone of the emergency rescue of pipeline leakage and undertakes the specific implementation tasks of accident rescue.

为应对管道破裂的情况，拟采取以下应急处置措施：

In order to deal with pipeline rupture, the following emergency measures are proposed:

①车间安排管道巡查人员，负责管道的日常巡查工作。

(1) The workshop shall arrange patrol inspection personnel to take charge of the daily patrol inspection of the pipes.

②铺设管道标识：于管道铺设处埋设明显标识，每 50 米一个标识牌

① Embedding identification for pipes: Distinct identification signboards shall be embedded along the route where the pipe is laid, at an interval of every 50 meters

③加强巡查力度：专人进行巡查，至少每 3 天巡查一次，对管道沿线施工处进行告

知，遇到距离管道 2 米以内的施工时，专人跟踪维护，避免管道遭到破坏。

③ Intensifying patrol inspection: A dedicated person shall be dispatched for patrol inspection, at a frequency of less than once every three days, and shall be responsible for informing the construction party who is working along the pipeline. If the construction work is carried within 2 meters from the pipe, a dedicated person shall be assigned for tracking maintenance, to avoid damage to the pipes.

④发现泄露情况第一时间告知水处理车间负责人，汇报泄漏地点、详细情况、最近路线等。

④ Once the leak is identified, the head of the water treatment workshop shall be informed at the earliest time of the location of leak point, details and the nearest route, etc.

⑤水处理负责人接到通知后立即启动《排海管线泄漏事故应急预案》。根据泄露情况采取以下措施：通知当班班组人员切换另外一条排水管道，关闭上下两个阀门进行抽水抢修；若出现异常情况，两条排水管线同时出现泄露，水处理启用应急事故池进行蓄水，泄露点进行应急抢修。同时通知厂区各生产车间积极采取应对措施减少排水，尽量增大蓄水时间；若泄漏点维修难度大，核算在应急蓄水期间不能完成抢修，水处理车间负责人向上级主管领导汇报，车间进行限产（必要时进行停产），确保管道的抢修工作顺利完成。

⑤ Upon receipt of this notice, the head of the water treatment workshop shall immediately start the *Emergency Preparedness Plan (EPP) for Leak Accidents of Sea Discharge Pipelines*. Depending upon the leakage condition, the following measures shall be taken: notify the shift personnel to switch another drainage pipeline, close the upper and lower valves for pumping and emergency repair; in the event of any abnormal condition where the two drainage pipelines leak at the same time, the emergency accident pool shall be put into service for water storage in water treatment plant, and emergency repair shall be carried out at the leakage point. At the same time, the production workshops in the plant area shall be notified to actively take actions to reduce the discharge of water and maximize the period of storing water. If the leak point is difficult to repair and it is impossible to complete the emergency repair within the emergency water storage period based on calculation, the head of the water treatment workshop shall report to his/her superior, who shall decide to limit the production (or stop the production as necessary) in workshops, to ensure that the emergency repair of the pipes can be successfully completed.

4.4.4.2 管道破裂维修

4.4.4.1 Repair of pipe rupture

①停水：停止输送水，并将出现泄露的管道前后两个阀门关闭。

① Stopping water: conveying of water shall be stopped, and the valves before and after the leak point of the pipe shall be closed.

②挖掘：用挖掘机仔细清理管道两侧土，管道两侧各保留 1 米工作面，距管道连接件 30cm 处用人工挖掘。

② Excavation: The soil at both side of the pipe shall be carefully removed from an excavator. A one-meter wide workface shall be kept respectively at both sides. The soil within range of 30cm from the pipe connectors shall be excavated manually.

③抽水：及时用潜水泵将漏点处水进行抽水，将泄露点水利用临时排水管道抽至就近车间集水池，经车间集水池送至水处理进行再处理。防止泄露水对周边地下水造成环境影响。

③ Pumping water: The water accumulated at the leak point shall be pumped out in time with a submersible pump, and through a temporary drain pipe, transferred to the water collecting basin in the nearest workshop, from which it will be delivered to water treatment workshop for retreatment. Leaked water shall be prevented from causing environmental impact on surrounding groundwater.

④当发现管道连接处出现沉降等原因造成的焊缝开裂，且管道无腐蚀情况，可对管道进行补焊处理。

④ Where weld cracks occur due to causes like settlement at the pipe connection and no corrosion is detected in the pipe, repair welding can be applied for the pipe.

⑤凡管道因防腐破坏出现裂纹，孔洞或其他严重损坏的管道等进行整体更换管道。

⑤ Where cracks, voids or other severe damage occur in the pipe due to corrosion, this entire pipe shall be replaced.

⑥管道取出：将存在问题的管道进行割除，然后仔细取出。

⑥ Removal of pipe: the problematic pipe shall be cut off and then carefully removed.

⑦管道更换：将应急备用的螺旋碳钢管进行等尺寸的焊接更换。焊接完成后进行防腐处理。焊接完成后进行管道试压。

⑦ Pipe replacement: the spare spiral carbon steel pipe for emergency applications shall be welded with the identical dimension as the replaced one. Upon completion of the welding, anticorrosion treatment shall be carried out. Upon completion of the welding, pipe pressure test shall be carried out.

⑧回填:试压正常后开始回填，回填沙至半管高度，用水沉降，然后用细碎土，用水灌实。注意回填过程中避免强夯。

⑧ Backfilling: Backfilling can be started after normal conditions is presented in the pressure test. When the backfilled sand reaches the height equal to half the pipe diameter, the filled sand shall be settled down with water, and then fine crushed soil shall be backfilled and consolidated with water. Care should be taken to avoid dynamic compaction during backfilling.

4.4.5小结

4.4.5 Summary

厂区位于大江口单元之中，大江口单元以北部湾海域为最低排泄基准面，该单元的地下水亦主要靠大气降水的渗入补给，大气降水大部分以地表径流方式排泄于北部湾海域。该单元的地下水亦处在相对独立的地下水系统之中，地下水运移于松散岩类孔隙中，大体上由北西向南东径流，地下水流程较短，以渗流的方式排泄。在厂区范围内，地下水由东北向西南径流，最终排泄至北部湾海域。

The plant area is located in Dajiangkou Unit. Dajiangkou Unit takes Beibu Gulf sea as the minimum drainage base level. Groundwater of the unit is mainly recharged by infiltration of atmospheric precipitation. Most atmospheric precipitation will be discharged into Beibu Gulf sea in the form of surface runoff. The groundwater in this unit is also in a relatively independent groundwater system; groundwater transports in loose rock pores and runs from northwest to southeast generally. The groundwater flow is short and is discharged by seepage. Within the plant area, groundwater flows from northeast to southwest and is finally discharged to the sea area of Beibu Gulf.

项目针对化学浆车间、化机浆车间、二氧化氯制备车间、污水处理站、事故应急池、储罐区等各类下设管道或废水收集池的区域，划为重点防渗区。重点防渗区防渗要求为等效黏土防渗层厚度≥6m，渗透系数小于 1.0×10^{-7}cm/s，可有效阻止废水渗流至地下导致地下水环境受到污染。正常工况下，项目的运营对地下水环境影响不大。

The project focuses on various areas with pipelines or wastewater collection tanks, such as chemical pulp workshop, chemical mechanical pulp workshop, chlorine dioxide preparation workshop, sewage treatment station, emergency pool, storage tank farm, etc., which are classified as key anti-seepage zone. Key anti-seepage zone is required to be have an equivalent clay seepage prevention layer thickness ≥ 6 m and permeability coefficient less than 1.0×10^{-7}cm/s, which can effectively prevent wastewater from seepage to the ground and cause groundwater environment pollution. Under normal working conditions, project operation will impose limited impact on the groundwater environment.

项目的非正常工况情景设置为污水处理站池底破损，防渗层失效，废水下渗至地下水环境中对地下水造成污染。通过数值法模拟，由预测结果可知，废水中的 COD 及 NH_3-N 在地下水流场中的影响范围均可到达场地下游 1750m 处，最广影响范围为场地下游 0.24km^2。最终排泄进入北部湾海域。但项目主要生产装置下游无饮用地下水的敏感点分布，因此泄露事故发生时对周边居民的饮用水安全影响不大。

The abnormal working conditions of the project are set as the pool bottom of sewage treatment station broken, the impermeable layer failed and groundwater polluted due to seepage of wastewater into the groundwater environment. Through numerical simulation, it can be known from the prediction results that the impact area of COD and NH3-N in the wastewater in the groundwater flow field can reach 1750m downstream of the site, and the widest impact area is 0.62 km2 downstream of the site , which is finally discharged into the Beibu Gulf sea area. However, there is no sensitive points of drinking groundwater distributed downstream of production plants of the project, so the safety of drinking water for the surrounding residents at the time of the leakage is not significantly affected.

本次环评拟于污水处理站南部厂界处设置地下水污染监测井，用于监测可能发生的污染泄露事故。建设监测井以及完善运营期地下水监测计划能对地下水污染事故起到防

范作用，及能在发生事故时作为临时应急地下水抽水井使用，对污染物的扩散起到一定的阻隔作用。

For the purpose of this EIA, a groundwater pollution monitoring well is proposed at the southern plant boundary of the sewage treatment station to monitor possible pollution leakage accidents. Construction of the monitoring wells and improvement of groundwater monitoring plans during the operation period can prevent groundwater pollution accidents, and can be used as temporary emergency groundwater pumping wells in case of accidents, thus blocking the diffusion of pollutants to a certain extent.

4.5 运营期声环境影响预测与评价

4.5 Prediction and assessment of impact on acoustic environment during the operation period

4.5.1噪声源强

4.5.1 Noise source intensity

项目噪声源主要为备料工段水洗机，制浆车间的除砂器、浆泵、真空泵等，造纸车间磨浆机、纸机等，二氧化氯制备车间的药剂泵和水泵，制氧站的鼓风机、真空泵、氧压机等机械设备。项目噪声源较多，大部分安置在工厂厂房内或相应设备的室内，同时通过选用低噪声设备，并采取房屋隔声、基础减振等措施进行降噪处理。

The noise sources of the Project are mainly water washing machines in the material preparation section, sand removers, pulp pumps, vacuum pumps, etc. in the pulping workshop, pulp refiners, paper machines, etc. in the papermaking workshop, chemical pumps and water pumps in the chlorine dioxide preparation workshop, blowers, vacuum pumps, oxygen compressors and other mechanical equipment in the thermoelectric workshop. There are many noise sources in the Project. Most of them are placed in the plant building or the room of corresponding equipment. Besides, noise reduction treatment is carried out by selecting low noise equipment and taking measures such as sound insulation of houses and vibration reduction of foundation.

一期、二期主要噪声源及源强见表4.5-1和表4.5-2。

Major noise sources and source intensity in Phase I and II are listed in Table 4.5-1 and 4.5-2.

表 4.5-1　一期主要噪声源
Table 4.5-1 Main noise sources of Phase I

工序/生产线 Process/production line	噪声源 Noise sources	生源类型 Source type	噪声源强 Noise source intensity		降噪措施 Noise reduction measures		数量（台） Quantity (set)	持续时间 Duration
			核算方法 Accounting method	噪声值 dB(A) Noise value dB (A)	工艺 Process	降噪后噪声值 dB(A) Noise after noise reduction dB(A)		
原料堆场及备料车间 Raw material stockyard and preparation workshop	削片机 Chipping machine	频发 Frequent	类比法 Analogy method	89~105	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	64~80	3	8160
	木片筛 Wood chip screen	频发 Frequent	类比法 Analogy method	85~90	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	4	8160
	再碎机 Rechipper	频发 Frequent	类比法 Analogy method	85~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	64~80	1	8160
制浆车间 Pulping workshop	除砂器 Grit separator	频发 Frequent	类比法 Analogy method	81~90	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	56~65	1	8160
	压力筛 Pressurized screen	频发 Frequent	类比法 Analogy method	85~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	3	8160
	洗浆机 Pulp washer	频发 Frequent	类比法 Analogy method	78~91	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	53~66	5	8160
	浆泵 Pulp pump	频发 Frequent	类比法 Analogy method	85~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	9	8160
二氧化氯制备车间 Chlorine dioxide	料泵 Material pump	频发 Freque	类比法 Analogy	85~90	基础减振、车间阻隔 Foundation vibration reduction and	60~65	1	8160

工序/生产线 Process/production line	噪声源 Noise sources	生源类型 Source type	噪声源强 Noise source intensity		降噪措施 Noise reduction measures		数量（台）Quantity (set)	持续时间 Duration
			核算方法 Accounting method	噪声值 dB(A) Noise value dB (A)	工艺 Process	降噪后噪声值 dB(A) Noise after noise reduction dB(A)		
preparation workshop		nt	method		vehicle blocking			
	水泵 Water pump	频发 Frequent	类比法 Analogy method	80~94	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	55~69	1	8160
化机浆车间 Chemimechanical pulp workshop	洗涤机 Washing machine	频发 Frequent	类比法 Analogy method	80~90	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	55~65	1	8160
	料塞螺旋 Material plug screw	频发 Frequent	类比法 Analogy method	83~89	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	58~64	1	8160
	高浓磨浆机 High-consistency fiberizer	频发 Frequent	类比法 Analogy method	91~100	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	66~75	4	8160
	低浓磨浆机 Low-consistency fiberizer	频发 Frequent	类比法 Analogy method	87~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	62~70	4	8160
	木片泵 Wood chip pump	频发 Frequent	类比法 Analogy method	85~90	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~65	1	8160
	压力筛 Pressurized screen	频发 Frequent	类比法 Analogy method	85~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	3 套 3 sets	8160
	渣浆磨 Slag pulp mill	频发 Frequent	类比法 Analogy method	86~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	61~70	2	8160

工序/生产线 Process/production line	噪声源 Noise sources	生源类型 Source type	噪声源强 Noise source intensity		降噪措施 Noise reduction measures		数量（台） Quantity (set)	持续时间 Duration
			核算方法 Accounting method	噪声值 dB(A) Noise value dB (A)	工艺 Process	降噪后噪声值 dB(A) Noise after noise reduction dB(A)		
	浆泵 Pulp pump	频发 Frequent	类比法 Analogy method	85~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	1 套 1 set	8160
空压站 Air compressor station	空压机 Air compressor	频发 Frequent	类比法 Analogy method	85~90	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	4	8160
浆板车间 Pulp board workshop	真空泵 Vacuum pump	频发 Frequent	类比法 Analogy method	85~100	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~75	4	8160
	碎浆机 Pulper	频发 Frequent	类比法 Analogy method	85~93	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~68	2	8160
	浆板机 Pulp machine	频发 Frequent	类比法 Analogy method	80~85	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	50~60	1	8160
文化用纸车间 Cultural paper	除砂器 Grit separator	频发 Frequent	类比法 Analogy method	85~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	2	8160
	磨浆机 Fiberizer	频发 Frequent	类比法 Analogy method	91~100	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	66~75	2	8160
	纸机 Paper-making machine	频发 Frequent	类比法 Analogy method	92~108	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	67~83	1	8160
特种纸车间	除砂器	频发	类比法	85~95	基础减振、车间阻隔	60~70	2	8160

工序/生产线 Process/production line	噪声源 Noise sources	生源类型 Source type	噪声源强 Noise source intensity		降噪措施 Noise reduction measures		数量（台） Quantity (set)	持续时间 Duration
			核算方法 Accounting method	噪声值 dB(A) Noise value dB (A)	工艺 Process	降噪后噪声值 dB(A) Noise after noise reduction dB(A)		
Special paper	Grit separator	Frequent	Analogy method		Foundation vibration reduction and vehicle blocking			
	磨浆机 Fiberizer	频发 Frequent	类比法 Analogy method	91~100	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	66~75	2	8160
	纸机 Paper-making machine	频发 Frequent	类比法 Analogy method	92~108	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	67~83	1	8160
碱回收车间 Alkaline recovery workshop	风机 Fan	频发 Frequent	类比法 Analogy method	78~91	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	53~66	6	8160
	真空泵 Vacuum pump	频发 Frequent	类比法 Analogy method	85~100	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~75	3	8160
热电站 Thermal power plant	汽轮机 Steam turbine	频发 Frequent	类比法 Analogy method	85~90	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	3	8160
	发电机 Generator	频发 Frequent	类比法 Analogy method	85~90	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	3	8160
	风机 Fan	频发 Frequent	类比法 Analogy method	78~91	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	53~66	4	8160
污水处理站 Sewage treatment plant	泵类 Pump	频发 Freque	类比法 Analogy	80~94	基础减振、车间阻隔 Foundation vibration reduction and	55~69	44	8160

工序/生产线 Process/production line	噪声源 Noise sources	生源类型 Source type	噪声源强 Noise source intensity		降噪措施 Noise reduction measures		数量（台） Quantity (set)	持续时间 Duration
			核算方法 Accounting method	噪声值 dB(A) Noise value dB (A)	工艺 Process	降噪后噪声值 dB(A) Noise after noise reduction dB(A)		
		nt	method		vehicle blocking			
	风机 Fan	频发 Frequent	类比法 Analogy method	78~91	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	53~66	8	8160

表 4.5-2　二期主要噪声源

Table 4.5-2 Main noise sources of Phase II

工序/生产线 Process/production line	噪声源 Noise sources	生源类型 Source type	噪声源强 Noise source intensity		降噪措施 Noise reduction measures		数量（台） Quantity (set)	持续时间 Duration
			核算方法 Accounting method	噪声值 dB(A) Noise value dB (A)	工艺 Process	降噪后噪声值 dB(A) Noise after noise reduction dB(A)		
原料堆场及备料车间 Raw material stockyard and preparation workshop	木片筛 Wood chip screen	频发 Frequent	类比法 Analogy method	85~90	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	4	8160
化机浆车间 Chemimechanical pulp workshop	洗涤机 Washing machine	频发 Frequent	类比法 Analogy method	80~90	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	55~65	1	8160
	料塞螺旋 Material plug	频发 Freque	类比法 Analogy	83~89	基础减振、车间阻隔 Foundation vibration reduction and	58~64	1	8160

工序/生产线 Process/production line	噪声源 Noise sources	生源类型 Source type	噪声源强 Noise source intensity		降噪措施 Noise reduction measures		数量（台） Quantity (set)	持续时间 Duration
			核算方法 Accounting method	噪声值 dB(A) Noise value dB (A)	工艺 Process	降噪后噪声值 dB(A) Noise after noise reduction dB(A)		
	screw	nt	method		vehicle blocking			
	高浓磨浆机 High-consistency fiberizer	频发 Frequent	类比法 Analogy method	91~100	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	66~75	4	8160
	低浓磨浆机 Low-consistency fiberizer	频发 Frequent	类比法 Analogy method	87~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	62~70	4	8160
	木片泵 Wood chip pump	频发 Frequent	类比法 Analogy method	85~90	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~65	1	8160
	压力筛 Pressurized screen	频发 Frequent	类比法 Analogy method	85~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	3 套 3 sets	8160
	渣浆磨 Slag pulp mill	频发 Frequent	类比法 Analogy method	86~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	61~70	2	8160
	浆泵 Pulp pump	频发 Frequent	类比法 Analogy method	85~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	1 套 1 set	8160
生活用纸车间 Life paper	真空泵 Vacuum pump	频发 Frequent	类比法 Analogy method	85~100	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~75	6	8160
	碎浆机 Pulper	频发 Frequent	类比法 Analogy method	85~93	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~68	9	8160

工序/生产线 Process/production line	噪声源 Noise sources	生源类型 Source type	噪声源强 Noise source intensity		降噪措施 Noise reduction measures		数量（台） Quantity (set)	持续时间 Duration
			核算方法 Accounting method	噪声值 dB(A) Noise value dB (A)	工艺 Process	降噪后噪声值 dB(A) Noise after noise reduction dB(A)		
	压力筛 Pressurized screen	频发 Frequent	类比法 Analogy method	85~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	9	8160
	纸机 Paper-making machine	频发 Frequent	类比法 Analogy method	92~108	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	67~83	3	8160
白卡纸车间 Ivory board	除砂器 Grit separator	频发 Frequent	类比法 Analogy method	85~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	5	8160
	磨浆机 Fiberizer	频发 Frequent	类比法 Analogy method	91~100	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	66~75	13	8160
	碎浆机 Pulper	频发 Frequent	类比法 Analogy method	85~93	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~68	8	8160
	压力筛 Pressurized screen	频发 Frequent	类比法 Analogy method	85~95	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	4	8160
	纸机 Paper-making machine	频发 Frequent	类比法 Analogy method	92~108	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	67~83	1	8160
热电站 Thermal power plant	汽轮机 Steam turbine	频发 Frequent	类比法 Analogy method	85~90	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	60~70	1	8160
	发电机	频发	类比法	85~90	基础减振、车间阻隔	60~70	1	8160

工序/生产线 Process/production line	噪声源 Noise sources	生源类型 Source type	噪声源强 Noise source intensity		降噪措施 Noise reduction measures		数量（台） Quantity (set)	持续时间 Duration
			核算方法 Accounting method	噪声值 dB(A) Noise value dB (A)	工艺 Process	降噪后噪声值 dB(A) Noise after noise reduction dB(A)		
	Generator	Frequent	Analogy method		Foundation vibration reduction and vehicle blocking			
	风机 Fan	频发 Frequent	类比法 Analogy method	78~91	基础减振、车间阻隔 Foundation vibration reduction and vehicle blocking	53~66	2	8160

4.5.2噪声影响预测模式

4.5.2 Prediction mode of noise impact

噪声预测按照《环境影响评价技术导则 声环境》（HJ2.4-2009）进行：首先，预测设备噪声到厂界排放值，并判断是否达标；其次，将各车间噪声值在敏感点处的贡献值与本底值进行叠加，看是否达标。声源有室外和室内两种声源，应分别计算。

Noise prediction shall be carried out in accordance with *Technical Guidelines for Environmental Impact Assessment - Noise Environment* (HJ2.4-2009): firstly, the emission value of equipment noise to the factory boundary is predicted and whether it meets the standard is judged. Secondly, the contribution value of noise value in each workshop at sensitive points is superimposed with the background value to see if it meets the standard. There are two types of sound sources, outdoor and indoor, which shall be calculated separately.

（1）单个室外的点声源在预测点产生的声级计算基本公式

(1) The basic equation for calculating the sound level generated by a single outdoor point sound source at the prediction point

① 如已知声源的倍频带声功率级（从 63Hz 到 8KHz 标称频带中心频率的 8 个倍频带），预测点位置的倍频带声压级 Lp(r)可按公式（A.1）计算：

① If the octave frequency band sound power level of the sound source (8 octave frequency bands from 63Hz to 8KHz nominal frequency band center frequency) is known, the octave frequency band sound pressure level Lp(r) at the prediction point position can be calculated according to Equation (A.1):

$$L_P(r) = L_w + D_c - A \quad \text{(A.1)}$$

$$A = A_{div} + A_{atm} + A_{gr} + A_{bar} + A_{misc}$$

式中：

Where:

Lw—倍频带声功率级，dB；

Lw - octave band sound power level, dB;

Dc—指向性校正，dB；它描述点声源的等效连续声压级与产生声功率级 Lw 的全向点声源在规定方向的级的偏差程度。指向性校正等于点声源的指向性指数 DI 加上计到

小于 4π 球面度（sr）立体角内的声传播指数 Dπ。对辐射到自由空间的全向点声源，Dc=0dB。

Dc - directivity correction, dB; it describes the degree of deviation between the equivalent continuous sound pressure level of the point sound source and the level of the omnidirectional point sound source that generates the sound power level LW in a specified direction. The directivity correction is equal to the directivity index DI of the point sound source plus the sound propagation index Dπ within the stereo angle less than 4π spherical degrees (sr). For an omnidirectional point source radiating into free space, Dc = 0dB.

A— 倍频带衰减，dB；

A - octave attenuation, dB;

Adiv—几何发散引起的倍频带衰减，dB；

Adiv - octave attenuation due to geometric divergence, dB;

Aatm—大气吸收引起的倍频带衰减，dB；

Aatm - atmospheric Absorption Induced Octave Band Attenuation, dB;

Agr—地面效应引起的倍频带衰减，dB；

Agr - ground effect induced octave attenuation, dB;

Abar— 声屏障引起的倍频带衰减，dB；

Abar - attenuation of octave band caused by sound barrier, dB;

Amisc—其他多方面效应引起的倍频带衰减，dB。

Amisc - attenuation of octave band caused by other multifaceted effects, dB.

② 如已知靠近声源处某点的倍频带声压级 Lp(r0)时，相同方向预测点位置的倍频带声压级 Lp(r)可按公式（A.2）计算：

② If the octave frequency band sound pressure level adjacent to a point of sound source Lp(r0) is known, the octave frequency band sound pressure level Lp(r) at the prediction point position can be calculated according to Equation (A.2):

$$L_P(r) = L_P(r_0) - A \qquad (A.2)$$

预测点的 A 声级 Lp(r)，可利用 8 个倍频带的声压级按公式（A.3）计算：

The A sound level Lp(r) at the prediction point can be calculated according to the Equation A.3 by using the sound pressure levels of 8 octave bands:

$$L_A(r) = 10\lg\left\{\sum_{i=1}^{8} 10^{\left[0.1L_{Pi}(r) - \Delta L_i\right]}\right\} \qquad (A.3)$$

式中：

Where:

L_{Pi}（r）—预测点（r）处，第 i 倍频带声压级，dB；

LPi (r) - sound pressure level of the i times octave band at the prediction point (r), dB;

ΔLi —i 倍频带 A 计权网络修正值，dB（见附录 B）。

ΔLi - the i times octave A weighted network correction value, dB (refer to Annex B).

③ 在不能取得声源倍频带声功率级或倍频带声压级，只能获得 A 声功率级或某点的 A 声级时，可按公式（A.4）和（A.5）作近似计算：

③ Where the sound power level of the frequency doubling band or the sound pressure level of the frequency doubling band of the sound source cannot be obtained, but only the sound power level of A or the sound level of A at a certain point can be obtained, approximate calculation can be made according to Equation (A.4) and (A.5):

$$L_A(r)=L_{Aw}-D_c-A \tag{A.4}$$

或

$$L_A(r)=L_A(r_0)-A \tag{A.5}$$

A 可选择对 A 声级影响最大的倍频带计算，一般可选中心频率为 500Hz 的倍频带作估算。

For A, the octave frequency band with greatest impact on A sound level is selectable for calculation, and generally can choose the octave frequency band with the center frequency of 500Hz for estimation.

本次评价进行保守预测，不考虑声屏障、遮挡物、空气吸收和地面效应等引起的衰减量 A_{bar}、A_{atm}、A_{gr}、A_{misc} 等。

This assessment is conservative without taking into account attenuation amounts A_{bar}, A_{atm}, A_{gr}, A_{misc}, etc. caused by sound barriers, shields, air absorption and ground effects.

（2）室内声源等效室外声源声功率级计算方法

(2) Equivalent outdoor sound source sound power level method for indoor sound sources

如图 4.5-1 所示，声源位于室内，室内声源可采用等效室外声源声功率级法进行计算。设靠近开口处（或窗户）室内、室外某倍频带的声压级分别为 Lp1 和 Lp2。

As shown in Figure 4.5-1, indoor sound sources can be calculated with equivalent outdoor sound source sound power level method. The sound pressure levels of certain indoor and outdoor octave frequency bands close to the opening (or window) is set as Lp1 and Lp2 respectively, as shown in the figure below.

① 若声源所在室内声场为近似扩散声场，则室外的倍频带声压级可按公式（A.6）

近似求出：

①If the indoor sound field where the sound source lies is approximate to a diffuse sound field, the sound pressure level of outdoor octave frequency band can be figured out as per the Equation (A.6):

$$L_{p2} = L_{P1} - (TL + 6) \quad \text{(A.6)}$$

式中：

Where:

TL—隔墙（或窗户）倍频带的隔声量，dB。

TL - sound insulation of partition wall (or window) octave, dB.

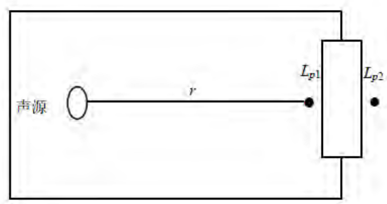


图 4.5-1　　室内声源等效为室外声源图例

Figure 4.5 Example of Indoor Sound Source Equivalent to Outdoor Sound Source

②也可按公式（A.7）计算某一室内声源靠近围护结构处产生的倍频带声压级：

②The octave frequency band sound pressure level generated by an indoor sound source near the enclosure structure can also be calculated as per the Equation A.7:

$$L_{P1} = L_W + 10\lg\left(\frac{Q}{4\pi r^2} + \frac{4}{R}\right) \quad \text{(A.7)}$$

式中：

Where:

Q—指向性因数；通常对无指向性声源，当声源放在房间中心时，Q=1；当放在一面墙的中心时，Q=2；当放在两面墙夹角处时，Q=4；当放在三面墙夹角处时，Q=8。

Q - directivity factor: generally, for a non-directional source placed at the center of a room, Q=1; placed at the center of a wall, Q=2; placed in the included angle of two walls: Q=4; placed in the included angle of three walls, Q=8.

R—房间常数；R =Sα/(1-α)，S 为房间内表面面积，m^2；α 为平均吸声系数。

R - Room constant; R=Sα/(1-α), S represents inner surface area of the room, m2; it is an average acoustical absorption coefficient.

r—声源到靠近围护结构某点处的距离，m。

r - distance from a certain sound source to a point near the building envelope, m;

然后按公式（A.8）计算出所有室内声源在围护结构处产生的 i 倍频带叠加声压级：

Next, the superimposed sound pressure level of octave frequency band i generated by all indoor sound sources in the envelop enclosure is calculated as per the Equation (A.8):

$$L_{P1i}(T)=10\lg(\sum_{j=1}^{N}10^{0.1L_{P1ij}}) \qquad (A.8)$$

式中：

Where:

L_{P1i} (T)—靠近围护结构处室内 N 个声源 i 倍频带的叠加声压级，dB；

L_{P1i} (T) - Superimposed sound pressure level of octave frequency band i generated by N indoor sound sources close to envelop enclosure, dB;

L_{P1ij}—室内 j 声源 i 倍频带的声压级，dB；

L_{P1ij} - Sound pressure level of octave frequency band i of indoor sound source j, dB;

N—室内声源总数。

N - Sum of indoor sound sources.

③在室内近似为扩散声场时，按公式（A.9）计算出靠近室外围护结构处的声压级：

③ When the indoor sound field is approximately diffused, the sound pressure level near the outdoor enclosure structure is calculated as per the Equation A.9:

$$L_{P2i}(T)=L_{P1i}(T)-(TL_i+6) \qquad (A.9)$$

式中：

Where:

L_{P2i} (T)—靠近围护结构处室外 N 个声源 i 倍频带的叠加声压级，dB；

L_{P2i} (T) - Superimposed sound pressure level of octave frequency band i generated by N outdoor sound sources close to envelop enclosure, dB;

TLi—围护结构 i 倍频带的隔声量，dB。

TLi - Sound insulation of octave frequency band i of envelop enclosure, dB.

然后按公式（A.10）将室外声源的声压级和透过面积换算成等效的室外声源，计算出中心位置位于透声面积（S）处的等效声源的倍频带声功率级。

Next, outdoor sound level and sound transmission area are converted into equivalent outdoor sound source as per Equation (A.10) and the octave frequency band sound power level of the equivalent sound source whose center lies in sound transmission area (S) is calculated:

$$L_W = L_{P2}(T) + 10\lg s \tag{A.10}$$

然后按室外声源预测方法计算预测点处的 A 声级。

Next, the A sound level at the prediction point is calculated according to the outdoor sound source method.

（3）噪声贡献值计算

(3) Calculation of contribution values of noise

设第 i 个室外声源在预测点产生的 A 声级为 L_{Ai}，在 T 时间内该声源工作时间为 t_i；第 j 个等效室外声源在预测点产生的 A 声级为 L_{Aj}，在 T 时间内该声源工作时间为 t_j，则拟建工程声源对预测点产生的贡献值（Leqg）为：

With the sound level A generated by the i-th outdoor sound source at the prediction point is set as LAI, and the working time of the sound source in T time is set as ti; the sound level A generated by the j-th equivalent outdoor sound source at the prediction point is LAj, and the working time of the sound source is tj within T time, then the contribution value (Leqg) generated by the sound source of the proposed project to the prediction point is:

$$L_{eqg} = 10\lg\left[\frac{1}{T}\left(\sum_{i=1}^{N} t_i 10^{0.1L_{Ai}} + \sum_{j=1}^{M} t_j 10^{0.1L_{Aj}}\right)\right] \tag{A.11}$$

式中：

Where:

jt—在 T 时间内 j 声源工作时间，s；

jt - Working time of sound source j within time T, s;

it—在 T 时间内 i 声源工作时间，s；

it - Working time of sound source i within time T, s;

T—用于计算等效声级的时间，s；

T - Equivalent sound level calculation time, s;

N—室外声源个数；

N - number of outdoor sound sources;

M—等效室外声源个数。

M - number of equivalent outdoor sound sources;

4.5.3噪声预测结果

4.5.3 Prediction results

根据本项目噪声产生特点，预测以每个生产车间视为一个整体，将其所有噪声源转化为点声源，噪声源中心取为生产单元中心。

According to the noise generation characteristics of this project, it is predicted that each production workshop will be regarded as a whole, all noise sources will be converted into point sound sources, and the center of noise sources will be taken as the center of the production unit.

转化后各声源源强情况见表 4.5-3 和表 4.5-4。

The intensity of each sound source after conversion is listed in Table 4.5-3 and 4.5-4 .

表 4.5-3 一期各车间噪声源与厂界预测点距离表

Table 4.5-3 List of Distance between Each Noise Source in Workshop of Phase I and Prediction Point at Plant Boundary

厂房 Plant	设备名称 Designation	降噪后源强叠加值 Superimposed source intensity value after noise reduction dB（A） dB (A)	距离东厂界（m） Distance from east plant boundary (m)	距离南厂界（m） Distance from south plant boundary (m)	距离西厂界（m） Distance from west plant boundary (m)	距离北厂界（m） Distance from north plant boundary (m)
原料堆场及备料车间 Raw material stockyard and preparation workshop	削片机、木片筛、再碎机 Chipping machine, wood chip screen, rechipper	86.43	965	412	90	906
制浆车间 Pulping workshop	除砂器、压力筛、洗浆机、浆泵 Grit separator, pressurized screen, pulp washer, pulp pump	81.56	425	774	780	660
二氧化氯制备车间 Chlorine dioxide preparation workshop	料泵、水泵 Material pump, water pump	65.97	657	845	630	690
化机浆车间 Chemimechanical pulp workshop	洗涤机、磨浆机、泵类等 Washing machine, fiberizer, pump, etc.	83.72	473	1006	775	487

空压站 Air compressor station	空压机 Air compressor	76.02	860	850	440	680
浆板车间 Pulp board workshop	真空泵、碎浆机、浆板机 Vacuum pump, pulper, pulp machine	81.46	634	947	562	595
文化用纸车间 Cultural paper	除砂器、磨浆机、纸机 Grit separator, fiberizer, paper-making machine	84.51	309	726	443	756
特种纸车间 Special paper	除砂器、磨浆机、纸机 Grit separator, fiberizer, paper-making machine	84.51	310	485	648	391
碱回收车间 Alkaline recovery workshop	风机、真空泵 Air fan, vacuum pump	80.75	310	870	780	558
热电站 Thermal power plant	汽轮机、发电机、风机 Steam turbine, generator, air fan	78.80	35	550	1187	1028
污水处理站（主要考虑氧化沟、污泥脱水间等反应单元） Sewage treatment station (mainly taking into account oxidation ditch, sludge dewatering room and other reaction units)	泵类、风机 Pump, air fan	75.59	190	1405	137	20

表 4.5-4　二期各车间噪声源与厂界预测点距离表　　单位:m

Table 4.5-4 List of Distance between Each Noise Source in Workshop of Phase II and Prediction Point at Plant Boundary in m

厂房 **Plant**	设备名称 **Designation**	降噪后源强叠加值 **Superimposed source intensity value after noise reduction dB（A）dB (A)**	距离东厂界（m） **Distance from east plant boundary (m)**	距离南厂界（m） **Distance from south plant boundary (m)**	距离西厂界（m） **Distance from west plant boundary (m)**	距离北厂界（m） **Distance from north plant boundary (m)**
原料堆场及备料车间 Raw material stockyard and preparation workshop	木片筛 Wood chip screen	76.02	965	412	90	906

化机浆车间 Chemimechanical pulp workshop	洗涤机、料塞螺旋、高浓磨浆机、低浓磨浆机、木片泵、压力筛、渣浆磨、浆泵 Washing machine, material plug screw, high-consistency fiberizer , low-consistency fiberizer, wood chip pump, pressurized screen, slag pulp mill, pulp pump	73.72	475	985	772	484
生活用纸车间 Life paper	真空泵、碎浆机、压力筛、纸机 Vacuum pump, pulper, pressurized screen, paper-making machine	89.71	310	372	652	1055
白卡纸车间 Ivory board	除砂器、磨浆机、碎浆机、压力筛、纸机 Grit separator, fiberizer, pulper, pressurized screen, paper-making machine	88.76	316	1115	443	377
热电站 Thermal power plant	汽轮机、发电机、风机 Steam turbine, generator, air fan	74.47	35	550	1187	1028

根据《环境影响评价技术导则 声环境》(HJ2.4-2009)，项目为新建项目，各厂界测点噪声评价采用贡献值作为评价量。噪声影响预测结果见表 4.5-5~·表 4.5-6。

In accordance with *Technical Guidelines for Environmental Impact Assessment - Noise Environment* (HJ2.4-2009), the project is a newly-built project, and the contribution value is used as the assessment quantity for noise assessment of each measuring point at plant boundary. Refer to Table 4.5-5 and 4.5-6 for prediction results of each noise source.

表 4.5-5 一期项目噪声预测结果 单位：dB（A）

Table 4.5-5 Prediction Results of the Noises of Phase I Project in dB (A)

预测点及名称 **Prediction point and name**	贡献值 **Contribution value**	标准值 **Standard value**		超标量 **Out-of-standard value**	
		昼间 **Daytime**	夜间 **Night**	昼间 **Daytime**	夜间 **Night**
厂界东 East of the plant boundary	48.62	65	55	0	0
厂界南 South of the plant boundary	37.36	65	55	0	0
厂界西 West of the plant boundary	47.77	70	55	0	0
厂界北 North of the plant	49.81	65	55	0	0

boundary					

表 4.5-6 二期项目噪声预测结果 单位：dB（A）

Table 4.5-6 Prediction Results of the Noises of Phase II Project in dB (A)

预测点及名称 Prediction point and name	贡献值 Contribution value	标准值 Standard value		超标量 Out-of-standard value	
		昼间 Daytime	夜间 Night	昼间 Daytime	夜间 Night
厂界东 East of the plant boundary	46.05	65	55	0	0
厂界南 South of the plant boundary	38.87	65	55	0	0
厂界西 West of the plant boundary	40.42	70	55	0	0
厂界北 North of the plant boundary	38.00	65	55	0	0

表 4.5-7 一期+二期项目噪声预测结果 单位：dB（A）

Table 4.5-7 Prediction Results of the Noises of Phase I + Phase II in dB (A)

预测点及名称 Prediction point and name	一期贡献值 Contribution values of Phase I	二期贡献值 Contribution values of Phase II	一期+二期叠加值 Superimposed values of Phase I + Phase II	标准值 Standard value		超标量 Out-of-standard value	
				昼间 Daytime	夜间 Night	昼间 Daytime	夜间 Night
厂界东 East of the plant boundary	48.62	46.05	50.53	65	55	0	0
厂界南 South of the plant boundary	37.36	38.87	41.19	65	55	0	0
厂界西 West of the plant boundary	47.77	40.42	48.50	70	55	0	0
厂界北 North of the plant boundary	49.81	38.00	50.19	65	55	0	0

由表 4.5-5 和表 4.5-7 可知，项目正常生产时，东、南、西、北厂界一期工程和二期达产后全厂噪声贡献值均达到《工业企业厂界环境噪声排放标准》（GB12348-2008）3 类标准要求，表明项目正常生产对周围声环境影响不大。

From Tables 4.5-5 and 4.5-7, it can be seen that during normal production of the project, the noise contribution values of the Phase I and II at the east, south, west and north plant boundary upon commissioning all meet the requirements of Class 3 standard in Emission Standard for Industrial Enterprise Noise at Boundary (GB12348-2008), indicating that the normal production of the project will impose limited impact on the surrounding acoustic environment.

4.5.4环境敏感点噪声影响分析

4.5. Analysis of noise impact on environmental sensitive points

项目厂界范围外 200 米内的敏感目标包括厂界南面的川江和坡尾底，距离南面厂界最近距离为 30m，项目两期建成投产后，厂界南面噪声贡献值为 41.19 dB(A)，叠加川江和坡尾底最大噪声本底值（昼间 55.3 dB(A)、夜间 48.8 dB(A)后，昼间和夜间预测值分别为 55.47 dB(A)和 49.49 dB(A)，均能满足《声环境质量标准》（GB3096-2008）中 2 类标准要求，敏感点处噪声级增高量在 1dB(A)以下，环境影响不大。

Sensitive targets within 200 meters from the project plant boundary include Chuanjiang and Poweidi to the south of the plant boundary. The nearest distance to the southern plant boundary is 30m. Upon completion and commissioning of both phases of the project, the noise contribution value in the south of the plant boundary will be 41.19 dB (A). After superimposing the maximum noise background values of Chuanjiang and Poweidi (55.3 dB (A) in daytime and 48.8 dB (A) at night), the predicted values in daytime and night will be 55.47 dB (A) and 49.49 dB (A) respectively, which can meet the requirements of Class 2 standards in *Acoustic Environment Quality Standard* (GB3096-2008) . The noise level increase at sensitive points will be below 1dB (A) and thus have limited environmental impact.

4.5.5运输车辆噪声影响分析

4.5.5 Analysis of noise impact of transportation vehicle

（1）物料运输量

(1) Material transportation volume

项目所需原材料主要为木片，本项目以外购桉木原木、外购桉木片等为原料。根据工程分析，项目全部建成后需要木片 232.8 万 t/a（绝干），原煤 877249t/a，加上其他原辅材料，合计运输量约 410 万 t/a。项目运输时车辆为中型车（载重 20t）、大型车（载重 50t），其比例分别为 20%、80%，平均每天运输车辆预计为 275 辆车（其中中型车 55 辆，大型车 220 辆），每小时约 12 辆。

The raw materials required by this project are mainly wood chips, which are made of purchased eucalyptus logs, and eucalyptus chips. According to engineering analysis, upon completion of the Project, 2,328,000 t/a (absolute dry) of wood chips, 877249t/a of raw coal, and other raw and auxiliary materials will be required; the total transportation volume will be about 3.5 million t/a. During the transportation of the project, the vehicles are medium-sized vehicles (with a load of 20t) and large-sized vehicles (with a load of 50t), accounting for 20% and 80% respectively. The average daily transportation vehicle is estimated to be 275 vehicles (including 55 medium-sized vehicles and 220 large-sized vehicles), with about 12 vehicles per hour.

（2）运输车辆交通噪声影响

(2) Noise impact of transportation vehicles

运输方式主要为公路运输和海上运输。公路运输涉及的交通道路主要为 209 省道、北铁一级公路、工业园区道路及厂内道路。项目的建成将导致周边交通道路新增运输车辆为 275 辆/天，其距离道路两侧不同距离的贡献值详见表 4.5-8。

The transportation methods are mainly road transportation and marine transportation. Road transportation mainly involves S209, Beitie Class 1 Highway, industrial park roads and factory-in roads. Completion of the project will result in 275 new transport vehicles per day on the surrounding traffic roads. Contribution values at different distances from both sides of the road are detailed in Table 4.5-8.

表 4.5-8 距离道路中心线不同距离预测结果

Table 4.5-8 Prediction Results at Different Distances from Centerline of the Road

单位：dB（A）

in dB (A)

距离 Distance 时段 Period	30m	40m	60m	80m	100m	120m	140m	160m	180m	200m
昼间 Daytime	52.7	50.7	48.2	46.6	45.2	44.1	43.2	42.3	41.5	40.8
夜间 Night	51.3	49.4	46.9	45.2	43.9	42.8	41.8	40.9	40.2	39.4

由表 4.5-8 可知，拟建项目物料运输车辆对道路两侧噪声贡献值较小，不会对道路两侧声环境造成较大的影响。

As can be seen from Table 4.5-8, the material transportation vehicles of the proposed project have a small contribution to the noise on both sides of the road and will not impose significant impact on the acoustic environment on both sides of the road.

4.5.6小结

4.5.6 Summary

项目噪声源较多，但大部分安置在工厂厂房内或相应设备的室内，同时通过选用低噪声设备，并采取房屋隔声、基础减振等措施进行降噪处理。项目正常生产时，东、南、西、北厂界一期工程和二期达产后全厂噪声贡献值均达到《工业企业厂界环境噪声排放标准》（GB12348-2008）3 类标准要求；周边敏感点川江和坡尾底噪声预测值能满足《声环境质量标准》（GB3096-2008）中 2 类标准；表明项目正常生产对周围声环境影响不大。

There are many noise sources in the Project, most of which are placed in the plant building or the room of corresponding equipment. Besides, noise reduction treatment is carried out by selecting low noise equipment and taking measures such as sound insulation of houses and vibration reduction of foundation. During normal production of the project, the noise contribution values of the Phase I and II at the east, south, west and north plant boundary upon reaching target output all meet the requirements of Class 3 standard in *Emission Standard for Industrial Enterprise Noise at Boundary* (GB12348-2008); Predicted noise values of surrounding sensitive points, Chuanjiang and Poweidi, all comply with requirements of Class 2 standard in *Acoustic Environment Quality Standard* (GB3096-2008), indicating that the normal production of the project will impose limited impact on the surrounding acoustic environment.

项目运输物料方式主要为公路运输和海上运输，项目的建成将导致周边交通道路新增运输车辆为 275 辆/天，经预测，运输车辆对道路两侧噪声贡献值较小，不会对道路两侧声环境造成较大的影响。

Major means of material transportation for the project are road and sea transportation. The completion of the project will lead to 275 new transportation vehicles per day on the surrounding traffic roads. Through prediction, the transportation vehicles have a small contribution to the noise on both sides of the road and will not impose significant impact on the acoustic environment on both sides of the road.

4.6 固体废物影响分析

4.6 Solid waste impact analysis

4.6.1固体废物产生情况

4.6.1 Solid waste production conditions

项目生产过程产生的固体废物主要有废木屑，锅炉渣及煤灰，浆渣，白泥、绿泥，石灰渣和污水处理污泥及生活垃圾等。

The solid wastes generated during production mainly include waste chippings, boiler slag and coal ash, pulp slag, white mud, green mud, lime slag, sewage treatment sludge and domestic garbage.

（1）一期固体废物产生量

(1) Total solid waste production of Phase I

一期固体废物产生情况为：废木屑（绝干）73100t/a、锅炉飞灰46126 t/a、锅炉炉渣30750 t/a、脱硫石膏8787t/a、废活性炭70 t/a、废催化剂20吨/3年、浆渣、节子（绝干）10200t/a、黑液658.82万t/a、白泥（绝干）207200t/a、绿泥（绝干）8500t/a、石灰渣1831t/a、废分子筛7.5t/5a、废离子交换树脂12t/3a、储油罐残渣0.03t/5a、隔油池污泥0.04t/a、污水处理站污泥（物理、生化段）81600t/a，污水处理站污泥（化学段）9200t/a、废机油2 t/a 生活垃圾829t/a。

Production condition of solid waste in Phase I is as follows: 73,100t/a of waste chippings(absolute dry), 46,126t/a of boiler fly ash, 30,750t/a of boiler slag, 8,787t/a of desulfurized gypsum, 70t/a of waste activated carbon, 20t/3a of waste catalyst, 10,200t/a of pulp slag and knot (absolute dry), 6,588,200t/a of black liquor, 207,200t/a of white mud (absolute dry), 8,500t/a of green mud (absolute dry), 1,831t/a of lime slag, 7.5t/5a of waste molecular sieve, 12t/3a of waste ion exchange resin, 0.03t/5a of oil storage tank residue, 0.04 t/a of sludge from oil separation tank, 81,600t/a of sludge from sewage treatment station (physical and biochemical section), 9,200t/a of sludge from sewage treatment station (chemical section), 2t/a of waste engine oil and 829t/a of domestic wastes.

（2）全厂固体废物产生量

(2) Total solid waste production of the whole plant

二期达产后全厂的固体废物产生情况：废木屑（绝干）85000t/a、锅炉飞灰116140t/a、锅炉炉渣77426t/a、脱硫石膏17052t/a、废活性炭100 t/a、废催化剂30吨/3年、浆渣、节子（绝干）17000t/a、黑液704.14万t/a、白泥（绝干）229600t/a、绿泥（绝干）9500t/a、石灰渣1918t/a、废分子筛7.5t/5a、废离子交换树脂12t/3a、储油罐残渣0.03t/5a、隔油池污泥0.04t/a、污水处理站污泥（物理、生化段）108800t/a，污水处理站污泥（化学段）17000t/a、废机油3t/a、生活垃圾1087t/a。

Production condition of solid waste in Phase II upon reaching target output is as follows: 85,000t/a of waste chippings(absolute dry), 116,140t/a of boiler fly ash, 77,426t/a of boiler slag, 17,052t/a of desulfurized gypsum, 100t/a of waste activated carbon, 30t/3a of waste catalyst, 17,000t/a of pulp slag and knot (absolute dry), 7,041,400t/a of black liquor, 229,600t/a of white mud (absolute dry), 9,500t/a of green mud (absolute dry), 1,918t/a of lime slag, 7.5t/5a of waste molecular sieve, 12t/3a of waste ion exchange resin, 0.03t/5a of oil storage tank residue, 0.04 t/a of sludge from oil separation tank, 108,800t/a of sludge from sewage treatment station (physical and biochemical section), 17,000t/a of sludge from sewage treatment station (chemical section), 3t/a of waste engine oil and 1,087t/a of domestic wastes.

4.6.2固体废物处置方案及环境影响分析

4.6.2 Solid waste disposal scheme and environmental impact analysis

（1）废木屑和浆渣

(1) Waste chippings and pulp slag

备料车间的废木屑和制浆车间的浆渣均属于一般工业固废，具有一定热值，可送固废锅炉与煤掺合燃烧，资源化处置，对周围环境影响较小。

The waste chippings in the material preparation workshop and the pulp slag in the pulping workshop belong to general industrial solid waste with a certain calorific value. They can be delivered to the solid waste boiler for blending combustion and resource disposal, with little impact on the surrounding environment.

（2）锅炉飞灰、锅炉灰渣、脱硫石膏

(2) Boiler fly ash, boiler slag and desulfurized gypsum

固废锅炉飞灰含少量重金属及二噁英，本项目焚烧的燃料成分主要为造纸废弃物、造纸渣浆及污泥，考虑到造纸废弃物的成分相对简单，其原生燃料里重金属等有害物质含量本身较低。对照国家危险废物名录，HW18 焚烧处置残渣中未明确规定一般固废和污泥焚烧产生的飞灰属于危险废物。类比山东太阳纸业已建成的造纸固废焚烧发电资源综合利用工程，该项目设有 1 台 180t/h 固废锅炉，燃料为造纸污泥、木屑、浆渣、煤。山东省环科院环境检测有限公司对该锅炉烟气除尘产生的飞灰的腐蚀性、易燃性、反应性、急性毒性、浸出毒性、物质毒性进行鉴别，采集飞灰样品 100 个，采样周期为一个月，鉴定结果显示，飞灰样品不具有 GB5085-2007 规定的危险特性（见附件 19）。本项目固废锅炉燃料与山东太阳纸业固废锅炉燃料种类一致，飞灰性质基本相近，属于一般工业固体废物，但考虑燃料组分和比例的差异性，评价要求本项目建成投产后，定期对固废锅炉的飞灰进行浸出毒性检测，如检测具有危险特性需委托有资质的单位进行处置。

The fly ash of solid waste boiler may contain a small amount of heavy metals and dioxins, and the fuel of the Project mainly includes paper-making waste, pulp slag and sludge; considering the simple composition of paper-making waste, the content of harmful substances, such as heavy metals, in parent fuel, is relatively low. Referring to the *National Catalog of Hazardous Wastes*, the fly ash generated through incineration of general solid waste and sludge not clearly specified in incineration by HW18 belongs to hazardous waste. Referring to the established papermaking solid waste incineration power generation comprehensive utilization project of Shandong Sun Paper, the Project is set with a 180t/h solid waste boiler, with the fuel of papermaking sludge, wood chippings, pulp slag, and coal. Shandong Academy of Environmental Sciences Environmental Testing Co., Ltd. has identified the corrosivity, flammability, reactivity, acute toxicity, leaching toxicity, and substance toxicity of fly ash generated by dedusting of flue gas of this boiler, and collected 100 fly ash samples, with the sampling period of one month. The results showed that fly ash samples do not have the hazardous characteristics specified in GB5085-2007 (see Appendix 19). The fuel for solid waste boilers of the Project is the same as that for solid waste boilers of Shandong Sun Paper, and the fly ash is basically similar in nature; so it falls under general industrial solid waste, but considering the difference in fuel composition and proportion, it is required carrying out regular testing on leaching toxicity of fly ash from solid waste boilers after completion of the Project; the hazardous testing shall be entrusted to a qualified unit for disposal.

锅炉灰渣属一般工业固废，综合利用价值高，用途较广，可作制砖和铺路，本项目锅炉灰渣可外售给制砖厂进行综合利用，对环境影响不大。

Boiler ash and slag fall under general industrial solid waste, with high comprehensive utilization value and wide application. It can be used for brick making and paving. The boiler ash and slag of this project can be sold to brick making factories for comprehensive utilization, with little impact on the environment.

锅炉烟气处置措施设有炉外石灰石/石膏湿法脱硫工艺脱硫，此措施会产生副产物脱硫石膏，主要成分为碳酸钙，属一般工业固废，可外售水泥厂作为水泥的缓凝剂或者建材厂制成石膏板、石膏砌块等建材材料，对环境影响不大。

The boiler flue gas treatment measure is mainly the out-of-furnace limestone/gypsum wet desulphurization process, which may produce the by-product desulfurized gypsum, whose main component is calcium carbonate, which falls under general industrial solid waste; and the desulfurized gypsum can be sold to cement plants as the retarder of cement or to building material plants for producing gypsum boards, gypsum blocks and other building materials, with little impact on the environment..

（3）白泥、绿泥、石灰渣

(3) White mud, green mud, lime slag

白泥、绿泥、石灰渣主要在碱回收苛化工序产生，白泥、绿泥的主要成分为碳酸钙、硅酸钙等无机物及少量碱；石灰渣主要为未烧过的砾石及碳酸钙。

White mud, green mud and lime slag are mainly produced in the causticization process of alkali recovery. The main components of white mud and green mud are inorganic substances such as calcium carbonate, calcium silicate and a small amount of alkali. Lime slag is mainly unburned gravel and calcium carbonate.

①白泥

① White mud

根据山东晨鸣齐河造纸厂白泥成分检测结果，碳酸钙含量在 91.37%。根据《固体废物排污申报登记指南》及《工业固体废物名录》第 3 项明确规定，白泥属于含钙固体废物，主要成分为氢氧化钙，属于一般工业固体废物，且属于一般工业固体废物中的第

II 类。

According to the detection results of white mud composition in Shandong Chenming Qihe Paper Mill, the calcium carbonate content is 91.37%. According to the *Guidelines for the Declaration and Registration of Solid Waste Discharge* and Item 3 of *Catalog of Industrial Solid Wastes*, white mud falls udner calcium-containing solid waste and its main component is calcium hydroxide. It falls under general industrial solid waste and is classified as Class II of general industrial solid waste.

项目产生的白泥暂存于板框车间内，一部分送去烟气脱硫，剩余部分送石灰窑回收处置。车间临时暂存场采用了水泥硬化处理，设有导排沟，符合一般工业固废贮存要求，在加强调度确保白泥综合利用的情况下，可满足白泥临时贮存需求。

The white mud generated by the project is temporarily stored in the plate and frame workshop, some of which is sent to flue gas desulfurization and the rest is sent to lime kiln for recycling and disposal. The temporary storage yard of the workshop adopts cement hardening treatment and is equipped with guide and drainage ditches, which meets the storage requirements of general industrial solid waste. Under the condition of strengthening dispatching to ensure comprehensive utilization of white mud, the temporary storage requirements of white mud can be met.

②绿泥

② Green mud

绿泥成分分析详见表 4.6-1。

Component analysis of green mud is detailed in Table 4.6-1.

表 4.6-1 绿泥主要化学组成

Table 4.6-1 Major Chemical Components of Green Mud

组分 Component	有机物 Organic matter	硅酸钙 Calcium silicate	碳酸钙 Calcium carbonate	铝、铁、镁的氧化物 Oxides of aluminum, iron and magnesium	碳酸钠 Sodium carbonate	苛性钠 Caustic soda
百分比% Percentage (%)	14.35	21.3	42.1	4.3	6.9	9.3

根据中国环境监测总站对采用硫酸盐法制浆企业绿泥的腐蚀性及浸出毒性试验分析结果，详见表 4.6-2。

Based on the test and analysis results of corrosion and leaching toxicity of green mud from enterprises adopting sulfate pulping by China Environmental Monitoring Station, as detailed in Table 4.6-2.

表 4.6-2 白泥、绿泥腐蚀性及浸出毒性试验结果 单位：mg/L（pH 值除外）

Table 4.6-2 Test Results of Corrosion and Extraction Toxicity of White and Green Mud in mg/L (except pH value)

样品 Sample	pH 值 pH value	铁 Ferrum	锰 Manganese	铝 Aluminum	总铬 Total chromium	铜 Copper	砷 Arsenic	镉 Cadmium
绿泥 Green mud	9-11	0.101	ND	1.023	ND	0.295	ND	ND
GB5085.1-2007 GB5085.3-2007	≥12.5 或 ≤2.0 ≥12.5 or ≤2.0	--	--	--	15	100	5	--
GB8978-1996 一级 Class I of GB8978-1996	6-9	--	2.0	--	1.5	0.5	0.5	--

注：ND 为未检出。

Note: ND refers to not detected.

试验结果各项指标均未超过 GB5085.3-2007《危险废物鉴别标准 浸出毒性鉴别》和 GB5085.1-2007《危险废物鉴别标准 腐蚀性鉴别》，确定绿泥为一般工业固体废物；但 pH 值已超过 GB8978-1996《污水综合排放标准》一级标准，因此属于第 II 类一般工业固体废物。绿泥临时暂存于板框车间内，板框车间占地面积 4485 立方米，可满足 800 吨以上绿泥暂存（一个月），采用了水泥硬化和涂料防渗处理，设有导排沟，符合一般工业固废贮存要求，在加强调度确保绿泥外运填埋的情况下，可满足绿泥临时贮存需求。

The test results showed that all indexes did not exceed the GB5085.3-2007 *Identification Standards for Hazardous Wastes-Identification for Extraction Toxicity* and GB5085.1-2007 *Standards for Hazardous Wastes-Identification for Corrosion*, and green mud was determined to be a general industrial solid waste. However, the pH value has exceeded the Class I standard of GB8978-1996 *Integrated Wastewater Discharge Standard*, so green mud is a Class II general industrial solid waste. Green mud is temporarily temporarily stored in the slab and frame workshop, which covers an area of 4,485 cubic meters and can meet the temporary storage of more than 800 tons of green mud (one month). Cement hardening and coating anti-seepage treatment are adopted, and drainage ditches are provided, which meet the storage requirements of general industrial solid waste. Under the condition of strengthening dispatching to ensure the outward transportation and landfill of green mud, the temporary storage requirements of green mud can be met.

③石灰渣

③ Lime slag

石灰渣的主要成分是碳酸钙、硅酸钙、有机物、砾石等，参照绿泥腐蚀性及浸出毒性试验分析结果，消化石灰渣及砾石也属于第 II 类一般工业固体废物，石灰渣暂存于灰渣场。

The main components of lime slag are calcium carbonate, calcium silicate, organic matter, gravel, etc., which are similar to the components of green mud. According to the analysis results of corrosion and extraction toxicity tests of green mud, digested lime slag and gravel also fall under Class II general industrial solid waste and the lime slag will be temporarily stored in slag yard.

（4）废分子筛

(4) Waste molecular sieve

制氧车间产生废分子筛填料，主要成分为沸石分子筛和活性氧化铝，约 5 年更换一次，根据《国家危险废物名录》（环境保护部令第 39 号），废分子筛不属于危险废物，为一般工业固体废物，由生产厂家回收再利用，对环境影响不大。

The waste molecular sieve filler produced in the oxygen production workshop is mainly composed of zeolite molecular sieve and activated alumina, which is replaced once every 5 years. In accordance with *National Catalog of Hazardous Wastes* (Ministry of Environmental Protection Order No. 39), the waste molecular sieve is not hazardous waste, but is a general industrial solid waste, which is recycled by the manufacturer and has little impact on the environment.

（5）污水处理站污泥

(5) Sludge of the sewage treatment station

污水处理站污泥主要含细小纤维与微生物，为生物处理污泥，从生产原辅材料及污水处理添加药剂分析，污泥中不会含有毒成份，且其有机物、N、P 等含量较高，为纤维、腐殖质胶体等，可送固废锅炉燃烧。根据相关研究，污泥低位热值在 2500kJ/kg 左右，具有一定的可燃性，成分分析详见表 4.6-3。

The sludge from the sewage treatment station mainly contains fine fibers and microorganisms, which is biological treatment sludge. From the analysis of raw and auxiliary materials produced and additives added to sewage treatment, the sludge does not contain toxic components, and its organic matter, N, P and other contents are relatively high, which are fibers, humus colloids and the like, and can be sent to solid waste boilers for combustion. According to relevant research, the low calorific value of sludge is about 2500kJ/kg, which has certain flammability. Composition analysis is detailed in Table 4.6-3.

表 4.6-3 污泥成分分析表
Table 4.6-3 Component Analysis of Sludge

燃料 **Fuel**	收到基低位热值（kJ/kg） **Low calorific value received (kJ/kg)**	**C （%）**	**H （%）**	**O （%）**	**N （%）**	**S （%）**	灰分（%） **Ash (%)**
污泥 Sludge	2500	14.48	1.92	17.1	0.67	0.11	15.18

同时根据工程分析，初沉池、厌氧沉淀池、终沉池的污泥通过污泥泵送至污泥浓缩池，经浓缩后泵送至污泥调理池，加药剂调理后再用泵将污泥泵送至板框压滤机进行脱水，脱水后的干污泥干度达到 42%以上。据相关研究，污泥含水率低于 70%就可以燃烧。将污泥与木屑、浆渣、燃煤等进行混烧，污泥占混合燃料质量的 8.68%，热量比 6.24%，对锅炉燃烧的影响较小。目前，在大型制浆造纸厂将污泥送入锅炉焚烧是一个成熟且普遍的处置方式，例如江西晨鸣、山东晨鸣等企业，锅炉掺烧污泥后均能够稳定燃烧。

Also according to engineering analysis, the sludge from the primary settling tank, the anaerobic sedimentation tank and the final settling tank is pumped to the sludge thickener. After concentration, the sludge is pumped to the sludge conditioning tank. After being conditioned with chemicals, the sludge is pumped to the plate-and-frame filter press for dehydration. The dryness of the dehydrated dry sludge reaches over 42%. According to relevant research, sludge can be burned if its moisture content is less than 70%. The sludge is mixed with sawdust, pulp slag, coal, etc. The sludge accounts for 8.68% of the mass of the mixed fuel and the heat ratio is 6.24%, which has little influence on boiler combustion. At present, it is a mature and common disposal method to send sludge to boilers for incineration in large pulp and paper mills. For example, in Jiangxi Chenming, Shandong Chenming and other enterprises, boilers can burn stably after mixing sludge.

由此可知，污泥经干化后具有一定的可燃性，且含水率较低，送固废锅炉燃烧后，

对周围环境影响较小。

It can be seen from this that the sludge has certain flammability after drying, and the water content is relatively low. After being sent to the solid waste boiler for combustion, the sludge has little impact on the surrounding environment.

少量化学处理段污泥不宜燃烧送一般工业固体废物集中处置场填埋处置。污泥暂存于污泥压滤间堆存库和干煤棚，占地面积分别为 4000 平方米和 31020 平方米，可满足 10000 吨以上（一个月）污泥暂存。

A small amount of sludge from the chemical treatment section is not suitable for combustion and is sent to the General Industrial Solid Waste Centralized Disposal Site for landfill disposal. Sludge is temporarily stored in the storage warehouse and dry coal shed of the sludge filter press room, covering an area of 4,000 square meters and 31,020 square meters respectively, which can meet the temporary storage of more than 10,000 tons (one month) of sludge.

（6）危险废物

(6) Hazardous waste

本项目生产过程产生的危险废物包括废离子交换树脂、储油罐残渣、隔油池污泥、废活性炭、废催化剂、废机油。根据《国家危险废物名录》（环境保护部令第 39 号），废离子交换树脂废物编号为 HW13；储油罐残渣、隔油池污泥废机油属于 HW08 废矿物油；废活性炭废物编号为 HW18；废催化剂废物编号为 HW50。

Hazardous wastes generated from this project include waste ion exchange resin, oil storage tank residue, grease trap sludge, waste activated carbon, waste catalyst, and waste machine oil. In accordance with the *National Catalog of Hazardous Wastes* (Ministry of Environmental Protection Order No. 39), the waste ion exchange resin shall be numbered HW13; waste oil from oil storage tank residue and sludge from oil separation tank falls under HW08 waste mineral oil; waste activated carbon waste number shall be numbered HW18; waste number of the spent catalyst shall be numbered HW50.

废离子交换树脂、废活性炭、废催化剂主要由供货厂家定期上门更换，更换下来的危险废物集中装入原包装容器中，由供货厂家回收综合利用或委托有资质单位处置。储油罐残渣、隔油池污泥、废机油等定期委托有资质单位上门处理，一般不在厂内做长期暂存。危险废物转运需委托有资质的单位进行，且严格按《危险废物转移联单制度》要

求执行。

Waste ion exchange resin, waste activated carbon and waste catalyst shall mainly be replaced by suppliers on a regular basis. The replaced hazardous waste shall be concentrated in the original packaging containers, which shall be recycled and comprehensively utilized by suppliers or entrusted to qualified organizations for disposal. Oil storage tank residues, sludge from oil separation tanks, waste engine oil, etc. are regularly entrusted to qualified units for on-site treatment, and are generally not temporarily stored in the factory for a long time. Hazardous waste transfer shall be entrusted to qualified units and shall be carried out fully in accordance with the requirements of the "Hazardous Waste Transfer Registration Sheet System".

危废收集：项目收集的各种危险废物需要在厂内暂存一段时间。由于这类废物中含有一定的有毒有害物质，一旦与水（雨水、地表径流或地下水等）接触，危险废物中的有毒有害成分将被浸滤出来，进入地表水体和地下含水层，可能对地表水和地下水造成二次污染。

Hazardous Waste Collection: various hazardous wastes collected by the project shall be temporarily stored in the factory for a period of time. As such wastes contain certain toxic and harmful substances, once they come into contact with water (rainwater, surface runoff or groundwater, etc.), the toxic and harmful components in hazardous wastes will be leached out and enter surface water bodies and underground aquifers, which may cause secondary pollution to surface water and groundwater.

危废暂存：生产工段产生的危险废物定期委托有资质的单位上门进行更换和收运，大部分做到即产即收，少量不能马上清运离场的危废送项目危废暂存库暂存，项目在热电站西北面设 1 座危险废物暂存库，主要暂存废活性炭、废催化剂、废机油等，占地面积 96 平方米，满足 20 吨以上危险废物暂存。按《危险废物贮存污染控制标准》（GB18597-2001）及其修改单标准要求建设，能有效的防止危险废物在车间内暂存带来的环境问题。

Temporary storage of hazardous wastes: hazardous wastes generated in the production section shall be regularly replaced and collected and transported by qualified entities on site. Most of them can be collected as soon as they are produced, and a small number of hazardous wastes that cannot be removed immediately are sent to the Project's hazardous waste temporary storage warehouse for temporary storage. The Project has a hazardous waste temporary storage warehouse in the northwest of the thermal power station, which mainly temporarily stores spent activated carbon, waste catalyst, waste engine oil, etc. It covers an area of 96m^2 and meets the temporary storage of over 20 tons of hazardous wastes. Construction in accordance with the requirements of *Standard for Pollution Control on Hazardous Waste Storage* (GB18597) and its amendment standard may effectively prevent environmental problems caused by temporary storage of hazardous waste in the workshop.

危废收运：危险废物转运需委托有资质的单位进行，且严格按《危险废物转移联单制度》要求执行，并采取密闭防渗的运输车辆运输，危废收运委托第三方有资质的单位进行。

Hazardous waste collection and transportation: Hazardous waste collection and transportation shall be entrusted to a qualified unit, and shall be carried out in strict accordance with the requirements of the "Hazardous Waste Transfer Form System", and shall be transported by sealed and seepage-proof transportation vehicles. Hazardous waste collection and transportation shall be entrusted to a qualified entity of a third party.

（7）黑液

(7) Black liquor

根据《国家危险废物名录》（环境保护部令第 39 号），黑液属于危险废物，编号为 HW35。黑液进入碱回收系统回收碱，在生产线中循环，不外排。

According to the *National Catalogue of Hazardous Wastes* (Ministry of Environmental Protection Order No. 39), black liquor belongs to hazardous waste, with the number of HW35. The black liquor will be sent to the alkali recovery system to recover alkali, which will circulate in the production line, without being discharged.

（8）生活垃圾

(8) Domestic waste

厂内生活垃圾堆放于厂内垃圾池中，由环卫部门统一处理，对周围环境影响较小。

Domestic wastes in the plant is piled up in the garbage pool in the plant and uniformly treated by the sanitation department, which has little impact on the surrounding environment.

4.6.3项目依托铁山港工业区一般工业固体废物集中处置场可行性分析

4.6.3 Feasibility analysis of the project relying on the General Industrial Solid Waste Centralized Disposal Site in Tieshan Port Industrial Park

本项目配套一般固体废物填埋场目前正在进行选址及前期工作，铁山港（临海）工业区管理委员会计划于 2020 年 6 月前完成选址（见附件 10），建设单位承诺于 2022 年底建成投入运行，本项目一期生产线计划于 2021 年 8 月建成投入试生产，在本项目配套一般固体废物填埋场正常运行前，计划依托铁山港区一般固体废物集中处置场过渡使用 5~12 个月。

The site of the supporting general solid waste landfill is being selected at present, and the preliminary work is being carried out; Tieshangang (Linhai) Industrial Park Management Committee plans to complete the site selection before June 2020 (see Appendix10). The construction unit promises to complete and put it into operation at the end of 2021. The Phase I production line is planned to be completed and put into trial operation in August 2021. Prior to the operation of the supporting general solid waste landfill, the General Solid Waste Disposal Site of Tieshangang District is planned to be used for 5~12 months as transition.

铁山港工业区一般工业固体废物集中处置场位于北海市铁山港工业区中石化配套道路以南，中石化火炬区以东，服务范围为铁山港工业区及北海市工业企业产生的第 II 类一般工业固体废物。填埋区库容 45.08 万 m^3，有效容积 40.07 万 m^3，设计服务年限 15 年，年运营天数为 365 天，设计填埋废物规模为 26713m^3/a，73.20m^3/d，处置场的废物处置主要处置绿泥、石灰渣、脱硫废渣等第 II 类一般工业废物，综合各处置废物性质，填埋废物密度暂按 1.36 吨/m^3 计算，项目可平均填埋经预处理后的固体废物 36329.68t/a，约 100t/d。项目服务范围为铁山港工业区及北海市工业企业，主要优先处置铁山港工业区内斯道拉恩索（广西）林浆纸项目、中国石化北海炼化有限责任公司产生的第 II 类一般工业固体废物。

Tieshangang Industrial Park General Industrial Solid Waste Centralized Disposal Site is located in the south of Sinopec supporting road and east of Huoju District in Tieshangang Industrial Park, Beihai City, which is mainly used to dispose Class II general industrial solid waste produced by Tieshangang Industrial Park and industrial enterprises in Beihai. The storage capacity of the landfill area is 450,800m^3, The effective volume is 407,700m^3, the design service life is 15 years, the annual operation days are 365 days, and the design landfill waste scale is 26,713m^3/a and 73.20m^3/d. The waste disposal in the disposal site mainly disposes of Class II general industrial wastes such as green mud, lime slag and desulfurization waste residue. Considering the properties of various disposal wastes, the landfill waste density is temporarily calculated at 1.36 tons/m3, and the project can average 36,329.68t/a, about 100t/d, of pretreated solid waste. The service scope of the project is Tieshan Port Industrial Park and industrial enterprises of Beihai City. The main priority is to dispose of Class II general industrial solid waste generated by Stora Ensorin (Guangxi) Pulp and Paper Project in Tieshan Port Industrial Zone and SINOPEC Beihai Refinery Co., Ltd.

本项目拟依托铁山港工业区一般工业固体废物集中处置场的时间为 2021 年 8 月~2022 年 8 月，根据调查中国石化北海炼化有限责任公司需填埋固体废物量为脱硫废渣 514t/a，斯道拉恩索（广西）林浆纸项目目前只建成 20 万吨化机浆项目和年产 45 万吨高档包装卡纸板，需填埋固体废物量为绿泥、石灰渣 1500 t/a（含水率 60%），斯道拉恩索（广西）林浆纸项目在本项目依托期间建成投产的可能性较小。综上分析，本项目依托期间，入场填埋的废物量为 2014t/a，剩余设计填埋量约 34316t/a。

The project is proposed to rely on the general industrial solid waste centralized disposal site in Tieshan Port Industrial Zone from August of 2021 to August of 2022. According to the investigation, the amount of solid waste to be buried in SINOPEC Beihai Refinery Co., Ltd. is 514t/a desulfurization waste residue. At present, only 200,000 tons of chemical mechanical pulp project and 450,000 tons of high-grade packaging cardboard have been completed in Stora Enso (Guangxi) forest pulp and paper project. The amount of solid waste to be buried is 1500t/a of green mud and lime residue (water content 60%). It is less likely that Stora Ensorin (Guangxi) Pulp and Paper Project will be completed and put into operation during the relying period of this project. To sum up, during the supporting period of this project, the amount of waste entering the landfill is 2,014t/a, and the remaining designed landfill amount is about 34,316t/a.

本项目需要填埋处置的一般固体废物为绿泥（绝干）8500t/a、石灰渣 1831t/a、污泥（化学处理段）9200 t/a，根据铁山港工业区一般工业固体废物集中处置场环评报告分析，石灰渣直接入场填埋，污泥经稳定干化系统预处理及堆放自然蒸发后，入场填埋含水率为 45%，故本项目污泥含水率按 65%（26286t/a）进场，污泥与石灰的配比为 1:0.35 进

行干化，处理后污泥含水率 50%（18400t/a），经堆放自然蒸发后，入场填埋含水率为 45%（16727t/a）。项目产生的绿泥经厂内预处理至含水率 45%后直接进填埋场填埋，入场量为 15455t/a。故本项目依托期间，入场填埋的一般固体废物总量为 34013t/a。未超出铁山港工业区一般工业固体废物集中处置场剩余处置能力。

The general solid wastes to be disposed of in this project are 8,500t/a of green mud (absolutely dry), 1,831t/a of lime slag, 9,200t/a of sludge (chemical treatment section), According to the analysis of EIA report of general industrial solid waste centralized disposal site in Tieshan Port Industrial Park, lime slag directly enters the site for landfill. After the sludge is pretreated by a stable drying system and piled up for natural evaporation, the water content of the sludge entering the site is 45%. Therefore, the water content of the sludge entering the site in this project is 65% (26,286t/a). The ratio of sludge to lime is 1: 0.35 for drying. The water content of the treated sludge is 50% (18,400t/a). After piling up for natural evaporation, the water content of the sludge entering the site is 45% (16,727t/a). The green mud produced by the project is pretreated to 45% water content in the plant and then directly entered the landfill site for landfill, with an admission volume of 15,455t/a, Therefore, during the support period of this project, the total amount of general solid waste entering the landfill is 34013t/a, which does not exceed the remaining disposal capacity of the general industrial solid waste centralized disposal site in Tieshan Port Industrial Park.

铁山港工业区一般工业固体废物集中处置场于目前正在建设，计划于 2020 年 12 月建成，能在本项目建成运行前投入使用。铁山港工业区一般工业固体废物集中处置场按项目环境影响报告书及环评批复要求建设，并完善竣工环保验收等相关环保手续的前提下，项目依托铁山港工业区一般工业固体废物集中处置场处置可行。本项目配套一般固体废物填埋场建成运行后，项目产生的一般固体废物不再进入园区集中处置场填埋，不影响处置场后续的正常运行。

Tieshan Port Industrial Park General Industrial Solid Waste Centralized Disposal Site is currently under construction, and it is planned to be completed in December of 2020, and put into operation prior to the completion of the project. Tieshan Port Industrial Park General Industrial Solid Waste Centralized Disposal Site is constructed according to the requirements of the EIA report of this project and approval requirements therefor. With relevant environmental protection procedures such as completion environmental protection acceptance being completed, it is feasible for the project to rely on the Tieshan Port Industrial Park General Industrial Solid Waste Centralized Disposal Site for disposal. Upon completion and operation of the supporting general solid waste landfill site for the project, general solid waste generated by the project will no longer enter the General Industrial Solid Waste Centralized Disposal Site for landfill, with no impact on subsequent normal operation of the disposal site.

4.6.4固体废物处置对周边环境影响分析

4.6.4 Analysis for impact of solid waste disposal on surrounding environment

4.6.4.1 依托期间固体废物处置对周边大气环境影响分析

4.6.4.1 Analysis for impact of solid waste disposal on surrounding atmospheric environment during relying period

本项目依托铁山港工业区一般工业固体废物集中处置场处置的工业固废为绿泥（绝干）、石灰渣、污泥（化学处理段），均为铁山港工业区一般工业固体废物集中处置场可处置的一般工业废物。项目依托期间，并未使铁山港工业区一般工业固体废物集中处置场新增气体污染物。

The industrial solid waste disposed of by the Tieshan Port Industrial Park General Industrial Solid Waste Centralized Disposal Site which this project relies on is green mud (absolutely dry), lime slag and sludge (chemical treatment section), which are all general industrial wastes disposable by the Centralized Disposal Site. During the relying period, no new gas pollutants will be added to the Tieshan Port Industrial Park General Industrial Solid Waste Centralized Disposal Site

根据《铁山港工业区一般工业固体废物集中处置场项目环境影响报告书》，填埋场产生的气体污染物主要为填埋作业扬尘、预处理车间粉尘、填埋气体

According to the Environmental Impact Report of the Tieshan Port Industrial Park General Industrial Solid Waste Centralized Disposal Site, the gas pollutants generated by the landfill site are mainly dust from landfill operation, dust from pretreatment workshop and landfill gas.

填埋场作业扬尘计算公式为：

The calculation equation of dust emission from landfill operation is as follows:

$$Q_p = 4.23 \times 10^{-4} \times U^{4.9} \times A_p$$

其中：Q_p—起尘量，mg/s；

Where, Q_p - dust quantity, mg/s;

U—平均风速，m/s；

U - mean wind speed, m/s;

A_p—起尘面积，m^2；

A_p - dust area, m2;

本项目依托期间，未增加填埋作业扬尘，未新增填埋作业过程中带来的扬尘影响。

During the relying period of this project, there will be no increase in dust from landfill operations and no increase in dust impact from landfill operations.

本项目产生的绿泥、石灰渣及污泥（化学工段）于厂内预处理达到进场填埋要求后再送往铁山港工业区一般工业固体废物集中处置场填埋处置。依托期间，无需进入铁山港工业区一般工业固体废物集中处置场预处理车间进行的固体废物量未超过原设计量。项目依托期间未增加废气产生量及排放量，对外环境的影响没有增加。

The green mud, lime residue and sludge (chemical section) generated by this project will be delivered to the general industrial solid waste centralized disposal site in Tieshan Port Industrial Park General Industrial Solid Waste Centralized Disposal Site for landfill disposal after the pretreatment in the plant meets the requirements for landfill. During the relying period, the amount of solid waste which need not to enter the pretreatment workshop of the general industrial solid waste centralized disposal site in Tieshan Port Industrial Park General Industrial Solid Waste Centralized Disposal Site will not exceed the original design amount. During the project support period, there will be no increase in waste gas production and emissions, and the impact on the external environment will not increase.

根据《铁山港工业区一般工业固体废物集中处置场项目环境影响报告书》大气环境影响预测结果：一般工业固废中均为无机物，有机成分含量极少。填埋过程中废气产生量较少，产生的少量填埋废气通过导气系统收集后排放，对周边环境影响不大。填埋场预处理车间排放的 TSP 及作业粉尘 TSP 在正常排放情况及非正常排放情况下的浓度预测值均达到《环境空气质量标准》（GB3096-2012）二级标准，外排废气对周围的大气环境影响较小。

According to the atmospheric environmental impact prediction results of the *Environmental Impact Report of the Tieshan Port Industrial Park General Industrial Solid Waste Centralized Disposal Site*, the general industrial solid waste will be inorganic and the content of organic components will be extremely low. In the landfill process, the amount of waste gas generated will be relatively small, and the generated small amount of landfill waste gas will be collected by the air guide system and then discharged, which will impose little impact on the surrounding environment. The predicted concentrations of TSP and TSP from the pretreatment workshop of the landfill site under normal and abnormal emission conditions will all comply with Class II standard of *Ambient Air Quality Standard* (GB3096-2012), and the discharged waste gas will impose little impact on the surrounding atmospheric environment.

针对项目防护距离内存在的居民，北海市铁山港区人民政府已拟定征地搬迁工作方案，处置场完成相关搬迁工作，满足竣工环保验收等相关环保要求后，本项目产生的一般固体废物方进入填埋处置。避免对周边居民环境产生影响。

For the residents within the protection distance of the project, People's Government of Tieshan Port District of Beihai City has drafted a work plan for land acquisition and relocation. The general solid waste generated by this project shall not be delivered into the landfill for disposal unless the disposal site has completed relevant relocation work and complied with the relevant environmental protection requirements such as the completion environmental protection acceptance so as to avoid any impact on the surrounding residential environment.

4.6.4.2 依托期间固体废物处置对周边地下水环境影响分析

4.6.4.2 Analysis for impact of solid waste disposal on surrounding groundwater environment during relying period

铁山港工业区一般工业固体废物集中处置场填埋场采用 HDPE 防渗膜为核心的防渗技术，并在填埋库区底部设置地下水导排系统。在防渗系统正常工作的工况下，填埋场的运行对地下水环境的影响不大。

Tieshan Port Industrial Park General Industrial Solid Waste Centralized Disposal Site adopts the anti-seepage technology with HDPE anti-seepage membrane as the core, and a groundwater drainage system is set up at the bottom of the landfill area. Under normal working conditions of anti-seepage system, operation of the landfill will impose limited impact on the groundwater environment.

根据《铁山港工业区一般工业固体废物集中处置场项目环境影响报告书》地下水环境影响预测结果：事故工况下的填埋库区、渗滤液调节池及废液处理车间防渗层出现破损。污水泄露 350 天后，填埋场下游方向 350m 范围内地下水环境高锰酸盐指数超过了《地下水环境质量标准》（GB/T14848-2017）中的III类水标准。目前，填埋场南侧填海工程已接近完成。填海工程完成后，下游方向将无居民地下水饮用水敏感点。填埋场对周边地下水环境影响较小。

According to the atmospheric environmental impact prediction results of the *Environmental Impact Report of the Tieshan Port Industrial Park General Industrial Solid Waste Centralized Disposal Site*, the anti-seepage layer of landfill reservoir area, leachate regulating tank and waste liquid treatment workshop is damaged under emergency conditions. In 350 days after the sewage leaked, the permanganate index of groundwater environment within 350m downstream of the landfill site exceeded the Category III water quality requirements in Standard for Groundwater Quality (GBT14848-2017). The marine reclamation land project on the south side of the landfill site now is nearly completed. Upon completion of the marine reclamation land project, there will be no sensitive points for residents' groundwater and drinking water in the downstream direction. Landfill will impose limited impact on surrounding groundwater.

《铁山港工业区一般工业固体废物集中处置场项目环境影响报告书》的渗滤液计算公式如下

The equation for calculating leachate in the Environmental Impact Report of the Tieshan Port Industrial Park General Industrial Solid Waste Centralized Disposal Site is as follows:

$$Q = (C \times A_1 + C \times A_2 + C \times A_3) \times I \times 10^{-3}$$

其中：Q—年平均渗滤液产生量（m^3）；

Where, Q - annual average leachate production (m3);

I—月平均降雨量（mm）；

I - average monthly rainfall (mm);

A_1—终场覆盖区填埋面积（m^2）；

A1 - landfill area of final coverage area (m^2);

A_2—中间覆盖区填埋面积（m^2）

A_2 - landfill area of intermediate coverage area (m^2)

A_3—填埋区作业面积（m^2）；

A_3 - operation area of landfill area (m^2);

C—为处置降雨量转为渗滤液之比率；

C - ratio of disposal rainfall converted to leachate;

本项目产生的一般工业固废进入填埋场后，并未改变终场覆盖区、中间覆盖区、填埋作业区汇水面积。填埋场产生的渗滤液总量并未改变，在接纳本项目的一般工业固体废物后并未产生新的环境影响，《铁山港工业区一般工业固体废物集中处置场项目环境影响报告书》的地下水环境影响预测结果并未因本项目一般工业固废进场后产生改变。

After the general industrial solid waste generated by this project enters the landfill site, the catchment area of the final coverage area, the intermediate coverage area and the landfill operation area has not been changed. The total amount of leachate produced by the landfill site has not changed, After accepting the general industrial solid waste of this project, no new environmental impact has been generated, and the groundwater environmental impact prediction results in the Environmental Impact Report of the Tieshan Port Industrial Park General Industrial Solid Waste Centralized Disposal Site have not changed after the general industrial solid waste of this project enters the site.

总体而言，本项目进入一般工业固体废物填埋在依托处置期间对填埋场周边地下水环境影响不大。

Generally speaking, the project entering the general industrial solid waste landfill has little impact on the groundwater environment around the landfill site during the supporting disposal period.

4.6.4.3 依托期间固体废物处置对周边地表水环境影响分析

4.6.4.2 Analysis for impact of solid waste disposal on surrounding surface water environment during relying period

铁山港工业区一般工业固体废物集中处置场主要排放的废水为填埋库区产生的渗滤液、预处理车间废水、洗车废水、生活污水等。

The main wastewater discharged from Tieshan Port Industrial Park General Industrial Solid Waste Centralized Disposal Site is leachate, pretreatment workshop wastewater, car washing wastewater, domestic sewage, etc. generated in the landfill reservoir area.

本项目污泥（化学处理段）进入处置场后依托处置场预处理设施进行处理，绿泥经厂内预处理后直接进入填埋场填埋。进入预处理的废物量未超过原处置场设计预处理能力，为新增预处理车间废水。本项目一般固体废物进场填埋量未超过处置场设计填埋量，为增加填埋过程产生的渗滤液量。故项目依托铁山港工业区一般工业固体废物集中处置场期间，未增加其废水产生排放量。

The sludge (chemical treatment section) of this project will be treated by relying on the pretreatment facilities of the disposal site after entering the disposal site, and the green sludge will directly enter the landfill site for landfill after being pretreated in the plant. The amount of waste entering the pretreatment does not exceed the designed pretreatment capacity of the original disposal site, which is the waste water from the newly added pretreatment workshop. In this project, the landfill volume of general solid waste entering the site does not exceed the designed landfill volume of the disposal site, so as to increase the leachate volume generated during the landfill process. Therefore, during the period when the project relies on Tieshan Port Industrial Park General Industrial Solid Waste Centralized Disposal Site, the discharge of waste water has not been increased.

铁山港工业区一般工业固体废物集中处置场废水采用“混凝沉淀+MBR 反应池+反渗透”的联合处理工艺处理，处理达标后接管排入铁山港工业区污水处理厂进行处理，经进一步处理后由深海排放管网排至 B3 深海排放口。

The wastewater from the Tieshan Port Industrial Park General Industrial Solid Waste Centralized Disposal Site is treated by the combined treatment process of "coagulation sedimentation + MBR reaction tank + reverse osmosis". After reaching the treatment standard, the wastewater is discharged into the sewage treatment plant of Tieshan Port Industrial Park for treatment. After further treatment, the wastewater is discharged from the deep sea discharge pipe network to B3 deep sea sewage outlet

4.6.4.4 依托期间固体废物处置对周边声环境影响分析

4.6.4.1 Analysis for impact of solid waste disposal on surrounding acoustic environment

during relying period

项目依托处置期间并未增加铁山港工业区一般工业固体废物集中处置场的噪声源，其原有噪声源强不变。

During the relying period, no new noise source will be added to the Tieshan Port Industrial Park General Industrial Solid Waste Centralized Disposal Site so that existing noise source intensity thereof will remain unchanged.

根据《铁山港工业区一般工业固体废物集中处置场项目环境影响报告书》声环境影响预测结果：填埋场运营作业期间，填埋场厂界东、南、西、北及周边敏感点在原有背景值的基础上叠加作业期间贡献值后均未出现超过《工业企业厂界环境噪声排放标准》

According to prediction results of acoustic environmental impact in the Environmental Impact Report of the Tieshan Port Industrial Park General Industrial Solid Waste Centralized Disposal Site: during the operation of the landfill site, the east, south, west, north and surrounding sensitive points of the landfill site boundary will not exceed Class 3 and 4 standard

（GB12348-2008）3 类标准及 4 类标准的现象。

of the *Emission Standard for Industrial Enterprises Noise at Boundary* (GB12348-2008);

4.6.4.5 依托期间固体废物处置对周边土壤环境影响分析

4.6.4.1 Analysis for impact of solid waste disposal on surrounding soil environment during relying period

根据《铁山港工业区一般工业固体废物集中处置场项目环境影响报告书》土壤环境影响分析结果：填埋场产生的渗滤液将可能对周围土壤环境产生一定的影响，可能导致土壤中重金属溶解趋势的增加，潜在的土壤及地下水重金属污染不容忽视。填埋场采用 HDPE 防渗膜为核心的防渗技术，并在填埋库区底部设置地下水导排系统。且根据上述章节分析，本项目依托铁山港工业区一般工业固体废物集中处置场处置一般工业固体废物期间并未改变原有渗滤液总量。在防渗系统正常工作的工况下，本项目依托期间，填埋场的运行对土壤环境的影响不大。

According to prediction results of soil environmental impact in the Environmental Impact Report of the Tieshan Port Industrial Park General Industrial Solid Waste Centralized Disposal Site: leachate produced by landfill site may have certain influence on the surrounding soil environment, which may lead to an increase in the dissolution trend of heavy metals in soil. The potential heavy metal pollution in soil and groundwater is nonnegligible. The landfill adopts the anti-seepage technology with HDPE anti-seepage membrane as the core, and a groundwater drainage system is set up at the bottom of the landfill area. According to the analysis of the above sections, the total amount of original leachate has not been changed during the disposal of general industrial solid waste by relying on the Tieshan Port Industrial Park General Industrial Solid Waste Centralized Disposal Site. Under normal working conditions of anti-seepage system, operation of the landfill will impose limited impact on the soil environment during the relying period of this project.

4.6.4.6 依托期间固体废物处置对周边生态环境影响分析

4.6.4.1 Analysis for impact of solid waste disposal on surrounding ecological environment during relying period

铁山港工业区一般工业固体废物集中处置场项目选址位于铁山港工业区内，周边用地均为工业用地。目前填埋场周边土地利用现状主要为废弃坑、已搬迁废弃建筑及荒草地等。本项目依托处置期间未对周边生态环境造成新的影响。

Tieshan Port Industrial Park General Industrial Solid Waste Centralized Disposal Site is located in Tieshan Port Industrial Park, and the surrounding land is all industrial land. At present, the current land use situation around the landfill site is mainly abandoned pits, relocated abandoned buildings and wasteland. The project will not impose any new impact on surrounding ecological environment during relying period.

4.6.5小结

4.6.5 Summary

厂区的固体废物主要有废木屑、竹片，锅炉渣及煤灰，浆节、渣，白泥、绿泥、石灰渣，污水处理厂污泥、生活垃圾、废离子交换树脂、储油罐残渣、隔油池污泥等，废离子交换树脂、储油罐残渣、隔油池污泥为危险废物，其余全部为一般工业固体废物。废竹屑、木屑、浆渣送厂内固废锅炉做燃料；锅炉炉渣、煤灰外卖制砖；白泥一部分送去烟气脱硫，剩余部分送石灰窑回收处置；绿泥、石灰渣和不宜燃烧的化学污泥送指定的固废堆场填埋处置；废分子筛由生产厂家回收再利用；污水处理站生化污泥送固废锅

炉燃烧；生活垃圾由环卫部门统一处理。因此，只要建设单位按规范要求采取有效的防治措施并加强管理和做好对外协调工作，项目固体废物可以得到妥善处置，对环境不会造成大的影响

The solid waste in the plant are mainly includes waste sawdust, boiler slag and coal ash, slurry joints, slag, white mud, green mud, lime slag, sludge from sewage treatment plant , domestic wastes, waste ion exchange resin, oil storage tank residue, and oil separation tank sludge, etc. Waste ion exchange resin, oil storage tank residue, and oil separation tank sludge are hazardous wastes and the rest are all general industrial solid wastes. Waste bamboo chips, wood chippings and pulp slag are sent to the solid waste boiler in the factory as fuel; Boiler slag and coal ash take-out brick making; Part of the white mud is sent to flue gas for desulfurization, and the rest is sent to lime kiln for recovery and disposal. Green mud, lime slag and chemical sludge that is not suitable for combustion shall be sent to the designated solid waste storage yard for landfill disposal; Waste molecular sieves are recycled by manufacturers. Biochemical sludge from sewage treatment station is sent to solid waste boiler for combustion. Domestic waste is uniformly treated by the sanitation department. Therefore, as long as the Employer takes effective control measures according to the specification requirements, strengthens management and completes external coordination, the solid waste of the Project can be properly disposed of without causing great impact on the environment.

本项目配套一般固体废物填埋场目前正在进行选址及前期工作，铁山港（临海）工业区管理委员会计划于 2020 年 6 月前完成选址（见附件 10），建设单位承诺于 2022 年底建成投入运行，本项目一期生产线计划于 2021 年 8 月建成投入试生产，在本项目配套一般固体废物填埋场正常运行前，依托铁山港区一般固体废物集中处置场过渡使用 5~12 个月。本项目产生的固体废物在铁山港区一般固体废物集中处置场严格按环评及批复要求完成建设、相关环保验收手续齐全后方进入填埋处置。项目配套一般固体废物填埋场投入使用后，项目产生的一般工业固体废物将不再依托铁山港区一般固体废物集中处置场处置。

The site of the supporting general solid waste landfill is being selected at present, and the preliminary work is being carried out; Tieshan Port (Linhai) Industrial Park Management Committee plans to complete the site selection before June 2020 (refer to Appendix10). The construction unit promises to complete and put it into operation at the end of 2022. The Phase

I production line is planned to be completed and put into trial operation in August 2021. Prior to the operation of the supporting general solid waste landfill, the Tieshan Port Industrial Park General Industrial Solid Waste Centralized Disposal Site is planned to be used for 5-12 months as transition. The solid waste generated by this project shall not be delivered into the landfill for disposal unless construction of the Tieshan Port Industrial Park General Industrial Solid Waste Centralized Disposal Site has been completed fully accordance with the requirements of EIA and approval, and the relevant environmental protection acceptance has been completed with complete formalities gone through. Upon operation of the supporting general solid waste landfill site for the project, general solid waste generated by the project will no longer enter the Tieshan Port Industrial Park General Industrial Solid Waste Centralized Disposal Site for landfill.

项目产生的绿泥（绝干）、石灰渣、污泥（化学处理段）依托铁山港工业区一般工业固体废物集中处置场过渡处置期间，进入铁山港工业区一般工业固体废物集中处置场的一般工业固体废物未增加新的废物类别和填埋量，未对周边环境增加新的污染。

The green mud (absolutely dry), lime slag and sludge (chemical treatment section) generated by the project will rely on the Tieshan Port Industrial Park General Industrial Solid Waste Centralized Disposal Site during the transitional disposal period. The general industrial solid waste entering the general industrial solid waste centralized disposal site in Tieshan Port Industrial Park General Industrial Solid Waste Centralized Disposal Site will not add new waste categories and landfill volume, and will not add new pollution to the surrounding environment.

4.7 土壤环境影响分析

4.7 Analysis of impact on soil environment

4.7.1土壤环境影响识别与识别

4.7.1 Discrimination and identification of soil environmental impact

根据《环境影响评价技术导则 土壤环境》（HJ610-2018）附录 A，本项目属于污染影响型。项目对土壤环境的影响途径判别见下表 4.7-1。

According to Appendix A of Technical Guidelines for Environmental Impact Assessment

- Soil Environment (Trial) (HJ610-2018), this project is a project with pollution impact. Discrimination of the impact route of the project on the soil environment is as shown in Table 4.7-1 below.

表 4.7-1 建设项目土壤环境影响类型与影响途径表

Table 4.7-1 Table of Soil Impact Type and Impact Route for Construction Projects

不同时段 **Different time periods**	污染影响型 **Pollution impact type**				生态影响型 **Ecological impact type**			
	大气沉降 **Atmospheric deposition**	地面漫流 **Ground surface runoff**	垂直入渗 **Vertical infiltration**	其他 **Other**	盐化 **Salinization**	碱化 **Alkalinization**	酸化 **Acidification**	其他 **Other**
建设期 **Construction period**	/	/	/		/	/	/	/
运营期 **Operation period**	√	/	√	/	/	/	/	/
服务期满后 **After expiration of service period**	/	/	/		/	/	/	/
注：在可能产生的土壤环境影响类型处打“√”，列表未涵盖的可自行设计 Note: Mark “√” in possible soil environmental impact types. Any item not covered in above table is allowed to be self-designed.								

项目各产污节点污染途径及污染特征因子识别见下表 4.7-2。

Identification of pollution route and pollution characteristic factors of each pollution producing node of the project is as shown in Table 4.7-2 below.

表 4.7-2 污染影响型建设项目土壤环境影响源及影响因子识别表

Table 4.7-2 Identification of Soil Environmental Impact Sources and Impact Factors of the Construction Project of Pollution Impact Type

污染源 **Source of pollution**	工艺流程/节点 **Process Flow/Milestone**	污染途径 **Pollution Route**	全部污染物指标 [a] **Index of all pollutants[a]**	特征因子 **Characteristic Factor**	备注 [b] **Remark[b]**
废气污染源 Waste gas pollution source	碱炉废气 Alkali furnace exhaust gas	大气沉降 Atmospheric deposition	烟尘、SO_2、NO_x、H_2S Smoke dust, SO_2, NO_x, H_2S	烟尘、SO_2、NO_x、H_2S Smoke dust, SO_2, NO_x, H_2S	1.污染源为连续排放；2.大气沉降预测范围内敏感点有：川江、坡尾底； 1. The pollution source is continuous emission; 2. Sensitive points within the prediction range of atmospheric subsidence include: Chuanjiang and Poweidi;
		地面漫流 Ground surface runoff	/	/	
		垂直入渗 Vertical infiltration	/	/	
		其他 Other	/	/	
	石灰窑废气 Exhaust gas of lime kiln	大气沉降 Atmospheric deposition	烟尘、SO_2、NO_x、H_2S Smoke dust, SO_2, NO_x, H_2S	烟尘、SO_2、NO_x、H_2S Smoke dust, SO_2, NO_x, H_2S	
		地面漫流 Ground surface runoff	/	/	
		垂直入渗 Vertical infiltration	/	/	
		其他 Other	/	/	
	固废综合利用锅炉废气 Exhaust gas of solid waste comprehensive utilization boiler	大气沉降 Atmospheric deposition	烟尘、SO_2、NO_x、氯化氢、一氧化碳、汞、镉、铊、锑、砷、铅、铬、钴、铜、锰、镍、镉+铊、锑+砷+铅+铬+钴+铜+锰+镍、二噁英 Smoke dust, SO2, NOx, hydrogen chloride, carbon monoxide, mercury, cadmium, thallium, antimony, arsenic, lead, chromium,	烟尘、SO_2、NO_x、氯化氢、一氧化碳、汞、镉、铊、锑、砷、铅、铬、钴、铜、锰、镍、镉+铊、锑+砷+铅+铬+钴+铜+锰+镍、二噁英 Smoke dust, SO2, NOx, hydrogen chloride, carbon monoxide, mercury, cadmium, thallium, antimony, arsenic, lead, chromium, cobalt, copper,	

污染源 Source of pollution	工艺流程/节点 Process Flow/Milestone	污染途径 Pollution Route	全部污染物指标 [a] Index of all pollutants[a]	特征因子 Characteristic Factor	备注 [b] Remark[b]
			cobalt, copper, manganese, nickel, cadmium + thallium, antimony + arsenic + lead + chromium + cobalt + copper + manganese + nickel, dioxin	manganese, nickel, cadmium + thallium, antimony + arsenic + lead + chromium + cobalt + copper + manganese + nickel, dioxin	
		地面漫流 Ground surface runoff	/	/	
		垂直入渗 Vertical infiltration	/	/	
		其他 Other	/	/	
	燃煤锅炉废气 Exhaust gas of the coal-fired boiler	大气沉降 Atmospheric deposition	烟尘、SO_2、NO_x、汞 Smoke dust, SO_2, NO_X, Hg	烟尘、SO_2、NO_x、汞 Smoke dust, SO_2, NO_X, Hg	
		地面漫流 Ground surface runoff	/	/	
		垂直入渗 Vertical infiltration	/	/	
		其他 Other	/	/	
	化学浆车间漂白工段尾气 Tail gas from bleaching section of chemical pulp workshop	大气沉降 Atmospheric deposition	Cl_2	Cl_2	
		地面漫流 Ground surface runoff	/	/	
		垂直入渗 Vertical infiltration	/	/	

污染源 **Source of pollution**	工艺流程/节点 **Process Flow/Milestone**	污染途径 **Pollution Route**	全部污染物指标 [a] **Index of all pollutants[a]**	特征因子 **Characteristic Factor**	备注 [b] **Remark[b]**
		其他 Other	/	/	
	二氧化氯制备尾气 Tail gas of preparation of chlorine dioxide	大气沉降 Atmospheric deposition	HCl、Cl_2 HCl, Cl_2	HCl、Cl_2 HCl, Cl_2	
		地面漫流 Ground surface runoff	/	/	
		垂直入渗 Vertical infiltration	/	/	
		其他 Other	/	/	
废水污染源 Wastewater pollution source	污水处理站 Sewage treatment plant	大气沉降 Atmospheric deposition	/	/	池底防渗措施失效时存在垂直入渗污染土壤风险 There is a risk of soil pollution by vertical infiltration when the anti-seepage measures at the bottom of the tank fail.
		地面漫流 Ground surface runoff	/	/	
		垂直入渗 Vertical infiltration	COD、BOD_5、SS、NH_3-N、TN、TP、AOX	COD、BOD_5、SS、NH_3-N、TN、TP、AOX	
		其他 Other	/	/	

4.7.1预测范围

4.7.1 Prediction range

情景一：项目预测范围与现状调查范围一致，占地范围内及周边 0.2km 范围内。

Scenario 1: The project forecast scope is consistent with the current investigation scope, within the occupied area and within the surrounding 0.2 km.

情景二：以污水处理站池底破损处为起点（0m），预测污染物在垂直范围内的影响深度，将预测终点设定为包气带土壤深度-4m 处（同时为污水处理站场地潜水埋深）。

模拟泄露事故泄露的污染物在 0m~-4m 范围内的浓度分布情况。

Scenario 2: Taking the damaged place at the bottom of the sewage treatment station as the starting point (0m), predict the influence depth of pollutants in the vertical range, and set the predicted end point as the soil depth of-4m in the aeration zone (also the submerged depth of the sewage treatment station site). The concentration distribution of pollutants leaked from the leakage accident in the range between 0m to -4m is simulated.

4.7.2预测评价时段

4.7.2 Prediction and assessment period

情景一：通过项目土壤环境影响识别结果，确定预测时段为从项目营运期开始的第一个五年、十年、二十年。

Scenario 1: according to the soil environmental impact identification results of the project, the prediction period is determined to be the first five, ten and twenty years from the project operation period.

情景二：假设污水处理站发生泄漏事故，泄露事故时长为 30 天。本情景模拟 30 天内污水于包气带土壤中的运移过程。

Scenario 2: assuming a leakage accident occurs in the sewage treatment station, the duration of the leakage accident is 30 days. This scenario simulates the transport process of sewage in aeration zone soil within 30 days.

4.7.3情景设置

4.7.3 Scenario setting

情景一：项目废气中含有重金属物质，随排放废气进入环境空气中，最后沉降在周围的土壤从而进入土壤环境，重金属进入土壤环境主要表现为累积效应。因此项目预测情景设定为，烟气中的重金属污染物通过累积效应对土壤的影响。

Scenario 1: the waste gas of the project contains heavy metals, which enter the ambient air with the discharged waste gas and finally settle in the surrounding soil to enter the soil environment. The entry of heavy metals into the soil environment is mainly manifested as cumulative effect. Therefore, the project forecast scenario is set as the impact of heavy metal pollutants in flue gas on soil through cumulative effect.

情景二：污水处理站为项目重点防渗区，废水经污水处理站处理后通过深海排放管

道排放至 B3 排海口。正常工况下，项目废水对土壤环境的影响不大。事故工况时，污水处理站的防渗系统失效，出现防渗层破损，将会对土壤环境造成影响。根据表 4.7-1 识别结果，本情景拟假设污水处理站池底防渗系统破损造成污水下渗，污染占地范围内土壤环境。

Scenario 2: the sewage treatment station is the key anti-seepage area of the project. After being treated by the sewage treatment station, the wastewater is discharged to B3 sewage outlet through the deep sea discharge pipeline. Under normal working conditions, the project wastewater has little impact on the soil environment. Under emergency working conditions, the anti-seepage system of the sewage treatment station fails and the anti-seepage layer is damaged, which will cause impact on the soil environment. According to the identification results in Table 4.7-1, this scenario is intended to assume that the damage of the anti-seepage system at the bottom of the sewage treatment station causes sewage infiltration and pollutes the soil environment within the occupied area.

4.7.4预测与评价因子

4.7.4 Prediction and assessment factors

情景一：累积性影响分析选取的评价因子，主要依据为大气预测中影响较大的重金属物质，因此选取镉、砷、汞作为评价因子。

Scenario 1: The assessment factors selected for cumulative impact analysis are mainly based on heavy metal substances with greater impact in atmospheric prediction, so cadmium, arsenic and mercury are selected as assessment factors.

情景二：垂直入渗影响分析选取的评价因子选取 COD、NH_3-N、BOD_5 作为评价因子。

Scenario 2: COD, NH_3-N and BOD5 are selected as assessment factors for vertical infiltration impact analysis.

4.7.5评价标准

4.7.5 Assessment standard

农用地中镉、砷、汞执行《土壤环境质量 农用地土壤污染风险管控标准（试行）》（GB36600-2018）筛选值标准。标准详见表 1.3-7。COD、NH_3-N、BOD_5 三项因子均无

相应土壤环境质量标准，因此垂直入渗型预测中仅对评价因子进行影响程度分析。

For cadmium, arsenic and mercury in agricultural land, the screening value standard in *Soil Environmental Quality - Risk Control Standard for Soil Contamination of Development Land (Trial)* (GB36600-2018) shall apply. Standards are detailed in Table 1.3-7. COD, NH3-N and BOD5 have no corresponding soil environmental quality standards, so only the influence degree analysis of assessment factors is carried out in vertical infiltration prediction.

4.7.6预测与评价方法

4.7.6 Prediction and assessment method

情景一：项目属于污染型建设项目，土壤评价工作等级为二级，采用《环境影响评价技术导则 土壤环境（试行）》（HJ 964-2018）中附录 E 推荐使用的预测方法。

Scenario 1: the project is of polluting construction type, and the soil assessment level is Grade II. The prediction method recommended in Annex E of *Technical Guidelines for Environmental Impact Assessment - Soil Environment (Trial)* (HJ 964-2018) is adopted.

（1）单位质量土壤中某种物质的增量可用下式计算：

(1) The increment of a certain substance in soil per unit mass can be calculated as follows:

$$\Delta S=n（I_S-L_S-R_S）/（\rho_b\times A\times D）$$

$$\Delta S=n\ (I_S-L_S-R_S)\ /\ (\rho_b\times A\times D)$$

式中：ΔS——单位质量表层土壤中某种物质的增量，g/kg；

Where, S - increment of a substance per unit mass in top soil, g/kg;

I_S——预测评价范围内单位年份表层土壤中某种物质的输入量，g；

I_S - the input amount of a certain substance in the top soil in a unit year within the scope of prediction and assessment, g;

L_S——预测评价范围内单位年份表层土壤中某种物质经淋溶排出的量，g；

L_S - the amount of leaching and discharge of certain substances in top soil in a unit year within the scope of prediction and assessment, g;

R_S——预测评价范围内单位年份表层土壤中某种物质经径流排出的量，g；

R_S - the amount of some substance discharged from top soil through runoff in a unit year within the scope of prediction and assessment, g;

ρ_b——表层土壤容重，kg/m^3；

ρ_b - bulk density of topsoil, kg/m3;

A——预测评价范围，m^2；

A- forecast assessment scope, m2;

D——表层土壤深度，一般取 0.2m，可根据实际情况适当调整；

D - depth of top soil, generally 0.2 m, can be adjusted according to the actual situation;

n——持续年份，a。

n - duration in years, a.

（2）单位质量土壤中某种物质的预测值可根据其增量叠加现状值进行计算：

(2) The predicated value of a certain substance in soil per unit mass can be calculated based on its increment superimposed by current value:

$$S=S_b+\Delta S$$

式中：Sb——单位质量土壤中某种物质的现状值，g/kg；

Where, Sb - current value of a substance per unit mass in soil, g/kg;

S——单位质量土壤中某种物质的预测值，g/kg。

S - predicated value of a substance per unit mass in soil, g/kg;

上述（1）中预测评价范围内单位年份表层土壤中某种物质的输入量 I_S 根据单位面积的沉降通量 F×预测评价范围 A 计算得出。

The input amount I_S of a certain substance in the surface soil per unit year within the prediction and assessment range in (1) above is calculated according to the settlement flux F × prediction and assessment area A per unit area.

沉降通量是指在单位时间内通过单位面积的污染物量，公式为：

Settlement flux refers to the amount of pollutants passing through a unit area in a unit time, of which the equation is:

$$F=C\times V\times T$$

式中：F——单位面积、单位时间的污染物沉降通量，$mg/m^2\cdot a$；

Where, F - pollutant sedimentation flux per unit area and unit time, mg/m2 · a;

C——污染物浓度，mg/m^3；保守考虑，取年平均最大落地浓度贡献值；根据大气预测结果，砷、汞、镉年均最大落地浓度分别为 $2\times10^{-5}\mu g/m^3$、$2\times10^{-5}\mu g/m^3$、$2\times10^{-4}\mu g/m^3$。

C - pollutant concentration, mg/m3; Conservative consideration, take the annual average maximum landing concentration contribution value; according to the atmospheric prediction results, the average annual maximum ground concentrations of arsenic, mercury and cadmium are 2×10^{-5}μg/m, 2×10^{-5}μg/m and 2×10^{-4}μg/m respectively.

V——污染物沉降速率，cm/s；项目排放烟尘粒度较细，沉降速率取 0.1cm/s；

V - sedimentation rate of pollutants, cm/s; the particle size of the smoke dust emitted by the project is relatively fine, and the sedimentation rate is 0.1 cm/s;

T——年内污染物沉降时间，s，取全年 330d（每天 24h）连续排放沉降。

T - the sedimentation time of pollutants in the year, s, taking 330 days (24 hours per day) of the year for continuous discharge and sedimentation.

污染物沉降速率 V 采用下式计算：

The pollutant sedimentation rate V is calculated as follows:

$$V=\frac{gd^2(\rho_1-\rho_2)}{18\eta}$$

式中 V：表示沉降速度 cm/s；

Where, V: represents the settling speed cm/s;

g——重力加速度，cm/s^2；

g - acceleration of gravity, cm/s^2;

d——粒子直径，cm；气态颗粒物 15μm；

d - particle diameter, cm; gaseous particulate matter 15μm;

ρ_1、ρ_2——颗粒密度和空气密度，g/cm^2；参照生活垃圾焚烧炉焚烧烟尘的密度为 2.2~2.3g/cm^2，选取颗粒密度 2.3g/cm^2 计算；30℃空气密度为 1.165g/cm^2；

ρ_1, ρ_2- particle density and air density, g/cm^2; Referring to the density of incineration smoke dust from the domestic waste incinerator of 2.2-2.3g/cm^2, the particle density of 2.3g/cm^2 is selected for calculation. The air density is 1.165g/cm^2 at 30 ℃;

η——空气的粘度，Pa·S，30℃空气粘度为 1.86×10^{-4}Pa·s。

η - air viscosity, Pa · S, air viscosity at 30 ℃ is 1.86×10^{-4}Pa · s.

项目土壤环境预测为大气沉降影响，不考虑输出量，即 $L_S=0$，$R_S=0$。

The soil environment of the project is predicted to be affected by atmospheric subsidence, regardless of output, i.e. LS=0 and RS=0.

情景二：垂直入渗型采用《环境影响评价技术导则 土壤环境（试行）》（HJ 964-2018）中附录 E 推荐使用的预测方法。

Scenario 2: the project is of vertical infiltration type. The prediction method recommended in Annex E of *Technical Guidelines for Environmental Impact Assessment -*

Soil Environment (Trial) (HJ 964-2018) is adopted.

一维非饱和溶质垂向运移控制方程：

One-dimensional control equation of vertical transport of unsaturated solute:

$$\frac{\partial(\theta c)}{\partial t}=\frac{\partial}{\partial z}\left(\theta D\frac{\partial c}{\partial z}\right)-\frac{\partial}{\partial z}(qc)$$

式中：c——污染物介质中的浓度，mg/L；

Where, c - concentration in pollutant medium, mg/L;

D ——弥散系数，m^2/d；

D - dispersion coefficient, m^2/d;

q——渗流速率，m/d；

q - seepage rate, m/d;

z——沿 z 轴的距离，m；

z - the distance along the z axis, m;

t——时间变量，d；

t - time variable, d;

θ ——土壤含水率，%；

θ - soil moisture content, %;

b）初始条件

b) Initial condition:

$$c（z，t）=0 \qquad t=0，L\leqslant z<0$$

$$c(z,t)=0 \qquad t=0, L\leq z<0$$

c）边界条件

c) Boundary condition

第一类 Dirichlet 边界条件：

The first type, Dirichlet boundary condition:

$$c（z，t）=c_0 \qquad t>0，z=0$$

$$c(z,t)=c_0 \qquad t>0, z=0$$

第二类 Neumann 零梯度边界：

The second type, Neumann zero gradient boundary:

$$-\theta D\frac{\partial c}{\partial z}=0 \qquad t>0，z=L$$

$$-\theta D\frac{\partial c}{\partial z}=0 \qquad t>0,\ z=L$$

4.7.7预测结果

4.7.7 Prediction results

4.7.7.1 情景一预测结果

4.7.7.1 Prediction results of Scenario 1

本次计算时长为从技改项目营运期开始的第一个 10 年、20 年、30 年，农用地土壤土壤现状值采用监测最大值，建设用地土壤现状值采用表层样的监测最大值，预测结果见下表 4.7-3。

The calculation time is the first 10, 20 and 30 years starting from the operation period of the technological transformation project. The current value of agricultural land soil adopts the monitoring maximum value, and the current value of construction land soil adopts the monitoring maximum value of surface sample. The prediction results are shown in Table 4.7-3 below.

表 4.7-3 不同年份农用地土壤中污染物预测值
Table 4.7-3 Predicted Values of Pollutants in Agricultural Land Soil in Different Years
单位:mg/kg
in mg/kg

污染物 Pollutant	表层土壤中物质的增量 ΔS Increment of a substance per unit mass in top soil ΔS;			农用地土壤现状值 Sb Current value of agricultural land soil Sb	表层土壤中某种物质的预测值 S Predicted value of a substance in top soil			标准值 Standard value
	10 年 10 years	20 年 20 years	30 年 30 years		10 年 10 years	20 年 20 years	30 年 30 years	
镉 Cadmium	0.001527	0.003055	0.004582	0.03	0.031527	0.033055	0.034582	0.3~0.6
汞 Mercury	0.000153	0.000305	0.000458	0.072	0.072153	0.072305	0.072458	0.5~3.4
砷 Arsenic	0.000153	0.000305	0.000458	8.01	8.010153	8.010305	8.010458	20~40

由表 4.7-3 可以看出，在项目建成后的 10 年、20 年、30 年，重金属在土壤中的累积量逐步增加，项目排放的大气污染物中含有的重金属对周边土壤造成一定的累积影响，但对土壤中镉、砷、汞重金属的预测值未超过《土壤环境质量 农用地土壤污染风险管控标准（试行）》（GB36600-2018）筛选值标准。

As can be seen from Table 4.7-3, In 10, 20 and 30 years after the completion of the project, The accumulation of heavy metals in the soil gradually increases, and the heavy metals contained in the air pollutants emitted by the project have certain cumulative impacts on the surrounding soil. However, the predicted values of cadmium, arsenic and mercury in the soil do not exceed the the screening value standard in *Soil Environmental Quality - Risk Control Standard for Soil Contamination of Development Land (Trial)* (GB36600-2018).

因此，本项目废气排放中重金属镉、砷、汞污染物进入土壤环境造成的累积量是有限的，在可接受范围内。

Therefore, the accumulation of heavy metals cadmium, arsenic and mercury pollutants in the waste gas emission of this project entering the soil environment is limited and within the acceptable range.

4.7.7.2 情景二预测结果

4.7.7.2 Prediction results of Scenario 2

当污水处理站池底发生破损时，污水中的污染物将下渗污染场地包气带土壤，将会持续下渗直至到达地下水潜水面，污染物到达潜水面后将会随着地下水运移至下游。预测选取项目生产废水中的主要污染物化学需氧量、氨氮、总氮、总磷等均无土壤环境质量标准，本次评价选取废水中的持久性有机物 AOX 作为预测因子，分析废水下渗进入土壤后持久性有机物的累积影响情况。

Where the bottom of the sewage treatment station is damaged, the pollutants in the sewage will infiltrate the soil in the aeration zone of the contaminated site and will continue to infiltrate until reaching the water table of groundwater. After reaching the water table, the pollutants will transport to the downstream with the groundwater. There is no soil environmental quality standard for the main pollutants in the production wastewater of the project selected in the prediction, such as chemical oxygen demand, ammonia nitrogen, total nitrogen, total phosphorus, etc. In this assessment, AOX, a persistent organic matter in wastewater, is selected as a predictor to analyze the cumulative impact of persistent organic matter after wastewater infiltration into soil.

本次预测拟将污水处理站事故泄露时间定为 30 天。污水处理站用地范围内潜水埋深约为 3~5m，因此将预测范围设定为由泄漏点（0m）至潜水面（地下埋深 4m），预测污染物抵达潜水面时的浓度及时间。

This assessment plans to set the accident leakage time of the sewage treatment station as 30 days. The submerged depth within the land area of the sewage treatment station is about 3-5m, so the prediction range is set from the leakage point (0m) to the water table (4m underground burial depth) to predict the concentration and time when pollutants arrive at the water table.

预测过程设计参数见下表 4.7-4。

Design parameters in the prediction process are as shown in Table 4.7-4 below.

表 4.7-4 垂直入渗预测过程参数

Table 4.7-4 Prediction Process Parameters for Vertical Infiltration

包气带性质 Nature of aeration zone	垂向弥散系数 Vertical dispersion coefficient	渗流速率 Seepage rate	预测深度 Predicted depth	泄露时长 Leakage duration	土壤含水率 Soil moisture content	备注 Remarks
	m^2/d	m/d	m	d	%	
砂层、亚粘土 Sand layer and loam	0.37	0.0896	4	30	20	①土壤含水率查找经验值获得；②垂向弥散系数取纵向弥散系数的 0.1 ①Soil moisture content is obtained by searching empirical values. ② The vertical dispersion coefficient is taken as 0.1 of the longitudinal dispersion coefficient

AOX 在预测时长 30 天内，在假设土壤（0~-4m）均已饱和，根据表 3.6-3 中污水处理站调查点位的土壤理化性质，得出 1kg 土壤体积为 0.77m3。则土壤中孔隙体积为 0.39 m^3。土壤中污染物浓度分布见下表 4.7-5。

For AOX, under the assumption that the soil (0 ~-4m) is saturated within 30 days of the prediction time, according to the physical and chemical properties of the soil at the investigation points of the sewage treatment station in Table 3.6-3, the volume of 1kg soil is 0.77m3. Then the pore volume in the soil is 0.39m3. Concentration distribution of pollutants in the soil is as shown in Table 4.7-5 below.

表 4.7-5 AOX 在土壤中的浓度与时间及深度关系 单位：mg/kg

Table 4.7-5 Relationship between AOX concentration in Soil and Time and Depth in mg/kg

深度（m） Depth (m) / 时间（d） Time (d)	1	2	3	4

10	4215.506	810.3241	400.4056	248.299
20	5862.188	1033.554	526.9384	337.6959
30	6739.762	1138.059	588.9796	383.7503

4.7.8小结

4.7.8 Summary

建设项目在运营期的 10 年、20 年、30 年，排放的大气污染物镉、砷、汞对评价范围内土壤的累积预测值能达到相关标准要求，其中镉、砷、汞能未超过《土壤环境质量 农用地土壤污染风险管控标准（试行）》（GB36600-2018）筛选值标准，表明建设项目土壤环境影响为可接受。

During the 10, 20 and 30 years of operation period of the construction project, the cumulative predicted values of the emitted air pollutants, cadmium, arsenic and mercury, on the soil within the assessment scope can comply with the requirements of relevant standards. Among them, lead, mercury and arsenic do not exceed the screening value standard of *Soil Environmental Quality - Agricultural Land Soil Pollution Risk Control Standard (Trial)* (GB36600-2018), indicating that the soil environmental impact of the construction project is acceptable.

在污水处理站发生破损时的事故工况预测结果中，AOX 在 30 天的模拟期内均对包气带土壤造成了不同程度的影响，AOX 无相关土壤环境质量标准，因此不对其进行达标评价，仅对其影响范围进行说明。本次预测范围为池底破损面至地下水潜水面（0~-4m），预测结果显示，泄露事故发生后，深度为 1m 处的土壤将会成为泄露事故前期污染物的聚集点；在 30 天时，1m 处的土壤 AOX 浓度为 6739.762mg/kg，达到预测时段内的浓度最大值，污染物的持续下渗至 4m 后的浓度为 383.7503mg/kg。达到潜水面后，污染物将会污染至区域地下水。污水处理站的持续泄露将会造成包气带的 AOX 浓度的持续上升，因此污水处理站泄露事故对于土壤环境及场地下地下水环境均会造成较大的影响，建设单位需做到安全生产，落实本报告书提出的环境保护措施，对生态环境负责。

In the prediction results of accident conditions when the sewage treatment station is damaged, AOX has caused different degrees of influence on the soil in the aeration zone within the 30-day simulation period. AOX has no relevant soil environmental quality standard, so it is not evaluated for reaching the standard, only its influence range is explained. The prediction range is from the damaged surface of the pool bottom to the water table of groundwater (0m to -4m). The prediction results show that after the leakage accident, the soil with a depth of 1m will become the accumulation point of pollutants in the early stage of the leakage accident. At 30 days, the concentration of AOX in the soil at 1m was 6,739.762mg/kg, reaching the maximum concentration in the predicted period, and the concentration of AOX after continuous infiltration to 4m was 383.7503mg/kg. After reaching the water table, pollutants will pollute the regional groundwater. The continuous leakage of the sewage treatment station will cause the continuous increase of AOX concentration in the aeration zone. Therefore, the leakage accident of the sewage treatment station will have a greater impact on the soil environment and the groundwater environment under the site. The Employer shall ensure safe production, implement the environmental protection measures proposed in this report, and be responsible for the ecological environment.

4.8 生态环境影响分析

4.8 Analysis of impact on ecological environment

项目废气排放的主要污染物有 SO_2、NO_x、HCl、PM_{10}、Cd、Hg、Pb、Cr、As、H_2S、NH_3、二噁英、VOCs 等。目前对于大气污染对植被的影响研究主要集中在 SO_2、NO_x、颗粒物、重金属等常规污染物，下面结合大气预测结果分析本项目排放的污染物对区域植被产生的影响：

The main pollutants emitted by the project waste gas include SO2, NOx, HCl, PM10, Cd, Hg, Pb, Cr, As, H2S, NH3, dioxin, VOCs, etc. At present, the research on the impact of air pollution on vegetation mainly focuses on conventional pollutants such as SO2, NOx, particulate matter, heavy metals, etc. The following is an analysis of the impact of pollutants discharged from this project on regional vegetation based on the atmospheric prediction results:

（1）SO_2 的影响

(1) Impact of SO_2

由于自然界的生物多样性，各种生物的特征各不相同，对 SO_2 的抗性差异也很大。根据目前的研究结果，大气中 SO_2 浓度达到 0.3ppm 时，植物就出现伤害症状，对 SO_2 伤害较为敏感的植物在 SO_2 浓度为 3.25mg/m³空气中暴露 1 小时产生初始可见伤害，即其可见伤害的阈值剂量为 3.25 mg/m³。一般情况下，SO_2 平均浓度不超过 18.13、1.05、0.68、0.47mg/m³，暴露时间相应为 1、2、4、8 小时，则植物可避免出现叶部伤害。植物的隐性伤害表现为生理干扰，或对生长和产量的影响，但植物不呈现外部可见伤害症

状。据研究，敏感作物光合作用受抑制的平均阈值剂量为 0.65 mg/m³·h。导致敏感作物光合作用速率减低 10%的平均暴露剂量为 1.17 mg/m³·h。

Due to the biodiversity in nature, the characteristics of various organisms are different, and the resistance to SO2 is also very different. According to the current research results, when the concentration of SO2 in the atmosphere reaches 0.3 ppm, plants will show injury symptoms. Plants sensitive to SO2 injury will produce initial visible injury when exposed to air with a concentration of SO2 of 3.25mg/m for 1 hour, i.e. The threshold dose of visible injury is 3.25mg/m. In general, the average concentration of SO2 is not more than 18.13, 1.05, 0.68 and 0.47mg/m, and the exposure time is 1, 2, 4 and 8 hours respectively, then the plant can avoid leaf injury. The hidden injury to plants is manifested by physiological interference or impact on growth and yield, but plants do not show external visible injury symptoms. According to research, the average threshold dose of photosynthesis inhibition for sensitive crops is 0.65mg/m³·h. The average exposure dose that caused the photosynthesis rate of sensitive crops to decrease by 10% is 1.17mg/m³·h.

大气预测结果表明，排放的 SO_2 小时浓度预测最大增值约为 0.009448mg/m³，叠加本底值后区域最大预测值为 0.010448mg/m³，低于上述研究的伤害阈值，因此本项目排放的 SO_2 不会对区域植被产生危害影响。

The atmospheric prediction results show that the predicted maximum increment of the hourly concentration of SO2 emitted is about 0.009448 mg/m³, and the maximum predicted value of the region after superimposing the background value is 0.010448 mg/m³, which is lower than the injury threshold of the above research. Therefore, the SO2 emitted by this project will not impose harmful impact on the vegetation in the region.

（2）NOx 的影响

(2) Impact of NOx

NOx 对植物的伤害没有 SO_2 对植物的伤害严重。大多数由 NOx 引起的对田间植物伤害和危害事件与某些工业生产过程中发生的事故性排放（如偶然释放或泄漏）有关。工厂的日常生产由于消耗矿物燃料也产生一些 NOx，但由于排放量不大，通常对植物的影响很小。据报道，一般来说对植物生长和代谢影响的 NOx 阈值剂量为 1.32mg/m³·h，叶子受伤害的阈值剂量为 5.64mg/m³·h，同时也有报道认为，低浓度的 NOx 可能会促进植物的生长。

NOx harms plants less than SO2. Most of the injury and harm events to field plants caused by NOx are related to accidental emissions (such as accidental release or leakage) occurring in some industrial production processes. The daily production of the plant also produces some NOx due to the consumption of fossil fuels, but due to the small emissions, the impact on plants is usually very small. It is reported that the threshold dose of NOx affecting plant growth and metabolism is generally 1.32mg/m³·h, and the threshold dose of leaf injury is 5.64mg/m³·h. It is also reported that low concentration of NOx may promote plant growth.

大气预测结果表明，排放的 NOx 小时浓度预测最大增值约为 0.008216mg/m³，叠加本底值后区域最大预测值为 0.029341mg/m³，低于上述研究的伤害阈值，因此本项目排放的 NOx 不会对区域植被产生危害影响。

The atmospheric prediction results show that the predicted maximum increment of the hourly concentration of NOx emitted is about 0.008216mg/m³, and the maximum predicted value of the region after superimposing the background value is 0.029341mg/m³, which is lower than the injury threshold of the above research. Therefore, the NOx emitted by this project will not impose harmful impact on the vegetation in the region.

（3）颗粒物影响

(3) Impact of particulate matter

颗粒物对植物的危害主要体现在：沉积在绿色植物叶面，堵塞气孔，阻碍光合作用、呼吸作用、蒸腾作用等，危害植物健康；且颗粒降尘中一些有毒物质可通过溶解渗透，进入植物体内，产生毒害作用。

The harm of particulate matter to plants is mainly reflected in: deposition on the leaves of green plants, blocking stomata, hindering photosynthesis, respiration, transpiration, etc., endangering plant health; In addition, some toxic substances in particulate dust can enter plants through dissolution and infiltration, resulting in toxic effects.

本项目以 PM_{10} 做预测，预测结果表明，PM_{10} 的 24 小时浓度预测最大增值占标率约 2.31%，叠加背景值占标率为 18.48%，因此本项目排放的颗粒物对区域植被不会造成明显的不良影响。

PM10 is used for prediction in this project. The prediction results show that the maximum value-added rate of PM10 in 24 hours is about 2.31%, and the superimposed background value is 18.48%. Therefore, the particulate matter emitted by this project will not cause obvious adverse effects on regional vegetation.

根据本项目其他污染物总沉积率预测结果，本项目各污染物的网格小时浓度、日均浓度最大增值均无超标点，污染物沉降过程主要发生在项目厂区周边，对绿化树种的影响较低，不会对周围植物群落产生影响。

According to the prediction results of the total deposition rate of other pollutants in this project, the maximum increment of grid hourly concentration and daily average concentration of each pollutant in this project does not exceed the standard. The sedimentation process of pollutants mainly occurs around the factory area of the project, which has low impact on greening tree species and will not affect the surrounding plant communities.

（4）二噁英对周围生态影响分析

(4) Analysis for impact of dioxin on surrounding ecology

二噁英是一类毒性很强的物质，人体对二噁英的暴露途径主要是经口摄入，皮肤接触以及呼吸道吸入。二噁英的主要靶器官有脂肪组织，免疫系统，肝脏以及胚胎。二噁英能够导致皮肤性疾病，产生免疫毒性，内分泌毒性，生殖毒性，发育毒性，并具有很强的致畸致癌性。

Dioxin is a kind of highly toxic substance. The exposure routes of human body to dioxin are mainly oral intake, skin contact and respiratory tract inhalation. The main target organs of dioxin are adipose tissue, immune system, liver and embryo. Dioxin may cause skin diseases, produce immunotoxicity, endocrine toxicity, reproductive toxicity and developmental toxicity, and has strong teratogenicity and carcinogenicity.

二噁英通常以颗粒态、气溶胶态或气态存在，通常由燃烧过程直接排放或前体物转化形成。二噁英排放导致的环境污染既涉及到大气，还影响下垫面如土壤的生态环境安全，二噁英类污染物可长期稳定存在于土壤中。目前对冶炼行业企业排放二噁英的研究主要集中在浓度监测、组分分析、大气模拟扩散等方面，鲜有考虑二噁英沉降对土壤污染的影响。此外，通过查阅《土壤污染防治行动计划》、《关于加强二噁英污染防治的指导意见》、《重点行业二噁英污染防治技术》等均未涉及二噁英烟气排放沉降对土壤污染的影响。本项目烟气二噁英排放浓度分别为 0.092TEQng/m^3。根据国内外学者研究结果，Schuhmacher 对西班牙 1999 年开始运行的危险废物焚烧炉周边环境进行了跟踪调查，危险废物焚烧炉对周边土壤、植物、生命体的影响很低；杜兵对国内 13 座不同类型、不同处理量的危险废物焚烧设施周边土壤的污染水平进行调查，研究表明二噁英的

污染处于较低水平，焚烧炉对周边土壤未造成明显风险（王奇，2014）。

Dioxin usually exists in particulate, aerosol or gaseous state and is usually formed by direct emission during combustion or precursor conversion. The environmental pollution caused by dioxin emission not only involves the atmosphere, but also affects the ecological environment safety of underlying surfaces such as soil. Dioxin pollutants can stably exist in soil for a long time. At present, the research on dioxin emission from smelting enterprises mainly focuses on concentration monitoring, component analysis, atmospheric simulation diffusion and other aspects, and rarely considers the impact of dioxin deposition on soil pollution. In addition, the impact of dioxin flue gas emission settlement on soil pollution has not been covered in *Action Plan on Prevention and Control of Soil Pollution*, *Guidance on Strengthening the Prevention and Control of Dioxin Pollution* and *Prevention and Control of Dioxin Pollution in Key Industries* by consulting these documents. The emission concentration of dioxin in flue gas of this project is 0.092TEQng/m3 respectively. According to the research results of academicians at home and abroad, Schuhmacher has conducted a follow-up investigation on the surrounding environment of hazardous waste incinerators that began to operate in Spain in 1999. The impact of hazardous waste incinerators on surrounding soil, plants and living organisms is very low. Du Bing investigated the pollution level of soil around 13 hazardous waste incineration facilities of different types and different treatment capacities in China. The research showed that the pollution of dioxin was at a relatively low level and the incinerator does not cause significant risks to the surrounding soil (Wang Qi, 2014).

所以本项目在结合实际技术情况的条件下，应尽量采用最优的烟气控制技术，遵循严格的烟气排放标准，加强运行管理，减少事故排放，尽可能把项目二噁英污染程度降到最低，降低其对周围生态环境产生的影响。

Therefore, in this project, depending upon the actual technical conditions, best efforts shall be made to adopt the optimal flue gas control technology, follow strict flue gas emission standards, strengthen operation management, and reduce accidental emission, so as to minimize the pollution level of the project dioxin as much as possible, and reduce its impact on the surrounding ecological environment.

（5）重金属对周围生态影响分析

(5) Analysis for impact of heavy metal on surrounding ecology

重金属对植物的影响主要表现为影响植物对某些营养元素的吸收。由于元素之间的拮抗作用，锌、镍等元素能严重防碍植物对磷的吸收；铝能使土壤中形成不溶性的铝－磷酸盐，影响植物对磷的吸收；砷能影响植物对钾的吸收。重金属影响植物细胞结构，可以诱导部分植物根、叶细胞核及线粒体结构发生变；抑制部分植物细胞分裂并导致染色体异常。

The influence of heavy metals on plants is mainly manifested in the absorption of some nutrient elements by plants. Due to the antagonism between elements, zinc, nickel and other elements can seriously hinder the absorption of phosphorus by plants. Aluminum can form insoluble aluminum-phosphate in soil and affect the absorption of phosphorus by plants. Arsenic can affect the absorption of potassium by plants. Heavy metal affects plant cell structure and can induce some plant root, leaf nucleus and mitochondrial structure changes. Inhibits some plant cell division and causes chromosome abnormalities.

另外重金属还影响植物种子活力并抑制植物生长发育。由于本项目危险废物中重金属经过高温还原，经过废气处理措施去除，烟尘中的重金属产生量及排放量都很小，且非本项目主要的大气污染物，则正常生产时排放烟气中的重金属不会对植物生长造成明显伤害。

In addition, heavy metal also affects plant seed vigor and inhibit plant growth and development. As the heavy metals in the hazardous waste of this project are reduced at high temperature and removed by waste gas treatment measures, the amount and emission of heavy metals in the smoke dust are very small and are not the main air pollutants of this project, then the heavy metals in the smoke discharged during normal production will not cause obvious damage to plant growth.

考虑到土壤、农作物以及动物、人体对铅等重金属的富集作用，建议在厂区周围作物以种植树苗等经济林为主。或者以一定的时间间隔轮番种植农作物和对铅等重金属具有富集作用的植物，使得土壤定期得到一定的修复。

In view of the enrichment of heavy metals such as lead by soil, crops, animals and human bodies, it is recommended that economic forests such as saplings be mostly grown around the plant, or crops and plants with enrichment effect on heavy metals such as lead be grown at certain time intervals, so that the soil can be regularly repaired to a certain extent.

根据园区总体规划，项目周边农田均已规划为工业用地，待远期将农田开发为工业用地后，此问题将不复存在。

According to the master plan of the park, the farmland around the project has been planned as industrial land, and this problem will no longer exist once the farmland is developed into industrial land in the long run.

5 环境风险分析

5. Environmental risk analysis

项目环境风险评价的目的是分析和预测建设项目存在的潜在危险、有害因素，建设项目建设和运行期间可能发生的突发事件或事故（一般不包括人为破坏及自然灾害），引起有毒有害、易燃易爆等物质泄露，或突发事件产生的新的有毒有害物质，所造成的对人身安全与环境的影响和损害程度，提出合理可行的防范、应急与减缓措施，以使建设项目事故率、损失和环境影响达到可接受水平。

For the purpose of this project, the environmental risk assessment is intended to analyze and predict the potential dangers and harmful factors in the construction project, and propose feasible preventive, emergency and mitigation measures according to the impact and damage extent on human safety and environment from leakage of toxic or harmful substances and combustible or explosive substances due to incidents or accidents that may occur during the construction and operation of the project (generally excluding human-made destruction and natural disasters), or new toxic or harmful substances produced due to an incident, so as to maintain the accident rate, loss and environmental impact of the construction project within the acceptable level.

环境风险评价应把事故引起厂（场）界外人群的伤害、环境质量的恶化及对生态系统影响的预测和防护作为评价工作重点。

The environmental risk assessment should be focused on the predication and protection of injury to people outside the plant (site), the deterioration of environmental quality and the impact on the ecosystem caused by the accident.

5.1 风险调查

5.1 Risk investigation

5.1.1 建设项目风险源调查

5.1.1 Investigation of risk sources of the construction project

1、危险物质调查

1. Investigation of hazardous substances

根据《建设项目环境风险评价技术导则》（HJ169-2018）附录 B 对项目所涉及的危险物质进行调查和识别，筛选出项目原辅料、产品中的危险物质见表 5.1-1。

The hazardous substances involved in the project are to be investigated and identified according to Annex B of *Technical guidelines for environmental risk assessment on projects* (HJ169-2018) to identify the hazardous substances contained in the raw and auxiliary materials as well as the products, as shown in Table 5.1-1.

表 5.1-1　危险物质调查表

Table 5.1-1 Hazardous Substance Investigation Form

危险物质名称 Name of hazardous substance	CAS 号 CAS No.	贮存位置 Storage location	危险性类别 Hazard category	最大存储量/t Maximum storage capacity/t	内部温度 Internal temperature	内部压力 Internal pressure	防护措施 Protection measures
氯气 Chlorine	7664-41-7	二氧化氯制备车间 Chlorine dioxide preparation workshop	第 2.3 类 有毒气体 Class 2.3 toxic gas	反应产生，不存储 No storage due to existence of reaction	常温 Room temperature	0.3~1Mpa	气体监控报警、围堰 Gas monitoring alarm, cofferdam
二氧化氯 Carbon dioxide	10049-04-4	二氧化氯制备车间 Chlorine dioxide preparation workshop	/	40	＜150	负压 Negative pressure	气体监控报警 Gas monitoring alarm
硫酸 Sulphuric acid	7664-38-2	化工库 Chemical warehouse	第 8.1 类酸性腐蚀品 Class 8.1 Corrosives presenting acid properties	250	常温 Room temperature	常压 Normal pressure	围堰 Cofferdam
20%氨水 20% ammonia	1336-21-6	化工库 Chemical warehouse	第 8.2 类碱性腐蚀品 Class 8.2 Corrosives presenting alkalinous properties	100	常温 Room temperature	常压 Normal pressure	围堰 Cofferdam
柴油 Diesel	/	加油站 Gas station	/	85.5	常温 Room	常压 Normal	围堰 Cofferdam

					temperature	pressure	
汽油 Gasoline		加油站 Gas station	/	15	常温 Room temperature	常压 Normal pressure	围堰 Cofferdam
氢氧化钠 Sodium hydroxide	1310-73-2	化工库 Chemical warehouse	第 8.2 类碱性腐蚀品 Class 8.2 Corrosives presenting alkalinous properties	880	常温 Room temperature	常压 Normal pressure	阴凉、干燥、通风、分区存储 Cool, dry, well-ventilated, partitioned
过氧化氢 Hydrogen peroxide	7722-84-1	化工库 Chemical warehouse	第 5.1 类氧化剂 Class 5.1 oxidizing agent	180	常温 Room temperature	常压 Normal pressure	
醋酸 Acetic acid	64-19-7	化工库 Chemical warehouse	第 8.1 类酸性腐蚀品 Class 8.1 Corrosives presenting acid properties	90	常温 Room temperature	常压 Normal pressure	
32%盐酸 32% hydrochloric acid	7647-01-0	化工库 Chemical warehouse	第 8.1 类酸性腐蚀品 Class 8.1 Corrosives presenting acid properties	480	常温 Room temperature	常压 Normal pressure	
次氯酸钠 Sodium hypochlorite	7681-52-9	制浆车间 Pulping workshop	第 8.3 类其它腐蚀品 Class 8.3 Other corrosives	90	常温 Room temperature	常压 Normal pressure	
半浓黑液 Semi concentrated black liquor	/	碱回收车间 Alkaline recovery workshop	/	2640m^3	常温 Room temperature	常压 Normal pressure	围堰 Cofferdam
浓黑液 Concentrated black liquor	/		/	1200m^3	常温 Room temperature	常压 Normal pressure	围堰 Cofferdam

2、生产工艺

2. Production process

本项目危险化学品均储存于化工库，根据&2.2.1 工程工艺流程及产排污节点分析，各生产单元涉及使用危险化学品识别如下。

The hazardous chemicals of this project are stored in the chemical warehouse. According to &2.2.1 "Engineering process flow and production sewage disposal node analysis", the identification of hazardous chemicals used in each production unit is as follows.

表 5.1-2 生产车间物质分布

Table 5.1-2 Substance Distribution in Production Workshop

生产单元 **Production unit**	风险类型 **Risk type**	危险物质 **Hazardous substance**	备注 **Remarks**
化学浆车间（化学木浆） Chemical pulp workshop (chemical wood pulp)	泄漏 Leakage	氢氧化钠、硫酸、过氧化氢、次氯酸钠 Sodium hydroxide, sulfuric acid, hydrogen peroxide, sodium hypochlorite	
碱回收车间 Alkaline recovery workshop	泄漏 Leakage	黑液（污染物浓度高） Black liquor (high concentration of pollutants)	
二氧化氯制备车间 Chlorine dioxide preparation workshop	泄漏 Leakage	氯气（中间产物）、氢氧化钠、氯酸钠（中间产物）、盐酸（中间产物）、二氧化氯、氢气 Chlorine (intermediate product), sodium hydroxide, sodium chlorate (intermediate product), hydrochloric acid (intermediate product), chlorine dioxide, hydrogen	
化机浆车间 Chemimechanical pulp workshop	泄漏 Leakage	双氧水、氢氧化钠、醋酸 Hydrogen peroxide, sodium hydroxide, acetic acid	
MVR 蒸发工段 MVR evaporation section	泄漏 Leakage	黑液（污染物浓度高） Black liquor (high concentration of pollutants)	
加油站 Gas station	泄漏、火灾 Leakage, fire	柴油 Diesel	
原料堆场、成品库 Raw material yard, finished product warehouse	火灾 Fire	木片、成品纸 Wood chips, finished paper	
天然气管道 Natural gas pipeline	泄漏、火灾 Leakage, fire	天然气 Natural gas	园区管道输送，无储存 No storage, and to be transported by pipeline in the industrial park

3、危险物质安全技术说明书（MSDS）

3. Material safety data sheet (MSDS)

表 5.1-3 氯气的理化性质及危险特性

Table 5.1-3 Physical and Chemical Properties & Hazardous Characteristics of Chlorine Gas

<table>
<tr><td rowspan="5">标识
Identification</td><td>中文名：
Chinese name:</td><td>氯；液氯；氯气
氯; 液氯; 氯气</td><td>英文名：
English name:</td><td colspan="2">Chlorine</td></tr>
<tr><td>分子式：
Molecular formula:</td><td>Cl_2</td><td>分子量：
Molecular weight:</td><td colspan="2">70.91</td></tr>
<tr><td>CAS 号：
CAS No.:</td><td>7782-50-50</td><td>RTECS 号：
RTECS No.:</td><td colspan="2">FO2100000</td></tr>
<tr><td>UN 编号：
UN No.:</td><td>1017</td><td>危险货物编号：
Dangerous goods code:</td><td colspan="2">23002</td></tr>
<tr><td>IMDG 规则页码：
Page number in IMDG Code:</td><td colspan="4">2116</td></tr>
<tr><td rowspan="7">理化性质
Physical & chemical properties</td><td>外观与性状：
Appearance and properties:</td><td colspan="4">黄绿色有刺激性气味的气体。
Yellow green gas with irritating odor</td></tr>
<tr><td>主要用途：
Main purpose:</td><td colspan="4">用于漂白，制造氯化合物、盐酸、聚氯乙烯等。
Used for bleaching, and manufacturing of chlorine compounds, hydrochloric acid, polyvinyl chloride, etc.</td></tr>
<tr><td>熔点（℃）：
Melting point (℃):</td><td>-101</td><td>沸点：
Boiling point:</td><td colspan="2">-34.5</td></tr>
<tr><td>溶解性：
Solubility:</td><td colspan="4">易溶于水、碱液。
Easily soluble in water and lye.</td></tr>
<tr><td>相对密度（水=1）：
Relative density (water =1):</td><td>1.47</td><td>相对密度（空气=1）：
Relative density (air=1):</td><td colspan="2">2.48</td></tr>
<tr><td>饱和蒸气压 kPa）：
Saturated vapor pressure (kPa):</td><td>506.62/10.3℃</td><td>燃烧热（kJ/mol）：
Heat of combustion (kJ/mol):</td><td colspan="2">无意义
Meaningless</td></tr>
<tr><td>临界温度（℃）：
Critical temperature (℃):</td><td>144</td><td>临界压力（MPa）：
Critical pressure (MPa):</td><td colspan="2">7.71</td></tr>
<tr><td rowspan="5">燃烧爆炸危险性
Combustion and explosion hazard</td><td>燃烧性：
Flammability:</td><td>助燃
Combustion supporting</td><td>建规火险分级：
Fire risk classification in building regulations:</td><td colspan="2">乙
Class II</td></tr>
<tr><td>闪点（℃）：
Flash point (℃):</td><td>无意义
Meaningless</td><td>自燃温度（℃）：
Autoignition temperature (℃):</td><td colspan="2">无意义
Meaningless</td></tr>
<tr><td>爆炸下限（V%）：
Lower explosive limit (v%):</td><td>无意义
Meaningless</td><td>爆炸上限（V%）：
Upper explosive limit (v%):</td><td colspan="2">无意义
Meaningless</td></tr>
<tr><td>危险特性：
Hazard characteristic:</td><td colspan="4">加压气体；急性毒性-吸入，类别 2；皮肤腐蚀/刺激，类别 2；严重眼损伤/眼刺激，类别 2；特异性靶器官毒性-一次接触，类别 3；（呼吸道刺激）危害水生环境-急性危害，类别 1
Pressurized gas; Acute toxicity - Inhalation, Category 2; Skin corrosion/irritation, Category 2; Serious eye damage/eye irritation, Category 2; Specific target organ toxicity - single exposure, Category 3; (Respiratory tract irritation) Aquatic toxicity - Acute hazard, Category 1</td></tr>
<tr><td>燃烧（分解）产物：</td><td>氯化氢。</td><td>稳定性：</td><td colspan="2">稳定</td></tr>
</table>

	Combustion (decomposition) product:	Hydrogen chloride.	Stability:	Stable
	聚合危害： Polymeric hazard:	不能出现 Not allowed	禁忌物： Prohibited substances:	易燃或可燃物、醇类、乙醚、氢 Flammable or combustible materials, alcohols, ether, hydrogen
	灭火方法： Fire extinguishing methods:	不燃。切断气源。喷水冷却容器，可能的话将容器从火场移至空旷处。 Non-flammable. Cut off the gas source. Spray water to cool the container; if possible, move the container from the fire site to the open space.		
包装与储运 Packaging, storage and transportation	危险性类别： Hazard category:	第 2，3 类有毒气体 Class 2/3 toxic gas	危险货物包装标志： Packing mark of dangerous goods:	4
	储运注意事项： Storage & transportation precautions:	不燃有毒压缩气体。储存于阴凉、通风仓间内，仓温不宜超过 30℃。远离火种、热源。防止阳光直射。应与易燃、可燃物、金属粉末等分开存放。不可混储混运。液氯储存区要建低于自然地面的围堤。验收时要注意品名，注意验瓶日期，先进仓的先发用。搬运时轻装轻卸，防治钢瓶及附件破损，运输按规定路线行驶，勿在居民区和人口稠密区停留。 Nonflammable toxic compressed gas. Store it in a cool, ventilated warehouse at a temperature no more than 30 ℃. Keep away from fire and heat sources. Prevent direct sunlight. Store it separately from flammables, combustibles, metal powder, etc. Avoid mixed storage and transportation. For liquid chlorine storage area, please build a embankment lower than the natural ground. Pay attention to the product name during acceptance, and please check the date on the bottle to ensure first-in first-out. Handle gently to avoid damage to cylinders and accessories. Drive along the prescribed route during transportation, and do not stop in residential areas and densely populated areas.		
毒性危害 Toxic hazard	接触限值： Exposure limit:	中国 MAC： China MAC:	$1mg/m^3$	
		苏联 MAC： Soviet MAC:	$1mg/m^3$	
		美国 STEL/ACGIH United States STEL/ACGIH	1ppm $3mg/m^3$	
		美国 TWA/ACGIH United States TWA/ACGIH	0.5ppm $1.5mg/m^3$	
		美国 TWA/ OSHA US TWA/OSHA	1ppm $3mg/m^3$（上限值） 1ppm $3mg/m^3$ (upper limit)	
	侵入途径： Invasion route:	吸入 Inhalation	毒性： Toxicity:	属高毒类；LC_{50}:293ppm 1 小时（大鼠吸入） Highly toxic; LC_{50}: 293ppm 1 hour (rat - inhalation)
	健康危害： Health hazard:	对眼、呼吸系统粘膜有刺激作用，可引起迷走神经兴奋、反射性心跳骤停。急性中毒，轻度者出现粘膜刺激症状；眼红、流泪、咳嗽，肺部无特殊所见；中度者出现支气管炎和支气管肺炎表现，病人胸痛、头痛、恶心、较重干咳、呼吸及脉搏增快，可有轻度紫绀等；重度者出现肺水肿，可发生昏迷和休克，有时发生喉头痉挛和水肿，造成窒息，还可引起反射性呼吸抑制，发生呼吸骤停死亡。慢性中毒：长期低浓度接触，可引起慢性支气管炎、支气管哮喘和肺水肿；可引起职业性癌症及牙齿		

		酸蚀性。 It is stimulative to eyes and mucous membranes of the respiratory system, and can cause vagus nerve stimulation and reflex cardiac arrest. Acute poisoning: for mild cases, mucous membrane irritation occurs, such as red eyes, tears and cough, but there are no special findings in lungs; for moderate cases, bronchitis and bronchopneumonia occurs, patients suffer from chest pain, headache, nausea, severe dry cough, increased breathing and pulse, and even mild cyanosis or other serious symptoms etc.; for severe cases, pulmonary edema is involved and causes coma and shoc, and sometimes laryngospasm and edema occur and cause suffocation and even reflex respiratory depression, respiratory arrest and death. Chronic poisoning: Long-term low-concentration exposure can cause chronic bronchitis, bronchial asthma and pulmonary edema, and also occupational cancer and tooth erosion.		
急救 First aid	皮肤接触： Skin contact:	脱去污染的衣着，立即用水冲洗至少 15 分钟。若有灼伤，按酸灼伤处理。 Remove contaminated clothing and rinse immediately with water for at least 15 minutes. If burn occurs, treat it in the same way as acid burns.		
	眼睛接触： Eye contact:	立即提起眼睑，用流动清水或生理盐水冲洗至少 15 分钟。 Lift eyelid immediately and rinse with running water or saline for at least 15 minutes.		
	吸入 Inhalation	迅速脱离现场至空气新鲜处，保持呼吸道通畅。呼吸困难时给输氧，给予 2~4%碳酸氢钠溶液雾化吸入。就医。 Immediately evacuate to a place with fresh air and keep the respiratory tract unobstructed. In case of expiatory dyspnea, give oxygen therapy as well as aerosol inhalation with 2 - 4% sodium bicarbonate solution. Seek medical advice.		
防护措施 Protection measures	工程控制： Engineering control:	严加密闭，提供充分的局部排风和全面排风。 Apply airtight measures, and provide sufficient local exhaust ventilation and comprehensive ventilation.		
	呼吸系统防护： Respiratory protection:	空气中浓度超标时，必须佩带防毒面具。紧急事态抢救或逃生时，建议佩带正压自给式呼吸器。 When the concentration in the air exceeds the standard, always wear a gas mask. In case of emergency rescue or escape, it is recommended to wear positive pressure self-contained respirator.		
	眼睛防护： Eye protection:	戴化学安全防护眼镜。 Wear chemical safety goggles.		
	防护服： Protective suit:	穿相应的防护服 Wear appropriate protective suite	手防护： Hand protection:	戴放化学品手套 Wear chemical gloves
泄漏处置 Leakage treatment		迅速撤离泄漏污染区人员至上风处，并隔离直至气体散尽。建议应急处理人员戴正压自给式呼吸器，穿厂商特别推荐的化学防护服(完全隔离)。避免与乙炔、松节油、乙醚、氨等物质接触。切断气源，喷雾状水稀释、溶解，然后抽排（室内）或强力通风（室外）。如有可能，用管道将泄漏物导至还原剂（酸式硫酸钠或酸式碳酸钠）溶液。也可以将漏气钢瓶置于石灰乳液中。漏气容器不能再用，且要经过技术处理以清除可能剩下的气体。 Excavate personnel in leakage polluted area immediately to the upwind area, and isolate the polluted area until the gas is dispersed. Emergency personnel are recommended to wear positive pressure self-contained respirators and chemical protective clothing (complete isolation) specially recommended by the manufacturer. Avoid contact with acetylene, turpentine, ether, ammonia and other substances. Cut off the gas source, dilute and dissolve by spraying water, and then carry out exhaust (indoor) or forced ventilation (outdoor). If possible, direct the leakage to the reducing agent (sodium acid sulfate or		

	sodium carbonate) solution by pipes. Alternatively, place the leaking steel cylinder in the lime emulsion. Do not use the leaking container, and remove any remaining gas by adopting appropriate technical approaches.
其他 Other	工作现场禁止吸烟、进食和饮水。工作后，淋浴更衣。保持良好的卫生习惯，进入罐或其他高浓度区作业，须有人监护。 Never smoke, eat and drink at the workplace. After work, take a shower and change clothes. Maintain good hygienic habits, and be sure to enter the tank or other high-concentration operating areas under supervision.

表 5.1-4 氢氧化钠的理化性质及危险有害特性表

Table 5.1-4 Physical and Chemical properties & Hazardous and Harmful Properties of Sodium Hydroxide

<table>
<tr><td>中文名称
Chinese name</td><td colspan="3">氢氧化钠
Sodium hydroxide</td><td>英文名称
English Name</td><td colspan="3">Sldium hydroxide
Sodium hydroxide</td></tr>
<tr><td>外观与性状
Appearance and properties</td><td colspan="3">白色不透明固体
White opaque solid</td><td>侵入途径
Invasion route</td><td colspan="3">吸入、食入
Inhalation, ingestion</td></tr>
<tr><td>分子式
Molecular formula</td><td>NaOH</td><td>分子量
Molecular weight</td><td>40.01</td><td>引燃温度
Ignition temperature (℃)</td><td>无意义
Meaningless</td><td>闪点
Flash point</td><td>无意义
Meaningless</td></tr>
<tr><td>熔点（℃）
Fusion point (℃)</td><td>318.4</td><td>沸点（℃）
Boiling point (℃)</td><td>1390</td><td colspan="2">饱和蒸气压（kPa）
Saturated vapor pressure (kPa)</td><td colspan="2">0.13（739℃）
0.13 (739℃)</td></tr>
<tr><td rowspan="2">相对密度
Relative condensation</td><td>水=1
Water ＝1</td><td>2.12</td><td colspan="2">燃烧热（Kj/mol）
Heat of combustion (Kj/mol)</td><td colspan="3">无意义
Meaningless</td></tr>
<tr><td>空气=1
Air =1</td><td>无资料
No data</td><td colspan="2">临界温度
Critical temperature</td><td colspan="3">无意义
Meaningless</td></tr>
<tr><td>主要用途
Main purpose</td><td colspan="7">用于石油精炼、造纸、肥皂、人造丝、染色、制革、医药、有机合成等。
Used for petroleum refining, paper making, soap, rayon, dyeing, leather making, medicine, organic synthesis, etc.</td></tr>
<tr><td>物质危险类别
Hazard category</td><td colspan="3">第 8.2 类 碱性腐蚀品
Class 8.2 Corrosives presenting alkalinous properties</td><td>燃烧性
Flammability</td><td colspan="3">不燃
Nonflammable</td></tr>
<tr><td>禁忌物
Prohibited substances</td><td colspan="3">强酸、易燃或可燃物、二氧化碳、过氧化物、水
Strong acids, flammable or combustible materials, carbon dioxide, peroxides, water</td><td>溶解性
Solubility</td><td colspan="3">易溶于水、乙醇、甘油，不溶于丙酮
Easily soluble in water, alcohol and glycerol, but insoluble in acetone.</td></tr>
<tr><td>燃烧分解产物
Combustion decomposition product</td><td colspan="2">可能产生有害毒性烟雾
It may produce harmful toxic fumes</td><td>UN编号
UN No.</td><td>1823</td><td colspan="2">CAS No.:
CAS No .:</td><td>1310-73-2</td></tr>
</table>

危险货物编号 Dangerous goods code	82001	包装类别 Packing category	052	包装标致 Packing mark	无资料 No data
危险特性 Hazard characteristics	与酸发生中和反应并放热。遇潮时对铝、锌和锡有腐蚀性，并放出易燃易爆的氢气。本品不会燃烧，遇水和水蒸气大量放热，形成腐蚀性溶液。具有强腐蚀性。 It will undergo neutral reaction with acid and release heat. In case of dampness, it is corrosive to aluminum, zinc and tin, and will generate inflammable and explosive hydrogen. This product is nonflammable, but will release a large amount of heat in face of water and vapor, and form corrosive solution. It is highly corrosive.				
灭火方法 Fire extinguishing methods	用水、沙土扑救，但须防止物品遇水产生飞溅，造成灼伤。 Extinguish fire with water and sandy soil. However, always take every possible effort to prevent splashing of substances when it comes in contact with water, which will cause burns.				
健康危害 Health hazard	本品有强烈刺激和腐蚀性。粉尘刺激眼和呼吸道，腐蚀鼻中隔；皮肤和眼直接接触可引起灼伤；误服可造成消化道灼伤，黏膜糜烂、出血和休克。 This product is highly irritant and corrosive. Dusts are irritant to eyes and respiratory tract and may corrode nasal septum; the direct contact with skin and eyes may cause burn; if swallowed, it may cause digestive tract burn, mucosal erosion, hemorrhage and shock.				
急救措施 Emergency treatment	皮肤接触：立即脱去被污染的衣着，用大量流动清水冲洗，至少15分钟。就医。眼睛接触：立即提起眼睑，用大量流动清水或生理盐水彻底冲洗至少15分钟。就医。吸入：迅速脱离现场至空气新鲜处。保持呼吸道通畅。如呼吸困难，给输氧。如呼吸停止，立即进行人工呼吸。就医。食入：误服者用水漱口。给饮牛奶或蛋清。就医。 [Skin contact]: Remove contaminated clothing and rinse immediately with a large amount of running water for at least 15 minutes. Seek medical advice. Eye contact: Lift eyelid immediately and rinse with a large amount of running water or saline for at least 15 minutes. Seek medical advice. Inhalation: Quickly leave the site for fresh air. Keep respiratory tract unobstructed. In case of expiatory dyspnea, give oxygen therapy. In case of respiratory arrest, give artificial respiration immediately. Seek medical advice. Ingestion: Gargle with water. Provide milk or egg whites. Seek medical advice.				
防护措施 Protection measures	可能接触其粉尘时，必须佩戴头罩型电动送风过滤式防尘呼吸器。必要时，佩戴空气呼吸器。穿橡胶耐酸碱服，戴橡胶耐酸碱手套。工作场所禁止吸烟、进食和饮水，饭前要洗手。工作毕，淋浴更衣。注意个人清洁卫生。 When exposure to its dust is expected, always wear a hood-type powered dust respirator. If necessary, wear an air breathing apparatus. Wear anti-acid & alkali rubber clothing and anti-acid & alkali rubber gloves. Never smoke, eat or drink in the workplace. Wash hands before meals. After work, take a shower and change clothes. Pay attention to personal hygiene.				
泄漏应急措施 Emergency measures in case of leakage	隔离泄漏污染区，限制出入。建议应急处理人员戴自给式呼吸器，穿防酸碱工作服。不要直接接触泄漏物。小量泄漏：避免扬尘，用洁净的铲子收集于干燥、洁净、有盖的容器中。也可用大量水冲洗，洗水稀释后放入废水系统。大量泄漏：收集回收或运至废物处理场所处置。				

	Isolate the leakage polluted area and strictly restrict the access. Emergency personnel are recommended to wear self-contained respirator and anti-acid & alkali suits. Do not touch the leakage directly. Small leakage: Avoid dust, and collect the leakage with a clean shovel into a dry, clean, covered container. Alternatively, flush with a large amount of water, and dilute the water for flushing before discharging it into the sewage system. Heavy leakage: Recycle or transport to waste disposal site.
储运注意事项 Storage & transportation precautions	储存于干燥清洁的仓间内。注意防潮和雨淋。应与易燃或可燃物及酸类分开存放。不可混储混运。分装和搬运作业要注意个人防护。搬运时要轻装轻卸，防止包装及容器损坏。雨天不宜运输。 Store in a dry and clean warehouse. Protect against moisture and rain. Store it separately from flammable or combustible materials and acids. Avoid mixed storage and transportation. Pay attention to personal protection during packaging and handling. Handle gently to prevent from damage of package and container. It is not recommended to transport on rainy days.

表 5.1-5　过氧化氢理化性质及危险特性

Table 5.1-5 Physical and Chemical Properties & Hazardous Characteristics of Hydrogen Peroxide

<table>
<tr><td rowspan="3">标识
Identification</td><td colspan="2">中文名：双氧水
Chinese name: 双氧水</td><td colspan="2">危险货物编号：51001
Dangerous goods No.: 51001</td><td colspan="2">UN 编号：2015
UN No.: 2015</td></tr>
<tr><td colspan="2">英文名：Hydrogen peroxide
English name: Hydrogen peroxide</td><td colspan="4">危险类别：第 5.1 类 氧化剂
Hazard category: Class 5.1 oxidizing agent</td></tr>
<tr><td colspan="2">分子式：H_2O_2
Molecular formula: H_2O_2</td><td colspan="2">分子量：34.01
Molecular weight: 34.01</td><td colspan="2">CAS 号：7722-84-1
CAS No.: 7722-84-1</td></tr>
<tr><td rowspan="5">理化性质
Physical & chemical properties</td><td colspan="2">外观与性状
Appearance and properties</td><td colspan="4">无色透明液体，有微弱的特殊气味
Colorless transparent liquid with slight special smell</td></tr>
<tr><td colspan="2">主要用途
Main purpose</td><td colspan="4">用于漂白，医药，也用作分析试剂。
Used for bleaching and medicine, and also used as analysis reagents.</td></tr>
<tr><td>熔点（℃）
Fusion point (℃)</td><td>-2℃（无水）
-2℃ (without water)</td><td>相对密度
Relative condensation
(水=1)
(Water ＝1)</td><td>1.46（无水）
1.46 (without water)</td><td>相对密度
Relative condensation
(空气=1)
(Air =1)</td><td>/</td></tr>
<tr><td>沸点（℃）
Boiling point (℃)</td><td colspan="2">158℃（无水）
158℃ (without water)</td><td>饱和蒸气压（kPa）
Saturated vapor pressure (kPa)</td><td colspan="2">0.13kpa(15.3℃)
0.13kpa (15.3℃)</td></tr>
<tr><td>溶解性
Solubility</td><td colspan="5">溶于水、醇、醚,不熔于苯、石油醚
Soluble in water, alcohol and ether, but insoluble in benzene and petroleum ether</td></tr>
<tr><td rowspan="3">毒性及健康危害
Toxicity and health hazards</td><td>侵入途径
Invasive route</td><td colspan="5">吸入、食入
Inhalation, ingestion</td></tr>
<tr><td>毒性
Toxicity</td><td colspan="5">LD_{50}：/；LC_{50}：/
LD_{50}:/; LC_{50}: /</td></tr>
<tr><td>健康危害
Health hazard</td><td colspan="5">吸入本品蒸气或雾对呼吸道有强烈刺激性。眼直接接触液体可导致不可逆损失甚至失明。 口服中毒出现腹痛、胸口痛、呼吸困难、呕吐、一时性运动和感觉障碍、体温升高等。个别病例出现视力障碍、癫痫样痉挛、轻瘫等。 长期接触本品可导致接触性皮炎。</td></tr>
</table>

		Inhalation of its vapor or mist will cause strong irritation to the respiratory tract. Direct eye contact with liquid will cause irreversible vision loss or even blindness. If swallowed, poisoning symptoms will occur, including stomachache, chest pain, difficult breathing, vomiting, transient dyskinesia and sensory disturbance, and increased body temperature. In some cases, visual impairment, epilepsy-like spasticity, and paralysis occurr. Long-term exposure to this product will cause contact dermatitis.		
	急救方法 First aid method	皮肤接触：立即脱去被污染的衣着，用大量清水冲洗； Skin contact: Remove contaminated clothing and rinse thoroughly with a large amount of water; 眼睛接触：立即提起眼睑，用大量流动清水或生理盐水彻底冲洗至少 15 分钟，就医； Eye contact: Lift eyelid immediately and rinse with a large amount of running water or saline for at least 15 minutes, and seek medical advice; 吸入：迅速脱离现场至空气新鲜处，保持呼吸道通畅，如呼吸困难，给输氧；如呼吸停止，立即进行人工呼吸，就医； Inhalation: Excavate to a place with fresh air immediately and keep the respiratory tract unobstructed; in case of dyspnea, give oxygen therapy; in case of respiratory arrest, give artificial respiration, and seek medical treatment. 食入：饮足量温水，催吐，就医。 Ingestion: Drink a large amount of warm water to introduce vomiting, and seek medical treatment.		
	防护措施 Protection measures	工程控制：生产过程密闭，全面通风，提供安全淋浴和洗眼设备； Engineering control: Ensure to carry out the production process in an enclosed environment, and provide comprehensive ventilation, and also safe shower and eyewash facilities; 呼吸系统防护：可能接触其蒸气时，佩戴自吸过滤式防毒面具（全面罩）；眼睛防护：呼吸系统中已作防护；身体防护：穿聚乙烯防毒服；手防护：带氯丁橡胶手套；其他：工作场所禁止吸烟。工作毕淋浴更衣，单注意个人清洁卫生。 Respiratory protection: When exposure to its vapor is expected, wear self-priming filter gas mask (full face mask); Eye protection: Eye protection has been provided in the respiratory system; Body protection: Wear PE gas protection suit; Hand protection: Wear neoprene gloves; Others: Never smoke in the workplace. After work, take a shower and change clothes, and pay attention to personal hygiene.		
燃烧爆炸危险性 Combustion and explosion hazard	燃烧性 Combustion	不燃 Nonflammable	燃烧分解物 Combustion decomposition product	氧气、水 Oxygen, water
	闪点(℃) Flash point (℃)	无意义 Meaningless	爆炸上限（v%） Upper explosive limit (v%)	无意义 Meaningless
	自燃温度(℃) Autoignition temperature (℃)	无意义 Meaningless	爆炸下限（v%） Lower explosive limit (v%)	无意义 Meaningless
	稳定性 Stability	稳定 Stable	聚合危害 Polymeric hazard	不聚合 No polymerization
	危险特性 Hazard characteristics	爆炸性强氧化剂。双氧水本身不燃，但能于可燃物反应放出大量热量和氧气而引起着火爆炸。双氧水 PH 值在 3.5～4.5 时最稳定，在碱性溶液中极易分解，在遇强光，特别是波射线照射时也能发生分解。当加热到 100℃以上时，开始急剧分解。它与许多有机物，如糖、淀粉、醇类、石油产		

		品等形成爆炸性混合物，在撞击、受热或电火花作用下能发 生爆炸。双氧水与许多无机化合物或杂质接触后会迅速分解而导致爆炸，放出大量的热量、氧和水蒸气。大多数重金属（如铁、铜、银、铅、汞、锌、钴、镍、铬、锰等）及其氧化物和盐类都是活性催化剂，尘土、香烟灰、炭粉、铁锈等也能加速分解。浓度超过 74%的双氧水，在具有适当的点火源或温度的密闭容器中，会产生气相爆炸。 Explosive strong oxidant. Hydrogen peroxide is not flammable, but it can react with combustibles and then produce a large amount of heat and oxygen, causing fire and explosion. The PH value of hydrogen peroxide is the most stable within 3.5 ~ 4.5; it is easy to decompose in alkaline solution, and it may also decompose when exposed to strong light, especially when exposed by wave rays. When heated above 100°C, it begins to decompose rapidly. It can mix with many organic compounds such as sugars, starches, alcohols, petroleum products and the like into explosive mixtures, which will explode under impact, heat or spark. After contact with many inorganic compounds or impurities, hydrogen peroxide will quickly decompose and cause an explosion, releasing a lot of heat, oxygen and water vapor. Most heavy metals (such as iron, copper, silver, lead, mercury, zinc, cobalt, nickel, chromium, manganese, etc.) and their oxides as well as salts are active catalysts, and dust, cigarette ash, carbon powder, rust and other similar substances can accelerate the decomposition. Hydrogen peroxide with a concentration higher than 74% will produce a gas phase explosion in a closed container when the ignition source or ignition temperature is present.
	包装与储运 Packaging, storage and transportation	储存于阴凉、通风良好内，远离火种、热源。仓内温度不宜超过 30℃。防止阳光直射。保持容器密封。应与易燃物、可燃物、还原剂、酸类、金属粉末等分开存放，不可混储、混运。搬运时要轻装轻卸，防止包装及容器损坏。夏季应早晚运输，防止日光曝晒。禁止撞击和震荡。 Store it in a cool, well-ventilated place and keep away from fire and heat sources. It is recommended to maintain the temperature in the warehouse at 30℃ or below. Prevent direct sunlight. Keep container sealed. Store it separately from inflammables, combustibles, reducing agents, acids, metal powders, etc., and avoid mixed storage or transportation. Handle gently to prevent from damage of package and container. In summer, carry out transportation in the morning and evening to prevent sun exposure. Avoid impact or shake.
	禁忌物 Prohibited substances	易燃和可燃物、强还原剂、铜、铁、铁盐、锌、活性金属粉末。 Flammable and combustible materials, strong reducing agents, copper, iron, iron salts, zinc, active metal powder.
灭火方法 Fire extinguishing methods	消防人员必须穿全身防火防毒服；尽可能将容器从火场移至空旷处。喷水冷却火场容器，直至灭火结束。处在火场中的容器若已变色或安全泄压装置中产生声音，必须马上撤离。灭火剂：水、雾状水、干粉、砂土。 Firefighters must wear fire-fighting and gas protection overall; and move the container from the fire site to an open area if possible. Sprinkle water to cool the containers in the fire site until the fire is extinguished. Move the container away from the fire site immediately if it becomes discoloured or its pressure relief device produces sound. Fire extinguishing media: water, water spray, dry powder, sand.	
泄漏处置 Leakage treatment	迅速撤离泄漏区人员至安全区，并进行隔离，严格限制出入，建议应急处理人员佩戴自给正压呼吸器，穿防酸碱工作服，尽可能切断泄漏源，防止进入下水道、排洪沟等限制性空间；　小量泄漏：用砂土、蛭石或其他惰性材料吸收，也可以用大量水冲洗，洗水稀释后排入废水系统；　大量泄漏：构筑围堤或挖坑收容；喷雾状水冷却和稀释蒸气、保护现场人员、把泄漏物稀释成不燃物。用泵转移至槽车或专用收集器内，回收或运至废物处理场所处置。 Evacuate the personnel in the leakage polluted area to the safe area immediately, isolate the	

	leakage polluted area and strictly restrict access. The emergency personnel are recommended to wear self-contained positive pressure respirator and anti-acid & alkali suits. Cut off the source of leakage if possible to prevent it from entering confined spaces such as sewers and flood drainage ditches. Small leakage: Absorb the leakage with activated carbon or other inert materials. Alternatively, flush with a large amount of water, and dilute the water for flushing before discharging it into the sewage system; Heavy leakage: Build embankment or dig a hole for containment. Spray water to cool and dilute the vapor, protect personnel on site, and dilute leakage until it becomes nonflammable. Transfer to tank car or special collector with pumps, and recycle or transport to the waste disposal site.

表 5.1-6 硫酸的理化性质及危险有害特性表

Table 5.1-6 Physical and Chemical Properties & Hazardous and Harmful Properties of Sulfuric Acid

<table>
<tr><td>中文名称
Chinese name</td><td colspan="3">硫酸
Sulphuric acid</td><td>英文名称
English Name</td><td colspan="3">Sulfuric acid</td></tr>
<tr><td>外观与性状
Appearance and properties</td><td colspan="3">纯品为无色透明油状液体，无臭
Colorless transparent oily and odorless liquid if pure</td><td>侵入途径
Invasion route</td><td colspan="3">吸入、食入
Inhalation, ingestion</td></tr>
<tr><td>分子式
Molecular formula</td><td>H2SO4</td><td>分子量
Molecular weight</td><td>98.08</td><td>引燃温度
Ignition temperature (℃)</td><td>无意义
Meaningless</td><td>闪点
Flash point</td><td>无意义
Meaningless</td></tr>
<tr><td rowspan="2">相对密度
Relative condensation</td><td>水=1
Water ＝1</td><td>1.83</td><td colspan="2">燃烧热（Kj/mol）
Heat of combustion (Kj/mol)</td><td colspan="3">无意义
Meaningless</td></tr>
<tr><td>空气=1
Air =1</td><td>3.4</td><td colspan="2">临界温度
Critical temperature</td><td colspan="3">无意义
Meaningless</td></tr>
<tr><td>爆炸极限（%）
Explosion limit (%)</td><td>无意义
Meaningless</td><td colspan="2">灭火剂
Fire extinguishing media</td><td colspan="4">砂土、干粉、二氧化碳
Sand, dry powder, carbon dioxide</td></tr>
<tr><td>主要用途
Main purpose</td><td colspan="7">用于生产化学肥料，在化工、医药、塑料、燃料、石油提炼等工业也有广泛应用
Used for manufacturing of chemical fertilizers, and also widely used in industries such as chemical industry, medicine, plastics, fuel, petroleum refining, etc.</td></tr>
<tr><td>物质危险类别
Hazard category</td><td colspan="3">第 8.1 类 酸性腐蚀品
Class 8.1 Corrosives presenting acid properties</td><td>燃烧性
Flammability</td><td colspan="3">不燃
Nonflammable</td></tr>
<tr><td>危险性类别
Hazard category</td><td colspan="7">皮肤腐蚀/刺激，类别 1A；严重眼损伤/眼刺激，类别 1
Skin corrosion/irritation, Category 1A; Serious eye damage/irritation, Category 1</td></tr>
<tr><td>禁忌物
Prohibited substances</td><td colspan="3">碱类、水、强还原剂、易燃物
Alkali, water, strong reducing agent, flammables</td><td>溶解性
Solubility</td><td colspan="3">与水混溶
Miscible with water</td></tr>
<tr><td>燃烧分解产物
Combustion</td><td colspan="2">氧化硫
Sulfur oxide</td><td>UN编号
UN No.</td><td>1830</td><td colspan="2">CAS No.：
CAS No .:</td><td>7664-93-9</td></tr>
</table>

decomposition product					
危险货物编号 Dangerous goods code	81007	包装类别 Packing category	051	包装标致 Packing mark	无资料 No data
危险特性 Hazard characteristics	与易燃物(如苯)和有机物(如糖、纤维素等)接触会发生剧烈反应，甚至引起燃烧。能与一些活性金属粉末发生反应，放出氢气。遇水大量放热，可发生沸溅。具有强腐蚀性。 Drastic action may be caused when it contacts with inflammables (for example: benzene) and organics (for example: sugar, cellulose, etc.), and even combustion may occur. It can react with some active metal powder and thereby emit hydrogen gas. It will release a lot of heat in face of water, causing boiling splash. It is highly corrosive.				
灭火方法 Fire extinguishing methods	砂土。禁止用水 Sand. It is prohibited to use water				
健康危害 Health hazard	侵入途径：吸入、食入。健康危害：对皮肤、粘膜等组织有强烈的刺激和腐蚀作用。对眼睛可引起结膜炎、水肿、角膜混浊，以致失明；引起呼吸道刺激症状，重者发生呼吸困难和肺水肿；高浓度引起喉痉挛或声门水肿而死亡。口服后引起消化道的烧伤以至溃疡形成。严重者可能有胃穿孔、腹膜炎、喉痉挛和声门水肿、肾损害、休克等。慢性影响有牙齿酸蚀症、慢性支气管炎、肺气肿和肺硬化。 Invasion route: Inhalation, ingestion. Health hazard: It can cause strong irritation and corrosion to skin, mucous membranes and other tissues; conjunctivitis, edema, corneal opacity and even blindness of eyes; respiratory irritation symptoms, severe breathing difficulties and pulmonary edema; and when the concentration is too high, laryngospasm, glottic edema and even die. If swallowed, it can cause burns of the digestive tract and even ulcers, and more seriously, gastric perforation, peritonitis, laryngospasm and glottis edema, kidney damage, shock, etc. Its chronic effects include tooth erosion, chronic bronchitis, emphysema, and lung sclerosis.				
急救措施 Emergency treatment	皮肤接触：脱去污染的衣着，立即用水冲洗至少15分钟。或用2%碳酸氢钠冲洗。眼睛接触：立即提起眼睑，用流动清水或生理盐水冲洗至少15分钟。就医。吸入：迅速脱离现场至空气新鲜处。呼吸困难时给输氧。给予2-4%碳酸氢钠溶液雾化吸入。食入：误服者给牛奶、蛋清、植物油等口服，不可催吐。立即就医。 Skin contact: Remove contaminated clothing and rinse immediately with water for at least 15 minutes. Alternatively, rinse with 2% sodium bicarbonate. Eye contact: Lift eyelid immediately and rinse with running water or saline for at least 15 minutes. Seek medical advice. Inhalation: Quickly leave the site for fresh air. In case of expiratory dyspnea, give oxygen therapy. Give aerosol inhalation with 2 - 4% sodium bicarbonate solution. Ingestion: If swallowed, give milk, egg whites, vegetable oil, etc., and do not introduce vomiting. Seek medical attention immediately.				

防护措施 Protection measures	呼吸系统防护：可能接触其蒸气或烟雾时，必须佩戴防毒面具或供气式头盔。紧急事态抢救或逃生时，建议佩带自给式呼吸器。眼睛防护：戴化学安全防护眼镜。 防护服：穿工作服（防腐材料制作）。手防护：戴橡皮手套。其它：工作后，淋浴更衣。单独存放被毒物污染的衣服，洗后再用。 Respiratory protection: When exposure to its vapor or smoke is expected, always wear a gas mask or an air-supply helmet. In case of emergency rescue or escape, it is recommended to wear self-contained respirator. Eye protection: Wear chemical safety goggles. Protective clothing: Wear work clothes (made of anti-corrosion materials). Hand protection: Wear rubber gloves. Others: After work, take a shower and change clothes. Store clothes contaminated by toxic substances separately and wash them before reuse.
泄漏应急措施 Emergency measures in case of leakage	疏散泄漏污染区人员至安全区，禁止无关人员进入污染区，建议应急处理人员戴好面罩，穿化学防护服。合理通风，不要直接接触泄漏物，勿使泄漏物与可燃物质（木材、纸、油等）接触，在确保安全情况下堵漏。喷水雾减慢挥发（或扩散），但不要对泄漏物或泄漏点直接喷水。用沙土、干燥石灰或苏打灰混合，然后收集运至废物处理场所处置。也可以用大量水冲洗，经稀释的洗水放入废水系统。如大量泄漏，利用围堤收容，然后收集、转移、回收或无害处理后废弃。 Evacuate personnel from the leakage polluted area to the safe area, and forbid irrelevant personnel from entering into polluted area; emergency personnel are recommended to wear gas masks and chemical protective clothing. Ensure reasonable ventilation, do not touch the leakage directly, and prevent the leakage from contacting with combustible substances (wood, paper, oil, etc.). Stop leakage without prejudice to the safety. Spray water to slow down the volatilization (or diffusion), but do not spray water directly on the leakage or leaking point. Use sand, dry lime or soda ash for mixing, and then collect and transport it to waste disposal site. Alternatively, flush with a large amount of water, and dilute the water for flushing before discharging it into the sewage system. In case of heavy leakage, build embankment for containment, and then perform collection, transfer, recovery or disposal after harmless treatment.
储存注意事项 Storage precautions	储存于阴凉、通风的库房。库温不超过35℃，相对湿度不超过85%。保持容器密封。应与易（可）燃物、还原剂、碱类、碱金属、食用化学品分开存放，切忌混储。储区应备有泄漏应急处理设备和合适的收容材料。 Store it in a cool, ventilated warehouse. The warehouse temperature shall not exceed 30℃, and the relative humidity shall not exceed 85%. Keep container sealed. Store it separately from combustible materials, reducing agents, alkalis, alkali metals and edible chemicals, and avoid mixed storage. Provide leakage emergency treatment equipment and suitable containing materials in the storage area.

表 5.1-7 氯酸钠理化性质及危险特性

Table 5.1-7 Physical and Chemical Properties & Hazardous Characteristics of Sodium Chlorate

危险性类别 **Hazard category**	第 5.1 类氧化剂 **Class 5.1 oxidant**

外观与用途 Appearance and use	无色无臭结晶，味咸而凉，有潮解性。用作氧化剂，及制氯酸盐、除草剂、医药品等，也用于冶金矿石处理。 Colorless and odorless crystal, salty and cool, deliquescent. Used as oxidant, and also used for manufacturing of chlorate, herbicide, medicine, as well as metallurgical ore processing.
理化特性 Physical and chemical properties	熔点（℃）：248～261。 Melting point (℃): 248～261。 相对密度（水=1）：2.49。 Relative density (water = 1): 2.49. 溶解性：易溶于水，微溶于乙醇。 Solubility: easily soluble in water, and slightly soluble in ethanol. 稳定性：稳定。 Stability: stable. 自燃温度（℃）：无意义 Autoignition temperature (℃): N/A 爆炸极限（V%）：无意义 Explosion limit (V%): N/A
危险特性 Hazard characteristics	强氧化剂。受强热或与强酸接触时即发生爆炸。与还原剂、有机物、易燃物如硫、磷或金属粉等混合可形成爆炸性混合物。急剧加热时可发生爆炸。 Strong oxidant. Explosion occurs when it is exposed to strong heat or strong acid. It will mix with reducing agent, organic matter and combustible materials including sulfur, phosphorus or metal powder into explosive mixtures. Explosion may occur in case of rapid heating.
燃烧（分解）产物 Combustion (decomposition) product	氧气、氯化物、氧化钠。 Oxygen, chloride, sodium oxide.
侵入途径 Invasion route	吸入、食入、经皮吸收 Inhalation, ingestion, and percutaneous absorption
接触限值和毒性 Exposure limit and toxicity	急性毒性：LD_{50}1200mg/kg（大鼠经口） Acute toxicity: LD_{50}1200mg/kg (oral-rat).
健康危害 Health hazard	本品粉尘对呼吸道、眼及皮肤有刺激性。口服急性中毒，表现为高铁血红蛋白血症，胃肠炎，肝肾损伤，甚至发生窒息。 The dust of this product is irritating to the respiratory tract, eyes and skin. If swallowed, it will cause acute poisoning symptoms, including amethemoglobinemia, gastroenteritis, liver and kidney damage, and even suffocation.
泄漏应急处理措施 Emergency measures in case of leakage	隔离泄漏污染区，限制出入。建议应急处理人员戴自给式呼吸器，穿一般工作服。不要直接接触泄漏物，勿使泄漏物与有机物、还原剂、易燃物接触。小量泄漏：避免扬尘，用洁净的铲子收集于干燥、洁净、有盖的容器中。大量泄漏：收集回收或运至废物处理场所处置。 Isolate the leakage polluted area and strictly restrict the access. The emergency personnel are recommended to wear self-contained respirator and common working suits. Do not touch the leakage directly, and prevent the leakage from contacting with organic substances, reducing agents and flammable substances. Small leakage: Avoid dust, and collect the leakage with a clean shovel into a dry, clean, covered container. Heavy leakage: Recycle or transport to waste disposal site.
灭火方法 Fire extinguishing methods	用大量水扑救，同时用干粉灭火剂闷熄。 Extinguish the fire with plenty of water, and smother with dry powder fire extinguishing agent.

表 5.1-8 氨水理化性质及危险特性

Table 5.1-8 Physical and Chemical Properties & Hazardous Characteristics of Ammonia Water

<table>
<tr><td rowspan="3">标识

Identification</td><td colspan="2">中文名：氨溶液[10%<含氨≤35%]；氢氧化氨；氨水

Chinese name: 氨溶液 [10% < ammonia content ≤35%]; 氢氧化氨; 氨水</td><td colspan="3">危险货物编号：82503

Dangerous goods No.: 82503</td></tr>
<tr><td colspan="2">英文名：Ammoniun hydroxide；Ammonia water

English name: Ammonium hydroxide; Ammonia water</td><td colspan="3">UN 编号：2672

UN No.: 2672</td></tr>
<tr><td>分子式：NH_4OH

Molecular formula: NH_4OH</td><td>分子量：35.05

Molecular weight: 35.05</td><td colspan="3">CAS 编号：1336-21-6（氨溶液[含氨＞10%]）

CAS No.: 1336-21-6 (ammonia solution [ammonia content > 10%])</td></tr>
<tr><td colspan="2">危险性类别
Hazard category</td><td colspan="4">第 8.2 类　碱性腐蚀品
Class 8.2 Corrosives presenting alkalinous properties</td></tr>
<tr><td rowspan="4">理化性质

Physical & chemical properties</td><td>外观与性状

Appearance and properties</td><td colspan="4">无色透明液体，有强烈的刺激性臭味

Colorless transparent liquid with strong pungent odor.</td></tr>
<tr><td>熔点（℃）：/

Fusion point (℃): /</td><td>相对密度（水=1）

Relative density (water=1)</td><td>0.91</td><td>相对密度（空气=1）

Relative density (air=1)</td><td>/</td></tr>
<tr><td>沸点（℃）：/

Boiling point (℃):/</td><td colspan="2">饱和蒸汽压（kPa）

Saturated vapor pressure (kPa)</td><td colspan="2">1.59/20℃</td></tr>
<tr><td>溶解性

Solubility</td><td colspan="4">溶于水、醇

Soluble in water and alcohol</td></tr>
<tr><td rowspan="3">毒性及健康危害

Toxicity and health hazards</td><td>侵入途经

Invasion route</td><td colspan="4">吸入、食入、经皮吸收

Inhalation, ingestion, and percutaneous absorption</td></tr>
<tr><td>毒性

Toxicity</td><td colspan="4">LD_{50}：350mg/kg（大鼠经口）；LC_{50}：无资料

LD_{50}: 350mg/kg (rat -oral); 50: not available</td></tr>
<tr><td>健康危害

Health hazard</td><td colspan="4">吸入后对鼻、喉和肺有刺激性，引起咳嗽、气短和哮喘等；可因喉头水肿而窒息死亡；可发生水肿，引起死亡。氨水溅入眼内，可造成严重损害，甚至导致失明；皮肤接触可致灼伤。慢性影响：反复低浓度接触，可引起支气管炎。皮肤反复接触，可致皮炎，表现为皮肤干燥、痒、发红。

If inhaled, it will cause irritation to the nose, throat and lungs, symptomized as cough, breath shortness and asthma; suffocation and even</td></tr>
</table>

		death will be caused if throat edema or other edema occurs. The ammonia water, if being splashed into eyes, will cause serious eye damage and even blindness; and in case of skin contact, it will cause scalding. Chronic effects: Repeated low-concentration exposure will cause bronchitis. Repeated skin contact will cause dermatitis, symptomized as dry, itchy and red skin.		
	急救方法 First aid method	皮肤接触：立即用水冲洗至少 15 分钟。如有灼伤，就医治疗。 Skin contact: Rinse immediately with water for at least 15 minutes. In case of burns, seek medical advice. 眼睛接触：立即提起眼睑，用流动清水或生理盐水冲洗至少 15 分钟，或用 3%硼酸溶液清洗，立即就医。 Eye contact: Lift the eyelid immediately, rinse with running water or saline for at least 15 minutes, or wash with 3% boric acid solution. Seek medical attention immediately. 吸入：迅速脱离现场至空气新鲜处。保持呼吸道通畅。呼吸困难时输氧。呼吸停止时，立即进行人工呼吸。就医。 Inhalation: Quickly leave the site for fresh air. Keep respiratory tract unobstructed. In case of expiatory dyspnea, give oxygen therapy. In case of respiratory arrest, give artificial respiration immediately. Seek medical advice. 食入：误服者立即漱口，口服稀释的醋或柠檬汁，就医。 Ingestion: Gargle immediately and drink diluted vinegar or lemon juice, and then seek medical advice.		
燃烧爆炸危险性 Combustion and explosion hazard	燃烧性 Combustion	可燃 Combustible	燃烧分解物 Combustion decomposition product	氨 Ammonia
	闪点（℃） Flash point (℃)	/	爆炸上限（v%） Upper explosive limit (v%)	25.0
	引燃温度（℃） Ignition temperature (℃)	/	爆炸下限（v%） Lower explosive limit (v%)	16.0
	危险特性 Hazard characteristics	易分解出氨气，温度越高，分解速度越快，可形成爆炸性气体。若遇高热，容器内压增大，有开裂和爆炸的危险。 It is easy to decompose to release ammonia gas; the higher the temperature is, the faster the decomposition will be; it is likely to generate explosive gas. The internal pressure in container will increase in case of high heat, probably leading to cracks and explosion.		
	稳定性 Stability	稳定 Stable	聚合危害 Polymeric hazard	不聚合 No polymerization

	禁忌物 Prohibited substances	酸类、铜、铝。 Acids, copper, aluminum.
	储运条件及泄漏处理 Storage & transportation conditions and leakage treatment	**储运条件：**储存于阴凉、干燥通风良好的仓间内。远离火种、热源、防止阳光直射。应与酸类、金属类粉末分开存放。搬运时应轻装轻卸，防止包装和容器损坏。运输按规定线路行驶，勿在居民区和人口稠密区停留。 **Storage & transportation conditions:** Store it in a cool, dry and well-ventilated warehouse. Keep away from fire, heat sources, and prevent direct sun exposure. Store it separately from acids and metal powders, etc. Handle gently to prevent damage to packages and containers. Drive along the prescribed route during transportation, and do not stop in residential areas and densely populated areas. **泄漏处理：**疏散泄漏污染区人员至安全区，防止无关人员进入污染区，建议应急处理人员戴自给式呼吸器，穿化学防护服。不要直接接触泄漏物，在确保安全情况下堵漏。用大量水冲洗，经稀释的洗水放入废水系统。用沙土、蛭石或其他惰性材料吸收，然后以少量加入大量水中。调节至中性，再放入废水系统。如大量泄漏，利用围堤收容，然后收集、转移、回收或无害后废弃。 **Leakage treatment:** Evacuate personnel from the leakage polluted area to a safety area, forbid irrelevant personnel from entering into polluted area; emergency personnel are recommended to wear self-contained respirator and chemical protective clothing. Do not touch the leakage directly. Stop leakage without prejudice to the safety. Alternatively, flush with a large amount of water, and dilute the water for flushing before discharging it into the sewage system. Absorb with sand, vermiculite or other inert materials, and then add water little by little. Dilute to neutral, and then discharge into the sewage system. In case of heavy leakage, build embankment for containment, and then perform collection, transfer, recovery or disposal after harmless treatment.
	灭火方法 Fire extinguishing methods	用雾状水、二氧化碳、沙土灭火。 Use water spray, carbon dioxide, and sand to extinguish the fire.

表 5.1-9 柴油理化性质及危险特性

Table 5.1-9 Physical and Chemical Properties & Hazardous Characteristics of Diesel Oil

标识 Identification	中文名：柴油 Chinese name: 柴油			英文名：Diesel oil English name: Diesel oil		
	分子式：C_4H_{10}~$C_{12}H_{26}$ Molecular formula: C_4H_{10}~$C_{12}H_{26}$			CAS 号：67-56-10 CAS No.: 67-56-10		
	分子量：/ Molecular weight:			危险性类别： 可燃液体 Hazard category: Flammable liquid		
理化性质 Physical & chemi	外观与性状 Appearance and properties			/		
	熔点（℃） Fusion point (℃)	-18	相对密度(水=1) Relative	/	相对密度(空气=1)	0.70~0.75

<table>
<tr><td rowspan="4">cal properties</td><td></td><td></td><td>density (water=1)</td><td></td><td>Relative density (air=1)</td><td></td></tr>
<tr><td>沸点（℃）
Boiling point (℃)</td><td colspan="2">282~338</td><td>饱和蒸气压（kPa）
Saturated vapor pressure (kPa)</td><td colspan="2">无资料
No data</td></tr>
<tr><td colspan="2">临界温度(℃)
Critical temperature (℃)</td><td>无资料
No data</td><td>临界压力(MPa)
Critical pressure (MPa)</td><td colspan="2">无资料
No data</td></tr>
<tr><td>溶解性
Solubility</td><td colspan="5">不溶于水，溶于醇等溶剂
Insoluble in water, soluble in alcohol and other solvents</td></tr>
<tr><td rowspan="3">毒性及健康危害
Toxicity and health hazards</td><td>急性毒性
Acute toxicity</td><td colspan="5">LD_{50}：＞5000mg／kg(大鼠经口)
LD_{50}: ＞5000mg／kg (rat - oral)
LC_{50}：＞5000mg/m³ 4 小时(大鼠吸入)
LC_{50}: ＞5000mg/m³ 4 hours (rat - inhalation)</td></tr>
<tr><td>健康危害
Health hazard</td><td colspan="5">急性中毒：吸入高浓度柴油蒸气，常先有兴奋，后转入抑制，表现为乏力、头痛、酩酊感、神志恍惚、肌肉震颤、共济运动失调；严重者出现定向力障碍、谵妄、意识模糊等；蒸气可引起眼及呼吸道刺激症状，重者出现化学性肺炎。吸入液态煤油可引起吸入性肺炎，严重时可发生肺水肿。摄入引起口腔、咽喉和胃肠道刺激症状，可出现与吸入中毒相同的中枢神经系统症状。慢性影响：神经衰弱综合征为主要表现，还有眼及呼吸道刺激症状，接触性皮炎，皮肤干燥等。环境危害：对环境有危害。对大气可造成污染。　　燃爆危险：其蒸气与空气可形成爆炸性混合物，遇明火、高热能引起燃烧爆炸。其蒸气比空气重，能在较低处扩散到相当远的地方，遇火源会着火回燃。若遇高热，容器内压增大，有开裂和爆炸的危险。
Acute poisoning: Inhalation of high-concentration diesel oil vapor will normally cause excitement and then inhibition, symptomatized as fatigue, headache, temulence, trance, muscle tremor, ataxia, and more seriously, disorientation, delirium and confusion etc.; its vapor can cause irritation to eyes and respiratory tract, and even chemical pneumonia. Inhalation of liquid kerosene can cause aspiration pneumonia, and more seriously, pulmonary edema. If swallowed, it will cause irritation to the mouth, throat, and gastrointestinal tract, and symptoms of central nervous system normally expected in case of inhalation poisoning. Chronic effects: Neurasthenia syndrome is the main symptom, and other symptoms include eye and respiratory tract irritation, contact dermatitis, dry skin, etc. Environmental hazard: It is harmful to the environment, and will cause pollution to the atmosphere. Combustion & explosion hazard: Its vapor will mix with air into an explosive mixture, and will burn and explode in case of open flame and high heat energy. Its vapor is heavier than air and can diffuse for a long distance at a lower level, and in face of an open flame, it will catch fire and burn backwards. The internal pressure in container will increase in case of high heat, probably leading to cracks and explosion.</td></tr>
<tr><td>急救方法
First aid method</td><td colspan="5">皮肤接触：立即脱去所有被污染的衣物，包括鞋类。用流动清水冲洗皮肤和头发（可用肥皂）。如果出现刺激症状，就医。眼睛接触：立即用流动、清洁水冲洗至少 15 分钟。如果疼痛持续或复发，就医。眼睛受伤后，应由专业人员取出隐形眼镜。吸入：如果吸入本品气体或其燃烧产物，脱离污染区。把病人放卧位，保暖并使其安静。开始急救前，首先取出假牙等，防止阻塞气道。如果呼吸停止，立即进行人工呼吸，用活瓣气囊面罩通气或有效的袖珍面具可能效果更佳。呼吸心跳停止，立即进行心肺复苏术。送医院或寻求医生帮助。食入：禁止催吐。如果发生呕吐，让病人前倾或左侧位躺下（头部保持低位），保持呼吸道通畅，防止吸入呕吐物。仔细观察病情。禁止给有嗜睡症状或知觉</td></tr>
</table>

		降低，即正在失去知觉的病人服用液体。意识清醒者可用水漱口，然后尽量多饮水。寻求医生或医疗机构的帮助。 Skin contact: Immediately take off all contaminated clothing, including footwear. Rinse skin and hair with running water (soap is acceptable). Seek medical attention if irritation occurs. Eye contact: Immediately rinse with clean running water for at least 15 minutes. Seek medical attention if pain persists or recurs. After an eye injury, ask a professional personnel to remove the contact lens. Inhalation: If inhaling the gas or combustion products of this product, please leave the polluted area. Put the patient in a lying position, and keep warm and quiet. Before starting first aid, first remove dentures, etc., to prevent obstruction of the respiratory tract. In case of respiratory arrest, give artificial respiration immediately, and if available, valve balloon mask or an effective pocket mask is preferred. In case of respiratory arrest and cardiac arrest, give CPR immediately. Send the victim to hospital or seek medical help. Ingestion: Do not introduce vomiting. If vomiting occurs, let the patient lean forward or lie down on the left side (with the head kept low) to keep the respiratory tract not obstructed by vomitus. Check the condition of patient carefully. Never give fluids to patients with lethargy symptoms or reduced consciousness, that is, patients who are losing consciousness. For those who are conscious, gargle with water, and drink as much water as possible. Seek help from a doctor or medical institution.		
燃烧爆炸危险性 Combustion and explosion hazard	燃烧性 Combustion	本品易燃，具窒息性。 This product is flammable and asphyxiant.	最大爆炸压力(MPa) Maximum explosion pressure (MPa)	无资料 No data
	闪点(℃) Flash point (℃)	38	爆炸上限（v%） Upper explosive limit (v%)	6.5
	引燃温度(℃) Ignition temperature (℃)	75~120	爆炸下限（v%） Lower explosive limit (v%)	0.6
	危险特性 Hazard characteristics	其蒸气与空气可形成爆炸性混合物，遇明火、高热能引起燃烧爆炸。与氧化剂可发生反应。流速过快，容易 产生和积聚静电。其蒸气比空气重，能在较低处扩散到相当远的地方，遇火源会着火回燃。若遇高热，容器内压增大，有开裂和爆炸的危险。有害燃烧产物：一氧化碳、二氧化碳。 Its vapor will mix with air into an explosive mixture, which will burn or explode in face of open fire and high heat energy. It may react with oxidants. Due to a high flow rate, it is likely to generate and accumulate static electricity. Its vapor is heavier than air and can diffuse for a long distance at a lower level, and in face of an open flame, it will catch fire and burn backwards. The internal pressure in container will increase in case of high heat, probably leading to cracks and explosion. Hazardous combustion products: carbon monoxide, carbon dioxide.		
	禁配物 Prohibited substances	强氧化剂 Strong oxidant		
	灭火方法 Fire extinguishing methods	灭火方法：尽可能将容器从火场移至空旷处。喷水保持火场容器冷却，直至灭火结束。处在火场中的容器若已变色或从安全泄压装置中产生声音，必须马上撤离。用雾状水、泡沫、干粉、二氧化碳、砂土灭火。 灭火注意事项：消防人员须佩戴防毒面具、穿全身消防服，在上风向灭火。 Fire extinguishing method: Move containers from the fire site to an open area if possible. Sprinkle water to keep the fire containers cool until the fire is extinguished. Move the container away from the fire site immediately if it becomes discoloured or its pressure relief device produces sound. Use water mist, foam, dry		

		powder, CO_2 and sands to extinguish the fire Fire-fighting precautions: Fire fighters must wear gas mask and fire-fighting overall, and put off the fire at the upwind position.		
贮运条件 Storage & transportation conditions	危规号：32501 DG No.: 32501	UN 编号：1223 UN No.: 1223	包装标志：易燃液体 Packing mark: flammable liquid	包装类别：Ⅲ类包装 Packing category: Ⅲ
	储存于阴凉、通风的库房。远离火种、热源。炎热季节库温不得超过 25℃。应与氧化剂、食用化学品分开存放，切忌混储。采用防爆型照明、通风设施。禁止使用易产生火花的机械设备和工具。储区应备有泄漏应急处理设备和合适的收容材料。 Store it in a cool, ventilated warehouse. Keep away from fire and heat sources. The storage temperature in hot seasons shall not exceed 25 ℃. Store it separately from oxidants and edible chemicals, and avoid mixed storage. Adopt explosion-proof lighting and ventilation facilities. It is forbidden to use mechanical equipment and tools that can easily generate sparks. Provide leakage emergency treatment equipment and suitable containing materials in the storage area.			
泄漏应急处理 Emergency measures in case of leakage	应急行动：迅速撤离泄漏污染区人员至安全区，并进行隔离，严格限制出入。切断火源。建议应急处理人员戴自给正压式呼吸器，穿防静电工作服。尽可能切断泄漏源。防止流入下水道、排洪沟等限制性空间。小量泄漏：用砂石或其它不燃材料吸附或吸收。也可以在保证安全情况下，就地焚烧。大量泄漏：构筑围堤或挖坑收容。用泵转移至槽车或专用收集器内，回收或运至废物处理场所处置。 操作处置与储存 Emergency actions: Evacuate the personnel in the leakage polluted area to the safe area immediately, isolate the leakage polluted area and strictly restrict access. Cut off the fire source. Emergency personnel are recommended to wear positive pressure self-contained respirator and anti-static work clothes. Cut off the leakage source if possible. Prevent the leakage from entering into confined space such as sewer and flood discharge ditches. Small leakage: Absorb with sand or other nonflammable materials. Alternatively, burn in place provided the safety is guaranteed. Heavy leakage: Build embankment or dig a hole for containment. Transfer to tank car or special collector with pumps, and recycle or transport to the waste disposal site. Handling and storage			

表 5.1-10 盐酸的理化性质及危险特性

Table 5.1-10 Physical and Chemical Properties & Hazardous Characteristics of Hydrochlori Acid

标识 Indicators	中文名：盐酸；氢氯酸。 Chinese name: 盐酸;氢氯酸.		英文名：Hydrochlori acid;chlorohydric acid English name: Hydrochlori acid; chlorohydric acid
	分子式：HCl Molecular formula: HCl	分子量：36.46 Molecular weight: 36.46	CAS 号：7647-01-0 CAS No.: 7647-01-0
	危险性类别：皮肤腐蚀/刺激，类别 1B；严重眼损伤/ 眼刺激，类别 1；特异性靶器官毒性-一次接触，类别 3；（呼吸道刺激）危害水生环境-急性危害，类别 2 Hazard category: Skin corrosion/irritation, Category 1B; Serious eye damage/eye irritation, Category 1; Specific target organ toxicity - single exposure, Category 3; (Respiratory tract irritation) Aquatic toxicity - Acute hazard, Category 2		化学类别：无机酸 Chemical category: Inorganic acid
组成与性状 Composition and	主要成分：含量 工业级 36% Main ingredients: content - 36%, industrial grade		
	外观与性状：无色或微黄色发烟液体，有刺鼻的酸味。 Appearance and properties: colorless or slightly yellow smoky liquid with a pungent sour taste.		
	主要用途：重要的无机化学品，广泛用于染料、医药食品、印染、皮革、冶金等行业。 Main purpose: an important inorganic chemical, widely used in dyes, medicine and food, printing and dyeing, leather, metallurgy and other industries.		

<table>
<tr><td>properties</td><td colspan="3"></td></tr>
<tr><td rowspan="3">健康危害
Health hazard</td><td colspan="3">侵入途径：吸入、食入。
Invasion route: Inhalation, ingestion.</td></tr>
<tr><td colspan="3">健康危害：接触其蒸气或烟雾，可引起急性中毒，出现眼结膜炎、鼻炎、口腔粘膜有灼烧感、鼻衄、齿龈出血、气管炎等。误服可引起消化道灼伤、溃疡形成，有可能引起胃穿孔、腹膜炎等。眼和皮肤接触可致灼伤。
Health hazard: Exposure to its vapor or fume will cause acute poisoning symptoms including conjunctivitis, rhinitis, burning sensation of oral mucosa, epistaxis, bleeding gums, tracheitis, etc. If swallowed, it will cause burns and ulcers of digestive tract, and possibly gastric perforation and peritonitis. If accidentally sprayed into eyes or onto skin, it may cause burns.
慢性影响：长期接触，引起慢性鼻炎，慢性支气管炎、牙齿酸蚀症及皮肤损害。
Chronic effects: Long-term exposure will cause chronic rhinitis, chronic bronchitis, tooth erosion and skin damage.</td></tr>
<tr><td rowspan="4">急救措施
Emergency treatment</td><td colspan="3">皮肤接触：立即脱去被污染的衣着，用大量流动清水冲洗，至少 15 分钟。就医。
[Skin contact]: Remove contaminated clothing and rinse immediately with a large amount of running water for at least 15 minutes. Seek medical advice.</td></tr>
<tr><td colspan="3">眼睛接触：立即提起眼睑，用大量流动清水或生理盐水冲洗至少 15 分钟，就医。
Eye contact: Lift eyelid immediately and rinse with a large amount of running water or saline for at least 15 minutes, and then seek medical advice.</td></tr>
<tr><td colspan="3">吸入：迅速脱离现场至空气新鲜处，保持呼吸道通畅。如呼吸困难，给输氧。如呼吸停止，立即进行人工呼吸。就医。
Inhalation: Evacuate to a place with fresh air and keep the respiratory tract unobstructed. In case of expiatory dyspnea, give oxygen therapy. In case of respiratory arrest, give artificial respiration immediately. Seek medical advice.</td></tr>
<tr><td colspan="3">食入：误服者用水漱口，给饮牛奶或蛋清。就医。
Ingestion: Rinse the mouth with water and provide milk or egg white. Seek medical advice.</td></tr>
<tr><td rowspan="5">燃爆特性
Combustion and explosion characteristics</td><td>燃烧性：不燃
Flammability: non-flammable</td><td>闪点（℃）：—
Flash point (℃): -</td><td>引燃温度（℃）：—
Ignition temperature (℃): -</td></tr>
<tr><td>爆炸下限（%）：—
Lower explosive limit (v%): -</td><td>爆炸上限（%）：—
Upper explosive limit (v%): -</td><td>最小点火能（mJ）：—
Minimum ignition energy (mJ): -</td></tr>
<tr><td>最大爆炸压力：—
Maximum explosion pressure: -</td><td></td><td></td></tr>
<tr><td colspan="3">危险特性：能与一些活性金属粉末发生反应，放出氢气。遇氰化物能产生剧毒的氰化氢气体。与碱发生中和反应，并放出大量的热。具有较强的腐蚀性。
Hazardous characteristics: It can react with some active metal powders and emit hydrogen gas. In face of cyanide, it will produce highly toxic hydrogen cyanide gas. It will undergo neutral reaction with alkali and release a lot of heat. It is highly corrosive.</td></tr>
<tr><td colspan="3">灭火方法：消防人员必须佩戴氧气呼吸器，穿全身防护服。用碱性物质如碳酸氢钠、碳酸钠、消石灰等中和。也可用大量水扑救。
Fire fighting methods: Firefighters must wear oxygen respirator and protective overall. Neutralize it with alkaline substances such as sodium bicarbonate, sodium carbonate, slaked lime, etc. Alternatively, use a lot of water to put out the fire.</td></tr>
<tr><td>泄漏处理
Leakage treatment</td><td colspan="3">迅速撤离泄漏污染区人员至安全区，并进行隔离，严格限制出入。建议应急处理人员戴自给正压式呼吸器，穿防酸碱工作服。不要直接接触泄漏物。尽可能切断泄漏源。防止进入下水道、排洪沟等限制性空间。小量泄漏：用砂土、干燥石灰或苏打灰混合。也可以用大量水冲洗，洗水稀释后放入废水系统。大量泄漏：构筑围堤或挖坑收容；用泵转移至槽车或专用收集器内，回收或运至废物处理场所处置。
Evacuate the personnel in the leakage polluted area to the safe area immediately, isolate the leakage</td></tr>
</table>

<table>
<tr><td></td><td colspan="3">polluted area and strictly restrict access. The emergency personnel are recommended to wear positive pressure self-contained respirator and anti-acid & alkali suits. Do not come into direct contact with the leakage. Cut off the leakage source if possible. Prevent the leakage from entering confined space such as sewers and flood discharge ditches. Small leakage: Mix it with sand, dry lime or soda ash. Alternatively, flush with a large amount of water, and dilute the water for flushing before discharging it into the sewage system. Heavy leakage: Build embankment or dig a hole for containment; Transfer to tank car or special collector with pumps, and recycle or transport to the waste disposal site for disposal.</td></tr>
<tr><td>储运事项 Storage & transportation precautions</td><td colspan="3">储存于阴凉、干燥、通风良好的仓间。应与碱类、金属粉末、卤素（氟、氯、溴）、易燃或可燃物等分开存放。不可混储混运。搬运时要轻装轻卸，防止包装及容器损坏。分装和搬运作业要注意个人防护。运输按规定路线行驶。
Store it in cool, dry and well-ventilated warehouse. Store it separately from alkali, metal powder, halogen (fluorine, chlorine, bromine), flammable or combustible materials Avoid mixed storage and transportation. Handle gently to prevent from damage of package and container. Pay attention to personal protection during packaging and handling. Drive along the prescribed route during transportation.</td></tr>
<tr><td rowspan="7">防护措施 Protection measures</td><td colspan="3">车间卫生标准： MAC（mg/m³）：7.5
Workshop housekeeping standards: MAC(mg/m³): 7.5</td></tr>
<tr><td colspan="3">工程控制：严加密闭，提供充分的局部排风。提供安全淋浴和洗眼设备。
Engineering control: Ensure a closed environment, and provide adequate local exhaust means. Provide safe shower and eyewash facilities.</td></tr>
<tr><td colspan="3">呼吸系统防护：可能接触其烟雾时，佩戴自吸过滤式防毒面具（全面罩）或空气呼吸器。紧急事态或撤离时，建议佩戴氧气呼吸器。
Respiratory protection: When exposure to its fume is expected, wear self-priming filter gas mask (full face mask) or air respirator. In case of emergency or evacuation, it is recommended to wear oxygen respirator.</td></tr>
<tr><td colspan="3">眼睛防护：呼吸系统防护中已作防护。
Eye protection: Eye protection has been provided in the respiratory system,</td></tr>
<tr><td colspan="3">身体防护：穿橡胶耐酸碱服。
Body protection: Wear anti-acid & alkali rubber clothing.</td></tr>
<tr><td colspan="3">手防护：戴橡胶手套。
Hand protection: Wear rubber gloves.</td></tr>
<tr><td colspan="3">其他：工作现场禁止吸烟、进食和饮水。工作毕，淋浴更衣。单独存放被毒物污染的衣服，洗后备用。保持良好的卫生习惯。
Others: Smoking, eating and drinking are prohibited at the workplace. After work, take a shower and change clothes. Store clothes contaminated by toxic substances separately and wash them for later use. Maintain good hygiene habits.</td></tr>
<tr><td rowspan="4">理化性质 Physical & chemical properties</td><td colspan="3">溶解性：与水混溶，溶于碱液。
Solubility: miscible with water, and soluble in lye.</td></tr>
<tr><td>熔点（℃）：-114.8（纯）
Melting point (℃): -114.8 (pure)</td><td>沸点(℃)：108.6(20%)
Boiling point (℃): 108.6 (20%)</td><td>相对密度（水=1）：1.20
Relative density (water = 1): 1.20.</td></tr>
<tr><td>临界温度（℃）：—
Critical temperature (℃): -</td><td>临界压力（MPa）：—
Critical pressure (MPa): -</td><td>相对密度（空气=1）：1.26
Relative density (air=1) : 1.26</td></tr>
<tr><td colspan="2">饱和蒸气压（kPa）：30.66(21℃)
Saturated vapor pressure (kPa): 30.66 (21 ℃)</td><td>燃烧热（kJ/mol）：—
Heat of combustion (kJ/mol): -</td></tr>
<tr><td>反应</td><td colspan="2">稳定性：稳定
Stability: stable</td><td>聚合危害：不聚合
Polymerization hazard: no polymerization</td></tr>
</table>

活性 Reactivity	避免接触的条件：— Conditions to avoid contact: -	禁忌物：碱类、胺类、碱金属、易燃或可燃物。 Prohibited substances: alkalis, amines, alkali metals, flammable or combustible materials.
	燃烧分解产物：氯化氢。 Combustion decomposition product: hydrogen chloride.	
毒性 Toxicity	急性中毒：LD_{50}（mg/kg）：— Acute poisoning: LD_{50} (mg/kg): -	LC_{50}（mg/m^3）：— LC_{50} (mg/m^3): -
	慢性毒性：存在 Chronic toxicity: Present	致癌性：— Carcinogenicity: -
环境资料 Environmental information	该物质对环境有危害，应特别注意对水体和土壤的污染。 This substance is harmful to the environment, and special attention should be paid to the pollution of water bodies and soil.	
废弃 Disposal	处置前参阅国家和地方有关法规。用焚烧法处置。 Refer to relevant national and local regulations before disposal. Dispose by adopting the incineration method.	
运输信息 Transportation information	危规号：81013 DG No.: 81013	UN 编号：1789 UN No.: 1789
	包装分类：Ⅱ、Ⅲ Packing category: Ⅱ, Ⅲ	包装标志：20 Packing mark: 20
	包装方法：螺纹口玻璃瓶、铁盖压口玻璃瓶、塑料瓶外木板箱；耐酸坛、陶瓷罐外木板箱或半花格箱；塑料桶。 Packing method: Threaded opening glass bottle, iron-covered glass bottle, plastic bottle outside wooden box; acid-resistant altar, ceramic tank outside wooden box or semi-lattice box; plastic barrel.	
法规信息 Regulatory information	《危险化学品安全管理条例》、《工作场所安全使用化学品规定》等法规针对危险化学品的安全使用、生产、储存、运输、装卸等方面均作了相应规定；《常用危险化学品的分类及标志》将该物质划分为第 8.1 类酸性腐蚀品。 Regulations including *Regulation on the Safety Management of Hazardous Chemicals* and the *Regulation on Safe Use of Chemicals in the Workplace* address the safe use, production, storage, transportation, loading and unloading of hazardous chemicals; As per the definition in the *Classification and labels of dangerous chemical substances commonly used*, this substance is: Class 8.1 Corrosives presenting acid properties.	
其他信息 Other information	上述资料来源于《危险化学品安全技术全书》（化学工业出版社）。 The above information is sourced from "Safety of Hazardous Chemicals" (Chemical Industry Press).	

表 5.1-11　二氧化氯的理化性质及危险特性

Table 5.1-11 Physical and Chemical Properties & Hazardous Characteristics of Chlorine Dioxide

标识 Identificat	中文名： Chinese name:	二氧化氯 Carbon dioxide	英文名： English name:	Chlorine dioxide Chlorine dioxide
	分子式：	ClO_2	分子量：	67.45

ion	Molecular formula:		Molecular weight:	
	CAS 号： CAS No.:	10049-04-4	RTECS 号： RTECS No.:	UN 编号：危险货物编号 UN No.: Dangerous goods code
理化性质 Physical & chemical properties	外观与性状： Appearance and properties:	黄红色气体，有刺激性气味，能沿地面扩散，一般稀释为 10%以下的溶液使用、贮存。 Yellow-red gas with irritating odor, which can diffuse along the ground. It is generally diluted to a concentration below 10% before use and storage.		
	主要用途： Main purpose:	用作漂白剂、除臭剂、氧化剂等。 Used as bleach, deodorant, oxidant, etc.		
	熔点（℃）： Melting point (℃):	-59	沸点： Boiling point:	9.9(97.2kPa，爆炸) 9.9 (97.2kPa, explosion)
	溶解性： Solubility:	不溶于水 Insoluble in water		
	相对密度（水=1）： Relative density (water =1):	3.09(11℃) 3.09 (11℃)	相对密度（空气=1）： Relative density (air=1):	2.3
	饱和蒸气压 kPa)： Saturated vapor pressure (kPa):	无资料 No data	燃烧热（kJ/mol）： Heat of combustion (kJ/mol):	无资料 No data
	临界温度（℃）： Critical temperature (℃):	无资料 No data	临界压力（MPa）： Critical pressure (MPa):	无资料 No data
燃烧爆炸危险性 Combustion & explosion Hazard	燃烧性： Flammability:	助燃 Combustion supporting	建规火险分级： Fire risk classification in building regulations:	甲 Class I
	闪点（℃）： Flash point (℃):	无意义 Meaningless	自燃温度（℃）： Autoignition temperature (℃):	无意义 Meaningless
	爆炸下限（V%）： Lower explosive limit (v%):	无意义 Meaningless	爆炸上限（V%）： Upper explosive limit (v%):	无意义 Meaningless
	燃烧(分解)产物： Combustion (decomposition) product:	无资料 No data	稳定性： Stability:	不稳定 Instable
	聚合危害： Polymeric hazard:	不能出现 Not allowed	禁忌物： Prohibited substances:	还原剂、易燃或可燃物、活性金属粉末。 Reducing agent, flammable or combustible substance, active metal powder.
	灭火方法： Fire extinguishing methods:	切断气源。喷水冷却容器，可能的话将容器从火场移至空旷处。 Cut off the gas source. Spray water to cool the container; if possible, move the container from the fire site to the open space.		
包装与储运 Packaging, storage	危险性类别： Hazard category:	无资料 No data	危险货物包装标志： Packing mark of dangerous goods:	无资料 No data
	储存注意事项 Storage precautions	储存于通风、低温的库房内。远离火种、热源。防止阳光直射。包装要求密封，不可与空气接触。防止受潮。应与还原剂、易燃、可燃物，等		

and transportation		分开存放。搬运时要轻装轻卸，防止包装及容器损坏。禁止撞击和震荡。 Select a well-ventilated low-temperature warehouse for storage. Keep away from fire and heat sources. Prevent direct sunlight. Package shall be sealed to ensure that the product therein will not be in contact with air. Prevent moisture. Store it separately from reducing agent, flammables, combustibles, etc. Handle gently to prevent from damage of package and container. Avoid impact or shake.		
毒性危害 Toxic hazard	接触限值： Exposure limit:	美国 TLV-TWA：ACGIH 0.1ppm，0.28 mg/m^3；美国 TLV-STEL：ACGIH 0.3ppm，0.38 mg/m^3 American TLV-TWA: ACGIH 0.1ppm, 0.28 mg/ 3; American TLV-STEL: ACGIH 0.3ppm, 0.38 mg/ 3		
	侵入途径： Invasion route:	吸入 Inhalation	毒性： Toxicity:	无资料 No data
	健康危害： Health hazard:	本品具有强烈刺激性。接触后主要引起眼和呼吸道刺激。吸入高浓度可发生肺水肿。能致死。对呼吸道产生严重损伤浓度的本品气体，可能对皮肤有刺激性。皮肤接触或摄入本品的高浓度溶液，可能引起强烈刺激和腐蚀。长期接触可导致慢性支气管炎。 This product is strongly irritant. If contacted, it may cause eye and respiratory tract irritation. Inhalation of this product of high concentration can cause pulmonary edema, and even death. The gas phase of this product will cause severe damage to the respiratory tract, and may be irritating to the skin. Skin contact or ingestion of the high concentration solution of this product may cause strong irritation and corrosion. Long-term exposure may cause chronic bronchitis.		
急救 First aid	皮肤接触： Skin contact:	脱去污染的衣着，立即用水冲洗至少 15 分钟。就医。 Remove contaminated clothing and rinse immediately with water for at least 15 minutes. Seek medical advice.		
	眼睛接触： Eye contact:	立即提起眼睑，用流动清水或生理盐水冲洗至少 15 分钟。就医。 Lift eyelid immediately and rinse with running water or saline for at least 15 minutes. Seek medical advice.		
	吸入 Inhalation	迅速脱离现场至空气新鲜处。保持呼吸道通畅。呼吸困难时给输氧。呼吸停止时，立即进行人工呼吸。就医。 Evacuate to a place wiwth fresh air. Keep respiratory tract unobstructed. In case of expiratory dyspnea, give oxygen therapy. In case of respiratory arrest, artificial respiration shall be performed immediately. Seek medical advice.		
防护措施 Protection measures	工程控制： Engineering control:	严加密闭，提供充分的局部排风和全面排风。 Apply airtight measures, and provide sufficient local exhaust ventilation and comprehensive ventilation.		
	呼吸系统防护： Respiratory protection:	空气中浓度超标时，必须佩带防毒面具。紧急事态抢救或逃生时，建议佩带正压自给式呼吸器。 When the concentration in the air exceeds the standard, always wear a gas mask. In case of emergency rescue or escape, it is recommended to wear positive pressure self-contained respirator.		
	眼睛防护： Eye protection:	戴化学安全防护眼镜。 Wear chemical safety goggles.		
	防护服： Protective suit:	穿防腐工作服。 Wear anti-corrosion overall.	手防护： Hand protection:	戴放化学品手套 Wear chemical gloves
泄漏处置 Leakage treatment		迅速撤离泄漏污染区人员至上风处，并隔离直至气体散尽，应急处理人员戴正压自给式呼吸器，穿化学防护服。切断火源。勿使泄漏物与可燃物质(木材、纸、油等)接触，切断气源，喷洒雾状水稀释，抽排(室内)或强力通风(室外)。漏气容器不能再用，且要经过技术处理以清除可能剩下的气体。		

	Excavate personnel in leakage polluted area immediately to the upwind area, and isolate the polluted area until the gas is dispersed. Emergency personnel are recommended to wear positive pressure self-contained respirators and chemical protective clothing. Cut off the fire source. Prevent the leakage from contacting with combustible substances (wood, paper, oil, etc.); Cut off the gas source, dilute by spraying water, and then carry out exhaust (indoor) or forced ventilation (outdoor). Do not use the leaking container, and remove any remaining gas by adopting appropriate technical approaches.

表 5.1-12　天然气理化性质表

Table 5.1-12 Physical and Chemical Properties of Natural Gas

理化性质 Physical & chemical properties	成分（V%）：CH_4（99.78）、CnHm（0.09）、CO_2（0.07）、N_2（0.06）、H_2S（0.00053） Ingredient (V%): CH_4 (99.78), CnHm (0.09), CO_2 (0.07), N_2(0.06), H_2S (0.00053) 密度：约 0.45 g/cm^3（液化）；沸点：　-161.5°C；熔点：−182.5°C；闪点：　-190°C Density: about 0.45 g/cm^3 (liquefied); Boiling point:　-161.5°C; Fusion point: -182.5°C; Flash point:　-190°C 性状：无色无臭气体。 Nature: Colorless odorless gas.
急性毒性 Acute toxicity	属微毒类，允许气体安全地扩散到大气中或当作燃料使用，有单纯性窒息作用，在高浓度时因缺氧窒息而引起中毒。 It is slightly toxic, and is allowed to be diffused into the atmosphere in the phase of gas or be used as a fuel. It is simple asphyxiant, and when the concentration is high enough, it will cause hypoxia suffocation and poisoning.
燃烧爆炸危险性 Combustion and explosion hazard	易燃，与空气混合能形成爆炸性混合物，遇热源和明火有燃烧爆炸的危险；与五氧化溴、氯气、次氯酸、三氟化氮、液氧、二氟化氧及其它强氧化剂接触发生剧烈化学反应；若遇高热，容器内压增大，有开裂和爆炸的危险。 It is flammable, and will be mixed with air into an explosive mixture, which may burn or explode in face of heat sources or open flame; it will undergo violent chemical reaction when contacting with pentoxide with bromine, chlorine, hypochlorous acid, nitrogen trifluoride, oxygen difluoride and other strong oxidants; in the event of high heat, the internal pressure of the container will increase, posing a risk of cracking and explosion.
对人体危害 Harm on human body	侵入途径：吸入，皮肤接 Invasion route: Inhalation, and skin contact. 健康危害：天然气主要成分是甲烷，甲烷对人基本无毒，但浓度过高时，使空气中氧含量明显降低使人窒息；当空气中甲烷达 25%-30%时，可引起头痛、头晕、乏力、注意力不集中、呼吸和心跳加速、共济失调，若不及时脱离，可致窒息死亡。皮肤接触液化本品，可致冻伤 Health hazards: The main ingredient of natural gas is methane, which is basically non-toxic to human, but when the concentration is too high, it will cause suffocation as the oxygen content in the air significantly reduces; when the methane content in the air is 25% -30%, headache, dizziness, fatigue, inattention, accelerated breathing and heartbeat and ataxia will occur, and if the victim does not leave in time, suffocation and even death will be caused. Skin contact with liquefied gas may cause frostbite.
防护措施	工程控制：密闭操作，提供良好的自然通风条件。 Engineering control: Ensure closed operation, and provide sound natural ventilation conditions.

Protection measures	呼吸系统防护：高浓度环境中，佩戴供气式呼吸器。 Respiratory protection: Wear air supplied respirator when the concentration of product in air is high. 眼睛防护：一般不需要特殊防护，高浓度接触时可戴化学安全防护眼镜。 Eye protection: Generally no special protection is required, and in case of high concentration exposure, wear chemical safety goggle. 身体防护：穿工作服。 Body protection: Wear work clothes. 手防护：必要时戴防护手套。 Hand protection: Wear protective gloves when necessary. 其它：工作现场严禁吸烟，避免高浓度吸入，进入罐或其它高浓度区作业时，需有人监护。 Others: Never smoke in the workplace; avoid inhaling high-concentration product, and in tanks or other areas of high concentration, operate under supervision.
储存 Storage	天然气应在 15℃或者高于露点的温度下保存，应与氧化剂分开存放，切忌混储；远离火种、热源，储存区应备有泄漏应急处理设备 Store the natural gas at 15°C or other temperature above the dew point separately from the oxidant, and avoid mixed storage; keep away from fire and heat sources, and equip the storage area with emergency treatment facilities for leakage.

5.1.2 环境敏感目标调查

5.1.2 Investigation of environment-sensitive targets

项目位于北海铁山港（临港）工业区，陆域评价范围内无风景名胜区、自然保护区、饮用水源地保护区、集中式饮用取水口等敏感保护目标，也无珍稀动、植物物种，主要环境敏感目标为居住区，距离项目最近的敏感点为项目用地南面的川江、坡尾底。周边环境敏感目标调查见下表。

The project is located in the Tieshangang (Lingang) Industrial Park of Beihai. There are no scenic spots, nature reserves, drinking water source protection zone, centralized drinking water intakes and other sensitive protection targets within the assessment range of land area, and there are also no rare plant and animal species. The main environment-sensitive target is the residential area, and the sensitive points closest to the project are Chuanjiang River and Poweidi to the south of the project site. The investigation of sensitive targets in the surrounding environment is shown in the table below.

表 5.1-13　建设项目敏感特征表
Table 5.1-13 Sensitive Characteristics of the Construction Project

类别 Category	环境敏感特征 Environmental sensitive characteristic
	厂址周边 5km 范围内 Within 5km around the site

	序号 S.N.	敏感目标名称 Name of sensitive target	相对方位 Relative orientation	距离（m） Distance (m)	属性 Property	人口数 Population
环境空气 Ambient air	1	大塘村 Datang Village	西南 Southwest	2650	居住区 Residential area	0
	2	对面垌 Duimiandong	西 West	1070	居住区 Residential area	338
	3	彬垌村 Bindong Village	西 West	2180	居住区 Residential area	0
	4	老妗垌 Laojindong	西 West	650	居住区 Residential area	1019
	5	新岭 Xinling	西 West	1300	居住区 Residential area	209
	6	猪血塘 Zhuxuetang	西 West	1600	居住区 Residential area	500
	7	中石化倒班宿舍（阳关海岸） Sinopec shift dormitory (Yangguan Haian)	西南 Southwest	2180	居住区 Residential area	572
	8	百班村 Baiban Village	西 West	1370	居住区 Residential area	48
	9	东方海岸大酒店 Oriental Coast Hotel	南 South	2180	居住区 Residential area	100
	10	竹儿根 Zhuergen	西 West	1080	居住区 Residential area	158
	11	山心 Shanxin	西 West	920	居住区 Residential area	280
	12	川江 Chuanjiang	南 South	30	居住区 Residential area	400
	13	坡尾底 Poweidi	南 South	30	居住区 Residential area	200
	14	南乐 Nanyue	西 West	740	居住区 Residential area	420
	15	岸泽 Anze	/	/	居住区 Residential area	0
	16	北暮 Beimu	/	/	居住区 Residential area	0
	17	那格塘（陂头） Nagetang (Pitou)	西北 Northwest	1700	居住区 Residential area	212
	18	新铺 Xinpu	北 North	460	居住区 Residential area	816
	19	海山排 Haishanpai	北 North	1400	居住区 Residential area	420
	20	亚细村 Yaxi Village	北 North	1430	居住区 Residential area	755
	21	南乐社区 Nanyue Community	北 North	2050	居住区 Residential area	280
	22	谢家村 Xiejiacun Village	北 North	1130	居住区 Residential area	360
	23	华南北苑 Huanan Beiyuan	西 West	1740	居住区 Residential area	215
	24	油麻山村	北	2450	居住区	120

类别 Category	环境敏感特征 Environmental sensitive characteristic					
	厂址周边 5km 范围内 Within 5km around the site					
	序号 S.N.	敏感目标名称 Name of sensitive target	相对方位 Relative orientation	距离（m） Distance (m)	属性 Property	人口数 Population
		Youmashan Village	North		Residential area	
	25	东岸场村 Donganchang Village	东北 Northeast	2550	居住区 Residential area	370
	26	山芦村 Shanlu Village	东北 Northeast	3000	居住区 Residential area	410
	27	大炮岭村 Dapaoling Village	东北 Northeast	3500	居住区 Residential area	280
	28	旦场村 Danchang Village	东北 Northeast	4000	居住区 Residential area	170
	29	只郎村 Zhilang Village	西北 Northwest	3250	居住区 Residential area	140
	30	贵余坛村 Guiyutan Village	北 North	1970	居住区 Residential area	1100
	31	浸谷塘村 Jingutang Village	西北 Northwest	4100	居住区 Residential area	160
	32	大竹园 Dazhuyuan	西南 Southwest	2400	居住区 Residential area	235
	33	彬定（旧） Binding (old)	西南 Southwest	2270	居住区 Residential area	0
	34	新村坡 Xincunpo	西 West	2440	居住区 Residential area	0
	35	江底村 Jiangdi Village	西 West	2850	居住区 Residential area	0
	36	彬定（新） Binding (New village)	西南 Southwest	1650	居住区 Residential area	1019
	37	槟榔根 Binlanggen	西南 Southwest	2340	居住区 Residential area	10
	38	塘细村 Tangxi Village	西南 Southwest	3200	居住区 Residential area	0
	39	邓屋（川江村） Dengwu (Chuanjiang Village)	西 West	310	居住区 Residential area	142
	40	港务集团宿舍区 Port Group dormitory	西南 Southwest	2600	居住区 Residential area	500
	41	屋背山 Wubeishan	西 West	3200	居住区 Residential area	48
	42	彬嵩 Binsong	西 West	1400	居住区 Residential area	159
	43	冲头村 Chongtou Village	西 West	3330	居住区 Residential area	338
	44	大田 Datian	西 West	2200	居住区 Residential area	212
	45	北塘村 Beitang Village	西 West	4050	居住区 Residential area	158
	46	下底村	西	4000	居住区	142

类别 Category	环境敏感特征 Environmental sensitive characteristic					
	厂址周边 5km 范围内 Within 5km around the site					
	序号 S.N.	**敏感目标名称 Name of sensitive target**	**相对方位 Relative orientation**	**距离（m） Distance (m)**	**属性 Property**	**人口数 Population**
		Xiadi Village	West		Residential area	
	47	黄稍村 Huangshao Village	西 West	4200	居住区 Residential area	159
	48	淡水口 Danshuikou	西南 Southwest	4000	居住区 Residential area	0
	49	兴港镇彬定小学 Xinggang Town Binding Primary School	北 North	2500	学校 School	约 500 人 About 500 persons
	50	红花根 Honghuangen	北 North	2600	居住区 Residential area	450
	51	山梓 Shanzi	西北 Northwest	4700	居住区 Residential area	480
	52	邓九垌 Dengjiudong	北 North	1450	居住区 Residential area	100
	53	彬池村 Binchi Village	北 North	3000	居住区 Residential area	1000
	54	下低垌村 Xiadidong Village	西北 Northwest	2600	居住区 Residential area	335
	55	上高垌 Shanggaodong	西北 Northwest	3450	居住区 Residential area	150
	56	上陂头 Shangpitou	西北 Northwest	3400	居住区 Residential area	310
	57	下陂头 Xiapitou	西北 Northwest	3600	居住区 Residential area	300
	58	南冲 Nanchong	西北 Northwest	4500	居住区 Residential area	350
	59	地罗 Diluo	西北 Northwest	4200	居住区 Residential area	209
	60	兴港镇 Xinggang Town	北 North	4750	居住区 Residential area	1200
	厂址周边 500m 范围内人口数小计 Subtotal of population within 500m around the site					742
	厂址周边 5km 范围内人口数小计 Subtotal of population within 5km around the site					18358
	大气环境敏感程度 E 值 Atmosphere environmental sensitivity E					E1

地表水 Surface water	受纳水体 Receiving water body			
	序号 S.N.	受纳水体名称 Name of receiving water	排放点水域环境功能 Environmental function of water area at discharge point	24 h 内流经范围/km Flowing range within 24 h/km
	/	铁山港排污区 Tieshangang sewage discharge area	四类水质目标 Class IV quality goal	/

<table>
<tr><td rowspan="8">类别
Category</td><td colspan="6">环境敏感特征
Environmental sensitive characteristic</td></tr>
<tr><td colspan="6">厂址周边 5km 范围内
Within 5km around the site</td></tr>
<tr><td>序号
S.N.</td><td>敏感目标名称
Name of sensitive target</td><td>相对方位
Relative orientation</td><td>距离（m）
Distance (m)</td><td>属性
Property</td><td>人口数
Population</td></tr>
<tr><td colspan="6">内陆水体排放点下游 10 km（近岸海域一个潮周期最大水平距离两倍）范围内敏感目标
Sensitive targets within 10 km (twice the maximum horizontal distance of a tidal cycle in coastal water) at downstream of the discharge point of inland water body</td></tr>
<tr><td>序号
S.N.</td><td>敏感目标名称
Name of sensitive target</td><td>环境敏感特征
Environmental sensitive characteristic</td><td>水质目标
Water quality goal</td><td colspan="2">与排放点距离/m
Distance from discharge point/m</td></tr>
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Shankou National Mangrove Forest Nature Reserve</td><td>国家级自然保护区
National Nature Reserve</td><td>一类
Class I</td><td colspan="2">3500</td></tr>
<tr><td>2</td><td>广西合浦儒艮国家级自然保护区
Guangxi Hepu Dugong National Nature Reserve</td><td>国家级自然保护区
National Nature Reserve</td><td>一类
Class I</td><td colspan="2">5500</td></tr>
<tr><td colspan="5">地表水环境敏感程度 E 值
Surface Water Environmental Sensitivity E</td><td>E2</td></tr>
<tr><td rowspan="4">地下水
Groundwater</td><td>序号
S.N.</td><td>环境敏感区名称
Name of environment-sensitive area</td><td>环境敏感特征
Environmental sensitive characteristic</td><td>水质目标
Water quality goal</td><td>包气带
Aeration zone
防污性能
Vulnerability</td><td>与下游厂界距离
Distance from downstream plant boundary /m</td></tr>
<tr><td>1</td><td>川江
Chuanjiang</td><td>G2
(分散式饮用水源)
(Decentralized drinking water source)</td><td>《地下水质量标准》(GB14848-2017)III类
Quality Standards for Groundwater (GB14848-2017) Grade III</td><td>D2</td><td>30</td></tr>
<tr><td>2</td><td>坡尾底
Poweidi</td><td>G2
(分散式饮用水源)
(Decentralized drinking water source)</td><td>《地下水质量标准》(GB14848-2017)III类
Quality Standards for Groundwater (GB14848-2017) Grade III</td><td>D2</td><td>30</td></tr>
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Groundwater environmental sensitivity E</td><td>E2</td></tr>
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5.2 环境风险评价工作等级

5.2 Grading of environmental risk assessment

5.2.1 环境风险潜势判定

5.2.1 Determination of environmental risk potential

5.2.1.1 危险物质及工艺系统危险性（P）的分级确定

5.2.1.1 Determination of hazard rank (P) of hazardous substances and process systems

（1）危险物质数量与临界量的比值（Q）

(1) Ratio of the quantity of hazardous substances to the critical quantity (Q)

根据《建设项目环境风险评价技术导则》（HJ169-2018）附录 C，环境风险物质数量与临界量比值的规定如下：

According to Annex C of *Technical Guidelines for Environmental Risk Assessment on Projects* (HJ169-2018), the ratio of the quantity of environmental risk substances to the critical quantity is as follows:

①当企业只涉及一种环境风险物质时，计算该物质的总数量与其临界量比值，即为 Q；

① When the enterprise involves only one environmental risk substance, calculate the ratio of the total quantity of the substance to its critical quantity, which is Q;

②当企业存在多种环境风险物质时，则按下式计算物质数量与其临界量比值（Q）：$Q=q_1/Q_1+q_2/Q_2+\ldots+q_n/Q_n$

② When the enterprise involves more than one environmental risk substances, the ratio (Q) of the quantity of the substance to its critical quantity is calculated as follows: $Q=q_1/Q_1+q_2/Q_2+\ldots+q_n/Q_n$

式中：q_1，q_2，…q_n—每种危险化学品实际存在量，单位为吨（t）；

Where, q_1,q_2,…q_n-Actual quantity of each hazardous chemical (t);

Q_1，Q_2，…Q_n—各危险化学品相对应的临界量，单位为吨（t）。

Q_1,Q_2,…Q_n-Critical quantity of each hazardous chemical (t).

当 Q＜1 时，该项目环境风险潜势为Ⅰ。

When Q < 1, the environmental risk potential of the project is Ⅰ.

当 Q≥1 时，将 Q 值划分为①1≤Q＜10；②10≤Q＜100；③Q≥100。

When Q≥1, the Q value is divided as follows: ① 1≤Q < 10; ② 10≤Q < 100; ③ Q≥100.

本项目使用的氢氧化钠、过氧化氢、硫酸、柴油等化学品，采用外购方式。项目主要危险物质使用情况见表 5.2-1。

The sodium hydroxide, hydrogen peroxide, sulfuric acid, diesel and other chemicals used in this project are outsourced. The use of the main hazardous substances for this project is shown in Table 5.2-1.

表 5.2-1　危险化学品使用运输贮存情况表

Table 5.2-1 Use, Transportation and Storage of Hazardous Chemicals

序号 S.N.	危险物质名称 Name of hazardous substance	CAS 号 CAS No.	最大存在总量 q_n/t Maximum total quantity q_n/t	临界量 Qn/t Critical amount Qn/t	该种危险物质 Q 值 Q value of the hazardous substance
1	NaOH	1310-73-2	917	—	—
2	过氧化氢 Hydrogen peroxide	7722-84-1	189	50	3.78
3	硫酸 Sulphuric acid	7664-93-9	254	10	25.4
4	氯气 Chlorine	7664-41-7	不储存，仅生产线 No storage, and to be prepared as per the demands of the production line 1	1	1
5	20%氨水 20% ammonia	1336-21-6	100	10	10
6	醋酸 Acetic acid	64-19-7	90.5	—	—
7	30%盐酸 30% hydrochloric acid	7647-01-0	492	—	—
8	柴油 Diesel	—	85.5	2500	0.0342
9	二氧化氯 Carbon dioxide	10049-04-4	40	0.5	80
10	汽油 Gasoline	—	15	2500	0.006
11	天然气 Natural gas	—	管道输送 Pipeline transport	—	—
项目 Q 值∑ Q value ∑ of the project					120.22

上表中，列入《建设项目环境风险评价技术导则》（HJ169-2018）附录 B 突发环境事件风险物质及临界量表中的物质有硫酸、氯气、二氧化氯及 20%氨水等，根据计算，本项目 Q 值为 120.22，Q≥100。

According to this table, the substances listed in Annex B “Table of Environmental Accident Risk Materials and Their Critical Quantity” of the *Technical Guidelines for Environmental Risk Assessment on Projects* (HJ169-2018) include sulfuric acid, chlorine gas, chlorine dioxide and 20% ammonia, etc., and it is then calculated that the Q value of this project is 120.22, Q≥100.

（2）行业及生产工艺（M）

(2) Industry and production process (M)

分析项目所属行业及生产工艺特点，按照表 5.2-2 评估生产工艺情况，具有多套生产工艺单元的项目，对每套生产工艺分别评分并求和。将 M 划分为①M＞20；②10＜M≤20；③5＜M≤10；④M=5，分别以 M1、M2、M3 和 M4 表示。

Analyze the involved industry and production process characteristics of the project, and evaluate the production process according to Table 5.2-2. For projects with multiple production process units, each production process is to be scored separately and the sum of scores is to be calculated thereby. The M value is divided as follows: ① M > 20 is; ② 10 < M≤20; ③. 5 < M≤10; ④ M =. 5, which are respectively represented as Ml, M2, M3 and M4.

表 5.2-2　行业及生产工艺（M）

Table 5.2-2 Industry and Production Process (M)

行业	评估依据	分值
石化、化工、医药、轻工、化纤、有色冶炼等	涉及光气及光气化工艺、电解工艺（氯碱）、氯化工艺、硝化工艺、合成氨工艺、裂解（裂化）工艺、氟化工艺、加氢工艺、重氮化工艺、氧化工艺、过氧化工艺、胺基化工艺、磺化工艺、聚合工艺、烷基化工艺、新型煤化工工艺、电石生产工艺、偶氮化工艺	10/套
	无机酸制酸工艺、焦化工艺	5/套
	其他高温或高压，且涉及危险物质的工艺过程 [a]、危险物质贮存罐区	5/套（罐区）
管道、港口/码头等	涉及危险物质管道运输项目、港口/码头等	10
石油天然气	石油、天然气、页岩气开采（含净化），气库（不含加气站的气库），油库（不含加气站的油库）、油气管线 [b]（不含城镇燃气管线）	10
其他	涉及危险物质使用、贮存的项目	5
[a] 高温指工艺温度≥300 ℃，高压指压力容器的设计压力（P）≥10.0 MPa； [b] 长输管道运输项目应按站场、管线分段进行评价。		

Industry	Assessment basis	Score

Petrochemical, chemical, pharmaceutical, light industry, chemical fiber, non-ferrous smelting, etc.	Involving phosgene and phosgenation process, electrolysis process (chlor-alkali), chlorination process, nitrification process, ammonia synthesis process, splitting (cracking) process, fluorination process, hydrogenation process, diazotization process, oxidation process, peroxidation process, amination process, sulfonation process, polymerization process, alkylation process, new coalification process, calcium carbide production process, diazotization process	10/set
	Inorganic acid production process, coking process	5/set
	Other High-temperature process involving hazardous substances[a], hazardous substance storage tank area	5/set (tank farm)
Pipelines, ports/terminals, etc.	Projects, ports/terminals, etc. involving hazardous materials pipeline transportation	10
Oil and natural gas	Exploitation (including purification) of oil, natural gas and shale gas, gas depots (excluding gas stations), oil depots (excluding gas stations), oil and gas pipelines[b] (excluding urban gas pipelines)	10
Others	Projects involving the use and storage of hazardous substances	5
[a] High temperature refers to the process temperature ≥300℃, high pressure refers to the design pressure of the pressure vessel (P) ≥10.0MPa; [b] Long-distance pipeline transportation projects shall be assessed according to station yard and pipeline segment.		

表 5.2-3 生产工艺评估情况

Table 5.2-3 Production Process Evaluation

序号 S.N.	工艺单元名称 Name of process unit	生产工艺 Production process	数量/套 Qty/set	分值 Score
1	二氧化氯制备车间 Chlorine dioxide preparation workshop	氧化工艺 Oxidation process	1	10
2	制浆生产线（漂白段） Pulp production line (bleaching section)	氧化工艺 Oxidation process	1	10
3	碱回收车间 Alkaline recovery workshop	高温且涉及危险物质的工艺过程 High-temperature process involving hazardous substances	1	5
5	加油站 Gas station	危险物质贮存罐区 Hazardous substance storage tank area	1	5

序号 S.N.	工艺单元名称 Name of process unit	生产工艺 Production process	数量/套 Qty/set	分值 Score
6	化工库（一） Chemical Engineering Storage (I)	危险物质贮存罐区 Hazardous substance storage tank area	1	5
7	化工库（二） Chemical Engineering Storage (II)	危险物质贮存罐区 Hazardous substance storage tank area	1	5
项目 M 值∑ M value ∑ of the project				40

根据上表，本项目生产工艺分值 M＞20，判断结果为 M1。

According to the table, the production process score of this project is M > 20, which is in the range of M1.

（3）危险物质及工艺系统危险性等级判定

(3) Determination of hazard rank of hazardous substances and process systems

根据危险物质数量与临界量比值（Q）和行业及生产工艺（M），按照表 5.2-4 确定危险物质及工艺系统危险性等级（P），分别以 P1、P2、P3、P4 表示。

According to the ratio (Q) of the quantity of hazardous substance to the critical quantity and the industry and production process (M), determine the hazard ranks (P) of hazardous substances and process systems as per Table 5.2-4, and express the result as P1, P2, P3, P4 respectively.

表 5.2-4　危险物质及工艺系统危险性等级判断（P）

Table 5.2-4 Determination of Hazard Rank (P) of Hazardous Substances and Process Systems

危险物质数量与临界值比值（Q） **Ratio (Q) of the quantity of hazardous substances to the critical quantity**	行业及生产工艺（M） **Industry and production process (M)**			
	M1	**M2**	**M3**	**M4**
Q≥100	P1	P1	P2	P3
10≤Q＜100	P1	P2	P3	P4
1≤Q＜10	P2	P3	P4	P4

根据表 5.2-4，本项目危险物质及工艺系统危险性等级为 P1。

According to Table 5.2-4, the hazard rank of hazardous substances and process systems of this project is determined as P1.

5.2.1.2 环境敏感程度（E）的分级确定

5.2.1.2 Classification of environmental sensitivity (E)

（1）大气环境敏感程度分级

(1) Classification of atmospheric environmental sensitivity

依据环境敏感目标环境敏感性和人口密度划分环境风险受体的敏感性，共分为三种类型，E1 为环境高度敏感区，E2 为环境中度敏感区，E3 为环境低度敏感区，分级原则见下表：

The sensitivity of environmental risk receptors is divided into the following three types according to the environmental sensitivity of the environment-sensitive target and the population density: E1 - highly environment-sensitive area, E2 - moderately environment-sensitive area, E3 - lowly environment-sensitive area. The classification principle is shown in the table below:

表 5.2-5 大气环境敏感程度分级

Table 5.2-5 Classification of Atmospheric Environmental Sensitivity

分级 **Classification**	大气环境敏感性 **Atmospheric environmental sensitivity**
E1	周边 5km 范围内居住区、医疗卫生、文化教育、科研、行政办公等机构人口总数大于 5 万人，或其他需要特殊保护区域；或周边 500m 范围内人口总数大于 1000 人；油气、化学品输送管线管段周边 200m 范围内，每千米管段人口数大于 200 人 Residential area, health care organization, education institute, research institute, administrative offices and other organization within 5km around the site with a total population greater than 50000, or other areas requiring special protection; or area within 500m around the site with a total population greater than 1000; area within 200mm around oil/gas/chemical pipelines with a population density greater than 200 people/1000km pipeline.
E2	周边 5km 范围内居住区、医疗卫生、文化教育、科研、行政办公等机构人口总数大于 1 万人，小于 5 万人；或周边 500m 范围内人口总数大于 500 人，小于 1000 人；油气、化学品输送管线管段周边 200m 范围内，每千米管段人口数大于 100 人，小于 200 人 Residential area, health care organization, education institute, research institute, administrative offices and other organization within 5km around the site with a total population greater than 10000 but less than 50000; or area within 500m around the site with a total population greater than 500 but less than 1000; area within 200mm around oil/gas/chemical pipelines with a population density greater than 100 people/1000km pipeline but less than 200 people/1000km pipeline.
E3	周边 5km 范围内居住区、医疗卫生、文化教育、科研、行政办公等机构人口总数小于 1 万人；或周边 500m 范围内人口总数小于 500 人；油气、化学品输送管线管段周边 200m 范围内，每千米管段人口数小于 100 人 Residential area, health care organization, education institute, research institute, administrative offices and other organization within 5km around the site with a total population less than 10000; or area within 500m around the site with a total population less than 500; area within 200mm of oil/gas/chemical pipelines with a population density less than 100 people/1000km pipeline.

本项目周边 5km 范围内居住区、医疗卫生、文化教育、科研、行政办公等人口 18358 人，周边 500m 范围内人口总数 742 人。因此本项目**大气环境敏感程度分级为 E1**。

For this project, the total population of residential area, health care organization, education institute, research institute, administrative offices and other organization within 5km around the site is 18358, and the total population of the area within 500m around the site is 742. Therefore, the atmospheric environmental sensitivity of this project is classified as E1.

（2）地表水环境敏感程度分级

(2) Classification of surface water environmental sensitivity

依据事故情况下危险物质泄漏到水体的排放点受纳地表水体功能敏感性，与下游环境敏感目标情况，共分为三种类型，E1 为环境高度敏感区，E2 为环境中度敏感区，E3 为环境低度敏感区，分级原则见表 5.2-6。其中地表水功能敏感性和环境敏感目标分级分别见表 5.2-7 和 5.2-8。

According to the functional sensitivity of the receiving surface water body at the discharge point of hazardous substance leakage within the water body in case of an accident as well as the situation of the downstream environment-sensitive targets, the surface water environmental sensitivity is classified into the following three types: E1 - highly environment-sensitive area, E2 - moderately environment-sensitive area, E3 - lowly environment-sensitive area. The classification principles are shown in Table 5.2-6. The classification of functional sensitivity and environment-sensitive target of surface water are shown in Tables 5.2-7 and 5.2-8 respectively.

表 5.2-6　地表水环境敏感程度分级
Table 5.2-6 Classification of Groundwater Environment Sensitivity

环境敏感目标 Environment-sensitive target	地表水功能敏感性 Surface water functional sensitivity		
	F1	F2	F3
S1	E1	E1	E2
S2	E1	E2	E3
S3	E1	E2	E3

表 5.2-7　地表水功能敏感性分区

Table 5.2-7 Division of Surface Water Functional Sensitivity

敏感性 Sensitivity	地表水环境敏感特征 Groundwater environmental sensitivity characteristic
敏感 F1	排放点进入地表水水域环境功能为Ⅱ类及以上，或海水水质分类第一类；

Sensitive F1	The environmental function of the surface water area where the leakage flows from the discharge point to is Class II or above, or seawater quality is Class I; 或以发生事故时，危险物质泄漏到水体的排放点算起，排放进入受纳河流最大流速时，24h 流经范围涉跨国界的 Or, the leakage of hazardous substance arising from an accident, with its discharge point into water body as start, flows through country border within 24h at the maximum flow rate of receiving river
较敏感 F2 Relatively sensitive F2	排放点进入地表水水域环境功能为III类及以上，或海水水质分类第二类； The environmental function of the surface water area where the leakage flows from the discharge point to is Class III or above, or seawater quality is Class II; 或以发生事故时，危险物质泄漏到水体的排放点算起，排放进入受纳河流最大流速时，24h 流经范围涉跨省界的 Or, the leakage of hazardous substance arising from an accident, with its discharge point into water body as start, flows through province border within 24h at the maximum flow rate of receiving river
低敏感 F3 Lowly sensitive F3	上述地区之外的其他地区 All other areas than those mentioned above

表 5.2-8　环境敏感目标分级

Table 5.2-8 Classification of Environment-sensitive Targets

分级 **Classification**	环境敏感目标 **Environment-sensitive target**
S1	发生事故时，危险物质泄漏到内陆水体的排放点下游（顺水流向）10km范围内、近岸海域一个潮周期水质点可能达到的最大水平距离的两倍范围内，有如下一类或多类环境风险受体：集中式地表水饮用水水源保护区（包括一级保护区、二级保护区及准保护区）；农村及分散式饮用水水源保护区；自然保护区；重要湿地；珍稀濒危野生动植物天然集中分布区；重要水生生物的自然产卵场及索饵场、越冬场和洄游通道；世界文化和自然遗产地；红树林、珊瑚礁等滨海湿地生态系统；珍稀、濒危海洋生物的天然集中分布区；海洋特别保护区；海上自然保护区；盐场保护区；海水浴场；海洋自然历史遗迹；风景名胜区；或其他特殊重要保护区域 In the event of an accident, one or more types of the following environmental risk receptors is involved within 10km the downstream of the discharge point of the hazardous substance leakage into the inland water body (along the downstream direction), and within the range of twice the maximum horizontal distance that the water quality point may reach within a tidal cycle in the offshore area: centralized surface water drinking water source protection zones (including Class I protection zones, Class II protection zones and quasi-protection zones); rural and decentralized drinking water source protection zones; nature reserves; important wetlands; natural concentrated distribution area of rare and endangered wild animals and plants; natural spawning grounds and feeding grounds, wintering grounds and migration passages of important aquatic organisms; world cultural and natural heritage sites; coastal

分级 **Classification**	环境敏感目标 **Environment-sensitive target**
	wetland ecosystems such as mangroves and coral reefs; natural concentrated distribution areas of rare and endangered marine organisms; marine special protection zones; marine nature protection zones; salt field protection zone; sea bathing area; marine natural historical sites; scenic spots; or other special important protection zones.
S2	发生事故时，危险物质泄漏到内陆水体的排放点下游（顺水流向）10km范围内、近岸海域一个潮周期水质点可能达到的最大水平距离的两倍范围内，有如下一类或多类环境风险受体的：水产养殖区；天然渔场；森林公园；地质公园；海滨风景游览区；具有重要经济价值的海洋生物生存区域 In the event of an accident, one or more types of the following environmental risk receptors is involved within 10km the downstream of the discharge point of the hazardous substance leakage into the inland water body (along the downstream direction), and within the range of twice the maximum horizontal distance that the water quality point may reach within a tidal cycle in the offshore area: aquaculture areas; natural fishing grounds; forest parks; geoparks; seaside scenic areas; living areas marine organisms with important economic value.
S3	排放点下游（顺水流向）10km范围、近岸海域一个潮周期水质点可能达到的最大水平距离的两倍范围内无上述类型1和类型2包括的敏感保护目标 There is no sensitive protection targets listed in Type 1 and Type 2 environmental risk receptors within 10km the downstream of the discharge point of the hazardous substance leakage into the inland water body (along the downstream direction), and within the range of twice the maximum horizontal distance that the water quality point may reach within a tidal cycle in the offshore area.

本项目污水经厂区自建污水处理站处理达标后排入铁山港区深海排放管网系统，在铁山港 B3 排污口深海排放。考虑所有措施失效情况下，危险物质泄漏到水体的排放点为 B3 排放口，位于排污区，海水水质目标为四类；若发生储罐泄露、事故池外溢事故，废水溢流出场外就近排入附近海域，根据《广西近岸海域环境功能区划调整方案》，铁山港湾西岸，从规划的白沙头港边界向南至玉塘村的规划岸线，长约 25km，岸线向海 1km 的海域为北海港铁山港作业区，项目邻近海域处于该范围内，海水水质目标为四类，地表水敏感特征为低敏感 F3；周边存在山口红树林保护区等敏感目标，环境敏感目标分级为 S1；综上所述，本项目**地表水环境敏感程度分级为 E2**。

The sewage of this project is discharged into the deep-sea discharge pipe network system of Tieshangang District after being processed by the self-built sewage treatment station in the plant area, and then discharged into the deep sea at the sewage outlet B3 of Tieshangang. Considering the possibility of failure of all measures, the discharge point of hazardous substances leakage into the water body is the discharge outlet B3, which is located in the sewage area, and where the seawater quality target is Class IV; in case of storage tank leakage or emergency pool overflow, the sewage overflows out of the site and is then discharged into the nearby sea area. As described in *Adjustment Plan for Guangxi Offshore Environmental Functional Zone Division*, the sea area within 1km of the 25km planned shoreline from the border of Baishatou Port southwards to Yutang Village is the operation are of Tieshangngang of Beihai, and the adjacent sea area of this project is within this range, the seawater quality target is Class IV, the surface water sensitivity characteristic is lowly sensitive F3; there are sensitive targets including Shankou Mangrove Protection Zones in the surrounding, and the environment-sensitive target is classified as S1; In summary, **the surface water environmental sensitivity of this project is classified as E2**.

（3）地下水环境敏感程度分级

(3) Classification of Groundwater Environment Sensitivity

依据地下水功能敏感性与包气带防污性能，，共分为三种类型，E1 为环境高度敏感区，E2 为环境中度敏感区，E3 为环境低度敏感区，分级原则见表 5.2-9。其中地下水功能敏感性和包气带防污性能分级分别见表 5.2-10 和 5.2-11。

The groundwater sensitivity is classified according to the groundwater functional sensitivity and the aeration zone vulnerability into the following three types: E1 - highly environment-sensitive area, E2 - moderately environment-sensitive area, E3 - highly environment-sensitive area. The classification principles are shown in Table 5.2- 9. The classification of groundwater functional sensitivity and the aeration zone vulnerability are shown in Tables 5.2-10 and 5.2-11 respectively.

表 5.2-9 地下水敏感程度分级

Table 5.2-9 Classification of Groundwater Environment Sensitivity

包气带防污性能 Aeration zone vulnerability	地下水功能敏感性 Groundwater functional sensitivity		
	G1	**G2**	**G3**
D1	E1	E1	E2
D2	E1	E2	E3
D3	E2	E3	E3

表 5.2-10 地下水功能敏感性分区

Table 5.2-10 Division of Groundwater Functional Sensitivity

敏感性 Sensitivity	地下水环境敏感特征 Ground water environment-sensitive characteristics
敏感 G1 Sensitive G1	集中式饮用水水源（包括已建成的在用、备用、应急水源，在建和规划的饮用水水源）准保护区；除集中式饮用水水源以外的国家或地方政府设定的与地下水环境相关的其他保护区，如热水、矿泉水、温泉等特殊地下水资源保护区 Quasi centralized drinking water source protection zones (including in-service, standby and emergency drinking water sources that have been completed, or that are under construction and planned); the protection zones regarding groundwater environment established by national or local government other than centralized drinking water sources, such as hot water, mineral water, hot spring and other special groundwater resource protection zones.
较敏感 G2 Relatively sensitive G2	集中式饮用水水源（包括已建成的在用、备用、应急水源，在建和规划的饮用水水源）准保护区以外的补给径流区；未划定准保护区的集中式饮用水水源，其保护区以外的补给径流区；分散式饮用水水源地；特殊地下水资源（如热水、矿泉水、温泉等）保护区以外的分布区等其他未列入上述敏感分级的环境敏感区 [a] The recharge runoff areas other than quasi centralized drinking water source protection zones (including in-service, standby and emergency drinking water sources that have been completed, or rare under construction and planned); the centralized drinking water sources that are not classified into quasi protection zones and the recharge runoff areas out of the protection zones; decentralized drinking water sources; other environmentally sensitive areas that are not included in the sensitivity classification above, e.g., the distribution areas other than special groundwater resources (such as hot water, mineral water and hot spring) protection zones[a].
不敏感 G3 Not sensitive G3	上述地区之外的其他地区 All other areas than those mentioned above
[a]“环境敏感区”是指《建设项目环境影响评价分类管理名录》中所界定的涉及地下水的环境敏感区 [a] "Environmentally sensitive areas" refer to the environmentally sensitive areas involving groundwater that are defined in Catalogue for the Classified Administration of Environmental Impact Assessments for Construction Projects.	

表 5.2-11　包气带防污性能分级

Table 5.2-11 Classification of Aeration Zone Vulnerability

分级 Classification	包气带岩土的渗透性能 Permeability of rock and soil in aeration zone
D3	Mb≥1.0m，K≤1.0×10^{-6}cm/s，且分布连续、稳定 Mb≥1.0m, K≤1.0×10^{-6}cm/s, continuously distributed and stable
D2	0.5m≤Mb<1.0m，K≤1.0×10^{-6}cm/s，且分布连续、稳定 0.5m≤Mb<1.0m，K≤1.0×10^{-6}cm/s, continuously distributed and stable Mb≥1.0m，1.0×10^{-6}cm/s＜K≤1.0×10^{-4}cm/s，且分布连续、稳定 Mb≥1.0m，1.0×10^{-6}cm/s＜K≤1.0×10^{-4}cm/s, continuously distributed and stable
D1	岩（土）层不满足上述“D2”和“D3”条件 Rock (soil) layer does not meet the conditions in “D2” and “D3”
Mb：岩土层单层厚度。K：渗透系数。 Mb: Thickness of single rock/soil layer. K: Permeability coefficient.	

项目周边无地方水源地保护区及特殊地下水保护区，场地下游分布有川江等村屯，村民主要通过各自打井抽取地下水作为饮用水源，属于分散式饮用水源水源地，地下水环境敏感特征为“较敏感 G2”，根据调查结果，本项目渗透系数 K 为 9.63×10^{-5} cm/s，包气带防污性能为 D2，综上所述，本项目**地下水敏感程度分级为 E2**。

There is no local water source protection zones and special groundwater protection zones around the project site; Chuanjiang Village and other residential areas are distributed at the downstream of the project site, and local residents obtain drinking water mainly by digging wells, which are decentralized drinking water sources, and where the groundwater environmental sensitivity is classified as "Relative sensitive G2". According to the investigation findings, the permeability coefficient K of this project is 9.63 × ×10^{-5} cm/s and the aeration zone vulnerability is D2. In summary, **the groundwater sensitivity of this project is classified as E2**.

5.2.1.3 建设项目风险潜势判断

5.2.1.3 Determination of risk potential of the construction project

环境风险潜势综合等级选择大气、地表水、地下水等各要素等级的相对高值进行判断，按照下表确定本项目环境风险潜势为Ⅳ$^+$级，详见表 5.2-12。

For the comprehensive determination of environmental risk potential, the relatively high value of the grade of elements such as atmosphere, surface water and groundwater are selected, and the environmental risk potential of this project is determined according to the following table as Grade Ⅳ +. See Table 5.2-12 for details.

表 5.2-12　项目环境风险潜势判断结果
Table 5.2-12 Determination of Environmental Risk Potential of the Project

序号 S.N.	项目 P 等级 P grade of project	环境要素 Environmental elements	环境敏感程度 Environmental sensitivity	该种要素环境风险潜势等级 Environmental risk potential grade of the element	项目环境风险潜势等级 Environmental risk potential grade of the project
1	P1	大气环境	E1	Ⅳ$^+$	Ⅳ$^+$
2		地表水环境	E2	Ⅳ	
3		地下水环境	E2	Ⅳ	

5.2.2 环境风险评价等级及评价范围

5.2.2 Grading and range of environmental risk assessment

5.2.2.1 评价等级

5.2.2.1 Assessment level

按《建设项目环境风险评价技术导则》（HJ169-2018）所提供的方法，根据建设项

目涉及的物质及工艺系统危险性和和所在地的环境敏感性确定风险潜势，按照表 5.2-13 确定项目风险评价工作级别。本项目风险综合潜势为Ⅳ⁺级，环境风险等级为一级，各要素环境风险等级详见表 5.2-14。

The risk potential of the project is determined according to the hazards of materials and process systems involved in the project and the environmental sensitivity of the project site by adopting the method mentioned in *Technical Guidelines for Environmental Risk Assessment on Projects* (HJ169-2018), and the risk assessment grade of the project is determined as per Table 5.2-13. The comprehensive risk potential of this project is Grade Ⅳ +, and the environmental risk is Grade 1, and the environmental risk grade of each element are shown in Table 5.2-14.

表 5.2-13 评价工作级别（HJ169-2018）
Table 5.2-13 Assessment Grade (HJ169-2018)

环境风险潜势 **Environmental risk potentiality**	**IV、IV⁺ IV， IV⁺**	**III**	**II**	**I**
评价工作等级 Levels of Assessment	一 I	二 II	三 III	简单分析 a Simple analysis a
a 是相对于详细评价工作内容而言，在描述危险物质、环境影响途径、环境危害后果、风险防范措施等方面给出定性的说明。 a is to give a qualitative description for hazardous substances, environmental impact method, environmental hazard consequences, risk prevention measures, etc. relative to the detailed assessment work description.				

表 5.2-14 项目环境风险评价等级
Table 5.2-14 Environmental Risk Assessment Grade of the Project

环境要素 **Environmental elements**	大气 **Atmosphere**	地表水 **Surface water**	地下水 **Groundwater**	综合等级 **Comprehensive grade**
环境风险潜势划分 Environmental risk potential grading	Ⅳ⁺ Ⅳ	Ⅳ	Ⅳ	Ⅳ⁺ Ⅳ
评价工作等级 Levels of Assessment	一 I	一 I	一 I	一 I

5.2.2.2 风险评价范围

5.2.2.2 Risk assessment range

根据项目风险评价等级，确定项目大气评价范围为距离项目边界 5km 范围，地下水风险评价范围为厂区范围内地下水，详见表 5.2-15。

According to the risk assessment grade of the project, it is determined that the atmosphere assessment range is the area within 5km from the project boundary, and the groundwater risk assessment range is the groundwater within the plant area. See Table 5.2-15 for details.

表 5.2-15 风险评价范围
Table 5.2-15 Risk Assessment Range

序号 S.N.	项目 Item	风险评价范围 Scope of risk assessment
1	大气 Atmosphere	距项目厂界 5km 范围内的区域 Area within 5km from the project boundary
2	地表水 Surface water	与本项目地表水评价范围一致 Consistent with the assessment range of surface water under the Project
3	地下水 Groundwater	与本项目地下水评价范围一致 Consistent with the groundwater assessment range under the Project

5.3 环境风险识别

5.3 Environmental risk identification

5.3.1 风险事故资料收集

5.3.1 Data collection of risk accidents

1、事故资料统计

1. Statistics of accident data

根据 1969 年至 1987 年 18 种在 95 个国家的登记化学品事故中，发生过突发性化学事件的事故分析比例见表 5.3-1。

According to 18 kinds of recorded chemical accidents in 95 countries from 1969 to 1987, the analysis proportion of accidents in which unexpected chemical events occurred is shown in Table 5.3-1.

表 5.3-1 化工事故分类情况表
Table 5.3-1 Classification of Chemical Accidents

类别 Category	名称 Description	比例（%） Proportion (%)	名称 Description	比例（%） Proportion (%)
化学品类别 Chemical category	液化石油气 LPG	25.3	煤油 Kerosene	14.9
	汽油 Gasoline	18.0	氯 Chlorine	14.4
	氨 Ammonia	16.1	原油 Crude	11.2
化学品 Chemicals 物质形态 Physical form	液体 Liquid	47.8	气体 Gas	18.9
	液化气 Liquefied gas	27.6	固体 Solid	8.2

类别 **Category**	名称 **Description**	比例（%） **Proportion (%)**	名称 **Description**	比例（%） **Proportion (%)**
生产系统 Production system	运输 Transportation	34.2	储存 Storage	23.1
	工艺过程 Process	33.0	搬运 Handling	9.6
事故来源 Source of accident	机械故障 Mechanical failure	34.2	人为因素 Human factors	22.8
	碰撞事故 Collision accident	26.8	外部因素 External factors	15.2

近几年国内化工行业发生 842 起各类事故，其中 116 次主要事故原因统计分析结果见表 5.3-2 和表 5.3-3。

In recent years, 842 accidents of various types have occurred in the domestic chemical industry, of which the statistical analysis results for causes of 116 major accidents are shown in Table 5.3-2 and Table 5.3-3.

表 5.3-2　国内化工行业近年（1990-1995）各类事故类型及直接经济损失
Table 5.3-2 Accidents Occurred in Domestic Chemical Industry in Recent Years (1990-1995) and Their Direct Economic Loss

事故类型	次数	比例（%）	直接经济损失（万元）
人身事故	430	51.1	
火灾事故	71	8.4	609.33
爆炸事故	49	5.8	460.61
设备事故	95	11.3	809.33
生产事故	116	13.8	400.68
交通事故	81	9.6	54.02
总计	842	100	2333.78

表 5.3-3　国内主要化工事故原因统计结果
Table 5.3-3 Statistical Results for Causes of Major Domestic Chemical Accidents

序号 **S.N.**	主要事故原因 **Cause of major accident**	出现次数 **Times of occurrence**	比例（%） **Proportion (%)**
1	违反操作规程 Violation of operating procedures	60	51.1
2	设备缺陷 Equipment defects	25	21.6
3	个人防护用具缺乏 Lack of personal protective equipment	9	7.8
4	不懂技术操作 Failure to understand technical operation	7	6.0
5	违反劳动纪律 Violation of labor discipline	5	4.3

序号 S.N.	主要事故原因 Cause of major accident	出现次数 Times of occurrence	比例（%） Proportion (%)
6	指挥失误 Command error	2	1.7
7	设计缺陷 Design defect	2	1.7
8	缺乏现场检查 Lack of on-site inspection	2	1.7
9	原料质量控制不严格 Relaxed raw material quality control	1	0.9
10	操作失灵 Operation failure	1	0.9
11	个人防护用具缺陷 PPE defects	1	0.9
12	没有安全规程 No safety regulations	1	0.9

注：本表为116次的火灾、爆炸和中毒窒息等三类事故统计结果（引自《全国化工事故案例集》）。

Note: This table addresses the statistical results of 116 accidents including fire, explosion and poisoning suffocation (Source: "National Chemical Accident Cases").

2、典型事故案例

2. Typical accident cases

①聊城市莘县化肥有限责任公司液氨泄漏事故

① Liquid ammonia leakage accident of Liaocheng Shenxian Fertilizer Co., Ltd.

2002年7月8日凌晨0点20分，一辆个体液氨罐车，在莘县化肥有限责任公司液氨库区灌装场地进行液氨灌装，到凌晨2点左右灌装基本结束时，液氨连接导管突然破裂，大量液氨泄漏。这起事故共泄漏液氨约20.1吨，造成死亡13人，重度中毒24人，直接经济损失约72.62万元。

At 0:30 on July 8, 2002, a private liquid ammonia tank truck was being filled with liquid ammonia in Shenxian Fertilizer Co., Ltd. and at about 2:00 when the filling came to the end, the liquid ammonia connection pipe burst suddenly and a large amount of liquid ammonia leaked. A total of 20.1 tons of liquid ammonia was leaked in the accident, causing 13 deaths, 24 severe poisonings, and a direct economic loss of about RMB 726,200.

②山东青州市潍坊弘润石油化工助剂总厂油罐爆炸事故

② Oil tank explosion accident of Weifang Hongrun Petrochemical Additive Factory in

Qingzhou City, Shandong Province

2000 年 7 月 1 日，为解决柴油存放一段时间后，由棕黄色变为深灰色的质量问题，厂领导决定采用临淄某个体技术人员的脱色技术，在柴油罐间加活性剂罐、混合罐、管道泵，将 307#罐、308#罐的柴油，经管道泵注入混合罐，同来自活性剂罐的活性剂混合脱色后，注入 20#罐储存外销。分管生产的副厂长直接安排生产设备部牵头，由机动车间维修班负责焊接安装。整个作业采用先将混合罐、活性剂罐、管道泵定位后，再对接同柴油罐相连接的阀门、法兰、管道，现场进行焊接的方法。因未堵盲板，违章动火焊接，造成 2 个 500 立方米油罐爆炸起火，10 人死亡，部分操作室及管排、管架烧毁，直接经济损失 200 余万元。

On July 1, 2000, to solve the color change of diesel oil from brown yellow to dark gray after long-term storage, the leadership of the factory decided to use the bleaching technique developed by an individual technician where the active agent tank, mixing tank and pipeline pump are added between diesel oil tank, the diesel oil in 07 # tank and 308 # tank are directed into the mixing tank through the pipeline pump, mixed with the active agent from the active agent tank for bleaching, and then injected into 20 # tank for storage and delivery. The Deputy Director in charge of production directly arranged the Production Equipment Department to take the lead, and the Repair Group of the Workshop was responsible for welding and installation. The whole operation is carried out in such a way where the mixing tank, active agent tank and pipeline pump are positioned at first, and then the valves, flanges and pipelines connected with the diesel oil tank are connected and welded on site,. Due to failure to install blind plate and follow the welding regulations, 2 diesel oil tanks of 500m^3 were exploded, causing 10 deaths, burning of some operating rooms, pipe banks and pipe brackets, and a direct economic loss more than RMB 2,000,000.

③江苏大和氯碱化工有限公司氯气泄漏事故

③ Chlorine gas leakage accident of Jiangsu Dahe Chlor-Alkali Chemical Co., Ltd.

2010 年 11 月 23 日上午，江苏大和氯碱化工有限公司发生氯气泄漏，导致下风向的江苏之江化工有限公司(江苏之江化工有限公司位于大和公司旁，两企业仅一路之隔)30 多名员工中毒，但未发生人员死亡。该公司位于江苏省站城市响水县陈港化工园区。在进行正常管道泄压时，因操作工违反操作规程，排气阀门开得过快导致氯气外泄，持续

时间约 5 分钟，致使江苏之江化工有限公司 30 余名职工中毒，出现呕吐现象。泄漏发生之后，企业立即启动应急预案，关闭泄压阀，并对泄出氯气进行应急处置。接报后，园区安监、环保部门也启动应急预案，组织环保专业人员进行应急处置。

In the morning on November 23, 2010, a chlorine gas leakage accident occurred in the Jiangsu Dahe Chlor-Alkali Chemical Co., Ltd., more than 30 staff of Jiangsu Zhijiang Chemical Co., Ltd. (Jiangsu Zhijiang Chemical Co., Ltd. is located next to Dahe, and they are separated from each other by a street only) in the downwind direction were posioned, but no deaths are caused. Dahe is located in the Chengang Chemical Industry Park of Xiangshui County, Zhancheng City, Jiangsu Province. During normal pipeline pressure relief, the operator failed to follow the correct operating procedure and opened the exhaust valve too quickly, resulting in chlorine gas leakage, which lasted for about 5 minutes and causes poisoning and vomiting of more than 20 staff of Jiangsu Zhijiang Chemical Co., Ltd. Immediately after the leakage occurred, Dahe launched the emergency plan, closed the pressure relief valve, and carried out emergency treatment on the leaked chlorine gas. After receiving the report, the Safety Supervision and Environmental Protection Department of the industrial park also launched the emergency plan and organized the environmental protection professionals to carry out emergency treatment.

④建平县鸿燊商贸有限公司“3.1”硫酸泄漏事故

④ "3.1" sulfuric acid leakage accident of Hung-san Trading Co., Ltd. in Jianping County

2013 年 3 月 1 日 15 时 20 分，在朝阳市建平县现代生态科技园区内，建平县鸿燊商贸有限公司 2 号硫酸储罐发生爆裂，并将 1 号储罐下部连接管法兰砸断，导致两罐约 2.6 万吨硫酸全部溢（流）出，造成 7 人死亡，2 人受伤，溢出的硫酸流入附近农田、河床及高速公路涵洞，引发较严重的次生环境灾害，造成直接经济损失 1210 万元。

At 15:20 on March 1, 2013, the 2# sylfuric acid storage tank of Hung-san Trading Co., Ltd. in the Jianping County Modern Ecological Science & Technology Park of Chaoyang City exploded and the lower connection pipe of 1# storage tank is broken therefrom, 26,000 tons of sulfuric aid leaked and flowed into nearby farmland, river bed and highway culvert, causing 7 deaths, 2 injuries, serious secondary environmental disaster, and a direct economic loss of RMB 12.1 million.

5.3.2 环境风险识别范围

5.3.2 Scope of environmental risk identification

环境风险识别范围包括生产设施风险识别、生产过程所涉及的物质风险识别和危险物质向环境转移的途径识别。

The environmental risk identification covers the identification of production facility risks, the identification of material risks involved in the production process and the identification of the ways by which hazardous substances are transferred to the environment.

生产设施风险识别范围：主要生产装置、贮运系统、公用工程系统、工程环保设施及辅助生产设施等。

The production facility risk identification covers main production equipment, storage & transportation system, utility system, engineering environmental protection facilities and auxiliary production facilities, etc.

物质风险识别范围：主要原材料及辅助材料、燃料、中间产品最终产品以及生产过程排放的“三废”污染物等。

Scope of substance risk identification: main raw materials and auxiliary materials, fuel, intermediate products, final products and “waste water, waste solid and waste gas” pollutants discharged during production.

危险物质向环境转移的途径识别：分析危险物质特性及可能的环境风险类型，识别危险物质影响环境的途径。

The identification of the ways by which the hazardous substances transferred to the environment includes analysis of the characteristics of hazardous substances and possible types of environmental risks, and the identification of the ways by which hazardous substances affect the environment.

5.3.3 危险物质识别

5.3.3 Identification of hazardous substances

根据《建设项目环境风险评价技术导则》附录 B，对工程主要原辅材料、燃料、中间产品、副产品、最终产品、污染物、火灾和爆炸伴生/次生物进行识别，危险物质包括

氯气、硫酸、20%氨水、氢氧化钠、过氧化氢、柴油、二氧化氯、氯酸钠等，危险特性见表 5.3-4。

According to Annex B of *Technical Guidelines for Environmental Risk Assessment on Projects*, the main raw and auxiliary materials, fuels, intermediate products, by-products, final products, pollutants, fire and explosion associated/secondary organisms of the project are identified., and the hazardous substances include chlorine gas, sulfuric acid, 20% ammonia water, sodium hydroxide, hydrogen peroxide, diesel oil, chlorine dioxide, sodium chlorate, etc..The hazardous characteristics are shown in Table 5.3-4.

表 5.3-4 主要危险物质毒理特性表

Table 5.3-4 Toxicology of Main Hazardous Substances

名称 **Description**	理化性质 **Physical & chemical properties**	毒理性质 **Toxicology**	主要危害 **Main hazards**
柴油 Diesel	稍有粘性棕色液体 Slightly viscous brown liquid	LD50：＞5000mg／kg(大鼠经口) Ld50: ＞5000mg／kg (rat -oral) LC50：＞5000mg/m³ 4 小时(大鼠吸入) Lc50: ＞5000mg/m³ 4 hours (rat-inhalation)	健康危害：皮肤接触柴油可引起接触性皮炎、油性座疮；吸入可引起吸入性肺炎，能经胎盘进入胎儿血中。柴油废气可引起眼、鼻刺激症状、头昏及头痛。 Health hazards: In case of skin contact, the diesel oil will cause contact dermatitis and oily sores; if inhaled, the diesel oil will cause aspiration pneumonia, and for pregnant, it can enter the fetal blood through the placenta. The exhaust gas of diesel gas can cause eye and nose irritation symptoms, dizziness and headache. 燃烧性：可燃。 Flammability: flammable.
氯气 Chlorine	黄绿色、刺激性气味的气体，易溶于水、碱液 Yellow-green pungent gas, easily soluble in water and lye	LD50：无资料 LD_{50}: Not available LC50：850mg/m^3，1 小时(大鼠吸入) LC_{50}: 850mg/m^3, 1 hour (rat-inhalation)	燃爆性：助燃，高毒，具刺激性，健康危害：对眼、呼吸道粘膜有刺激作用。 Flammability: This product is combustion-supporting, highly toxic and irritating; Health hazards: it will cause irritation to the eyes and respiratory tract mucosa.

硫酸 Sulphuric acid	无水硫酸为无色油状液体，沸点 337℃，能与水以任意比例互溶，同时放出大量的热，使水沸腾。 Anhydrous sulfuric acid is a colorless oily liquid with a boiling point of 337°C. It can be miscible with water in any proportion, and will release a lot of heat to make the water boil.	LD50 ：2140 mg/kg(大鼠经口) LD50: 2140 mg/kg (oral-rat) LC50 ：510mg/m³，2 小时(大鼠吸入)；320mg/m³，2 小时(小鼠吸入) LC_{50}: 510mg/m³, 2 hours (rat-inhalation); 320mg/m³, 2 hours (mouse-inhalation)	燃烧性：本品助燃，具强腐蚀性、强刺激性，可致人体灼伤。 Flammability: This product is combustion-supporting, highly corrosive and irritating, and can cause burns to human body. 侵入途径：吸入、食入。健康危害：对皮肤、粘膜等组织有强烈的刺激和腐蚀作用。浓硫酸发生泄露，会腐蚀周边金属等材料，皮肤接触到浓硫酸会立刻被烧坏。 Invasion route: Inhalation, ingestion. Health hazard: It can cause strong irritation and corrosion to skin, mucous membranes and other tissues; If leaked, the concentrated sulfuric acid will corrode the surrounding metals and other materials, and if coming into contact with the concentrated sulfuric acid, the skin will be burned immediately.
氨水 Ammonia water	无色透明液体，有强烈的刺激性臭味 Colorless transparent liquid with strong pungent odor.	LD50：350mg/kg(大鼠经口) LD50: 350mg/kg (oral-rat) LC50：/ LC50:/	燃爆危险：不燃，具腐蚀性、刺激性，可致人体灼伤。吸入后对鼻、喉和肺有刺激性，引起咳嗽、气短和哮喘等；可因喉头水肿而窒息死亡；可发生水肿，引起死亡。氨水溅入眼内，可造成严重损害，甚至导致失明；皮肤接触可致灼伤。 Explosion hazard: This product is non-flammable, but it is corrosive and irritating, and can cause burns to human body. If inhaled, it will cause irritation to the nose, throat and lungs, symptomized as cough, breath shortness and asthma; suffocation and even death will be caused if throat edema or other edema occurs. The ammonia water, if being splashed into eyes, will cause serious eye damage and even blindness; and in case of skin contact, it will cause scalding.
氢氧化钠 Sodium hydroxide	白色不透明固体，易潮解，易溶于水、乙醇、甘油，不溶于丙酮 White opaque solid, which is deliquescent, soluble in water, ethanol and glycerin, but insoluble in acetone	刺激性：家兔经眼：1%重度刺激。家兔经皮：50mg/24 小时，重度刺激 Irritation: Rabbit eyes: 1% severe irritation. Rabbit percutaneous: 50mg/24 hours, severe irritation	燃爆性：本品不燃，具强腐蚀性、强刺激性，可致人体灼伤。 Flammability & explosibility: This product is non-flammable, but it is highly corrosive and irritating, and can cause burns to the human body. 本品有强烈刺激和腐蚀性 This product is highly irritant and corrosive.

过氧化氢 Hydrogen peroxide	无色透明液体，有微弱的特殊气味 Colorless transparent liquid with slight special smell	LC50：2000mg/m^3，4 小时(大鼠吸入)， LC_{50}: 2000mg/m^3, 4 hours (rat-inhalation) LD50：4060 mg/kg(大鼠经口) LD_{50}: 4060 mg/kg (oral-rat)	爆炸性强氧化剂，本身不燃，但能与可燃物反应放出大量热量和气氛而引起着火爆炸，pH 值为 3.5～4.5 时最稳定，在碱性溶液中极易分解 This product is an explosive strong oxidant; through non-flammable, it can react with combustible materials, releasing a lot of heat and atmosphere and causing fire and explosion. Its pH value is most stable within 3.5 ~ 4.5, it is easy to decompose in alkaline solution.
盐酸 Hydrochloric acid	无色或微黄色发烟液体，有刺鼻的酸味 Colorless or yellowish smoky liquid with pungent sour taste	LD50：900mg/kg(兔经口)； LC50：3124ppm，1 小时(大鼠吸入) LD_{50}: 900mg/kg (rabbit-oral); LC_{50}: 3124ppm, 1 hour (rat-inhalation)	能与一些活性金属粉末发生反应，放出氢气。遇氰化物能产生剧毒的氰化氢气体。与碱发生中合反应，并放出大量的热。具有强腐蚀性。 It can react with some active metal powder and thereby emit hydrogen gas. In face of cyanide, it will produce highly toxic hydrogen cyanide gas. It will undergo neutral reaction with alkali and then release a lot of heat. It is highly corrosive.
氯酸钠 Sodium chlorate	无色正交或三方晶系（本项目使用溶液） Colorless orthorhombic crystal system (solution is used for this project)	LD50：1200mg/kg(大鼠经口) LD50: 1200mg/kg (oral-rat)	强氧化剂。受强热或与强酸接触时即发生爆炸。与还原剂、有机物、易燃物如硫、磷或金属粉等混合可形成爆炸性混合物。急剧加热时可发生爆炸。 Strong oxidant. Explosion occurs when it is exposed to strong heat or strong acid. It will mix with reducing agent, organic matter and combustible materials including sulfur, phosphorus or metal powder into explosive mixtures. Explosion may occur in case of rapid heating.
二氧化氯 Carbon dioxide	黄红色气体，有刺激性气味，能沿地面扩散，本项目稀释为10%以下的溶液使用、贮存 Yellow-red gas with irritating odor, which can diffuse along the ground. For the purpose of this project, it is diluted to a solution with concentration below 10% before use and storage.	有毒 Toxic	具有强氧化性。能与许多化学物质发生爆炸性反应。受热、震动、撞击、摩擦，相当敏感，极易分解发生爆炸 It has a strong oxidizing property. It can react explosively with many chemical substances. It is very sensitive to heat, vibration, impact and friction, and it is easy to decompose and explode.

醋酸 Acetic acid	无色透明液体，有刺激性酸臭。 Colorless and transparent liquid, with irritation and sour.	LD50：3530 mg/kg(大鼠经口)；1060 mg/kg(兔经皮) LD_{50}: 3530 mg/kg (rat-oral); 1060 mg/kg (rabbit-percutaneous) LC50：13791mg/m^3，1 小时(小鼠吸入) LC_{50}: 13791mg/m^3, 1 hour (rat-inhalation)	易燃，其蒸气与空气可形成爆炸性混合物，遇明火、高热能引起燃烧爆炸。与铬酸、过氧化钠、硝酸或其它氧化剂接触，有爆炸危险。具有腐蚀性。 It is flammable, and its vapor will mix with air into an explosive mixture, which will cause fire or explosion in face of open flame or high heat. It becomes explosive when contacting and reacting with chromic acid, sodium peroxide, nitric acid or other oxidants. It is highly corrosive.
黑液 Black liquor	黑色、呈碱性的有机废液，含有大量的有机物质，SS、COD 浓度高。 Black, alkaline organic waste liquid containing a large amount of organic substances and high-concentration SS and COD.	/	黑液主要是在蒸煮过程中产生，在洗浆中分离出来，然后进入碱回收工段回收。若跑冒滴漏到江河，对水体会造成严重污染。高温的黑液溅到皮肤上会导致烫伤事故。 The black liquor is mainly produced during cooking, separated out in the washing pulp, and then recovered in the alkali recovery section. If leaked into the river, it will cause serious pollution to the water body. The high temperature black liquor, if splashed onto the skin, will cause burns.

5.3.4 生产系统危险性识别

5.3.4 Identification of production system risks

5.3.4.1 生产系统危险性

5.3.4.1 Risks of production system

生产系统突发环境事件多发生在生产装置区、物料存储区以及物料输送管线等，主要是易发生有毒有害、易燃易爆物料的泄漏，并间接引起火灾爆炸事故，从而产生一定范围内的环境质量恶化或人员伤害。

Sudden environmental incidents of production system mostly occur in the production equipment area, material storage area, and material delivery pipeline, mainly including leakage of toxic and harmful materials as well as flammable and explosive materials, and indirectly resultant fire and explosion accidents, causing environmental quality deterioration or personal injury.

结合产品生产工艺、生产设备及污染物治理设备，总结本企业生产设施的环境风险如下：

In combination with production process, production equipment and pollutant treatment equipment of the product, the environmental risks of the company's production facilities are summarized as follows:

（1）化学浆车间、化机浆车间

(1) Chemical pulp workshop, chemimechanical pulp pulp workshop

公司制浆采用氧脱木素无元素氯漂白工艺，主要包括 1 条化学木浆生产、2 条化机浆生产线。通过对生产工艺分析，化学浆车间和化机浆车间主要风险为车间内硫酸、氢氧化钠、过氧化氢等化学品储罐或输送管道等设备发生破损泄漏，导致风险事故发生。国内外统计资料显示， 焊缝爆裂或大裂纹泄漏的重大事故概率仅为 6.9×10^{-7}~6.9×10^{-8} 次/a；据我国不完全统计，设备容器一般破裂泄漏的事故概率在 1×10^{-5} 次/a，随着近年来防灾技术水平的提高，呈下降趋势。因此化学浆车间及化机浆车间出现泄漏事故风险较小。

The oxygen delignification elemental chlorine-free bleaching process is adopted for pulping, which mainly includes 1 chemical wood pulp production line and 2 chemimechanical pulp production lines. Through the analysis of the production process, the main risks of the chemical pulp workshop and chemimechanical pulp workshop include damage and leakage of storage tanks or transportation pipelines and other equipment for chemicals including sulfuric acid, sodium hydroxide, hydrogen peroxide, etc. in the workshop, which will cause risk accidents. Statistics at home and abroad show that the probability of major accidents caused by weld bursting or cracks is only 6.9×10^{-7}~6.9×10^{-8} times/a; according to incomplete statistics in China, the probability of leakage accidents of equipment containers caused by general cracks is 1×10^{-5} times/a, which is decreasing in recent years along with the improvement of disaster prevention technology. Therefore, the risk of leakage accidents in the chemical pulp workshop and chemimechanical pulp workshop is very low.

（2）二氧化氯制备

(2) Preparation of chlorine dioxide

二氧化氯制备以盐酸为原料，消耗电能，为一封闭的电化学系统，它包括氯酸钠制备、盐酸合成以及二氧化氯发生三个部分。二氧化氯制备过程产生的氯气属于剧毒气体，二氧化氯有与氯气相似的刺激性气味，具有强烈刺激性，接触后主要引起眼和呼吸道刺

激，吸入高浓度可发生肺水肿，能致死，对呼吸道产生严重损伤，高浓度的本品气体，可能对皮肤有刺激性。皮肤接触或摄入本品的高浓度溶液，可能引起强烈刺激和腐蚀，长期接触可导致慢性支气管炎。氯气和二氧化氯一旦发生泄漏，导致中毒事故发生。氢气为极易可燃气体，一旦遇到明火，容易发生火灾爆炸事故。

The chlorine dioxide is prepared electrically by using hydrochloric acid as the raw material in a closed electrochemical system through 3 stages: sodium chlorate preparation, hydrochloric acid synthesis, and chlorine dioxide generation. The chlorine gas produced during the preparation of chlorine dioxide is highly toxic. Chlorine dioxide has an irritating odor similar to chlorine gas and is strongly irritant. After exposure, it mainly causes eye and respiratory tract irritation. Inhalation of the chlorine dioxide of high concentration will cause pulmonary edema and even death, and also severe damage to the respiratory tract. The gas of high concentration of this product is irritating to the skin. Skin contact or ingestion of the high concentration solution of this product may cause strong irritation and corrosion. Long-term exposure may cause chronic bronchitis. The leakage of chlorine gas and chlorine dioxide will lead to poisoning accidents. Hydrogen is an extremely flammable gas, and in face of open flame, it is likely to cause fire and explosion accidents.

（3）碱回收工段：黑液主要来制浆生产线，黑液全部进入碱回收工段，生产工序有蒸发工段、燃烧工段、苛化工段、石灰回收工段。生产过程中涉及次高温次高压蒸汽设备、高速旋转与移动的机械，各种电器以及各种污染防治设备，因此在生产过程中存在的主要设施风险因素有：黑液泄漏、锅炉及管道爆炸、废气处理设施故障导致污染物超标排放、电气伤害、机械伤害等。

(3) Alkali recovery section: Black liquor mainly comes from the pulp production line, and all of it are delivered to the alkali recovery section. The production process consists of evaporation section, combustion section, causticization section, and lime recovery section. The production process involves sub-high temperature and sub-high pressure steam equipment, high-speed rotating and moving machinery, various electrical appliances, and various pollution prevention equipment. Therefore, the main facility risk factors in the production process include black liquor leakage, boiler and pipeline explosion, excessive pollutant emissions caused by exhaust gas treatment facility failure, electrical injuries and

mechanical injuries.

（4）MVR 蒸发工段：采用并联运行 6 台 MVR 板式降膜蒸发器和串联 3 台强制循环蒸发器的组合工艺处理化机浆车间送来的黑液。在生产过程中存在的主要风险为黑液槽泄漏，及电气伤害、机械伤害等。

(4) MVR evaporation section: 6 sets of MVR plate falling film evaporator connected in parallel and 3 sets of forced circulation evaporator connected in series are combined to process the black liquor sent from the chemimechanical pulp. The main risks in the production process include black liquor tank leakage, aswell as electrical injuries and mechanical injuries.

（5）文化用纸车间、生活用纸车间、白卡纸车间

(5) Cultural paper workshop, household paper workshop, white cardboard workshop

生产运行系统：生产过程中因操作不当或设备老化、磨损等，在加料口、排料口易产生跑、冒、滴、漏现象，管道连接点密封不严造成料液、废水泄漏，对环境产生污染。

Production operation system: the feeding inlet and discharge outlet may generate leakage or dripping due to improper operation or aged and worn equipment during operation; liquid material and wastewater may be leaked on connecting points of pipeline which are not sealed well, leading to environmental pollution.

纸制品属于易燃性物质，遇明火易引起火灾事故。

Paper products are flammable, and may cause fire accidents when exposed to open flame.

（6）热电站

(6) Thermal power plant

根据工程分析，项目热电站一期配套一台设计能力 4600tds/d 的碱回收炉，焚烧生产过程中产生的黑液；一台额定蒸发量为 220t/h 的循环流化床锅炉，主要燃料为制浆生产过程产生的树皮、木屑、好氧污泥等废渣；一台额定蒸发量为 280t/h 的循环流化床锅炉，燃料为燃煤；二期新增一台一台额定蒸发量为 280t/h 的循环流化床锅炉，燃料为燃煤。生产过程中不涉及危险化学品，存在的风险因素主要有废气处理设施事故排放，电气伤害、机械伤害等。

According to engineering analysis, the Phase I of the project's thermal power plant is equipped with an alkali recovery furnace with a design capacity of 4600tds/d to burn the black liquor produced during the production process; a circulating fluidized bed boiler with a rated evaporation capacity of 220t/h and mainly fueled by bark, sawdust, aerobic sludge and other waste residues generated in the pulp production process; and a circulating fluidized bed boiler with a rated evaporation capacity of 280t/h and fueled by coal; an additional circulating fluidized bed boiler with a rated evaporation capacity of 280t/h and fueled by coal is added for the Phase II. The production process does not involve any hazardous chemicals, and it main risk factors include accidental emissions from exhaust gas treatment facilities, electrical injuries, and mechanical injuries.

（7）加油站

(7) Gas station

加油站主要分为油罐车卸油过程和给过往车辆加油过程，加油站采用地下油罐形式，设两个50m^{3}柴油贮油罐和一个20m^{3}汽油贮油罐。营运过程主要风险事故类型为柴油、汽油溢出、泄漏和火灾爆炸。

The gas station mainly include tank truck unloading process and vehicle refueling process. The gas station adopts the underground oil tanks, including two 50m^3 diesel oil storage tanks and one 20m^3 gasoline storage tank. The main risk accidents involved in the process of operation include diesel oil/gasoline spillage/leakage, fire and explosion.

（8）天然气管道

(8) Natural gas pipeline

本项目天然气使用依托园区天然气工程，天然气经管道输送至厂内，不进行储存，风险大大降低。天然气输送过程中主要风险为输气管道破裂风险，并由于管道破裂液化天然气外溢造成火灾、爆炸等风险。造成管道破裂的原因主要是管道设计不合理、材料缺陷、误用代材和制造质量低劣、管道施工过程违章作业等。管道做为工业园区的公用设施，由工业园区统一规划和实施，通过招标的方式委托有资质和实力的单位进行设计、建设，管道设计不合理、材料缺陷、误用代材和制造质量低劣、管道施工过程违章作业、误操作的可能性极低。管道建成投产前，按规定的流程进行压力试验，并按规范进行验收，可以将设计、制过程中管道的质量缺陷降到最低。管道运行过程中，出现异常破裂时，设计有各类紧急关闭措施，减少燃气泄漏防止事故进一步扩大。燃气管道技术和安

全措施非常成熟，已在铁山港工业区运行多年未发生破裂事故，管道破裂的概率极低，风险很小。

The supply of natural gas for this project relies on the natural gas project in the park. Specifically, the natural gas is delivered directly into the plant through pipelines without storage, and the risk is greatly reduced. The main risk in the process of natural gas transmission is natural gas pipeline rupture, and the fire and explosion caused by leakage of liquefied natural gas therefrom. The main causes of pipeline rupture include unreasonable pipeline design, material defect, misuse of substitute materials and poor manufacturing quality, and pipeline construction against operation regulations. As industrial park utilities, the pipelines are uniformly planned and implemented by the industrial park via tendering a qualified unit to design and construct, and the possibility of operation against regulations and misoperation in the pipeline construction process is extremely low. Before the pipeline is put into production, pressure test is carried out according to the prescribed process and acceptance is carried out according to the specifications, which can minimize the quality defects of the pipeline in the design and manufacturing process. For abnormal rupture of pipeline during operation, various emergency cutoff measures are designed to reduce gas leakage and prevent the accident from further expanding. Gas pipeline technology and safety measures are very mature, and no rupture accident has occurred after years of operation in Tieshangang Industrial Park. Therefore, the probability and risk of pipeline rupture is extremely low.

5.3.4.2 储运系统风险因素识别

5.3.4.2 Identification of risk factors of storage & transportation system

本项目储运系统中储罐可能发生泄漏事故的主要原因有：①罐体腐蚀破裂；②罐体焊缝开裂；③罐体与线接头密封损坏或螺丝松动；④进料口阀门密封不严或螺丝松动；⑤塔体腐蚀破裂或焊缝开裂；⑥塔体与管线接头密封损坏或螺丝松动；⑦输送管线腐蚀破裂或接头密封损坏；⑧塔顶安全阀或紧急放空阀密封损坏或螺丝松动；⑨加料口阀门密封不严或螺丝松动。

The main possible causes for leakage accidents of the storage tanks in the storage & transportation system of this project include: ① corrosion and cracking of tank; ② cracking of tank welds; ③ seal damage or screw looseness of tank and pipeline joint; ④

poor sealing or screw looseness of inlet valve; ⑤ corrosion cracking or weld cracking of tower body; ⑥ seal damage or screw looseness of tower body and pipeline joint; ⑦ corrosion cracking or joint seal damage of transportation pipeline; ⑧ seal damage or screw looseness of tower top safety valve or emergency vent valve; ⑨ poor sealing or screw looseness of feeding port valve.

以上可能发生泄漏的原因中，①、②、⑤项设备腐蚀发生破裂的情况，可以在安装设备前通过对设备质量的严格检查使其发生的可能性降至最小。③、④、⑥、⑦、⑧、⑨项均与设备相互连接处的密封有关，也是工艺装置在生产中最容易出现事故的方面，其中以输送管线接头破裂或阀门螺丝松动可能性较大。

Possible leakage causes ①, ② and ⑤ listed above are related to the corrosion and cracking of equipment, and can be minimized by strict inspection of the equipment quality before installation. Possible leakage causes ③, ④, ⑥, ⑦, ⑧ and ⑨ are all related to the sealing of the connections between equipment, and are also the most likely causes of leakage accident for process plants, and among them, the joint damage or valve screw looseness of transmission pipelines has the largest possibility.

本项目危险化学品泄漏造成的突发环境事件主要为罐区储罐泄漏引发的大气和水环境污染事故。

The main sudden environmental incidents caused by the leakage of hazardous chemicals in this project are air and water environmental pollution accidents caused by the leakage of storage tanks in the storage tank area.

此外，公司制浆原料及造纸生产线产品均为易燃物质，一旦遇到明火，容易发生火灾事故，产生的消防废水如果处理不当，容易对环境造成二次污染。

In addition, the raw materials of pulping process and the paper production line products are flammable, and prone to fire accidents in face of open flame, and the firefighting wastewater arising from the fire accident, if not properly process, may cause secondary pollution to the environment.

5.3.4.3 环保设施风险因素识别

5.3.4.3 Identification of risk factors of environmental protection facilities

污水处理站：

Sewage treatment station:

污水处理设施发生故障，或投加药剂不足时，污水处理系统去除率下降，对受纳地表水体造成冲击。在污水处理的收集、输送及处理过程中需要管道，如遇不可抗拒之自然灾害（如地震、地面沉降等）原因，可能使管道破裂而废水溢流于附近地区和水域，造成严重的局部污染。此外，污水管网系统由于管道堵塞、破裂和接头处的破损，会造成大量废水外溢，污染地表水和地下水。为防止该类事故发生，本项目设置了事故池和初期雨水池收集废水。

When the sewage treatment facility fails, or when the dosage of chemicals is insufficient, the removal rate of the sewage treatment system decreases, which will cause impact to the receiving surface water body. Pipes are needed in the collection, transportation and treatment processes of sewage, and in case of force majeures (including earthquakes, ground subsidence, etc.), the pipes may be ruptured and the wastewater will leak to the nearby areas and water areas, causing serious local pollution. In addition, the obstruction, rupture and joint damage of sewage pipe network system will cause leakage of a large amount of waste water, polluting surface water and groundwater. In order to prevent such accidents, an emergency pool and an initial stormwater tank are designed for this project to collect wastewater.

废气处理设施：

Waste gas treatment facilities

有组织废气主要包括碱炉废气、固废锅炉废气、锅炉废气、漂白工段废气及二氧化氯制备废气。一旦废气处理设施故障，造成环境空气中有毒有害物质超标。

Organized exhaust gases mainly include alkali furnace exhaust gas, solid waste boiler exhaust gas, boiler exhaust gas, bleaching section exhaust gas and chlorine dioxide preparation exhaust gas. Once the exhaust gas treatment facility fails, the toxic and harmful substances in the ambient air will increase above the standard.

本项目生产系统危险性识别汇总见表5.3-5。

The summary of hazard identification of the production system of this project is shown in Table 5.3-5.

表 5.3-5 生产系统危险性识别

Table 5.3-5 Identification of Production System Risks

序号 S	生产危险单元 Hazardous	风险源 Source of risk	危险物质 **Hazardous substance**	最大储存/在线量/t **Maximum**	存在条件 **Conditions**	触发因素 **Triggering factors**
1	制浆车间（化学木浆） Pulp workshop (chemical wood pulp)	洗选、氧脱工段、漂白工段发生泄漏 Leakage in washing, oxygen delignification and bleaching sections	氢氧化钠 Sodium hydroxide	15	液态、常温、常压 Liquid, normal temperature, normal pressure	泄漏或破裂、机械故障 Leakage or rupture, mechanical failure
			过氧化氢 Hydrogen peroxide	3	液态、常温、常压 Liquid, normal temperature, normal pressure	
			硫酸 Sulphuric acid	4	液态、常温、常压 Liquid, normal temperature, normal pressure	
			盐酸 Hydrochloric acid	12	液态、常温、常压 Liquid, normal temperature, normal pressure	
2	碱回收车间 Alkaline recovery workshop	黑液泄漏 Black liquor leakage	黑液 Black liquor	/	液态 Liquid state	
		碱炉 Alkali furnace	CO、H_2S 等气体 CO, H_2S and other gases	/	/	
3	二氧化氯制备车间 Chlorine dioxide preparation workshop	二氧化氯制备发生泄漏 Leakage during preparation of chlorine dioxide	二氧化氯 Carbon dioxide	40	液态、常压/气态 Liquid, normal pressure/gaseous	
		二氧化氯制备发生泄漏 Leakage during preparation of chlorine dioxide	氯气 Chlorine	1	气态、常温 Gaseous, normal temperature	
4	化机浆车间 Chemimechanical pulp workshop	生产过程发生泄漏 Leakage during production	氢氧化钠 Sodium hydroxide	22	液态、常温、常压 Liquid, normal	
			醋酸 Acetic acid	0.5		

			过氧化氢 Hydrogen peroxide	6	temperature, normal pressure	
5	MVR 蒸发工段 MVR evaporation section	浓黑液槽泄漏 Leakage of high-concentration black liquor tank	黑液 Black liquor	/	液态 Liquid state	
6	加油站 Gas station	柴油储罐发生泄漏 Leakage of diesel oil storage tank	柴油 Diesel	85.5	液态 Liquid state	
		汽油储罐发生泄漏 Leakage of gasoline storage tank	汽油 Gasoline	15	液态 Liquid state	
7	化工库 Chemical warehouse	化工库 Chemical warehouse	氢氧化钠 Sodium hydroxide	880	液态 Liquid state	密封损坏、误操作 Seal damage, misoperation
			硫酸 Sulphuric acid	250	液态、常温、常压 Liquid, normal temperature, normal pressure	
			过氧化氢(100%) Hydrogen peroxide (100%)	180	液态、常温、常压 Liquid, normal temperature, normal pressure	
			醋酸 Acetic acid	90	液态、常温、常压 Liquid, normal temperature, normal pressure	
			20%氨水 20% ammonia	100	液态、常温、常压 Liquid, normal temperature, normal pressure	
			32%盐酸 32% hydrochloric acid	480		

8	污水处理站 Sewage treatment plant	/	/	/	/	设备故障、泄漏或破裂 Equipment failure, leakage or rupture
9	废气处理系统 Exhaust gas treatment system	/	/	/	/	设备故障 Equipment failure
10	文化用纸车间、生活用纸车间、白卡纸车间 Cultural paper workshop, household paper workshop, white cardboard workshop	料液、废水泄漏，纸制品火灾 Feeding liquid and waste water leakage, paper products fire	料液、废水、产品 Feeding liquid, wastewater, products	/	/	管理不善 Poor management
11	天然气管道 Natural gas pipeline	天然气泄漏 Natural gas leakage	天然气 Natural gas	无储存	气态 Gaseous state	密封损坏、误操作 Seal damage, misoperation

5.3.5 环境风险类型

5.3.5 Types of environmental risks

根据项目风险源位置、涉及风险物质的实际情况，分析可能引发或次生风险事件的最坏情景。主要从以下方面考虑：①火灾、爆炸、泄露等生产安全事故及可能引起的次生、衍生厂外环境污染及人员伤亡事件；②环境风险防控设施失灵或非正常操作；③非正常工况；④污染治理设施非正常运行；⑤停电、断水、停气等；⑥通讯或运输系统故障；⑦其它可能情景，详见表 5.4-6。

The worst scenario that may cause derivative or secondary risk event is analyzed based on the location of the project risk source and the actual situation involving the risk substance. The following is analyzed: ① production safety accidents such as fires, explosions, leakage, and possible secondary and derivative environmental pollutions and casualties outside the plant; ② failure or abnormal operation of environmental risk prevention and control facilities; ③ abnormal working conditions; ④ abnormal operation of pollution control facilities; ⑤ power failure, water outage, gas supply cut-off, etc.; ⑥ communication or transportation system failure; ⑦ other possible scenarios, as detailed in Table 5.4-6.

表 5.3-6 可能发生的环境风险事故

Table 5.3-6 Possible Environmental Risk Accidents

<table>
<tr><th>风险源类型
Risk source type</th><th colspan="2">具体风险环节
Specific risk unit</th><th>触发因素
Triggering factors</th><th>危险物质向环境转移的可能途径
Possible transfer modes of hazardous substances to the environment</th></tr>
<tr><td>危险物质泄露事故
Hazardous substance leakage accident</td><td colspan="2">硫酸、氨水、氢氧化钠、双氧水、氯气、二氧化氯、氯酸钠、盐酸、醋酸、柴油泄漏
Leakage of sulfuric acid, ammonia water, sodium hydroxide, hydrogen peroxide, chlorine, chlorine dioxide, sodium chlorate, hydrochloric acid, acetic acid, and diesel oil</td><td>①生产过程各工艺系统和设备故障，或储罐、储槽损坏泄露；②包装袋损坏引发泄露；③管道密封性损坏引发泄露。
① leakage due to failure of each process system and equipment, or damage of storage tank or storage bunker in the production process; ② leakage caused by damage of packing bags; ③ leakage resulting from pipe seal damage.</td><td>①对厂区或周围大气环境质量产生不利影响；②泄漏物料被截留在储罐区围堰内，不向外扩散，对外界影响不大；③氨水泄漏蒸发进入大气环境，将造成污染事故；④氯气、二氧化氯气体泄漏，进入大气对外界影响较大。
①adversely affect the quality of the plant environment or the ambient atmospheric environment; ②the leaked materials are captured in the cofferdam of the storage tank area and do not spread outward so that they have little impact on the outside environment; ③ ammonia water leaks and vaporizes into the atmospheric environment, causing pollution accidents; ④ chlorine or chlorine dioxide leaking into the air has great impact on the outside environment.</td></tr>
<tr><td rowspan="2">污染物事故排放
Accidental discharge of pollutants</td><td colspan="2">废气处理系统
Exhaust gas treatment system</td><td>①废气处理系统出现故障，处理效率下降；②开停车或检修
① The waste gas treatment system fails and the treatment efficiency decreases; ② start-up or shut-down or overhauling</td><td>①废气处理系统其中一级发生故障对周边影响较小；②开停车或检修可能对周边造成影响，及时采取恢复措施，将事故后果减少到最小。
① The failure of one stage of the waste gas treatment system has little impact on the surrounding area; ② start-up or shut-down or overhauling may affect the surrounding area. When such is the case, timely recovery measures should be taken to minimize the consequences of the accident.</td></tr>
<tr><td>废水事故排放
Accidental</td><td>生产废水超标排放
Excessive discharge of</td><td>①废水处理系统出现故障；②废水管道堵塞、破裂、收集池破损等。
① The wastewater treatment</td><td>①发生泄漏可能进入厂区土壤环境，进一步下渗污染地下水。
① Leaked wastewater may enter the soil environment of the plant</td></tr>
</table>

	discharge of wastewater	production wastewater	system fails; ② The wastewater pipe is blocked, broken, or the collection pool is damaged.	and further seep into the groundwater. ②超标排放影响地表水环境。 ② Excessive discharge affects the surface water environment.
		事故消防废水外流 Accident outflow of fire wastewater	装置或储罐爆炸火灾后，消防废水未得到有效收集 Fire wastewater is not effectively collected following an explosion fire of an installation or a storage tank.	消防废水外流影响地表水、土壤环境，可能影响地下水环境。 Fire wastewater flowing out affects the surface water, soil environment and may even affect the groundwater environment.
	碱回收系统 Recovery system		黑液从储槽中溢出，管道、阀门破裂 Black liquor spills out of the storage bunker, and pipes, valves break.	发生泄漏可能进入厂区土壤环境，进一步下渗污染地下水。 Leaked black liquor may enter the soil environment of the plant and further seep into the groundwater.
火灾爆炸次生污染事故 Secondary pollution accidents caused by fire explosion	柴油 Diesel		储罐破裂，发生泄漏进而引起火灾 The storage tank ruptures, causing leakage and even fire.	①污染厂区内/厂区周围环境空气质量;②消防废水及时收集在消防水池，不向外扩散，对外界影响不大。 ① Pollute the air in/around the plant area; ② Fire wastewater is collected in the fire pool in a timely manner and does not spread outward so that it has little impact on the outside environment.
	原料堆场/木片堆场 Raw material yard/Wood chip yard		管理不善引发火灾 Mismanagement leads to fires.	
	成品库/平板纸成品库 Finished product warehouse/finished sheet paper warehouse		管理不善引发火灾 Mismanagement leads to fires.	
	二氧化氯制备车间 Chlorine dioxide preparation workshop		产生的二氧化氯、氢气、氯酸钠可能引发火灾或爆炸 The generated chlorine dioxide, hydrogen and sodium chlorate may cause a fire or an explosion.	
	化工库 Chemical warehouse		爆炸性物质因管理或操作不当引发火灾/爆炸 Improper management or operation of explosive substances causes a fire/an explosion.	
	碱回收炉 Alkali recovery furnace		由于机械故障，设备维修保养不当引发爆炸 Improper repairing of equipment due to mechanical failure causes an explosion.	
	天然气管道 Natural gas pipeline		管道泄漏遇明火引发爆炸 Pipe leak in an open fire causes an explosion.	

5.3.6 重点风险源

5.3.6 Key risk sources

根据环境风险识别结果，对项目涉及的主要危险物质和工艺装置分析如下：

Based on the results of the environmental risk identification, the main hazardous substances and process installations involved in the project are analyzed as follows::

（1）氯气，毒性较大，本项目不存储氯气，氯气在生产过程中产生、循环，一旦发生泄漏，迅速扩散到大气环境中，会对周边大气环境带来污染，其环境风险不容忽视；

(1) Chlorine, which is highly toxic, is not stored for this project; chlorine is generated and circulated during the production process, and once it is leaked, it will spread rapidly to the atmosphere and cause pollution to the ambient atmospheric environment. In view of this, the environmental risks of chlorine cannot be ignored.

（2）氯酸钠，具有一般毒性、燃烧、爆炸等危险性，以溶液状态存在，溶液浓度仅 500~540g/L，只有在与硫、磷和有机物混合或受撞击时易引起燃烧和爆炸，在不考虑人为因素将氯酸钠混入硫、磷和有机物，不考虑自然灾害情况下氯酸钠恰有机会与硫、磷和有机物混合的情况下，氯酸钠溶液很难发生燃烧和爆炸事故，环境风险相对不大；

(2) Sodium chlorate, which is moderately toxic, combustive, and explosive, exists in solution with a concentration of only 500 ~ 540 g/L, and is prone to cause combustion and explosion only when mixed with sulphur, phosphorus and organic matter or impacted. The sodium chlorate solution is less likely to cause combustion and explosion accidents without consideration of mixing of sodium chlorate into sulphur, phosphorus and organic matter due to human factors, or without any regard to sodium chlorate solution having the opportunity to mix with sulphur, phosphorus and organic matter in natural disasters. Therefore, the environmental risk is relatively low.

（3）二氧化氯，具有一般毒性、易爆等危险性，以溶液状态储存，溶液浓度仅 10±0.5g/l，明显低于 30%，爆炸危险性大大降低，二氧化氯液体泄漏环境风险相对不大；二氧化氯发生器产生二氧化氯气体一旦发生泄漏，会对周边大气环境带来污染，其环境风险不容忽视；

(3) Chlorine dioxide, which is moderately toxic and explosive, is stored in solution with

a concentration of only 10±0.5g/l, significantly less than 30%. Therefore, the explosion risk is greatly reduced, and environmental risk caused by chlorine dioxide liquid leakage is relatively low; once the chlorine dioxide gas produced by the chlorine dioxide generator will bring pollution to the ambient atmospheric environment, so its environmental risks cannot be ignored.

（4）氢气，具有易燃、爆炸等危险性，不涉及储存，存在于二氧化氯车间，在线量较小，其中的少量氢气有组织排放，排放口附近不存在其他易燃助燃品，发生火灾或爆炸的风险相对不大；

(4) Hydrogen, which is flammable and explosive, does not involve storage, and is present in chlorine dioxide workshops with small quantities for online production. A small amount of hydrogen is discharged in an organized manner and no other flammable combustion-supporting articles are present near the discharge outlet, so the risk of fire or explosion is relatively low.

（5）氨水，不属于有毒、易燃或者爆炸性物质，但氨水的挥发物氨气为一般毒性物质，有刺激性恶臭气味，易燃，与空气混合能形成爆炸性混合物。本项目使用的氨水溶液（含氨 20%）外购回来后储存于氨水储罐中，周围不存在其他易燃助燃品，发生火灾或爆炸的风险相对不大；

(5) Ammonia water, which is not a toxic, flammable or explosive substance, but ammonia gas, a volatile product of ammonia water, is generally toxic and flammable, and can produce irritating foul odor and form an explosive mixture when mixed with air. The ammonia water solution (containing 20% ammonia) used in this project is purchased and stored in an ammonia water storage tank with no other flammable combustion-supporting articles in the vicinity, so the risk of fire or explosion is relatively low.

（6）柴油，具有易燃、爆炸等危险性，储存于地埋式柴油储罐中，西侧为木片堆场，可能引发连锁火灾，发生火灾或爆炸可能会对周边人群生命健康安全带来较大威胁，发生火灾后燃烧产生次生一氧化碳及二氧化硫也可能污染项目周边大气环境；

(6) Diesel oil, flammable and explosive, is stored in the buried diesel oil storage tank, of which the wood chip yard is located to the west. This may trigger chain-fire or explosion accidents that may pose a greater threat to the life health and safety of the surrounding

population. After a fire, secondary carbon monoxide and sulphur dioxide may also pollute the ambient atmospheric environment.

（7）黑液，其有机污染物浓度高，具有毒性，一旦发生泄漏可能污染水环境，由于黑液储槽均设有围堰，厂内设有事故池，一般不会对污水处理系统带来较大冲击，更难经污水处理站污染地表水体，环境风险相对不大；

(7) Black liquor, featuring high concentration of organic pollutants and toxicity, may pollute the water environment in case of leakage. Since cofferdams are provided for black liquor storage bunkers and an accident pool is provided in the plant, generally, no large impact will act on the sewage treatment system, and it is more difficult to pollute surface water bodies through sewage treatment stations. From the above, the environmental risk is relatively low.

（8）氢氧化钠、过氧化氢、盐酸、硫酸、醋酸，均不具有剧毒、火灾、爆炸等危险性，均以溶液状态存在，环境风险也相对不大；

(8) Since sodium hydroxide, hydrogen peroxide, hydrochloric acid, sulphuric acid and acetic acid are not highly toxic, have no risk of causing fire or explosion, and are in solution, they pose relatively little environmental risk.

（9）碱炉、石灰窑、原料堆场等环节一旦发生火灾爆炸事故，产生二氧化碳和颗粒物等物质，对周边大气环境影响相对不大；

(9) Substances such as carbon dioxide and particulate matter produced in the event of a fire explosion in an alkaline furnace, lime kiln, raw material yard, etc., have a relatively insignificant impact on the ambient atmospheric environment.

（10）碱炉废气、石灰窑、锅炉、固废锅炉废气的事故排放，由大气环境影响预测评价结果可知其环境影响相对不大。

(10) Accidental emission of alkaline furnace exhaust gas, lime kiln, boiler, and solid waste boiler exhaust have a relatively insignificant impact on the ambient atmospheric environment, as indicated by the results of prediction and assessment of atmospheric environmental impact.

根据上述各危险物质和工艺装置的危险性分析，结合国内同行业事故统计分析、事故案例资料及项目周边情况，二氧化氯工段、加油站及储存化学品的化工库列为重点风

险源。

Based on the abovementioned analysis of the hazards of hazardous substances and process installations, combined with the statistical analysis of accidents in the same industry in China, accident case information and the surrounding situation of the project, the chlorine dioxide sections, gas stations and chemical depots where chemicals are stored are listed as key risk sources.

5.3.7 风险识别结果

5.3.7 Risk identification result

从上述 5.3.1 小节的统计资料可以看出，石化行业贮存系统事故占总事故的 20～30%，事故概率较高，并且，贮存系统危险物料存量远大于生产系统危险物料的量，事故发生时对环境造成的风险危害也相应的大于生产系统，但是装置区的风险事故也是不容忽视的。

It can be seen from the statistical information in the above Section 5.3.1 that storage system accidents in the petrochemical industry account for 20-30% of the total accidents, with a high probability of occurrence. Furthermore, the amount of hazardous materials in the storage system is much greater than that in the production system, and the risk to the environment in the event of an accident is correspondingly greater than that of hazardous materials in the production system, but the risk of accidents in the installation area cannot be ignored.

根据事故的类比调查和统计，项目的危险物质和生产系统危险性识别，并结合对项目各工艺过程的分析，识别项目环境风险详见下表。

Based on the analogy survey and statistics of accidents, the hazardous substances and production system hazards of the project are identified, and combined with the analysis of the project processes, the environmental risks of the project are identified as indicated in the following table.

表 5.3-7　项目环境风险识别表

Table 5.3-7 Environmental Risks Identification

序号	危险单元 Hazard unit	风险源 Source of risk	主要危险物质 Main hazardous substance	环境风险类别 Types of environmental risks	环境影响途径 Means of environment impact	可能受影响的环境敏感目标 Environment-sensitive targets that may be affected	备注 Remarks
1	制浆车间 Pulping workshop	洗选、氧脱工段、漂白工段发生泄漏 Leakage in washing, oxygen delignification and bleaching sections	氢氧化钠、过氧化氢、硫酸等 Sodium hydroxide, hydrogen peroxide, sulfuric acid, etc.	泄漏 Leakage	化学品溶液在围堰中收集，通过管线进入事故池 The chemical solution is collected in a cofferdam and flows through pipes into the accident pool.	地表水、地下水、土壤 Surface water, groundwater, soil	过氧化氢、双氧水、醋酸、黑液等液态危险物质泄漏可能对对泄漏处地表植被、土壤、水环境均产生影响，致使局部地区动植物死亡，但通过事故后生态恢复等措施降低环境影响。 Leakage of liquid hazardous substances such as hydrogen peroxide, acetic acid and black liquor may affect the surface vegetation, soil and water environment of the leak, resulting in the death of plants and
2	碱回收车间 Alkaline recovery workshop	黑液泄漏 Black liquor leakage	黑液 Black liquor	泄漏 Leakage	黑液收集于围堰及事故池，后重新进行处理 Black liquor is collected in cofferdams and accident pools and then reprocessed.	土壤、地下水 Soil, groundwater	
		碱炉 Alkali furnace	爆炸 Explosion	火灾/爆炸 Fire/explosion	火灾产生 CO_2、TSP 进入大气 Fires produced CO2 and TSP get into the atmosphere.	厂区员工/邻近厂区人群 Employees in the plant/populations in the vicinity	

3	二氧化氯制备车间 Chlorine dioxide preparation workshop	二氧化氯制备发生泄漏 Leakage during preparation of chlorine dioxide	二氧化氯、氯酸钠 Chlorine dioxide, sodium chlorate	火灾/爆炸 Fire/explosion	火灾产生 CO_2、TSP 进入大气 Fires produced CO2 and TSP get into the atmosphere.	厂区员工/邻近厂区人群 Employees in the plant/populations in the vicinity	animals in the local area, but the environmental impact can be reduced through measures such as ecological recovery after the accident. 硫酸、盐酸泄漏产生酸雾不大，影响较小。Leaks of sulfuric acid and hydrochloric acid produce little acid mist and have less effect. 氯气为毒性气体，对人群影响较大。Chlorine is a toxic gas and has a high impact on the population. 氨水泄漏会挥发生成氨气，氨水泄漏概率较小，但发生泄漏即造成环境空气污染，威胁群众身体健康，影响较大。天然气经园区管道输送至厂内使用，不进行储存，风险大大降低。Leaked ammonia water will volatilize to produce ammonia gas. Though ammonia water has a small
			二氧化氯、氯酸钠、盐酸等 Chlorine dioxide, sodium chlorate, hydrochloric acid, etc.	泄漏 Leakage	化学品溶液在围堰中收集，通过管线进入事故池 The chemical solution is collected in a cofferdam and flows through pipes into the accident pool.	地表水、地下水、土壤 Surface water, groundwater, soil	
			氯气、二氧化氯 Chlorine, chlorine dioxide	泄漏 Leakage	向大气环境中排放 Discharged into the atmosphere	厂区员工风险评价范围内人群 Populations within the scope of risk assessment of employees in the plant	
		盐酸合成塔发生泄漏 Hydrochloric acid synthesis tower leaks.	氯气、盐酸等 Chlorine, hydrochloric acid, etc.	泄漏 Leakage	化学品溶液在围堰中收集，通过管线进入事故池，氯气向大气环境中排放 The chemical solution is collected in a cofferdam and flows through pipes into the accident pool; chlorine is discharged into the atmosphere.	地表水、地下水、土壤 Surface water, groundwater, soil	

		$NaClO_3$ 电解系统发生泄漏 NaClO3 electrolysis system leaks.	氢气 Hydrogen	火灾/爆炸 Fire/explosion	火灾产生 CO_2、TSP 进入大气 Fires produced CO2 and TSP get into the atmosphere.	厂区员工/邻近厂区人群 Employees in the plant/populations in the vicinity	probability of leakage, it will cause ambient air pollution once leaked, threatening the health of the masses as well as exercising a great influence. Natural gas is piped through the park to the plant for use and not stored, reducing the risk considerably.
4	化机浆车间 Chemimechanical pulp workshop	生产过程发生泄漏 Leakage during production	过氧化氢、氢氧化钠、醋酸等 Hydrogen peroxide, sodium hydroxide, acetic acid, etc.	泄漏 Leakage	化学品经收集进入事故池 The chemicals are collected and flow through pipes into the accident pool.	土壤、地下水 Soil, groundwater	
5	MVR 蒸发工段 MVR evaporation section	浓黑液槽泄漏 Leakage of high-concentration black liquor tank	黑液 Black liquor	泄漏 Leakage	黑液收集于围堰及事故池，后重新进行处理 Black liquor is collected in cofferdams and accident pools and then reprocessed.	土壤、地下水 Soil, groundwater	
6	加油站 Gas station	柴油、汽油储罐 Diesel oil and gasoline storage tanks	柴油、汽油 Diesel oil, gasoline	泄漏、火灾 Leakage, fire	火灾产生 CO_2、TSP 进入大气 Fires produced CO2 and TSP get into the atmosphere.	厂区员工/邻近厂区人群 Employees in the plant/populations in the vicinity	

				泄漏/火灾/次生污染物 Leakage/fire/secondary pollutants	柴油燃烧产生次生污染物（二氧化硫和不完全燃烧次生一氧化碳） Secondary pollutants (sulphur dioxide and secondary carbon monoxide due to incomplete combustion) are produced during diesel oil combustion.	厂区员工 Employees in the plant 风险评价范围内人群 Populations within the scope of risk assessment	
			氢氧化钠 Sodium hydroxide	泄漏 Leakage	化学品溶液在围堰中收集，通过管线进入事故池 The chemical solution is collected in a cofferdam and flows through pipes into the accident pool.	地表水、地下水、土壤 Surface water, groundwater, soil	
			硫酸 Sulphuric acid				
			过氧化氢(100%) Hydrogen peroxide (100%)				
			醋酸 Acetic acid				
			20%氨水 20% ammonia		收集于围堰/事故池内，蒸发进入大气环境 Collected in cofferdams/accident pools and evaporated into the atmosphere.	厂区员工 Employees in the plant 风险评价范围内人群 Populations within the scope of risk assessment 地下水、土壤 Groundwater, soil	
			30%盐酸 30% hydrochloric acid		化学品溶液在围堰中收	地表水、地下	

			30%NaOH		集，通过管线进入事故池 The chemical solution is collected in a cofferdam and flows through pipes into the accident pool.	水、土壤 Surface water, groundwater, soil	
8	污水处理站 Sewage treatment plant	/	/	泄漏、事故排放 Leakage, accidental discharge	地表水、地下水 Surface water, groundwater		
9	废气处理系统 Exhaust gas treatment system	/	/	事故排放 Accidental discharge	地表水、地下水、土壤 Surface water, groundwater, soil	环境空气 Ambient air	
10	原料堆场/成品库 Raw material yard/ finished products warehouse	原料堆场/成品库发生火灾 Fires in raw material yard/ finished products warehouse	木片/纸品 Wood chips/paper products	火灾 Fire	环境空气 Ambient air		
11	文化用纸车间、生活用纸车间、白卡纸车间 Cultural paper workshop, household paper workshop, white cardboard workshop	料液、废水泄漏，纸制品火灾 Feeding liquid and waste water leakage, paper products fire	料液、废水、产品 Feeding liquid, wastewater, products	泄漏、火灾 Leakage, fire	环境空气、土壤 Ambient air, soil		

12	天然气管道 Natural gas pipeline	天然气泄漏 Natural gas leakage	天然气 Natural gas	泄漏、火灾 Leakage, fire	火灾产生 CO_2、TSP 进入大气 Fires produced CO2 and TSP get into the atmosphere.	厂区员工/邻近厂区人群 Employees in the plant/populations in the vicinity	

5.4 风险事故情景分析

5.4 Analysis of risk accident scenario

5.4.1 风险事故情形设定

5.4.1 Risk accident scenario setting

根据 HJ169-2018 附录 B，属于附录 B 中所列危险物质，且最大储存量超出临界量的物质为硫酸、氯气、20%氨水、二氧化氯，因此本次风险评价将四者列为主要危险因子，同时考虑加油站柴油存在火灾爆炸分析及危险化学品的最大存储量，将柴油和储量较大的氢氧化钠、过氧化氢也列为危险因子。通过对本工程各装置和设施的分析，本次环境风险评价确定以硫酸储罐、氨水储罐、过氧化氢储罐、氢氧化钠储罐发生泄漏、氯气输送管线发生泄漏、二氧化氯制备过程中二氧化氯发生爆炸致使气体泄漏、加油站发生火灾爆炸事故。本项目风险事故情形设定如下：

According to Annex B of HJ169-2018, the hazardous substances listed in Annex B and of which the maximum storage capacity is above the critical level are sulphuric acid, chlorine, 20% ammonia water and chlorine dioxide. Therefore, these four substances are listed as the main risk factors in this risk assessment report. In addition, taking into account the fire explosion of diesel oil in the gas stations and the maximum storage capacity of hazardous chemicals, the diesel oil and the sodium hydroxide and hydrogen peroxide with a large storage capacity are also listed as risk factors. Based on the analysis of the installations and facilities of the project, the leakage of sulphuric acid storage tank, ammonia water storage tank, hydrogen peroxide storage tank, sodium hydroxide storage tank, leakage of chlorine delivery pipes, as well as leakage caused by explosion of chlorine dioxide during the preparation of chlorine dioxide, and fire explosion at the gas station are identified as the risk accident scenarios in this environmental risk assessment. The risk accident scenarios for this project are set as follows.

表 5.4-1　风险事故情形设定

Table 5.4-1 Risk Accident Scenario Setting

危险单元 Hazard unit	风险源 Source of risk	风险物质 Risk substance	风险类型 Risk type	事故情形 Accident scenario	影响途径 Means of Impact	部件类型 Part type	泄漏模式 Leakage mode	泄漏频率 Leakage frequency	事故持续时间 Duration of the accident
化工库 Chemical warehouse	硫酸储罐 Sulfuric acid storage tank	硫酸 Sulphuric acid	泄漏 Leakage	硫酸储罐破裂，硫酸液体泄漏在厂房内 Sulfuric acid liquid leaks in the plant due to sulfuric acid storage tank rupture.	地表水、地下水、土壤 Surface water, groundwater, soil	储罐 Storage tank	全破裂 Completely ruptured	5.00×10^{-6}/a	10min
				硫酸泄漏聚集在厂房内，发生蒸发进入大气，造成污染事故 Sulfuric acid leaks and accumulates in the plant, and evaporates into the atmosphere, causing pollution accidents.	大气 Atmosphere	/	/	/	15min
	氨水储罐 Ammonia water storage tank	氨水 Ammonia water	泄漏 Leakage	氨水罐破裂，氨水泄露聚集在厂房内 Sulfuric acid leaks and accumulates in the plant due to ammonia water storage tank rupture.	地表水、地下水、土壤 Surface water, groundwater, soil	储罐 Storage tank	全破裂 Completely ruptured	5.00×10^{-6}/a	10min
				氨水形成液池蒸发进入大气 Ammonia water-forming liquid in the pool evaporates into the atmosphere.	大气 Atmosphere	/	/	/	15min

	过氧化氢储罐 Hydrogen peroxide storage tank	过氧化氢 Hydrogen peroxide	泄漏 Leakage	过氧化氢储罐连接管破裂 Hydrogen peroxide storage tank connection pipe rupture	地表水、地下水、土壤 Surface water, groundwater, soil	φ100mm 管道 φ100mm pipe	泄露孔径为 10%孔径 Leak pore size is 10% pore size.	2.00×10^{-6}/a	10min
	氢氧化钠储罐 Sodium hydroxide storage tank	氢氧化钠 Sodium hydroxide	泄漏 Leakage	氢氧化钠储罐连接管破裂 Sodium hydroxide storage tank connection pipe rupture	地表水、地下水、土壤 Surface water, groundwater, soil	φ100mm 管道 φ100mm pipe	泄露孔径为 10%孔径 Leak pore size is 10% pore size.	2.00×10^{-6}/a	10min
二氧化氯制备 Preparation of chlorine dioxide	二氧化氯制备 Preparation of chlorine dioxide	氯气 Chlorine	泄漏 Leakage	出口管线发生破裂，氯气泄露进入大气环境，造成大气环境风险事故。 Chlorine leaks into the atmospheric environment due to rupture of the outlet pipe, resulting in an atmospheric risk accident.	大气 Atmosphere	φ100mm 管道 φ100mm pipe	泄露孔径为 10%孔径 Leak pore size is 10% pore size.	2.00×10^{-6}/a	10min
	二氧化氯发生器 Chlorine dioxide generator	二氧化氯、氯气 Chlorine dioxide, chlorine	爆炸 Explosion	二氧化氯发生器发生爆炸事故，二氧化氯扩散进入大气造成事故。 An explosion of a chlorine dioxide generator occurs and chlorine dioxide diffuses into the atmosphere causing an accident.	大气 Atmosphere	反应装置 Reaction device	/	10^{-6}/a	5min

加油站 Gas station	柴油储罐 Diesel oil storage tank	柴油 Diesel	火灾、爆炸 Fire, explosion	柴油储罐泄漏，遇明火发生火灾爆炸事故 Diesel oil storage tank leaks, causing a fire explosion in case of open fire.	地表水、地下水、土壤、大气 Surface water, groundwater, soil, atmosphere	储罐 Storage tank	全破裂 Completely ruptured	5.00×10^{-6}/a	15min

注：①泄露事故类型参考风险导则 HJ169-2018 附录 E，并选择小于 10^{-6}/a 作为最大可信事故设定参考。②项目均设有紧急隔离系统，根据风险导则，管道泄露事故时间可设定为 10min，泄露液体形成液池蒸发可按 15~30min 计。

Note: ①Refer to Annex E of *Technical Guidelines for Environmental Risk Assessment on Projects* HJ169-2018 for leakage accident type, and select a value less than 10^{-6}/a as the maximum credible event setting reference. ②The project is equipped with an emergency isolation system. According to the *Technical Guidelines for Environmental Risk Assessment on Projects*, the pipe leakage accident time can be set at 10min, and the time for evaporation in the leaking liquid-forming liquid pool can be calculated at 15~30min.

5.4.2 源项分析

5.4.2 Source analysis

5.4.2.1 氨水泄漏源强

5.4.2.1 Ammonia water leakage source intensity

（1）氨水泄漏量计算

(1) Calculation of ammonia water leakage

当氨水储罐发生泄漏时，其泄漏速率为：

When an ammonia water storage tank leaks, the leakage rate is:

$$Q_L = C_d A\rho\sqrt{\frac{2(P-P_0)}{\rho}+2gh}$$

式中：Q_L—液体泄漏速度，kg/s；

Where, Q_L-Liquid leakage rate, kg/s;

P—容器内介质压力，Pa；

P-Medium pressure in the container, Pa;

P0—环境压力，Pa；

P0-Ambient pressure, Pa;

ρ—泄漏液体密度，kg/m^3；

ρ-Density of leaking liquid, kg/m^3;

g —重力加速度，$9.81m/s^{-2}$。

g-gravity acceleration, $9.81m/s^{-2}$;

h—裂口之上液位高度，m，本次均取 2m。

h-Level above breach, m, 2m for this project.

Cd—液体泄漏系数。

Cd-Liquid leakage coefficient

A—裂口面积，m^2；

A-Breach area, m^2;

（2）氨水泄漏后的挥发量计算

(2) Calculation of volatile quantity of leaked ammonia water

氨水是在常温、常压条件下贮存的，发生泄漏时，因物料温度与环境温度基本相同，

25%氨水沸点为 37.7℃，本项目为 20%氨水，沸点高于 37.7℃，因此通常不会发生闪蒸和热量蒸发，泄漏后在其周围形成液池，而挥发主要原因是液池表面气流运动使液体蒸发，由于泄漏发生后液体流落到混凝土地坪上液面不断扩大，同时不断挥发并扩散转入大气，造成大气污染。质量蒸发速度按下式计算：

Ammonia water is stored at room temperature under atmospheric pressure. Flash evaporation and heat evaporation is rather an unusual case in the event of leakage as the material temperature and ambient temperature is basically the same, and the boiling point of 25% ammonia water is 37.7 ℃ which is lower than that of this project-related 20% ammonia water. A liquid pool will be found around it after leakage, and the main reason for volatilization is airflow movement on the liquid pool surface. Liquid falls to the concrete floor after leakage, causing liquid surface expanding, while liquid volatilizes and diffuses into the atmosphere, resulting in atmospheric pollution. The mass evaporation velocity is calculated as follows:

$$Q_3 = \alpha p \frac{M}{RT_0} u^{\left(\frac{2-n}{2+n}\right)} r^{\left(\frac{4+n}{2+n}\right)}$$

式中：Q_3—质量蒸发速度，kg/s；

Where, Q_3-mass evaporation velocity, kg/s;

p—液体表面蒸气压，Pa；

p-liquid surface vapor pressure, Pa;

R—气体常数；J/mol·k；

R-gas constant; J/mol · k;

T_0—环境温度，k；

T_0-ambient temperature, k;

M—物质的摩尔质量，kg/mol；

M-molar mass of substance, kg/mol;

u—风速，m/s；（两种情形的风速）

u-wind velocity, m/s; (wind velocity in both cases)

r—液池半径，m。

r-Pool radius, m.

α，n—大气稳定度系数；

α, n - atmospheric stability factor;

表 5.4-2　液池蒸发模式参数

Table 5.4-2 Pool Evaporation Mode Parameters

大气稳定度 **Atmospheric stability**	**n**	**α**
不稳定（A，B） Instable (A, B)	0.2	3.846×10^{-3}
中性（D） Neutral (D)	0.25	4.685×10^{-3}
稳定（E，F） Stable (E, F)	0.3	5.285×10^{-3}

液池最大直径取决于泄漏点附近的地域构型、泄漏的连续性或瞬时性。有围堰时，以围堰最大等效半径为液池半径；无围堰时，设定液体瞬间扩散到最小厚度时，推算液池等效半径。

The maximum diameter of the liquid pool depends on the regional configuration near the leakage point, and the continuity or instantaneity of the leakage. In case a cofferdam is provided, the maximum equivalent radius of the cofferdam is the liquid pool radius; when no cofferdam is provided and the set liquid diffuses to the minimum thickness instantaneously, the equivalent radius of the liquid pool can be calculated.

（3）氨水泄漏量计算结果

(3) Calculation results of leaked ammonia water

表 5.4-3　氨水事故泄漏量计算表

Table 5.4-3 Calculation of Ammonia Water Accidental Leakage

计算参数 **Calculation parameters**	氨水储罐 **Ammonia water storage tank**
假设裂口面积 Hypothetical breach area	单个储罐全破裂 A single storage tank completely ruptured
地面情况 Ground conditions	水泥 Cement
环境压力 p0 Ambient pressure p0	101325Pa
气体常数 J/mol·k; Gas constant J/mol·k;	22.4
环境温度 Ambient temperature	25℃（常温） 25℃ (room temperature)
液池面积 Liquid pool area	$107m^2$

计算参数 **Calculation parameters**	氨水储罐 **Ammonia water storage tank**	
泄漏时间 Leakage time	10min	
泄露速率 Leakage rate	/	
气象条件 Meteorological conditions	最不利气象 Most adverse meteorological conditions	最常见气象 Most common meteorological conditions
蒸发速率 Q Evaporation rate Q	0.066kg/s	0.11kg/s

5.4.2.2 硫酸源强

5.4.2.2 Sulfuric acid source intensity

表 5.4-4 硫酸事故泄漏量计算表

Table 5.4-4 Calculation of Sulfuric Acid Accidental Leakage

计算参数 **Calculation parameters**	硫酸储罐 **Sulfuric acid storage tank**	
假设裂口面积 Hypothetical breach area	单个储罐全破裂 A single storage tank completely ruptured	
地面情况 Ground conditions	水泥 Cement	
环境压力 p0 Ambient pressure p0	101325Pa	
气体常数 J/mol·k; Gas constant J/mol·k;	22.4	
环境温度 Ambient temperature	25℃（常温） 25℃ (room temperature)	
液池面积 Liquid pool area	90m^2（化学浆车间硫酸储罐 2#） 90m^2 (sulphuric acid storage tank 2# in chemical slurry workshop)	
泄漏时间 Leakage time	10min	
最大泄漏量 Maximum leakage	/	
气象条件 Meteorological conditions	最不利气象 Most adverse meteorological conditions	最常见气象 Most common meteorological conditions
蒸发速率 Q Evaporation rate Q	0.00000005kg/s	0.000000087kg/s

5.4.2.3 过氧化氢及氢氧化钠源强

5.4.2.3 Source intensity of hydrogen peroxide and sodium hydroxide

表 5.4-5　过氧化氢及氢氧化钠事故泄漏量计算表

Table 5.4-5 Calculation of Accidental Leakage of Hydrogen Peroxide and Sodium Hydroxide

计算参数 **Calculation parameters**	过氧化氢储罐 **Hydrogen peroxide storage tank**	氢氧化钠储罐 **Sodium hydroxide storage tank**
假设裂口面积 Hypothetical breach area	0.0000785m^2（直径为 0.01m） 0.0000785m^2 (diameter: 0.01m)	0.0000785m^2（直径为 0.01m） 0.0000785m^2 (diameter: 0.01m)
地面情况 Ground conditions	水泥 Cement	水泥 Cement
环境压力 p0 Ambient pressure p0	101325Pa	101325Pa
气体常数 J/mol·k; Gas constant J/mol·k;	22.4	22.4
环境温度 Ambient temperature	25℃（常温） 25℃ (room temperature)	25℃（常温） 25℃ (room temperature)
泄漏时间 Leakage time	10min	10min
泄露速率 Leakage rate	0.36	0.42

5.4.2.4 氯气泄漏源强

5.4.2.1 Chlorine gas leakage source intensity

气体或蒸汽经小孔泄漏，因压力降低而膨胀，该过程可视为绝热过程。假设气体符合理想气体状态方程，则根据柏努利方程可推导出如下的气体泄漏公式：

The process during which gas or vapor leaks through a small hole and expands due to a decrease in pressure can be considered an adiabatic process. Assuming that gases conform to the ideal gas state equation, the following gas leakage equation can be derived from the Bernoulli equation:

$$Q = YC_d AP\sqrt{\frac{M\gamma}{RT}\left[\frac{2}{\gamma+1}\right]^{\frac{\gamma+1}{\gamma-1}}}$$

式中：Q ——气体泄漏流量， kg/s；

Where, Q-gas leakage rate, kg/s;

P ——容器压力，Pa；

P-vessel pressure, Pa;

Cd——气体泄漏系数，当裂口形状为圆形时取 1.00，三角形时取 0.95，长方形时取 0.90；

Cd-gas leakage factor of 1.00 for a circular breach, 0.95 for a triangle and 0.90 for a rectangle;

M ——物质的摩尔质量， kg/mol；

M-molar mass of substance, kg/mol;

R ——气体常数，取 8.314 J/mol·K。

R-gas constant, 8.314 J/mol·K;

T——气体温度，K；

T-gas temperature, K;

A ——裂口面积，m^2；

A-breach area, m^2;

Y——流出系数，对于临界流 Y=1.0；对于次临界流按下式计算：

Y-outflow factor, for critical flow Y = 1.0; for subcritical flow, the following equation applies:

$$Y=\left[\frac{P_0}{P}\right]^{\frac{1}{\gamma}}\times\left\{1-\left[\frac{p_0}{p}\right]^{\frac{(\gamma-1)}{\gamma}}\right\}^{\frac{1}{2}}\times\left\{\left[\frac{2}{\gamma-1}\right]\times\left[\frac{\gamma+1}{2}\right]^{\frac{(\gamma+1)}{(\gamma-1)}}\right\}^{\frac{1}{2}}$$

当下式成立时，气体流动属于音速流动（临界流）：

When the following equation holds, the gas flow is sonic flow (critical flow):

$$\frac{P_0}{P}\le\left(\frac{2}{\gamma+1}\right)^{\frac{\gamma}{\gamma-1}}$$

当下式成立时，气体流动属于亚音速流动（次临界流）：

When the following equation holds, the gas flow is subsonic flow (subcritical flow):

$$\frac{P_0}{P}>\left(\frac{2}{\gamma+1}\right)^{\frac{\gamma}{\gamma-1}}$$

式中：P——容器压力，Pa；

Where, P-vessel pressure, Pa;

P_0——环境压力，Pa；

P_0-ambient pressure, Pa;

r——气体的绝热指数（比热容比），即定压比热容 Cp 与定容比热容 CV 的比值；

R-gas adiabatic index (specific heat ratio), i.e. the ratio of specific heat at constant pressure Cp to specific heat at constant volume C_V;

表 5.4-6 氯气事故泄漏量计算表

Table 5.4-6 Calculation of Chlorine Accidental Leakage

<table>
<tr><td>计算参数
Calculation parameters</td><td colspan="2">二氧化氯制备氯气输送管道
Delivery pipes for chlorine prepared from chlorine dioxide</td></tr>
<tr><td>假设裂口面积；
Hypothetical breach area;</td><td colspan="2">0.0000785m²（直径为 0.01m）
0.0000785m² (diameter: 0.01m)</td></tr>
<tr><td>气体泄漏系数 Cd
Gas leakage coefficient Cd</td><td colspan="2">1</td></tr>
<tr><td>容器压力 p
Vessel pressure p</td><td colspan="2">0.3MPa（参考取值）
0.3MPa (reference value)</td></tr>
<tr><td>环境压力 p0
Ambient pressure p0</td><td colspan="2">101325Pa</td></tr>
<tr><td>分子量 M
Molecular weight M</td><td colspan="2">70.9</td></tr>
<tr><td>气体温度
Gas temperature</td><td colspan="2">45℃</td></tr>
<tr><td>r</td><td colspan="2">1.308</td></tr>
<tr><td>流出系数 Y
Outflow factor Y</td><td colspan="2">1.0</td></tr>
<tr><td rowspan="2">气体泄漏流量 Q
Gas leakage Q</td><td>最不利气象
Most adverse meteorological conditions</td><td>最常见气象
Most common meteorological conditions</td></tr>
<tr><td>0.058kg/s</td><td>0.074 kg/s</td></tr>
</table>

5.4.2.5 柴油储罐事故源强

5.4.2.5 Diesel oil storage tank accident source intensity

项目柴油储罐为地埋式储罐，规格为 50m³，假设最不利的事故情形为单个储罐 10min 泄漏完，最大泄漏量为 42t，泄漏速率为 70kg/s。

The project-related diesel oil storage tank is a 50m³ buried diesel oil storage tank; assuming the most unfavorable accident scenario that the duration for complete leakage of diesel oil in a single tank is 10min, the maximum leakage is 42t and the leakage rate is 70kg/s.

5.4.2.6 火灾事故源强

5.4.2.6 Fire accident source intensity

本项目储罐区柴油闪点最低，为易燃液体，因此本次火灾事故考虑柴油从储罐中泄漏出来而引发池火。柴油不完全燃烧产生 CO 有害气体，将会产生火灾伴生污染事故。根据《建设项目环境风险评价技术导则》（HJ169-2018）附录 F.3 公式计算。

In the tank area, This project has the lowest flash point of diesel oil which is a flammable liquid, so this fire accident is considered as a pool fire caused by diesel oil leaking out of the tank. Incomplete combustion of diesel oil generates harmful gas CO, which will lead to fire-associated pollution accidents. Calculate according to the equation stated in F.3 in Annex F of the *Technical Guidelines for Environmental Risk Assessment on Projects* (HJ169-2018).

①燃烧速率

①Combustion speed

由于柴油沸点高于环境温度，其燃烧速度采用下列公式进行计算：

As the boiling point of diesel oil is higher than the ambient temperature, its combustion speed is calculated using the following equation:

$$m_f = \frac{cH_c}{c_p(T_b - T_a) + H_V}$$

式中：m_f——液体单位面积燃烧速率，kg/（m²·s）；

Where, m_f -combustion speed of liquid per unit area, kg/(m²·s);

c——常数，0.001 kg/（m²·s）；

c-constant, 0.001 kg/(m²·s);

H_c——液体燃烧热，J/kg，取 4.27×10⁷ J/kg；

H_c-liquid combustion heat, J/kg, 4.27×10^7 J/kg for this project;

H_{vap}——蒸发热，J/kg，取 750×10^3 J/kg ；

H_{vap}-evaporation heat, J/kg, 750×10^3 J/kg for this project;

C_p——恒压时比热容，J/（kg・K），取 2100 J/（kg・K）；

C_p-specific heat at constant pressure, J/(kg·K), 2100 J/(kg·K) v;

T_b——沸点，K，取 553K；

T_b-boiling point, K, 553K for this project;

T_a——周围温度，K，取 298K。

T_a-ambient temperature, K, 298 K for this project.

由此可计算出柴油燃烧速率为 0.033 kg/m²·s，柴油泄漏后在柴油罐区内形成液池，

液池面积约为 55m^2，则柴油燃烧速率为 1.815kg/s。

From this, it can be calculated that the diesel oil combustion speed is 0.033 kg/m^2·s, and the area of liquid pool formed after leakage in the diesel oil storage tank area is about 55m^2, so the diesel oil combustion speed is 1.815kg/s.

②CO 产生量计算公式

②CO generation equation

$$G_{一氧化碳}=2330qCQ$$

$$G_{Carbon\ monoxide} = 2330qCQ$$

式中：$G_{一氧化碳}$：CO 的产生量，kg/s；

Where, G_{CO}: CO generation, kg/s;

C：物质中碳的含量，取 85%；

C: Content of carbon in the material, 85%;

q：不完全燃烧百分率，取 1.5~6.0%，本项目取 6%；

q: Incomplete combustion percentages, 1.5~6.0%, 6% for this project;

Q：参与燃烧的量（t/s）；

Q: Mass of matter involved in combustion, t/s.

根据计算，柴油不完全燃烧 SO_2、CO 源强结果见下表。

According to the calculation, the source intensities of SO2 and CO generated from diesel oil incomplete combustion are shown in the table below.

表 5.4-7　柴油储罐火灾燃烧源强计算

Table 5.4-7 Calculation of Combustion Source Intensity of Diesel Oil Storage Tank Fire

燃烧物质 Burning substance	燃烧速度 Combustion speed kg/（m^2·s） kg/(m^2·s)	燃烧量（kg/s） Combustion capacity (kg/s)	CO 产生量 CO output (kg/s)	排放高度 Emission height （m） (m)	燃烧时间 Combustion duration （min） (min)	环境温度 Ambient temperature （℃）
柴油 Diesel	0.033	1.815	0.216	0	30	25

5.4.2.7 二氧化氯事故源强

5.4.2.6 Chlorine dioxide accident source intensity

根据工程分析，二氧化氯按 24 小时连续制备，当发生压力爆炸事故，反应器立即停止进料，爆炸事故二氧化氯散放量按二氧化氯 5min 制备产量进行计算。二氧化氯制备系统设计能力为 50t/d，运行负荷 80%计算，二氧化氯制备产生速率为 0.46kg/s，本项

目二氧化氯车间设有气体监测及喷淋系统，事故发生后喷淋可有效控制二氧化氯扩散，废液进入事故池后待进一步处理，二氧化氯气体散放量以产生量 50%计算，因此二氧化氯发生压力爆炸事故后的散放量为 0.23kg/s，泄漏量为 69kg。

According to engineering analysis, chlorine dioxide is subject to 24-hour continuous preparation; in case a pressure explosion occurs, and the reactor immediately stops feeding, the chlorine dioxide dispersion in the explosion accident will be calculated as the chlorine dioxide preparation duration is 5min. The chlorine dioxide preparation system design capacity of is 50t/d, 80% of the operating load calculation, chlorine dioxide preparation production rate of 0.46kg/s, the project chlorine dioxide workshop with gas monitoring and spraying system, spraying after the accident can effectively control the spread of chlorine dioxide, waste liquid into the accident pond for further treatment, chlorine dioxide gas dispersion to produce 50% of the calculation, so the chlorine dioxide dispersion after a pressure explosion accident is 0.23kg/s, leakage of 69kg.

5.4.2.8 项目风险源强汇总

5.4.2.8 Summary of project risk source intensities

表 5.4-8 建设项目源强一览表

Table 5.4-8 Summary of Project Risk Source Intensities

序号 S. N.	风险事故情形描述 Description of risk accident scenario	危险单元 Hazard unit	危险物质 Hazardous substance	影响途径 Means of Impact	释放或泄漏速率 kg/s Release or leakage rate kg/s	释放或泄漏时间 min Release or leakage duration min	最大释放或泄漏量 kg Maximum release or leakage kg	蒸发时间 min Evaporation duration min	泄漏液体蒸发量 kg Evaporation of leaked liquid kg
1	硫酸储罐泄漏 Sulfuric acid storage tank leakage	化工库 Chemical ware house	硫酸 Sulphuric acid	大气、地表水、地下水、土壤 Atmosphere, surface water, groundwater, soil	0.00000005	10	90000	15	0.00054
2	氨水储罐泄漏 Ammonia water storage tank		氨水 Ammonia water		0.11	10	222000	15	99

序号 S. N.	风险事故情形描述 Description of risk accident scenario	危险单元 Hazard unit	危险物质 Hazardous substance	影响途径 Means of Impact	释放或泄漏速率 kg/s Release or leakage rate kg/s	释放或泄漏时间 min Release or leakage duration min	最大释放或泄漏量 kg Maximum release or leakage kg	蒸发时间 min Evaporation duration min	泄漏液体蒸发量 kg Evaporation of leaked liquid kg
	leakage								
3	过氧化氢储罐连接管破裂 Hydrogen peroxide storage tank connection pipe rupture		过氧化氢 Hydrogen peroxide	地表水、地下水、土壤 Surface water, groundwater, soil	0.36	10	216	/	/
4	氢氧化钠储罐连接管破裂 Sodium hydroxide storage tank connection pipe rupture		氢氧化钠 Sodium hydroxide		0.42	10	252	/	/
5	氯气泄漏 Chlorine leakage	氯气输送管线 Chlorine delivery pipes	氯气 Chlorine	大气 Atmosphere	0.074	10	44.4	/	/
6	柴油储罐泄漏 Diesel oil storage tank leakage	加油站 Gas station	柴油 Diesel	大气、地表水、地下水、土壤 Atmosphere, surface water, groundwater, soil	70	10	42000	/	/
7	火灾次生污染物排放 Discharge of fire secondary		CO		0.216	15	194.4	/	/

序号 S. N.	风险事故情形描述 **Description of risk accident scenario**	危险单元 **Hazard unit**	危险物质 **Hazardous substance**	影响途径 **Means of Impact**	释放或泄漏速率 kg/s **Release or leakage rate kg/s**	释放或泄漏时间 min **Release or leakage duration min**	最大释放或泄漏量 kg **Maximum release or leakage kg**	蒸发时间 min **Evaporation duration min**	泄漏液体蒸发量 kg **Evaporation of leaked liquid kg**
	pollutants								
8	二氧化氯爆炸 Chlorine dioxide explosion	二氧化氯制备车间 Chlorine dioxide preparation workshop	二氧化氯 Carbon dioxide	大气 Atmosphere	0.23	5	69	/	/

5.5 风险预测与评价

5.5 Risk prediction and assessment

5.5.1 有毒有害物质在大气中的扩散

5.5.1 Dissemination of toxic and hazardous Substances in the atmosphere

5.5.1.1 预测模型

5.5.1.1Prediction model

采用风险导则附录 G 中 G.2 推荐的理查德数 Ri 用为标准判断 CO 和甲醇是否为重质气体。Ri 的概念公式为：

The Richardson number Ri recommended in G.2 of Annex G of the *Technical Guidelines for Environmental Risk Assessment on Projects* is used as a criterion for determining whether CO and methanol are heavy gases. Ri's conceptual equation is:

$$R_i = \frac{\text{烟团的势能}}{\text{环境的湍流动能}}$$

Ri 是个流体动力学参数。根据不同的排放性质，理查德森数的计算公式不同。一般地，依据排放类型，理查得森数的计算分连续排放、瞬时排放两种形式：

Ri is a hydrodynamic parameter. The Richardson number is calculated depending on the nature of the discharge. In general, Richardson number is calculated as either continuous or instantaneous emission depending on the type of emission.

连续排放：

Continuous emission:

$$R_i = \frac{\left[\frac{g(Q/\rho_{rel})}{D_{rel}} \times \left(\frac{\rho_{rel}-\rho_a}{\rho_a}\right)\right]^{\frac{1}{3}}}{U_r}$$

瞬时排放：

Instantaneous emission:

$$R_i = \frac{g(Q_t/\rho_{rel})^{\frac{1}{3}}}{U_r^2} \times \left(\frac{\rho_{rel}-\rho_a}{\rho_a}\right)$$

式中：ρ_{rel}——排放物质进入大气的初始密度，kg/m^3；

Where, ρrel-initial density of the emitted substance into the atmosphere, kg/m^3;

ρa——环境空气密度，kg/m^3；

ρa-ambient air density, kg/m^3;

Q——连续排放烟羽的排放速率，kg/s；

Q-emission rate of the continuous plume, kg/s;

Qt——瞬时排放的物质质量，kg；

Qt-mass of the substance emitted instantaneously, kg;

Drel——初始的烟团宽度，即源直径，m；

Drel-initial puff width, i.e. source diameter, m;

Ur—10m 高处风速，m/s。

Ur-wind velocity at 10m height, m/s.

判定连续排放还是瞬时排放，可以通过对比排放时间 Td 和污染物到达最近的受体

点（网格点或敏感点）的时间 T 确定。

Determining whether a continuous or instantaneous emission can be determined by comparing the emission time Td with the time T when the pollutant reaches the nearest receptor point (grid point or sensitive point).

$$T = \frac{2X}{U_r}$$

式中：X——事故发生地与计算点的距离，m，取最近敏感点川江 30m；

Where, X-distance between the accident site and the calculation point, m, the nearest sensitive point, Chuanjiang River, 30m for this project;

Ur——10m 高处风速，m/s。假设风速和风向在 T 时间段内保持不变，按导则推荐最不利风速 1.5m/s 取值。

Ur-wind velocity at 10m height, m/s. Assuming that the wind velocity and direction remain unchanged over the T time period, the most unfavorable wind velocity of 1.5 m/s is recommended in accordance with the *Technical Guidelines for Environmental Risk Assessment on Projects*.

当 T_d＞T 时，可被认为是连续排放；当 $T_d \leq T$ 时，可被认为是瞬时排放。

When T_d＞T, it can be considered a continuous emission; when $T_d \leq T$, it can be considered an instantaneous emission.

对于连续排放，Ri≥1/6 为重质气体，Ri＜1/6 为轻质气体；对于瞬时排放，Ri＞0.04 为重质气体，Ri≤0.04 为轻质气体。当 Ri 处于临界值附近时，说明烟团/烟羽既不是典型的重质气体扩散，也不是典型的轻质气体扩散。可以进行敏感性分析，分别采用重质气体和轻质气体模型进行模拟，选取影响范围最大的结果。

For continuous emissions, Ri≥1/6 indicates heavy gas and Ri<1/6 indicates light gas; for instantaneous emissions, Ri>0.04 indicates heavy gas and Ri≤0.04 indicates light gas. When Ri is near a critical value, it indicates that the puff/plume is neither typical diffusion of heavy gas nor typical diffusion of light gas. Sensitivity analyses can be performed by simulations using heavy and light gas models, respectively, to select the results with the greatest range of influence.

根据计算，各污染因子推荐选取模型如下。

Based on the calculations, the recommended model for each pollution factor is as follows.

表 5.5-1 环境风险预测选取模型一览表
Table 5.5-1 List of Selected Models for Environmental Risk Prediction

气体名称 **Gas name**	到达时间 **T Arrival time T**	排放时间 **T_d Emission time T_d**	排放形式 **Emission form**	理查德森数 **Richardson number**	判断标准 **Judgment criteria**	气体性质 **Gas property**	选取预测模型 **Selected prediction model**
氨水 Ammonia water	20S	15min	连续排放 Continuous emission	/	烟团初始密度未大于空气 Initial density of puff not greater than air	轻气体 Light gas	AFTOX
氯气 Chlorine	20S	15min	连续排放 Continuous emission	2.06	Ri≥1/6	重质气体 Heavy gas	SLAB
CO	20S	30min	连续排放 Continuous emission	/	烟团初始密度未大于空气 Initial density of puff not greater than air	轻气体 Light gas	AFTOX
二氧化氯 Carbon dioxide	20S	5min	连续排放 Continuous emission	0.82	Ri≥1/6	重质气体 Heavy gas	SLAB

注：硫酸蒸发量较小，对周边环境空气影响不大，因此不进行预测。
Note: Sulfuric acid has a small evaporation and has no significant impact on the ambient air, and therefore is not predicted.

5.5.1.2 事故源参数

5.5.1.2 Accident source parameters

事故源强具体见表 5.4-7。

See Table 5.4-7 for the accident source intensity.

5.5.1.3 气象参数

5.5.1.3 Meteorological parameters

根据北海气象统计数据的大气稳定度以中性类 D 类为主。本次预测以 D 类稳定度下的年平均风速(3.2m/s)下进行评价，并对最不利气象条件 F 类稳定度，1.5m/s 风速，温度 25℃，相对湿度 50%进行后果预测。

According to the North Sea meteorological statistics, atmospheric stability is mainly neutral category D. The prediction assesses the meteorological parameters at the annual average wind velocity (3.2 m/s) at the stability of category D, and predicts the consequences for the most adverse meteorological conditions at the wind velocity of 1.5 m/s at the stability of category F under the conditions of 25°C temperature and 50% relative humidity.

5.5.1.4 大气毒性终点浓度值

5.5.1.4 Air toxic endpoint

表 5.5-2 各污染因子毒性终点浓度 单位：mg/m³

Table 5.5-2 Air Toxic Endpoint of Each Pollution Factor in mg/m³

污染因子 Pollution factor	毒性终点浓度-1/（mg/m³） Air toxic endpoint-1/(mg/m³)	毒性终点浓度-2/ Air toxic endpoint-2/（mg/m³） (mg/m³)	标准来源 Standard source
氯气 Chlorine	58	5.8	《建设项目环境风险评价技术导则》（HJ169-2018）附录 H Annex H of the *Technical Guidelines for Environmental Risk Assessment on Projects* (HJ169-2018)
氨水 Ammonia water	770	110	
二氧化氯 Carbon dioxide	6.6	3	
一氧化碳 Carbon monoxide	380	95	

5.5.1.5 预测模型主要参数

5.5.1.5 Main parameters of prediction model

表 5.5-3 大气风险预测模型主要参数表

Table 5.5.1.5 Main Parameters of Atmospheric Risk Prediction Model

参数类型 Parameter type	选项 Options	参数 Parameters			
		氨水泄漏 Ammonia water leakage	氯气泄漏 Chlorine leakage	柴油火灾 Diesel oil fire	二氧化氯泄漏 Chlorine dioxide leakage
基本情况 Basic information	事故源经纬度° Accident source latitude and longitude°	109.546919	109.54667	109.54467	109.54677
	事故源纬度° Accident source latitude°	21.5240016	21.525836	21.52637	21.524836
	事故源类型 Accident source type	泄漏 Leakage			
气象参数 Meteorological parameter	气象条件类型 Meteorological condition type	最常见气象条件 Most common meteorological condition		最不利气象条件 Most adverse meteorological condition	
	风速 m/s	3.2		1.5	

参数类型 **Parameter type**	选项 **Options**	参数 **Parameters**			
		氨水泄漏 **Ammonia water leakage**	氯气泄漏 **Chlorine leakage**	柴油火灾 **Diesel oil fire**	二氧化氯泄漏 **Chlorine dioxide leakage**
	Wind velocity m/s				
	环境温度℃ Ambient temperature ℃	25		25	
	相对湿度% Relative humidity%	—		50	
	稳定度 Stability	D		F	
其他参数 Other parameters	地表粗糙度 cm Surface roughness cm	城市地形、地表湿度主要为湿润气候，按通用地表类型地面特征参数选取 Select the urban topography and surface humidity (humid climate) according to the surface characteristics parameters of common surface type.			100
	是否考虑地形 Whether the terrain is taken into account	不考虑 Not considered			
	地形数据精度 m Topography data accuracy m	—			

5.5.1.6 预测结果

5.5.1.6 Prediction results

1、氨水泄漏事故风险预测

1. Risk prediction for ammonia water leakage

（1）预测结果

(1) Prediction results

单个氨水储罐破裂，氨水泄露积聚在围堰内蒸发释放出氨气，扩散至大气环境，造成大气环境风险事故的预测见表 5.5-4。

A single ammonia water storage tank ruptures, and ammonia water leaks and accumulates in the cofferdam and evaporates to release ammonia gas, which spread to the atmospheric environment. Prediction of atmospheric environmental risk accidents is shown in Table 5.5-4.

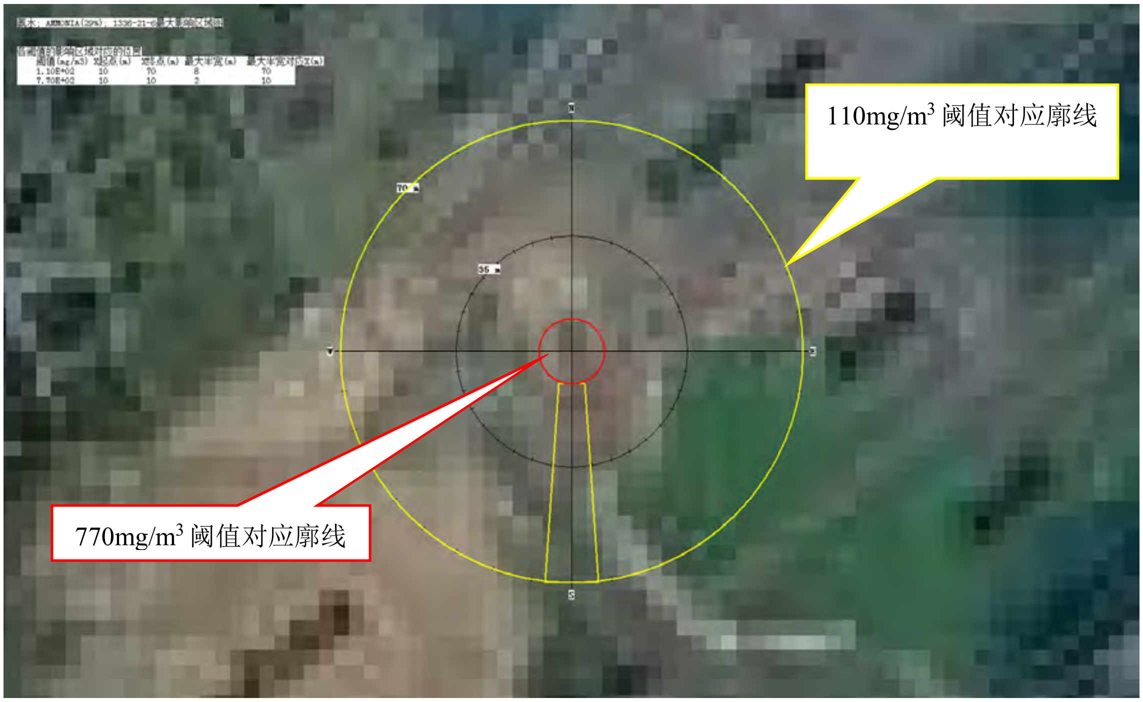
表 5.5-4　氨水泄露下风向轴线预测结果表

Table 5.5-4 Downwind Axis Prediction Results for Ammonia Water Leakage

距离 m Distance m	最不利气象条件 Most adverse meteorological condition		常见气象条件 Most common meteorological conditions	
	浓度出现时间 min Concentration time min	高峰浓度 mg/m³ Peak concentration mg/m³	浓度出现时间 min Concentration time min	高峰浓度 mg/m³ Peak concentration mg/m³
10	0.11	1.13E+03	0.05	1.70E+03
110	1.22	2.24E+02	0.57	5.28E+01
210	2.33	7.88E+01	1.09	1.76E+01
310	3.44	4.15E+01	1.61	8.99E+00
410	4.56	2.61E+01	2.14	5.54E+00
510	5.67	1.81E+01	2.66	3.80E+00
610	6.78	1.34E+01	3.18	2.78E+00
710	7.89	1.04E+01	3.70	2.14E+00
810	9.00	8.35E+00	4.22	1.70E+00
910	10.11	6.87E+00	4.74	1.39E+00
1010	11.22	5.77E+00	5.26	1.16E+00
1110	12.33	4.93E+00	5.78	9.77E-01
1210	13.44	4.26E+00	6.30	8.60E-01
1310	14.56	3.73E+00	6.82	7.65E-01
1410	20.67	3.28E+00	7.34	6.86E-01
1510	21.78	2.99E+00	7.86	6.20E-01
2010	28.33	2.04E+00	10.47	4.06E-01
2510	35.89	1.52E+00	13.07	2.92E-01
3010	40.44	1.19E+00	22.68	2.23E-01
3510	46.00	9.68E-01	25.28	1.78E-01
4010	51.56	8.06E-01	27.89	1.45E-01
4510	57.11	6.83E-01	30.49	1.21E-01
4960	62.11	5.95E-01	32.83	1.05E-01
毒性终点浓度 Air toxic endpoint	起点 m Starting point m	终点 m Endpoint m	起点 m Starting point m	终点 m Endpoint m
大气毒性终点浓度-1 对应位置 m Position corresponding to air toxic endpoint-1 m	10	170	10	70
大气毒性终点浓度-2 对应位置 m Position corresponding to air toxic endpoint-2 m	40	40	10	10

图 5.5-1　最不利气象条件氨气最大影响范围图

Fig. 5.5-1 Map of the Maximum Impact Range for Ammonia Gas under the Most Adverse Meteorological Conditions



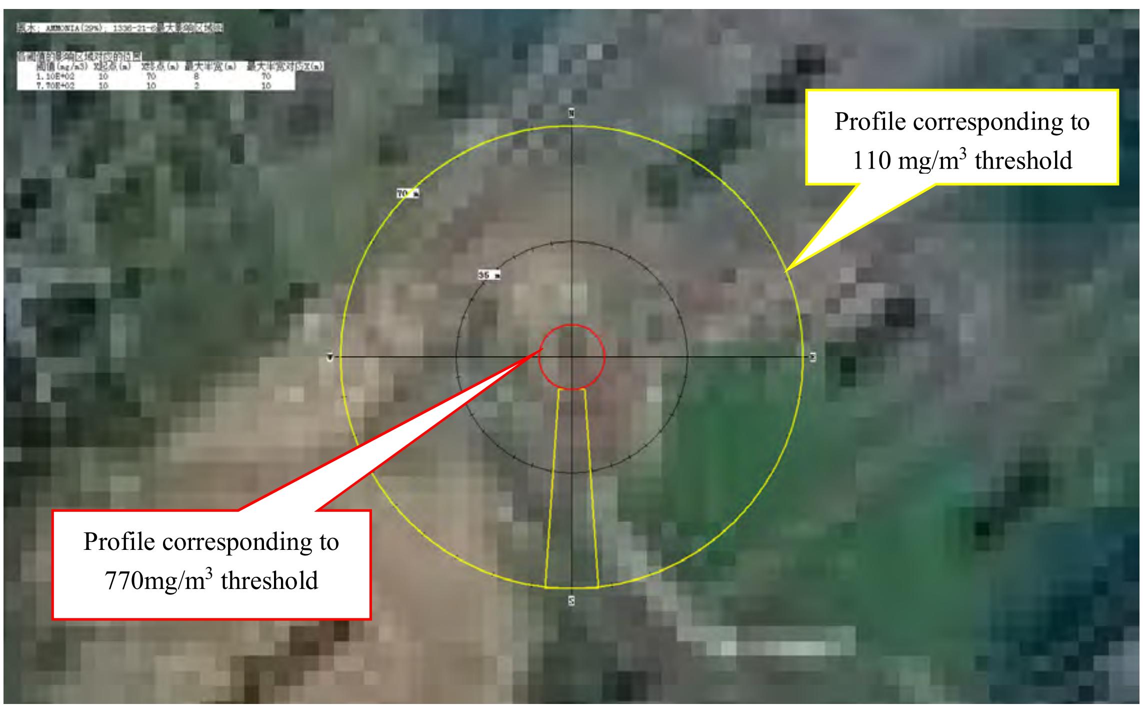


图 5.5-2　最常见气象条件氨气最大影响范围图

Fig. 5.5-2 Map of the Maximum Impact Range for Ammonia Gas under the Most Common Meteorological Conditions

根据最大影响范围图，最不利气象条件及最常见气象条件下，最大影响范围均不涉及敏感点，因此关心点预测结果仅分析影响范围更广的最不利气象条件下浓度随时间变

化情况。在预测中，由于软件只能预测单一风向浓度，因此在模型中，设定在单一风险 S 情况下，让评价范围内敏感目标刚好处于预测单一风向 S 下风向，即 Y 轴设为各敏感目标与风险源的距离，再次运行模型。关心点氨气浓度随时间变化见下表。

According to the maximum impact range map, the maximum impact range does not involve sensitive points under both the most adverse and the most common meteorological conditions, so the prediction results of the locations of concern only analyze the change in concentration over time under the most adverse meteorological conditions with a wider impact range. In the prediction, since the software can only predict the concentration in a single wind direction, the model is so designed that the sensitive targets in the assessment scope are just located in the predicted single downwind direction S provided that a single wind direction S is set, i.e. the Y axis is set to the distance of each sensitive target from the risk source. The model should be operated again if concentrations in other wind direction are required to be predicted. The ammonia gas concentration at the locations of concern varies over time as shown in the table below.

表 5.5-5　最不利气象条件下氨水泄漏关系点预测结果

Table 5.5-5 Prediction Results of Ammonia Water Leakage at Locations of Concern under the Most Adverse Meteorological Conditions

单位：mg/m³

Unit: mg/m³

时间 Time	5min	10min	15min	20min	25min	30min
大塘村 Datang Village	0.00E+00	0.00E+00	0.00E+00	2.35E-14	1.30E-08	1.15E-03
对面垌 Duimiandong	0.00E+00	0.00E+00	0.00E+00	1.47E+00	2.42E+00	2.42E+00
彬垌村 Bindong Village	0.00E+00	0.00E+00	0.00E+00	5.19E-10	4.06E-04	2.13E-01
老妗垌 Laojindong	0.00E+00	0.00E+00	3.55E+00	3.55E+00	3.55E+00	1.85E+00
新岭 Xinling	0.00E+00	0.00E+00	0.00E+00	1.43E-01	2.00E+00	2.06E+00
猪血塘 Zhuxuetang	0.00E+00	0.00E+00	0.00E+00	8.09E-04	6.42E-01	1.70E+00
中石化倒班宿舍 Sinopec shift dormitory	0.00E+00	0.00E+00	0.00E+00	5.19E-10	4.06E-04	2.13E-01
百班村	0.00E+00	0.00E+00	0.00E+00	5.09E-02	1.78E+00	1.97E+00

时间 **Time**	**5min**	**10min**	**15min**	**20min**	**25min**	**30min**
Baiban Village						
东方海岸大酒店 Oriental Coast Hotel	0.00E+00	0.00E+00	0.00E+00	5.19E-10	4.06E-04	2.13E-01
竹儿根 Zhuergen	0.00E+00	0.00E+00	0.00E+00	1.38E+00	2.40E+00	2.40E+00
山心 Shanxin	0.00E+00	0.00E+00	0.00E+00	2.59E+00	2.73E+00	2.71E+00
川江 Chuanjiang	0.00E+00	9.97E+00	9.97E+00	9.97E+00	1.14E-02	0.00E+00
坡尾底 Poweidi	0.00E+00	9.97E+00	9.97E+00	9.97E+00	1.14E-02	0.00E+00
南乐 Nanyue	0.00E+00	0.00E+00	3.19E+00	3.19E+00	3.19E+00	2.65E+00
岸泽 Anze	0.00E+00	1.07E+01	1.07E+01	1.07E+01	5.43E-04	0.00E+00
北暮 Beimu	0.00E+00	1.07E+01	1.07E+01	1.07E+01	5.43E-04	0.00E+00
那格塘（陂头） Nagetang (Pitou)	0.00E+00	0.00E+00	0.00E+00	6.57E-05	2.80E-01	1.57E+00
新铺 Xinpu	0.00E+00	0.00E+00	4.58E+00	4.58E+00	4.58E+00	5.33E-02
海山排 Haishanpai	0.00E+00	0.00E+00	0.00E+00	3.16E-02	1.66E+00	1.93E+00
亚细村 Yaxi Village	0.00E+00	0.00E+00	0.00E+00	1.92E-02	1.53E+00	1.89E+00
南乐社区 Nanyue Community	0.00E+00	0.00E+00	0.00E+00	8.59E-09	3.40E-03	5.30E-01
谢家村 Xiejiacun Village	0.00E+00	0.00E+00	0.00E+00	9.52E-01	2.32E+00	2.32E+00
华南北苑 Huanan Beiyuan	0.00E+00	0.00E+00	0.00E+00	5.76E-06	1.89E-01	1.50E+00
油麻山村 Youmashan Village	0.00E+00	0.00E+00	0.00E+00	1.57E-12	4.40E-07	1.45E-02
东岸场村 Donganchang Village	0.00E+00	0.00E+00	0.00E+00	1.90E-13	7.68E-08	4.29E-03
山芦村 Shanlu Village	0.00E+00	0.00E+00	0.00E+00	2.02E-17	2.38E-11	6.57E-07
大炮岭村 Dapaoling Village	0.00E+00	0.00E+00	0.00E+00	1.80E-21	3.39E-15	3.22E-10
旦场村 Danchang Village	0.00E+00	0.00E+00	0.00E+00	3.89E-25	7.83E-19	1.37E-13
只郎村	0.00E+00	0.00E+00	0.00E+00	1.70E-19	2.72E-13	1.54E-08

时间 Time	5min	10min	15min	20min	25min	30min
Zhilang Village						
贵余坛村 Guiyutan Village	0.00E+00	0.00E+00	0.00E+00	4.78E-08	1.10E-02	8.03E-01
浸谷塘村 Jingutang Village	0.00E+00	0.00E+00	0.00E+00	7.95E-26	1.57E-19	2.97E-14
大竹园 Dazhuyuan	0.00E+00	0.00E+00	0.00E+00	4.57E-12	1.04E-06	2.55E-02
彬定（旧） Binding (old)	0.00E+00	0.00E+00	0.00E+00	7.44E-11	6.24E-05	9.70E-02
新村坡 Xincunpo	0.00E+00	0.00E+00	0.00E+00	1.95E-12	5.23E-07	1.62E-02
江底村 Jiangdi Village	0.00E+00	0.00E+00	0.00E+00	3.96E-16	3.57E-10	4.07E-05
彬定（新） Binding (New village)	0.00E+00	0.00E+00	0.00E+00	2.66E-04	4.37E-01	1.64E+00
槟榔根 Binlanggen	0.00E+00	0.00E+00	0.00E+00	1.65E-11	2.86E-06	4.85E-02
塘细村 Tangxi Village	0.00E+00	0.00E+00	0.00E+00	4.35E-19	6.61E-13	3.30E-08
邓屋（川江村） Dengwu (Chuanjiang Village)	0.00E+00	0.00E+00	5.78E+00	5.78E+00	5.45E+00	0.00E+00
港务集团宿舍区 Port Group dormitory	0.00E+00	0.00E+00	0.00E+00	6.66E-14	3.17E-08	2.25E-03
屋背山 Wubeishan	0.00E+00	0.00E+00	0.00E+00	4.35E-19	6.61E-13	3.30E-08
彬嵩 Binsong	0.00E+00	0.00E+00	0.00E+00	3.16E-02	1.66E+00	1.93E+00
冲头村 Chongtou Village	0.00E+00	0.00E+00	0.00E+00	3.87E-20	6.60E-14	4.50E-09
大田 Datian	0.00E+00	0.00E+00	0.00E+00	3.37E-10	2.83E-04	1.81E-01
北塘村 Beitang Village	0.00E+00	0.00E+00	0.00E+00	1.75E-25	3.50E-19	6.38E-14
下底村 Xiadi Village	0.00E+00	0.00E+00	0.00E+00	3.89E-25	7.83E-19	1.37E-13
黄稍村 Huangshao Village	0.00E+00	0.00E+00	0.00E+00	1.68E-26	3.24E-20	6.51E-15
淡水口 Danshuikou	0.00E+00	0.00E+00	0.00E+00	3.89E-25	7.83E-19	1.37E-13
兴港镇彬定小学 Xinggang Town Binding	0.00E+00	0.00E+00	0.00E+00	5.45E-13	1.85E-07	7.97E-03

时间 Time	5min	10min	15min	20min	25min	30min
Primary School						
红花根 Honghuangen	0.00E+00	0.00E+00	0.00E+00	6.66E-14	3.17E-08	2.25E-03
山梓 Shanzi	0.00E+00	0.00E+00	0.00E+00	1.10E-29	1.73E-23	4.05E-18
邓九垌 Dengjiudong	0.00E+00	0.00E+00	0.00E+00	1.36E-02	1.43E+00	1.87E+00
彬池村 Binchi Village	0.00E+00	0.00E+00	0.00E+00	2.02E-17	2.38E-11	6.57E-07
下低垌村 Xiadidong Village	0.00E+00	0.00E+00	0.00E+00	6.66E-14	3.17E-08	2.25E-03
上高垌 Shanggaodong	0.00E+00	0.00E+00	0.00E+00	4.39E-21	8.08E-15	7.01E-10
上陂头 Shangpitou	0.00E+00	0.00E+00	0.00E+00	1.08E-20	1.93E-14	1.52E-09
下陂头 Xiapitou	0.00E+00	0.00E+00	0.00E+00	3.10E-22	6.08E-16	6.78E-11
南冲 Nanchong	0.00E+00	0.00E+00	0.00E+00	1.89E-28	3.28E-22	7.41E-17
地罗 Diluo	0.00E+00	0.00E+00	0.00E+00	1.68E-26	3.24E-20	6.51E-15
兴港镇 Xinggang Town	0.00E+00	0.00E+00	0.00E+00	5.50E-30	8.41E-24	1.98E-18

表 5.5-6 最常见气象条件下氨水泄漏关系点预测结果

Table 5.5-6 Prediction Results of Ammonia Water Leakage at Locations of Concern under the Most Common Meteorological Conditions

单位：mg/m³

Unit: mg/m³

时间 Time	5min	10min	15min	20min	25min	30min
大塘村 Datang Village	0.00E+00	0.00E+00	0.00E+00	1.71E-01	1.92E-01	1.66E-01
对面垌 Duimiandong	0.00E+00	4.98E-01	4.98E-01	4.98E-01	1.26E-01	0.00E+00
彬垌村 Bindong Village	0.00E+00	0.00E+00	2.41E-01	2.40E-01	2.39E-01	1.17E-01
老妗垌 Laojindong	0.00E+00	7.48E-01	7.48E-01	7.32E-01	5.97E-04	0.00E+00
新岭	0.00E+00	4.15E-01	4.15E-01	4.15E-01	2.49E-01	1.45E-04

时间 Time	5min	10min	15min	20min	25min	30min
Xinling						
猪血塘 Zhuxuetang	0.00E+00	0.00E+00	3.37E-01	3.37E-01	3.01E-01	8.72E-03
中石化倒班宿舍 Sinopec shift dormitory	0.00E+00	0.00E+00	2.41E-01	2.40E-01	2.39E-01	1.17E-01
百班村 Baiban Village	0.00E+00	3.94E-01	3.94E-01	3.94E-01	2.73E-01	5.19E-04
东方海岸大酒店 Oriental Coast Hotel	0.00E+00	0.00E+00	2.41E-01	2.40E-01	2.39E-01	1.17E-01
竹儿根 Zhuergen	0.00E+00	4.94E-01	4.94E-01	4.94E-01	1.29E-01	0.00E+00
山心 Shanxin	0.00E+00	5.69E-01	5.69E-01	5.68E-01	4.29E-02	0.00E+00
川江 Chuanjiang	2.14E+00	2.14E+00	2.14E+00	2.18E-02	0.00E+00	0.00E+00
坡尾底 Poweidi	2.14E+00	2.14E+00	2.14E+00	2.18E-02	0.00E+00	0.00E+00
南乐 Nanyue	0.00E+00	6.79E-01	6.79E-01	6.72E-01	4.05E-03	0.00E+00
那格塘（陂头） Nagetang (Pitou)	0.00E+00	0.00E+00	3.16E-01	3.16E-01	2.95E-01	1.87E-02
新铺 Xinpu	0.00E+00	9.39E-01	9.39E-01	8.31E-01	0.00E+00	0.00E+00
海山排 Haishanpai	0.00E+00	3.86E-01	3.86E-01	3.86E-01	2.83E-01	8.57E-04
亚细村 Yaxi Village	0.00E+00	3.78E-01	3.78E-01	3.78E-01	2.86E-01	1.23E-03
南乐社区 Nanyue Community	0.00E+00	0.00E+00	2.58E-01	2.58E-01	2.55E-01	8.80E-02
谢家村 Xiejiacun Village	0.00E+00	4.74E-01	4.74E-01	4.74E-01	1.61E-01	0.00E+00
华南北苑 Huanan Beiyuan	0.00E+00	0.00E+00	3.08E-01	3.08E-01	2.92E-01	2.41E-02
油麻山村 Youmashan Village	0.00E+00	0.00E+00	2.11E-01	2.03E-01	2.10E-01	1.55E-01
东岸场村 Donganchang Village	0.00E+00	0.00E+00	2.01E-01	1.87E-01	2.01E-01	1.63E-01
山芦村 Shanlu Village	0.00E+00	0.00E+00	0.00E+00	1.06E-01	1.64E-01	1.59E-01
大炮岭村 Dapaoling Village	0.00E+00	0.00E+00	0.00E+00	3.56E-02	1.22E-01	1.36E-01
旦场村	0.00E+00	0.00E+00	0.00E+00	8.49E-03	6.80E-02	1.13E-01

时间 **Time**	**5min**	**10min**	**15min**	**20min**	**25min**	**30min**
Danchang Village						
只郎村 Zhilang Village	0.00E+00	0.00E+00	0.00E+00	6.48E-02	1.45E-01	1.48E-01
贵余坛村 Guiyutan Village	0.00E+00	0.00E+00	2.70E-01	2.69E-01	2.65E-01	6.99E-02
浸谷塘村 Jingutang Village	0.00E+00	0.00E+00	0.00E+00	6.22E-03	5.81E-02	1.07E-01
大竹园 Dazhuyuan	0.00E+00	0.00E+00	2.16E-01	2.10E-01	2.15E-01	1.52E-01
彬定（旧） Binding (old)	0.00E+00	0.00E+00	2.30E-01	2.28E-01	2.29E-01	1.34E-01
新村坡 Xincunpo	0.00E+00	0.00E+00	2.12E-01	2.04E-01	2.11E-01	1.55E-01
江底村 Jiangdi Village	0.00E+00	0.00E+00	0.00E+00	1.34E-01	1.76E-01	1.64E-01
彬定（新） Binding (New village)	0.00E+00	0.00E+00	3.26E-01	3.26E-01	2.98E-01	1.26E-02
槟榔根 Binlanggen	0.00E+00	0.00E+00	2.22E-01	2.18E-01	2.22E-01	1.45E-01
塘细村 Tangxi Village	0.00E+00	0.00E+00	0.00E+00	7.22E-02	1.49E-01	1.50E-01
邓屋（川江村） Dengwu (Chuanjiang Village)	1.20E+00	1.20E+00	1.20E+00	7.34E-01	0.00E+00	0.00E+00
港务集团宿舍区 Port Group dormitory	0.00E+00	0.00E+00	1.97E-01	1.79E-01	1.96E-01	1.64E-01
屋背山 Wubeishan	0.00E+00	0.00E+00	0.00E+00	7.22E-02	1.49E-01	1.50E-01
彬嵩 Binsong	0.00E+00	3.86E-01	3.86E-01	3.86E-01	2.83E-01	8.57E-04
冲头村 Chongtou Village	0.00E+00	0.00E+00	0.00E+00	5.41E-02	1.38E-01	1.44E-01
大田 Datian	0.00E+00	0.00E+00	2.38E-01	2.37E-01	2.37E-01	1.21E-01
北塘村 Beitang Village	0.00E+00	0.00E+00	0.00E+00	7.27E-03	6.30E-02	1.10E-01
下底村 Xiadi Village	0.00E+00	0.00E+00	0.00E+00	8.49E-03	6.80E-02	1.13E-01
黄稍村 Huangshao Village	0.00E+00	0.00E+00	0.00E+00	4.52E-03	4.91E-02	1.02E-01
淡水口 Danshuikou	0.00E+00	0.00E+00	0.00E+00	8.49E-03	6.80E-02	1.13E-01

时间 **Time**	**5min**	**10min**	**15min**	**20min**	**25min**	**30min**
兴港镇彬定小学 Xinggang Town Binding Primary School	0.00E+00	0.00E+00	2.06E-01	1.95E-01	2.06E-01	1.60E-01
红花根 Honghuangen	0.00E+00	0.00E+00	1.97E-01	1.79E-01	1.96E-01	1.64E-01
山梓 Shanzi	0.00E+00	0.00E+00	0.00E+00	8.73E-04	1.78E-02	6.82E-02
邓九垌 Dengjiudong	0.00E+00	3.72E-01	3.72E-01	3.72E-01	2.89E-01	1.59E-03
彬池村 Binchi Village	0.00E+00	0.00E+00	0.00E+00	1.06E-01	1.64E-01	1.59E-01
下低垌村 Xiadidong Village	0.00E+00	0.00E+00	1.97E-01	1.79E-01	1.96E-01	1.64E-01
上高垌 Shanggaodong	0.00E+00	0.00E+00	0.00E+00	4.04E-02	1.26E-01	1.39E-01
上陂头 Shangpitou	0.00E+00	0.00E+00	0.00E+00	4.57E-02	1.31E-01	1.41E-01
下陂头 Xiapitou	0.00E+00	0.00E+00	0.00E+00	2.73E-02	1.11E-01	1.32E-01
南冲 Nanchong	0.00E+00	0.00E+00	0.00E+00	1.70E-03	2.75E-02	8.22E-02
地罗 Diluo	0.00E+00	0.00E+00	0.00E+00	4.52E-03	4.91E-02	1.02E-01
兴港镇 Xinggang Town	0.00E+00	0.00E+00	0.00E+00	7.38E-04	1.59E-02	6.47E-02

（2）风险后果分析

(2) Analysis of risk consequences

由预测结果可知，在设定的氨水储罐发生泄漏，氨水泄漏聚集在围堰内蒸发进入大气环境，造成大气风险事故情形下，氨气出现超大气毒性终点浓度-1 的最远距离为 40m，出现超大气毒性终点浓度-2 的最远距离为 170m，对应的不利气象条件为风速 1.5m/s，稳定度 F。无论在最不利气象条件还是最常见气象条件下，氨水蒸发的预测浓度在各关心均未超过毒性终点浓度-1 和毒性终点浓度-2。

It can be seen from the prediction results that in the case of ammonia water leaking from the set storage tank, accumulating in the cofferdam and evaporating into the atmospheric environment, resulting in an atmospheric risk accident, the farthest distance for ammonia having a concentration above the air toxic endpoint-1 is 40m, the farthest distance for ammonia gas having a concentration above the air toxic endpoint-2 is 170m, the corresponding adverse meteorological conditions are wind velocity 1.5m/s and stability F. Predicted concentrations of ammonia water evaporation do not exceed air toxic endpoint-1 and air toxic endpoint-2 under either the most adverse or the most common meteorological conditions at locations of concern.

（3）风险事故疏散范围

(3) Scope of risk accident evacuation

根据预测结果，在设定的氨水储罐泄漏事故情景下，毒性终点浓度-1 和毒性终点浓度-2 内均不存在环境敏感目标，因此事故发生首要疏散范围为厂内工作人员，除应急处置人员外，其他人员应沿厂区道路有序疏散，在临时应急场所进行集合。

According to the prediction results, there are no environmentally sensitive targets within air toxic endpoint-1 and air toxic endpoint-2 under the set scenario of ammonia water leaking from the storage tank, therefore, the primary evacuees are the employees in the plant, except for emergency disposal personnel, and other personnel should be evacuated in an orderly manner along the plant road and get together at temporary emergency locations.

2、氯气泄漏事故预测

2. Chlorine leakage accident prediction

（1）预测结果

(1) Prediction results

二氧化氯制备车间管线发生泄漏，设备中氯气扩散至大气环境，造成大气环境风险事故的预测见表 5.5-7。

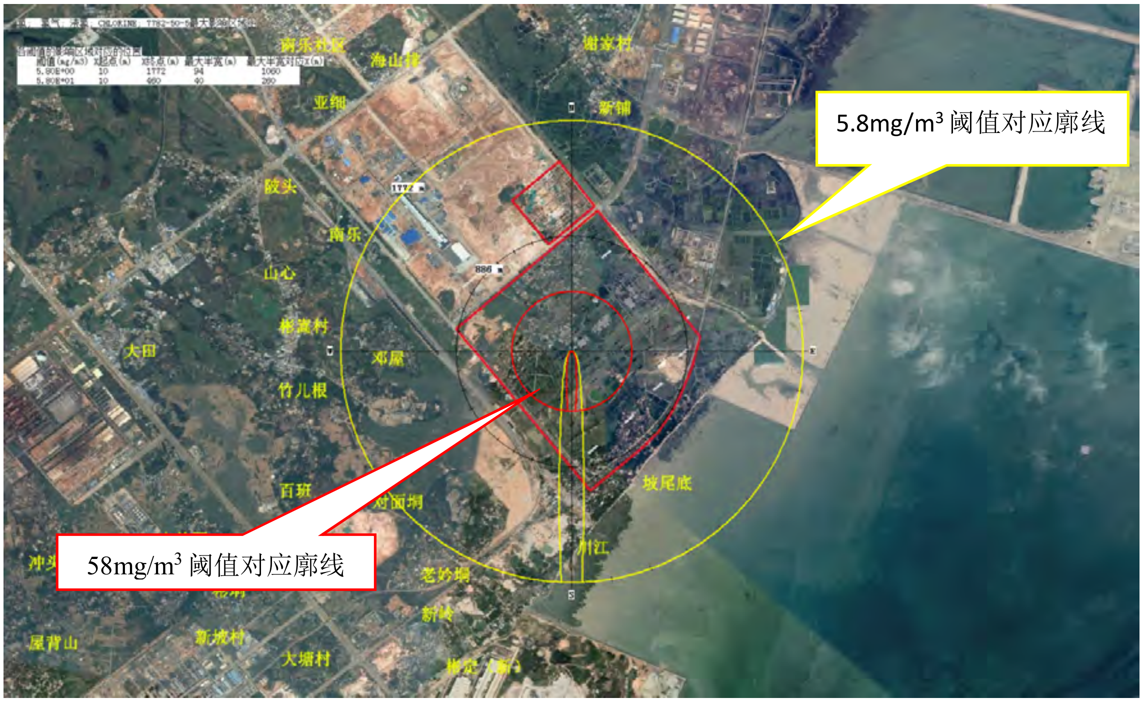
The predictions of atmospheric risk accidents caused by leaks in the chlorine dioxide preparation plant pipes and the spread of chlorine from the equipment to the atmosphere are shown in Table 5.5-7.

表 5.5-7　氯气泄露下风向轴线预测结果表（最不利气象）

Table 5.5-7 Downwind Axis Prediction Results for Chlorine Leakage (Most Adverse Meteorological Conditions)

距离(m) Distance (m)	浓度出现时间 (min) Concentration time (min)	高峰浓度 (mg/m^3) Peak concentration	质心高度(m) Height of center of mass (m)	出现时间 (min) Emergence time (min)	质心浓度 (mg/m^3) Concentration at center of

		(mg/m^3)			mass (mg/m^3)
10	5.31	3.31E+03	0.00	5.31	7.89E+03
110	8.70	4.10E+02	0.00	8.70	4.85E+02
210	12.44	1.83E+02	0.00	11.44	1.83E+02
310	13.43	1.04E+02	0.00	13.43	1.04E+02
410	15.19	6.93E+01	0.00	15.19	6.93E+01
510	16.81	5.00E+01	0.00	16.81	5.00E+01
610	18.33	3.80E+01	0.00	18.33	3.80E+01
710	19.77	2.97E+01	0.00	19.77	2.97E+01
810	21.16	2.39E+01	0.00	21.16	2.39E+01
910	22.49	1.96E+01	0.00	22.49	1.96E+01
1010	23.79	1.64E+01	0.00	23.79	1.64E+01
1110	25.05	1.38E+01	0.00	25.05	1.38E+01
1210	26.28	1.19E+01	0.00	26.28	1.19E+01
1310	27.48	1.03E+01	0.00	27.48	1.03E+01
1410	28.66	8.95E+00	0.00	28.66	8.95E+00
1510	29.82	7.88E+00	0.00	29.82	7.88E+00
2010	35.34	4.57E+00	0.00	35.34	4.57E+00
2510	40.52	2.93E+00	0.00	40.52	2.93E+00
3010	45.46	2.03E+00	0.00	45.46	2.03E+00
3510	50.20	1.50E+00	0.00	50.20	1.50E+00
4010	54.80	1.13E+00	0.00	54.80	1.13E+00
4510	59.27	8.97E-01	0.00	59.27	8.97E-01
5010	63.63	7.16E-01	0.00	63.63	7.16E-01
6010	72.09	4.94E-01	0.00	72.09	4.94E-01
7010	80.27	3.60E-01	0.00	80.27	3.60E-01
类型 Type	阈值(mg/m^3) Threshold (mg/m^3)	X 起点(m) X starting point (m)	X 终点(m) X endpoint (m)	最大半宽(m) FWHM (m)	最大半宽对应 X(m) FWHM corresponding X (m)
毒性终点浓度-2/（mg/m^3） Air toxic endpoint-2/(mg/m^3)	5.8	10	1772	94	1060
毒性终点浓度-1/（mg/m^3） Air toxic endpoint-1/(mg/m^3)	58	10	460	40	260



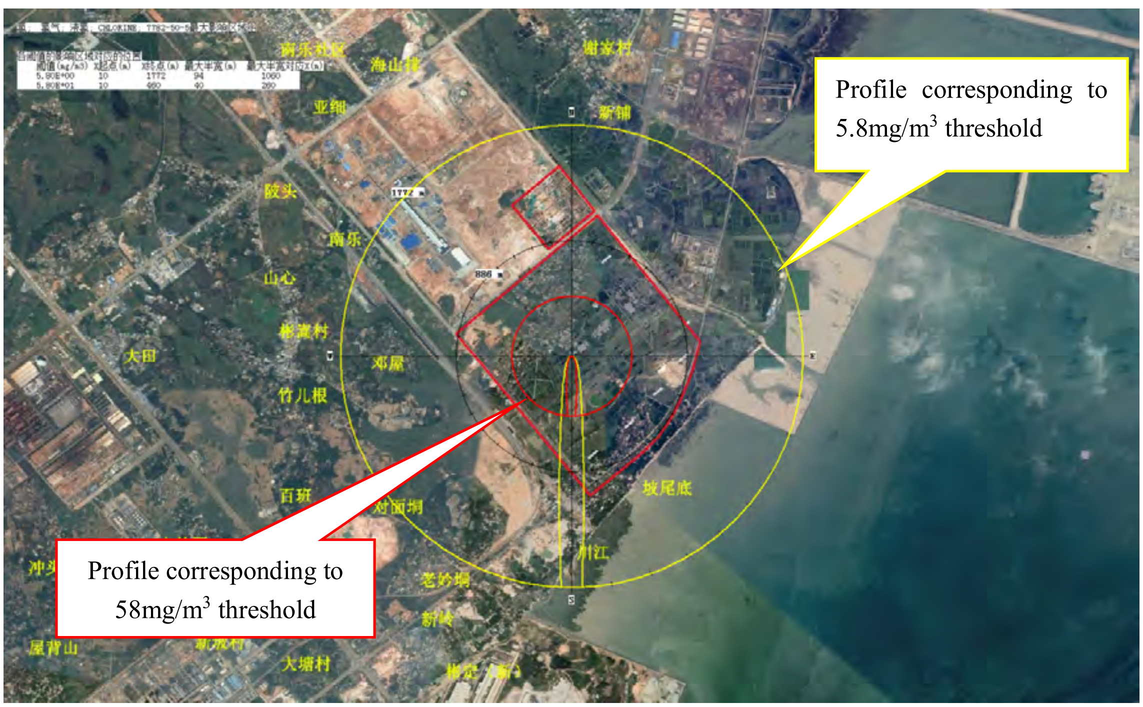


图 5.5-3　最不利气象条件氯气最大影响范围图

Fig. 5.5-3 Map of the Maximum Impact Range for Chlorine under the Most Adverse Meteorological Conditions

由监测结果可知毒性终点浓度-1 浓度范围内敏感目标主要为厂区人员，毒性终点浓度-2 浓度范围较广，涉及多个敏感目标。在预测中，由于软件只能预测单一风向浓度，

因此在模型中，设定在单一风向 S 情况下，让评价范围内敏感目标刚好处于预测单一风险下风向，即 Y 轴设为各敏感目标与风险源的距离，再次运行模型。各关心点氯气浓度随时间变化见下表。

From the monitoring results, it can be seen that the sensitive targets in the air toxic endpoint-1 range are mainly personnel in the plant, and the air toxic endpoint-2 range is wide, involving multiple sensitive targets. In the prediction, since the software can only predict the concentration in a single wind direction, the model is so designed that the sensitive targets in the assessment scope are just located in the predicted single downwind direction provided that a single wind direction S is set, i.e. the Y axis is set to the distance of each sensitive target from the risk source. The model should be operated again if concentrations in other wind direction are required to be predicted. The chlorine concentrations at the locations of concern vary over time as shown in the table below.

表 5.5-8 最不利气象条件下氯气泄漏关系点预测结果

Table 5.5-8 Prediction Results of Chlorine Leakage Locations of Concern under the Most Adverse Meteorological Conditions

单位：mg/m³

Unit: mg/m³

关心点 Locations of concern	5min	10min	15min	20min	25min	30min	45min	超标时间 Time for excessive leakage	持续时间 Duration
大塘村 Datang Village	0.00	0.00	0.00	0.00	0.00	0.00	1.55	/	/
对面垌 Duimiandong	0.00	0.00	0.00	0.00	1.95	5.24	2.97	/	/
彬垌村 Bindong Village	0.00	0.00	0.00	0.00	0.00	0.00	2.07	/	/
老妗垌 Laojindong	0.00	0.00	0.00	0.00	8.51	8.51	1.95	23	15
新岭 Xinling	0.00	0.00	0.00	0.00	0.00	4.18	3.47	/	/
猪血塘 Zhuxuetang	0.00	0.00	0.00	0.00	0.00	1.78	3.21	/	/
中石化倒班宿舍 Sinopec shift dormitory （阳关海岸）	0.00	0.00	0.00	0.00	0.00	0.00	2.07	/	/

关心点 Locations of concern	5min	10min	15min	20min	25min	30min	45min	超标时间 Time for excessive leakage	持续时间 Duration
(Sunshine Seacoast)									
百班村 Baiban Village	0.00	0.00	0.00	0.00	0.00	3.87	3.60	/	/
东方海岸大酒店 Oriental Coast Hotel	0.00	0.00	0.00	0.00	0.00	0.00	2.07	/	/
竹儿根 Zhuergen	0.00	0.00	0.00	0.00	1.84	5.19	2.99	/	/
山心 Shanxin	0.00	0.00	0.00	0.00	4.11	6.14	2.60	26	13
川江 Chuanjiang	0.00	0.00	3.69	22.90	22.90	9.70	0.00	16	17
坡尾底 Poweidi	0.00	0.00	3.69	22.90	22.90	9.70	0.00	16	17
南乐 Nanyue	0.00	0.00	0.00	0.00	7.63	7.63	2.16	24	14
那格塘（陂头） Nagetang (Pitou)	0.00	0.00	0.00	0.00	0.00	0.00	2.98	/	/
新铺 Xinpu	0.00	0.00	0.00	4.41	11.00	11.00	0.00	21	16
海山排 Haishanpai	0.00	0.00	0.00	0.00	0.00	3.54	3.65	/	/
亚细村 Yaxi Village	0.00	0.00	0.00	0.00	0.00	3.22	3.70	/	/
南乐社区 Nanyue Community	0.00	0.00	0.00	0.00	0.00	0.00	2.27	/	/
谢家村 Xiejiacun Village	0.00	0.00	0.00	0.00	0.00	4.95	3.11	/	/
华南北苑 Huanan Beiyuan	0.00	0.00	0.00	0.00	0.00	0.00	2.89	/	/
油麻山村 Youmashan Village	0.00	0.00	0.00	0.00	0.00	0.00	1.76	/	/
东岸场村 Donganchang Village	0.00	0.00	0.00	0.00	0.00	0.00	1.65	/	/
山芦村	0.00	0.00	0.00	0.00	0.00	0.00	1.26	/	/

关心点 Locations of concern	5min	10min	15min	20min	25min	30min	45min	超标时间 Time for excessive leakage	持续时间 Duration
Shanlu Village									
大炮岭村 Dapaoling Village	0.00	0.00	0.00	0.00	0.00	0.00	0.00	/	/
旦场村 Danchang Village	0.00	0.00	0.00	0.00	0.00	0.00	0.00	/	/
只郎村 Zhilang Village	0.00	0.00	0.00	0.00	0.00	0.00	1.11	/	/
贵余坛村 Guiyutan Village	0.00	0.00	0.00	0.00	0.00	0.00	2.40	/	/
浸谷塘村 Jingutang Village	0.00	0.00	0.00	0.00	0.00	0.00	0.00	/	/
大竹园 Dazhuyuan	0.00	0.00	0.00	0.00	0.00	0.00	1.81	/	/
彬定（旧） Binding (old)	0.00	0.00	0.00	0.00	0.00	0.00	1.95	/	/
新村坡 Xincunpo	0.00	0.00	0.00	0.00	0.00	0.00	1.77	/	/
江底村 Jiangdi Village	0.00	0.00	0.00	0.00	0.00	0.00	1.37	/	/
彬定（新） Binding (New village)	0.00	0.00	0.00	0.00	0.00	1.47	3.09	/	/
槟榔根 Binlanggen	0.00	0.00	0.00	0.00	0.00	0.00	1.87	/	/
塘细村 Tangxi Village	0.00	0.00	0.00	0.00	0.00	0.00	1.14	/	/
邓屋（川江村） Dengwu (Chuanjiang Village)	0.00	0.00	0.00	11.60	13.90	12.90	0.00	19	17
港务集团宿舍区 Port Group dormitory	0.00	0.00	0.00	0.00	0.00	0.00	1.60	/	/
屋背山 Wubeishan	0.00	0.00	0.00	0.00	0.00	0.00	1.14	/	/
彬嵩 Binsong	0.00	0.00	0.00	0.00	0.00	3.54	3.65	/	/

关心点 Locations of concern	5min	10min	15min	20min	25min	30min	45min	超标时间 Time for excessive leakage	持续时间 Duration
冲头村 Chongtou Village	0.00	0.00	0.00	0.00	0.00	0.00	1.07	/	/
大田 Datian	0.00	0.00	0.00	0.00	0.00	0.00	2.04	/	/
北塘村 Beitang Village	0.00	0.00	0.00	0.00	0.00	0.00	0.00	/	/
下底村 Xiadi Village	0.00	0.00	0.00	0.00	0.00	0.00	0.00	/	/
黄稍村 Huangshao Village	0.00	0.00	0.00	0.00	0.00	0.00	0.00	/	/
淡水口 Danshuikou	0.00	0.00	0.00	0.00	0.00	0.00	0.00	/	/
兴港镇彬定小学 Xinggang Town Binding Primary School	0.00	0.00	0.00	0.00	0.00	0.00	1.70	/	/
红花根 Honghuangen	0.00	0.00	0.00	0.00	0.00	0.00	1.60	/	/
山梓 Shanzi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	/	/
邓九垌 Dengjiudong	0.00	0.00	0.00	0.00	0.00	3.02	3.63	/	/
彬池村 Binchi Village	0.00	0.00	0.00	0.00	0.00	0.00	1.26	/	/
下低垌村 Xiadidong Village	0.00	0.00	0.00	0.00	0.00	0.00	1.60	/	/
上高垌 Shanggaodong	0.00	0.00	0.00	0.00	0.00	0.00	0.87	/	/
上陂头 Shangpitou	0.00	0.00	0.00	0.00	0.00	0.00	0.95	/	/
下陂头 Xiapitou	0.00	0.00	0.00	0.00	0.00	0.00	0.00	/	/
南冲 Nanchong	0.00	0.00	0.00	0.00	0.00	0.00	0.00	/	/
地罗 Diluo	0.00	0.00	0.00	0.00	0.00	0.00	0.00	/	/
兴港镇	0.00	0.00	0.00	0.00	0.00	0.00	0.00	/	/

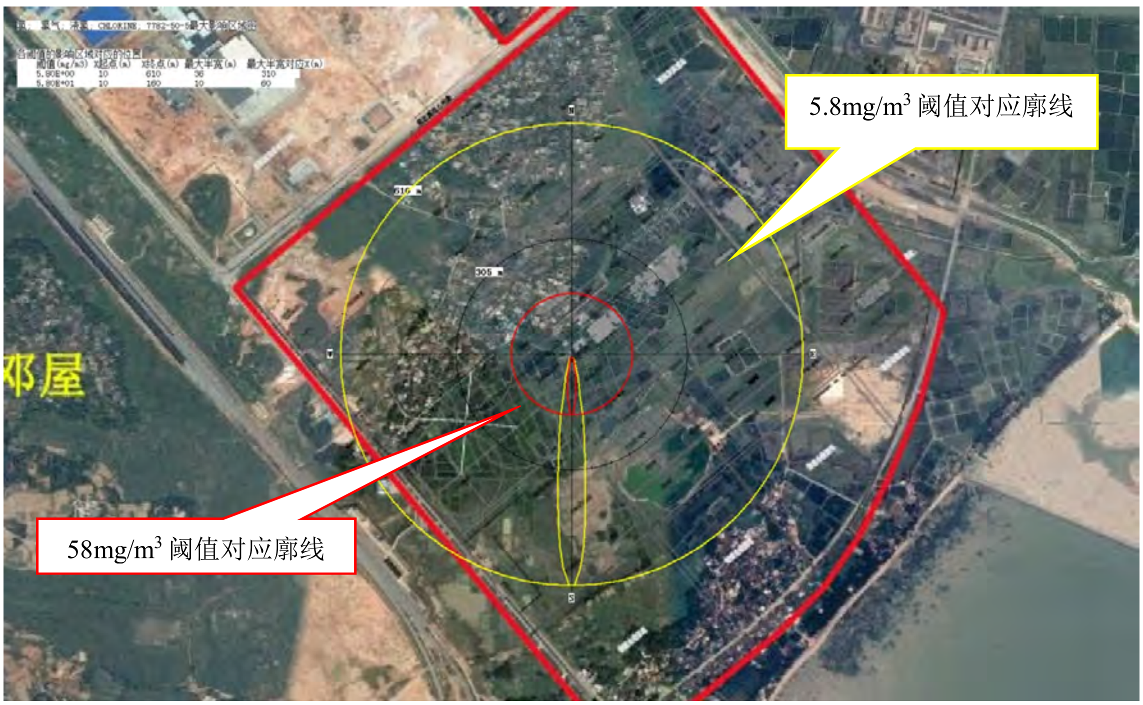
关心点 Locations of concern	5min	10min	15min	20min	25min	30min	45min	超标时间 Time for excessive leakage	持续时间 Duration
Xinggang Town									

表 5.5-9　氯气泄露下风向轴线预测结果表（常见气象）

Table 5.5-9 Downwind Axis Prediction Results for Chlorine Leakage (Most Common Meteorological Conditions)

距离(m) Distance (m)	浓度出现时间 (min) Concentration time (min)	高峰浓度 (mg/m3) Peak concentration (mg/m3)	质心高度(m) Height of center of mass (m)	出现时间 (min) Emergence time (min)	质心浓度 (mg/m3) Concentration at center of mass (mg/m3)
10	5.05	3.50E+03	0.00	5.05	5.20E+03
110	5.58	1.14E+02	0.00	5.58	1.18E+02
210	6.12	3.82E+01	0.00	6.12	3.88E+01
310	6.65	1.94E+01	0.00	6.65	1.96E+01
410	7.18	1.19E+01	0.00	7.18	1.20E+01
510	7.72	8.12E+00	0.00	7.72	8.15E+00
610	8.25	5.92E+00	0.00	8.25	5.94E+00
710	8.78	4.53E+00	0.00	8.78	4.55E+00
810	9.32	3.59E+00	0.00	9.32	3.62E+00
910	9.86	2.94E+00	0.00	9.86	2.95E+00
1010	10.31	2.39E+00	0.00	10.31	2.39E+00
1110	10.68	1.92E+00	0.00	10.68	1.92E+00
1210	11.06	1.59E+00	0.00	11.06	1.59E+00
1310	11.43	1.35E+00	0.00	11.43	1.35E+00
1410	11.80	1.18E+00	0.00	11.80	1.18E+00
1510	12.16	1.03E+00	0.00	12.16	1.03E+00
2010	13.89	6.02E-01	0.00	13.89	6.02E-01
2510	15.55	4.00E-01	0.00	15.55	4.00E-01
3010	17.14	2.87E-01	0.00	17.14	2.87E-01
3510	18.70	2.18E-01	0.00	18.70	2.18E-01
4010	20.21	1.72E-01	0.00	20.21	1.72E-01
4510	21.70	1.38E-01	0.00	21.70	1.38E-01
5010	23.16	1.15E-01	0.00	23.16	1.15E-01
6010	26.02	8.28E-02	0.00	26.02	8.28E-02
7010	28.82	6.25E-02	0.00	28.82	6.25E-02
类型 Type	阈值(mg/m^3) Threshold (mg/m^3)	X 起点(m) X starting point (m)	X 终点(m) X endpoint (m)	最大半宽(m) FWHM (m)	最大半宽对应 X(m) FWHM corresponding X (m)
毒性终点浓度-2/	5.8	10	610	36	310

（mg/m3） Air toxic endpoint-2/(mg/m3)					
毒性终点浓度-1/（mg/m3） Air toxic endpoint-1/(mg/m3)	58	10	160	10	60



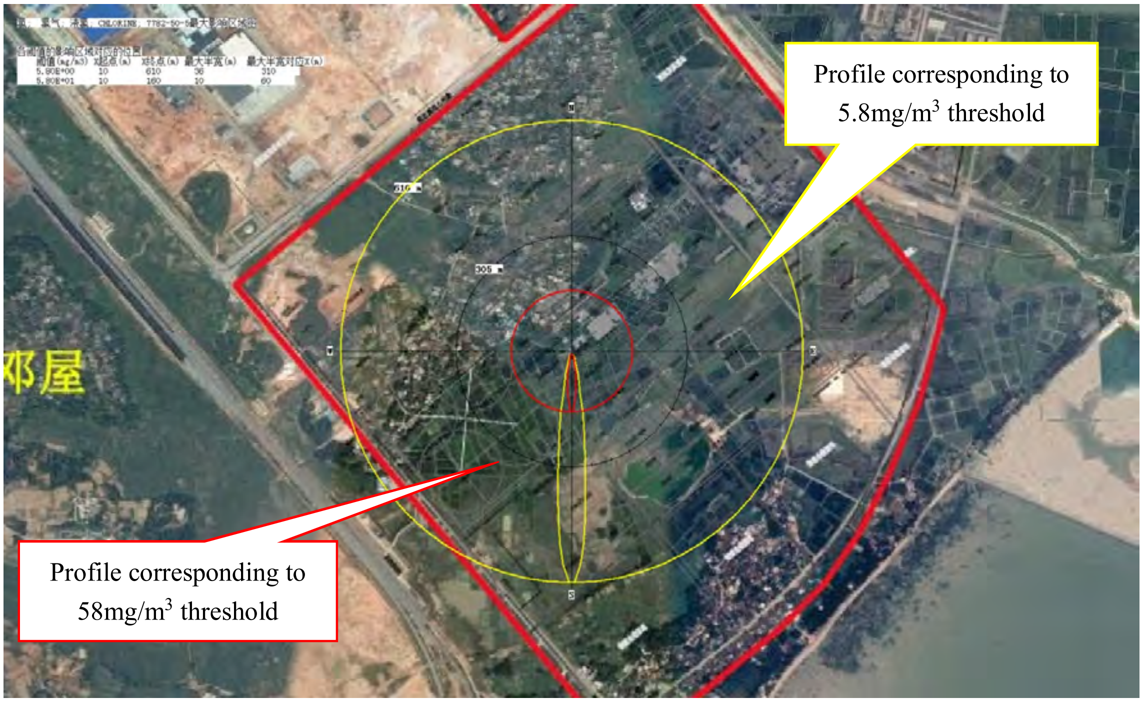


图 5.5-4 常见气象条件氯气最大影响范围图

Fig. 5.5-4 Map of the Maximum Impact Range for Chlorine under the Most Common Meteorological Conditions

根据常见气象条件氯气最大影响范围图，最大影响范围不涉及敏感点，关心点预测结果浓度随时间变化情况如下。

According to the map of the maximum impact range for chlorine under the most common meteorological conditions, the maximum impact range does not involve sensitive points. The change in predicted concentrations of the locations of concern over time is as follows.

表 5.5-10 常见气象条件下氯气泄漏关心点预测结果

Table 5.5-10 Prediction Results of Chlorine Leakage at Locations of Concern under the Most Adverse Meteorological Conditions

单位：mg/m³

Unit: mg/m³

关心点 Locations of concern	5min	10min	15min	20min	25min	30min	45min	超标时间 Time for excessive leakage	持续时间 Duration
大塘村 Datang Village	0.000	0.000	0.108	0.320	0.320	0.000	0.000	/	/
对面垌 Duimiandong	0.000	0.992	0.992	0.801	0.000	0.000	0.000	/	/
彬垌村 Bindong Village	0.000	0.000	0.419	0.419	0.346	0.000	0.000	/	/
老妗垌 Laojindong	0.000	1.610	1.610	0.379	0.000	0.000	0.000	/	/
新岭 Xinling	0.000	0.000	0.797	0.797	0.000	0.000	0.000	/	/
猪血塘 Zhuxuetang	0.000	0.000	0.624	0.624	0.126	0.000	0.000	/	/
中石化倒班宿舍 Sinopec shift dormitory（阳关海岸）(Sunshine Seacoast)	0.000	0.000	0.419	0.419	0.346	0.000	0.000	/	/
百班村 Baiban Village	0.000	0.000	0.749	0.749	0.000	0.000	0.000	/	/
东方海岸大酒店 Oriental Coast Hotel	0.000	0.000	0.419	0.419	0.346	0.000	0.000	/	/
竹儿根 Zhuergen	0.000	0.982	0.982	0.811	0.000	0.000	0.000	/	/
山心 Shanxin	0.000	1.160	1.160	0.642	0.000	0.000	0.000	/	/
川江 Chuanjiang	4.970	4.970	3.770	0.000	0.000	0.000	0.000	/	/
坡尾底 Poweidi	4.970	4.970	3.770	0.000	0.000	0.000	0.000	/	/
南乐 Nanyue	0.000	1.430	1.430	0.460	0.000	0.000	0.000	/	/
那格塘（陂头）Nagetang (Pitou)	0.000	0.000	0.577	0.577	0.156	0.000	0.000	/	/
新铺 Xinpu	0.000	2.110	2.110	0.237	0.000	0.000	0.000	/	/
海山排 Haishanpai	0.000	0.000	0.730	0.730	0.000	0.000	0.000	/	/

关心点 Locations of concern	5min	10min	15min	20min	25min	30min	45min	超标时间 Time for excessive leakage	持续时间 Duration
亚细村 Yaxi Village	0.000	0.000	0.712	0.712	0.000	0.000	0.000	/	/
南乐社区 Nanyue Community	0.000	0.000	0.454	0.454	0.289	0.000	0.000	/	/
谢家村 Xiejiacun Village	0.000	0.000	0.937	0.863	0.000	0.000	0.000	/	/
华南北苑 Huanan Beiyuan	0.000	0.000	0.560	0.560	0.169	0.000	0.000	/	/
油麻山村 Youmashan Village	0.000	0.000	0.271	0.356	0.356	0.000	0.000	/	/
东岸场村 Donganchang Village	0.000	0.000	0.176	0.337	0.337	0.000	0.000	/	/
山芦村 Shanlu Village	0.000	0.000	0.000	0.268	0.268	0.123	0.000	/	/
大炮岭村 Dapaoling Village	0.000	0.000	0.000	0.215	0.215	0.215	0.000	/	/
旦场村 Danchang Village	0.000	0.000	0.000	0.070	0.176	0.176	0.000	/	/
只郎村 Zhilang Village	0.000	0.000	0.000	0.239	0.239	0.176	0.000	/	/
贵余坛村 Guiyutan Village	0.000	0.000	0.477	0.477	0.255	0.000	0.000	/	/
浸谷塘村 Jingutang Village	0.000	0.000	0.000	0.000	0.169	0.169	0.000	/	/
大竹园 Dazhuyuan	0.000	0.000	0.329	0.366	0.366	0.000	0.000	/	/
彬定（旧） Binding (old)	0.000	0.000	0.396	0.396	0.386	0.000	0.000	/	/
新村坡 Xincunpo	0.000	0.000	0.282	0.358	0.358	0.000	0.000	/	/
江底村 Jiangdi Village	0.000	0.000	0.000	0.289	0.289	0.096	0.000	/	/
彬定（新） Binding (New village)	0.000	0.000	0.600	0.600	0.140	0.000	0.000	/	/
槟榔根 Binlanggen	0.000	0.000	0.380	0.380	0.380	0.000	0.000	/	/

关心点 Locations of concern	5min	10min	15min	20min	25min	30min	45min	超标时间 Time for excessive leakage	持续时间 Duration
塘细村 Tangxi Village	0.000	0.000	0.000	0.244	0.244	0.165	0.000	/	/
邓屋（川江村） Dengwu (Chuanjiang Village)	0.000	2.720	2.720	0.000	0.000	0.000	0.000	/	/
港务集团宿舍区 Port Group dormitory	0.000	0.000	0.139	0.328	0.328	0.000	0.000	/	/
屋背山 Wubeishan	0.000	0.000	0.000	0.244	0.244	0.165	0.000	/	/
彬嵩 Binsong	0.000	0.000	0.730	0.730	0.000	0.000	0.000	/	/
冲头村 Chongtou Village	0.000	0.000	0.000	0.231	0.231	0.195	0.000	/	/
大田 Datian	0.000	0.000	0.414	0.414	0.355	0.000	0.000	/	/
北塘村 Beitang Village	0.000	0.000	0.000	0.059	0.172	0.172	0.000	/	/
下底村 Xiadi Village	0.000	0.000	0.000	0.070	0.176	0.176	0.000	/	/
黄稍村 Huangshao Village	0.000	0.000	0.000	0.000	0.163	0.163	0.000	/	/
淡水口 Danshuikou	0.000	0.000	0.000	0.070	0.176	0.176	0.000	/	/
兴港镇彬定小学 Xinggang Town Binding Primary School	0.000	0.000	0.220	0.346	0.346	0.000	0.000	/	/
红花根 Honghuangen	0.000	0.000	0.139	0.328	0.328	0.000	0.000	/	/
山梓 Shanzi	0.000	0.000	0.000	0.000	0.138	0.138	0.000	/	/
邓九垌 Dengjiudong	0.000	0.000	0.701	0.701	0.000	0.000	0.000	/	/
彬池村 Binchi Village	0.000	0.000	0.000	0.268	0.268	0.123	0.000	/	/
下低垌村 Xiadidong Village	0.000	0.000	0.139	0.328	0.328	0.000	0.000	/	/
上高垌	0.00	0.00	0.00	0.21	0.21	0.21	0.00	/	/

关心点 Locations of concern	5min	10min	15min	20min	25min	30min	45min	超标时间 Time for excessive leakage	持续时间 Duration
Shanggaodong	0	0	0	9	9	9	0		
上陂头 Shangpitou	0.000	0.000	0.000	0.224	0.224	0.211	0.000	/	/
下陂头 Xiapitou	0.000	0.000	0.000	0.206	0.206	0.206	0.000	/	/
南冲 Nanchong	0.000	0.000	0.000	0.000	0.147	0.147	0.000	/	/
地罗 Diluo	0.000	0.000	0.000	0.000	0.163	0.163	0.000	/	/
兴港镇 Xinggang Town	0.000	0.000	0.000	0.000	0.136	0.136	0.000	/	/

（2）风险后果分析

(2) Analysis of risk consequences

由预测结果可知，在发生氯气泄漏，在最不利气象条件下（风速 1.5 米/秒，稳定度 F），氯气出现超大气毒性终点浓度-1 的最远距离为 460 米，出现超大气毒性终点浓度-2 的最远距离为 1772 米；在常见气象条件下（风速 3.2 米/秒，稳定度 D），氯气出现超大气毒性终点浓度-1 的最远距离为 160 米，出现超大气毒性终点浓度-2 的最远距离为 610 米。由表 5.5-8 及表 5.5-10 可知，在发生氯气泄漏的情形下，周边关心点部分出现超出大气毒性终点浓度-2（灰色标记），为了保证地区的可持续发展，项目在生产过程中必须加强管理，避免事故的发生，一旦发生事故，立即开展应急措施，必要时根据事故预警级别，向北海市政府汇报，组织居民进行疏散。

From the prediction results, the farthest distance for chlorine having a concentration above the air toxic endpoint-1 after leakage under the most adverse meteorological conditions (wind velocity 1.5m/s, stability F) is 460m and the farthest distance for chlorine having a concentration above the air toxic endpoint-2 is 1,772m; the farthest distance for chlorine having a concentration above the air toxic endpoint-1 under the most common meteorological conditions (wind velocity 3.2m/s, stability D) is 160m and the farthest distance for chlorine having a concentration above the air toxic endpoint-2 is 610m. As shown in Tables 5.5-8 and

5.5-10, in the case of chlorine leakage, the concentration of chlorine in some of the surrounding locations of concern have exceeded the air toxic endpoint-2 (grey mark). In order to ensure the sustainable development of the area, management in the production process of the project must be strengthened to avoid accidents; in case of accidents, immediately carry out emergency measures, and if necessary, report to the Beihai Government and organize the evacuation of residents according to the accident warning level.

各关心点超出毒性终点浓度的持续时间较短，经预测关心点受大气伤害概率均为0%，对关心点人体健康造成伤害的概率不大，计算过程见图 5.5-5，对周边在大气毒性终点浓度范围内关心点的持续影响的大气影响概率分析如下。

For all locations of concern, the concentrations of chlorine are above the air toxic endpoint for a short duration; the predicted probability of harm to atmosphere at the locations of concern is 0%, accompanied with a low probability of harm to human health as calculated shown in Fig. 5.5-5; the probability of continuous atmospheric effects on the surrounding locations of concern in the range of air toxic endpoint is analyzed below.

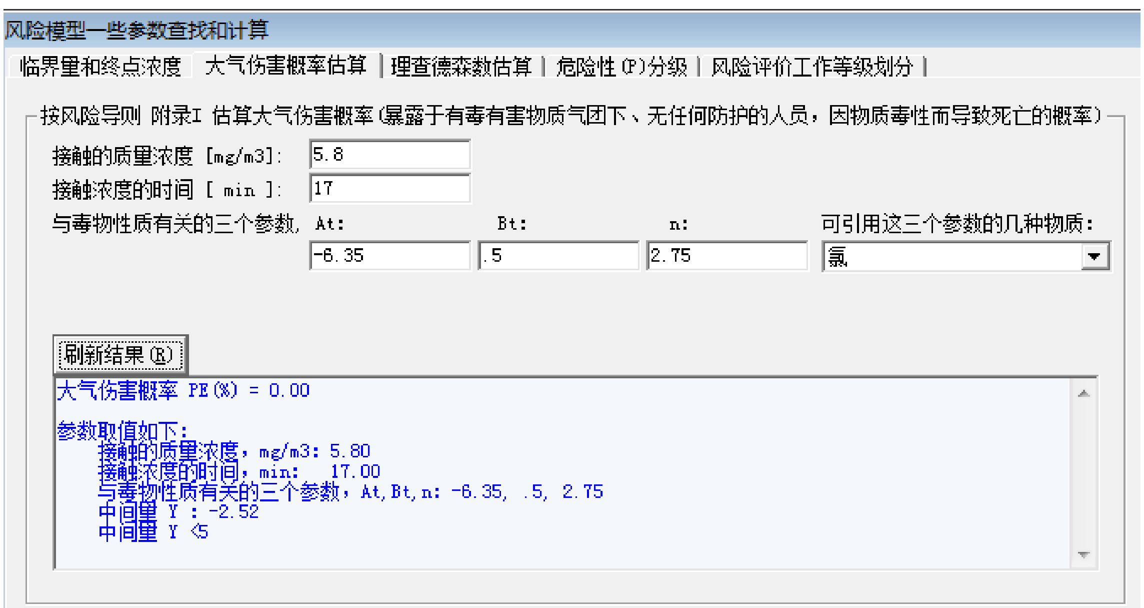


图 5.5-5　氯气泄漏事故关心点大气伤害概率计算（川江）

Fig. 5.5-5 Calculation of the Probability of of Harm to Atmosphere at the Locations of Concern in a Chlorine Leakage Accident (Chuanjiang River)

表 5.5-11 氯气泄漏事故关心点大气伤害概率估算

Table 5.5-11 Calculation of the Probability of of Harm to Atmosphere at the Locations of Concern in a Chlorine Leakage Accident

关心点 Locations of concern	大气伤害概率 PE（%） Probability of harm to atmosphere PE (%)	关心点 Locations of concern	大气伤害概率 PE（%） Probability of harm to atmosphere PE (%)
对面垌 Duimiandong	0.00	南乐 Nanyue	0.00
老妗垌 Laojindong	0.00	新铺 Xinpu	0.00
山心 Shanxin	0.00	邓屋（川江村） Dengwu (Chuanjiang Village)	0.00
川江 Chuanjiang	0.00	坡尾底 Poweidi	0.00

（3）风险疏散范围

(3) Scope of risk evacuation

项目氯气泄漏风险源主要为二氧化氯制备车间氯气生产输送管道。对于二氧化氯制备车间，应配有碱液喷淋装置和漏氯自动吸收装置，并设有氯气泄漏监测报警装置，设有安全阀、压力表等，安全阀及事故放空均设有收集处理系统，设有集水设施。日常操控完全按照《氯气安全规程》（GB11984-2008）进行：氯气生产、使用的厂房、库房建筑符合《建筑设计防火规范》（GB50016-2014）的规定；氯属于Ⅱ级（高度危害）物质，直接接触氯气生产、使用、贮存、运输等作业人员，必须经专业培训，考试合格，取得特种作业合格证后，方可上岗操作；氯气生产、使用、贮存、运输车间（部门）负责人（含技术人员），应熟练掌握工艺过程和设备性能，并能正确指挥事故处理；氯气生产、使用、贮存、运输等现场，都应配备抢修器材；另外，还制定了《危险化学品安全管理制度》，规范危险化学品的管理。在氯气泄漏事故发生后，企业在第一时间切断泄漏源，并进行应急处置，对室外及周边敏感目标的影响将远小于本次预测结果。

The chlorine leakage risk in the project is mainly from the delivery pipes for chlorine prepared from chlorine dioxide. The chlorine dioxide preparation workshop should be equipped with the lye spray plant, automatic leaked chlorine-absorbing device, chlorine leak monitoring and alarm device, safety valve, pressure gauge, etc.; safety valve and accident blow tank are equipped with collection and treatment systems and water collection facilities.

The daily operation should be carried out in full accordance with the *Safety Regulation for Chlorine* (GB11984-2008): the chlorine production, used plant and warehouse buildings should comply with the *Code for Fire Protection Design of Buildings* (GB50016-2014); since chlorine is a class II (highly hazardous) substance, operators directly exposed to its production, use, storage, transport must be professionally trained, and pass the examination and obtain a special operation certificate, before operation; the responsible persons of chlorine production, use, storage, transport workshop (department) (including technical personnel) should be skilled in the process and equipment performance, and can correctly command the handling of accidents; the sites for chlorine production, use, storage, transport should be equipped with emergency equipment; in addition, the *Safety Management System for Dangerous Chemicals* is prepared to regulate the management of hazardous chemicals. In the event of a chlorine leak, the impact on the outdoor and surrounding sensitive targets will be much smaller than the results of this prediction, as the company cuts off the leak source at the first opportunity and carries out emergency disposal.

为了更大限度地控制氯气泄漏的环境风险，应对项目周边居民做好宣传工作，指导居民如何应对风险。氯气管线泄漏时，根据事故发生时的气象条件及时与相应的村民委员会或社区委员会联系，共同疏散下风向人群，降低危害。根据事故发生时的气象特征，以及受风险影响的程度，确定风险事故疏散范围如下：

In order to better control the environmental risks of chlorine leakage, residents in the vicinity of the project should be sensitized and instructed on how to deal with the risks. In the event of chlorine pipe leak, contact the corresponding villagers' committee or community committee in time according to the meteorological conditions at the time of the accident to jointly evacuate people downwind to reduce the hazard. Based on the meteorological characteristics at the time of the accident and the degree of exposure to the risk, the evacuation scope for the risk accident is determined as follows:

①首要疏散范围：依据毒性终点浓度-1 浓度及事故发生时的风向，确定设定事故发生时，应立即疏散的范围是事故泄漏源下风向 460m 范围内的人员(主要为厂内工作人员)；

①Primary evacuation scope: Based on the air toxic endpoint-1 and the wind direction at the time of the accident, the immediate evacuation scope at the time of the accident when it is determined that the set accident is personnel within 460 m from the downwind direction of the leakage source of the accident (mainly including employees in the plant).

②)重点疏散范围:依据毒性终点浓度-2 浓度及事故发生时的风向，确定设定事故发生时，应重点疏散的范围是事故泄漏源下风向 1772m 范围内的人员，及预测中超出大气毒性终点浓度-2 的关心点居民（可能包括对面垌、老妗垌、新岭、山心、川江、坡尾底、新铺、邓屋）。

②Critical evacuation scope: Based on the air toxic endpoint-2 and the wind direction at the time of the accident, the critical evacuation scope at the time of the accident when it is determined that the set accident is personnel within 1,772 m from the downwind direction of the leakage source of the accident, as well as the residents of locations of concern where the predicted concentration is higher than the air toxic endpoint-2 (possibly including Duimiandong, Laojindong, Xinling, Shanxin, Chuanjiang River, Poweidi, Xinpu, Dengwu).

设定事故发生时,建设单位应急指挥领导小组责任领导应立即辨别当时的上风向和设定事故发生时,建设单位应急指挥领导小组责任领导应立即辨别当时的上风向和侧风向，并通报“首要疏散范围”、“重点疏散范围”所涉及村委会领导，由建设单位应急指挥领导小组人员与村委会领导共同指导村民向事故发生地的上风向或侧风向撤离。

When an set accident occurs, the responsible leader of the emergency command leading group of the construction unit shall immediately identify the upwind direction and and sidewind direction, and notify the village committee leaders involved in the "primary evacuation scope" and "critical evacuation scope", and the construction unit emergency command leading group personnel and village committee leaders shall jointly guide the villagers to evacuate to the upwind or sidewind direction of the accident site.

一旦发生氯气泄漏，应第一时间通知最近敏感目标川江及坡尾底居民进行疏散，在发生泄漏事故之后采取及时有力的措施且做好下风向人群的疏散工作，项目氯气管线发生泄漏事故的风险是可以接受的。

In the event of a chlorine leak, the residents of the nearest sensitive target, Chuanjiang River and Poweidi should be notified for evacuation at the first time, and timely and effective measures should be taken to evacuate the people downwind after the leakage accident. The risk of leakage accidents of the project chlorine pipes is acceptable.

3、二氧化氯爆炸事故预测

3. Prediction of chlorine dioxide explosion accident

（1）预测结果

(1) Prediction results

二氧化氯制备装置发生燃爆，二氧化氯扩散至大气环境，造成大气环境风险事故的预测见表 5.5-12。

The predictions of atmospheric risk accidents caused by explosion in the chlorine dioxide preparation plant and the spread of chlorine dioxide to the atmosphere are shown in Table 5.5-12.

表 5.5-12　二氧化氯泄露下风向轴线预测结果表（最不利气象）

Table 5.5-12 Downwind Axis Prediction Results for Chlorine Dioxide Leakage (Most Adverse Meteorological Conditions)

距离(m) Distance (m)	浓度出现时间 (min) Concentration time (min)	高峰浓度 (mg/m^3) Peak concentration (mg/m^3)	质心高度(m) Height of center of mass (m)	出现时间 (min) Emergence time (min)	质心浓度 (mg/m^3) Concentration at center of mass (mg/m^3)
10	2.60	1.14E+02	0.00	2.60	1.15E+02
110	3.65	8.89E+01	0.00	3.65	8.95E+01
210	4.71	7.35E+01	0.00	4.71	7.39E+01
310	5.89	6.73E+01	0.00	5.89	6.73E+01
410	7.20	6.11E+01	0.00	7.20	6.11E+01
510	8.54	5.40E+01	0.00	8.54	5.40E+01
610	9.91	4.68E+01	0.00	9.91	4.68E+01
710	11.27	4.00E+01	0.00	11.27	4.00E+01
810	12.62	3.41E+01	0.00	12.62	3.41E+01
910	13.96	2.92E+01	0.00	13.96	2.92E+01
1010	15.26	2.51E+01	0.00	15.26	2.51E+01
1110	16.55	2.18E+01	0.00	16.55	2.18E+01
1210	17.80	1.90E+01	0.00	17.80	1.90E+01
1310	19.04	1.67E+01	0.00	19.04	1.67E+01
1410	20.26	1.48E+01	0.00	20.26	1.48E+01
1510	21.45	1.31E+01	0.00	21.45	1.31E+01
2010	27.16	7.82E+00	0.00	27.16	7.82E+00
2510	32.51	5.13E+00	0.00	32.51	5.13E+00
3010	37.59	3.60E+00	0.00	37.59	3.60E+00
3510	42.47	2.66E+00	0.00	42.47	2.66E+00
4010	47.18	2.03E+00	0.00	47.18	2.03E+00
4510	51.75	1.61E+00	0.00	51.75	1.61E+00
5010	56.21	1.29E+00	0.00	56.21	1.29E+00
6010	64.83	8.90E-01	0.00	64.83	8.90E-01

7010	73.15	6.54E-01	0.00	73.15	6.54E-01

类型 Type	阈值(mg/m^3) Threshold (mg/m^3)	X 起点(m) X starting point (m)	X 终点(m) X endpoint (m)	最大半宽(m) FWHM (m)	最大半宽对应 X(m) FWHM corresponding X (m)
毒性终点浓度-2/（mg/m^3） Air toxic endpoint-2/(mg/m^3)	3.00	10	3299	172	2110
毒性终点浓度-1/（mg/m^3） Air toxic endpoint-1/(mg/m^3)	6.60	10	2201	126	1310

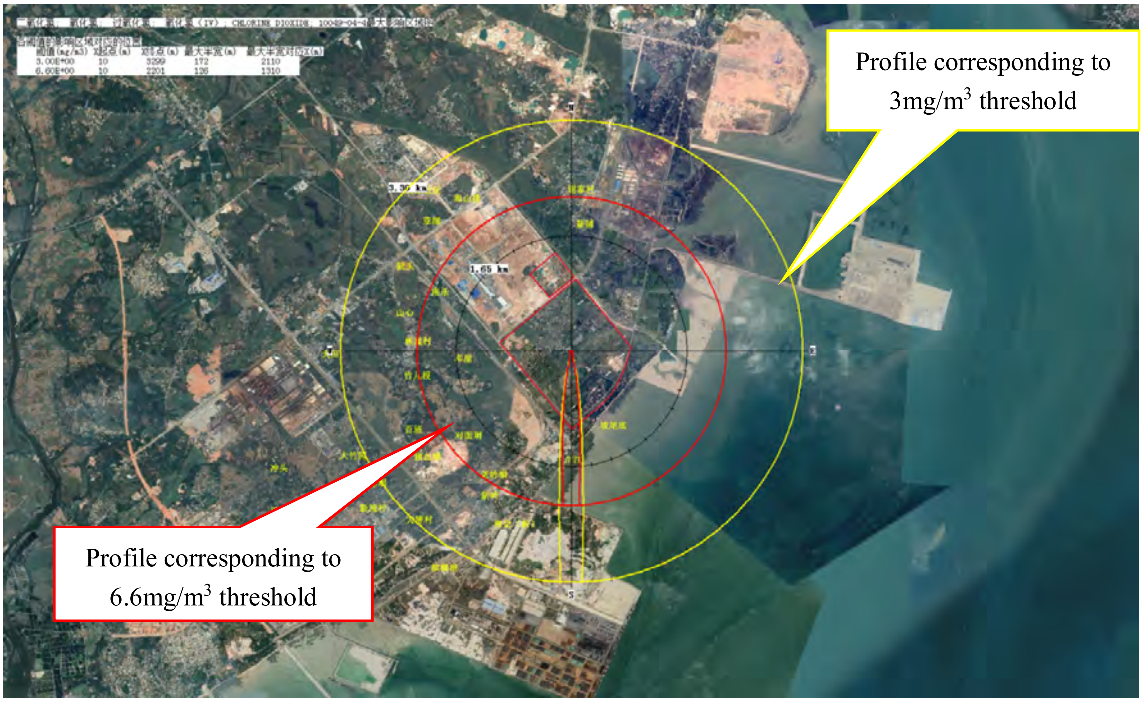


图 5.5-6　最不利气象条件二氧化氯最大影响范围图

Fig. 5.5-6 Map of the Maximum Impact Range for Chlorine Dioxide under the Most Adverse Meteorological Conditions

由监测结果可知毒性终点浓度-1 及毒性终点浓度-2 浓度范围较广，涉及多个敏感目标。在预测中，由于软件只能预测单一风向浓度，因此在模型中，设定在单一风向 S 情况下，让评价范围内敏感目标刚好处于预测单一风险下风向，即 Y 轴设为各敏感目标与风险源的距离，再次运行模型。各关心点二氧化氯浓度随时间变化见下表。

From the monitoring results, it can be seen that the concentration scopes of the air toxic endpoint-1 and the air toxic endpoint-2 are wide, involving multiple sensitive targets. In the prediction, since the software can only predict the concentration in a single wind direction, the model is so designed that the sensitive targets in the assessment scope are just located in the predicted single downwind direction provided that a single wind direction S is set, i.e. the Y axis is set to the distance of each sensitive target from the risk source. The model should be operated again if concentrations in other wind direction are required to be predicted. The chlorine dioxide concentrations at the locations of concern vary over time as shown in the table below.

表 5.5-13　最不利气象条件下二氧化氯泄漏关系点预测结果　单位：mg/m³

Table 5.5-13 Prediction Results of Chlorine Dioxide Leakage at Locations of Concern under the Most Adverse Meteorological Conditions (in mg/m³)

关心点 Locations of concern	5min	10min	15min	20min	25min	30min	45min	超标时间 Time for excessive leakage	持续时间 Duration
大塘村 Datang Village	0.00	0.00	0.00	0.00	0.18	1.84	2.76	/	/
对面垌 Duimiandong	0.00	0.00	1.10	8.95	8.95	8.95	1.93	17	25
彬垌村 Bindong Village	0.00	0.00	0.00	0.00	1.42	3.67	3.67	28	21
老妗垌 Laojindong	0.00	0.00	14.10	14.10	14.10	8.79	1.17	13	23
新岭 Xinling	0.00	0.00	0.14	5.69	7.21	7.21	2.42	19	25
猪血塘 Zhuxuetang	0.00	0.00	0.00	1.49	5.59	5.59	3.11	22	24
中石化倒班宿舍 Sinopec shift dormitory（阳关海岸）(Sunshine Seacoast)	0.00	0.00	0.00	0.00	1.42	3.67	3.67	28	21
百班村 Baiban Village	0.00	0.00	0.07	4.32	6.79	6.79	2.58	20	24
东方海岸大酒店 Oriental Coast Hotel	0.00	0.00	0.00	0.00	1.42	3.67	3.67	28	21
竹儿根 Zhuergen	0.00	0.00	1.01	8.87	8.87	8.87	1.95	17	25
山心 Shanxin	0.00	0.00	3.27	10.40	10.40	10.40	1.63	17	25
川江 Chuanjiang	0.00	33.00	33.00	20.80	8.18	3.53	0.49	7	25
坡尾底 Poweidi	0.00	33.00	33.00	20.80	8.18	3.53	0.49	7	25
南乐 Nanyue	0.00	0.00	9.49	12.70	12.70	9.56	1.31	14	25
那格塘（陂头）Nagetang (Pitou)	0.00	0.00	0.00	0.87	5.17	5.17	3.34	23	24
新铺 Xinpu	0.00	1.29	17.80	17.80	15.10	7.07	0.91	11	25
海山排 Haishanpai	0.00	0.00	0.00	3.81	6.62	6.62	2.65	20	24

关心点 Locations of concern	5min	10min	15min	20min	25min	30min	45min	超标时间 Time for excessive leakage	持续时间 Duration
亚细村 Yaxi Village	0.00	0.00	0.00	3.35	6.46	6.46	2.72	20	25
南乐社区 Nanyue Community	0.00	0.00	0.00	0.09	2.26	4.02	4.02	26	23
谢家村 Xiejiacun Village	0.00	0.00	0.67	8.44	8.44	8.44	2.05	17	25
华南北苑 Huanan Beiyuan	0.00	0.00	0.00	0.70	5.01	5.01	3.43	23	24
油麻山村 Youmashan Village	0.00	0.00	0.00	0.00	0.46	3.01	3.09	30	21
东岸场村 Donganchang Village	0.00	0.00	0.00	0.00	0.29	2.38	2.91	/	/
山芦村 Shanlu Village	0.00	0.00	0.00	0.00	0.00	0.65	2.26	/	/
大炮岭村 Dapaoling Village	0.00	0.00	0.00	0.00	0.00	0.10	1.77	/	/
旦场村 Danchang Village	0.00	0.00	0.00	0.00	0.00	0.00	1.41	/	/
只郎村 Zhilang Village	0.00	0.00	0.00	0.00	0.00	0.27	1.99	/	/
贵余坛村 Guiyutan Village	0.00	0.00	0.00	0.16	2.93	4.25	3.89	26	22
浸谷塘村 Jingutang Village	0.00	0.00	0.00	0.00	0.00	0.00	1.35	/	/
大竹园 Dazhuyuan	0.00	0.00	0.00	0.00	0.58	3.18	3.18	30	21
彬定（旧） Binding (old)	0.00	0.00	0.00	0.00	1.00	3.46	3.46	29	21
新村坡 Xincunpo	0.00	0.00	0.00	0.00	0.48	3.08	3.11	30	21
江底村 Jiangdi Village	0.00	0.00	0.00	0.00	0.06	1.04	2.46	/	/
彬定（新） Binding (New village)	0.00	0.00	0.00	1.15	5.37	5.37	3.23	22	24
槟榔根	0.00	0.00	0.00	0.00	0.75	3.31	3.31	29	21

关心点 Locations of concern	5min	10min	15min	20min	25min	30min	45min	超标时间 Time for excessive leakage	持续时间 Duration
Binlanggen									
塘细村 Tangxi Village	0.00	0.00	0.00	0.00	0.00	0.32	2.04	/	/
邓屋（川江村） Dengwu (Chuanjiang Village)	0.00	7.35	21.80	21.80	12.80	5.72	0.74	10	25
港务集团宿舍区 Port Group dormitory	0.00	0.00	0.00	0.00	0.23	2.10	2.83	/	/
屋背山 Wubeishan	0.00	0.00	0.00	0.00	0.00	0.32	2.04	/	/
彬嵩 Binsong	0.00	0.00	0.00	3.81	6.62	6.62	2.65	20	24
冲头村 Chongtou Village	0.00	0.00	0.00	0.00	0.00	0.19	1.91	/	/
大田 Datian	0.00	0.00	0.00	0.00	1.31	3.62	3.62	28	22
北塘村 Beitang Village	0.00	0.00	0.00	0.00	0.00	0.00	1.38	/	/
下底村 Xiadi Village	0.00	0.00	0.00	0.00	0.00	0.00	1.41	/	/
黄稍村 Huangshao Village	0.00	0.00	0.00	0.00	0.00	0.00	1.29	/	/
淡水口 Danshuikou	0.00	0.00	0.00	0.00	0.00	0.00	1.41	/	/
兴港镇彬定小学 Xinggang Town Binding Primary School	0.00	0.00	0.00	0.00	0.37	2.68	3.00	/	/
红花根 Honghuangen	0.00	0.00	0.00	0.00	0.23	2.10	2.83	/	/
山梓 Shanzi	0.00	0.00	0.00	0.00	0.00	0.00	0.85	/	/
邓九垌 Dengjiudong	0.00	0.00	0.00	3.07	6.35	6.35	2.77	20	25
彬池村 Binchi Village	0.00	0.00	0.00	0.00	0.00	0.65	2.26	/	/

关心点 Locations of concern	5min	10min	15min	20min	25min	30min	45min	超标时间 Time for excessive leakage	持续时间 Duration
下低垌村 Xiadidong Village	0.00	0.00	0.00	0.00	0.23	2.10	2.83	/	/
上高垌 Shanggaodong	0.00	0.00	0.00	0.00	0.00	0.12	1.81	/	/
上陂头 Shangpitou	0.00	0.00	0.00	0.00	0.00	0.15	1.85	/	/
下陂头 Xiapitou	0.00	0.00	0.00	0.00	0.00	0.06	1.69	/	/
南冲 Nanchong	0.00	0.00	0.00	0.00	0.00	0.00	1.15	/	/
地罗 Diluo	0.00	0.00	0.00	0.00	0.00	0.00	1.29	/	/
兴港镇 Xinggang Town	0.00	0.00	0.00	0.00	0.00	0.00	0.78	/	/

表 5.5-14 二氧化氯泄露下风向轴线预测结果表（常见气象）

Table 5.5-14 Downwind Axis Prediction Results for Chlorine Dioxide Leakage (Most Common Meteorological Conditions)

距离(m) Distance (m)	浓度出现时间(min) Concentration time (min)	高峰浓度(mg/m^3) Peak concentration (mg/m^3)	质心高度(m) Height of center of mass (m)	出现时间(min) Emergence time (min)	质心浓度(mg/m^3) Concentration at center of mass (mg/m^3)
10	2.54	9.54E+01	0.00	2.54	9.67E+01
110	2.96	4.06E+01	0.00	2.96	4.08E+01
210	3.38	2.16E+01	0.00	3.38	2.18E+01
310	3.80	1.36E+01	0.00	3.80	1.36E+01
410	4.22	9.39E+00	0.00	4.22	9.43E+00
510	4.64	6.92E+00	0.00	4.64	6.94E+00
610	5.05	5.33E+00	0.00	5.05	5.33E+00
710	5.46	4.11E+00	0.00	5.46	4.11E+00
810	5.86	3.26E+00	0.00	5.86	3.26E+00
910	6.25	2.67E+00	0.00	6.25	2.67E+00
1010	6.63	2.23E+00	0.00	6.63	2.23E+00
1110	7.01	1.90E+00	0.00	7.01	1.90E+00
1210	7.37	1.63E+00	0.00	7.37	1.63E+00
1310	7.73	1.42E+00	0.00	7.73	1.42E+00
1410	8.09	1.25E+00	0.00	8.09	1.25E+00
1510	8.44	1.11E+00	0.00	8.44	1.11E+00

2010	10.15	6.79E-01	0.00	10.15	6.79E-01
2510	11.78	4.64E-01	0.00	11.78	4.64E-01
3010	13.36	3.39E-01	0.00	13.36	3.39E-01
3510	14.90	2.61E-01	0.00	14.90	2.61E-01
4010	16.40	2.08E-01	0.00	16.40	2.08E-01
4510	17.88	1.70E-01	0.00	17.88	1.70E-01
5010	19.34	1.43E-01	0.00	19.34	1.43E-01
6010	22.19	1.04E-01	0.00	22.19	1.04E-01
7010	24.98	7.98E-02	0.00	24.98	7.98E-02
类型 Type	阈值(mg/m^3) Threshold (mg/m^3)	X 起点(m) X starting point (m)	X 终点(m) X endpoint (m)	最大半宽(m) FWHM (m)	最大半宽对应 X(m) FWHM corresponding X (m)
毒性终点浓度-2/（mg/m3） Air toxic endpoint-2/(mg/m3)	3.00E+00	10	850	98	850
毒性终点浓度-1/（mg/m3） Air toxic endpoint-1/(mg/m3)	6.60E+00	10	524	28	260

图 5.5-7　常见气象条件二氧化氯最大影响范围图

Fig. 5.5-7 Map of the Maximum Impact Range for Chlorine Dioxide under the Most Common Meteorological Conditions

表 5.5-15　常见气象条件下二氧化氯泄漏关心点预测结果　单位：mg/m^3

Table 5.5-15 Prediction Results of Chlorine Dioxide Leakage at Locations of Concern under the Most Common Meteorological Conditions (in mg/m^3)

关心点 Locations of concern	5min	10min	15min	20min	25min	30min	超标时刻 Time for excessive leakage	持续时间 Duration
大塘村	0.00	0.05	0.26	0.26	0.00	0.00	0.00	0.00
对面垌	0.00	0.73	0.42	0.00	0.00	0.00	0.00	0.00
彬垌村	0.00	0.34	0.34	0.13	0.00	0.00	0.00	0.00
老妗垌	0.00	1.13	0.18	0.00	0.00	0.00	0.00	0.00
新岭	0.00	0.61	0.60	0.00	0.00	0.00	0.00	0.00
猪血塘	0.00	0.48	0.48	0.00	0.00	0.00	0.00	0.00
中石化倒班宿舍（阳	0.00	0.34	0.34	0.13	0.00	0.00	0.00	0.00
百班村	0.00	0.57	0.57	0.00	0.00	0.00	0.00	0.00
东方海岸大酒店	0.00	0.34	0.34	0.13	0.00	0.00	0.00	0.00
竹儿根	0.00	0.73	0.42	0.00	0.00	0.00	0.00	0.00
山心	0.00	0.85	0.32	0.00	0.00	0.00	0.00	0.00
川江	2.84	2.20	0.00	0.00	0.00	0.00	0.00	0.00
坡尾底	2.84	2.20	0.00	0.00	0.00	0.00	0.00	0.00
南乐	0.00	1.02	0.22	0.00	0.00	0.00	0.00	0.00

关心点 Locations of concern	5min	10min	15min	20min	25min	30min	超标时刻 Time for excessive leakage	持续时间 Duration
那格塘（陂头）	0.00	0.45	0.45	0.00	0.00	0.00	0.00	0.00
新铺	0.16	1.43	0.00	0.00	0.00	0.00	0.00	0.00
海山排	0.00	0.56	0.56	0.00	0.00	0.00	0.00	0.00
亚细村	0.00	0.55	0.55	0.00	0.00	0.00	0.00	0.00
南乐社区	0.00	0.36	0.36	0.11	0.00	0.00	0.00	0.00
谢家村	0.00	0.70	0.46	0.00	0.00	0.00	0.00	0.00
华南北苑	0.00	0.44	0.44	0.00	0.00	0.00	0.00	0.00
油麻山村	0.00	0.15	0.29	0.20	0.00	0.00	0.00	0.00
东岸场村	0.00	0.09	0.28	0.23	0.00	0.00	0.00	0.00
山芦村	0.00	0.00	0.22	0.22	0.00	0.00	0.00	0.00
大炮岭村	0.00	0.00	0.18	0.18	0.07	0.00	0.00	0.00
旦场村	0.00	0.00	0.15	0.15	0.13	0.00	0.00	0.00
只郎村	0.00	0.00	0.20	0.20	0.05	0.00	0.00	0.00
贵余坛村	0.00	0.38	0.38	0.10	0.00	0.00	0.00	0.00
浸谷塘村	0.00	0.00	0.15	0.15	0.14	0.00	0.00	0.00
大竹园	0.00	0.19	0.30	0.19	0.00	0.00	0.00	0.00
彬定（旧）	0.00	0.32	0.32	0.15	0.00	0.00	0.00	0.00
新村坡	0.00	0.16	0.29	0.20	0.00	0.00	0.00	0.00
江底村	0.00	0.00	0.24	0.24	0.00	0.00	0.00	0.00
彬定（新）	0.00	0.47	0.47	0.00	0.00	0.00	0.00	0.00
槟榔根	0.00	0.24	0.31	0.17	0.00	0.00	0.00	0.00
塘细村	0.00	0.00	0.21	0.21	0.05	0.00	0.00	0.00
邓屋（川江村）	1.76	1.76	0.00	0.00	0.00	0.00	0.00	0.00
港务集团宿舍区	0.00	0.07	0.27	0.24	0.00	0.00	0.00	0.00
屋背山	0.00	0.00	0.21	0.21	0.05	0.00	0.00	0.00
彬嵩	0.00	0.56	0.56	0.00	0.00	0.00	0.00	0.00
冲头村	0.00	0.00	0.19	0.19	0.06	0.00	0.00	0.00
大田	0.00	0.33	0.33	0.14	0.00	0.00	0.00	0.00
北塘村	0.00	0.00	0.15	0.15	0.13	0.00	0.00	0.00
下底村	0.00	0.00	0.15	0.15	0.13	0.00	0.00	0.00
黄稍村	0.00	0.00	0.14	0.14	0.14	0.00	0.00	0.00
淡水口	0.00	0.00	0.15	0.15	0.13	0.00	0.00	0.00
兴港镇彬定小学	0.00	0.12	0.28	0.21	0.00	0.00	0.00	0.00
红花根	0.00	0.07	0.27	0.24	0.00	0.00	0.00	0.00
山梓	0.00	0.00	0.04	0.12	0.12	0.03	0.00	0.00
邓九垌	0.00	0.54	0.54	0.00	0.00	0.00	0.00	0.00
彬池村	0.00	0.00	0.22	0.22	0.00	0.00	0.00	0.00

关心点 Locations of concern	5min	10min	15min	20min	25min	30min	超标时刻 Time for excessive leakage	持续时间 Duration
下低垌村	0.00	0.07	0.27	0.24	0.00	0.00	0.00	0.00
上高垌	0.00	0.00	0.19	0.19	0.07	0.00	0.00	0.00
上陂头	0.00	0.00	0.19	0.19	0.06	0.00	0.00	0.00
下陂头	0.00	0.00	0.17	0.17	0.08	0.00	0.00	0.00
南冲	0.00	0.00	0.07	0.13	0.13	0.00	0.00	0.00
地罗	0.00	0.00	0.14	0.14	0.14	0.00	0.00	0.00
兴港镇	0.00	0.00	0.00	0.12	0.12	0.04	0.00	0.00

（2）风险后果分析

(2) Analysis of risk consequences

由预测结果可知，在发生二氧化氯爆炸，最不利气象条件下（风速 1.5m/s，稳定度 F），二氧化氯出现超大气毒性终点浓度-1 的最远距离为 2201m，出现超大气毒性终点浓度-2 的最远距离为 3299m；最常见气象条件下（风速 3.2m/s，稳定度 D），二氧化氯出现超大气毒性终点浓度-1 的最远距离为 524m，出现超大气毒性终点浓度-2 的最远距离为 850m。由表 5.5-13 及表 5.5-15 可知，在发生二氧化氯泄漏的情形下，周边关心点部分出现超出大气毒性终点浓度-1（红色标记）及大气毒性终点浓度-2（灰色标记），为了保证地区的可持续发展，项目在生产过程中必须加强管理，避免事故的发生，一旦发生事故，立即开展应急措施，必要时根据事故预警级别，向北海市政府汇报，组织居民进行疏散。

From the prediction results, the farthest distance for chlorine dioxide having a concentration above the air toxic endpoint-1 after explosion under the most adverse meteorological conditions (wind velocity 1.5m/s, stability F) is 2,201m and the farthest distance for chlorine having a concentration above the air toxic endpoint-2 is 3,299m; the farthest distance for chlorine dioxide having a concentration above the air toxic endpoint-1 under the most common meteorological conditions (wind velocity 3.2m/s, stability D) is 524m and the farthest distance for chlorine dioxide having a concentration above the air toxic endpoint-2 is 850m. As shown in Tables 5.5-13 and 5.5-15, in the case of chlorine dioxide leakage, the concentration of chlorine in some of the surrounding locations of concern have exceeded the air toxic endpoint-1 (red mark) and the air toxic endpoint-2 (grey mark). In order to ensure the sustainable development of the area, management in the production process of the project must be strengthened to avoid accidents; in case of accidents, immediately carry out emergency measures, and if necessary, report to the Beihai Government and organize the evacuation of residents according to the accident warning level.

鉴于项目组未搜集到二氧化氯大气伤害概率关于与毒性物质有关的三个参数，因此计算的三个参数取值，参照 HJ169-2018 附录 I 中表 I.2 所提供的已知参数物质中，大气毒性终点浓度与本项目最为接近的磷化氢（毒性终点浓度-1、2 分别为 5mg/m^3、2.8 mg/m^3）参数取值，计算过程示例见图 5.5-8，对周边在大气毒性终点浓度-2 范围内关心点的持续影响的大气影响概率分析如下。

Since the project group did not collect the three parameters related to toxic substances from the analysis of probability of harm of chlorine dioxide to atmosphere, the three parameters were calculated with reference to the parameter of hydrogen phosphide of which the air toxic endpoint is closest to that for this project in the known parameter substances provided in Table I.2 in Annex I of HJ169-2018 (air toxic endpoints-1 and 2 are 5mg/m^3 and 2.8mg/m^3, respectively), as shown in Fig. 5.5-8; the probability of continuous atmospheric effects on the surrounding locations of concern in the range of air toxic endpoint-2 is analyzed below.

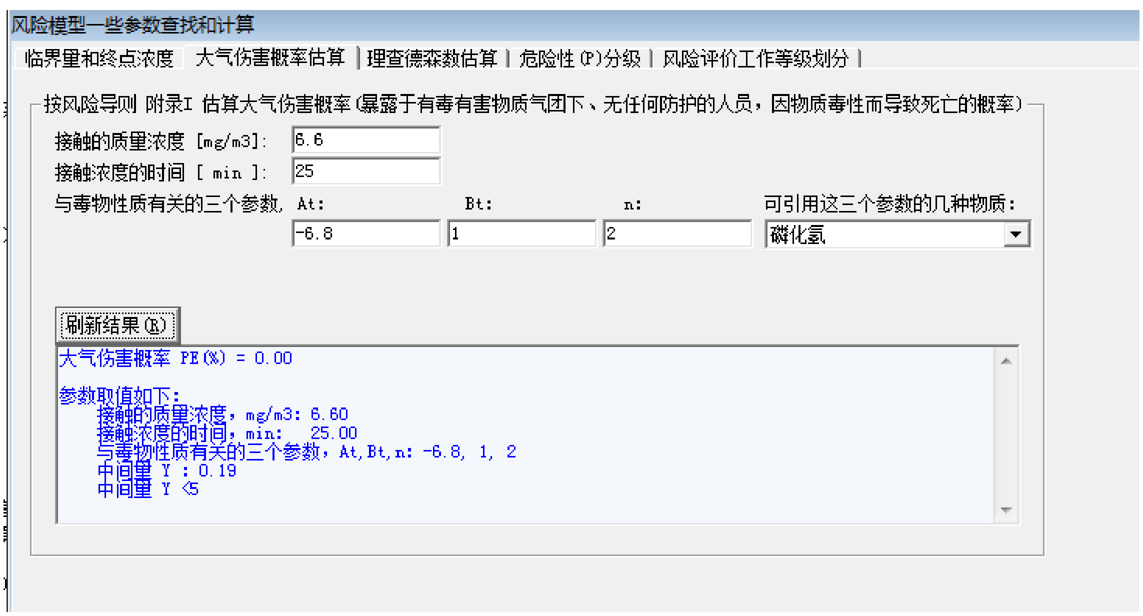


图 5.5-8　二氧化氯泄漏事故关心点大气伤害概率估算（川江）

Fig. 5.5-8 Calculation of the Probability of Harm to Atmosphere at the Locations of Concern in a Chlorine Dioxide Leakage Accident (Chuanjiang River)

表 5.5-16 二氧化氯泄漏事故关心点大气伤害概率估算

Table 5.5-16 Calculation of the Probability of Harm to Atmosphere at the Locations of Concern in a Chlorine Dioxide Leakage Accident

关心点 Locations of concern	PE（%）	关心点 Locations of concern	PE（%）
坡尾底 Poweidi	0.0	贵余坛村 Guiyutan Village	0.0
南乐 Nanyue	0.0	大竹园 Dazhuyuan	0.0
那格塘（陂头） Nagetang (Pitou)	0.0	彬定（旧） Binding (old)	0.0
新铺 Xinpu	0.0	新村坡 Xincunpo	0.0
海山排 Haishanpai	0.0	彬定（新） Binding (New village)	0.0
亚细村 Yaxi Village	0.0	槟榔根 Binlanggen	0.0
南乐社区 Nanyue Community	0.0	邓屋（川江村） Dengwu (Chuanjiang Village)	0.0
谢家村 Xiejiacun Village	0.0	彬嵩 Binsong	0.0
华南北苑 Huanan Beiyuan	0.0	大田 Datian	0.0
油麻山村 Youmashan Village	0.0	邓九垌 Dengjiudong	0.0

（3）风险疏散范围

(3) Scope of risk evacuation

为了更大限度地控制氯气泄漏的环境风险，应对项目周边居民做好宣传工作，指导居民如何应对风险。氯气管线泄漏时，根据事故发生时的气象条件及时与相应的村民委员会或社区委员会联系，共同疏散下风向人群，降低危害。根据事故发生时的气象特征，以及受风险影响的程度，确定风险事故疏散范围如下：

In order to better control the environmental risks of chlorine leakage, residents in the vicinity of the project should be sensitized and instructed on how to deal with the risks. In the event of chlorine pipe leak, contact the corresponding villagers' committee or community committee in time according to the meteorological conditions at the time of the accident to jointly evacuate people downwind to reduce the hazard. Based on the meteorological characteristics at the time of the accident and the degree of exposure to the risk, the evacuation scope for the risk accident is determined as follows:

①首要疏散范围：依据毒性终点浓度-1 浓度及事故发生时的风向，确定设定事故发生时，应立即疏散的范围是事故泄漏源下风向 2201m 范围内的人员（主要为厂内工作人员及对面垌、老妗垌、新岭、竹儿根、山心、川江、坡尾底、南乐、那格塘（陂头）、新铺、谢家村、、邓屋（川江村）、彬嵩）。

①Primary evacuation scope: Based on the air toxic endpoint-1 and the wind direction at the time of the accident, immediate evacuation scope at the time of the accident when it is determined that the set accident is personnel within 2,201 m from the downwind direction of the leakage source of the accident (mainly including employees in the plant and populations in Duimiandong, Laojindong, Xinling, Zhuergen, Shanxin, Chuanjiang River, Poweidi, Nanle, Nagetang (Beitou), Xinpu, Xiejia Village, Dengwu (Chuanjiang Village), Binsong).

②重点疏散范围:依据毒性终点浓度-2 浓度及事故发生时的风向，确定设定事故发生时，应重点疏散的范围是事故泄漏源下风向 3299m 范围内的人员，及风险评价范围内敏感目标人群（主要为厂内工作人员及对面垌、老妗垌、彬垌村、新岭、猪血塘、百班村、竹儿根、山心、川江、坡尾底、南乐、那格塘（陂头）、新铺、海山排、亚细村、南乐社区、谢家村、华南北苑、油麻山、大竹园、彬定（旧）、新村坡、彬定（新）、槟榔根、邓屋（川江村）、彬嵩、大田、邓九垌）。。

②Critical evacuation scope: Based on the air toxic endpoint-2 and the wind direction at the time of the accident, the critical evacuation scope at the time of the accident when it is determined that the set accident is personnel within 3,299m from the downwind direction of the leakage source of the accident, as well as sensitive target populations within the scope of the risk assessment (including employees in the plant and populations in Duimiandong, Laojindong, Bindong Village, Xinling, Zhuxietang, Baiban Village, Zhuergen, Shanxin, Chuanjiang River, Poweidi, Nanle, Nagetang (Beitou), Xinpu, Haishanpai, Yaxi Village, Nanle Community, Xiejia Village, Huananbeiyuan, Youmashan, Dazhuyuan, Binding (old), Xincunpo, Binding (new), Binglanggen, Dengwu (Chuanjiang Village), Binsong, Datian, Dengjiudong).

设定事故发生时,建设单位应急指挥领导小组责任领导应立即辨别当时的上风向和侧风向，并通报“首要疏散范围”、“重点疏散范围”所涉及村委会领导，由建设单位

应急指挥领导小组人员与村委会领导共同指导村民向事故发生地的上风向或侧风向撤离。

When an set accident occurs, the responsible leader of the emergency command leading group of the construction unit shall immediately identify the upwind direction and and sidewind direction, and notify the village committee leaders involved in the "primary evacuation scope" and "critical evacuation scope", and the construction unit emergency command leading group personnel and village committee leaders shall jointly guide the villagers to evacuate to the upwind or sidewind direction of the accident site.

4、柴油火灾事故

4. Diesel oil fire accident

（1）预测结果

(1) Prediction results

单个柴油储罐破裂，遇明火发生火灾，产生次生污染物 CO，扩散至大气环境，造成大气环境风险事故的预测见表 5.5-17。

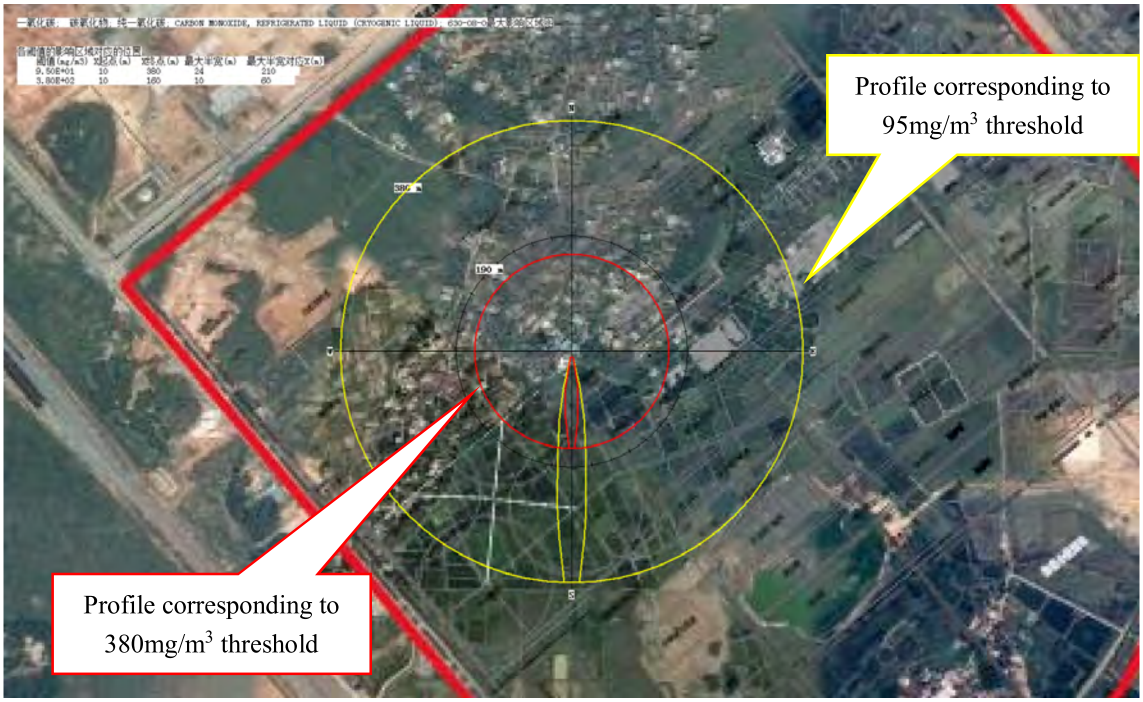
A single diesel oil storage tank ruptures, and diesel oil causes a fire in open fire, producing secondary pollutant CO that diffuses into the atmosphere. Prediction of atmospheric environmental risk accidents is shown in Table 5.5-17.

表 5.5-17 CO 次生污染下风向轴线预测结果表

Table 5.5-17 Downwind Axis Prediction Results for Secondary Pollutant CO

距离 m Distance m	最不利气象条件 Most adverse meteorological condition		常见气象条件 Most common meteorological conditions	
	浓度出现时间 min Concentration time min	高峰浓度 mg/m³ Peak concentration mg/m³	浓度出现时间 min Concentration time min	高峰浓度 mg/m³ Peak concentration mg/m³
10	0.11	3.65E+03	0.05	3.28E+03
110	1.22	7.27E+02	0.57	1.02E+02
210	2.33	2.56E+02	1.09	3.40E+01
310	3.44	1.35E+02	1.61	1.74E+01
410	4.56	8.45E+01	2.14	1.07E+01
510	5.67	5.87E+01	2.66	7.33E+00
610	6.78	4.36E+01	3.18	5.37E+00
710	7.89	3.38E+01	3.70	4.13E+00
810	9.00	2.71E+01	4.22	3.28E+00
910	10.11	2.23E+01	4.74	2.68E+00
1010	11.22	1.87E+01	5.26	2.24E+00

1110	12.33	1.60E+01	5.78	1.89E+00
1210	13.44	1.38E+01	6.30	1.66E+00
1310	14.56	1.21E+01	6.82	1.48E+00
1410	15.67	1.06E+01	7.34	1.32E+00
1510	16.78	9.71E+00	7.86	1.20E+00
2010	22.33	6.63E+00	10.47	7.84E-01
2510	27.89	4.93E+00	13.07	5.64E-01
3010	42.44	3.87E+00	15.68	4.31E-01
3510	49.00	3.15E+00	18.28	3.43E-01
4010	56.56	2.63E+00	20.89	2.82E-01
4510	63.11	2.25E+00	23.49	2.37E-01
大气毒性终点浓度-1 对应位置 m Position corresponding to air toxic endpoint-1 m	起点 10 Starting point 10	终点 380 Endpoint 380	起点 10 Starting point 10	终点 110 Endpoint 110
大气毒性终点浓度-2 对应位置 m Position corresponding to air toxic endpoint-2 m	起点 10 Starting point 10	终点 160 Endpoint 160	起点 40 Starting point 40	终点 40 Endpoint 40


Profile corresponding to 95mg/m3 threshold
Profile corresponding to 380mg/m3 threshold


95mg/m3 阈值对应廓线
380mg/m3 阈值对应廓线

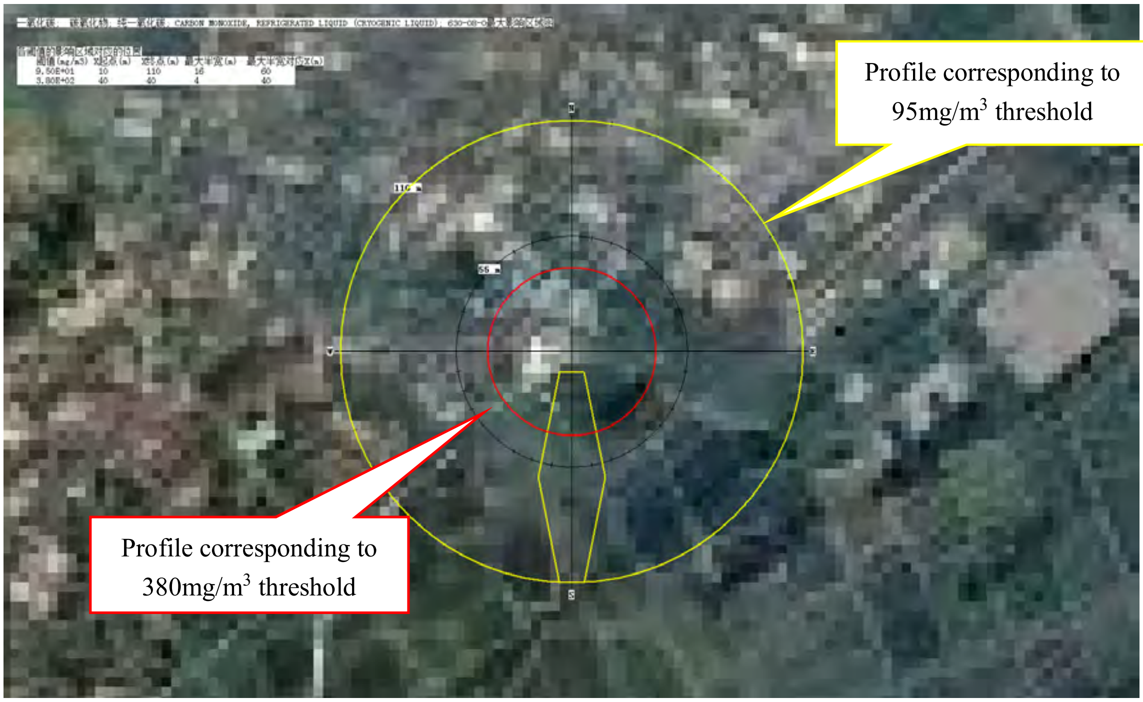


图 5.5-9　最不利气象条件 CO 最大影响范围图

Fig. 5.5-9 Map of the Maximum Impact Range for CO under the Most Adverse Meteorological Conditions

图 5.5-10　常见气象条件 CO 最大影响范围图

Fig. 5.5-10 Map of the Maximum Impact Range for CO under the Most Common Meteorological Conditions

在预测中，由于软件只能预测单一风向浓度，因此在模型中，设定在单一风险 S 情况下，让评价范围内敏感目标刚好处于预测单一风向 S 下风向，即 Y 轴设为各敏感目标与风险源的距离，再次运行模型。各关心点 CO 浓度随时间变化见下表。

In the prediction, since the software can only predict the concentration in a single wind direction, the model is so designed that the sensitive targets in the assessment scope are just located in the predicted single downwind direction S provided that a single wind direction S is set, i.e. the Y axis is set to the distance of each sensitive target from the risk source. The model should be operated again if concentrations in other wind direction are required to be predicted. The CO concentrations at the locations of concern vary over time as shown in the table below.

表 5.5-18　最不利气象条件下 CO 泄漏关系点预测结果

Table 5.5-18 Prediction Results of CO Leakage at Locations of Concern under the Most Adverse Meteorological Conditions

单位：mg/m³

Unit: mg/m³

关心点 Locations of concern	5min	10min	15min	20min	25min	30min
大塘村 Datang Village	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
对面垌 Duimiandong	0.00E+00	0.00E+00	0.00E+00	7.86E+00	7.86E+00	7.86E+00
彬垌村 Bindong Village	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.10E+00
老妗垌 Laojindong	0.00E+00	0.00E+00	1.15E+01	1.15E+01	1.15E+01	1.15E+01
新岭 Xinling	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.68E+00	6.68E+00
猪血塘 Zhuxuetang	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.54E+00	5.54E+00
中石化倒班宿舍（阳关海岸） Sinopec shift dormitory (Yangguan Haian)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.10E+00
百班村 Baiban Village	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.38E+00	6.38E+00
东方海岸大酒店 Oriental Coast Hotel	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.10E+00
竹儿根 Zhuergen	0.00E+00	0.00E+00	0.00E+00	7.80E+00	7.80E+00	7.80E+00
山心 Shanxin	0.00E+00	0.00E+00	0.00E+00	8.85E+00	8.85E+00	8.85E+00
川江 Chuanjiang	0.00E+00	3.23E+01	3.23E+01	3.23E+01	3.23E+01	3.23E+01
坡尾底 Poweidi	0.00E+00	3.23E+01	3.23E+01	3.23E+01	3.23E+01	3.23E+01
南乐 Nanyue	0.00E+00	0.00E+00	1.04E+01	1.04E+01	1.04E+01	1.04E+01
那格塘（陂头） Nagetang (Pitou)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.23E+00	5.23E+00
新铺 Xinpu	0.00E+00	0.00E+00	1.49E+01	1.49E+01	1.49E+01	1.49E+01
海山排 Haishanpai	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.26E+00	6.26E+00
亚细村	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.14E+00	6.14E+00

Yaxi Village						
南乐社区 Nanyue Community	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.36E+00
谢家村 Xiejiacun Village	0.00E+00	0.00E+00	0.00E+00	7.52E+00	7.52E+00	7.52E+00
华南北苑 Huanan Beiyuan	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.12E+00
油麻山村 Youmashan Village	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
东岸场村 Donganchang Village	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
山芦村 Shanlu Village	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
大炮岭村 Dapaoling Village	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
旦场村 Danchang Village	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
只郎村 Zhilang Village	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
贵余坛村 Guiyutan Village	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.54E+00
浸谷塘村 Jingutang Village	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
大竹园 Dazhuyuan	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
彬定（旧） Binding (old)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
新村坡 Xincunpo	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
江底村 Jiangdi Village	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
彬定（新） Binding (New village)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.38E+00	5.38E+00
槟榔根 Binlanggen	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
塘细村 Tangxi Village	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
邓屋（川江村） Dengwu (Chuanjiang Village)	0.00E+00	0.00E+00	1.88E+01	1.88E+01	1.88E+01	1.88E+01
港务集团宿舍区 Port Group dormitory	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
屋背山 Wubeishan	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

彬嵩 Binsong	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.26E+00	6.26E+00
冲头村 Chongtou Village	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
大田 Datian	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
北塘村 Beitang Village	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
下底村 Xiadi Village	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
黄稍村 Huangshao Village	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
淡水口 Danshuikou	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
兴港镇彬定小学 Xinggang Town Binding Primary School	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
红花根 Honghuangen	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
山梓 Shanzi	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
邓九垌 Dengjiudong	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.06E+00	6.06E+00
彬池村 Binchi Village	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
下低垌村 Xiadidong Village	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
上高垌 Shanggaodong	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
上陂头 Shangpitou	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
下陂头 Xiapitou	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
南冲 Nanchong	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
地罗 Diluo	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
兴港镇 Xinggang Town	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

表 5.5-19 常见气象条件下 CO 泄漏关心点预测结果

Table 5.5-19 Prediction Results of CO Leakage at Locations of Concern under the Most Adverse Meteorological Conditions

单位：mg/m³

Unit: mg/m³

关心点 Locations of concern	5min	10min	15min	20min	25min	30min
大塘村 Datang Village	0.0000	0.0000	0.3840	0.3840	0.3840	0.3840
对面垌 Duimiandong	0.0000	1.0300	1.0300	1.0300	1.0300	1.0300
彬垌村 Bindong Village	0.0000	0.0000	0.4840	0.4840	0.4840	0.4840
老妗垌 Laojindong	0.0000	1.5800	1.5800	1.5800	1.5800	1.5800
新岭 Xinling	0.0000	0.8500	0.8500	0.8500	0.8500	0.8500
猪血塘 Zhuxuetang	0.0000	0.6840	0.6840	0.6840	0.6840	0.6840
中石化倒班宿舍（阳关海岸） Sinopec shift dormitory (Yangguan Haian)	0.0000	0.0000	0.4840	0.4840	0.4840	0.4840
百班村 Baiban Village	0.0000	0.8050	0.8050	0.8050	0.8050	0.8050
东方海岸大酒店 Oriental Coast Hotel	0.0000	0.0000	0.4840	0.4840	0.4840	0.4840
竹儿根 Zhuergen	0.0000	1.0200	1.0200	1.0200	1.0200	1.0200
山心 Shanxin	0.0000	1.1800	1.1800	1.1800	1.1800	1.1800
川江 Chuanjiang	5.0300	5.0300	5.0300	5.0300	5.0300	5.0300
坡尾底 Poweidi	5.0300	5.0300	5.0300	5.0300	5.0300	5.0300
南乐 Nanyue	0.0000	1.4200	1.4200	1.4200	1.4200	1.4200
那格塘（陂头） Nagetang (Pitou)	0.0000	0.0000	0.6410	0.6410	0.6410	0.6410
新铺 Xinpu	2.0400	2.0400	2.0400	2.0400	2.0400	2.0400
海山排 Haishanpai	0.0000	0.7880	0.7880	0.7880	0.7880	0.7880
亚细村 Yaxi Village	0.0000	0.7700	0.7700	0.7700	0.7700	0.7700
南乐社区	0.0000	0.0000	0.5200	0.5200	0.5200	0.5200

Nanyue Community						
谢家村 Xiejiacun Village	0.0000	0.9760	0.9760	0.9760	0.9760	0.9760
华南北苑 Huanan Beiyuan	0.0000	0.0000	0.6240	0.6240	0.6240	0.6240
油麻山村 Youmashan Village	0.0000	0.0000	0.4220	0.4220	0.4220	0.4220
东岸场村 Donganchang Village	0.0000	0.0000	0.4020	0.4020	0.4020	0.4020
山芦村 Shanlu Village	0.0000	0.0000	0.0000	0.3300	0.3300	0.3300
大炮岭村 Dapaoling Village	0.0000	0.0000	0.0000	0.2730	0.2730	0.2730
旦场村 Danchang Village	0.0000	0.0000	0.0000	0.0000	0.2300	0.2300
只郎村 Zhilang Village	0.0000	0.0000	0.0000	0.2990	0.2990	0.2990
贵余坛村 Guiyutan Village	0.0000	0.0000	0.5440	0.5440	0.5440	0.5440
浸谷塘村 Jingutang Village	0.0000	0.0000	0.0000	0.0000	0.2230	0.2230
大竹园 Dazhuyuan	0.0000	0.0000	0.4330	0.4330	0.4330	0.4330
彬定（旧） Binding (old)	0.0000	0.0000	0.4620	0.4620	0.4620	0.4620
新村坡 Xincunpo	0.0000	0.0000	0.4240	0.4240	0.4240	0.4240
江底村 Jiangdi Village	0.0000	0.0000	0.0000	0.3520	0.3520	0.3520
彬定（新） Binding (New village)	0.0000	0.0000	0.6620	0.6620	0.6620	0.6620
槟榔根 Binlanggen	0.0000	0.0000	0.4460	0.4460	0.4460	0.4460
塘细村 Tangxi Village	0.0000	0.0000	0.0000	0.3050	0.3050	0.3050
邓屋（川江村） Dengwu (Chuanjiang Village)	2.6600	2.6600	2.6600	2.6600	2.6600	2.6600
港务集团宿舍区 Port Group dormitory	0.0000	0.0000	0.3930	0.3930	0.3930	0.3930
屋背山 Wubeishan	0.0000	0.0000	0.0000	0.3050	0.3050	0.3050
彬嵩 Binsong	0.0000	0.7880	0.7880	0.7880	0.7880	0.7880

冲头村 Chongtou Village	0.0000	0.0000	0.0000	0.2900	0.2900	0.2900
大田 Datian	0.0000	0.0000	0.4790	0.4790	0.4790	0.4790
北塘村 Beitang Village	0.0000	0.0000	0.0000	0.0000	0.2260	0.2260
下底村 Xiadi Village	0.0000	0.0000	0.0000	0.0000	0.2300	0.2300
黄稍村 Huangshao Village	0.0000	0.0000	0.0000	0.0000	0.2160	0.2160
淡水口 Danshuikou	0.0000	0.0000	0.0000	0.0000	0.2300	0.2300
兴港镇彬定小学 Xinggang Town Binding Primary School	0.0000	0.0000	0.4120	0.4120	0.4120	0.4120
红花根 Honghuangen	0.0000	0.0000	0.3930	0.3930	0.3930	0.3930
山梓 Shanzi	0.0000	0.0000	0.0000	0.0000	0.1860	0.1860
邓九垌 Dengjiudong	0.0000	0.7590	0.7590	0.7590	0.7590	0.7590
彬池村 Binchi Village	0.0000	0.0000	0.0000	0.3300	0.3300	0.3300
下低垌村 Xiadidong Village	0.0000	0.0000	0.3930	0.3930	0.3930	0.3930
上高垌 Shanggaodong	0.0000	0.0000	0.0000	0.2780	0.2780	0.2780
上陂头 Shangpitou	0.0000	0.0000	0.0000	0.2830	0.2830	0.2830
下陂头 Xiapitou	0.0000	0.0000	0.0000	0.2630	0.2630	0.2630
南冲 Nanchong	0.0000	0.0000	0.0000	0.0000	0.1970	0.1970
地罗 Diluo	0.0000	0.0000	0.0000	0.0000	0.2160	0.2160
兴港镇 Xinggang Town	0.0000	0.0000	0.0000	0.0000	0.1840	0.1840

（2）风险后果分析

(2) Analysis of risk consequences

由预测结果可知，在设定的柴油火灾事故情形下，产生次生污染物CO污染大气环境，造成大气风险事故情形下，CO出现超大气毒性终点浓度-1的最远距离为160m，出现超大气毒性终点浓度-2的最远距离为380m，对应的不利气象条件为风速1.5m/s，稳

定度 F。无论在最不利气象条件还是最常见气象条件下，CO 的预测浓度在各关心均未超过毒性终点浓度-1 和毒性终点浓度-2。

It can be seen from the prediction results that in the case of secondary pollutant CO produced in the set diesel oil fire accident pollutes the atmospheric environment, resulting in an atmospheric risk accident, the farthest distance for CO having a concentration above the air toxic endpoint-1 is 160m, the farthest distance for CO having a concentration above the air toxic endpoint-2 is 380m, the corresponding adverse meteorological conditions are wind velocity 1.5m/s and stability F. Predicted concentrations of CO do not exceed air toxic endpoint-1 and air toxic endpoint-2 under either the most adverse or the most common meteorological conditions of locations of concern.

（3）风险应急疏散

(3) Risk emergency evacuation

根据预测结果，在设定的柴油火灾爆炸故情景下，毒性终点浓度-1 和毒性终点浓度-2 内均不存在环境敏感目标，因此事故发生首要疏散范围为厂内工作人员，除应急处置人员外，其他人员应沿厂区道路有序疏散，在临时应急场所进行集合。

According to the prediction results, there are no environmentally sensitive targets within air toxic endpoint-1 and air toxic endpoint-2 under the set scenario of diesel oil fire explosion, therefore, the primary evacuees are the employees in the plant, except for emergency disposal personnel, and other personnel should be evacuated in an orderly manner along the plant road and get together at temporary emergency locations.

5.5.2 水环境风险事故分析

5.5.2Analysis of water environmental risk accident

（1）事故应急池设置合理性分析

(1) Rationalization analysis of the accident emergency pool set-up

在发生风险事故的情况下，事故废水主要指初期雨水和消防废水。由于设备的跑冒滴漏等原因，生产区及储罐区地面上不可避免的含有物料，遇雨时会将随雨水通过雨水管线外排至园区雨水管网，对后续处理水质造成一定的影响；另一方面，在设计中消防废水是通过雨水管线进行收集，在发生爆炸火灾事故的时候，生产装置及储罐区的物料极有可能进入消防水中，并随消防水进入雨水收集池。

In the case of a risk accident, accident wastewater mainly refers to initial rainwater and fire wastewater. It is inevitable for materials to present themselves on the ground in the production area and storage tank area due to leakage and venting of the equipment and other reasons, and they will be discharged with the rainwater through the rainwater pipes to the park rainwater pipe network in case of rain, causing a certain impact on the subsequent treatment of water quality; on the other hand, the fire wastewater is designed to be collected through the rainwater pipes, and in the event of a fire explosion accident, the materials in the production plant and storage tank area are very likely to enter the fire wastewater, and flow with the fire water into the rainwater collection pool.

事故废水量参考中国石化建标〔2006〕43 号《关于印发<水体污染防控紧急措施设计导则>的通知》中计算公式确定。具体公式如下：

The amount of accident wastewater is determined by reference to the calculation equation in Sinopec Construction Standard *Notice on the Issuance of the Design Guideline for Water Pollution Prevention and Control Emergency Measures* (No. 43 [2006]). The specific equation is as follows:

V 总=（V1+V2-V3）+V4+V5

V_{Total} = (V1+V2-V3) +V4+V5

式中：V_1——收集系统范围内发生事故的一个罐组或一套装置的物料量；

Where, V_1 - The material volume of one tank group or one plant that has accident within the scope of the collection system;

V_2——发生事故的贮罐或装置的消防水量，m^3；

V_2 - Amount of fire wastewater in the tank or installation in the event of an accident, m^3;

V_3——发生事故时可以转输到其它储存或处理设施的物料量，m^3；

V_3 - The material that can be transferred to other storage or treatment facilities in case of accident, m^3;

V_4——发生事故时仍必须进入该收集系统的生产废水量，m^3；

V_4 - The production waste water that still needs to enter the collection system in case of accident, m^3;

V_5——发生事故时可能进入该收集系统的降雨量，m^3。

V_5 - The rainfall that is possible to enter the collection system in case of accident, m^3.

A. 事故装置可能溢流出的液体（V_1）

A. Liquid likely to spill out from the accident installation (V1)

本项目单个最大储罐为半浓黑液槽，物料贮存量为储存量 3300m^3。

The single largest storage tank for this project is a semi-thick black liquor tank with a storage capacity of 3,300m^3.

B. 消防废水（V2）

B. Fire wastewater (V_2)

根据项目可研报告，项目一次火灾总需消防水量 3348m^3。

According to the project feasibility study report, the total amount of water required for a fire in the project is 3,348m^3.

C. 发生事故时可以转输到其它储存或处理设施的物料量（V_3）

C. Materials that can be transferred to other storage or treatment facilities in case of accident (V_3);

保守计算，V_3=0 m^3。

Conservatively, V_3=0 m^3.

D. 事故发生时仍必须进入收集系统的废水量（V_4）

D. Production wastewater that still needs to enter the collection system in case of accident, (V_4)

根据前述工程分析，项目二期建成后废水产生量为 3959m^3/h，假设污水处理系统发生故障，事故发生后，6h 得到控制，则事故发生时接纳废水量 V_4=3659×6=23756m^3。

According to the aforementioned engineering analysis, the wastewater generated after the completion of the second phase of the project is 3,959m^3/h. Assuming the sewage treatment system fails and the accident is controlled after 6h, the accepted wastewater volume V4=3,659×6=23,756m^3 when the accident occurs.

E. 事故时雨水量（V_5）

E. Rainfall in case of accident (V_5)

$$V_5＝10qF$$

$$V_5=10qF$$

q——降雨强度，mm；按平均日降雨量；

q-rainfall intensity, mm; average daily rainfall;

$$q=q_a/n$$

q_a——年平均降雨量，mm，北海地区年平均降雨量 1548mm；

qa-average annual rainfall, mm, and average annual rainfall of 1,548mm in the Beihai region.

n——年平均降雨日数，135 天。

n-Average annual rainfall days, 135 days

F——必须进入事故废水收集系统的雨水汇水面积，ha。

F-Rainwater catchment area which must enter into accident wastewater collection system, ha.

计算得 $V_5=192m^3$

Calculated as $V_5=192m^3$

综上事故应急池所需总有效容积为 $V_{总}=（V_1+V_2-V_3）_{max}+V_4+V_5=（3300+3348-0）+29826+192=36666m^3$，项目拟在污水处理站设置一座容积为 40000 m^3 的废水事故池，可在满足生产区废水事故排放容量的同时接纳污水处理系统故障 10 小时排水量。

In summary, the total effective volume required for the accident emergency pool is $V_{total}=(V_1+V_2-V_3)_{max}+V_4+V_5=(3300+3348-0)+29826+192=36666m^3$, the project intends to build a 40,000m^3 wastewater accident pool at the wastewater treatment station, and this pool can store the 10-hour water discharge in the event of wastewater treatment system failure while meeting the wastewater accidental discharge of the production area.

（2）原料堆场初期雨水收集系统

(2) Initial rainwater collection system for raw material yard

根据《关于印发<制浆造纸行业现场环境监察指南（试行）>的通知》（环办 [2010]146 号），拟建项目须对厂区初期雨水进行收集处理。项目木材原料采用先筛后存储工艺，采购木片含水率约 40~50%，当遇到降雨时，雨水淋湿堆存的木材，部分雨水被木材吸收，由于木材的吸水性能一般，过饱和后的雨水不再被木材吸收，木片在被水浸泡一段时间后会有一些污染物析出溶解在水中，因此初期雨水具有较高的污染物负荷，需要收集并进行处理。

According to the *Notice on the Issuance of the Guidelines for Environmental Monitoring* *in Pulp and Paper Industry (Trial)* (No. 146 [2010] of the General Office of the Ministry of Environmental Protection), the proposed project shall collect and treat rainwater at the initial stage of the plant. For the project, wood raw materials are sifted and then stored, and the water content of purchased wood chips is about 40~50%; when it rains, rainwater wet the stored wood materials, and part of the rainwater is absorbed by the wood; due to the general water absorption of wood materials, the rainwater after saturation is no longer absorbed by the wood materials, and wood chips after being soaked in water for some time will produce some pollutants precipitation dissolved in water, so the initial rainwater has a high pollutant load and needs to be collected and processed.

项目在堆场四周设置集水沟，设置有雨水沟闸板阀，将降雨初期的雨水截流后通过埋地管道送入配套建设的初期雨水收集池，收集后的初期雨水分批进入污水处理站处理达标后排放，15 分钟后的雨水通过厂区雨水管网外排。降雨结束后，堆场表面木材吸收的水份在日照和风吹的情况下大部分挥发进入大气，只有少部分在长期堆存后渗滤出来，经堆场地面流入淋滤水收集池。本项目木片原料周转较快，一般堆存时间不超过 1 个月，淋滤液的产生量较小，除少量流入淋滤液收集池外，部分随下一次降雨的初期雨水进入初期雨水收集池。如发生生产废水、事故废水、消防废水等混入集水沟，可关闭闸阀避免事故废水通过雨水管网进入外环境，混入雨水管网的废水暂存于管网内，后导入事故池进行处理。

Collecting ditches are set up around the yard, accompanied with rain gutter gate valves, to cut the rainfall at the beginning of the rainfall and then have it flow through the buried pipes into the initial rainwater collection pool; the collected initial rainwater flows in batches into the sewage treatment station and then be discharged after being treated meeting relevant standards;15 minutes later, the rainwater is discharged outside through the plant rainwater pipe network. After the rainfall, most of the water absorbed by the wood on the surface of the stockyard will evaporate into the atmosphere under sunshine and wind, and only a small amount will leach out after long-term storage and flow into the leaching water collection pool from ground of the stockyard. Considering the rapid turnover, the wood chips are generally stored for less than a month, so there will be only a small amount of leachate; in addition to the part flowing into the leachate collection pool, the rest part will flow to the initial rainwater collection tank along with the initial rainwater of the next rainfall. If production wastewater, accident wastewater and fire wastewater are mixed into the collecting ditches, the gate valves can be closed to prevent accident wastewater from flowing outside through the rainwater pipe network; the wastewater mixed into the rainwater pipe network is temporarily stored in the pipe network, and then introduced into the accident pool for treatment.

（3）事故废水厂内控制分析

(3) Analysis of control of accident wastewater in the plant

厂区排水系统分为污水系统（生活污水、生产污水）和雨水系统，实行雨污分流、清浊分流制。项目产生的生产废水经污水处理站处理达标后深海排放，对于事故生产废水，以及发生事故泄漏的相应围堰内无法收集接纳的危险化学品等危险物质（其主要储存设施均设置了可以收纳单个最大容积储罐/储槽泄漏量的围堰，危险物质一旦发生泄漏，首先在围堰内收集），可引入厂内应急事故池暂存。根据上文事故应急池合理性分析，本项目事故应急池已充分考虑事故情形下可能排入该事故池系统的收集系统范围内发生事故的的物料量、发生事故的储罐或装置的消防水量、发生事故时可能进入该收集系统的降雨量、事故时必须进入该系统的废水量。且故障短时间内无法排除，应停止生产，待污水处理设施修理完毕且将事故池中的废水处理完毕后方可开机。

Drainage system in the plant area is divided into sewage system (domestic sewage and production sewage) and rainwater system, with rainwater-sewage diversion and segregation of high and low concentration wastewater implemented. The production wastewater will be discharged into the deep sea after being treated at the sewage treatment station meeting the relevant standards. For the accident production wastewater and the hazardous chemicals that cannot be collected in the corresponding cofferdam where the accident leakage occurs (the main storage facilities are equipped with cofferdams that can collect the maximum volume of leakage from a single storage tank/storage bunker, and in case of leakage of hazardous substances, they will be collected in the cofferdam first), they can be introduced into the accident emergency pool in the plant for temporary storage. Based on the above analysis of the reasonableness of the accident emergency pool, the accident emergency pool of this project has been designed by adequately considering the amount of materials that may be discharged into the collection system of the accident pool system in the event of an accident, the amount of fire wastewater in the storage tank or installation where an accident occurred, the amount of rainfall that may enter the collection system in the event of an accident, and the amount of wastewater that must enter the system in the event of an accident. If the failure cannot be solved within a short period of time, production should be stopped and can be resumed after the sewage treatment facility has been repaired and the wastewater in the accident pool has been treated.

初期雨水经雨水沟闸板阀截留后进入初期雨水收集池暂存，收集后的初期雨水分批进入污水处理站处理达标后排放，15 分钟后的雨水通过厂区雨水管网外排，雨水管网排口设有闸阀，对于生产事故废水（如池体溢流）、消防废水等，可关闭闸阀避免事故废水通过雨水管网进入外环境，混入雨水管网的废水暂存于管网内，后导入事故池进行处理。

The initial rainwater is cut by the rain gutter gate valves and then enters the initial rainwater collection pool for temporary storage; the collected initial rainwater flows in batches into the sewage treatment station and then be discharged after being treated meeting relevant standards;15 minutes later, the rainwater is discharged outside through the plant rainwater pipe network. The rainwater pipe network is equipped with gate valves at the outfalls, which can be closed to avoid production accident wastewater (such as pool overflow), fire wastewater, etc., from entering the external environment through the rainwater pipe network; the wastewater mixed into the rainwater pipe network is stored in the pipe network for temporary storage, then introduced into the accident pool for treatment.

本项目作为现代化制浆造纸厂，设备先进，管理完善，生产线物料泄漏事故发生的可能性较小，且事故池和初期雨水收集池的设置，可较大限度上减轻项目事故排水对地表水环境可能带来的冲击影响，即使发生事故，也能将事故风险控制在车间或厂内，基本不会流入外界地表水体。

As a modern pulp and paper mill with advanced equipment and perfect management, the project has a small probability of leaking production line material, and the set accident pool and initial rainwater collection pool can reduce the impact of the project accident drainage on the surface water environment to a greater extent, even if an accident occurs, the accident risk can be controlled in the workshop or the plant, and basically, the accident drainage will not flow into the external surface water body.

（4）项目废水事故排放环境影响分析

(4) Environmental impact analysis of accidental discharge of project wastewater

根据项目特征和环境风险防控措施，项目产生的黑液、消防事故废水等废水泄露排放入海的可能性较小，本评价以项目污水处理站废水事故排放入海的情景进行分析。

Based on the characteristics of the project and environmental risk prevention and control measures, it is less likely that the wastewater generated by the project, such as black liquor and accident fire wastewater, will be leaked and discharged into the sea, and this assessment analyzes the scenario of accidental discharge of wastewater from the project sewage treatment station into the sea.

根据§4.3 运营期海洋环境影响章节，项目废水事故排放情景取项目综合废水未经处理事故排放 6h，事故排放的同时 B3 排污口其他废水源正常排放，项目 6h 后回归正常排放情景，预测时间取海域废水浓度变化稳定止，预测结果表明，项目废水事故排放时海域浓度增量扩散范围有所增加，但叠加各海洋环境功能区水质本底浓度后，仍能达到相应海洋环境功能区海水水质指标要求，不降低排海口周边海域海水环境功能级别，对东北部山口红树林保护区、东南部儒艮自然保护区等敏感海域影响不大。

According to §4.3 Marine Environment Impact during the Operation Period, the project wastewater accidental discharge scenario is based on the accidental discharge of project comprehensive wastewater before treatment lasts for 6h, while the discharge of other wastewater sources from the B3 outfall is normal, the discharge of project comprehensive wastewater returns to the normal state after 6h, and the prediction time is based on the sea wastewater concentration change and stabilization; the prediction results show that the accidental discharge of project wastewater increases the seawater concentration increment diffusion range, but as the water quality background concentration of each marine environment functional area is considered, the seawater concentration can still meet the corresponding marine environment functional area seawater quality index requirements, with the environment functional level of the seawater around the outfall, and has little impact on sensitive sea areas such as the Northeast Shankou Mangrove Nature Reserve and Southeast Dugong Nature Reserve.

5.5.3 地下水环境风险事故分析

5.5.3 Analysis of groundwater environmental risk accident

5.5.3.1 事故情景地下水风险

5.5.3.1 Groundwater risk in accident scenario

根据地下水环境影响预测与评价章节，项目的非正常工况情景设置为污水处理站池底破损，防渗层失效，废水下渗至地下水环境中对地下水造成污染。通过数值法模拟，由预测结果可知，废水中的 COD 及 NH_3-N 在地下水流场中的影响范围均可到达场地下游 1800m 处，最广影响范围为场地下游 0.62km^2。但场地下游无饮用地下水的敏感点分布，因此泄露事故发生时对周边居民的饮用水安全影响不大。

According to the section on groundwater environmental impact prediction and assessment, the abnormal working conditions of the project are set as the pool bottom of sewage treatment station broken, the impermeable layer failed and groundwater polluted due to seepage of wastewater into the groundwater environment. Through numerical simulation, it can be known from the prediction results that the influence range of COD and NH3-N in the wastewater in the groundwater flow field can reach 1800m downstream of the site, and the widest influence range is 0.62 km2 downstream of the site. However, there is no sensitive points of drinking groundwater distributed downstream of the site, so the safety of drinking water for the surrounding residents at the time of the leakage is not significantly affected.

5.5.3.2 风险事故情景设定

5.5.3.2 Risk accident scenario setting

按照《建设项目环境风险评价技术导则》（HJ169-2018）要求，本次地下水风险预测将会给出有毒有害物质进入地下水体到达下游厂区边界和环境敏感目标的到达时间、超标时间、超标持续时间及最大浓度。

According to the *Technical Guidelines for Environmental Risk Assessment on Projects* (HJ169-2018), this groundwater risk prediction will give the arrival time, time for excessive leakage, duration for excessive leakage and maximum concentration of toxic and hazardous substances entering the groundwater body and reaching the boundary of the downstream plant and environmentally sensitive targets.

本次情景设定为加油站柴油发生火灾爆炸事，导致防渗破损，消防废水通过裂隙下渗进入地下水，假设底部破裂总面积为 5m^2，泄漏物料均为柴油，事故在发生 6 小时后事故得到控制，泄漏柴油均被收集处理。

The scenario is set as a fire explosion of diesel oil in a gas station, resulting in a breach of the impermeability layer, fire wastewater seepage into the groundwater through the fissure, assuming that the total area of the bottom rupture is $5m^2$, the leaking material is diesel oil, the accident is controlled 6 hours after the accident, the leaking diesel oil is collected and processed.

（1）风险事故源强设定

(1) Setting for risk accident source intensity

①柴油在包气带中渗透系数计算

① Calculation of diesel oil permeability coefficient in the aeration zone

$$K_{h,柴油} = \mathrm{K}_{\mathrm{h,water}}\left(\frac{\rho_1}{\rho_w}\right)\left(\frac{\mu_w}{\mu_1}\right)$$

$$K_{h,\text{diesel oil}} = \mathrm{K}_{\mathrm{h,water}}\left(\frac{\rho_1}{\rho_w}\right)\left(\frac{\mu_w}{\mu_1}\right)$$

某种流体渗透系数公式按下式计算：

The permeability coefficient of some kind of fluid is calculated by the following equation:

$K_{h,柴油}$为柴油在某种土壤中的渗透系数；

$K_{h,\text{diesel oil}}$-permeability coefficient of diesel oil in a kind of soil;

$K_{h,water}$为水在某种土壤中的渗透系数，本次取值 2.13×10^{-4}；

$K_{h,water}$ -permeability coefficient of water in a kind of soil, 2.13×10^{-4} for this project;

ρ_1 柴油密度；$0.84g/cm^3$

ρ_1-diesel oil density, $0.84g/cm^3$;

ρ_w 水密度；$1.0g/cm^3$

ρ_w-water density, $1.0g/cm^3$;

μ_1 柴油动力粘度，取值为 6.72mPa.s；

μ_1-diesel oil kinetic viscosity, 6.72 mPa.s;

μ_w 水动力粘度，取值为 1.005mPa.s；

μ_w-water kinetic viscosity, 1.005 mPa.s;

经计算，柴油在项目所处地包气带渗透系数为 $2.68\times10^{-5}m/s$。

The permeability coefficient of diesel oil in the aeration zone where the project is located is calculated to be $2.68 \times 10^{-5}m/s$.

②柴油泄漏地下水风险事故源强

② Source intensity of risk of diesel oil leakage into groundwater

假定渗漏物料均为柴油，则一次事故泄漏进入地下水的柴油体积为：

Assuming that the leaking material is only diesel oil, the volume of diesel oil entering the groundwater in an accident leakage is:

$V=2.68\times10^{-5}\times5\times6\times3600= 0.58m^3$

一次事故柴油泄漏质量为：

Mass of diesel oil in an accident leakage is:

$M=0.58\times840=487kg$

③水文地质参数

③ Hydrogeological parameters

参照项目资料及区域地质资料，本次预测范围内，预测所需相关水文地质参数情况详见表 5.5-20。

With reference to the project information and regional geological information, the relevant hydrogeological parameters required for the prediction within the scope of this prediction are detailed in Table 5.5-20.

表 5.5-20　地下水溶质运移渗透系数、弥散系数等参数建议值

Table 5.5-20 Recommended Values for Groundwater Solute Transport Permeability Coefficient and Dispersion Coefficient

参数名称 Description	地下水流速 Groundwater flow rate	纵向弥散系数 Longitudinal diffusion coefficient
	U	D_L
	m/d	m^2/d
参数取值 Value	0.37	3.7

④预测模型

④ Prediction model

本次预测采用一维无限长多孔介质柱体，示踪剂瞬时注入，其公式如下：

$$C(x,t)=\frac{m/w}{2n_e\sqrt{\pi D_L t}}e^{-\frac{(x-ut)^2}{4D_L t}}$$

For this prediction, a one-dimensional infinitely long porous medium column is used with instantaneous injection of tracer agent as shown below:

C（x,t）:t 时刻 x 处的污染物浓度，mg/L；

C(x,t): pollutant concentration at x at moment t, mg/L;

x：距注入点的距离，m；

x: distance from the injection point, m;

t：时间，d；

t: time, d;

m：注入示踪剂质量，kg；

m: mass of injected tracer agent, kg;

W：横截面面积，m^2；

W: cross-sectional area, m^2;

u：水流速度，m/d；

u: water velocity, m/d;

n_e：有效孔隙度，无量纲；

ne: effective porosity, non-dimensional;

D_L：纵向弥散系数，m^2/d；

D_L: longitudinal diffusion coefficient, m^2/d;

π：圆周率。

π: circumference.

⑤预测结果

⑤ **Prediction results**

在风险事故情景下，柴油储罐火灾爆炸发生突发性泄漏直接进入地下水，根据地下水流场方向，污染物扩散方向未经过川江及坡尾底，柴油污染对下游各关心点影响持续时间及浓度见表 5.5-21，在下游厂界染物浓度变化与时间关系见图 5.5-6。

In the event of a risk accident, diesel oil suddenly leaks directly into groundwater after the storage tank fire explosion; according to the direction of groundwater flow field, pollutant does not diffuse through the Chuanjiang River and Poweidi. The duration of impact on the downstream locations of concern and concentration of the diesel oil pollutant are shown in Table 5.5-21, and the change of pollutant concentration in the downstream plant boundary over time is shown in Fig. 5.5-6.

表 **5.5-21** 各关心点影响持续时间及浓度

Table 5.5-21 Duration of Impact on the Downstream Locations of Concern and Concentration of the Diesel Oil Pollutant

序号 S.N.	敏感点 Sensitive points	污染物到达时间 Arrival time （d） (d)	污染物超标时间 Time for excessive leakage （d） (d)	污染物超标持续时间 Duration for excessive leakage （d） (d)	污染物最大浓度 Maximum pollutant concentration （mg/L） (mg/L)
1	东南侧下游厂界 Southeast downstream plant boundary	1440	1500	3910	4458.3

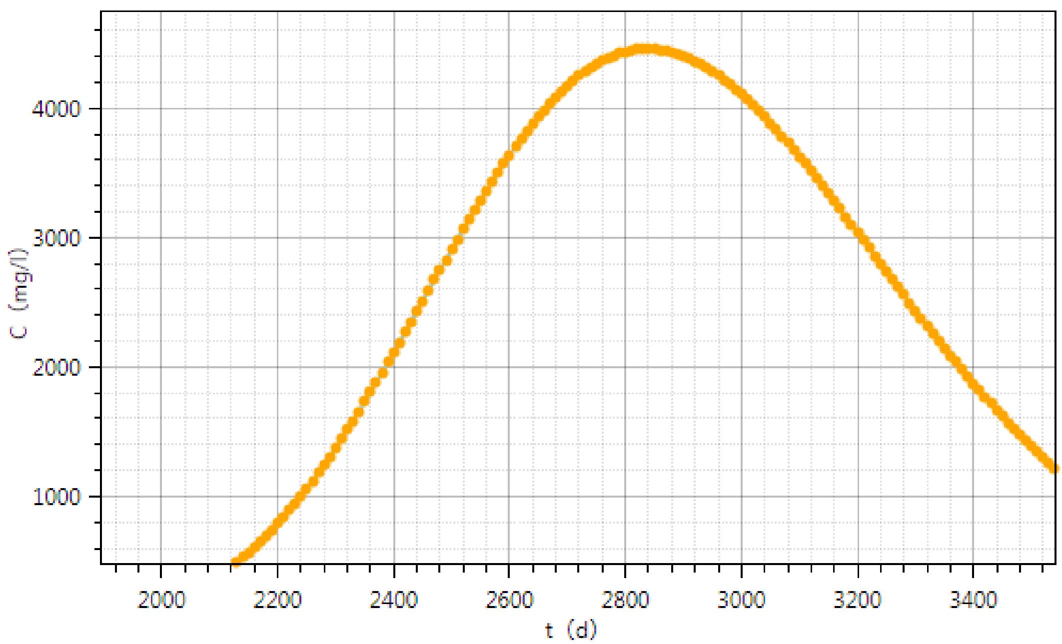


图 **5.5-4** 厂界污染物浓度与时间关系图

Fig. 5.5-4 Plant Boundary Pollutant Concentrations over Time

5.5.4 预测结果汇总

5.5.4 Summary of prediction results

对代表性风险事故风险进行预测和评价，风险事故情形分析情况见表 5.5-22。

The risk of a representative risk accident is predicted and assessed as shown in Table 5.5-22.

表 5.5-22 事故源项及事故后果基本信息表（1）

Table 5.5-22 Basic Information on Source and Consequences of Accidents (1)

<table>
<tr><td colspan="6">风险事故情形分析
Analysis of risk accident scenario</td></tr>
<tr><td>代表性风险事故情形描述
Description of representative risk accident scenario</td><td colspan="5">氨水泄漏
Ammonia water leakage</td></tr>
<tr><td>环境风险类型
Type of environmental risks</td><td colspan="5">危险物质泄漏
Hazardous substance leakage</td></tr>
<tr><td>泄露设备类型
Type of leakage equipment</td><td>储罐
Storage tank</td><td>操作温度/℃
Operating temperature/℃</td><td>25</td><td>操作压力/MPa
Operating pressure/MPa</td><td>0.101325</td></tr>
<tr><td>泄露危险物质
Leaked hazardous substance</td><td>氨水
Ammonia water</td><td>最大存在量/kg
Maximum existing amount/kg</td><td></td><td>泄露孔径/mm
Leakage aperture/mm</td><td>/</td></tr>
<tr><td>泄露速率/（kg/s）
Leakage rate/(kg/s)</td><td></td><td>泄露时间/min
Leakage time/min</td><td>10</td><td>泄漏量/kg
Leakage/kg</td><td></td></tr>
<tr><td>泄露高度/m
Leakage height/m</td><td>2</td><td>泄漏液体蒸发量/kg
Evaporation of leaked liquid/kg</td><td>59.4</td><td>泄露频率
Leakage frequency</td><td>5×10^{-6}</td></tr>
<tr><td colspan="6">事故后果预测
Prediction of accident consequences</td></tr>
<tr><td rowspan="6">大气
Atmosphere</td><td>危险物质
Hazardous substance</td><td colspan="4">大气环境影响
Atmospheric environment impact</td></tr>
<tr><td rowspan="5">氨水
Ammonia water</td><td>指标
Indicator</td><td>浓度值/（mg/m³）
Concentration /(mg/m³)</td><td>最远影响距离/m
Maximum impact distance/m</td><td>到达时间/min
Arrival time/min</td></tr>
<tr><td>大气毒性终点浓度-1
Air toxic endpoint-1</td><td>770</td><td>40</td><td>0.6</td></tr>
<tr><td>大气毒性终点浓度-2
Air toxic endpoint-2</td><td>110</td><td>170</td><td>1.8</td></tr>
<tr><td>敏感目标名称
Name of sensitive target</td><td>超标时间/min
Time for excessive leakage/min</td><td>超标持续时间/min
Duration for excessive leakage/min</td><td>最大浓度/（mg/m³）
Maximum concentration/(mg/m³)</td></tr>
<tr><td>/</td><td>/</td><td>/</td><td>/</td></tr>
</table>

表 5.5-22　事故源项及事故后果基本信息表（2）

Table 5.5-22 Basic Information on Source and Consequences of Accidents (2)

风险事故情形分析 Analysis of risk accident scenario					
代表性风险事故情形描述 Description of representative risk accident scenario	氯气泄漏 Chlorine leakage				
环境风险类型 Type of environmental risks	危险物质泄漏 Hazardous substance leakage				
泄露设备类型 Type of leakage equipment	输送管道 Delivery pipe	操作温度/℃ Operating temperature/℃	45	操作压力/MPa Operating pressure/MPa	0.3
泄露危险物质 Leaked hazardous substance	氯气 Chlorine	最大存在量/kg Maximum existing amount/kg	/	泄露孔径/mm Leakage aperture/mm	/
泄露速率/（kg/s） Leakage rate/(kg/s)	0.089	泄露时间/min Leakage time/min	10	泄漏量/kg Leakage/kg	53.2
泄露高度/m Leakage height/m	2	泄漏液体蒸发量/kg Evaporation of leaked liquid/kg	/	泄露频率 Leakage frequency	5×10^{-6}

事故后果预测 Prediction of accident consequences					
大气 Atmosphere	危险物质 Hazardous substance	大气环境影响 Atmospheric environment impact			
	氯气 Chlorine	指标 Indicator	浓度值/（mg/m^3） Concentration /(mg/m^3)	最远影响距离/m Maximum impact distance/m	到达时间/min Arrival time/min
		大气毒性终点浓度-1 Air toxic endpoint-1	58	460	16.01
		大气毒性终点浓度-2 Air toxic endpoint-2	5.8	1772	32.6
		敏感目标名称 Name of sensitive target	超标时间/min Time for excessive leakage/min	超标持续时间/min Duration for excessive leakage/min	最大浓度 mg/m^3|时刻 min Maximum concentration mg/m^3|time min
		老妗垌 Laojindong	23	15	8.51E+00|24

		山心 Shanxin	26	13	6.14E+00|27
		川江 Chuanjiang	16	17	2.29E+01|18
		坡尾底 Poweidi	16	17	2.29E+01|18
		南乐 Nanyue	24	14	7.63E+00|25
		新铺 Xinpu	21	16	1.10E+01|22
		邓屋（川江村） Dengwu (Chuanjiang Village)	19	17	1.39E+01|21

表 5.5-22 事故源项及事故后果基本信息表（3）

Table 5.5-22 Basic Information on Source and Consequences of Accidents (3)

风险事故情形分析 Analysis of risk accident scenario					
代表性风险事故情形描述 Description of representative risk accident scenario	二氧化氯制备装置爆炸 Explosion of chlorine dioxide preparation plant				
环境风险类型 Type of environmental risks	爆炸、泄漏 Explosion, leakage				
泄露设备类型 Type of leakage equipment	二氧化氯发生器 Chlorine dioxide generator	操作温度/℃ Operating temperature/℃	/	操作压力/MPa Operating pressure/MPa	/
泄露危险物质 Leaked hazardous substance	二氧化氯 Carbon dioxide	最大存在量/kg Maximum existing amount/kg	40000	泄露孔径/mm Leakage aperture/mm	/
泄露速率/（kg/s） Leakage rate/(kg/s)	0.23	泄露时间/min Leakage time/min	5	泄漏量/kg Leakage/kg	138
泄露高度/m Leakage height/m	1	泄漏液体蒸发量/kg Evaporation of leaked liquid/kg	/	泄露频率 Leakage frequency	10-6
事故后果预测 Prediction of accident consequences					
大气 Atmosphere	危险物质 Hazard	大气环境影响 Atmospheric environment impact			

	ous substance				
	二氧化氯 Carbon dioxide	指标 Indicator	浓度值/（mg/m³）Concentration /(mg/m³)	最远影响距离/m Maximum impact distance/m	到达时间/min Arrival time/min
		大气毒性终点浓度-1 Air toxic endpoint-1	6.6	2210	29.3
		大气毒性终点浓度-2 Air toxic endpoint-2	3	3299	40.5
		敏感目标名称 Name of sensitive target	超标时间/min Time for excessive leakage/min	超标持续时间/min Duration for excessive leakage/min	最大浓度 mg/m³|时刻 min Maximum concentration mg/m³|time min
		对面垌 Duimiandong	17	25	8.95E+00|19
		彬垌村 Bindong Village	28	21	3.67E+00|29
		老妗垌 Laojindong	13	23	1.41E+01|15
		新岭 Xinling	19	25	7.21E+00|21
		猪血塘 Zhuxuetang	22	24	5.59E+00|24
		中石化倒班宿舍（阳关海岸）Sinopec shift dormitory (Yangguan Haian)	28	21	3.67E+00|29
		百班村 Baiban Village	20	24	6.79E+00|22
		东方海岸大酒店 Oriental Coast Hotel	28	21	3.67E+00|29
		竹儿根 Zhuergen	17	25	8.87E+00|19
		山心	17	25	1.04E+01|18

		Shanxin			
		川江 Chuanjiang	7	25	3.30E+01|9
		坡尾底 Poweidi	7	25	3.30E+01|9
		南乐 Nanyue	14	25	1.27E+01|16
		那格塘（陂头） Nagetang (Pitou)	23	24	5.17E+00|25
		新铺 Xinpu	11	25	1.78E+01|14
		海山排 Haishanpai	20	24	6.62E+00|22
		亚细村 Yaxi Village	20	25	6.46E+00|22
		南乐社区 Nanyue Community	26	23	4.02E+00|27
		谢家村 Xiejiacun Village	17	25	8.44E+00|20
		华南北苑 Huanan Beiyuan	23	24	5.01E+00|25
		油麻山村 Youmashan Village	30	21	3.09E+00|31
		贵余坛村 Guiyutan Village	26	22	4.25E+00|27
		大竹园 Dazhuyuan	30	21	3.18E+00|30
		彬定（旧） Binding (old)	29	21	3.46E+00|29
		新村坡 Xincunpo	30	21	3.11E+00|31
		彬定（新） Binding (New village)	22	24	5.37E+00|24
		槟榔根 Binlanggen	29	21	3.31E+00|30
		邓屋（川江村） Dengwu (Chuanjiang Village)	10	25	2.18E+01|12
		彬嵩 Binsong	20	24	6.62E+00|22

		大田 Datian	28	22	3.62E+00|29
		邓九垌 Dengjiudong	20	25	6.35E+00|23

表 5.5-22 事故源项及事故后果基本信息表（4）

Table 5.5-22 Basic Information on Source and Consequences of Accidents (4)

<table>
<tr><td colspan="6">风险事故情形分析
Analysis of risk accident scenario</td></tr>
<tr><td>代表性风险事故情形描述
Description of representative risk accident scenario</td><td colspan="5">柴油储罐发生火灾、爆炸后，伴生污染物 SO_2、CO 进行大气环境，通过大气扩散对项目周围环境造成危害
The accompanying pollutants SO_2 and CO generated from the fire and explosion of the diesel oil storage tank get into the atmospheric environment to cause harm to the surrounding environment of the project under the action of atmospheric dispersion.</td></tr>
<tr><td>环境风险类型
Type of environmental risks</td><td colspan="5">火灾、爆炸等引发的伴生/次生污染物排放
Discharge of accompanying/secondary pollutants generated from a fire or an explosion</td></tr>
<tr><td>泄露设备类型
Type of leakage equipment</td><td>储罐
Storage tank</td><td>操作温度/℃
Operating temperature/℃</td><td>25</td><td>操作压力/MPa
Operating pressure/MPa</td><td>0.101325</td></tr>
<tr><td>泄露危险物质
Leaked hazardous substance</td><td>柴油
Diesel</td><td>最大存在量/kg
Maximum existing amount/kg</td><td>68</td><td>泄露孔径/mm
Leakage aperture/mm</td><td>/</td></tr>
<tr><td>泄露速率/（kg/s）
Leakage rate/(kg/s)</td><td>70</td><td>泄露时间/min
Leakage time/min</td><td>10</td><td>泄漏量/kg
Leakage/kg</td><td>34000</td></tr>
<tr><td>泄露高度/m
Leakage height/m</td><td>0</td><td>泄漏液体蒸发量/kg
Evaporation of leaked liquid/kg</td><td>/</td><td>泄露频率
Leakage frequency</td><td>5×10^{-6}</td></tr>
<tr><td colspan="6">事故后果预测
Prediction of accident consequences</td></tr>
</table>

<table>
<tr><td rowspan="6">大气
Atmosphere</td><td>危险物质
Hazardous substance</td><td colspan="4">大气环境影响
Atmospheric environment impact</td></tr>
<tr><td rowspan="5">CO</td><td>指标
Indicator</td><td>浓度值/（mg/m^3）
Concentration /(mg/m^3)</td><td>最远影响距离/m
Maximum impact distance/m</td><td>到达时间/min
Arrival time/min</td></tr>
<tr><td>大气毒性终点浓度-1
Air toxic endpoint-1</td><td>380</td><td>160</td><td>1.6</td></tr>
<tr><td>大气毒性终点浓度-2
Air toxic endpoint-2</td><td>95</td><td>380</td><td>4.2</td></tr>
<tr><td>敏感目标名称
Name of sensitive target</td><td>超标时间/min
Time for excessive leakage/min</td><td>超标持续时间/min
Duration for excessive leakage/min</td><td>最大浓度/（mg/m^3）
Maximum concentration/(mg/m^3)</td></tr>
<tr><td>/</td><td>/</td><td>/</td><td>/</td></tr>
</table>

表 5.5-22　事故源项及事故后果基本信息表（5）

Table 5.5-22 Basic Information on Source and Consequences of Accidents (5)

风险事故情形分析 Analysis of risk accident scenario					
代表性风险事故情形描述 Description of representative risk accident scenario	柴油火灾爆炸致使防渗层破损，污染物下渗污染地下水 Groundwater is polluted by seepage of pollutants due to damage to impermeable layer caused by diesel oil fire explosion.				
环境风险类型 Type of environmental risks	泄漏 Leakage				
泄露设备类型 Type of leakage equipment	反应器 Reactor	操作温度/℃ Operating temperature/℃	/	操作压力/MPa Operating pressure/MPa	/
泄露危险物质 Leaked hazardous substance	/	最大存在量/kg Maximum existing amount/kg	/	泄露孔径/m Leakage aperture/m	1.3
泄露速率 Leakage rate	0.040m/d	泄露时间/min Leakage time/min	长期 Long-term	泄漏量/kg Leakage/kg	9.05
泄露高度/m Leakage height/m	/	泄漏液体蒸发量/kg Evaporation of leaked liquid/kg	/	泄露频率 Leakage frequency	/

事故后果预测 Prediction of accident consequences						
地下水 Groundwater	危险物质 Hazardous substance	地下水环境影响 Groundwater Environmental Impact				
	石油类 Petroleum	厂区边界 Plant boundary	到达时间/d Arrival time/d	超标时间/d Time for excessive leakage/d	超标持续时间/d Duration for excessive leakage/d	最大浓度/（mg/L） Maximum concentration /(mg/L)
		东南侧边界 Southeast boundary	1440	1500	3910	4458.3
		敏感目标名称 Name of sensitive target	到达时间/d Arrival time/d	超标时间/d Time for excessive leakage/d	超标持续时间/d Duration for excessive leakage/d	最大浓度/（mg/L） Maximum concentration /(mg/L)
		/	/	/	/	/

5.5.5 环境风险定性分析

5.5.5.2 Qualitative analysis of environmental risks

5.5.5.1 危险物质泄漏分析

5.5.5.1 Analysis of hazardous substance leakage

可能发生泄漏的危险化学品主要包括氯气、氯酸钠、二氧化氯、氢氧化钠、过氧化氢、盐酸、硫酸等，其中氯气为反应过程中产生，在设备内循环，不进行储存，其余均以溶液状态存储，一旦发生泄漏，各储罐将立即开启碱液或水喷淋装置，泄漏出的溶液暂存于储罐的围堰中，及时采取相关措施，将泄漏的化学品溶液回用或排入事故池，不会对厂外污水处理系统带来显著不利影响，对区域水环境可能带来的环境风险则更小。

The hazardous chemicals that may leak mainly include chlorine, sodium chlorate, chlorine dioxide, sodium hydroxide, hydrogen peroxide, hydrochloric acid, sulfuric acid, etc., in which chlorine is produced during the reaction process, circulates in the equipment, and is not stored, and the rest are stored in the form of solution; once any of the stored chemicals leaks, the storage tank will immediately open the lye or water spray plant, and the leaked solution is temporarily stored in the cofferdam of the storage tank; in this case, timely take relevant measures to reuse the leaked chemical solution or discharge it into the accident pool, which will not pose significant adverse effects on the sewage treatment system outside the plant, and reduce the possible environmental risks to the regional water environment.

此外，碱回收车间、MVR 蒸发工段应设置黑液储罐。一般情况下管道、法兰、阀门的破裂而泄漏的碱回收炉黑液量相对不大，在碱回收系统、MVR 蒸发工段出现暂时故障情况下，可暂时将黑液收集在黑液储罐；黑液储罐区设有围堰，当黑液储罐也发生泄漏时，黑液可在围堰中暂存，并根据需要引入事故池暂存。待系统恢复运行后继续处理，如故障短期内不能排除，必须停止制浆系统，严禁黑液直接排入厂外污水处理站或直接排入水体中。

In addition, black liquor storage tanks should be installed in the alkali recovery workshop and MVR evaporation section. Under normal circumstances, a relatively small amount of black liquor leaks from the alkali recovery furnace due to rupture of pipes, flanges and valves, and in the case of temporary failure of alkali recovery system and MVR evaporation section, the black liquor can be temporarily collected in the black liquor storage tank; black liquor storage tank area is equipped with the cofferdam, therefore the black liquor can be therefore temporarily stored in the cofferdam when the black liquor storage tank also leaks, and then be introduced to the accident pool for temporary storage as needed. Continue to handle the black liquor leakage when the system resumes operation; if the fault cannot be eliminated in the short term, the pulping system must be stopped, and the black liquor is strictly prohibited to be discharged directly into the sewage treatment station outside the plant or directly into the water body.

5.5.5.2 火灾和爆炸分析

5.5.5.2 Analysis of fire and explosion

项目可能引发火灾的环节主要包括二氧化氯车间氢气、氯酸钠、二氧化氯，加油站的柴油，原料堆场堆放的木材原料、成品库堆放的纸品；项目可能引发爆炸的环节主要包括二氧化氯车间氯酸钠、二氧化氯，碱炉等。

The units of the project that may cause a fire mainly include hydrogen, sodium chlorate, and chlorine dioxide in a chlorine dioxide workshop, diesel in a gas station, raw wood in the raw material yard, and paper products in the finished products warehouse; the units of the project that may cause an explosion mainly include sodium chlorate and chlorine dioxide in a chlorine dioxide workshop, alkaline furnace, etc.

项目发生火灾或爆炸产生的主要污染物是二氧化碳与颗粒物，短时间内会对大气环境造成影响，不会造成长久性的污染。加强管理，配备足够的消防设施，可将项目可能引发的火灾爆炸事故控制在厂区内，不会对区域环境带来不利影响。

The main pollutants from fires or explosions for the project are carbon dioxide and particulate matter, which will affect the atmospheric environment for a short period of time and do not cause long-term pollution. Strengthened management with adequate firefighting facilities will allow for the control of potential fire and explosion accidents within the site without adversely affecting the area environment.

5.5.5.3 污染物质事故排放分析

5.5.5.3 Analysis of accidental discharge of pollutants

根据大气环境影响预测与评价章节预测结果，本项目废气处理系统发生非正常排放情况下，NO_2、PM_{10}、$PM_{2.5}$ 网格点最大小时浓度贡献值占标率及环境空气保护目标贡献值最大占标率均无超标现象，对周围环境空气质量影响可以接受。

According to the predicted results of the section on atmospheric and environmental impact prediction and evaluation, the maximum hourly contribution of NO2, PM10, PM2.5 grid points and the maximum contribution of ambient air protection target are not exceeded in the case of abnormal emissions from the waste gas treatment system of the project, and the impact on the ambient air quality is acceptable.

5.5.5.4 自然灾害影响分析及防范措施

5.5.5.4 Impact analysis of natural disasters and preventive measures

（1）地震是一种能产生巨大破坏作用的自然灾害，尤其对构筑物的破坏作用更为明显，它的作用范围大，威胁设备和人员安全。若污水处理站或储罐发生破损，污水将溢流附近地区及区域，造成严重的局部污染事故。

(1) The earthquake is a natural disaster that can cause great damage, especially to structures, and its effects are widespread, threatening the safety of equipment and personnel. If a sewage treatment station or storage tank is damaged, the sewage will overflow into the vicinity and nearby areas, causing serious local pollution accidents.

本项目拟建厂址所在地的抗震设防烈度为 6 度。设计地震分组为第一组，设计基本地震加速度值 0.05g；场地类别：II 类，不存在液化土层。此外工程施工过程中，严格按照设计方案建设，并加强施工监理，保障建设质量，可有效避免地震对工程破坏造成不良影响的环境风险。

The seismic fortification intensity of the proposed site for the project is 6 degrees. The design earthquake group is the first group, the design base seismic acceleration is 0.05g; the site type: Class II, there is no liquefied soil layer. In addition, the construction will be carried out in strict accordance with the design plan, and construction supervision will be strengthened to ensure the quality of construction, which can effectively avoid the environmental risks of adverse effects of the earthquake on the project.

（2）暴雨和洪水是另一种能产生严重破坏的自然灾害，若不能及时疏导，将对工程造成冲击。为了避免暴雨季节雨水对排水口的冲刷，降低污水回水风险，项目建设有雨污分流系统，可有效避免雨水对污水管道的冲击。

(2) Heavy rains and floods are another type of natural disaster that can cause severe damage and will have an impact on the construction if not dredged in time. In order to avoid the washout of rainwater on the outfall during the storm season and reduce the risk of wastewater return, the project will be constructed with a rainwater and sewage diversion system, which can effectively avoid the impact of rainwater on sewage pipes.

（3）本项目在滨海地区进行工程建设，台风是必须考虑的自然灾害，台风是一种破坏力很强的灾害性天气系统，往往同时伴随大风、暴雨及风暴潮的影响。台风过境时常常带来狂风暴雨天气，引起海面巨浪，严重威胁航海安全。登陆后，可摧毁庄稼、各种建筑设施等，造成人民生命、财产的巨大损失。

(3) Typhoons are a type of natural disaster that must be considered for the construction of this project in the coastal area. They are considered as a highly destructive and disastrous weather system that is often accompanied by high winds, heavy rains and storm surges. Typhoons are often accompanied by stormy weather during passing through, causing huge waves at sea and posing a serious threat to maritime safety. After landfalling, crops, various construction facilities, etc. will be destroyed, causing huge losses of people's lives and property.

对此，建设单位应在施工建设中严格按设计方案执行，加强监理，及时编制防台风应急预案，成立防台风指挥部，及时关注台风的发布情况，通过新闻、报纸、互联网等多种渠道收集了解附近及当地区域的海面活动情况和台风预报信息，做到早准备、早防御。台风来临前，做好对厂区防台风防汛隐患排除并及时落实整改措施，做好隐患消除、人员和财物的安全转移，增加安全巡查密度，特别是对易出险情的部门加强巡视。

In this regard, the construction unit should be in strict accordance with the design plan during construction, strengthen supervision, timely prepare typhoon prevention emergency plans, establish a Headquarters of Control of Typhoon, pay timely attention to the release of the typhoon, and collect information about the sea surface activities in the vicinity and local areas and typhoon forecast through the news, newspapers, the Internet and other channels, so as to achieve early preparation and early prevention. Before landfalling, eliminate the hidden danger of typhoon and flood in the plant area and timely implement corrective measures, eliminate potential hazards, safely transfer personnel and property, increase the density of safety inspections, and especially strengthen inspection on the departments are more likely to suffer dangers.

5.6 环境风险管理

5.6 Environmental risk management

环境风险管理目标是采用最低合理可靠原则管控环境风险。采取的环境风险防范措施应与社会经济技术发展水平相适应，运用科学的技术手段和管理方法，对环境风险进行有效的预防、监控、响应。

The objective of environmental risk management is to control the environmental risk following the minimum reasonable and reliable principle. The environmental risk prevention measures to be taken shall be adaptable to the development level of social economy and technology. Scientific technical means and management methods shall be used to effectively prevent, monitor and respond to the environmental risk.

5.6.1 环境风险管理措施

5.6.1 Environmental risk management measures

5.6.1.1 生产装置区风险防范措施

5.6.1.1 Risk prevention measures in production plant area

（1）制定岗位操作规范，操作规程上墙。

(1) The operation specification for each position shall be formulated and the operation procedures shall be put up on walls.

（2）物料进出口阀、燃料系统阀、防爆门设计规范，针对阀门、法兰、管线接口处等易发生跑冒滴漏部位应定期检查、维护，保证灵活好用。

(2) The design specifications for material inlet/outlet valves, fuel system valves and explosion doors shall include such requirement that the valves, flanges, pipeline connections and other positions prone to cause running, emitting, dripping and leaking problems shall be periodically inspected and maintained to ensure they can act flexibly and function normally.

（3）防止易燃易爆物质泄漏，配置防火器材。

(3) Any leaks of flammable and explosive materials shall be prevented and firefighting equipment shall be prepared.

（4）保证通风良好，防止爆炸气体滞留聚集。

(4) Good ventilation shall be ensured to prevent accumulation of explosive gas.

（5）重要部位要用防火材料保护，防烧毁。

(5) Important positions shall be protected with fireproofing material to prevent damage in fire.

（6）在生产工艺中的带压设备如塔、容器等处设置安全阀及放空系统，具有安全联锁装置，以保证人身安全和设备完好。

(6) The pressure plants like towers and containers in the production process shall be equipped with the safety valve or emptying system and the safety interlock device, to ensure safety of persons and intactness of equipment.

（7）精心操作，平稳操作，加强设备检查，在年检时对塔、罐等大型设备要作探

伤检查，出现疑点，一定要检修好才能运行。

(7) Careful and stable operation and intensified inspection shall be provided for the equipment. The large equipment like towers and tanks shall be subject to flaw detection test during each annual inspection. If any suspected point is detected, the equipment can’t be put into service until it has been well repaired and maintained.

5.6.1.2 槽罐装置风险防范措施

5.6.1.2 Risk prevention measures for tanks

（1）根据化学品储罐区的特点，氢氧化钠、硫酸、醋酸等强腐蚀性介质的作业场所的地面、墙壁、设备基础均根据要求做防腐处理，地面做防渗漏处理。

(1) According to the features of the storage tank farm, the floor, wall and equipment foundation of the operating place for the sodium hydroxide, sulfuric acid, acetic acid and other media of strong corrosion nature shall be subject to corrosion-resistant treatment as per requirements, and floor surface shall be subject to anti-leakage treatment.

（2）二氧化氯车间设立防爆检测和报警系统。

(2) An explosive detection and alarm system shall be installed in the chlorine dioxide workshop.

（3）储罐设备良好接地，设永久性接地装置。

(3) The storage tanks shall be properly earthed, and permanent earthing devices shall be provided.

（4）装罐输送中防静电限制流速，禁止高速输送，禁止在静电时间进行检查作业。

(4) Static electricity shall be prevented, and flow speed shall be limited during the process of loading and conveying operations. Any conveying at high speed is prohibited. No inspections are allowed during the discharge of static electricity.

（5）项目各储槽的液位通过液位计与 DCS 系统相连。

(5) The storage tanks used in the project shall be indicated in the DCS system through the level meter.

（6）防止机械（撞击、摩擦）着火源。

(6) Any mechanical ignition sources (resulting from collision and friction) shall be prevented.

（7）控制高温物体着火源，电气着火源及化学着火源。

(7) The high-temperature, electrical and chemical ignition sources shall be controlled.

（8）每年对管道、阀门以及设备等进行一次大修，保证设备的安全运行，对于生产中发现的问题及时进行维修，对于安全隐患及时进行整改。设备要经常进行保养，如果发现异常情况，应立即报告进行维修，保证相关设备的正常运行。

(8) The pipes, valves and equipment shall be overhauled once a year to ensure the safe operation of the equipment. Maintenance shall be implemented in time if any problem is found during production, and rectification shall be provided in time if any safety hazard is identified. The equipment shall be maintained on a frequent basis. Any abnormal conditions detected shall be immediately reported for maintenance, to ensure the normal operation of the related equipment.

5.6.1.3 安全管理措施

5.6.1.3 Safety management measures

（1）安全检修

(1) Safety maintenance

在存有易燃、易爆物质的场所动火或装置检修前，必须严格执行安全防火和有害气体检测的规程，经安全部门同意并发给动火证后才能操作。停车检修设备、管道必须按照操作规程操作，首先将工作介质排净，再用氮气或蒸汽进行吹扫、置换至合格，方可进行检修。必须做到“隔离、置换、分析、办证、确认”十字方针。安全部门应彻底检查待修设备，切实考虑检修人员的安全，慎重签发每一个动火证。

Before commencement of hot work or plant maintenance in places where the flammable or explosive materials are stored, the procedures for safety-related fire prevention and hazardous gas detection must be strictly implemented, and the work cannot be started without the consent given and the hot work permit issued by the safety department. The equipment or pipe must be shut down in accordance with the operation procedures for maintenance purpose, that is, it shall be thoroughly emptied to remove all the working media and purged and replaced with nitrogen or steam to the acceptable level before the maintenance is started. The principle of “segregation, replacement, analysis and applying permit” must be followed. The safety department shall thoroughly check the equipment to be repaired, conscientiously consider the safety of the maintenance personnel and cautiously issue each hot work permit.

（2）安全标志、安全色、警示标志及风向标

(2) Safety signs, safety color, warning signs and wind vanes

本项目生产场所与作业地点的紧急疏散通道、紧急疏散口设置醒目的标志和指示箭头，满足人员紧急疏散的需要。在容易发生事故危及生命安全的场所和设备的各个作业地点设置安全警示标识。如塔区设置易燃易爆等警示牌，在存在高处坠落地点设置警示标志，在汽车可能行驶的路线上设置减速限速标识。

Distinct signs and indication arrows shall be set for emergency excavation pathways and emergency exits in the project production and work places, to meet the requirement of emergent excavation of personnel. Safety warning signs shall be set up in accident-prone and life-threatening places or equipment operating sites. For example, warning signs such as the sign indicating flammable and/or explosive materials shall be set up in tower area, the warning sign shall be set up at the spot which may be hit by falling objects, and the speed limit signs shall be set up on the route along which the cars may be driven.

5.6.1.4 其他管理措施

5.6.1.4 Other management measures

①对职工要加强环保、安全生产教育，生产中积极采取防范措施，厂区内特别是易燃、可燃物品储存和使用场所严禁吸烟、禁火，在醒目处要设有禁烟、禁火的标志。

① The employees shall be provided education on environment protection and work safety to make them actively take preventive measures in production. No smoking and fire is allowed in the plant area, particularly for the storage and use places involving with flammable or combustible articles. The signs of prohibiting smoking and fire shall be set at distinct locations for these areas.

②制定严格的工艺操作规程，加强安全监督和管理，对设备的运行进行实时监控，严格执行生产管理的规章制度和操作规程，防止工人误操作。

② Strict process operation procedures shall be formulated, safety supervision and management shall be strengthened, live monitoring shall be provided for the running equipment, the rules, regulations and operation procedures for production management shall be strictly implemented, to prevent mis-operation of workers.

③加强对各类操作人员、特种作业人员的安全技能教育、培训和考核，并经考核合格后持证上岗。

③ Various operators and special operation personnel shall be provided with appropriate education, training and assessment on safety skills, and can't work until they have successfully passed the assessment.

④要合理安排生产和检修计划，降低设备故障的出现机率，对生产系统容易出现故障的设备要有一定数量的库存设备和备品备件。

④ The production and maintenance plans shall be reasonably developed and implemented, to reduce the occurrence probability of equipment failure. A certain amount of inventoried equipment and spare parts shall be kept available for the equipment that is prone to get malfunctioned in the production system.

⑤加强对生产装置、设备的检修、维护和保养。按规定对特种设备、仪表、安全阀、压力容器定期进行检定、检验，并建立档案。

⑤ More effort shall be made on the repairs, maintenance and servicing of the production plants and equipment. The special equipment, instrument, safety valves and pressure vessels shall be verified and inspected on a regular basis and appropriate records shall be retained according to the regulations.

⑥设立设备管理信息系统，注重设备状态监测和故障诊断，使设备管理从事后维修和计划维修向预测预报过渡降低设备突发故障率，避免重大事故发生。

It is required to establish asset management information system (AMS) and focus on equipment condition monitoring and fault diagnostics, to make the equipment management transited from the breakdown maintenance and scheduled maintenance to the prediction and forecast, to reduce the unexpected failure rate of the equipment, avoiding the occurrence of major accidents.

⑦厂内应设置专用仓库，存放灭火沙土、防护服和灭火器等安全器材，应急救援组织的人员应接受专门培训，在发生火灾、爆炸等突发事故时能够及时利用这些安全设备与工具进行应急工作。

⑦ The special-purpose warehouse shall be built in the plant for storing the sandy soil for fire, protective clothing, fire extinguishers and other safety equipment. The emergency rescue personnel shall receive special trainings to make them able to implement some emergency work with these safety equipment and tools in case of fire, explosion or other emergency accidents.

5.6.2 环境风险防范措施

5.6.2 Environmental risk prevention measures

5.6.2.1 事故大气环境风险防范措施

5.6.2.1 Environmental risk prevention measures for accident atmosphere

（1）物料泄漏应急、救援及减缓措施

(1) Emergency, rescue and mitigation measures for leaks of materials

当发生易燃易爆或有毒物料泄漏时，可根据物料性质，选择采取以下措施，防止事态进一步发展：

When there is any leak of flammable, explosive or toxic materials, following options of measures can be taken according to the nature of materials to prevent further development of the situation:

①根据事故级别启动应急预案；

① The emergency preparedness plan (EPP) shall be initiated according level of the accident;

②根据装置各高点设置的风向标，将无关人员迅速疏散到上风向安全区，对危险区域进行隔离，并严格控制出入，切断火源；根据需要疏散周围居住区人群。

According to the indication of the wind vane set at the high points of the plants, it is required to quickly evacuate the unrelated personnel to the safety zone upwind of the accident, to segregate the hazardous zone, strictly control the access and shut off the fire source; and to evacuate the people in the surrounding residential area as needed.

③易挥发易燃液体泄漏时，用工业覆盖层或吸附/吸收剂盖住泄漏点附近的下水道等地方，防止气体进入。

③ In case of leaks of volatile and/or flammable liquid, the places like sewers near the leak point shall be covered with an industrial coating or adsorbent/absorbent to prevent entry of gases.

④喷雾状水稀释，构筑临时围堤收容产生的大量废水。

④ The leaked liquid shall be diluted with sprayed water mist, and a temporary border dike shall be built to confine the large amount of waste water generated.

⑤小量液体泄漏：用砂土或其它不燃材料吸附或吸收。也可以用大量水冲洗，稀释水排入废水系统。大量液体泄漏：构筑临时围堤收容。用泡沫覆盖，降低挥发蒸气灾害。用防爆泵转移至槽车或专用收集器内，回收或外委资质单位处置。

⑤ For minor liquid leaks: the leak shall be absorbed or taken in with sand or other non-inflammable materials. Alternatively, it can be flushed with a large amount of water and the diluted solution shall be discharged into the wastewater system. For major liquid leaks: a temporary border dike shall be built to confine the leaked liquid. The top of the leaks shall be covered with foam to reduce the hazards caused by the volatilized steam. The leaked liquid shall be transferred to a tank truck or a special collector with explosion-proof pump, to be recovered or dispositioned by a outsourced unit with appropriate qualification.

（2）火灾、爆炸事故防范措施

(2) Prevention measures for fire and explosion accidents

为了避免或减少火灾发生，在原料堆场、化工库、加油站及成品库等四周每隔一定距离设置消防栓；消防用水储存于生产、消防高位水池中，并设有消防用水不被它用的技术设施，以保证用水安全。消防废水不能直接排放，须经监测处理达标后方可外排。

To avoid or reduce fire accidents, the fire hydrants shall be set at a certain interval surrounding the raw material stockyard, chemical warehouse, petrol station and finished product warehouse; The fire water shall be stored in the high-level production and fire water tanks, with effective technical approaches to ensure the fire water will not be used for other purposes, to ensure safety of using water. The waste fire water cannot be directly discharged. It shall be monitored and treated until it can meet the standard requirement before discharge.

对于消防要求高的车间，要设置自动喷水灭火系统，并配置报警、烟感、水流指示器等装置；同时在各车间内设置室内消火栓及灭火器，并在室内消火栓上设置报警阀。

For the workshops with higher fire control requirements, the automatic sprinkler system shall be equipped together with such devices as the alarms, smoke sensors and flow indicators; In addition, the fire hydrants and fire extinguishers shall be equipped inside the workshops, and alarm valves shall be installed in these internal fire hydrants.

储槽、储罐等各类存储危险化学品应与周围的厂房以及其他的存储装置保持一定的防火间距。

The reservoirs, storage tanks and various facilities for storing hazardous chemicals shall be set with a certain fire separation distance from the surrounding workshops and other storage units.

当装置或储罐发生火灾或爆炸时：

In case of fire or explosion of the plant or storage tank:

①根据事故级别启动应急预案；

① The emergency preparedness plan (EPP) shall be initiated according level of the accident;

②根据需要，切断着火设施上、下游物料，尽可能倒空着火设施附近装置或贮罐物料，防止发生连锁效应；

② As required, the material fed from the upstream unit and fed to the downstream unit of the burning facility shall be cut off, and the materials in the plants or storage tanks near the burning facility shall be emptied as far as possible, to prevent occurrence of linkage effect.

③救火的同时，采用水幕或喷淋的方法，防止引发继发事故；

③ The water curtain or sprinkling method shall be used in the process of extinguishing the fire, to prevent occurrence of secondary accidents;

④据事故级别疏散周边人员。

④ The surrounding personnel shall be excavated as required according to the level of the accident.

（3）碱炉、石灰窑、锅炉风险防范措施

(3) Prevention measures for alkali furnaces, lime kilns and boilers

为了有效地预防碱炉爆炸事故的发生，必须从碱炉、石灰窑、锅炉的选购、安装、使用、维修、保养等环节着手，切实贯彻执行国家有关法律、法规和标准。

To effectively prevent the occurrence of explosion accident of the alkali furnace, focus must be given to all the links including purchase, installation, operation, maintenance and servicing of the alkali furnace, lime kiln and boiler, to conscientiously implement the applicable national laws, regulations and standards.

①选购必须严格要求

① The purchase must be in strict compliance with the requirements

对碱回收、石灰窑、锅炉等车间全套设备的选择均应严格要求。选择的碱炉、石灰

窑要特别在炉膛中部设计相对薄弱结构，当炉膛发生意外爆炸时，巨大冲击力通过薄弱结构定向的尽快释放，使损失降低到最低程度。

The selection of the all the equipment in the alkali recovery, lime kiln workshop and boiler workshops, etc. shall be in strict compliance with the requirements. In selecting the alkali furnace and lime kiln, special attention shall be given to the furnace intermediate section which shall be designed as a relatively weaker structure. In case of explosion in the furnace, the huge impact force can be quickly released following the preset direction through this weak structure, thus to minimize the loss as much as possible.

②安装必须符合要求

② The installation must comply with the requirements

安装单位必须取得相应的资质。碱炉、石灰窑、锅炉安装前，应对各个部件的质量进行逐个检查，发现质量不合格，有权拒绝安装。确保所有的对接焊缝均满足质量要求。

The installation contractor must obtain appropriate qualification. Prior to installation of the alkali furnace, lime kiln and boiler, check the quality of each component. The installation contractor has the right to refuse the installation if any nonconforming quality is detected. All the butt welding shall be aligned with the quality requirements.

③加强使用中的安全管理和维修

③ Safety management and maintenance shall be intensified during operation.

为了预防碱炉、石灰窑、锅炉事故，必须加强安全管理工作。做好碱炉、石灰窑、锅炉的运行管理、维修保养、定期检查等工作。应有专人负责设备的技术管理，要建立以岗位责任制为主的各项规章制度，应制订防爆、防火、防毒细则，还应建立巡回监视检查和对自动仪表定期进行校验检修的制度。司炉工人应经考核取得《特种设备作业人员证书》方准操作。碱炉、石灰窑、锅炉运行值班人员应不间断地观察燃料及废液供给、燃烧等情况，如发现异常危险征兆，要立即上报，采取措施、防止爆炸。

To prevent accidents in the alkali furnace, lime kiln and boiler, the safety management must be intensified. Proper operation management, maintenance & servicing, regular inspection and other work shall be conducted for the alkali furnace, lime kiln and boiler. A dedicated person shall be dispatched to take charge of technical management. The rules and regulations mainly including the job responsibility system, the detailed rules for measures to prevent explosion, fire and toxins, and the patrol monitoring & inspection system and the system of periodical calibration & maintenance of automatic instrument shall be established. The boiler worker shall not start work without the *Operator's License for Special Equipment.* The personnel on duty for the alkali furnace, lime kiln and boiler shall unremittingly observe the supply, combustion and other conditions of the fuel and waste liquid, and shall immediately report and take actions to prevent explosion if any signal of abnormal hazards is detected.

④建立健全消防及火灾报警系统

④ The fire protection and fire alarm system (FAS) shall be established and improved.

要有完善的安全消防措施，配备完善的消防系统，设有固定泡沫灭火系统及冷却水喷淋系统。各重点部位设备应设置自动控制系统控制和设置完善的报警连锁系统，制定严格的作业制度。

Complete fire protection measures shall be available, and a perfect fire protection system shall be equipped, containing the stationery foam fire extinguishing system and cooling water sprinkling system. The automatic control system shall be installed at key positions, perfect alarm interlocking system shall be provided, and stringent operation system shall be formulated.

（4）烟气事故排放

(4) Emergency emission of off gas

做好废气处理设施的日常维护工作，对于电器元件的损坏、故障问题及时进行修理。设置备用电路，以保证在电路故障时除尘、脱硝系统正常运行。按要求设置碱回收锅炉、220t/h 固废综合利用锅炉、2×280t/h 燃煤锅炉、850t/d 石灰窑废气的在线监测装置，随时监控污染物的排放情况，发现风险排污及时采取处理措施。

Proper daily maintenance shall be provided for the waste gas treatment facilities. The damaged or faulty electrical elements shall be repaired in time. The backup electric circuit shall be set to ensure the normal operation of the dust collection and denitration system in case of failure of the electric circuit. Online waste gas monitoring devices shall be installed as required for the alkali recovery boiler, 220t/h integrated solid waste recycling boiler, 2×280t/h coal-fired boilers and 850t/d lime kiln, to monitor the discharge of the pollutants at any time. Measures shall be taken in time when any risk of pollutant discharge is detected.

（5）臭气处理系统故障

(5) Failure of odor treatment system

臭气收集系统包括高浓度不凝气(CNCG)系统、低浓度不凝气(DNCG)系统和汽提气(SOG)系统三套处理装置，分别将蒸煮、洗浆及碱回收蒸发过程中产生的不凝气全部收集起来，高浓臭气和汽提气经处理后直接送到碱回收炉燃烧，低浓臭气经碱液洗涤后送碱回收炉作二次送风。如处理系统突然停电或臭气输送管路出现破裂导致臭气未经处理直接外泄，会影响到周边区域。

The odor treatment system includes three treatment systems consisting of the concentrated non-condensable gas (CNCG) system, dilute non-condensable gas (DNCG) system and stripper off-gas (SOG) system, to collect all the non-condensable gas generated respectively from the steaming, pulp washing and alkali recovery processes. The concentrated odor and the stripper off-gas after treatment is directly led to the alkali recovery furnace for combustion, and the dilute odor after washed in the alkali liquor is conveyed to the alkali recovery furnace as the secondary air supply. The surrounding area may be affected if the odor without any treatment is directed emitted to the atmosphere due to abrupt power failure of the treatment system or fracture of the pipeline conveying the odor.

防范措施包括臭气处理系统采用双路供电，输送管路采用优质耐腐管材、阀门、接头并及时维护。

The prevention measures include power supply through double circuits for the odor treatment system, and top-quality corrosion resistant pipes, valves and joints used and timely maintenance provided for the conveying pipes.

（6）可挥发危险物质风险防范措施

(6) Risk prevention measures for volatile hazardous substances

项目涉及的泄漏后可挥发至大气环境中的危险物质包括氯气、液氨、二氧化氯、盐酸、硫酸等。

The hazardous substances that can be volatilized into the atmospheric environment after leakage in this project includes chlorine gas, liquid ammonia, chlorine dioxide, hydrochloric acid and sulfuric acid, etc.

①对于氯气、二氧化氯，存在于二氧化氯车间设备及管线中，配备氯气泄漏报警装置及碱液喷淋装置，一旦氯气管线发生泄漏事故，立即启动喷淋装置，最大限度地控制氯气扩散至周边大气环境中。同时配备氯气应急监测设施，及时开展氯气应急监测。

① The chlorine gas and chlorine dioxide exist in the chlorine dioxide workshop equipment and pipelines which are installed with the chlorine gas leak alarm and the alkali liquor sprinkler. In case of any leak accident in the chlorine gas pipeline, the sprinkler is immediately started to control the chlorine gas spread into the surrounding atmospheric environment to the maximum extent as possible. In addition, the chlorine gas emergency monitoring device is equipped to provide emergency monitoring of the chlorine gas in time.

②对于液氨，存在于液氨储罐中，配备液氨泄漏报警装置及喷淋装置，一旦液氨储罐发生泄漏事故，立即启动喷淋装置，最大限度地控制氨气扩散至周边大气环境中。同时配备氨气应急监测设施，及时开展氨气应急监测。

② The liquid ammonia exists in the liquid ammonia storage tanks which are installed with the liquid ammonia leak alarm and the sprinkler. In case of any leak accident in the liquid ammonia tanks, the sprinkler is immediately started to control the ammonia gas spread into the surrounding atmospheric environment to the maximum extent as possible. In addition, the ammonia gas emergency monitoring device is equipped to provide emergency monitoring of the ammonia gas in time.

③对于二氧化氯、盐酸、硫酸等化学品，均以溶液状态存在于各储罐中，储罐均设有围堰，配备喷淋装置，一旦储罐发生泄漏事故，溶液收集在相应围堰内，立即启动喷淋装置，最大限度地控制相应大气污染物扩散至周边大气环境中。

③ The chemicals like chlorine dioxide, hydrochloric acid and sulfuric acid are presented in the state of solution and exist in the storage tanks. A cofferdam is built around the storage tank and the sprinkler is installed. In case of any leak accident in the storage tanks, the solution is collected within the cofferdam and the sprinkler is immediately started to control the air pollutants spread into the surrounding atmospheric environment to the maximum extent as possible.

④化学品生产线设置有害气体监测装置，有害气体一旦超标，系统即会发出警报，并自动切断化学反应源，从源头上减少风险值。

④ The chemicals process line is equipped with hazardous gas monitoring device. Once the hazardous gas is out of the standard, the system will send out alarm signals and automatically cut off the chemical reaction source, to reduce the risk from the source.

⑤此外，项目配备应急处理设施和人员防护设施，用于事故泄漏后的应急处理。

⑤ In addition, emergency treatment facilities and personnel protective equipment are provided in this project, to be used for the emergency treatment after leak accidents.

（7）二氧化氯制备车间风险防范措施

（7）Risk prevention measures for chlorine dioxide preparation workshop

二氧化氯制备车间及厂界四周设置氯气、二氧化氯在线监测报警装置。根据二氧化氯制备车间的特点，盐酸、氯气、二氧化氯溶液等强腐蚀性介质的作业场所的地面、墙壁、设备基础均应根据要求做防腐处理，地面还应作防渗漏处理。氯气、二氧化氯有毒作业场所应设置防毒器材专用柜，配备足量应急救援器材，并设专人管理，应急救援器材要确保在任何情况下都处于备用状态。

The on-line monitoring & alarm devices for chlorine gas and chlorine dioxide are installed in the chlorine dioxide preparation workshop and at the periphery of the plant boundary. According to the features of the chlorine dioxide preparation workshop, the floor, wall and equipment foundation of the operating place for the hydrochloric acid, chlorine gas, chlorine dioxide solution and other media of strong corrosion nature shall be subject to corrosion-resistant treatment as per requirements, and floor surface shall be subject to anti-leakage treatment. The operating places for the toxic substances of chlorine gas and chlorine dioxide shall be equipped with special-purpose cabinet to be used for storing toxic protection equipment. Sufficient emergency rescue equipment shall be prepared and a dedicated person shall be assigned for management, to ensure the emergency rescue equipment is in ready state at any conditions.

每年对管道、阀门以及设备等进行一次大修，保证设备的安全运行，对于生产中发现的问题及时进行维修，对于安全隐患及时进行整改。设备要经常进行保养，如果发现异常情况，应立即报告进行维修，保证相关设备的正常运行。

The pipes, valves and equipment shall be overhauled once a year to ensure the safe operation of the equipment. Maintenance shall be implemented in time if any problem is found during production, and rectification shall be provided in time if any safety hazard is identified. The equipment shall be maintained on a frequent basis. Any abnormal conditions detected shall be immediately reported for maintenance, to ensure the normal operation of the related equipment.

对于输送管道以及二氧化氯的储存容器加强维护，杜绝生产过程中跑冒滴漏现象的

发生。

Intensified maintenance shall be provided for the conveying pipes and the chlorine dioxide storage containers. Any occurrence of running, emitting, dripping and leaking problems in the process of production shall be avoided.

5.6.2.2 事故废水环境防范措施

5.6.2.2 Environmental risk prevention measures for accident waste water

1、建立“三级”防控体系

1. Establishment of “three-level” prevention and control system

（1）三级风险防范措施

(1) Three-level risk prevention measures

为避免项目事故废水进入外环境造成污染，项目设置三级风险防范措施：

To avoid the pollution that may be caused by the accident waste water flowing into the external environment, three-level risk prevention measures are applied in the project:

① 一级风险防范措施——地沟及围堰

② Level I risk prevention measures - trenches and cofferdams

必须建设装置区围堰、罐区防火堤及其配套设施（如备用罐、储液池、导流设施、清污水切换设施等），防止污染雨水和轻微事故泄漏造成的环境污染；设置车间事故废水、废液的收集系统。项目各车间内建有地沟，储罐设置围堰，地沟及围堰内设泵、管线与厂区事故应急池相连，可及时将废水导排至事故应急池。建设单位应严格按照相关规范建设围堰，围堰容积需满足事故下储罐泄漏最大量的要求。正常情况下，应保证围堰内不能存放废水或其他水，降水时积聚的水应及时排空。若车间发生泄漏事故，泄漏物料进入地沟，待事故妥善处理后将可回收部分进行回收利用，不可回收部分分批送至污水处理站进行处理后达标排放；若化学品储罐发生泄漏，首先将泄漏物料收集在围堰内，待事故妥善处理后将可回收部分进行回收利用，不可回收部分分批送至污水处理站进行处理后达标排放。当多个储罐装置同时发生泄漏事故，必要时可向园区应急处理指挥部门请求援助，根据突发环境事件对应的应急等级启动应急程序

The cofferdams around the plant area as well as the fire dike and its auxiliary facilities (spare tank, storage pool, diversion unit and clean & wastewater switching unit, etc.) shall be built, to prevent pollution to the rainwater as well as the pollution to the environment due to the minor leak accident; the accident waste water and waste liquid collection systems shall be installed in workshops. Trenches shall be constructed in the workshops, cofferdams shall be built around the storage tanks, pumps shall be equipped for the trenches and cofferdams with pipelines connected with the emergency pool, which makes it possible to pump the waste water to the emergency pool in time. The Employer shall built the cofferdam in strict accordance with applicable specifications. The volume of the cofferdam shall meet the requirement that the maximum amount of leakage from the storage tank can be accommodated under accident conditions. Under normal conditions, no wastewater or the water for other purposes can be stored in the cofferdam. The water accumulated during raining days shall be drained out in time. If a leak accident occurs in the workshop, the leaked material will flow into the trench. After the accident has been properly handled, the recyclable leaked material will be recycled and the non-recyclable will be conveyed by batches to the wastewater treatment station for treatment and discharged up to standard; If leaks occur to the chemicals storage tank, the leaked material shall be firstly collected within the cofferdam. After the accident is properly handled, the recyclable leaked material will be recycled and the non-recyclable will be conveyed by batches to the wastewater treatment station for treatment and discharged up to standard. In case of leaks occurring to more than one storage tank, assistance can be requested from the Emergency Response Command Department of the Park, and the emergency procedure will be started according to the emergency level of the sudden environmental event.

③ 二级风险防范措施——事故应急池

④ Level II risk prevention measures - emergency pool

事故池规模合理性见 5.5.2 水环境风险事故分析。正常情况下，应保证事故池内不能存放废水或其他水，降水时可能积聚的少量雨水应及时排空。

For the reasonability of the volume of the emergency pool, please refer to Item 5.5.2 - Risk analysis of accidents for water environment. Under normal conditions, no wastewater or the water for other purposes can be stored in the emergency pool. The small amount of rainwater that may be accumulated during raining days shall be drained out in time.

若泄漏物料超过储罐/储槽围堰高度的三分之二，应立即打开阀门，将泄漏物料引入事故池，避免泄漏物料溢流出围堰，待事故妥善处理后，将可回收部分进行回收利用，不可回收部分分批送污水处理站处理后达标排放；若泄漏物料量超过事故池容量的三分

之二而事故仍无法得到有效控制，应立即采取停产措施。

If the level of the leaked material exceeds two-thirds of the height of the storage tank / reservoir, the valve shall be opened immediately, to introduce the leaked material to the emergency pool, avoiding overflow of the leaked material out of the cofferdam. After the accident has been properly handled, the recyclable leaked material will be recycled and the non-recyclable will be conveyed by batches to the wastewater treatment station for treatment and discharged up to standard; If the level of the leaked material exceeds two-thirds of the height of the emergency pool while the accident hasn't been effectively controlled, the production shall be immediately stopped.

一般情况下制浆造纸企业生产设施发生泄漏的可能性较小，且事故发生后较易控制，可将风险控制在车间或浆厂内；污水处理系统出现自身故障或由其他外部因素影响而发生故障的几率相对较大，若污水处理站发生事故，导致污水无法处理达标，可将该污水排入事故池中暂存。

In general, there is small probability of leaks occurring to the production facilities in a pulp & paper making enterprise, and the accident is easy to control after occurrence, with the risk controlled within the workshop or the pulp plant; While there is relatively large probability to have troubles in the waste water treatment system itself or caused by other external factors. If the wastewater cannot be discharged due to failure to meet the standard requirement resulting from accident of the wastewater treatment station, the wastewater can be discharged into the emergency pool for temporary storage.

③三级风险防范措施——雨水废水排口闸阀

③ Level III risk prevention measures - gate valve at the waste rainwater discharge outlet

一般情况下，事故发生后，一级、二级风险防范措施即能够将事故控制在厂内，不会对左江水环境造成不良影响，但由于自然灾害等强烈不可抗力造成的危害则更加难以控制。

Usually, after occurrence of the accident, the accident can be controlled within the plant after implementing Level and I & II risk prevention measures, causing no adverse impact on the water environment of the Zuo River. However, it is more difficult to control the harm caused by the severe force majeure like natural disasters.

项目在厂区雨水和废水排口设置闸阀，一旦由于自然灾害等强烈不可抗力造成物料

或污水泄漏，停产后一级、二级风险防范措施未能全部储存物料或污水，或由于自然灾害等不可抗力因素造成围堰、事故池破裂，立即关闭闸阀，避免事故废水由雨水排口进入外环境，最大限度避免事故废水进入地表水体。

The gate valve is set at the discharge outlet of the rainwater and wastewater in the plant. In case of leaks of materials or wastewater caused by the severe force majeure like natural disasters, and it is unable to store all the leaked materials or wastewater after implementation of Level I and II risk prevention measures, or in case of fracture of the cofferdam or emergency pool due to the force majeure like natural disasters, the gate valve shall be closed immediately, to prevent the accident wastewater from entering the external environment through the rainwater discharge outlet, and thus to avoid entry of the accident wastewater into the surface water body to the maximum extent as possible.

（2）雨水系统设计

(2) Design of clean rainwater system

项目实施“雨污分流”，但雨水管沟内也应在关键节点闸门、抽水泵、管线与厂区事故池相连，废水一旦进入雨水系统，可将废水抽至事故池后再送至污水处理站处理，阻断事故废水直接通过雨水系统进入厂外水体，造成污染。

The “rainwater & wastewater diversion” measure shall be implemented in this project, but the valve, suction pump and pipeline at the key node in the rainwater pipe ditch shall be connected with the emergency pool in the plant area. In case the wastewater enters the rainwater system, the wastewater can be pumped to the emergency pool and then delivered to the wastewater treatment station for treatment, blocking off the accident wastewater and preventing it from directly entering the external water body through the rainwater system, to avoid pollution.

（3）事故状态下废水收集机制

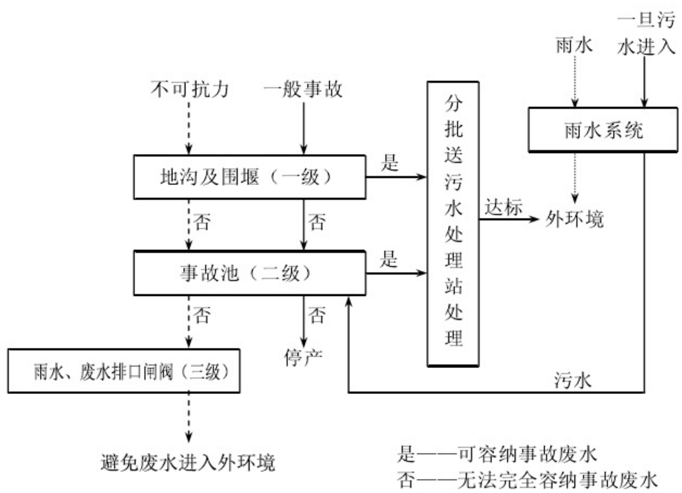
(3) Wastewater collection system under accident conditions

事故情形下，事故生产废水可直接进入事故池进行暂存，若发生储罐/储槽泄漏事故，泄漏物料首先由围堰进行收集，后导入事故池等待处理；初期雨水经雨水沟闸板阀截留后进入初期雨水收集池暂存，后分批进入污水处理站处理，雨水管网排口设有闸阀，一旦生产事故废水（如池体溢流）、消防废水等混入雨水管网，可关闭闸阀避免事故废水通过雨水管网进入外环境，混入雨水管网的废水暂存于管网内，后导入事故池进行处理。

Under accident conditions, the wastewater generated from the accident can be directly led to the emergency pool for temporary storage. In case of leaks occurring to the storage tanks / reservoirs, the leaked materials shall be firstly collected in the cofferdam, and then led to the emergency pool for further treatment; The initial runoff that is entrapped by the gate valve set in the rainwater trench shall be led into the initial runoff collection pool for temporary storage and then transferred by batches to the wastewater treatment station for treatment. The gate valve is set at the discharge outlet of the rainwater pipe system. In case the wastewater generated from production accidents (e.g., overflows from tanks) and waste fire water, etc. enters the rainwater pipe system, the gate valve can be closed to avoid entry of the accident wastewater into the external environment through the rainwater pipe system. The wastewater entering the rainwater pipe system can be temporarily stored in the pipe and then transferred to the emergency pool for treatment.

项目厂区三级风险防范措施示意图见下图。

The sketch of the Level III risk prevention measures for the project area is shown in the figure below.



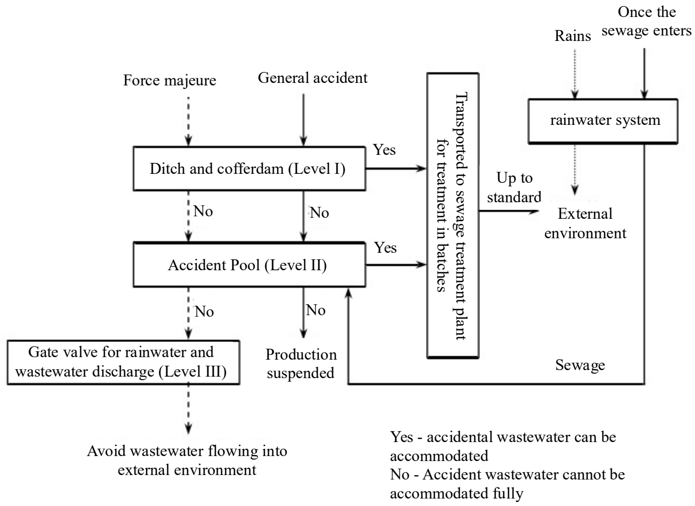
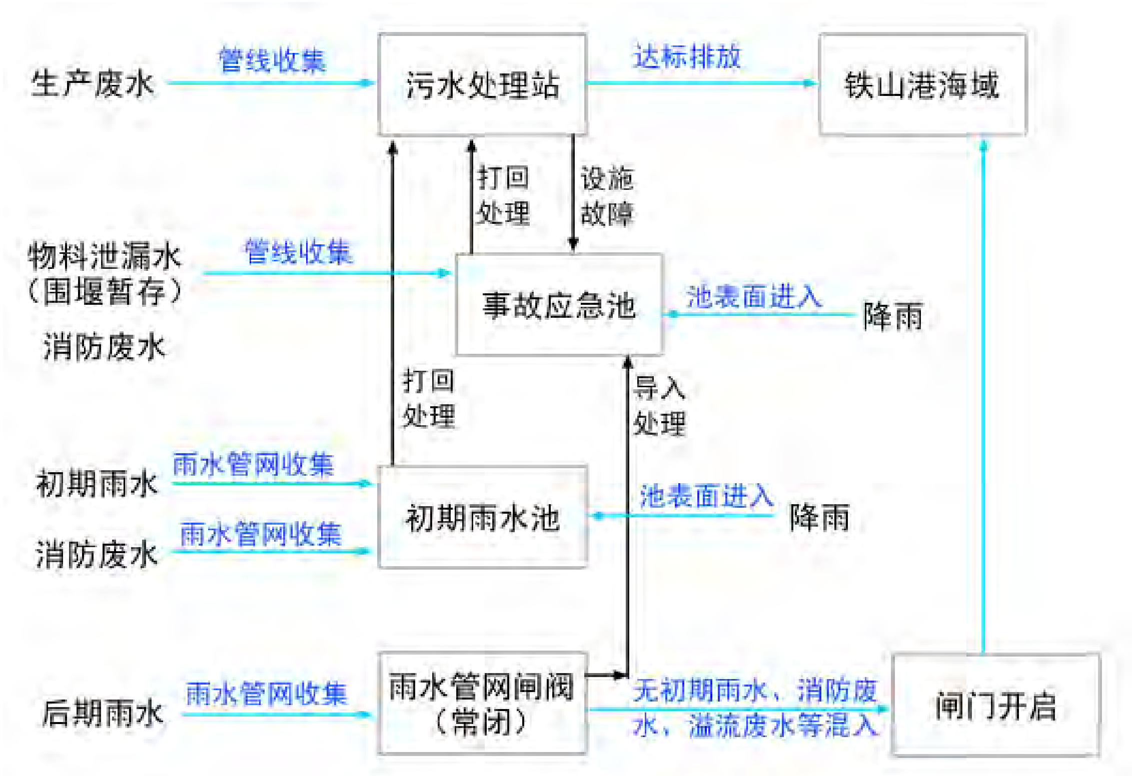


图 5.6-1　项目三级风险防范措施示意图

Figure 5.6-1 Sketch of the Project Level III Risk Prevention Measures



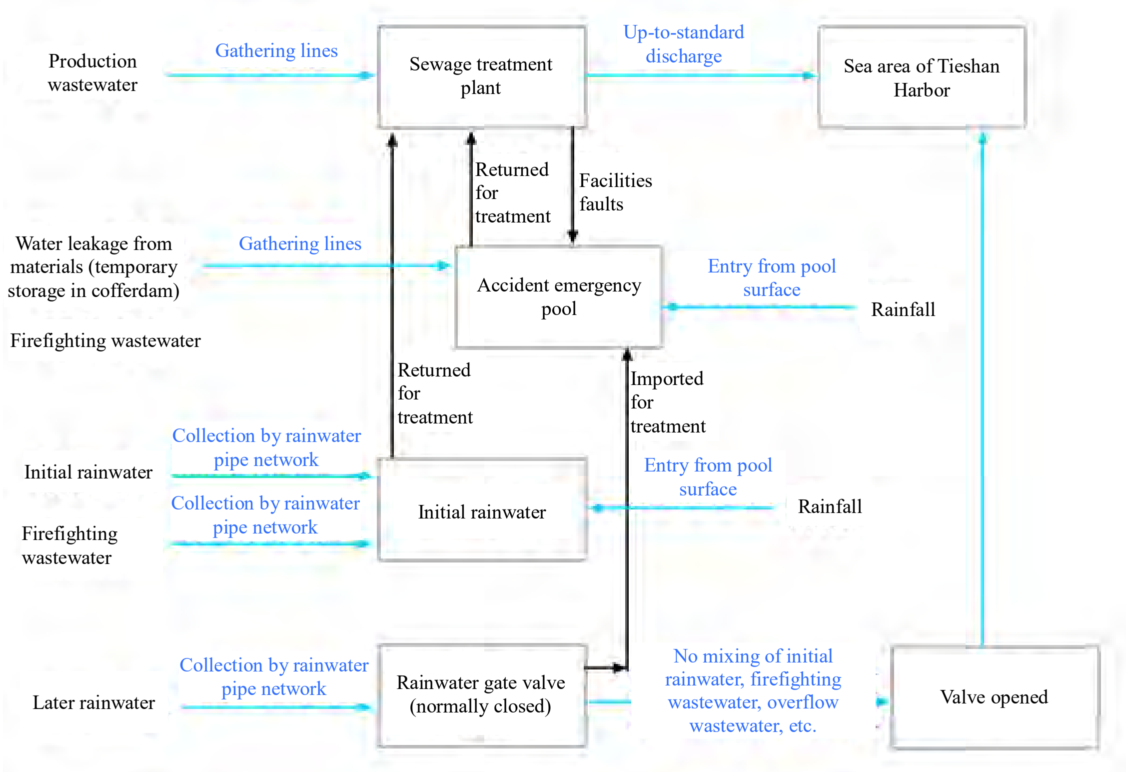


图 5.6-2 项目水环境风险防控体系封堵措施体系示意图

Figure 5.6-2 Sketch of Blockage Measures for Project Water Environment Risk Prevention and Control System

2、黑液事故排放

2. Accident discharge of black liquor

污水处理站设有事故池用于贮存事故时排放的黑液，同时污水处理场有一定的处理余量，黑液少量泄漏时，靠污水处理厂的事故池和调节池的缓冲，不会对废水处理厂正常运行产生影响，所以一般的管线、阀门、法兰等因破裂或损坏泄漏出的黑液对环境影响不大。但是，如果因火灾、雷击等造成贮罐严重破损使得黑液出现大量泄漏直接排入污水处理系统则会影响污水处理站的正常运行甚至使污水处理站崩溃。

The emergency pool constructed in the wastewater treatment station is used for storing the black liquor in case of an accident. Furthermore, there is certain allowance in treatment capacity in the wastewater treatment station. For minor leak of black liquor, there will be no impact on the normal operation of the wastewater treatment station by relying on the buffer of the emergency pool and regulating pool set in the wastewater treatment station, so little impact will be generated on the environment due to the leaked black liquor due to the common fracture or damage of the pipes, valves and flanges, etc. However, if a large amount black liquor leaks due to severe damage of the storage tanks caused by a fire accident or lightning strike, etc., and it is directly into the wastewater treatment station, it will affect the normal operation or even cause collapse of the wastewater treatment station.

为防范黑液泄漏风险，项目设置黑液储槽，储槽区设有围堰，黑液贮存区设置溢流报警控制系统，避免黑液大量溢流冲击污水处理系统。在碱回收系统出现暂时故障情况下，可暂时将黑液收集在黑液储槽；黑液储存区设有围堰，当黑液储槽也发生泄漏时，黑液可在围堰中暂存，并根据需要引入事故池暂存。待系统恢复运行后继续处理，如故障短期内不能排除，必须停止制浆系统，严禁黑液直接排入污水处理系统或直接排入地表水体中。

To prevent the leak risk of the black liquor, the black liquor storage tanks is provided in the project. The black liquor storage tank area is provided with cofferdam and overflow alarm control system, to avoid impact of large amount of black liquor on the wastewater treatment system. In case of temporary failure of the alkali recovery system, the black liquor can be temporarily collected in the black liquor storage tank; The black liquor storage area is provided with cofferdam. When leak occurs in the black liquor storage area, the black liquor can be temporarily stored within the cofferdam, and can be transferred to the emergency pool as required. When the system resume to normal operation for treatment and if the fault cannot be eliminated in a short period of time, the pulp making system must be stopped, and any direct discharge of black liquor into the wastewater treatment system or into the surface water body is strictly prohibited.

3、污水处理站故障

3. Failure of wastewater treatment station

造成污水处理厂故障的原因有突然停电、关键设备出问题(如提升泵、供氧系统)，高负荷废水或大量酸性废水冲击会导致污水处理厂崩溃，处理效率急剧下降。造成大量未达标的废水直接排入受纳水体，污染受纳水体。

The factors that can result in failure of the wastewater treatment station includes sudden outage of power supply, troubles in key equipment (e.g., lift pump and oxygen supply system), as well as the impact of high-load wastewater or a large amount of acidic wastewater, will result in collapse of the wastewater treatment station, making the treatment efficiency sharply drop, because of which a large amount of wastewater that is not up to standard is directly discharged in to the receiving water, polluting the receiving water.

防范措施包括对污水处理厂关键设备应有备用并采用双路供电，备用水泵及风机；设置足够大的事故池。并在调节池安装 pH 计、溶解氧和黑液监控系统，如果污水处理厂在短时间内不能恢复正常运行，应停止生产。

The prevention measures include provision of standby units and power supply through double circuits for the key equipment used in the wastewater treatment station, provision of standby water pumps and fans; construction of emergency pool of sufficient size. The regulating pool shall be installed with the pH meter and the dissolved oxygen (DO) and black liquor monitoring system. If the wastewater treatment station cannot be resumed to normal operation in a short period of time, the production shall be stopped.

4、措施有效性分析

4. Effectiveness analysis of measures

项目废水事故源主要为储罐/储槽泄漏废水、消防废水以及污水处理站事故排放废水，项目采取废水三级防范措施，第一级为围堰/防火堤、地沟，厂区各罐组均设有围堰、防火堤及导流设施、清污水切设施等配套设施，围堰有效容积可满足事故下储罐泄漏最大量的要求。当事故发生时，作为生产过程中环境安全的第一层防控网，围堰可有效将泄漏物料切换到处理系统，防止污染雨水和轻微事故泄漏造成的环境污染。

The accident wastewater sources mainly include the wastewater from the storage tanks / reservoirs, the waste fire water and the accident discharge wastewater from the wastewater treatment station. The three-level prevention measures are applied in this project. The first level is the cofferdam / fire dike and trench. The tank units in the plant area are built with cofferdams and fire dikes as well as diversion facilities, clean water & wastewater switching facility and other auxiliary facilities. The effective volume of the cofferdam shall be so designed that the maximum amount of leakage of the storage tank can be accommodated under accident conditions. When the accident occurs, the cofferdam, as the first prevention and control shield for the environmental safety in the production, can effectively transfer the leaked material to the treatment system, to prevent pollution to the rainwater as well as the pollution to the environment due to the minor leak accident;

二级防范措施为事故应急池，根据前述分析，项目设置 40000 m^3 事故应急池，根据

项目可研报告，项目一次火灾消防水量为 3300m^3，事故池容积可在满足生产区废水事故排放容量的同时接纳污水处理系统故障 6 小时排水量。且当事故池存纳废水量已达到有效容积的 2/3 时，污水处理站还未恢复正常运行处理废水，则企业立即停止生产，因此不会发生事故池溢流事故。

The Level II prevention measure is the emergency pool. According to the aforesaid analysis, the 40000 m3 emergency pool will be constructed in this project. According to the feasibility study report of this project, the volume of the fire water required for one fire accident for this project is 3300m3. The volume of the emergency pool is sufficient to accommodate the wastewater discharged due to accident from the production area and 6-hour’s discharge of wastewater due to failure of the wastewater treatment system. In addition, when the wastewater stored in the emergency pool reaches two thirds of the effective volume but the wastewater treatment station hasn’t resumed to normal operation, the enterprise will immediately stop the production, so the overflow accident will not occur for the emergency pool.

废水末端防控措施为废水排放口闸阀、雨水总排口闸阀，闸阀由中控系统控制，当事故发生、废水出现异常时，可立即关闭闸阀避免事故水进入外环境。

The prevention and control measures taken at the end route of the wastewater are the gate valves installed at the discharge outlet of the wastewater and at the master discharge outlet of the rainwater. The gate valves are controlled through the central control system. When an accident occurs and abnormal wastewater appears, the gate valves can be immediately closed to avoid entry of the accident wastewater into the external environment.

同时，污水处理站排口设有在线监控系统，实时关注废水水质情况，如出现异常波动，可及时进行排查；废水处理池设有回流装置，当处理不达标时可打开回流系统重新处理；污水处理站与事故池连接，必要时废水可进入事故池暂存，故障排除后重新打回污水处理站达标排放。

In addition, the on-line monitoring system is installed at the discharge outlet of the wastewater treatment station, to provide live monitoring of the quality of the wastewater. If any irregular fluctuation occurs, the inspection can be started in time; A backflow device is installed for the wastewater treatment pool. When the treated wastewater cannot meet the requirement, the backflow system can be started to retreat the wastewater; The wastewater treatment station is connected with the emergency pool, so the wastewater can be transferred into the emergency pool for temporary storage as necessary. After the fault is eliminated, the wastewater treatment station can be restarted to discharge the wastewater up to standard.

综上，废水风险防范措施具有针对性，且考虑情景较完备，采取措施具有可行性。

In summary, the wastewater risk prevention measures are target-oriented with comprehensive consideration of possible situations, and measures to be taken are feasible.

5.6.2.3 事故地下水风险防范措施

5.6.2.3 Risk prevention measures for accident groundwater

（1）污染源头控制措施

(1) Measures to control pollution sources

本项目选择先进、成熟、可靠的工艺技术，并对产生的废物进行合理的回用和治理，以尽可能从源头上减少污染物排放。主要包括在工艺、管道、设备、污水储存及处理构筑物上采取相应措施，防止和降低污染物跑、冒、滴、漏；尽量“可视化”，做到污染物“早发现、早处理”。

The wastes generated in this project will be recycled as practical and reasonably treated with advanced, mature and reliable process technology, to minimize the discharge of pollutants from the sources as far as possible. The measures to be taken mainly include the approaches applied for the process, pipes, equipment, wastewater storage and treatment structures, to prevent and reduce the running, emitting, dripping and leaking of the pollutants; Efforts will be made to ensure “visualization” to ensure early detection and early treatment of the pollutants.

厂区运营期间，应对污水管道严把质量关，采用良好的抗腐蚀管道，对管道排水采用监控措施，一旦污水处理站入口处监控发现异常情况，发生污水管道泄漏，应立即对管道进行检修，若短时间内泄漏源可修缮完毕，则应在最快时间内修复，若泄漏源大，应适时考虑停产，防止泄漏污水进一步污染地下水，待管道修复后恢复生产。

During the operation of the plant, the quality of the wastewater pipes shall be strictly controlled. The corrosion resistant pipes of good performance shall be used, and monitoring facilities shall be provided for the water discharge of the pipes. In case any irregularity is detected at the inlet of the wastewater treatment station and leak of the wastewater pipe is found, the pipes shall be immediately repaired. If the leak source can be repaired in a short period of time, the repairing work shall be completed in the shortest time. If large leak source is detected, it is necessary to consider stopping the production at the right time, to prevent the leaked wastewater from further polluting the groundwater. The production can be resumed after the repairing work of the pipes has been completed.

为监控厂区地下水环境质量及项目对地下水环境的影响，须对地下水进行定期监测，地下水监测计划和监测点位详见＆环境管理与监测计划章节。

To monitor the quality of groundwater environment and the impact of the project on the groundwater environment, it is required to monitor the groundwater on a regular basis. The Monitoring Plan and the monitoring points of the groundwater are shown in the Chapter of Environmental Management and Monitoring Plan.

（2）分区防渗措施

(2) Seepage prevention measures for subzones

全厂地面、路面均需进行水泥硬化处理，生产区及储罐区还需采取专门的防腐防渗措施，防止废水或废液下渗污染地下水环境。项目采取的人工防渗措施主要包括厂区内污染区地面的防渗措施和泄漏、渗漏污染物收集措施。通过在各化学品储罐区、柴油储罐区、碱回收车间等污染区地面进行防渗处理，防止洒落地面的污染物渗入地下，并把滞留在地面的污染物收集起来，集中送至污水处理系统处理。对事故池、初期雨水收集池、各储罐/储槽围堰的内壁及底部利用平滑耐磨、抗冲击性较好的材料采取防渗、防腐蚀措施；污水的收集、储存和输送设施均采取防渗、防腐措施，并配备检修人员防毒设施。项目运营期间，要定期进行管道壁厚的测量，对严重管壁减薄的管段，及时维修更换。此外，各功能区地面应做硬化处理，以避免废弃物在雨水的淋滤下进入地下水中。项目地下水环境风险防范措施详见地下水污染防治措施章节。

The ground and pavement of the entire plant shall be subject to hardening treatment with cement, and the production area and tank farm shall be treated with special corrosion-resistant and seepage prevention measures, to prevent the wastewater or waste liquid from infiltrating into the groundwater, polluting the groundwater environment. The manual seepage prevention measures to be taken in this project mainly include the seepage prevention measures for the floor surface in the polluted area and collection measures for the leaked pollutants in the plant area. Anti-infiltration treatment shall be provided for the floor surface of the chemicals storage tank farm, diesel oil storage tank farm, alkali recovery workshop and other polluted areas, to prevent the pollutants leaked out on the ground from infiltrating into the ground. In addition, the pollutants on the ground shall be collected and centrally sent for treatment in the wastewater treatment system. The smooth, wear-resistant and impact-resistant materials shall be used as the seepage prevention and corrosion resistance measures for the interior wall and bottom of the emergency pool, initial runoff collection pool, cofferdams of the storage tanks / reservoirs; The seepage prevention and corrosion resistance measures shall be provided for the wastewater collection, storage and conveying facilities, the maintenance personnel shall be provided with toxic protection equipment. During operation period of the project, the wall thickness of the pipes shall be measured on a regular basis. The pipe section with wall thickness subjected to severe reduction shall be maintained and replaced in time. In addition, the floor surface of the functional zones shall be subjected to hardening treatment, to avoid entry of the wastes into the groundwater by the sprinkling action of the rainwater. The project risk prevention measures for groundwater environment are shown in the Chapter of Prevention and Control Measures for Pollution of Groundwater.

5.6.2.4 危险化学品事故防范措施

5.6.2.4 Prevention measures for accidents of hazardous chemicals

项目危险物质风险主要发生在储存、运输、使用危险化学品过程中，为减少和避免事故发生造成环境污染和人员伤亡，建设单位对可能出现跑冒滴漏的泵、阀门等处，设自动切换系统，酸、碱、化学品贮存区等做建筑防腐。危险化学品在生产和储运过程中的要求以及安全处置方案见表 5.6-1。

The risk of the hazardous substances in this project will mainly occur in the process of storing, transporting and using the hazardous substances. To reduce and avoid occurrence of the accident resulting in pollution to the environment and injures and casualties of persons, the Employer will install automatic switching system at the running, emitting, dripping and leaking points of the pumps, valves and other components, and will provide the construction corrosion resistance measures for acid, alkali and chemicals storage areas. The requirements for the production and storage & transportation of the hazardous chemicals as well as the safety disposition program are shown in Table 5.6-1.

另外，针对本项目，还提出以下防范措施：

In addition, the following prevention measures are proposed for this project:

①储存场所要符合消防安全条件。各类化学品仓库、储罐、堆场等建筑物的选址，建筑物的结构构造、电器设备、防爆泄压、灭火设施等都要满足消防安全要求；化学品储罐的放置符合安全要求，储存于干燥清洁的仓间内；注意防潮和雨淋，分开存放，分装和搬运作业要注意个人防护。

① The storage places shall conform to the fire safety requirements. The location selected for the chemicals warehouse, storage tanks, storage yards and other related buildings, as well as the structure and construction of the buildings, electrical equipment, explosion-proof & pressure relief facilities and fire extinguishing units, etc. shall conform to the fire safety requirements; The chemicals storage tanks shall be put in a place in aligned with the safety requirements, stored in a dry and clean warehouse; Attention shall be given to measures against moisture and rainwater. The chemicals shall be stored in separated units. Attention shall be given to personal protection during the separating and handling processes.

②各项危险化学品必须有专人管理，并作好使用记录，责任到人。仓库工作人员应进行专门培训，经考核合格后持证上岗。保管人员要做到一日三查，即上班后、当班中、下班前检查:查码垛是否牢固，查包装是否渗漏，查电源是否安全。发现问题及时处理，消除隐患。

② The hazardous chemicals must be managed by a dedicated person, proper use records shall be made, and the responsibility shall be assigned to the individual person. The working personnel in the warehouse shall be subjected to special training, and they are not allowed to work until they have successfully passed the assessment and obtained the work permit. The custodian shall check the articles three times a day, to inspect the following points at the beginning of day work, any time in the working time, and before the end of the day work: if the stack is firm, if the package is subjected to leak and if the power supply is safe. Any problems found shall be solved in time, to eliminate the potential hazard.

③适时对输送管道、阀门及设备等进行检修，保证设备的安全运行，对于生产中发现的问题及时进行维修，对于安全隐患及时进行整改。设备要经常进行保养，如果发现异常情况，应立即报告进行维修，保证相关设备的正常运行。

③ The transfer pipes, valves and equipment shall be maintained at the right time to ensure the safe operation of the equipment. Maintenance shall be implemented in time if any problem is found during production, and rectification shall be provided in time if any safety hazard is identified. The equipment shall be maintained on a frequent basis. Any abnormal conditions detected shall be immediately reported for maintenance, to ensure the normal operation of the related equipment.

④建立工业卫生、环境监测及管理系统。对工厂的正常运行进行管理。当事故发生时进行应急防毒监测、防毒指导和人员中毒救护。

④ A industrial sanitation, environmental monitoring and management system shall be established, to manage the normal operation of the factory. When the accident occurs, it is required to conduct emergency anti-toxic monitoring, anti-toxic guidance and rescue of the poisoned persons.

⑤运输危险化学品的单位必须要有危险化学品运输资质；用于危险化学品运输工具的槽罐以及其他容器，由专业生产企业定点生产，并经检测、检验合格，方可使用；运输化学品的驾驶员、装卸人员和押运人员必须了解所运载的化学品的性质、危害特性、包装容器的使用特性和发生意外时的应急措施；运输危险化学品，必须配备必要的应急处理器材和防护用品。

⑤ The company responsible for transporting the hazardous chemicals must have the appropriate qualification; The storage tanks and other containers that are used as the transportation tools of the hazardous chemicals shall be produced by a designated professional production enterprise, and can be used after they have successfully passed the testing and inspection; The drivers, loading & unloading personnel and cargo attendants must know the nature, hazardous characteristics, operation characteristics of the packaging containers and the emergency measures to be taken in case of accidental events for the chemicals transported; Necessary appliances and protection equipment for emergency treatment must be available when the hazardous chemicals are transported.

⑥加强危险物质运输管理，采用专用合格车辆进行运输，并配备押运人员，驾驶员及押运人员需持证上岗，严禁疲劳驾驶；运送车辆不得超装、超载，不得进入危险化学品运输车辆禁止通行的区域，确需进入禁止通行区域的，应当事先向当地公安部门报告，并按公安部门指定的行车时间和路线进行运输，并做到文明行车；在运输车辆明显位置贴示“危险”警示标记；不断加强对运输人员及押运人员的技能培训。

⑥ The transportation management for hazardous substances shall be strengthened, the special-purpose and acceptable vehicles shall be used and the cargo attendants shall be dispatched. The drivers and cargo attendants must work with appropriate licenses. Drowsy driving is strictly prohibited; The transportation vehicles shall not be overloaded and shall not enter the zones where the access of vehicles carrying hazardous chemicals is not allowed. If it is really required to enter such “”No Pass” zones, report shall be submitted to the local Public Security Authority, and the vehicles can be driven along the time and route instructed by the Public Security Authority, to ensure courteous driving behavior; The warning sign of “DANGER” shall be glued to the distinct position of the transportation vehicle; The trainings for enhancing the skills of the transportation personnel and cargo attendants shall be provided on a frequent basis.

⑦加强装卸作业管理。装卸作业场所应设置在人群活动较少的偏僻处，装卸作业人员必须具备合格的专业技能，装卸作业机械设备的性能必须符合要求，不得野蛮装卸作业，在装卸作业场所的明显位置贴示“危险”警示标记，不断加强对装卸作业人员的技能培训。

⑦ The management of the loading and unloading operations shall be strengthened. The loading and unloading workplace shall be set at a remote place with quite a few crowd activities. The loading and unloading personnel must have qualified professional skills, and the performance of the machinery used for handling operation must conform to the requirement. The handling operation in a violent and uncontrolled manner is not allowed. The warning sign of “DANGER” shall be glued to the distinct position of the handling workplace; The trainings for enhancing the skills of the loading and unloading personnel shall be provided on a frequent basis.

表 5.6-1　危险化学品的储运要求以及安全处置措施一览表

Table 5.6-1 Table of Storage & Transportation Requirements and Safety Disposition Measures for Hazardous Chemicals

名称 **Description**	存储要求 **Storage Requirements**	运输要求 **Transportation Requirements**	安全处理措施 **Safety Treatment Measures**
氨水 Ammonia water	储罐储存与阴凉、避风，隔绝火源的场所，减少按的挥发和避免发生爆炸事故。 The storage tanks shall be put in a cool and windproof place, which is isolated from fire sources, to reduce volatilization of the ammonia and avoid explosion accidents.	对储运设施轻装轻卸，防治破损。配备相应品种和数量的消防器材及泄漏应急处理设备。 The storage & transportation facilities shall be handled lightly with care, to prevent damage. The fire-fighting equipment and emergency leakage treatment units of the appropriate kinds and quantity shall be provided.	迅速撤离泄漏污染区人员至上风向处，并立即进行隔离；建议应急处理人员戴自给正压式空气呼吸器，穿防毒服。尽可能切断泄漏源，合理通风，加速扩散。 The persons in the leak contaminated area shall be quickly evacuated to a place upwind and immediately isolated; The emergency treatment personnel are recommended to wear self-contained positive breathing apparatus and anti-toxic clothing. The leak sources shall be cut off to the maximum extent as practical, reasonable ventilation shall be ensured to speed up the dispersion.
氯气 Chlorine	要求环境阴凉、通风，远离火种、热源。本项目氯气仅为生产过程中产生，在设备内循环，不进行储存。氯气管线所在区域报警装置、防护服、防毒面具、碱液喷淋装置等。 It shall be stored in a cool and well-ventilated place and kept far away from fire and heat sources. The chlorine gas involved in this project is generated in the production process and will circulate inside the equipment, and no storage is required. The area where the chlorine gas pipelines are laid shall be provided with alarm device, protective clothing, anti-toxic gas mask, and	对储运设施轻装轻卸，防止破损。配备相应品种和数量的消防器材及泄漏应急处理设备。 The storage & transportation facilities shall be handled lightly with care, to prevent damage. The fire-fighting equipment and emergency leakage treatment units of the appropriate kinds and quantity shall be provided.	迅速撤离泄漏污染区人员至上风处，并立即进行隔离；建议应急处理人员戴自给正压式呼吸器，穿防毒服。尽可能切断泄漏源，合理通风，加速扩散。 The persons in the leak contaminated area shall be quickly evacuated to a place upwind and immediately isolated; The emergency treatment personnel are recommended to wear self-contained positive breathing apparatus and anti-toxic clothing. The leak sources shall be cut off to the maximum extent as practical, reasonable ventilation shall be ensured to speed up the dispersion.

名称 Description	存储要求 Storage Requirements	运输要求 Transportation Requirements	安全处理措施 Safety Treatment Measures
	alkali liquor sprinkler, etc.		
氯酸钠 Sodium chlorate	储存环境要求阴凉、通风，远离火种、热源。包装密封，应与易（可）燃物、还原剂、醇类等分开存放，切忌混储,储区应备有合适的材料收容泄漏物。 It shall be stored in a cool and well-ventilated place and kept far away from fire and heat sources. The package shall be enclosed and placed separate from the flammable (combustible) materials, the reducing agent or the substances of alcohol category, etc. No mixing is allowed. The storage area shall be provided appropriate material to receive the leakage.	搬运时要轻装轻卸，防止包装及容器损坏。禁止震动、撞击和摩擦。配备相应品种和数量的消防器材及泄漏应急处理设备。 Handle gently to prevent from damage of package and container. Any vibration, impact and friction is prohibited. The fire-fighting equipment and emergency leakage treatment units of the appropriate kinds and quantity shall be provided.	隔离泄漏污染区，限制出入。应急处理人员戴自给式呼吸器，穿一般工作服。不要直接接触泄漏物，勿使泄漏物与有机物、还原剂、易燃物接触。 Isolate the leakage polluted area and strictly restrict the access. The emergency treatment personnel shall wear SCBA and common working suits. Do not touch the leakage directly, and prevent the leakage from contacting with organic substances, reducing agents and flammable substances.
二氧化氯 Carbon dioxide	存储区内采用抗蚀性建材，地板不能使用木质及可燃类、塑胶品，储存及工作区要有良好通风；于适当处张贴警示标志，限制人员接近储存区；贮存区及其附近须备可用的灭火器材及适量沙土；二氧化氯溶液存储槽设溢流堰；定期检查贮桶有无缺陷如破损或溢漏等。 The storage area shall be constructed with corrosion resistant building materials. The floor cannot be built with wood, combustible materials or plastic products. The storage and work places shall be well-ventilated; The	做好运输工具的防水、防雨工作，搬运过程中轻拿轻放；禁止与酸类、有机物、易燃、易爆物品一起运输。 The transportation vehicles shall be properly protected against water and rains, and the articles shall be handled lightly with care; Transportation together with acid category materials, organic compound, flammable and explosive items is prohibited.	疏散泄漏污染区人员至上风处，并隔离直至气体散尽。应急处理人员戴正压自给式呼吸器，穿化学防护服。切断火源，避免泄漏物与可燃物质(木材、纸、油等)接触，切断气源，喷洒雾状水稀释，抽排(室内)或强力通风(室外)。漏气容器不能再用，且要经过技术处理以清除可能剩下的气体。 The persons in the leak contaminated area shall be evacuated to the place upwind and properly isolated until the gas is dispersed. The emergency treatment personnel shall wear positive pressure self-contained breathing apparatus and chemical protective clothing. It is required to shut off power supply to avoid contact of the leakage

名称 Description	存储要求 Storage Requirements	运输要求 Transportation Requirements	安全处理措施 Safety Treatment Measures
	warning signs shall be put up at appropriate position and access of persons to the storage area shall be restricted; The fire extinguishing equipment and adequate sand shall be provided at and near the storage area; Overflow weir shall be built at the periphery of the storage tank for chlorine dioxide solution; The storage drum shall be checked on a regular basis for any defects such as damage or leakage.		with the combustible substances (wood, paper, oil, etc.); to shut off gas source, dilute by spraying water mist, and exhaust the gas (indoor) and start forced ventilation (outdoor). Do not use the leaking container, and remove any remaining gas by adopting appropriate technical approaches.
氢气 Hydrogen	本项目生产过程中产生、使用氢气，不进行储存。 The hydrogen generated and used in the production of this project will not be stored.	本项目生产过程中产生、使用氢气，不进行储存。 The hydrogen generated and used in the production of this project will not be stored.	迅速撤离泄漏污染区人员至上风处，并进行隔离，严格限制出入。建议应急处理人员戴自给正压式呼吸器，穿一般作业工作服。尽可能切断泄漏源。合理通风，加速扩散。漏气容器要妥善处理，修复、检验后再用。 The persons in the leak contaminated area shall be quickly evacuated to the place upwind and properly isolated. Any access shall be strictly restricted. The emergency treatment personnel are recommended to wear SCBA and common working suits. Cut off the leakage source if possible. Reasonable ventilation shall be ensured to speed up the dispersion. The gas leak container shall be properly treated, repaired and inspected before it is used again.
醋酸 Acetic acid	储存于阴凉、通风的库房。远离火种、热源。应与氧化剂、碱类分开存放，切忌混储。储区应备有泄漏应急处理设备和合适的收容材料。	起运时包装要完整，装载应稳妥。运输过程中要确保容器不泄漏、不倒塌、不坠落、不损坏。严禁与氧化剂、碱类、食用化学品等混装混运。	迅速撤离泄漏污染区人员至安全区，并进行隔离，严格限制出入。切断火源。建议应急处理人员戴自给正压式呼吸器，穿防酸碱工作服。不要直接接触泄漏物。尽可能切断泄漏源

名称 **Description**	存储要求 **Storage Requirements**	运输要求 **Transportation Requirements**	安全处理措施 **Safety Treatment Measures**
	Store it in a cool, ventilated warehouse. Keep away from fire and heat sources. It shall be placed separately from the oxidant and alkalis. No mixing storage is allowed. Provide leakage emergency treatment equipment and suitable containing materials in the storage area.	The packages shall be intact before they are dispatched and shall be loaded stably. No leaks, no collapse, no fall and no damage shall occur to the containers during transportation. Any packing and transportation in a mixed manner with the oxidant, alkalis and edible chemicals are strictly prohibited.	Evacuate the personnel in the leakage polluted area to the safe area immediately, isolate the leakage polluted area and strictly restrict access. Cut off fire sources. The emergency personnel are recommended to wear positive pressure self-contained respirator and anti-acid & alkali suits. Do not come into direct contact with the leakage. The leak sources shall be cut off to the maximum extent as practical.
硫酸 Sulphuric acid	储存于阴凉、通风的库房，库温不超过 35℃，相对湿度不超过 85%，保持容器密封。应与易（可）燃物、还原剂、碱类、碱金属、食用化学品分开存放，切忌混储。储区应备有泄漏应急处理设备和合适的收容材料。 It shall be stored in a cool and well-ventilated warehouse, with the ambient temperature not more than 35℃ and relative humidity not more than 85%. The containers shall be kept enclosed. Store it separately from combustible materials, reducing agents, alkalis, alkali metals and edible chemicals, and avoid mixed storage. Provide leakage emergency treatment equipment and suitable containing materials in the storage area.	运输过程中要确保容器不泄漏、不塌倒、不坠落、不损坏，运输途中应防曝晒、雨淋，防高温。严禁与易燃物或可燃物、还原剂、碱类、碱金属、食用化学品等混装混运。运输时运输车辆应配备泄漏应急处理设备。公路运输时要按规定路线行驶，勿在居民区和人口稠密区停留。搬运时要轻装轻卸，防止包装及容器损坏。 During transportation, no leaks, no collapse, no fall and no damage shall occur to the containers, and the containers shall be properly protected against the direct exposure to the burning sun, rains and high temperature. Any packing and transportation in a mixed manner with the flammable or combustible materials, reducing agent, alkalis, alkali metal and edible chemicals are strictly prohibited. The emergency leakage treatment units shall be equipped for the vehicles	注意对硫酸雾的控制，加强通风排气。车间内要有方便的冲洗器具。 Attentions shall be given to control the sulfuric acid mist, to ensure adequate ventilation and exhaust of the gas. Convenient flushing appliances shall be made available in the workshop.

名称 Description	存储要求 Storage Requirements	运输要求 Transportation Requirements	安全处理措施 Safety Treatment Measures
		during transportation. For road transport, the vehicles shall travel as per the preset route and cannot stay in the residential area and densely populated area. Handle gently to prevent from damage of package and container.	
盐酸 Hydrochloric acid	存储区内采用抗蚀性建材；密封阴凉 通风 处 保 存；于适当处张贴警示标志，限制人员接近储存区；定期检查贮桶有无缺陷如破损或溢漏等。 The storage area shall be constructed with corrosion resistant building materials. It shall be stored in a cool and well-ventilated place; The warning signs shall be put up at appropriate position and access of persons to the storage area shall be restricted; The storage drum shall be checked on a regular basis for any defects such as damage or spillage.	搬运时要轻装轻卸，防止包装及容器损坏，雨天不宜运输。 It shall be handled lightly with care in the handling process to prevent damage to the packages and containers. It should not be transported during raining days.	迅速撤离泄漏污染区人员至安全区；应急处理人员戴自给正压式呼吸器，穿防酸碱工作服。小量泄漏：用砂土、干燥石灰或苏打灰混合，也可用大量水冲洗，洗水稀释后放入废水系统；大量泄漏：用泵转移至槽车或专用收集器内，回收或运至废物处理场所处置。 The persons in the leak contaminated area shall be quickly evacuated to the safety zone; The emergency treatment personnel shall wear self-contained positive breathing apparatus and acid and alkali protective clothing. Minor leaks: shall be mixed with sand, dry lime or soda ash, or alternatively, flushed with a large amount of water, the diluted solution with water to be discharged into the wastewater system; Major leaks: shall be transferred to a tank truck or a special collector with a pump, to be recycled or transported to the waste disposal place.
氢氧化钠 Sodium hydroxide	注意防潮和雨淋。应与易燃或可燃物及酸类分开存放；避免与铝、锌和锡等金属接触反应。 Protect against moisture and rain. It shall be stored separately from the flammable or	搬运时要轻装轻卸，防止包装及容器损坏。雨天不宜运输。 Handle gently to prevent from damage of package and container. It is not recommended to transport on rainy days.	用清洁铲子收集于干燥、洁净、有盖的容器中，也可用大量水冲洗，冲洗水稀释后排入污水处理站。皮肤接触：立即用大量水冲洗，再涂上 3%-5%的硼酸溶液。眼睛接触：立即提起眼睑，用流动清水或生理盐水冲洗至少 15 分钟；如仍有不适立即就医。吸入：迅速撤离现场至

名称 Description	存储要求 Storage Requirements	运输要求 Transportation Requirements	安全处理措施 Safety Treatment Measures
	combustible materials and the acids; Contact and reaction with the metals such as aluminum, zinc and tin shall be avoided.		空气新鲜处，必要时进行人工呼吸，就医。食入：尽快使用蛋白质含量较高的食品清洗干净口中毒物，如牛奶、酸奶等奶质物品，患者清醒时立即漱口，口服稀释的醋或柠檬汁，就医。 It shall be collected with a clean shovel and put in a dry and clean container with a cover. Alternatively, it can be flushed with a large amount of water and the leakage diluted with flushing water shall be discharged into the wastewater treatment station. After skin contact: Immediately flush the contaminated skin with a large amount of water and apply 3%-5% boric acid solution. After eye contact: Promptly lift the eyelid and wash it with flowing water or balanced saline for at least 15 minutes; Seek professional medial attention immediately if the victim is still unconformable. After inhalation: Immediately evacuate the victim to a place with fresh air, apply artificial respiration as necessary and seek profession medical attention. After swallowing: Promptly wash out the mouth with high-protein foods like milk, yogurt and other milky products. When the patient is awake, immediately rinse the mouth and take diluted vinegar or lemon juice. Seek professional medical attention.
过氧化氢 Hydrogen peroxide	防止阳光直射，应有足够的水源和消防水龙带及喷雾装置；场所不得有燃料、氧化剂、有机物等，必须保持整齐清洁；储存	运输 20-60%过氧化氢应储存于聚乙烯桶或纯铝桶中，容器盖应有排气孔；60%以上的过氧化氢用纯铝(99.6%以上)聚四氯乙烯、聚三氯乙	迅速撤离泄漏污染人员至安全区，并进行隔离，严格限制出入。建议应急处理人员戴自给正压式呼吸器，穿防酸碱工作服。尽可能切断泄漏源，防止进入下水道、排

名称 Description	存储要求 Storage Requirements	运输要求 Transportation Requirements	安全处理措施 Safety Treatment Measures
	场地禁止吸烟，禁止使用无防护的灯及可能发生火花的设备；储罐四周应建设有围堰和应急坑，当发生泄漏时能有效收集，避免泄漏流入雨水沟或排水沟。 It shall be stored in a place protected against direct exposure to sunlight, equipped with sufficient water source, fire hose and mist sprayers; The storage place shall be kept clean and tidy, free from such substances as fuel, oxidant and organic matters; No smoking is allowed and the use of a lamp without protection or equipment that may generate sparks is prohibited in the storage place; The periphery of the storage tank shall be constructed with cofferdam and emergency pit, with which the leakage can be effectively collected, to prevent the leaked material from flowing into the rainwater trench or drainage ditch.	烯制成容器，严禁铁、铁锈或尘土等杂质进入；运输车辆上应装备车载电话和卫星定位系统，掌握运输车辆在运输过程中的情况，便于发现问题、解决问题，在第一时间内通知地方和厂区消防有关部门进行救援。 The 20~60% hydrogen peroxide to be transported shall be stored in polyethylene drums or pure aluminum drums, and the cover of the container shall be designed with vent holes; More than 60% of the hydrogen peroxide is accommodated with the containers made from pure aluminum (with purity higher than 99.6%), polytetrafluoroethylene and polytrichloroethylene, and ingress of impurities such as iron, rust or dust is strictly prohibited; Transportation vehicles shall be equipped with on-board telephones and satellite positioning systems to make people related know the status of the vehicles during transportation, based on which the problem can be found and solved in time, and the local and plant fire protection departments can be notified for rescue at the earliest time.	洪沟等限制性空间。小量泄漏：用砂土、蛭石或其他惰性材料吸收，也可用大量水冲洗，冲洗水稀释后排入污水处理站。大量泄漏：围堰或应急坑收容，喷雾状水冷却和稀释蒸汽，用泵转移至槽车或专用收集器内。发生着火：用水扑救，并用水冷却其它容器。若发生高浓度过氧化氢贮罐排气孔中冒出蒸汽，所有人员应迅速散至安全地方。 The persons in the leak contaminated area shall be quickly evacuated to the safety zone and properly isolated. Any access shall be strictly restricted. The emergency personnel are recommended to wear positive pressure self-contained respirator and anti-acid & alkali suits. The leak sources shall be cut off to the maximum extent as practical, to prevent ingress into the confined space such as sewers and flood drainage ditches. Minor leaks: can be absorbed with sand, vermiculite or other inert materials. Alternatively, it can be flushed with a large amount of water and the leaks diluted with flushing water shall be discharged into the wastewater treatment station. Major leaks: can be accommodated by use of a cofferdam or emergency pit, and cooled with sprayed water mist and diluted steam, and then transferred to a tank truck or a special collector with a pump. The fire shall be put out with water and other containers shall be cooled with water. If steam is emitted from the vent hole of the storage tank containing concentrated hydrogen peroxide, all the personnel shall

名称 **Description**	存储要求 **Storage Requirements**	运输要求 **Transportation Requirements**	安全处理措施 **Safety Treatment Measures**
			quickly evacuated to a safe place.
次氯酸钠 Sodium hypochlorite	储存于阴凉、通风的库房。远离火种、热源。库温不宜超过 30℃。应与酸类分开存放，切忌混储。储区应备有泄漏应急处理设备和合适的收容材料。 Store it in a cool, ventilated warehouse. Keep away from fire and heat sources. The storage temperature should not exceed 30℃. It shall be stored separately from the acids. No mixing storage is allowed. Provide leakage emergency treatment equipment and suitable containing materials in the storage area.	起运时包装要完整，装载应稳妥。运输过程中要确保容器不泄漏、不倒塌、不坠落、不损坏。严禁与酸类、食用化学品等混装混运。运输时运输车辆应配备泄漏应急处理设备。运输途中应防曝晒、雨淋，防高温。公路运输时要按规定路线行驶，勿在居民区和人口稠密区停留。 The packages shall be intact before they are dispatched and shall be loaded stably. No leaks, no collapse, no fall and no damage shall occur to the containers during transportation. Any packing and transportation in a mixed manner with the acids and edible chemicals are strictly prohibited. The emergency leakage treatment units shall be equipped for the vehicles during transportation. During transportation, the containers shall be properly protected against the direct exposure to the burning sun, rains and high temperature. For road transport, the vehicles shall travel as per the preset route and cannot stay in the residential area and densely populated area.	应急处理：迅速撤离泄漏污染区人员至安全区，并进行隔离，严格限制出入。建议应急处理人员戴自给正压式呼吸器，穿防酸碱工作服。不要直接接触泄漏物。尽可能切断泄漏源。小量泄漏：用砂土、蛭石或其它惰性材料吸收。大量泄漏：构筑围堤或挖坑收容。用泡沫覆盖，降低蒸气灾害。用泵转移至槽车或专用收集器内，回收或运至废物处理场所处置。 Emergency treatment: The persons in the leak contaminated area shall be quickly evacuated to the safety zone and properly isolated. Any access shall be strictly restricted. The emergency personnel are recommended to wear positive pressure self-contained respirator and anti-acid & alkali suits. Do not come into direct contact with the leakage. Cut off the leakage source if possible. Small leakage: Absorb the leakage with activated carbon or other inert materials. Heavy leakage: Build embankment or dig a hole for containment. Cover with foam to reduce steam hazards. Transfer to tank car or special collector with pumps, and recycle or transport to the waste disposal site.
一氧化碳 Carbon monoxide	本项目不涉及一氧化碳的储存和运输。 No storage and transportation of carbon monoxide is involved in this project.	本项目不涉及一氧化碳的储存和运输 No storage and transportation of carbon monoxide is involved in this project.	吸入：迅速脱离现场至空气新鲜处。保持呼吸道通畅。如呼吸困难,如出现呼吸困难症状应立即就医。泄漏应急处置:迅速撤离泄漏污染区人员至上风处，并立即隔离 150m，严格限制出入。立即切断泄漏点，应急处置人员

名称 Description	存储要求 Storage Requirements	运输要求 Transportation Requirements	安全处理措施 Safety Treatment Measures
			应佩戴安全防护设施。喷雾状水稀释、溶解。漏气容器要妥善处理，修复、检验后再用。 Inhalation: Quickly leave the site for fresh air. Keep respiratory tract unobstructed. If shortness of breath and the related symptoms occur, seek medical attention immediately. Emergency treatment of leakage: The persons in the leak contaminated area shall be quickly evacuated to the place upwind and properly isolated at a place 150m away from from the contaminated area. Any access shall be strictly restricted. The leak point shall be immediately cut off. The emergency treatment personnel shall were personal protective equipment. To be diluted and dissolved with sprayed water mist. The gas leak container shall be properly treated, repaired and inspected before it is used again.
柴油 Diesel	按丙类储存物品贮存罐设计防火间距。 The fire separation distance shall be designed in accordance with the storage tanks for articles classified in Category C.	运输过程中禁止混入水分和杂质。 No moisture or foreign things shall be mixed in the diesel during transportation.	尽可能切断泄漏源，防止进入下水道、排洪沟等限制性空间。小量泄漏：用砂土、蛭石或其它惰性材料吸收，大量泄漏用泵转移至槽车或专用收集器内。 The leak sources shall be cut off to the maximum extent as practical, to prevent ingress into the confined space such as sewers and flood drainage ditches. A small amount of leakage: shall be absorbed with sand, vermiculite or other inert materials. A large amount of leakage shall be transferred to a tank truck or a special collector with a pump.

5.6.2.5 火灾爆炸事故防范措施

5.6.2.5 Prevention measures for fire and explosion accidents

1、生产车间防范措施

1. Prevention measures for production workshop

为了避免或减少火灾发生，在原料堆场、各生产车间四周每隔一定距离设置消防栓；消防用水储存于净化站清水池中，生产备用泵兼消防泵。若发生火灾事故，应立即启用应急预案，进行灭火处理，消防废水不能直接排放，须排入事故池暂存，经监测处理达标后方可外排，若监测超标，应分批进入污水处理站处理达标后排放。

To avoid or reduce fire accidents, the fire hydrants shall be set at a certain interval surrounding the raw material stockyard and in the workshops; The fire water is stored in the clean water pool in the water purification station. The standby pump for production is also used as the fire pump. In case of a fire accident, the emergency preparedness plan (EPP) shall be immediately started, to put out the fire. Instead of direct discharge, the waste fire water shall be led into the emergency pool for temporary storage, monitored, treated and discharged after the water quality is up to standard. If the quality monitored of the treated waste fire water is beyond the standard requirement, the wastewater shall be discharged by batches into the wastewater treatment station and then discharged when it is treated up to standard.

对于成品仓库和其它消防要求高的车间，应根据《建筑设计防火规范》（GB50016-2006）要求，设置自动喷水灭火系统，并配置报警、烟感、水流指示器等装置。

For the finished product warehouse and other workshops with higher fire control requirements, the automatic sprinkler system shall be equipped together with such devices as the alarms, smoke sensors and flow indicators in accordance with the requirements of *Code for Fire Protection Design of Buildings* (GB50016-2006).

同时加强天然气管道进入厂内后的管理和维护，避免天然气泄漏事故发生。

In addition, the management and maintenance of the natural gas pipe section within the plant area shall be strengthened, to avoid occurrence of natural gas leak accidents.

2、原料堆场火灾防范措施

2. Prevention measures for accidents in raw material stockyard

本项目原料主要以木片为主，原料堆场主要考虑木片堆场，同时也需要考虑原木收购情况，布置一定面积的原木堆场。根据工程分析，木片堆存时间按 1 个月考虑，需堆存 19.4 万吨绝干木片，按照木片堆虚积 150kg/m^3 计，需要堆存约 130 万 m^3。堆存量较大，一旦发生火灾，会影响到周边设施正常生产，会引发中毒事故，甚至引发更大火灾爆炸事故，事故火星等飘落到周边企业，可能会引发周边企业火灾爆炸事故。为避免火灾事故发生，堆场拟提出如下措施：

The raw materials in this project are mainly wood chip, so the raw material stockyard is mainly used to store wood chip, and a wood log stockyard of a certain area shall be arranged considering the purchasing of wood logs. According to the engineering analysis, if the stacking period is considered as 1 month, 194,000 tons absolute dry chip shall be stacked; as calculated based on the virtual volume of 150kg/m3 of the wood chip, approximately 1.3 million cubic meters for stack piles is required. Due to the large stacking volume, any fire accident (once occurs) will affect the normal production of the surrounding facilities, cause poisoning accident, or even bigger fire & explosion accident. If the fire spark from the accident drifts down to the surrounding enterprise, a fire & explosion accident may be caused in the surrounding enterprise. To avoid occurrence of the fire accident, the following measures are proposed for the stockyard:

（1）堆场四周设立“严禁吸烟”、“禁止乱扔杂物入内"等告示牌，四周要经常保持清洁，设立场用垃圾箱，由管理人员负责定期清倒。

(1) The signs such as “No Smoking” and “No Littering” shall be set up around the stockyard. The periphery of the stockyard shall be kept clean and tidy, rubbish bins shall be provided, and the management personnel shall dump the rubbish bins on a regular basis.

（2）设立堆场岗哨，设专职保卫人员看管堆场。木片堆场保卫员要按本规定对进入堆场的机械及入员进行严格的检查，严禁任何人携带火种进入堆场，发现有违反规定的机械及人员，坚决不予进入。

(2) Sentries shall be set for the stockyard. Full-time security personnel shall be arranged to watch the stockyard. The guards of the wood chip stockyard shall strictly check the machines and persons to enter the stockyard according to this regulation. Access of anyone with any kindling material is strictly prohibited. Any machines or persons that are in violation of the regulations are not allowed to enter the stockyard.

（3）现场所有人员发现异物及超标木片(木皮、腐片及大于20mm的木片)要及时拾除。

(3) Anyone in the site shall pick up and remove any detected foreign things or wood chip out of specification (bark, rotted chip and wood chip larger than 20mm) in time.

（4）切实加强对有关作业人员的安全质量教育、防止各类机械零件、工属具、生活用品(如鞋、手套、快餐盒)等异物混入木片中。

(4) The education on safety and quality for related persons shall be effectively strengthened, to prevent mixing of various mechanical parts, tools and daily necessities (e.g., shoes, gloves and snack boxes) into the wood chip.

（5）木片堆场内不准存放其它物品，严禁将石油系列制品(如塑料、薄膜、尼龙绳等物品)带入堆场。

(5) Storing other articles in the wood chip stockyard is not allowed. It is strictly prohibited to bring petroleum products (such as plastics, films and nylon ropes, etc.) into the stockyard.

（6）特殊情况下，非“原料运输专用车”须进入木片堆场时必须请示总经理或生产副总经理，经同意后方可进入。

(6) Under special circumstances, if those other than the “dedicated raw material transportation vehicles” need to enter the stockyard, the request must be submitted to the general manager or deputy general manager for production. Upon approval, such vehicle can be allowed in.

（7）所有进入木片堆场的机械、必须进行全面检查，对不清洁的车辆应及时冲洗，防止车厢(斗)、驾驶室、车架、轮胎夹带煤块(粉)、硫磺及其它异物，并经安保人员严格检验，合格后方可进入。

(7) All machines that are mobilized into the wood chip stockyard must be subjected to an overall inspection. The uncleaned vehicles shall be flushed in time, to prevent mixing of any coal lump (powder), sulfur and other foreign things entrained by the truck carriage (bucket), cabin, frame and tyres, and can be allowed to enter the stockyard after stringent inspection of the security guards.

（8）堆场内的灭火器配备要齐全、有效，派专人管理，定期检查和维护，不经允许严禁挪作它用，使用过后的灭火器要及时报告，及对更换。进入堆场作业的机械必须

每台随机配备一个灭火器。

(8) The fire extinguishers shall be fully equipped and effectively functioned in the stockyard. They shall be managed by a dedicated person, periodically inspected and maintained. Use of these fire extinguishers for other purposes is strictly prohibited without authorization. The fire extinguisher that has been used shall be reported and replaced in time. Every machine entering the stockyard must equip one fire extinguisher, carried with the machine.

（9）进行木片装卸作业的机械，在每班次开工前，司机要清理机上积尘，避免因电器短路起火。

(9) For the machine used for loading and unloading the wood chip, the driver shall remove the deposited dust on the machine prior to commencement of work in each shift, to avoid fire arising from short circuit of the electrical elements.

（10）严禁任何人损坏或偷盗堆场四周的消防水阀，消防水带，严禁随意使用消防用水。安环人员定期对消防设施进行检查。

(10) Any behavior by anybody of damaging or stealing the fire water valves and fire water hose equipped at the periphery of the stockyard is strictly prohibited. Use of the fire water randomly is also strictly prohibited. The safety and environment protection (SEP) personnel shall check the fire fighting facilities on a regular basis.

（11）一旦出现火险， 现场一切作业人员一定要冷静.迅速、有序地进行抢救。一边安排人员就近取灭火器或其它物件扑救，一边派人取消防水带喷水救火，一边向消防部门求援。灭火后，对被污染的原料要及时清除。

(11) Once any fire danger is detected, all the operation personnel at the site must keep calm, to perform rescue in a quick and well-organized manner. On the one hand, persons are arranged to take the fire extinguishers or other objects nearby to put out the fire, and on the other hand, the fire department shall be called for help. After the fire is put out, the raw material contaminated shall be removed in time.

5.6.2.6 生产废气事故排放环境风险防范措施

5.6.2.6 Risk prevention measures for the accident of emitting production waste gas into environment

（1）厂区运营时，要求员工严格按照工艺和控制规则操作。

(1) During operation of the plant, the employees are required to work in strict accordance with the process and control procedures.

（2）加强废气处理设施的维修保养，确保处理设施稳定达标排放。

(2) The waste gas treatment facilities shall be appropriately maintained and serviced, to ensure stable and up-to-standard emission of the treatment facilities.

（3）设立专人岗位，定期对废气处理设施的设备运行状况进行检修、维护和保养，并建立相关维护档案。

(3) A dedicated job post shall be set, responsible for periodical repair, maintenance and servicing of equipment used in the waste gas treatment facilities and for establishing related maintenance archives.

（4）定期监控在线监测系统，并与厂内调度建立联动机制。一旦发生处理设施处理失效事故排放，应立即停止生产并进行检查，待处理设施维修完毕，确定能正常运行后方可恢复生产。

(4) The on-line monitoring system shall be monitored on a regular basis, and a linkage mechanism shall be established with the in-plant scheduling system. In case any accident emission occurs due to failure of the treatment facilities, the production shall be immediately stopped and the inspection shall be started. After the treatment facilities have been repaired and can definitely resume to normal operation, the production can be resumed.

5.6.2.7 项目排水管线事故及应急措施

5.6.2.7 Accidents of project drain pipelines and emergency measures

广西太阳纸业项目废水经处理后最终经铁山港深海排放管网在 B3 排污口深海排放，项目建设废水排放管接入园区深海排放管陆域段深海排放井后统一深海排放。项目排水管线设置两道 DN1200 螺旋碳钢管道（内外防腐）。当出现异常情况时，可能造成管道泄漏，需及时修复，避免因管道泄漏造成环境影响。可能出现的异常情况有：

The wastewater generated from Guangxi Sun Papermaking Project, after treated, will be discharged into the deep sea at Discharge Outlet B3 through the Tieshangang deep sea discharge pipe network. The construction wastewater discharge pipe of this project is connected to the deep sea discharge well of the land section of the deep sea discharge pipe in the Park, and then the construction wastewater generated will be uniformly discharged into the deep sea. Two DN1200 spiral carbon steel pipes (corrosion protection applied both internally and externally) are set for the drain pipeline of this project. When any irregularity occurs which may result in leak of pipes, it is required to repair in time time, to avoid impact on the environment due to leak of pipes. The irregularities that may occur include:

（1）防腐漆出现脱落，管道遭到腐蚀，出现裂缝漏水；

(1) The corrosion resistant paint falls off, the pipe is rotting with cracks from which water leaks;

（2）管道受到施工破坏：管道标识不明，巡查力度低，外协施工人员未被告知情况下盲目施工造成损坏。

(2) The pipe is damaged due to construction: damages are caused due to the unclear identification on pipes, low frequency and effect of patrol inspection, and the blind construction performed by the construction personnel from an outsourced company under the conditions of not being informed.

为保证广西太阳纸业项目废水排海管道全线畅通，保证水处理系统正常运行，避免因管道泄漏造成环境污染事故；根据项目情况，本着“预防为主、统一指挥、分工负责”的原则，企业制定《废水排放管线泄漏事故应急预案》。

To ensure smooth flow of the sea discharge pipes for the wastewater generated from Guangxi Sun Papermaking Project and the normal operation of the water treatment system, and to avoid environmental pollution accidents caused by leaks of pipes, the Enterprise formulates the Emergency Preparedness Plan (EPP) for Leak Accidents of Wastewater Discharge Pipelines in accordance with the principle of “prevention first, uniform command and division of responsibilities”.

成立管道泄漏事故应急救援“指挥小组”，由水处理负责人任指挥组长，下设应急救援办公室，日常工作由安全科管理。负责 “管道泄漏应急预案”的制定，修订；组建应急救援队伍，并组织应急救援的实施与演练，检查督促做好重大事故的预防和应急救援的各项准备工作。发生事故时，组织救援小组实施救援活动；向上级领导汇报事故

情况，必要时向有关单位发出救援请求；组织事故调查，总结应急救援经验教训。

A “command team” for emergency rescue of pipe leakage accidents shall be established, with the head of water treatment sector as the command team leader, under which the emergency rescue office is set. The daily work shall be managed by the Safety Division. Responsible for the formulation and revision of the "pipeline leakage emergency plan"; set up an emergency rescue team, and organize the implementation and drill of emergency rescue, check and supervise the preparation of major accident prevention and emergency rescue. When an accident occurs, organize a rescue team to carry out rescue activities; report the accident situation to the superior leaders, and send rescue requests to the relevant units when necessary; organize accident investigations and summarize the experience and lessons of emergency rescue.

成立管道泄漏事故救援小组，由水处理设备负责人、电仪负责人、设备人员、电气人员及当班班组成员组成。救援小组是管道泄漏应急救援的骨干力量，担负事故的救援的具体实施任务。

Set up a pipeline leakage accident rescue team, consisting of the person in charge of water treatment equipment, the person in charge of electrical instruments, equipment personnel, electrical personnel and members of the shift team. The rescue team is the backbone of the emergency rescue of pipeline leaks, and is responsible for the specific implementation of accident rescue.

1、应急处置措施

1. Emergency disposition measures

（1）车间安排管道巡查人员，负责管道的日常巡查工作。

(1) The workshop shall arrange patrol inspection personnel for pipes, to take charge of the daily patrol inspection of the pipes.

①铺设管道标识：于管道铺设处埋设明显标识，每 50 米一个标识牌。

① Embedding identification for pipes: Distinct identification signboards shall be embedded along the route where the pipe is laid, at an interval of every 50 meters.

②加强巡查力度：专人进行巡查，至少每 3 天巡查一次，对管道沿线施工处进行告知，遇到距离管道 2 米以内的施工时，专人跟踪维护，避免管道遭到破坏。

② Intensifying patrol inspection: A dedicated person shall be dispatched for patrol inspection, at a frequency of less than once every three days, and shall be responsible for informing the construction party who is working along the pipeline. If the construction work is carried within 2 meters from the pipe, a dedicated person shall be assigned for tracking maintenance, to avoid damage to the pipes.

（2）发现泄露情况第一时间告知水处理车间负责人，汇报泄漏地点、详细情况、最近路线等。

(2) Once the leak is identified, the head of the water treatment workshop shall be informed at the earliest time of the location of leak point, details and the nearest route, etc.

（3）水处理负责人接到通知后立即启动《排海管线泄漏事故应急预案》。根据泄露情况采取以下措施：

(3) Upon receipt of this notice, the head of the water treatment workshop shall immediately start the *Emergency Preparedness Plan (EPP) for Leak Accidents of Sea Discharge Pipelines*. The following measures shall be taken according to the leak conditions:

①通知当班班组人员切换另外一条排水管道，关闭上下两个阀门进行抽水抢修。

① The team member on duty shall be notified to switch the water to another drain pipe, and to start pumping water for emergency repair by closing the valve respectively at the upstream and the downstream section.

②若出现异常情况，两条排水管线同时出现泄露，水处理启用应急事故池进行蓄水，泄露点进行应急抢修。同时通知厂区各生产车间积极采取应对措施减少排水，尽量增大蓄水时间。

② If any irregularity occurs and two drain pipelines leak at the same time, the water treatment workshop shall start the use of the emergency pool for storing water, and provide emergency repair for the leak point. At the same time, the production workshops in the plant area shall be notified to actively take actions to reduce the discharge of water, to extend the period of storing water as far as possible.

③若泄漏点维修难度大，核算在应急蓄水期间不能完成抢修，水处理车间负责人向上级主管领导汇报，车间进行限产（必要时进行停产），确保管道的抢修工作顺利完成。

③ If the leak point is difficult to repair and it is impossible to complete the emergency repair within the emergency water storage period based on calculation, the head of the water treatment workshop shall report to his/her superior, who shall decide to limit the production (or stop the production as necessary) in workshops, to ensure that the emergency repair of the pipes can be successfully completed.

2、管道维修方案

2. Pipe maintenance plan

（1）停水：停止输送水，并将出现泄露的管道前后两个阀门关闭。

(1) Stopping water: Conveying of water shall be stopped, and the valves before and after the leak point of the pipe shall be closed.

（2）挖掘：用挖掘机仔细清理管道两侧土，管道两侧各保留 1 米工作面，距管道连接件 30cm 处用人工挖掘。

(2) Excavation: The soil at both side of the pipe shall be carefully removed from an excavator. A one-meter wide workface shall be kept respectively at both sides. The soil within range of 30cm from the pipe connectors shall be excavated manually.

（3）抽水：及时用潜水泵将漏点处水进行抽水，将泄露点水利用临时排水管道抽至就近车间集水池，经车间集水池送至水处理进行再处理。防止泄露水对周边地下水造成环境影响。

(3) Pumping water: The water accumulated at the leak point shall be pumped out in time with a submersible pump, and through a temporary drain pipe, transferred to the water collecting basin in the nearest workshop, from which it will be delivered to water treatment workshop for retreatment. Prevent leakage water from causing environmental impact on surrounding groundwater.

（4）管道泄漏情况检查及维修方案：

(4) Inspection of pipe leak conditions and maintenance plan:

①当发现管道连接处出现沉降等原因造成的焊缝开裂，且管道无腐蚀情况，可对管道进行补焊处理。

① When weld cracks occur due to causes like settlement at the pipe connection and no corrosion is detected in the pipe, repair welding can be applied for the pipe.

②凡管道因防腐破坏出现裂纹，孔洞或其他严重损坏的管道等进行整体更换管道。

② Where cracks, voids or other severe damage occur in the pipe due to corrosion, this entire pipe shall be replaced.

管道取出：将存在问题的管道进行割除，然后仔细取出。

Pipe taking-out:

管道更换：将应急备用的螺旋碳钢管进行等尺寸的焊接更换。焊接完成后进行防腐处理。焊接完成后进行管道试压。

Pipe replacement: The spare spiral carbon steel pipe for emergency applications shall be welded with the identical dimension as the replaced one. Carry out anti-corrosion treatment after welding. After welding is completed, pipeline pressure test is performed.

（5）回填：试压正常后开始回填，回填沙至半管高度，用水沉降，然后用细碎土，用水灌实。注意回填过程中避免强夯。

(5) Backfilling: Backfilling can be started after normal conditions is presented in the pressure test. When the backfilled sand reaches the height equal to half the pipe diameter, the filled sand shall be settled down with water, and then fine crushed soil shall be backfilled and consolidated with water. Pay attention to avoid strong tamping during backfilling.

5.6.2.8 二氧化氯泄漏事故及应急措施

5.6.2.8 Chlorine dioxide Leak accidents and emergency measures

1、事故特征

1. Accident characteristics

（1）危险性分析、可能的事故类型：

(1) Analysis of hazards and types of possible accidents

①二氧化氯泄漏危害性分析

① Hazard analysis of chlorine dioxide leak

二氧化氯气体为红黄色有强烈刺激性臭味的气体：1℃时液化成红棕色液体，-59℃时凝固成橙红色晶体。有类似氯气和硝酸的特殊刺激臭味。液体为红褐色，固体为橙红色。沸点 1℃。相对蒸气密度 2.3g/L。遇热水则分解成次氯酸、氯气、氧气，受光也易分解，其溶液于冷暗处相对稳定。二氧化氯能与许多化学物质发生爆炸性反应。对热、震动、撞击和摩擦相当敏感，极易分解发生爆炸。受热和受光照或遇有机物等能促进氧化作用的物质时，能促进分解并易引起爆炸。若用空气、二氧化碳、氮气等惰性气体稀释时，爆炸性则降低。属强氧化剂，其有效氯是氯的 2.6 倍。与很多物质都能发生剧烈反应。腐蚀性很强。生产中产生的是二氧化氯的水溶液，浓度约为 2000ppm。

Chlorine dioxide gas is a reddish-yellow gas with a pungent, sharp odor: that will liquefy into a reddish-brown liquid at 1℃ and solidify into orange-yellow crystals at -59℃. It has the special pungent odor similar to that of chlorine and nitric acid. Chlorine dioxide exists as reddish-brown gas and or as orange-yellow solid. Its boiling point is 1 ℃. Its relative vapor density is 2.3g/L. It decomposes to hypochlorous acid, chlorine and oxygen in hot water, and it will easily decompose on exposure to light. Its solution is relatively stable in a cold and dark place. Chlorine dioxide can react explosively with many chemical substances. It is very sensitive to heat, vibration, shock and friction and it is extremely easy to decompose and explode. When heated and exposed to sunlight or by reaction with organics or other substances that can promote oxidation, chlorine dioxide may discompose and lead to an explosion. If chlorine dioxide is diluted with inert gas such as air, carbon dioxide, nitrogen, etc., the rate of explosion can be reduced. It is a powerful oxidizing agent, and its available chlorine is 2.6 times more effective than chlorine. It can violently react with many substances, and it is very corrosive. The substance generated in the production process is the chlorine dioxide solution with a concentration of about 2000 ppm.

②原料突发泄漏情况类型

Type of sudden raw material leakage

a) 原料罐泄露，罐内料液过多，有可能造成外溢；

a) If the raw material tank leaks and there is too much liquid in the tank, spillage may occur;

b) 管道泄漏，需使用过量清水冲洗，有可能造成原料废水外溢；

b) If the pipe leaks, which needs to be flushed with excess water, overflow/spillage of the raw material wastewater may occur;

c) 突发大暴雨出现水淹情况，造成原料外溢；

c) In case of a sudden heavy rainstorm which causes flooding, the overflow/spillage of the raw material may occur;

d) 发生自然灾害，造成产品储罐损坏，导致原料外排。

d) In case of natural disasters which cause damage to the product storage tank, discharge of the raw material may occur.

（2）事故发生的区域、地点、装置：二氧化氯发生器、液体产品储罐、管道。

(2) The area, location and plant where the accident occurs: chlorine dioxide generator,

liquid product storage tank and pipe.

（3）事故可能发生的季节：设备损坏时四季可发生，设施正常时在雨季可能发生外溢。

(3) Season in which the accident may occur: The equipment may be damaged in any season, and overflow may occur during rainy seasons when the facilities are in normal conditions.

（4）事故造成的危害程度：对环境造成污染和影响人畜饮水安全；

(4) The degree of damage caused by the accident: pollution to the environment and impact on the safety of drinking water for humans and animals;

（5）事故前可能出现的征兆：大暴雨、火灾、地震；

(5) Signs that may be presented before the accident: heavy rainstorm, fire accident and earthquake;

2、应急组织人员的构成和职责（车间级）

2. Constitution and responsibilities of emergency organization members (workshop level)

（1）部门自救组织形式及人员构成：

(1) Organization form of self-rescue within department and constitution of members

现场指挥 1 人

1 on-site commander

应急处置分队长：1 人

1 emergency disposition sub-team leader

应急处置人员：车间全体人员

Members for emergency disposition: all persons in workshop

（2）相关人员的应急工作职责：

(2) Responsibilities of relative personnel in emergency treatment:

车间人员：围堵泄露废水进入事故应急池，避免外排，将原料废水抽入事故应急池。

Workshop personnel shall: enclose and block off the leaked wastewater and transfer it into the emergency pool to avoid external discharge, and pump the raw material wastewater into the emergency pool.

办公室人员：负责指挥装运沙土进行围堵。

Office staff shall: direct the loading and transporting of the sand for containment of the leaked wastewater.

配电室：负责接通备用泵电源。

Power distribution room shall: be responsible for connecting the power supply for the standby pump.

其他人员：在人员紧迫时进行增援。

Others shall: act as reinforcements for sectors where assistance is in urgent demand

3、应急处置

3. Emergency disposition

（1）应急处理报告程序：

(1) Emergency disposition report procedure:

二氧化氯制备车间安装有二氧化氯气体监测报警系统，发生事故报警时，值班人员及时向分队长汇报，分队长及时组织人员处置救援，并向应急处置队长汇报，应急队长到达现场后，根据事态指挥人员进行处置救援，并及时汇报现场指挥，现场指挥到达现场后，指挥组织人员进行处置救援，并根据事态决定是否向公司领导汇报，启动公司应急预案。救援过程由现场指挥长统一指挥，各部门、救援分队相互配合完成救援处置工作。

The chlorine dioxide preparation workshop is equipped with chlorine dioxide gas monitoring alarm system. When accident occurs and alarm is sent out, the persons on duty shall report in time to the sub-team leader, who shall organize persons for disposition and rescue in time, and at the same time, report to the emergency disposition team leader. When the team leader arrives at the site, he/she shall organize the disposition and rescue according to the on-site situations, and report it to the on-site commander in time. When the on-site commander arrives at the site, he/she shall organize persons for disposition and rescue and shall, according to the on-site situations, decide whether to report it to the Company management to start the Company’s emergency preparedness plan (EPP). The rescue process shall be under the unified command of the on-site commander, and all departments and rescue teams shall cooperate with one other to complete the rescue and disposition work.

（2）现场应急处置措施：

(2) On-site emergency disposition measures:

①应急处置装备

① Emergency disposition equipment

为了有效控制事态，提高应急能力，对突发事故采取提前预防，建有容量为 10m³ 事故应急池一个。

To effectively control the situation and enhance the capacity to address emergency event, preventive measures shall be taken for the unexpected accidents, so one emergency pool with a capacity of 10m³ has been built.

②处置方法

② Disposition method

a）原料突发泄漏：采用围堰筑堵的方法围堵住泄漏的原料，若发生火灾用沙土或大量的水喷雾淹没原料作灭火处理，可使用消防水或生产工艺水施救，产生的污水围堵进入事故应急池。

a) Unexpected leaks of raw materials: The leaked material shall be enclosed and blocked off with the built cofferdam. If fire occurs, the fire shall be put out by cover the raw material with sand or a large amount of sprayed water mist. The fire water or production process water can be used, and the wastewater generated shall be enclosed and transferred to the emergency pool.

b）操作失误造成原料外泄：将外泄原料围堵入事故池，及时查清原料泄漏原因，加强巡检。

b) Spillage of raw material due to misoperation: The leaked raw material shall be enclosed and transferred to the emergency pool. The causes for leakage of the raw material shall be identified in time and patrol inspection shall be intensified.

c）突发暴雨、水灾：将泄漏的原料引入事故应急池，疏通沟道，不让雨水流入池内。

c) For sudden rainstorms or water disaster: the leaked raw material shall be led to the emergency pool, and unblock the trench, to stop any flow of rainwater into the pool.

d）发生自然灾害，造成贮罐、围堰损坏：先围堵住外排沟道出口，然后将泄露的原料引入事故应急池。

d) In case of natural disasters which cause damage to the storage tank and cofferdam: the external discharge outlet shall be firstly blocked off and then the leaked raw material shall be led to the emergency pool.

③在进行原料泄漏控制时必须安排人员对污水的流向进行检查，如果发现有进入水体的情况，须及时报告并再组织人员对受污染的水体进行围堵或隔绝，防止事态扩大。

③ While measures are taken to control the leakage of the raw material, persons must be dispatched to check the flow direction of the wastewater. If any entry of the wastewater flow into the water body, it is required to report in time and organize persons to enclose, block off or isolate the contaminated water body, to prevent expansion of the situation.

④相关应急救援人员和联系电话

④ Relative emergency rescue personnel and contact telephone numbers

4、注意事项

4. Precautions

a）佩戴个人防护器具方面的注意事项：抢险救援人员必须穿戴好劳保用品；必须穿水鞋、戴浸塑手套，若雾气浓度大，必须使用重型防化服和正压式空气呼吸器。

a) Precautions for wearing personal protective equipment (PPE): The rescue personnel must properly wear the PPEs, water shoes and plastic-impregnated gloves; and heavy duty chemical protective clothing and self-contained positive breathing apparatus if it is a day of heavy fog.

b）使用抢险救援器材方面的注意事项：水鞋、戴耐酸乳胶手套、重型防化服和正压式空气呼吸器正常有效并能正确使用；

b) Precautions for using rescue equipment: The water shoes, acid-resistant latex gloves, heavy duty chemical protective clothing and self-contained positive breathing apparatus are in normal and effective conditions and can be used correctly;

c）采取救援对策或措施方面的注意事项：防范污水外泄漏、防止触电、防止污水中亚氯酸钠对人的伤害；

c) Precautions for taking rescue measures or actions: measures or actions implemented shall be able to prevent external leakage of the wastewater, prevent electric shock and prevent the harm of the sodium chlorate contained in the wastewater to persons;

d）现场自救和互救注意事项：参加救援人员必须两人一组，互相监督，站在上风口施救；

d) Precautions for on-site self-rescue and mutual rescue: the personnel participating in the rescue must work in pairs, supervise each other, and perform rescue by standing upwind;

e）现场应急处置能力确认和人员安全防护等事项： 作业人员为熟悉本岗位操作人员并有安全作业证，作业前检查防护情况；

e) Confirmation of capability of applying on-site emergency disposition, personnel safety protection and other matters: The operating personnel shall be familiar with the job in this position and shall hold a safety operation permit. The status of protection shall be checked before operation;

f）应急救援结束后的注意事项：清点人数并确认其身体情况、检查是否有污水泄漏出去、清理现场、检查设备；

f) Precautions after the completion of emergency rescue: It is required to count the number of people and confirm their physical conditions, check whether there is wastewater leaking to the outside, clean the site and check the equipment;

g）其他需要特别警示的事项：确认污水是否进入外部区域和水体。

g) Other matters requiring special attentions: It is required to confirm whether the wastewater has entered the external area and water body.

5.6.3 风险措施可行性和有效性

5.6.3 Feasibility and effectiveness of risk prevention measures

广西太阳纸业有限公司制定了安全生产责任制度和管理制度，针对项目可能存在的环境风险隐患，基本上制定了相应的预防、预警措施以及应急处置措施，并配备了相应的火灾消防器材和劳保用品，风险防范措施相对比较充分，具有一定的针对性。

Guangxi Sun Paper Co., Ltd. has established a work safety responsibility system and management system. In light of the potential environmental hazards that may exist in the project, the Company has basically developed corresponding prevention and early warning measures as well as emergency disposition measures, and equipment appropriate fire-fighting equipment and personnel protection equipment. These risk prevention measures are relatively adequate with a certain pertinence.

广西太阳纸业有限公司将针对危险化学品二氧化氯、液氨、氢氧化钠、硫酸等以及污水排海管道等发生泄漏、中毒、火灾等突发环境污染事故编制应急预案，并配套了相应的应急器材，各类风险防范措施基本有效、可行。

Guangxi Sun Paper Co., Ltd. will develop a emergency preparedness plan (EPP) with the aim to address the unexpected environmental pollution accidents resulting from poisoning, fire as well as the leaks of the hazardous chemicals such as chlorine dioxide, liquid ammonia, sodium hydroxide and sulfuric acid and the leaks of the sea discharge pipes for wastewater, and has equipped corresponding emergency equipment. The risk prevention measures are basically effective and feasible.

广西太阳纸业有限公司承诺，将根据项目实际情况，对于可能存在的风险可能，制定针对性的《突发环境事件应急预案》，并对于潜在风险较大的风险源制定专项应急预案，在项目建成后立即组织专家对厂区环境风险进行评估并针对问题作出整改。应急预案编制完成后在北海市生态环境局进行备案，并定期更新应急预案。

Guangxi Sun Paper Co., Ltd. has committed to develop a *Emergency Preparedness Plan (EPP) for Unexpected Environmental Events* pertinent to the actual conditions of the project and possibility of existing potential hazards, to prepare a special EPP particularly for the risk sources with greater potential hazards, to organize experts to evaluate the environmental risks in the plant area and make rectifications for for the problems detected after completion of the project. The completed EPP will be archived in Beihai Ecological Environment Protection Bureau and will be updated on a regular basis.

5.7 风险事故应急预案

5.7 Emergency Preparedness Plan (EPP) for risk accidents

项目投入运行后，建设单位需针对本项目编制环境风险应急预案，并每三年 修订一次，对项目投入运行后可能发生的各类环境事故风险提出有效的应对措施 并定期加以演练，不断细化相关内容，有效应对环境风险。下面就本项目环境风险应急预案编制总体框架进行综述。

After the project is put into operation, the Employer shall develop an EPP for environmental risks for this project and have it revised once every three years, to propose effective response actions for the potential environmental accidents and risks after operation of this project, and perform drills for these actions. The related information in the EPP shall be constantly updated as detailed as possible to effectively address the environmental risks. The summary below is the overall framework for preparing the EPP for environmental risks of this project.

5.7.1 编制目的

5.7.1 Purpose of compilation

为有效应对突发环境事故，提高企业应对突发环境事件的能力，将突发环境 事件对人员、财产和环境造成的损失减少到最小、最大限度的保障人民群众的生命财产安全及环境安全，根据相关法律法规要求，结合项目实际，制定出环境风险应急预案。

To effectively address the unexpected environmental accidents, enhance the Company's capacity to treat the unexpected environmental events, minimize the loss caused to the people, the property and the environment, and protect the safety of the people's lives and properties as well as the safety of the environment to the maximum extent as possible, the emergency preparedness plan (EPP) for environmental risks is formulated according to the statutory and regulatory requirements and the actual conditions of the project.

5.7.2 编制依据

5.7.2 Preparation basis

（1）《建设项目环境风险评价技术导则》（HJ/T169-2018）；

(1) *Technical Guidelines for Environmental Risk Assessment of Construction Project* (HJ/T169-2018);

（2）《企业突发环境事件风险评估指南（试行）》（环办[2014]34 号）；

(2) *Enterprise's Guide for Environmental Risk Assessment of Unexpected Environmental Events* (Trial) (H.B. [2014] No. 34);

（3）《国家突发环境事件紧急预案》（国办函[2014]119 号）；

(3) *National Emergency Preparedness Plan (EPP) for Unexpected Environmental Events* (G.B.H. [2014] No. 119);

（4）《突发环境事件应急管理办法》（环境保护部，部令第 34 号，2015 年）；

(4) *Emergency Management Method of Unexpected Environmental Events* (B.L.No.34. 2015, Ministry of Environmental Protection)

（5）《关于加强环境影响评价管理与防范环境风险的通知》（环发[2012]77 号）；

(5) *Notice on Enhancement of Environmental Impact Assessment and Prevention of Environmental Risks* (H.F. [2012] No. 77).

（6）《关于切实加强风险防范严格环境影响评价管理的通知》（环发[2012]98 号）。

(6) *Notice on Substantial Enhancement of Risk Prevention and Strict Management of Environmental Impact Assessment* (H.F. [2012] No. 98).

5.7.3 适用范围

5.7.3 Scope of application

适用于广西太阳纸业有限公司可预见的环境污染以及其他事故所引发的突发环境污染事件，本项目可能发生的风险事故主要包括生产过程中危险化学品的泄漏、易燃易爆物质发生的火灾爆炸以及污染物质的事故排放，以二氧化氯制备车间发生氯气泄漏排放事故排放为重点。

This document applies to the unexpected environmental pollution events caused by the foreseeable environmental pollution and other accidents related to Guangxi Sun Paper Co., Ltd. The risk accidents that may occur in this project mainly include the chemical leaks during production, the fire/explosion of flammable and/or explosive materials and the accident discharge of pollution substances, mainly involved with the accident discharge of the chlorine gas leaks that may occur in chlorine dioxide preparation workshop.

5.7.4 组织机构与职责

7.7.3.3 organization and responsibilities

应急预案必须明确应急组织体系和指挥机构及职责的基本要求，只有组织完备、分工明确，才能有效地开展应急工作。预案应成立相应的应急预案领导小组展开相应的工作，公司成立应急指挥小组，由公司主要负责人担任组长，下设综合协调组、应急抢险组、应急监测组、后勤保障组、医疗救助组等行动小组，各个行动小组又分为多个分小组，由各部门主要领导担任小组/分小组组长。在发生环境风险事故时，各应急小组按各自职责分工开展应急救援工作。

The emergency organization system, command mechanism as well as the basic requirements for authority and responsibility must be explicitly described in the emergency preparedness plan (EPP). The emergency work can be effectively implemented only with a complete organization and clear division of work. According to the EPP, corresponding EPP leadership team shall be set up to implement corresponding work. The Company shall establish a emergency response command team, with the principal person in charge of the

Company as the team leader, under which the comprehensive coordination team, emergency rescue team, emergency monitoring team, logistics support team, medical rescue team, and other action teams are set. Each action team is also divided into a number of sub-teams, and the principal person in charge of each department is designated as the team/sub-team leader. In the event of an environmental risk accident, the emergency response teams shall start emergency rescue work according to their respective responsibilities.

（1）应急指挥小组

(1) emergency response command team shall

①第一时间接警，甄别是一般还是较大环境污染事故，并根据事故等级，下达启动应急预案指令，同时向相关职能管理上报事故发生情况；

① acknowledge the reported alarm at the earliest time, identify whether it is a moderate or major environmental pollution accident, and issue the order of starting emergency preparedness plan (EPP) if necessary according to the level of the accident, and at the same time, report the accident occurrence conditions to the related functional management level;

②负责制定环境污染事故的应急方案并组织现场实施；

② be responsible for developing the EPP for environmental pollution accidents and organizing the implementation at the site;

③制定应急演习工作计划、开展相关人员培训；

③ develop the emergency drill work plan and organize trainings for related personnel.

④负责组织协调有关部门，动用应急队伍，做好事故处置、控制和善后工作，及时向地方政府和上级应急处理指挥部门报告，征得其援助，消除污染影响。

④ organize and coordinate the departments concerned, mobilize the emergency response teams, properly handle the project, control and complete post-accident work, as well as report in time to the local government and the superior emergency disposition & command department, to solicit assistance and eliminate the impact of the pollution.

（2）综合协调小组

(5) Comprehensive coordination team shall

①主要负责事故现场调查取证，调查分析主要污染物种类、污染程度和范围，对周边生态环境影响情况；

① be mainly responsible for the investigation and getting evidence at the accident site, the investigation and analysis of main pollutant types, degree and scope of the pollution, and the impact on the surround ecological environment;

②承担与当地区域或各职能管理部门的应急指挥机构的联系工作，及时将事故发生情况及最新进展向有关部门汇报，并将上级指挥机构的命令及时向应急指挥小组汇报；

② undertake the work to contact with the emergency response command units in the local area or of the functional management departments, report in time the accident occurrence conditions and the latest development to related departments, and report in time the order issued by the superior command unit to the emergency response command team;

③进行环境污染事故经济损失评估，并对应急预案进行及时总结，协助应急指挥小组完成事故应急预案的修改或完善工作；

③ evaluate the economic loss caused by the environmental pollution accident, make a summary about the emergency preparedness plan (EPP) in time, and assist the emergency response command team to complete the modification or improvement of the EPP for the accident;

④负责编制环境污染事故报告，并将事故报告向上级部门汇报。

④ prepare reports for environmental pollution accidents, and report the accident reports to the superior departments.

（3）应急抢险小组

(3) Emergency rescue team shall

①在事故发生后，迅速派出人员进行抢险救灾，负责在专业队伍来到之前，进行火灾及污染物泄漏的预防和扑救，尽可能减少损失；

① after occurrence of the accident, promptly dispatch persons for rescue, and take preventive and makeup measures to address the fire and the leaked pollutants before arrival of the professional fleet, to minimize the loss;after occurrence of the accident, promptly dispatch persons for rescue, and take preventive and makeup measures to address the fire and the leaked pollutants before arrival of the professional fleet, to minimize the loss;

②专业队伍来到后，按专业队伍指挥员要求，配合进行工程抢险或火灾扑救；

② after arrival of the professional fleet, assist with the professional fleet to save the project or extinguish the fire following the requirement of the fleet commander;

③应急抢险完成后，尽快组织力量抢修厂内的供电、供水等重要设施，尽快恢复功

能。

③ after completion of the rescue, organize workforces to provide emergency repairs for the important facilities like power supply and water supply units in the plant, to recover their functions as soon as possible.

（4）应急监测小组

(4) Emergency monitoring team shall

①确定事故现场监测采样地点；

① determine the monitoring & sampling location at the accident site;

②负责对大气、污水等进行现场监测，并将监测结果及时反馈应急指挥小组；

② be responsible for the on-site monitoring of the atmosphere and wastewater, and reflecting the monitoring result to the emergency response command team in time;

③如可能影响水质的，及时监测项目出厂水质，发现总排水有异常的须及时反馈，并建议是否启用应急事故池。

③ monitor the quality of the water discharged outside the plant if the water quality may be affected, and reflect in time and put forward suggestions on whether to use the emergency pool if irregularities are detected for the water quality at the master discharge outlet.

（5）后勤保障小组

(5) Logistics support team shall

①负责应急设施或装备的购置和妥善存放保管；

① be responsible for the procurement and proper storage & safekeeping of the emergency facilities or equipment;

②在事故发生时及时将有关应急装备、安全防护品、现场应急处置材料等应急物资运送到事故现场；

② when the accident occurs at the site, promptly convey the related emergency equipment, personal protective equipment and on-site emergency disposition materials, etc. to the accident site;

③负责厂区内的治安警戒、治安管理和安全保卫工作，预防和打击违法犯罪活动，维护厂内交通秩序；

③ be responsible for the security alert, security management and safety & guarding related work, prevent and combat illegal and criminal activities, and maintain the traffic order within the plant area;

④负责厂内车辆及装备的调度。

④ be responsible for the scheduling & dispatching of the vehicles and equipment within the plant area.

（6）医疗救助小组

(6) Medical rescue team shall

①负责事故现场的伤员转移、救助工作；

① responsible for transferring and rescuing the injuries at the accident site;

②协助医疗救护部门将伤员护送到相关单位进行抢救和安置；

② assisting with the medial rescue unit to escort the injures to related resettlement places for first aid treatment and proper arrangement;

③发生重大污染事故时，组织厂区人员安全撤离现场；

③ organize the persons in the plant area to safely evacuate from the site when a major pollution accident occurs;

④协助领导小组做好死难者的善后工作。

④ Assist with the leadership team to properly cope with the aftermath of the casualties.

5.7.5 预警分级

5.7.5 Early warning classification

5.7.5.1 预警分级指标

5.7.5.1 Early warning classification indicators

突发事件预警级别：一般依据突发事件可能造成的危害程度、波及范围、影响力大小、人员及财产损失等情况，由高到低划分为特别重大(Ⅰ级)、重大(Ⅱ级)、较大(III级)、一般(Ⅳ级)四个级别，并依次采用红色、橙色、黄色、蓝色来加以表示。具体分级标准由建设单位编制应急预案时细化。

According the hazard degree, scope of impact, influence, and person injuries & casualties and property losses, etc.arising from an unexpected event, it is generally categorized into four levels, from the high to the low level, respectively as extreme (Level Ⅰ), severe (Level Ⅱ), major (Level Ⅲ) and moderate (Level Ⅳ), and expressed respectively in color red, orange, yellow and blue. The specific classification criteria shall be described in detail when the emergency preparedness plan (EPP) is compiled by the Employer.

根据事态的发展情况和采取措施的效果，预警级别可以升级、降级或解除。

According to the development of the situation and the effect of the measures taken, the early warning level can be upgraded, downgraded or removed.

发生一般（Ⅳ级）突发环境事件，启动Ⅳ级预警（蓝色）。

When a moderate (Level Ⅳ) unexpected environment event occurs, the Level Ⅳ early warning system (colored blue) shall be started.

发生较大（III级）突发环境事件，启动III级预警（黄色）。

When a major (Level Ⅲ) unexpected environment event occurs, the Level Ⅲ early warning system (colored yellow) shall be started.

发生重大（Ⅱ级）突发环境事件，启动Ⅱ级预警（橙色）。

When a severe (Level Ⅱ) unexpected environment event occurs, the Level Ⅱ early warning system (colored orange) shall be started.

发生特别重大（Ⅰ级）突发环境事件，启动Ⅰ级预警（红色）。

When a extreme (Level Ⅰ) unexpected environment event occurs, the Level Ⅰ early warning system (colored red) shall be started.

表 5.7-1 突发环境事件预警分级一览表

Table 5.7-1 Table of Early Warning Classification for Unexpected Environment Events

序号 **S.N.**	环境风险因素 **Environmental Risk Factors**	触发事件 **Triggering Event**	预警分级指标 **Early warning classification indicators**	预警等级 **Early Warning Levels**
1	突发环境风险物质、危险废物 Unexpected environmental risk substances, and hazardous wastes	泄漏 Leakage	公司内小范围少量泄漏、渗漏 Minor spill and leak involving with a small scope within the company	Ⅳ（蓝色） Ⅳ (blue)
			大量泄漏，未流出公司，且无流出公司的趋势 Major spill with no spilled material flowing out of the Company and with no trend of flowing out of the Company	Ⅱ（橙色） Ⅱ (orange)
			发生泄漏，流出公司，影响周边地表水、土壤 Occurrence of spillage, with spilled material flowing out of the Company, affecting the surrounding surface water	Ⅰ（红色） Ⅰ (red)

			and soil		
		泄漏、挥发 Spill and volatilization	易挥发扩散物质泄漏，能够及时封堵或处理 Spill of volatile and dispersing substance, which can be enclosed, blocked off or treated		Ⅲ（黄色） Ⅲ (yellow)
			易挥发扩散物质泄漏，短时间内无法控制 Spill of volatile and dispersing substance, which cannot be controlled within a short period of time		Ⅰ（红色） Ⅰ (red)
2	加油站、二氧化氯车间 Petrol station: Chlorine dioxide preparation workshop	火灾、 Fire, 爆炸 Explosion	单独发生火灾 Fire only		Ⅱ（橙色） Ⅱ (orange)
			火势范围扩大导致厂区发生连锁火灾时 Fire expands leading to a chain fire in the plant area		Ⅰ（红色） Ⅰ (red)
3	废气处理装置 Waste gas treatment plant	故障或者失效 Malfunction or failure	废气超标 Waste gas out of standard	NOx >100 mg/m^3	Ⅰ（红色） Ⅰ (red)
				SO_2> 35mg/m^3	
				烟尘>10mg/m^3 Gas dust >10mg/m^3	
				酸性气体>60mg/m^3 Acidic gas >60mg/m^3	
				汞>0.03mg/m^3 Mercury >0.03mg/m^3	
4	出水水质 Effluent quality	超标排放 Out-of-standard discharge	通过调整污水处理工艺参数、加大污水处理系统加药量等方法，使得出水水质不超标 By adjusting the process parameters for wastewater treatment, increasing the dosage of the wastewater treatment system or other means, to make the effluent quality not out of standard		Ⅲ（黄色） Ⅲ (yellow)
			厂区内采取一定的应急措施后，不能短时间内得到有效控制，使得外排水水质持续超标 After some emergency measures taken within the plant area, the situation cannot be effectively controlled within a short period of time, and the effluent quality is on a continuous out-of-standard level		Ⅰ（红色） Ⅰ (red)
5	污水管网破裂、自然灾害等 Fracture of wastewater pipe network and natural disaster, etc.	废水泄漏 Spill of wastewater	小范围少量泄漏、渗漏 Minor spills and leaks involving with a small scope		Ⅳ（蓝色） Ⅳ (blue)
			泄漏量较大，但没有流入周围地表水、土壤等 Major spills, but with no spilled material flowing into the surrounding surface water and soil, etc.		Ⅱ（橙色） Ⅱ (orange)
			大量泄漏，流入周围地表水、土壤等 Major spills, with spilled material flowing into the surrounding surface water and soil, etc.		Ⅰ（红色） Ⅰ (red)

6	污泥 Sludge	流失 washed away	车辆运输过程中外泄、流失，影响地表水、土壤 Material leakage and loss in the process of transportation by vehicles, affecting the surface water and soil	Ⅱ（橙色） Ⅱ (orange)
7	无组织废气 Unorganized emission of waste gas	超标排放 Out-of-standard discharge	废气超标排放 Out-of-standard emission of waste gas	Ⅳ（蓝色） Ⅳ (blue)

5.7.5.2 预警行动

5.7.5.2 Early warning actions

当公司危险源出现异常时，岗位人员或企业内任何单位和个人发现异常事故，应及时通知值班人员，如果需要社会援助可直接拨打“110”、“119”、“120”等电话，请求社会援助。值班人员不管以任何方式接到报警后，立即查明事故原因，及时报告公司突发环境事件应急指挥部，公司环境事件应急指挥部接到预警报告，指令各成员应急处置小组进入应急状态，立即开展应急调查工作，随时掌握并报告事态进展情况。针对环境突发事件可能造成的危害，提出封闭、隔离或者限制使用有关场所，中止可能导致危害扩大的行为和活动的建议。

When irregularities occur at the Company’s hazard source, the person on the job or any departments or individuals in the Company who find this irregular accident shall notify the person on duty in time. If necessary, the telephone number “110”, “119” and “120” can be directly dialed to seek social assistance. After receipt of the alarm, no matter in what forms, the person on duty shall immediately identify the causes of the accident and report it to the Company’s emergency response command department for unexpected environmental events. Upon receipt of the early warning report, the emergency response command department shall order the emergency disposition teams to enter emergency state and promptly start the emergency investigations, to master and report the progress of the event whenever necessary. In view of the possible hazards caused by the unexpected environmental events, proposal should be put forward to close, isolate or restrict the use of relevant places, and suspend the acts and activities that may lead to expansion of the hazards.

厂区应急指挥部将立即按突发环境事件应急预案组织本单位各应急队伍奔赴事件现场进行应急处置工作。

The emergency response command department of the plant area shall immediately organize the emergency response teams of the Company according to the emergency preparedness plan (EPP) for unexpected environmental events, to go to the accident site for emergency disposition.

进入预警状态后，厂区突发环境事件应急指挥部应当采取以下措施：

After entering the early warning state, the emergency response command department of the plant area shall:

（1）立即启动相关应急预案。

(1) immediately start the related emergency preparedness plan (EPP).

（2）发布预警公告。

(2) issue the early warning announcement.

（3）转移、撤离或者疏散可能受到危害的人员，并进行妥善安置。

(3) transfer, withdraw or evacuate the persons that may be affected by the hazards, and have them properly arranged.

（4）指令各环境应急队伍进入应急状态，环境监测部门立即开展应急监测，随时掌握并报告事态进展情况。

(4) order the environment - related emergency response teams to enter emergency state, and order the environment monitoring department to carry out emergency monitoring, to master and report the progress of the event whenever necessary.

（5）针对突发环境事件可能造成的危害，封闭、隔离或者限制使用有关场所，中止可能导致危害扩大的行为和活动。

(5) in view of the possible harm caused by the unexpected environmental event, close, isolate or restrict use of relevant places, and suspend the acts and activities that may lead to expansion of the hazards.

（6）调集环境应急所需物资和设备，确保应急保障工作。

(6) muster the supplies and equipment that are required by environmental emergencies, to ensure the support for emergency response work.

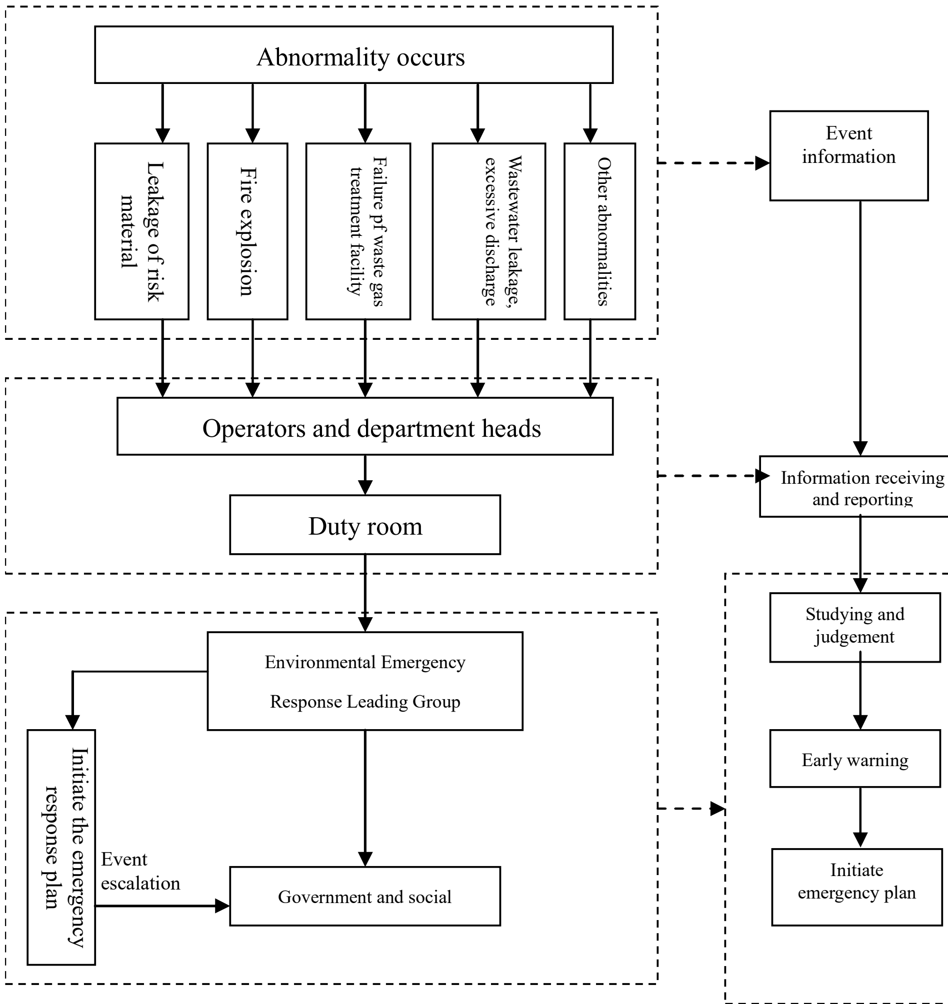


图 5.7-1 突发环境事件预警应急流程图

Figure 5.7-1 Early Warning & Emergency Response Flow Diagram for Unexpected Environmental Events

5.7.6 信息报告与应急响应

5.7.6 Information report and emergency response

一旦发生环境风险事故，企业应急指挥小组接到报警，立即通知各应急小组到达各自岗位，完成人员、车辆及装备调度，第一时间及时地向上级应急指挥部门报告，并且同时向上级主管部门和地方人民政府报告事故；其中的综合协调小组立即到达事故现场进行调查取证，保护现场，查找污染源，并对事故类型、发生时间、地点、污染源、主要污染物质、影响的范围和程度等基本情况进行初步调查分析，形成初步意见，及时反馈应急指挥小组；由应急指挥小组根据事故情况启动相应的应急预案，领导各应急小组/分小组展开工作，在污染事故现场处置妥当后，经应急指挥小组研究确定后，向当地政

府机关和上级事故应急处理指挥部报告处理结果。

Once an environmental risk accident occurs, the Company's emergency response command team, upon receipt of the alarm report, shall immediately notify the emergency response teams to get ready on their respective position, complete the scheduling & dispatching of personnel, vehicles and equipment, report to the emergency response command department at superior level at the earlies time, and meanwhile, report this accident to the superior competent department and the local people 's government; The comprehensive coordination team shall promptly arrive at the accident site to investigate and collect evidence, protect the spot, identify the source of pollution, make preliminary investigation and analysis of the basic conditions such as the accident type, time of occurrence, place, pollution source, main pollutants, and the scope and degree of impact, provide preliminary comments, and reflect to the emergency response command team in time; The emergency response command team shall start corresponding emergency preparedness plan (EPP) according to the conditions of the accident, organize the emergency response teams / sub-teams to start work. After the pollution accident site has been properly dispositioned, the result of treatment that has been studied and confirmed by the emergency command team, shall be reported to the local government organs and the accident emergency response command department at superior level.

项目应急疏散通道、安置场所位置见图 5.7-2。

For the location of the project emergency exit pathway and the resettlement place, see Figure 5.7-2.

图 5.7-2　项目应急疏散通道、安置场所位置图

Figure 5.7-2 Location of the Project Emergency Exit Pathway and the Resettlement Place

图 5.7-3　项目应急疏散通道、安置场所位置图

Figure 5.7-3 Location of the Project Emergency Exit Pathway and the Resettlement Place

当发生一般性危险物质泄漏、大气污染物事故排放、火灾爆炸等事故时，可将办公宿舍区作为临时应急安置场所，厂内非应急工作人员迅速沿厂内主干道、向远离事故发生源的方向做应急疏散，疏散至临时应急安置场所。当发生较为重大的环境风险事故，如氯气泄漏、较大规模的火灾爆炸事故等，厂内非应急工作人员迅速沿厂内主干道、向远离事故发生源的方向做应急疏散，快速就近地从厂区大门走出厂区，沿厂外道路向下

风向侧疏散，在应急避难场所集合后，在根据安排进行进一步撤离安置。

In the event of spill of general hazardous substances, accident emission of air pollutants, fires / explosions and other accidents, the offices and dormitory areas can be taken as the temporary emergency resettlement places. The persons other than the emergency response working personnel shall quickly evacuate along the main road in the plant in the direction away from the accident occurrence source, to the temporary emergency resettlement place. In the event of a major environmental risk accident, for example, a chlorine gas leak or a large fire explosion accident, the persons other than the emergency response working personnel shall quickly evacuate along the main road in the plant in the direction away from the accident occurrence source, and shall promptly walk out of the plant area from the nearest plant gate, to evacuate along the road outside the plant in the direction downwind. After gathering in the emergency shelter, they shall be further evacuated and resettled according to the arrangement.

5.7.7 应急救援技术方案

5.7.7 Technical proposal for emergency rescue

（1）氯气泄漏应急救援

(1) Emergency rescue for chlorine gas leak accident

①项目氯气在反应过程中有产生，在设备内循环，不进行存储。在使用及输送过程中一旦发生泄漏，工作人员立即通知企业应急指挥小组和公安、消防等应急救援部门，相关单位和部门接到报警后迅速展开行动，实施救援。

① The chlorine gas involved in this project is generated in the reaction process and will circulate inside the equipment, and no storage is required. In case leak occurs during the use and conveying processes, the working personnel shall immediately notify the Company’s emergency response command team as well as the public security department, fire department and other emergency rescue departments. Upon receipt of the alarm report, the related units and departments shall promptly start action to perform rescue.

②二氧化氯制备车间应配有碱液喷淋装置和漏氯自动吸收装置，每个储罐设有氯气泄漏监测报警装置，设有安全阀、压力表等，安全阀及事故放空均设有收集处理系统，设有集水设施。当氯气发生泄漏时，报警装置发出警报，当班人员立即开启应急碱液喷淋装置，迅速撤离疏散现场无关人员，并立即进行隔离，在企业应急指挥小组的领导下，

应急处理人员需戴自给正压式呼吸器，穿防毒服，在保证安全的情况下尽可能切断泄漏源。如氯气泄漏量较大，企业应急指挥小组通知全厂工作人员及下风向居民有序撤离至上风向或侧风向安全区域内，请求上级应急指挥部及政府有关应急管理部门协助开展应急救援。

② The chlorine dioxide preparation workshop shall be equipped with alkali liquor sprinkler and automatic absorption device for the leaked chlorine dioxide. Each storage tank shall be equipped with chlorine gas leak monitoring & alarm device, integrated with safety valve and pressure gauge, etc. The safety valve and emergency relieving unit shall be equipped with collection treatment system. A water collection facility shall be provided. When chlorine gas leaks, the alarm device will send out alarming signal. The personnel on duty shall immediately start the emergency sprinkling device, promptly evacuate and isolate all the unrelated personnel from the site. Under the instruction of the Company's emergency response command team, the emergency disposition personnel shall wear self-contained positive breathing apparatus and anti-toxic clothing. The leak source shall be cut off as far as possible while ensuring safety. If a large amount of chlorine gas leaks, the Company's emergency response command team shall notify all the employees in the entire plant as well as the residents living downwind to evacuate to a safety place in the upwind or crosswind direction, and request the emergency response command department at superior level as well as related emergency response management department of the government to provide assistance for emergency rescue.

③现场救援准备消防部队在接到报警后，消防队员佩戴好个人防护装备，立即赶赴现场，进行初级处置，了解事故的状况，辨明事故性质，实施救援措施，控制事态发展，并及时划定警戒区，而后对灾害现场受伤人员组织抢救。应急救援小队到达事故现场后，应迅速做好救援准备工作，选择上风方向或侧风方向为停车位置，各小组迅速展开行动，利用大功率扩音器向附近群众广播，警示群众迅速撤离灾害现场，气象员架设随车综合电子气象仪，监测气象参数，检测小组携带气体监测仪进人事故现场进行气体检测。

After the on-site rescue preparation & fire brigade receives the alarm report, the firemen will properly wear their PPEs and promptly rush to the site for preliminary disposition, get knowledge of the accident, identify the accident nature, apply rescue measures, control the situation, and delimit the alert zone, and then organize rescue for the injuries at the accident site. After arrival at the accident site, the emergency rescue team shall quickly make proper preparation for the rescue, selecting a place in the upwind or crosswind direction as the parking position. The rescue teams shall promptly start action, broadcast to the people nearby with a high-power loudspeaker to ask them quickly to evacuate from the accident site. The weatherman shall set up a vehicle-mounted complex electronic meteorological instrument, to monitor the meteorological parameters. The test team shall bring a gas monitor into the accident site to test the gases.

④现场处理、控制扩散

④ Site treatment and spread control

在水枪的掩护下，区别不同情况先用捆绑式堵漏袋、阀门堵漏工具组、金属堵漏工具、木质堵漏楔等器材，实施堵漏。泄漏现场应去除或消除所有可燃和易燃物质，所使用的工具严禁粘有油污，防止发生爆炸事故。发生小量泄漏，可采用化学中和方法，即在消防车水罐中加入苏打粉等碱性物质向罐体、容器喷射液中，使其中和，以减轻危害。消防部门可以在容器的四周设置水幕或喷雾水枪喷射雾状水进行稀释降毒，但不宜喷射直流水。外围保护的消防支队水罐车，使用雾化水枪，降低空气中氯气的浓度。

Under the cover of the water cannons, plug the leak point with strapped plugging bags, plugging tool kits for valves, tools for metal elements, wooden plugging wedge and other equipment, to be selected according to the different situations. All combustible and flammable substances shall be removed or eliminated at the site of the leak. Use of tools contaminated with oil or grease is strictly prohibited to prevent explosion accident. For a minor leak, the chemical neutralization method can be used. That is, alkaline materials such as soda powder can be added to the water tank on the fire truck, and then the liquid can be sprayed to the tanks and containers, to neutralize the leaked chemicals, thus to alleviate the harm. The fire department can set water curtain or produce sprayed water mist with the fire nozzle to dilute the chemicals and reduce its poison, instead of injecting straight-line water. The fire brigade responsible for protection at the periphery shall unit the fire nozzle that is equipped at the water tank truck and that can produce water mist, to reduce the concentration of chlorine gas in the air.

如果泄漏无法很快得到控制，现场指挥者和政府领导下达疏散的指令，公安人员和运输系统要积极配合，使群众能够在最短的时间内撤离危险区域，路上要有指示牌或指

示人员，避免走错方向。加强警戒的范围和强度，避免有人靠近危险区域。同时通过媒体和通信设备，通告疏散的原因和路径，以免造成恐慌。

If the leak cannot be controlled in a very short time, the on-site commander and the government leader shall give an evacuation order. The public security personnel and the transportation system shall actively cooperate, to ensure the masses can be evacuated out of the hazardous area within the shortest time. Instruction signs or personnel shall be set up on the way of evacuation, to avoid going in the wrong direction. The scope and intensity of the alert shall be strengthened, to prevent anyone from approaching the hazardous area. At the same time, the cause and route of the evacuation shall be announced by use of the media and the communication equipment, to avoid panic.

⑤预案结束完成现场堵漏、人员救治和居民疏散后，要利用气体监测仪对现场进行仔细的检查，特别是一些地势比较低的地区，当确定受影响的区域中基本没有残留的氯气或空气中的氯气含量达到标准时，现场的应急救援行动就基本结束，可以进行恢复善后、损失评估、总结等行动。

⑤ After completion of the plugging of site leak points, rescue of persons and evacuation of residents according to the EPP, the site shall be carefully inspected with a gas monitor, especially in areas of low terrain. When it is confirmed that there is basically no residual chlorine gas or the content of chlorine gas in the air can reach to the standard, the on-site emergency rescue action can be basically concluded, and the restoration, coping with the aftermath, loss assessment, summaries and other work can be started.

（2）其他危险化学品泄漏应急救援

(2) Emergency rescue for leak accidents caused by other hazardous chemicals

①当储存酸、碱等有腐蚀性或毒性等化学品的储槽、储罐、管线等发生泄漏时，应及时使用防护器具设法关闭阀门、堵漏，并视情况疏散人员避免受腐蚀性液体及刺激性气体的侵害。

① If a leak occurs at the storage tanks and pipes, etc. that contains corrosive or toxic chemicals like acids and alkalis, actions shall be taken immediately with the protection equipment to try to close the valves and plug the leak points, and the persons shall be evacuated, as necessary, to avoid harm from the corrosive liquid and pungent gas.

②组织人员将可能受腐蚀的物品和可移动设备转移至安全处，同时把与泄漏化学品

相反应的化学品转移到安全处，并在泄漏区域设立警告标示牌。

② It is required to organize persons to move the articles that may be corroded and the movable equipment to a safe place, and at the same time, transfer the chemicals that will react with the leaked material to a safe place, and set a warning sign at the leak zone.

③当连接储槽、储罐的管线发生泄漏时，首先关闭桶槽的阀门，切断污染源，妥善处理管道的残留化学品。

③ f a leak occurs at the pipeline connecting the storage reservoirs and tanks, the valve of the drum or tank shall be firstly closed to cut off the pollution source, and then the residual chemicals leaked from the pipe shall be properly dispositioned.

④输送酸、碱等化学品的泵发生泄漏时，停泵，关闭离泵最近的进出阀门，切断污染源。

④ If a leak occurs at the pump used for transferring the chemicals like acids and alkalis, the pump shall be stopped and the inlet and outlet valves nearest to the pump shall be closed to cut off the pollution sources.

⑤当进入厂区运输化学品的槽车在送达收料地点前发生泄漏时，门卫、厂区员工、厂内巡查人员、或原料收料人员立即要求驾驶员将车辆停于相对安全处（远离雨水沟及货物堆场），并先行采取有效防泄措施，如自行无法处理则及时联络收料部门，收料部门接到通知后立即组织应急处理小组赶往泄漏现场。

⑤ If a leak occurs at the tank truck carrying chemicals when the truck arrives at the receiving place in the plant area, the gate guard, employees, patrol inspectors or the raw material receiving persons in the plant area shall immediately ask the driver to park the vehicle in a relatively safe place (far from rainwater trench and cargo stockyard), and take effective measures to prevent infiltration. If it is impossible to treat it, they shall contact in time with the material receiving department, who shall promptly organize the emergency disposition team to rush to the leak site upon receipt of the notification.

⑥当连接储槽、储罐之管路、槽体、输送泵发生泄漏时，按上述措施进行处理，当大量泄漏又无法控制时，应及时采取有效措施堵住附近雨水沟、仓库，将泄漏化学品控制在一定范围内，防止化学品顺雨水沟流出或流入仓库，污染水源及货物。必要时关闭全厂出水控制闸阀。

⑥ If a leak occurs at the pipeline connecting the storage reservoirs and tanks, the tanks or the transfer pumps, the site shall be dispositioned as per the procedure stated above. When major leaks which is out of control, effective measures shall be taken in time to block off the rainwater trench and warehouse nearby, to confine the leaked chemicals within a certain range, to prevent the chemicals from flowing out of or into the warehouse through the rainwater trench, polluting the water source and cargo. The master effluent control gate valve of the plant shall be closed, as necessary.

（3）火灾爆炸事故应急救援

(3) Prevention measures for fire and explosion accidents

①发现氢气、二氧化氯等漏气事故，必须立即切断气源，采取通风等防火措施，并报告。设置专职抢修队伍，配齐抢修人员、防护用品、车辆、器材、通讯设备等，并预先制定各类突发事故的抢修方案，事故发生后，必须迅速组织抢修。

① If a hydrogen, chlorine dioxide or other gas leak accident is detected, the gas source must be immediately cut off, fire prevention measures like ventilation shall be implemented and report shall be made. A full-time emergency repair fleet shall be established, equipped with emergency members, personal protective equipment, vehicles, appliances and communication devices, etc. In addition, the emergency repair plans for all kinds of unexpected accidents shall be developed ahead of the time. After the accident occurs, the emergency repair shall be promptly organized.

②生产操作人员一旦发现火情，根据火势大小果断采取措施：如果是火势不大，应使用就近配备的灭火器材及时灭火；如果火势无法控制，应立即向消防队（119）及企业应急指挥小组报警，同时采取必要的措施，为专业消防队的赶到现场争取时间。

Once the production operators detect the fire, they shall take decisive measures according to the fire size. They shall: put out the fire with the fire extinguishing appliances nearby for a small fire size; if the fire is out of control, shall immediately call the fire brigade (119) and the Company’s emergency response command team, and at the same time, take necessary measures to save more time before the professional fire brigade arrives.

③储罐、管线、公路等发生火灾时应尽可能距离灭火或者使用遥控水枪进行扑救，用大容量的水冷却容器，直至火灾扑灭。

③ When fire occurs at storage tanks, pipelines and roads, etc., actions shall be taken by keeping a certain distance from the fire or by using remote control fire nozzles, to cool down the container with a large amount of water until the fire is put out.

④企业应急指挥小组接到报警后应迅速通知事故发生部门负责人查明事故情况，下达应急救援预案处理的指令，通知小组成员及消防队、医疗救护队迅速赶往事故现场。

④ After receiving the alarm report, the Company's emergency response command team shall promptly notify the head of the department where the accident occurs, give the order to implement EPP, and notify the rescue team members as well as the fire brigade and medical rescue fleet to rush to the accident site.

⑤消防队到达现场后应及时灭火，搜救现场中毒以及受伤人员，以最快速度脱离现场，严重者应立即送往医院进行治疗。事故处理过程中产生的消防废水不能直接排放，需要储存在应急事故池中，处理达标后方可排放。

⑤ After arriving the site, the fire brigade shall put out the fire first, then search and rescue the poisoned and injured persons at the site, to evacuate them from the site at the fastest speed, and then immediately send the seriously injured to hospital for medical treatment. The waste fire water generated in the disposition process cannot be directly discharged. It shall be stored in the emergency pool and treated up to standard before discharged.

（4）废水事故排放应急措施建立事故紧急通讯渠道，保持渠道畅通。当污水处理系统发生故障，当班人员马上与厂内联系，立即组织抢修，并向上级主管报告情况。抢修期间厂内生产废水排入事故池，若事故池废水收集达容量2/3时故障还未得到排除，应及时停止生产，关闭全厂出水控制闸阀，待污水处理设施修理完毕且将事故池中的废水处理完毕后方可开机。

(4) Regarding the emergency measures for wastewater emergency discharge, an emergency communication channel shall be established and guaranteed smooth communication effect. If the wastewater treatment system malfunctions, the person on duty shall immediately contact with the plant to request immediate emergency repairs, and shall report to the supervisor at superior level. The production wastewater in the plant will be discharged in the emergency pool during emergency repair period. If the wastewater accommodated in the emergency pool hasn't been discharged when it reaches two thirds of the pool volume, the production shall be stopped in time and the master effluent control gate valves of the plant shall be closed. The production can be resumed after the wastewater

treatment facilities have been repaired and the wastewater stored in the emergency pool has been properly treated.

（5）地下水污染事故应急措施

(5) Emergency measures for groundwater polluted accidents

一旦发现地下水发生异常情况，必须按照应急预案马上采取应急措施。

Once any irregularity is detected in the groundwater, emergency measures shall be taken as per the Emergency preparedness plan (EPP) immediately. We shall:

①当确定发生地下水异常情况时，第一时间上报企业应急指挥小组及有关领导，通知当地环保部门、附近居民等，密切关注地下水水质变化情况。

① report to the Company's emergency response command team at the earliest time, notify the local environment protection department and the residents nearby, and pay close attention to the variation of the quality of the groundwater, when any irregularities are really detected in the groundwater.

②组织专业队伍对事故现场进行调查、监测，查找污染事故发生地点、分析事故原因，尽量将紧急事件局部化，如可能应予以消除，采取包括切断生产装置或设施等措施，防止事故的扩散、蔓延及连锁反应，尽量缩小地下水污染事故对人和财产的影响。

② organize a professional fleet to make investigation and monitoring at the accident site, identify the location where the pollution accident occurs, analyze the cause of the accident, try to localize the emergency and eliminate it if possible, take measures like cutting off the production plant or facilities to prevent dissemination, spread and chain reaction of the accident, to reduce the impact of the groundwater polluted accident on people and properties to the maximum extent as possible.

③对被破坏的区域设置紧急隔离围堤，防止物料及消防水进一步渗入地下。

③ set up emergency isolation border dike around the damaged area, to prevent the leaked material and fire water further infiltrate into the ground.

④对事故后果进行评估，并制定防止类似事件发生的措施。

④ access the consequences of the accident consequences and develop measures to prevent occurrence of similar events.

⑤如企业内部力量无法应对污染事故，应立即请求社会应急力量协助处理。

⑤ ask social emergency response forces for assistance immediately if the Company is unable to handle the pollution accidents itself.

（6）黑液事故排放应急措施在碱回收系统出现暂时故障情况下，可暂时将黑液收集在黑液储槽；黑液储槽区设有围堰，当黑液储槽也发生泄漏时，黑液可在围堰中暂存，并根据需要引入事故池暂存。待系统恢复运行后继续处理，如故障短期内不能排除，必须停止制浆系统，严禁黑液直接排入污水处理系统或直接排入水体中。

(6) Regarding the emergency measures for the accident discharge of the black liquor, when a temporary failure occurs at the alkali recovery system, the black liquor can be temporarily collected in the black liquor storage tank; The black liquor storage tanks area is provided with cofferdam. When leak occurs in the black liquor storage area, the black liquor can be temporarily stored within the cofferdam, and can be transferred to the emergency pool as required. When the system resume to normal operation for treatment and if the fault cannot be eliminated in a short period of time, the pulp making system must be stopped, and any direct discharge of black liquor into the wastewater treatment system or into the water body is strictly prohibited.

（7）废气事故排放应急措施碱回收锅炉、220t/h 固废综合利用锅炉、2×280t/h 燃煤锅炉、850t/d 石灰窑废气除尘系统、脱硫、脱硝系统发生故障时，立即降低运行负荷，组织人员及时抢修，如依然无法达标则考虑停炉。

(7) Regarding the emergency measures for the accident emission of waste gas, when failures occur at the waste gas dust collection system, desulfurization and denitration systems of the alkali recovery boiler, 220t/h integrated solid waste recycling boiler, 2×280t/h coal-fired boilers and 850t/d lime kiln, the operating load must be reduced, and persons must be organized for emergency repair in time. If the emission is still out of standard, it is necessary to consider stopping the operation of the furnace.

5.7.8 危险区隔离与现场处理

5.7.8 Hazardous zone isolation and on-site treatment

发生环境风险事故时，在事故现场划定危险区，设警戒哨，限制人员、车辆进入，对事故现场周边区域的道路实施交通管制，除救护车、消防车、抢险物资运输车、指挥车辆可进入事故隔离区内，其它车辆均不得进入事故隔离区内，对原停留在隔离区内的车辆实施疏导。

When environmental risk accident occurs, it is required to delimit the hazardous zone at the accident site, set up alert guards, restrict access of persons and vehicles, apply traffic control for the roads surrounding the accident site, direct the ambulances, fire trucks and vehicles carrying rescue supplies to enter the accident isolation zone (no entry of other vehicles is allowed), and provide instruction for the vehicles entering the isolation zone.

事故现场由后勤保障小组负责保护，特别是关系事故原因分析所必须的残物、痕迹等更要注意保护；在事故发生现场设置内部警戒线，以保护现场和维护现场的秩序；在现场搜集到的所有物件应贴上标签，注明地点、时间及管理者；对搜集到的物件应保持原样，不准冲洗擦拭。

The accident site, especially the residuals and traces that must be required in identifying and analyzing the causes of the accident, shall be carefully protected by the logistics support team; Alert lines shall be set up in the accident site, to protect the scene and maintain the order at the site; All the articles collected at the site shall be properly labeled with the indicated location, time and managing person; The articles collected shall be kept as they are. No washing or wiping is allowed.

5.7.9 医疗救护与公众健康

5.7.9 Medical rescue and public health

发生环境风险事故后，根据事故发生的程度做出判断，配合医疗救护部门做好企业员工及周边群众的疏散工作，对于已经出现中毒以及其他身体伤害反应的人群要及时地进行救治，确保人员生命安全。

After an environmental risk accident, it is required to make a judgment according to the degree of the accident, cooperate with the medical rescue department to properly evacuate the Company's employees and the surrounding people, and promptly treat the persons who have presented with poisoned symptoms and who have other injury reactions, to ensure the life safety of the people.

5.7.10 应急环境监测

5.7.10 Emergency environmental monitoring

事故发生后，厂内必须利用现有监测设备，积极配合当地环境监测部门做好相应污染物质的监测工作，分析对周边环境所造成的影响并提出可行的控制措施。对于毒性物

质泄漏引发的大气环境影响，要对相应的污染物浓度进行监测，分析影响的范围以及程度，提出可行的措施；对于水体有害的液体以及废水则需要控制在事故池中，确保污染控制在厂内进行有效的处理后，监测达标后才可排出厂区。

After occurrence of the accident, the Company must actively cooperate the local environmental monitoring agency with the available monitoring equipment, to do well in monitoring the environment, analyzing the impact on the surrounding environment and propose feasible control measures. For the impact on the atmospheric environment caused by the toxic substance leaks, it is required to monitor the concentration of the pollutants, analyze the scope and degree of the impact, and propose feasible measures; The liquid having harmful impact on water bodies and the wastewater shall be confined in the emergency pool, to ensure the pollution is controlled within the plant, and cannot be discharged external to the plant area until it is effected treated and monitored up to standard.

大气、废水和地下水的应急监测点位、因子、频次及时间见下表。

The points, factors, frequency and time for emergency monitoring are shown in the table below.

表 5.7-2 环境应急监测方案

Table 5.7-2 Emergency Environmental Monitoring Plan

污染因素 **Pollution Factors**	监测布点 **Monitoring points**
大气应急监测 Emergency monitoring of air	
烟气处理统事故 Accident of off gas treatment system 排放或有毒有害气体泄漏 Emission or leak of toxic and harmful gas	应视当时风向风速情况，在下风向 200m、500m、1000m、1500m、2000m 处设置监测点位，特别应关注近距离居民区。 According to the wind direction and velocity at that time, the monitoring points shall be set respectively at 200m, 500m, 1000m, 1500m and 2000m downwind. Special attention shall be given to the residential area near the accident site.
废气监测因子 Monitoring factors for waste gas	根据事故范围选择适当的监测因子，如二氧化硫、氮氧化物、烟尘、氯化氢、氨气、氯气、二氧化氯。 Appropriate monitoring factors such as sulfur dioxide, nitrogen oxides, gas dust, hydrogen chloride, ammonia gas, chlorine gas and chlorine dioxide shall be selected according to the scope covered of the accident.
监测时间和频次 Monitoring time	按照事故持续时间决定监测时间，根据事故严重性决定监测频次。一般情况下每小时监测 1 次，随事故控制减弱，适当减少监测频次。

and frequency	Monitoring time shall be determined according to the duration of the accident, and monitoring frequency shall be determined according to the severity of the accident. In general, the monitoring factors shall be monitored once an hour, and the monitoring times can be appropriately reduced as the accident control weakens.
废水应急监测 Emergency monitoring of wastewater	
监测位置 Monitoring location	事故废水进入地表水体排放点 Discharge point where accident wastewater enters the surface water
监测因子 Monitoring factor	根据事故范围选择适当的监测因子。事故则选择 pH、COD、NH_3 等作为监测因子。 Appropriate monitoring factors shall be selected according to the scope covered of the accident. Such monitoring factors as pH, COD and NH3 shall be selected for accident monitoring.
监测时间和频次 Monitoring time and frequency	按照事故持续时间决定监测时间，根据事故严重性决定监测频次。一般情况下每小时监测 1 次，随事故控制减弱，适当减少监测频次。 Monitoring time shall be determined according to the duration of the accident, and monitoring frequency shall be determined according to the severity of the accident. In general, the monitoring factors shall be monitored once an hour, and the monitoring times can be appropriately reduced as the accident control weakens.
地下水应急监测 Emergency monitoring of groundwater	
监测因子 Monitoring factor	pH 值、色度、总硬度、耗氧量（COD_{Mn}）、溶解性总固体、硫化物、氨氮、氯化物、硫酸盐、挥发性酚类、阴离子合成洗涤剂、硝酸盐（NO_3^-）、亚硝酸盐（NO^{2-}）、K^+、Na^+、Ca^{2+}、Mg^{2+}、CO_3^{2-}、HCO_3 pH value, color, total hardness, chemical oxygen demand (CODMn), total dissolved solids, sulfide, ammonia nitrogen, chloride, sulfate, volatile phenols, anionic synthetic detergent, nitrate (NO_3^{-}), nitrite (NO^{2-}), K^+, Na^+, Ca^{2+}, Mg^{2+}, CO_3^{2-} and HCO_3
监测时间和频次 Monitoring time and frequency	长期定时监测，事故发生时增加监测频次，一般情况下每小时取样一次。 Long-time monitoring at a fixed interval is required. The monitoring interval shall be shortened when the accident occurs. Usually, the sample shall be taken once every hour.

5.7.11 应急终止与恢复措施

5.7.11 Emergency response termination and restoration measures

确保应急救援工作完全结束的工作条件是：所有的火灾全部被扑灭，所有的可能的污染物泄漏均被隔离控制不再对周边环境产生影响时，才可以通知本单位相关部门、周边人员事故危险已解除并终止应急程序。

The work conditions to ensure all the emergency rescue related work has been thoroughly completed are that: the related departments in the Company and the people nearby can be informed that the accident hazards been eliminated and the emergency response procedure has been terminated only when the fire has been completely put out, all the possible pollutant leaks have been isolated and controlled which will not produce any impact on the surrounding environment.

事故应急终止后，根据突发事故计划组织实施恢复工作，包括设备的检修、安装以及调试工作。对于事故的发生情况编制事故报告，报告中应指明事故发生的原因、损失情况、并总结经验教训以免同类事故再次发生。对于事故引发的损失，要对受灾人员进行合理安置及损失赔偿。组织专家对环境污染事故中长期环境影响进行评估，提出补偿和对遭受污染的生态环境进行恢复的建议。

After termination of the emergency response for the accident, the restoration including the maintenance, installation and commissioning of the equipment, shall be implemented according to the conditions of the unexpected accident. An accident report shall be prepared for the details of the accident. The cause of the accident, loss suffered and the lessons learned shall be described in the report, to avoid reoccurrence of similar accidents. For the loss caused by the accident, it is required to provide reasonable resettlement and loss compensation for the victims. Experts shall be organized to assess the mid- and long-term environmental impact caused by the environmental pollution accident, to propose suggestions on the compensation and on the restoration of the ecological environment that has been polluted.

5.7.12 人员培训与演练

5.7.12 Personnel training and drill

由应急指挥小组对全厂职工进行应急教育，危险岗位职工进行安全和事故处置培训，实行上岗考核；对于风险应急预案要及时进行演练，定期开展理论知识培训和环境风险应急演练。

The emergency response command team shall provide the education for all the employees in the Company on emergency response and the training for those working in hazardous positions on safety and accident disposition, and apply the work assessment system; and shall organize drills of the emergency preparedness plan (EPP) in time, provide trainings on the theoretical knowledge and the drills on emergency response for the environmental risks on a regular basis.

5.7.13 应急救援保障

5.7.13 Emergency rescue support

一旦发生风险事故，必须保障相关应急救援预案能够及时启动，能够在第一时间将污染控制，将影响减少到最小，因此在日常的工作中必须做好应急救援的相关保障工作。

Once the risk accident occurs, the related emergency preparedness plan (EPP) must be ensured to get started in time, to control the pollution at the earliest time and reduce the impact to the maximum extent as possible. Therefore, it is necessary to properly complete related supporting activities to response to the emergency rescue in daily work.

（1）应急通讯保障明确与应急工作相关联的单位或人员的通信联系方式和方法，并提供备用方案。建立信息通信系统及维护方案，确保应急期间信息通畅。

(1) Ensuring emergency communication It is required to identify the communication & contact method of the emergency work - related units or persons, and to prepare alternative plans. Information communication system and its maintenance plan shall be established, to ensure smooth communication during the emergency period.

（2）应急队伍保障明确各类应急响应人力资源，包括专业及兼职应急队伍的组织与保障方案。

(2) Emergency response teams support It is required to identify the emergency response human resources in different fields, including the organization and support plan about the professional and part-time emergency response teams.

（3）应急物资装备保障划拨一定的污染事故应急资金，用于日常应急物资与设备的购买、管理、维护上，主要是对于一些消防设备，防止污染物扩散的喷淋装置、一些配用装置的情况进行检查，由专人进行保管。

(3) Emergency supplies & equipment support It is required to allocate a certain emergency funds to address the pollution accident, to be used for purchasing, managing and maintaining the daily emergency supplies and equipment, particularly some fire apparatuses, the sprinkling devices for preventing spread of the pollutants, and for the inspection of some auxiliary devices, which shall be kept by dedicated persons.

（4）经费保障单位需要保证划拨一定的资金进行用于风险防范的工作，做到专款专用，保障应急状态时应急经费的及时到位。

(4) Funds support The Company shall ensure to allocate some funds for the risk prevention related work, so that special-purpose funds can be used exclusively to ensure the emergency funds are in place when any emergency occurs.

（5）其他保障根据本项目应急工作需求还需要确定的其他相关保障措施，如：技术保障、交通运输保障、治安保障、医疗保障、后勤保障等。

(5) Other supports According to the requirement of the emergency work in this project, it is required to determine other related support measures, for example, technical support, transportation support, security support, medical support and logistics support, etc.

5.8 与区域风险应急预案联动

5.8 Linkage with local emergency preparedness plan (EPP)

企业建立的应急预案应与铁山港(临海)工业区、北海市事故应急预案相衔接。积极配合当地政府建设和完善环境风险预警体系、环境风险防控工程、环境应急保障体系，并建立本建设项目与工业区、周边企业、村镇、政府等之间的应急联动机制，做好企业突发环境事件应急预案与区域相关部门的应急预案相衔接，并加强区域应急物资调配管理，构建区域环境风险联控机制。

The EPP prepared by the Company shall be linked up with that of Tieshangang (Linhai) Industrial Park and of Beihai City. The Company shall actively cooperate with the local government in the construction and improvement of the environmental risk early warning system, environmental risk prevention and control project, and environmental emergency support systems, and establish an emergency linkage mechanism between this construction project on the one hand and the industrial park, surrounding enterprises, towns & villages and the government on the other hand, properly link up the Company’s EPP for unexpected events with that of the competent departments locally, strengthen the management for allocating regional emergency supplies and create a regional joint control system to prevent environmental risks.

本项目生产事故发生后，应根据事故类别，执行其制定的环境风险应急预案，并根据风险事故的类型和等级，充分发挥与区域有关部门的分级响应联动机制，如废水事故

排放应急预案。而对于超出本预案规定的适用范围的其他事故，或者事故扩大升级，演变为较大、重大、特别重大事故，超出公司的应对能力时，建设单位应立即通知铁山港区政府及其他相关管理部门，降低环境风险影响。

After occurrence of production accident in this project, the formulated EPP for environmental risks shall be implemented according to the category of the accident. In addition, according to the type and level of the risk accidents, it is required to give full play to the role of the hierarchical response linkage mechanism that is established with the related departments locally, for example, the EPP for accident discharge of wastewater. For other accidents that have been out of the scope of application of this EPP, or the accidents that has been expanded and changed into major, severe or extreme level, which has been beyond the response capability of the Company, the Employer shall immediately notify the local government of Tieshangang and other related management authorities, to reduce the impact of the environmental risk.

5.9 评价结论与建议

5.9 Assessment conclusion and suggestions

5.9.1 项目危险因素

5.9.1 Project hazardous factors

本项目生产过程中涉及的危险物质有：氢氧化钠、过氧化氢、硫酸、氯气、氨水、柴油、二氧化氯等。

The hazardous substances involved during the production process of this project include: sodium hydroxide, hydrogen peroxide, sulfuric acid, chlorine gas, ammonia water, diesel oil and chlorine dioxide, etc.

本项目生产设施、储存工程均构成重点风险源，主要风险事故为有毒有害物质的泄漏，火灾、爆炸产生次生/伴生 CO 的排放。

The production plants and storage works of this project can be categorized as the key risk sources. The main risk accidents include the leaks of toxic and hazardous substances, the secondary / associated CO emissions generated from fires or explosions.

5.9.2 环境敏感性及事故影响

5.9.2 Environment sensibility and impact of accidents

项目位于北海铁山港（临港）工业区，陆域评价范围内无风景名胜区、自然保护区、饮用水源地保护区、集中式饮用取水口等敏感保护目标，也无珍稀动、植物物种，主要环境敏感目标为居住区，距离项目最近的敏感点为项目用地南面的川江。

The project is located in the Tieshangang (Lingang) Industrial Park of Beihai. In scope of the land area assessed, there are no scenic spots, nature reserves, drinking water source protection zone, centralized drinking water intakes and other sensitive protection targets, and there are also no rare plant and animal species. The main environment-sensitive target is the residential area, and the sensitive points closest to the project are Chuanjiang to the south of the project site.

项目生产废水经厂区污水处理站处理达标后通过 B3 排放口排放，项目设有三级防控体系，污水处理站发生故障时未达标的废水抽入事故应急池；化学品储罐区设置围堰，雨水管沟内关键节点处设置闸门、抽水泵，管线与厂区事故池相连，万一泄露化学品、黑液或事故废水进入雨水系统，可将其抽至事故池后再送至污水处理站处理，阻断事故废水直接通过雨水系统进入厂外水体。

The production wastewater generated from this project will be discharged through Discharge Outlet B3 after it has been treated up to standard in the wastewater treatment station in the plant area. A three-level prevention and control system is established in the project. The wastewater fails reach the standard in case of failure of the wastewater treatment station will be pumped into the emergency pool; Cofferdam is built around the chemicals storage tank farm. The valve, suction pump and pipeline at the key node in the rainwater pipe ditch are connected with the emergency pool in the plant area. In case the leaked chemicals, black liquor or accident wastewater enters the rainwater system, these substances can be pumped to the emergency pool and then delivered to the wastewater treatment station for treatment, blocking off the accident wastewater and preventing it from directly entering the external water body through the rainwater system.

本项目在设定的氨水储罐发生泄漏，氨水泄漏聚集在围堰内蒸发进入大气环境，造成大气风险事故情形下，氨气出现超大气毒性终点浓度-1 的最远距离为 40m，出现超大

气毒性终点浓度-2 的最远距离为 170m，各关心均未超过毒性终点浓度-1 和毒性终点浓度-2；在设定的柴油火灾事故情形下，产生次生污染物 CO 污染大气环境，造成大气风险事故情形下，CO 出现超大气毒性终点浓度-1 的最远距离为 160m，出现超大气毒性终点浓度-2 的最远距离为 380m，无论在最不利气象条件还是最常见气象条件下，CO 的预测浓度在各关心均未超过毒性终点浓度-1 和毒性终点浓度-2；在发生氯气泄漏风险事故情形下，在最不利气象条件下，氯气出现超大气毒性终点浓度-1 的最远距离为 460 米，出现超大气毒性终点浓度-2 的最远距离为 1772 米；在常见气象条件下，氯气出现超大气毒性终点浓度-1 的最远距离为 160 米，出现超大气毒性终点浓度-2 的最远距离为 610 米，周边关心点部分出现超出大气毒性终点浓度-2。在发生二氧化氯爆炸，造成大气风险事故情形时，最不利气象条件下，二氧化氯出现超大气毒性终点浓度-1 的最远距离为 2201m，出现超大气毒性终点浓度-2 的最远距离为 3299m；最常见气象条件下，二氧化氯出现超大气毒性终点浓度-1 的最远距离为 524m，出现超大气毒性终点浓度-2 的最远距离为 850m，周边关心点部分出现超出大气毒性终点浓度-1 及大气毒性终点浓度-2。项目必须采取严密的氯气及二氧化氯泄漏防治措施和预案，一旦发生事故，立即开展应急措施，对风险疏散范围内人群进行疏散。必要时根据事故预警级别，向北海市政府汇报。

In this project, supposed a scenario that the ammonia water storage tank leaks, and the leaked ammonia water is confined within the cofferdam and evaporates into the atmosphere environment, resulting in an atmospheric risk accident. Under such circumstances, the greatest distance is 40m for ammonia gas exceeding the air toxic endpoint concentration -1 and 170m for ammonia gas exceeding the air toxic endpoint concentration -2. The concentrations at the concerned points haven’t exceeded the toxic endpoint concentration-1 and the toxic endpoint concentration-2; Supposed a scenario that a fire is caused by diesel, the secondary pollutant CO generated pollutes the atmosphere, resulting in an atmospheric risk accident. Under such circumstances, the greatest distance is 160m for CO exceeding the air toxic endpoint concentration -1 and 380m for CO exceeding the air toxic endpoint concentration -2. No matter under the worst meteorological conditions or under the most common meteorological conditions, the predicted concentrations of CO at the concerned points haven’t exceeded the toxic endpoint concentration-1 and the toxic endpoint concentration-2; Supposed a scenario that chlorine gas leak accident occurs, under the most unfavorable meteorological conditions, the greatest distance is 460m for chlorine gas exceeding the air toxic endpoint concentration -1 and 1772m for chlorine gas exceeding the air toxic endpoint concentration -2; Under common meteorological conditions, the greatest distance is 160m for chlorine gas exceeding the air toxic endpoint concentration -1 and 610m for chlorine gas exceeding the air toxic endpoint concentration -2; The concentration of the chlorine gas at some of the surrounding concerned points exceeds the air toxic endpoint concentration -2. Supposed a scenario that an explosion of chlorine dioxide causing an atmospheric risk accident, under the most unfavorable meteorological conditions, the greatest distance is 2201m for chlorine dioxide exceeding the air toxic endpoint concentration -1 and 3299m for chlorine dioxide exceeding the air toxic endpoint concentration -2; Under the most common meteorological conditions, the greatest distance is 524m for chlorine dioxide exceeding the air toxic endpoint concentration -1 and 850m for chlorine dioxide exceeding the air toxic endpoint concentration -2; The concentration of the chlorine dioxide at some of the surrounding concerned points exceeds the air toxic endpoint concentration -1 and -2. Strict prevention and control measures and the EPP for the chlorine gas and chlorine dioxide leak accidents must be implemented in this project. In the event of an accident, the emergency response measures shall be immediately implemented to evaluate the crowd within the evacuation scope affected by the risk. When necessary, report to Beihai Government according to the early warning level of the accident.

厂区采用雨污分流，原材料区、生产区、产品区等设置截污沟，项目设有围堰、事故应急池，可有效控制本项目事故废水不排出厂区。通过认真落实各类风险防范措施、事故应急对策措施，加强员工的安全教育，风险事故发生概率较小。通过加强管理、采取风险防范措施、应急救援措施等可将对环境的影响降到最低，环境风险可接受。

The rainwater & wastewater diversion system is constructed in the plant area. The sewage interception channel is set in the raw material area, production area and product area, etc. The cofferdam and emergency pool are provided in the project, to effectively confine the accident wastewater generated from this project to prevent it from flowing out of the plant area. There is a small probability of occurrence of risks & accidents through conscientiously implementing the risk prevention measures and emergency countermeasures for accidents and strengthening the education on safety for the employees. By strengthening management and implementing risk prevention measures and emergency rescue measures, etc., the environmental impact can be minimized, and the environmental risk is acceptable.

5.9.3 环境风险防范措施和应急预案

5.9.3 Environmental risk prevention measures and emergency preparedness plan (EPP)

为了预防环境风险，本项目有针对性地采取了事故预防、事故预警、事故应急处置等措施，主要包括总图布置和建筑安全措施、防火防爆措施、消防安全措施、防渗措施、建立事故状态下水体污染的预防与控制体系等。

To prevent environmental risk, the accident prevention, accident early warning, accident emergency disposition and other measures pertinent to this project will be implemented for this project, mainly including general layout and building safety measures, fire and explosion protection measures, fire safety measures, seepage prevention measures and establishment of the prevention and control system for water pollution under accident conditions.

建设单位应确保环境风险防范措施与主体工程同时设计、同时施工、同时投入使用。风险防范措施、应急处置及救援资源和应急预案应纳入环保设施竣工验收“三同时”检查内容。针对本项目特点及环境风险类型，建设单位应编制本项目环境应急预案，企业突发环境事件应急预案应体现分级响应、区域联动的原则，与地方政府突发环境事件应急预案相衔接，明确分级响应程序。

The Employer shall ensure these environmental risk prevention measures will be designed, constructed and put into service in parallel with the mainstructures of the project. The risk prevention measures, the emergency disposition and rescue resources as well as the emergency preparedness plan (EPP) are incorporated into the items to be inspected included in the “Three Synchronous” of the completion acceptance for environment protection facilities. Regarding the features of this project and the type of environmental risks, the Employer shall develop a emergency preparedness plan (EPP) for environmental risks for this project. The Company’s EPP for unexpected environmental events shall embody the hierarchical response and regional linkage principle, and linked up with the local government’s EPP for unexpected environment events, with the explicit hierarchical response procedure.

项目业主应充分利用区域安全、环境保护等资源，不断完善应急救援体系，确保应急预案具有针对性和可操作性。

The Owner of the project shall make full use of the resources like region safety and environment protection and continuously improve the emergency rescue system, to ensure the pertinence and operability of this emergency preparedness plan (EPP).

5.9.4 环境风险评价结论与建议

5.9 Conclusion and suggestions for environmental risk assessment

1、结论

1. Conclusion

通过认真落实各类风险防范措施、事故应急对策措施，加强员工的安全教育，风险事故发生概率较小。通过加强管理、采取风险防范措施、应急救援措施等可将对环境的影响降到最低，环境风险可接受。

There is a small probability of occurrence of risks & accidents through conscientiously implementing the risk prevention measures and emergency countermeasures for accidents and strengthening the education on safety for the employees. By strengthening management and implementing risk prevention measures and emergency rescue measures, etc., the environmental impact can be minimized, and the environmental risk is acceptable.

2、建议

2. Suggestions

（1）建议建设单位编制应急预案。

(1) The Employer is recommended to compile an emergency preparedness plan (EPP).

（2）应在后续的设计、建设和运行过程中，严格按照国家、行业和地方的法律法规和相关标准、规范的要求，健全、完善、落实和保持公司风险源的安全控制措施和设施。

(2) The Employer shall improve, perfect, implement and maintain the measures and facilities for the safety control of the Company’s risk sources in the following processes of design, construction and operation in strict accordance with the national, industrial and local laws and regulations as well as the requirements as stipulated in applicable codes and standard.

（3）建立、完善和落实事故预防措施和应急预案，进一步提高公司设备的安全水平，保障人员和财产的安全，将环境风险降低到合理可行的最低水平上。

(3) The Company shall establish, improve and implement the accident prevention measures and emergency preparedness plan (EPP), further enhance the safety level of the Company's equipment and protect the safety of people and property, to reduce the environmental risks to the maximum extent reasonable and feasible.

（4）按照"企业自救、属地为主、分级响应、区域联动"的原则，制定企业突发环境事故应急预案，并实现与地方政府或相关管理部门突发环境事故应急预案的有效衔接。

(4) Based on the principle of "Enterprise self-rescue, dependency autonomy, hierarchical response and regional linkage", the Company shall develop the emergency preparedness plan (EPP) for unexpected environmental accidents and achieve the effective connection with the EPP for unexpected environmental events issued by the local government or competent management authorities.

（5）建设单位安全环保部等工作人员对公司各级领导和员工进行相应的各级《环境风险事故应急预案》进行宣传和培训，并定期组织演练。

(5) Personnel from the Safety & Environmental Protection Department of the Employer shall be responsible for the publicity and training for the Company's management at all levels and the employees about the *Emergency Preparedness Plan (EPP) for Environmental Risk Accidents*, and shall organize corresponding drills on a regular basis.

（6）建设单位必须高度重视，做到风险防范警钟常鸣，环境安全管理常抓不懈；严格落实各项风险防范措施，不断完善风险管理体系。

(6) The Employer must attach great importance to the protection of environment, to exert unremitting efforts in prevention of risks and management of environmental safety; and must strictly implement the risk prevention measures and continuously improve the risk management system.

6 环境保护措施及其可行性分析

6 Environmental protection measures and feasibility analysis

6.1 施工期污染防治措施

6.1 Pollution control measures during construction

施工期主要环境问题为土建施工、物料运输、设备安装等产生的扬尘、噪声及建筑垃圾和施工废水。

The main environmental problems during construction are dust, noise, construction waste and construction wastewater generated from civil construction, material transportation and equipment installation.

6.1.1 大气污染防治措施

6.1.1 Control measures for air pollution

施工期大气污染产生源主要有：开挖基础、临时混凝土搅拌站运行、运输车辆和施工机械等产生扬尘；建筑材料（水泥、石灰、砂石料）的运输、装卸、储存和使用过程产生扬尘。施工期采用下列污染防治措施：

The main sources of air pollution during construction include dust generated by excavation of foundation, operation of temporary concrete batching plant, transportation vehicles and construction machinery, etc. and dust generated during the transportation, loading and unloading, storage and use of building materials (cement, lime, sand and gravel). The following pollution control measures shall be adopted during construction:

（1）分段施工，合理安排施工工期；施工工地应定期洒水，特别是旱季施工；施工现场周边应设置符合要求的围挡；竣工后要及时清理场地。

(1) Construction shall be carried out in sections and the construction period shall be reasonably arranged. The construction site shall be sprinkled with water regularly, especially in dry season. Up-to-standard enclosures shall be set up in the surrounding area. Upon completion, the site shall be cleaned up in time.

（2）开挖基础作业时，应经常洒水使作业面土壤保持较高的湿度；对施工场地内裸露的地面，也应经常洒水防止扬尘。土方应随挖随运，不要堆存在施工场地，以免风吹扬尘。

(2) During foundation excavation, water should be sprinkled frequently to keep the soil on the operation surface at a high humidity; for the bare ground in the construction site, water should also be sprinkled frequently to prevent dust. Earthwork should be transported as it is dug, and should not be piled up on the construction site to avoid flying dust.

（3）临时混凝土搅拌站对主要产尘的粉料罐、搅拌机、进出料口等位置采取封闭、设置粉尘收集和布袋除尘器等措施进行控制。砂石堆场采用封闭结构，定期进行洒水降尘。

(3) The temporary concrete batching plant shall take measures such as closing the main dust-producing powder silo, mixer, inlet and outlet, and setting up dust collection and bag dust collector. The aggregate storage yard adopts a closed structure and water should be regularly sprinkled to reduce dust.

（4）施工过程堆放的渣土必须有防尘措施并及时清运；屑粒物料与多尘物料堆的四周与上方应封盖，以减少扬尘；如需经常取料而无法覆盖，则应当洒水以减少扬尘。

(4) The muck piled up during the construction process shall be subject to dust prevention measures and be removed in time; the surroundings and upper parts of the pile of scrap materials and dusty materials shall be sealed to reduce dust. In case of failure to cover these parts due to frequent material collection, water should be sprinkled to reduce dust.

（5）对区内的运输道路定期洒水，来往于各施工场地的卡车上的多尘物料均应用帆布覆盖；尽量选择对周围环境影响较小的运输路线：应限制施工区内运输车辆的速度，对运输过程中散落的路面上的泥土要及时清扫，以减少运行过程中的扬尘。

(5) Water should be sprinkled regularly on the transportation roads in the area, and dusty materials on trucks traveling to and from various construction sites should be covered with canvas; transportation routes with less impact on the surrounding environment should be selected; speed of transportation vehicles in the construction area should be limited, and the soil scattered on the road surface during transportation should be cleaned in time to reduce dust during operation.

6.1.2 水污染防治措施

6.1.2 Control measures for water pollution

项目施工期产生的施工废水主要为混凝土拌和、浇筑及养护过程产生的施工废水，雨水冲刷施工场地产生的雨污径流和施工人员生活污水。

The construction wastewater generated during the construction of the Project mainly includes the construction wastewater generated during the concrete mixing, pouring and maintenance process, the rain and sewage runoff generated by rainwash on the construction site and the domestic sewage of construction personnel.

（1）项目施工期生产废水应集中收集处理，通过沉沙池、隔油池等措施处理后上清液回用于项目扬尘治理、道路养护、车辆清洗等。

(1) During construction of the Project, the production wastewater shall be collected and treated in a centralized manner, and the supernatant after treatment through sand settling tank, oil separation tank and other measures shall be reused for dust control, road maintenance, vehicle cleaning, etc. of the Project.

（2）混凝土输送泵及运输车辆清洗处应当设置沉淀池，废水不得直接排放，经二次沉淀后循环使用或用于洒水降尘。

(2) Sedimentation tanks shall be set up at the cleaning place of concrete transfer pumps and transportation vehicles. Wastewater shall not be directly discharged and shall be recycled after secondary sedimentation or used for sprinkling water to reduce dust.

（3）现场存放油料，必须对库房进行防渗漏处理，储存和使用都要采取措施，防止油料泄漏，污染土壤及水体。各类施工材料应有防雨遮雨设施，工程废料要及时运走，通过完善施工区排水沟渠，可避免场外雨水径流进入施工区，减少雨污径流产生量。

(3) For on-site storage of oil, anti-leakage treatment must be carried out on the warehouse. Measures must be taken for storage and use to prevent oil leakage and pollution of soil and water. All kinds of construction materials should be equipped with rain-proof and rain-shedding facilities, and the engineering waste should be transported away in time. Off-site rainwater runoff can be prevented from entering the construction area by improving the drainage ditches in the construction area and the amount of rainwater and sewage runoff can be reduced.

（4）施工营地的生活污水不能任意排放。施工期生活污水经过化粪池预处理后进园区污水处理厂处理。

(4) Domestic sewage in the construction camp cannot be discharged arbitrarily. During construction, domestic sewage is pretreated by a septic tank and then treated by the sewage treatment plant in the park.

6.1.3 噪声防治措施

6.1.3 Control measures for noise

施工噪声对周围环境的影响虽然是短暂的，随着施工期的结束而自动消除，但由于施工时噪声值较大，为了最大限度地减轻施工噪声对周围环境的影响，必须采取如下具体污染防治措施：

Although the impact of construction noise on the surrounding environment is temporary and will be automatically eliminated with the end of the construction period, due to the large noise value during construction, the following specific pollution control measures must be taken in order to minimize the impact of construction noise on the surrounding environment:

⑴施工单位严格执行《建筑施工场界环境噪声排放标准》（GB12523-2011）要求；通过合理调整、控制及优化施工时间，在12：00～14：30、22：00～6：00时段内严禁施工，尽量减小施工噪声对周围环境的影响。

(1) The construction contractor strictly implements the requirements of Emission Standard for Environment Noise for Boundary of Construction Site (GB12523-2011); through reasonable adjustment, control and optimization of construction time, construction is strictly prohibited during the periods of 12: 00 ~ 14: 30 and 22: 00 ~ 6: 00 to minimize the impact of construction noise on the surrounding environment.

⑵加强声源噪声控制，尽可能选用噪声较小的施工设备，同时经常保养设备，使设备维持在最低声级状态下工作。对动力机械设备应适时进行维修，尤其是对因松动部件的震动或降低噪声部件的损坏而产生很强噪声的设备，更应经常检查维护。

⑵ Strengthen the noise control of sound sources, select construction equipment with less noise as much as possible, and maintain the equipment regularly to keep the equipment working at the lowest sound level. Power machinery and equipment should be repaired in due time. In particular, for equipment with strong noise caused by vibration of loose parts or damage of noise-reducing parts, regular inspection and maintenance should be carried out.

⑶注意做好接触高噪声人员的劳动保护，采取轮岗、缩短接触高噪声时间、带防声耳塞、耳罩等措施减轻噪声的影响程度。

(3) Pay attention to the labor protection of personnel exposed to high noise, and take measures such as job rotation, shortening the time of exposure to high noise, and wearing anti-sound earplugs and earmuffs to reduce the impact of noise.

6.1.4 固体废物防治措施

6.1.4 Control measures for solid waste

施工期的固体废物主要包括施工土石方、建筑垃圾和施工人员的生活垃圾。根据《中华人民共和国固体废物污染环境防治法》第十六条和第十七条的规定，必须对这些固废妥善收集、合理处置。

Solid waste during construction mainly includes construction earthwork, construction waste and domestic waste of construction personnel. According to the provisions of Articles 16 and 17 of the Law of the People’s Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste, these solid wastes shall be properly collected and reasonably disposed of.

⑴对施工中产生的建筑垃圾，应集中堆放，在建筑材料堆放地及建筑垃圾堆放地周围建立简易的防护围带，以防止垃圾的散落，并定期清运至有关部门指定的地点处置。

(1) The construction waste generated during the construction shall be piled up in a centralized way and shall be regularly removed and transported to the place designated by relevant departments for disposal. Simple protective enclosure shall be established around the building material stacking place and the construction waste stacking place to prevent the waste from being scattered.

⑵对于建筑垃圾中的稳定成分，如碎砖等，可将其与施工挖出的土石一起堆放或回填；对于如废油漆、涂料等不稳定的成分，采用容器进行收集，并定期清理；对钢筋、钢板、木材等下角料可分类回收，交废物收购站处理。

(2) For stable components in construction waste, such as broken bricks, etc., they can be

piled up or backfilled with earth and stone excavated during construction; for unstable components such as waste paints and coatings, containers shall be used for collection and regular cleaning. The leftover bits and pieces such as steel bars, steel plates and wood can be sorted and recycled and handed over to the waste purchasing station for treatment.

⑶对施工场地人员产生的生活垃圾，应采用定点收集方式，设立专门的容器加以收集，由当地环卫部门统一收集运至垃圾处理场集中处理，禁止随意堆放、倾倒垃圾和固体废物。

(3) For domestic waste generated by construction site personnel, fixed-point collection shall be adopted, and special containers shall be set up for collection. The local sanitation department shall collect and transport the waste to the garbage disposal plant for centralized treatment. It is forbidden to pile up and dump garbage and solid waste at will.

6.2 运营期污染防治措施及其可行性分析

6.2 Pollution control measures and feasibility analysis during operation

6.2.1 大气污染防治措施及其可行性分析

6.2.1Air pollution control measures and feasibility analysis

针对生产过程中产污环节的特点，为减轻项目对环境的影响，本项目采取了一系列污染防治措施，具体见表 6.2-1。

According to the characteristics of pollution-producing links in the production process, the Project has adopted a range of pollution control measures to reduce the impact of the Project on the environment, as shown in Table 6.2-1.

表 6.2-1　污染防治措施一览表
Table 6.2-1 Pollution Control Measures

序号 S.N.	污染因素 Pollution Factors	污染源 Source of pollution	环保措施 Environmental protection measures	排放去向 Discharge destination	
1	废气 Exhaust gas	4600tds/d 碱回收炉 4600tds/d alkali recovery furnace	三列四电场的静电除尘器 Three-row four-electric field electrostatic precipitator	经 1 根 150mH×Φ5.2m 烟囱排放至大气环境 It is discharged to the atmosphere through a 150mH×Φ5.2m chimney	集束烟囱 Cluster Chimney

序号 S.N.	污染因素 Pollution Factors	污染源 Source of pollution	环保措施 Environmental protection measures	排放去向 Discharge destination
2		850t/d 石灰窑 850t/d lime kiln	一列四电场静电除尘器 One-row four-electric field electrostatic precipitator	经 1 根 150mH×Φ2.6m 烟囱排放至大气环境 It is discharged to the atmosphere through a 150mH×Φ2.6m chimney
3		220t/h 固废锅炉 220t/h solid waste boiler	SNCR/SCR 联合脱硝+活性炭吸附+布袋除尘器+炉外石灰石/石膏湿法脱硫+高效除雾器 SNCR/SCR combined denitration +activated carbon adsorption+bag-type dust collector+wet desulphurization of limestone/gypsum outside the furnace+high-efficiency demister	经 1 根 150mH×Φ4.8m 烟囱排放至大气环境 It is discharged to the atmosphere through a 150mH×Φ4.8m chimney
4		280t/h 燃煤锅炉 280t/h coal-fired boiler	SNCR/SCR 联合脱硝+电袋除尘器+炉外石灰石/石膏湿法脱硫+高效除雾器 SNCR/SCR combined denitration+electrostatic-bag type dust collector+limestone outside the boiler/gypsum wet desulfurization +high efficiency demister	
5		漂白车间漂白工段废气 Waste gas from bleaching section of bleaching workshop	碱洗 Alkaline washing	经 1 根 150mH×Φ1.0m 烟囱放至大气环境 It is discharged to the atmosphere through a 150mH×Φ1.0m chimney
6		臭气燃烧炉 Odor combustion furnace	碱炉事故状态下启用臭气燃烧炉焚烧制浆过程产生的臭气 Stink produced in the pulping process is incinerated by the stink incinerator under the accident state of the alkali furnace.	经 1 根 150mH×Φ1.5m 烟囱排放至大气环境 It is discharged to the atmosphere through a 150mH×Φ1.5m chimney
7		二氧化氯制备车间 Chlorine 过量氢气排空尾气 Excess hydrogen evacuates tail gas	碱洗 Alkaline washing	经 1 根 25mH×Φ0.2m 排气筒排放至大气环境 It is discharged to the atmosphere through a 25mH×Φ0.2m exhaust funnel
8		盐酸合成尾气	软化水洗涤	经 1 根 42mH×Φ0.25m 排气筒

序号 S.N.	污染因素 Pollution Factors	污染源 Source of pollution		环保措施 Environmental protection measures	排放去向 Discharge destination
		dioxide preparation workshop	Tail gas from hydrochloric acid synthesis	Washing by softened water	排放至大气环境 It is discharged to the atmosphere through a 42mH×Φ0.25m exhaust funnel
9			二氧化氯储槽尾气 Tail gas from chlorine dioxide storage tank	海波塔洗涤 Washing by Hypo tower	经1根30mH×Φ0.3m排气筒排放至大气环境 It is discharged to the atmosphere through a 30mH×Φ0.3m exhaust funnel
10		污水处理站 Sewage treatment plant		项目对污水处理站产生臭气的构筑物进行加盖密封，并配置一套碱洗除臭系统，臭气经抽风管送至除臭系统，经喷淋洗涤后，送至生产区碱炉内燃烧分解。 The Project covers and seals the structures producing stink of the sewage treatment plant, and arranges an alkaline washing deodorant system, which can send the stink gas to the deodorant system through the exhaust tube; the stink gas, after spray washing, will be sent to the alkali furnace in the production area for combustion and decomposition.	经过碱炉烟囱排放 Discharge through the chimney of the alkali furnace
10	废水 Waste water	化学浆车间、化机浆车间、造纸车间、热电站等 Chemical pulp workshop, chemical mechanical pulp workshop, papermaking workshop, thermal power station, etc.		废水进入自建污水处理站处理，总处理规模为100000m^3/d，工艺采用初沉池+厌氧反应器+生物选择池+卡鲁塞尔氧化沟+高级氧化池 The wastewater enters the self-built sewage treatment plant for treatment, with a total treatment scale of 100000m3/d. The processes adopted are as follows: Primary settling tank + anaerobic reactor + biological selection tank + Carrousel oxidation ditch + advanced oxidation tank.	废水处理达标后排入铁山港区深海排放管网系统，在铁山港B3排污口深海排放。 The sewage is discharged into the deep-sea discharge pipe network system of Tieshangang District after being processed, and then discharged into the deep sea at the sewage outlet B3 of Tieshangang.
11	噪声 Noise	各生产设备 Various production equipment		设备选型时，尽量选用低噪声设备；风机布置在车间内，连接处采用柔性接头；各类水泵安装在泵房之内；在房间墙壁上采用吸声、隔声材料，设置隔声门窗。	

序号 S.N.	污染因素 Pollution Factors	污染源 Source of pollution	环保措施 Environmental protection measures	排放去向 Discharge destination
			When selecting equipment, try to select low noise equipment; fans should be arranged in the workshop, and flexible joints are adopted; various water pumps are installed in the pump room; sound absorption and sound insulation materials are used on the walls of the room, and sound insulation doors and windows are set up.	
12	固体废物 Solid waste	制浆造纸生产过程、锅炉等 Pulp and paper production process, boiler, etc.	①木屑、浆渣、污泥送至固废锅炉做燃料； ①Wood chips, pulp slag, and sludge are sent to the solid waste boiler as fuel; ②白泥一部分作为锅炉烟气脱硫剂，剩余部分送石灰窑处置回用； ②A part of white mud is taken as the desulfurizer of the boiler flue gas, and the remaining will be sent to the lime kiln for disposal and reuse; ③绿泥、石灰渣、不宜焚烧的化学污泥送一般工业固体废物集中处置场填埋； ③The green mud, lime sludge, and other chemical sludges that are unsuitable for burning will be sent to the centralized disposal site of general industrial solid waste for landfill; ④制浆黑液全部送碱回收系统回收碱。 ④The black liquor will be sent to the alkali recovery system for recycling. ⑤锅炉飞灰、炉渣外售水泥厂、砖厂综合利用。（固废锅炉飞灰需在投产后重新进行固体废物类别鉴定，若属于危险废物需委托有资质单位处置。） ⑤Fly ash and furnace slag will be sold to cement plants and brick plants for comprehensive utilization. (Fly ash from solid waste boilers shall be re-identified as solid waste after it is put into production. If it belongs to hazardous waste, it shall be entrusted to a qualified unit for disposal.) ⑥废分子筛由厂家回收利用；锅炉灰渣外售制砖和铺路； ⑥The waste molecular sieve will be recycled by the manufacturer; and boiler ash will be sold for making bricks and paving; ⑦脱硫石膏外售水泥厂作为水泥的缓凝剂或者建材厂制成石膏板、石膏砌块等建材材料； ⑦ Desulfurized gypsum will be sold to cement plants as the retarder of cement or to building material plants for producing gypsum boards, gypsum blocks and other building materials; ⑧废离子交换树脂、储油罐残渣、隔油池污泥、废活性炭、废催化剂、废机油为危险废物，由供货厂家回收综合利用或委托有资质单位处置； ⑧ Waste ion exchange resin, oil storage tank residue, grease trap sludge, waste activated carbon, waste catalyst, and waste machine oil are hazardous wastes, which shall be recycled by the supplier for comprehensive utilization or disposed of by a qualified unit; ⑨生活垃圾由环卫部门统一清运处置。	

序号 S.N.	污染因素 Pollution Factors	污染源 Source of pollution	环保措施 Environmental protection measures	排放去向 Discharge destination
			⑨Domestic wastes will be cleared and transported uniformly by the environmental protection authority.	

6.2.2.1 碱回收炉烟气可达性分析

6.2.2.1 Accessibility analysis of flue gas of alkali recovery furnace

（1）除尘

(1) Dust removal

碱回收炉除尘采用三列四电场的静电除尘器。

The three-row four-electric-field electrostatic precipitators are used for dust removal of alkali recovery furnace.

静电除尘器是利用静电力实现粒子与气流分离的一种除尘装置。静电除尘器的放电极（又称为电晕极）和收尘极（又称为集尘极）与高压直流电源相连接，当含尘气体通过两极间非均匀高压电场时，在放电极周围强电场力的作用下，气体首先被电离，并使尘粒荷电，荷电的尘粒在电场力的作用下在电场内向集尘极迁移并沉积在集尘极上，得以从气体中分离并被收集，从而达到除尘目的。

Electrostatic precipitator is a kind of dust removal device that uses electrostatic force to separate particles from airflow. The discharge electrode (also called corona electrode) and dust collecting electrode (also called dust collection electrode) of electrostatic precipitators are connected with high voltage DC power supply. When the dusty gas passes through the non-uniform high-voltage electric field between the two electrodes, under the action of the strong electric field force around the discharge electrode, the gas is first ionized and the dust particles are charged. Under the action of the electric field force, the charged dust particles migrate to the dust collecting electrode in the electric field and deposit on the dust collecting electrode, so that they can be separated from the gas and collected, thus achieving the purpose of dust removal.

静电除尘器的除尘过程主要包括四个阶段：气体的电离；粉尘获得离子而荷电；荷电粉尘向电极移动；将电极上的粉尘清除到灰斗中去。

The dust removal process of electrostatic precipitator mainly includes four stages:

Ionization of gas; dust is charged with ions; charged dust moves to the electrode; remove the dust from the electrode to the ash hopper.

静电除尘器的主要特点：分离力（主要是静电力）直接作用在粒子上，而不是作用在整个气流上，这就决定了它具有分离粒子耗能少、气流阻力小的特点。由于作用在粒子上的静电力相对较大，所以即使对 10gm 以下的粒子也能较好捕集。

The main characteristics of electrostatic precipitator: The separation force (mainly electrostatic force) acts directly on the particles, rather than on the whole airflow. In this way, the electrostatic precipitator is characterized by less energy consumption and less airflow resistance for separating particles. As the electrostatic force acting on the particles is relatively large, even particles below 10gm can be well collected.

根据《除尘工程设计手册》（张殿印 王纯），静电除尘器除尘效率在 99%以上，电场数越多，除尘效率越高。根据同类企业运行情况，三列四电场静电除尘去除效率在 99.99%以上。静电除尘器的主要优点有：压力损失小，一般为 200～500Pa；处理烟气量大，单台静电除尘装置烟气处理量可达 105～106m3/h；能耗低，大约 0.2～0.4kWh/1000m3；对细粉尘有较高的捕集效率；耐高温，可达 350～450℃；干法除灰，有利于粉尘的输送和再利用，没有水污染；自动化程度高，运行可靠。

According to the Dust Removal Engineering Design Manual (Zhang Dianyin and Wang Chun), the dust removal efficiency of the electrostatic precipitator is above 99%, and the more electric fields, the higher the dust removal efficiency. According to the operation of similar enterprises, the electrostatic dust removal efficiency of three-row four-electric-field electrostatic precipitators is above 99.99%. The main advantages of electrostatic precipitator are: Small pressure loss, generally 200 ~ 500Pa; large flue gas treatment capacity, with the flue gas treatment capacity of a single electrostatic dust removal device reaching 105 ~ 106m3/h; low energy consumption, about 0.2 ~ 0.4 kWh/1000m3; higher collection efficiency for fine dust; high temperature resistance, up to 350 ~ 450 ℃; dry ash removal, which is beneficial to dust transportation and reuse without water pollution; and a high degree of automation and reliable operation.

根据湛江晨鸣项目 4500tds/d 碱回收炉运行情况，类比可行性分析及其烟气产排数据见2.2.7.1章节，三列四电场静电除尘去除效率可达99.99%，保守起见，本项目4600tds/d 碱回收炉去除率取 99.92%，经处理后烟尘排放浓度为 27.6mg/m^3，满足《火电厂大气污

染物排放标准》（GB 13223-2011）表 1 标准限值要求（烟尘≤30 mg/m^3）。

According to the operation of the 4500tds/d alkali recovery furnace in the Zhanjiang Chenming Project (refer to 2.2.7.1 for feasibility analysis and flue gas production and emission data), the electrostatic dust removal efficiency of three-row four-electric-field electrostatic precipitators can reach 99.99%. For conservative reasons, the removal efficiency of the 4600tds/d alkali recovery furnace in this Project is 99.92%, and the treated flue gas emission concentration is 27.6 mg/m3, which meets the standard limit requirements of the Emission Standard of Air Pollutants for Thermal Power Plants (GB 13223-2011) (flue gas ≤ 30 mg/m3) in Table 1.

（2）氮氧化物排放可达性分析

(2) Accessibility analysis of nitrogen oxide emission

本项目选择低氮碱回收炉，较传统碱回收炉多了一层 4 次供风，其原理为空气分级燃烧。

In this Project, a low-nitrogen alkali recovery furnace is selected, which has one layer more than the traditional alkali recovery furnace, providing another four air supply. Its operating principle is air staged combustion.

将燃烧所需的空气分级送入炉内的燃烧技术称为空气分级燃烧。将第一级空气(α≈0.8)和全部燃料送入炉内进行燃料过浓燃烧，其余空气作为第二级空气在火焰下游送入，使燃料完全燃烧。在第二级空气送入点之前为一次燃烧区，之后为二次燃烧区。

The combustion technology of staging the air needed for combustion into the furnace is called air staging combustion. The first stage air (α≈0.8) and all the fuel are sent into the furnace for over-rich combustion of the fuel, and the rest air is sent downstream of the flame as the second stage air to completely burn the fuel. There is a primary combustion zone before the second stage air feed point, and then there is a secondary combustion zone.

一次燃烧区内由于氧量不足，使燃烧速度和温度水平下降，热力型 NOx 减少；燃料中氮分解生成大量中间活产物，将一部分 NO 还原，又抑制了燃料型 NOx 的生成。二次燃烧区内氧量充足，但此处温度较低，不会生成过多的 NOx。与不分级相比，空气分级燃烧可使 NOx 排放量降低 200mg/m^3，即减少 20%～30%。

Due to insufficient oxygen in the primary combustion zone, the combustion speed and temperature level decrease and the thermal NOx decreases. Nitrogen in the fuel decomposes to generate a large number of intermediate living products, reducing part of NO and inhibiting the generation of fuel NOx. There is sufficient oxygen in the secondary combustion zone, but the temperature here is relatively low and no excessive NOx will be generated. Compared with non-staged combustion, air staging combustion can reduce NOx emissions by 200mg/m3, i.e. 20% ~ 30%.

根据晨鸣集团子公司寿光美伦纸业有限公司低氮碱炉实测数据，低氮碱炉氮氧化物排放浓度为 161mg/m^3 左右，满足《火电厂大气污染物排放标准》（GB 13223-2011）表 1 标准限值要求（氮氧化物≤200 mg/m^3）。

According to the measured data of the low-nitrogen alkali furnace of Shouguang Meilun Paper Co., Ltd., a subsidiary of Chenming Group, the nitrogen oxide emission concentration of the low-nitrogen alkali furnace is about 161mg/m3, which meets the standard limit requirements of Emission Standard of Air Pollutants for Thermal Power Plants (GB 13223-2011) (nitrogen oxide ≤ 200 mg/m3) in Table 1.

（3）二氧化硫排放可达性分析

(3) Accessibility analysis of SO2 emission

本项目采用硫酸盐法制浆，碱回收炉烟气有少量二氧化硫排放。根据湛江晨鸣项目 4500tds/d 碱回收炉运行情况，类比可行性分析及其烟气产排数据见 2.2.7.1 章节，该企业碱回收炉未设置脱硫措施，根据二氧化硫监测数据，排放浓度为未检出。通过类比，本项目碱回收炉不设脱硫装置，二氧化硫排放浓度可满足《火电厂大气污染物排放标准》（GB 13223-2011）表 1 标准限值要求（二氧化硫≤400 mg/m^3）。

In this Project, sulfate pulping is adopted, and a small amount of sulfur dioxide is emitted from the flue gas of the alkali recovery furnace. According to the operation of the 4500tds/d alkali recovery furnace in the Zhanjiang Chenming Project (refer to 2.2.7.1 for feasibility analysis and flue gas production and emission data), the alkali recovery furnace in the company is not equipped with desulfurization measures. Based on the sulfur dioxide monitoring data, the emission concentration is not detected. By analogy, the alkali recovery furnace of this Project is not equipped with a desulfurization device, and the sulfur dioxide emission concentration can meet the standard limit requirements of the Emission Standard of Air Pollutants for Thermal Power Plants (GB 13223-2011) (sulfur dioxide ≤ 400 mg/m3) in Table 1.

6.2.2.2 石灰窑烟气可达性分析

6.2.2.2 Accessibility analysis of lime kiln flue gas

石灰窑采取一列四电场静电除尘器进行除尘，静电除尘器原理见 6.2.2.1 章。

Lime kilns adopt one-row four-electric-field electrostatic precipitators for dust removal. Refer to 6.2.2.1 for the operating principle of electrostatic precipitators.

根据湛江晨鸣项目石灰窑（800t/d）运行情况，类比可行性分析及其烟气产排数据见 2.2.7.1 章节，一列四电场静电除尘去除效率可达 99.8%，本项目 850tds/d 石灰窑去除率取 99%，经处理后烟尘排放浓度为 58.4mg/m^3，满足《工业炉窑大气污染物排放标准》（GB 9078-1996）标准限值要求（烟尘≤200 mg/m^3）。

According to the operation of the lime kiln (800t/d) in the Zhanjiang Chenming Project (refer to 2.2.7.1 for feasibility analysis and flue gas production and emission data), the electrostatic dust removal efficiency of one-row four-electric-field electrostatic precipitators can reach 99.8%. In this Project, the dust removal rate in the 850tds/d lime kiln is 99% and the treated flue gas emission concentration is 58.4 mg/m3, which meet the standard limit requirements of Emission Standard for Air Pollutants from Industrial Furnaces and Kilns (GB 9078-1996) (flue gas ≤ 200 mg/m3).

6.2.2.3 锅炉烟气可达性分析

6.2.2.3 Accessibility analysis of boiler flue gas

（1）除尘

(1) Dust removal

为实现超低排放，在湿法脱硫前对烟尘的高效脱除，称为一次除尘，主流技术包括电除尘技术、电袋复合除尘技术和袋式除尘技术。烟气湿法脱硫过程中对颗粒物进行协同脱除、在烟气脱硫后采用湿式电除尘器进一步脱除颗粒物，称为二次除尘。石灰石-石膏湿法脱硫复合塔技术配套采用高效的除雾器或在脱硫系统内增加湿法除尘装置，协同除尘效率可不低于 70%；湿法脱硫后加装湿式电除尘器，除尘效率可不低于 70%，且除尘效果稳定。

To realize ultra-low emission, the efficient removal of smoke dust before wet desulfurization is called primary dust removal. Mainstream technologies include electric dust removal technology, electric bag composite dust removal technology and bag dust removal technology. In the process of flue gas wet desulfurization, particulate matter is removed. After flue gas desulfurization, wet electrostatic precipitators are used to further remove particulate matter, which is called secondary dust removal. The limestone-gypsum wet desulfurization composite tower technology adopts high-efficiency demister or adds wet dust removal device in the desulfurization system, and the cooperative dust removal efficiency can not be less than 70%; after wet desulfurization, a wet electrostatic precipitator is added, achieving a dust removal efficiency of no less than 70% and stable dust removal effect.

项目锅炉烟气除尘采用二次除尘措施，一次除尘采用电袋复合除尘器，二次除尘为湿法脱硫配套高效除雾器协同除尘。项目220t/h固废锅炉一次除尘采用布袋除尘器，二次除尘为湿法脱硫协同除尘；2×280t/h燃煤锅炉一次除尘采用电袋复合除尘器，二次除尘为湿法脱硫配套高效除雾器协同除尘。

The boiler flue gas dust removal of the Project adopts secondary dust removal measures. The primary dust removal adopts an electric bag composite dust collector and the secondary dust removal is a coordinated dust removal by high-efficiency demister and wet desulfurization. Bag dust collector is used for primary dust removal of 220t/h solid waste boiler in the Project, and wet desulfurization for secondary dust removal. The primary dust removal of 2 × 280 t/h coal-fired boiler adopts an electric bag composite dust collector and the secondary dust removal is completed by high-efficiency demister and wet desulfurization.

布袋除尘器是一种当今企业选用较多、技术成熟的除尘方法。布袋除尘器工作原理：含尘气体由进风口进入灰斗，由于气体体积的急速膨胀，一部分较粗的尘粒受惯性或自然沉降等原因落入灰斗，其余大部分尘粒随气流上升进入袋室，经滤袋过滤后，尘粒被滞留在滤袋的外侧，净化后的气体由滤袋内部进入上箱体，再由阀板孔、排风口排入大气，从而达到除尘的目的。随着过滤的不断进行，除尘器阻力也随之上升，当阻力达到一定值时，清灰控制器发出清灰命令，首先将提升阀板关闭，切断过滤气流；然后，清灰控制器向清灰执行机构发出信号，将高压逆向气流送入袋内，滤袋迅速鼓胀，并产生强烈抖动，导致滤袋外侧的粉尘抖落，达到清灰的目的。由于设备分为若干个箱区，所以上述过程是逐箱进行的，一个箱区在清灰时，其余箱区仍在正常工作，保证了设备的连续正常运转。

Bag dust collector is a technically mature dust removal method frequently used by enterprises nowadays. Operating principle of bag dust collector: Dusty gas enters the ash hopper from the air inlet. Due to the rapid expansion of the volume of gas, a part of the coarser dust particles falls into the ash hopper due to inertia or natural settlement, while the rest of the dust particles rise with the airflow and enter the bag. After filtering by the filter bag, the dust particles are stranded on the outside of the filter bag. The purified gas enters the upper box from the inside of the filter bag, and then is discharged into the atmosphere through the valve plate hole and the air outlet, thus achieving the purpose of dust removal. The ongoing filtration also increases the resistance of the dust collector. When the resistance reaches a certain value, the dust removal controller issues a dust removal command. First, the poppet valve plate is closed to cut off the filtered air flow. Then, the ash removal controller sends a signal to the ash removal actuator to send the high-pressure reverse airflow into the bag, and the filter bag swells rapidly and shakes strongly, causing the dust outside the filter bag to shake off, thus achieving the purpose of ash removal. Since the equipment is divided into several boxes, the above process is carried out box by box. When one box is undergoing ash removal, other boxes are operating normally, ensuring the continuous and normal operation of the equipment.

电袋除尘技术是电除尘和袋式除尘有机结合的一种复合除尘技术，利用前级电场收集大部分烟尘，同时使烟尘荷电，利用后级袋区过滤拦截剩余的烟尘，实现烟气净化。

Electric bag dust removal technology is a composite dust removal technology that organically combines electric dust removal and bag dust removal. The front electric field is used to collect most of the smoke dust, and the smoke dust is charged at the same time. The back bag area is used to filter and intercept the remaining smoke dust to realize flue gas purification.

电袋除尘器工作原理为烟尘气体在气流分布板的作用下均匀进入除尘器，电场使烟尘大部分带负电荷，并在电场力作用下向阳极移动并沉积于阳极板上，经过电除尘处理后含有少量烟尘的烟气少部分通过多孔板进入滤袋收尘区，其余大部分烟气向下部，然后由下而上进入布袋除尘区，烟尘被滞留在滤袋表面上，经过两次除尘的纯净烟气经提升阀进入烟道排出。

The operating principle of the electric bag dust collector is that the smoke dust gas uniformly enters the dust collector under the action of the airflow distribution plate. The electric field negatively charges most of the smoke dust, which moves toward the anode under the action of electric field force and deposits on the anode plate. After being treated by electric dust removal, a small part of the flue gas containing a small amount of smoke dust enters the filter bag dust collection area through the perforated plate, while the rest of the flue gas moves to the lower part and then enters the bag dust collection area from the bottom up. The smoke dust is retained on the surface of the filter bag, and the pure flue gas after two dust removal enters the flue through the poppet valve for discharge.

项目二次除尘采用湿法脱硫协同除尘，脱硫塔配合高效的除雾器使用。

The secondary dust removal of the Project adopts wet desulfurization and the desulfurization tower is used with an efficient demister.

吸收塔采用逆流喷淋塔，吸收塔内配有足够的喷咀，喷嘴覆盖率不小于 300%，浆液喷淋系统由分配管网（含多孔性分布器）和喷嘴组成，喷淋系统的设计应能合理分布要求的喷淋量， 使烟气流向均匀，并确保石灰石浆液与烟气充分接触和反应。喷淋系统应设置不小于 4 层喷淋层+1 层多孔性分布器，浆液联箱不仅能在母管内均匀分布浆液，而且也能把浆液均匀分配给连接喷嘴的支管。

The absorption tower adopts a countercurrent spray tower. The absorption tower is equipped with sufficient nozzles, and the nozzle coverage rate is not less than 300%. The slurry spray system consists of a distribution pipe network (including porous distributors) and nozzles. The design of the spray system shall be able to reasonably distribute the required spray amount, make the flue gas flow uniformly, and ensure that limestone slurry and flue gas fully contact and react. The spray system shall set no less than 4 spray layers +1 layer of porous distributor. The slurry header can not only evenly distribute the slurry in the main pipe, but evenly distribute the slurry to the branch pipe connecting the nozzle.

除雾器安装在吸收塔上部或吸收塔出口的烟道上，用以分离净烟气夹带的雾滴。设计要求保证其具有较高的可利用性和良好的去除液滴效果。

The demister is installed on the flue at the upper part of the absorption tower or at the outlet of the absorption tower to separate the droplets entrained by the clean flue gas. The design shall ensure high availability and sound droplet removal effect.

除雾器系统还包括去除除雾器沉积物的冲洗和排水系统，运行时根据给定或可变化的程序，既可进行自动冲洗，也可进行人工冲洗除雾器冲洗系统应能够对除雾器进行全面冲洗。冲洗水的压力应进行监视，冲洗水母管的布置应能使每个喷嘴基本运行在平均

水压。除雾器冲洗用水为石灰石－石膏湿法烟气脱硫系统的工艺水，由单独设置的除雾器冲洗水泵提供，不新增废水、固废。

The demister system also includes a flushing and drainage system to remove demister deposits. During operation, either automatic flushing or manual flushing can be carried out according to given or variable procedures. The demister flushing system shall be able to fully flush the demister. The pressure of flushing water shall be monitored, and the arrangement of flushing water-feed main shall enable each nozzle to basically operate at the average water pressure. The demister flushing water is the process water of limestone-gypsum wet flue gas desulfurization system, which is provided by a separate demister flushing water pump and no wastewater or solid waste will be increased.

根据《火电厂污染防治可行技术指南》（HJ2301-2017），布袋除尘器除率≥99.9%；电袋除尘器能够长期稳定保持污染物达标或超低排放，电袋除尘对烟尘的去除率≥99.9%，电袋除尘处理后烟尘浓度通常在20 mg/m^{3}以下。湿法脱硫协同除尘效率为70%，项目二级除尘措施综合去除率≥99.97%。本次评价220t/h固废综合利用锅炉烟尘去除效率取99.91~99.92%，280t/h燃煤锅炉烟尘去除效率取99.93%，经处理后排放浓度分别为9.88mg/m^3、9.87mg/m^3，满足《全面实施燃煤电厂超低排放和节能改造工作方案》（环发〔2015〕164号）中锅炉废气超低排放标准限值（烟尘≤10 mg/m^3）。

According to the Guideline on Available Technologies of Pollution Prevention and Control for the Thermal Power Plant (HJ2301-2017), the removal rate of bag filter is ≥ 99.9%; the electric bag dust collector can stably keep pollutants up to standard or ultra-low emission for a long time. The removal rate of smoke dust by electric bag dust collector is ≥ 99.9%, and the concentration of smoke dust after electric bag dust removal treatment is usually below 20 mg/m3. The coordinated dust removal efficiency of wet desulfurization is 70%, and the comprehensive removal rate of secondary dust removal measures of the Project is ≥ 99.97%. In this assessment, the smoke dust removal efficiency of 220t/h solid waste comprehensive utilization boilers is 99.91 ~ 99.92%, and that of 280t/h coal-fired boilers is 99.93%. After treatment, the emission concentrations are 9.88 mg/m3 and 9.87 mg/m3 respectively, meeting the ultra-low emission standard limit (smoke dust ≤ 10 mg/m3) of boiler waste gas in the Full Implementation of Ultra-low Emission and Energy Saving Transformation Work Plan for Coal-fired Power Plants (HF [2015] No.164).

（2）脱硫

(2) Desulfurization

锅炉烟气采用白泥-石灰石湿法脱硫。

Boiler flue gas is desulfurized by the white mud-limestone wet method.

造纸碱回收车间黑液浓缩焚烧后，从燃烧炉底部流出的熔融物主要成分是碳酸钠和硫化钠，溶于稀白液后，称为绿液。在苛化工段，往绿液中加消石灰，使碳酸钠转化为氢氧化钠。澄清后的液体称为白液，即蒸煮用的碱液，沉淀出的碳酸钙称为白泥。白泥-石灰湿法烟气脱硫原理在于白泥中含有碳酸钙和少量的氢氧化钠，可与石灰一同作为脱硫吸收剂。锅炉烟气经除尘、降温后进入吸收塔。烟气在吸收塔内向上流动且被向下流动的循环浆液以逆流方式洗涤。循环浆液则通过喷浆层内设置的喷嘴喷射到吸收塔中，以便脱除 SO_2、SO_3，反应原理如下：

After the black liquor in the papermaking alkali recovery workshop is concentrated and incinerated, the main components of the melt flowing out from the bottom of the combustion furnace are sodium carbonate and sodium sulfide, which are called green liquor after being dissolved in dilute white liquor. In the caustic chemical section, hydrated lime is added to the green liquor to convert sodium carbonate into sodium hydroxide. The clarified liquid is called white liquid, i.e. Alkali liquor for cooking and precipitated calcium carbonate is called white mud. The working principle of white mud-lime wet flue gas desulfurization is that white mud contains calcium carbonate and a small amount of sodium hydroxide, which can be used as a desulfurization absorbent together with lime. Boiler flue gas enters the absorption tower after dust removal and cooling. The flue gas flows upward in the absorption tower and is washed in a countercurrent manner by circulating slurry flowing downward. The circulating slurry is sprayed into the absorption tower through nozzles arranged in the spraying layer to remove SO2 and SO3. The reaction principle is as follows:

①在脱硫吸收塔内，烟气中的 SO_2 首先被石灰石浆液中的水吸收，形成亚硫酸，并部分电离。

① In the desulfurization absorption tower, SO2 in flue gas is first absorbed by water in limestone slurry to form sulfurous acid, which is partially ionized.

$$SO_2+H_2O\rightarrow H_2SO_3\rightarrow H^{+}+HSO_3^{-}\rightarrow 2H^{+}+SO_3^{2-}$$

②与吸收塔浆液中的 $CaCO_3$ 细颗粒反应生成 $CaSO_3 \cdot 1/2H2O$ 细颗粒。

② React with CaCO3 fine particles in the absorber slurry to form CaSO3·1/2H2O fine particles.

$$CaCO_3 + 2H^+ \rightarrow Ca^{2+} + H_2O + CO_2\uparrow$$

$$Ca^{2+} + SO_3^{2-} \rightarrow CaSO_3 \cdot 1/2H_2O\downarrow + H^+$$

$CaSO_3 \cdot 1/2H_2O$ 利用空气中的氧气氧化，最终生成石膏 $CaSO_4 \cdot 2H2O$。

CaSO3·1/2H2O is oxidized by oxygen in the air to produce gypsum CaSO4·2H2O.

$$HSO^{3-} + 1/2O_2 \rightarrow H^+ + SO_4^{2-}$$

$$Ca^{2+} + SO_4^{2-} + 2H_2O \rightarrow CaSO_4 \cdot 2H_2O\downarrow$$

循环浆液通过浆液循环泵向上输送到喷淋层中，通过喷嘴进行雾化，使气体和液体得到充分接触。每个泵通常都与其各自的喷淋层相连接，即通常采用单元制。在吸收塔中，白泥、石灰与二氧化硫反应并氧化生成石膏，这部分石膏浆液通过石膏浆液泵排出，进入石膏脱水系统。石膏脱水系统主要包括石膏水力旋流器(作为一级脱水设备)、浆液分配器和真空皮带脱水机。

The circulating slurry is transported upward to the spray layer through the slurry circulating pump and atomized through the nozzle so that the gas and the liquid are fully contacted. Each pump is usually connected to its respective spray layer in a unit system manner. In the absorption tower, white mud, lime and sulfur dioxide react and oxidize to generate gypsum. The gypsum slurry is discharged through the gypsum slurry pump and enters the gypsum dehydration system. Gypsum dehydration system mainly includes gypsum hydrocyclone (as primary dehydration equipment), slurry distributor and vacuum belt dehydrator.

经过净化处理的烟气流经两级除雾器除雾，去除清洁烟气中所携带的浆液雾滴。同时按特定程序不时地用工艺水对除雾器进行冲洗，一是为了防止除雾器堵塞，二是可将冲洗水作为补充水以稳定吸收塔液位。

The purified flue gas flows through a two-stage demister to remove slurry droplets carried in the clean flue gas. Meanwhile, the defogger is flushed with process water from time to time according to specific procedures. First, the defogger is prevented from being blocked. Second, the flushing water can be used as supplementary water to stabilize the liquid level of the absorption tower.

根据《火电厂污染防治可行技术指南》（HJ2301-2017），石灰石-石膏湿法脱硫去除效率为95~99.7%。根据国电肇庆热电有限公司2×350MW超临界锅炉机组采用白泥脱硫，二氧化硫进口浓度为1948~1999 mg/m³的条件下，白泥脱硫的效率为99.25%~99.49%，白泥作为脱硫剂时，烟气出口二氧化硫排放浓度最低仅为10 mg/m³，可满足超低排放标准对 SO_2 控制的要求。本次评价 220t/h 固废综合利用锅炉二氧化硫去除效率取94.7~96.1%，280t/h 燃煤锅炉二氧化硫去除效率取 97.73%，经处理后排放浓分别为34.73~34.83mg/m³、34.9mg/m³，满足《全面实施燃煤电厂超低排放和节能改造工作方案》（环发〔2015〕164号）中锅炉废气超低排放标准限值（二氧化硫≤35 mg/m³）。

According to the Guideline on Available Technologies of Pollution Prevention and Control for the Thermal Power Plant (HJ2301-2017), the removal efficiency of limestone-gypsum wet desulfurization is 95 ~ 99.7%. The 2 × 350 MW supercritical boiler unit of China Guodian Corporation Zhaoqing Thermal Power Co., Ltd. adopts white mud desulfurization. Under the condition that the inlet concentration of sulfur dioxide is 1948 ~ 1999 mg/m3, the desulfurization efficiency of white mud is 99.25% ~ 99.49%. When white mud is used as a desulfurizing agent, the minimum emission concentration of sulfur dioxide from the flue gas outlet is only 10 mg/m3, which can meet the requirements of an ultra-low emission standard for SO2 control. In this assessment, the sulfur dioxide removal efficiency of 220t/h solid waste comprehensive utilization boilers is 94.7 ~ 96.1%, and that of 280t/h coal-fired boilers is 97.73%. After treatment, the emission concentrations are 34.73~ 34.83mg/m3 and 34.9mg/m3 respectively, meeting the ultra-low emission standard limit (sulfur dioxide ≤ 35 mg/m3) of boiler waste gas in the Full Implementation of Ultra-low Emission and Energy Saving Transformation Work Plan for Coal-fired Power Plants (HF [2015] No.164).

（3）脱硝

(3) Denitration

锅炉烟气脱硝采用SNCR-SCR 联合脱硝技术。

SNCR-SCR combined denitration technology is adopted for boiler flue gas denitration.

SNCR-SCR联合脱硝技术是将SNCR 与SCR组合应用，即在炉膛上部的高温区域（850℃~1150℃）采用SNCR 技术脱除部分 NO_x，再在炉外采用SCR 技术进一步脱除烟气中 NO_x。SNCR-SCR联合脱硝系统一般由还原剂储存系统、还原剂混合喷射系统、

反应器系统及监测控制系统等组成。

SNCR-SCR combined denitration technology is a combination of SNCR and SCR, i.e. SNCR technology is used to remove part of NOx in the high temperature area (850 ℃ ~ 1150 ℃) at the upper part of the furnace, and SCR technology is used to further remove NOx from flue gas outside the furnace. SNCR-SCR combined denitration system is generally composed of reducing agent storage system, reducing agent mixed injection system, reactor system and monitoring and control system.

SNCR 指的是选择性非催化还原技术，SCR 指的是选择性催化还原技术，SNCR/SCR 联合脱硝技术，则综合了两种技术的优势，一方面能够提高 NO_x 的脱除率，另一方面有利于降低脱硝成本、减少氨逃逸。联合脱硝过程中，SNCR 技术会带来一定的氨逃逸，刚好为 SCR 技术提供了还原剂，从而除掉更多的 NO_x，不仅氨逃逸数量明显减少，而且和单纯采用 SCR 技术相比，能够减少催化剂的使用量。从脱硝反应原理来看，SNCR 技术是将氨水、尿素溶液等还原剂喷进高温炉膛，一般温度在 850~1100℃，还原剂在高温下分解出 NH_3，并和烟气中的 NOx 反应，最终生成无害的 N_2。可见，炉膛作为反应器，温度控制是关键，还原剂能够选择性的和 NO_x 发生反应，而不会和 O_2 发生反应。以氨气为例，反应式为 $NH_3+NO_x \rightarrow N_2+H_2O$，如果温度过高，氨气就会被氧化成 NO_x，反应式为 $NH_3+NO_2 \rightarrow NO_x+H_2O$。联合脱硝期间，将稀释后的氨水、尿素溶液喷进高温的炉膛或烟道中在 850~1100℃温度条件下与 NO_x 反应生成 N_2、H_2O，逃逸的氨气会在下游的催化剂作用下与 NO_x 反应生成为 N_2、H_2O，反应式为：$4NO+4NH_3+O_2 \rightarrow 4N_2+6H_2O$；$NO+NO_2+2NH_3 \rightarrow N_2+3H_2O$。

SNCR refers to selective non-catalytic reduction technology, SCR refers to selective catalytic reduction technology, and SNCR/SCR combined denitration technology combines the strengths of the two technologies. For one thing, it can improve the NOx removal rate; for another, it is conducive to reducing denitration cost and ammonia escape. In the process of combined denitration, SNCR technology will bring certain ammonia escape, which provides a reducing agent for SCR technology, thus removing more NOx. Not only is the amount of ammonia escape significantly reduced, but the use of catalysts can be reduced compared with SCR technology alone. Judging from the principle of denitration reaction, SNCR technology is to inject reducing agents such as ammonia water and urea solution into a high-temperature furnace, generally at 850 ~ 1100 ℃, and the reducing agent decomposes NH3 at high temperature and reacts with NOx in the flue gas to finally generate harmless N2. It can be seen that with the furnace as a reactor, temperature control is of great importance. Reducing agent can selectively react with NOx, but not with O2. Taking ammonia as an example. The reaction formula is NH3+NOx→N2+H2O. If the temperature is too high, ammonia will be oxidized to NOx, and the reaction formula is NH3+NO2→NOx +H2O. During the combined denitration, the diluted ammonia water and urea solution are sprayed into a high-temperature furnace or flue to react with NOx to generate N2 and H2O at 850-1100 ℃, and the escaped ammonia gas will react with NOx to generate N2 and H2O under the action of downstream catalyst, and the reaction formula is 4NO+4NH3+O2→4N2+6H2O; NO+NO2+2NH3→N2+3 H2O.

根据《火电厂污染防治可行技术指南》（HJ2301-2017），SNCR-SCR 联合脱硝技术脱硝效率一般为 55~85%。2017 年 10 月山西汾西矿业(集田)有限责任公司发电厂 2×220th 循环流化床锅炉实施超低排放技术改造，脱硝采用 SNCR+SCR 联合脱硝技术，并顺利投入运行，2018 年 3 月，经监测结果表明，在锅炉负荷为 2x220th 时，脱硝设施出口 NOx 浓度仅为 15.17mg/Nm^3，除尘效率达到 87.5%以上，脱硝效果显著。本次评价 220t/h 固废锅炉、280t/h 燃煤锅炉氮氧化物去除效率取 83.35~83.4%，去除效率在火电厂污染防治可行技术指南和同类企业实际运行去除效果范围内，经处理后氮氧化物排放浓度均为 49.8~49.95mg/m^3，满足《全面实施燃煤电厂超低排放和节能改造工作方案》（环发〔2015〕164 号）中锅炉废气超低排放标准限值（氮氧化物≤50 mg/m^3）。

According to the Guideline on Available Technologies of Pollution Prevention and Control for the Thermal Power Plant (HJ2301-2017), the denitration efficiency of SNCR-SCR combined denitration technology is generally 55 ~ 85%. In October 2017, the 2 × 220 th circulating fluidized bed boiler in the power plant of Shanxi Fenxi Mining (Jitian) Co., Ltd. implemented ultra-low emission technical transformation. SNCR+SCR combined denitration technology was adopted for denitration and put into operation smoothly. In March 2018, the monitoring results showed that when the boiler load was 2x220 th, the NOx concentration at the outlet of denitration facility was only 15.17 mg/Nm3, the dust removal efficiency reached more than 87.5%, and the denitration effect was remarkable. In this assessment, the nitrogen oxide removal efficiency of 220t/h solid waste boiler and 280t/h coal-fired boiler is 83.35 ~ 83.4%. The removal efficiency meets the standard of the Guideline on Available Technologies of Pollution Prevention and Control for the Thermal Power Plant and is within the actual operation removal effect range of similar enterprises. After treatment, the emission concentration of nitrogen oxides is 49.8 ~ 49.95 mg/m3, which meets the ultra-low emission standard limit (nitrogen oxides ≤ 50 mg/m3) of boiler waste gas in the Full Implementation of Ultra-low Emission and Energy Saving Transformation Work Plan for Coal-fired Power Plants (HF [2015] No.164).

（4）重金属及二噁英治理措施

(4) Treatment measures for heavy metals and dioxins

目前去除焚烧烟气中重金属污染物及二噁英有效的方法是采用布袋除尘和活性碳吸附相结合方法。本项目固废综合利用锅炉烟气经活性炭吸附、布袋除尘处理相结合进行吸附去除。

Currently, the effective method to remove heavy metal pollutants and dioxin in incineration flue gas is to adopt a combination of bag dust removal and activated carbon adsorption. In this Project, the flue gas of solid waste comprehensive utilization boilers is adsorbed and removed by activated carbon adsorption and bag dust removal.

含重金属废物焚烧后，部分经挥发而存在于废气中，当废气通过冷却设备后，重金属经降温而凝结成粒状，或因吸附作用而附着于细灰表面，可被后续的除尘设备去除，当废气通过除尘设备时的温度越低，去除效率越佳。而经降温仍以气态存在的重金属物质，因吸附于飞灰上及喷入的活性碳去除。本项目在布袋除尘器入口前的烟道内喷入具有强吸附能力的活性碳，并在布袋除尘器袋壁上沉积，形成滤饼，活性炭与废气接触，利用吸附将重金属吸附到活性炭上；若废物中含有汞金属，由于汞的饱和蒸气压较高，不易凝结，因此其去除效率与布袋除尘器活性碳滤饼厚度有直接的关系，根据工程分析可知，本项目废物汞含量很低，产生浓度为0.0167 mg/Nm^3，已满足《生活垃圾焚烧污染控制标准》（GB18485-2014）排放限值要求（汞≤0.05 mg/Nm^3）。为保证除尘效果，项目应定期更换滤袋。更换的滤袋先用压缩空气吹净，再检查有无破洞，有破洞修好后留待更换。如被粉尘糊住的布袋，用水冲洗，凉干后留待更换。除尘器布袋更换周期理论上是4-5年，建设单位应根据实际运行情况，及时更换滤袋。

After incineration, some of the waste containing heavy metals is volatilized and exists in the waste gas. When the waste gas passes through the cooling equipment, the heavy metals are cooled and condensed into granules, or adhere to the surface of fine ash due to adsorption, which can be removed by subsequent dust removal equipment. The lower the temperature when the waste gas passes through the dust removal equipment, the better the removal efficiency. However, heavy metals that still exist in the gaseous state after cooling are removed by adsorption on fly ash and sprayed activated carbon. In this project, activated carbon with strong adsorption capacity is sprayed into the flue in front of the inlet of the bag filter, and deposited on the bag wall of the bag filter to form filter cakes. Activated carbon contacts with waste gas, and heavy metals are adsorbed to the activated carbon by adsorption. If the waste contains mercury metal, due to the high saturated vapor pressure of mercury, condensation can hardly be formed, so its removal efficiency is directly related to the thickness of activated carbon filter cake of bag filter. According to engineering analysis, the waste mercury content of this Project is low, and the generated concentration is 0.0167 mg/Nm3, which has met the emission limit requirements of the Standard for Pollution Control on the Municipal Solid Waste Incineration (GB18485-2014) (mercury ≤ 0.05 mg/Nm3). To ensure the dust removal effect, the Project should replace the filter bag regularly. The replaced filter bag shall be blown clean with compressed air first, and then checked for holes. After the holes are repaired, the filter bag shall be replaced. If the cloth bag is pasted with dust, rinse it with water and leave it for replacement after cooling. In theory, the replacement period of the dust collector bag is 4-5 years, and the Employer shall replace the filter bag in time based on the actual operation.

根据山东太阳纸业股份有限公司 180t/h 造纸固废综合利用锅炉实际生产情况，监测数据详见 2.2.7.1 章节，锅炉烟气经活性炭吸附+布袋除尘器处理后，重金属及二噁英排放浓度可满足《生活垃圾焚烧污染控制标准》（GB18485-2014）。

According to the actual production situation of the 180t/h paper-making solid waste comprehensive utilization boiler of Shandong Sun Paper Industry Joint Stock Co., Ltd. (refer to 2.2.7.1 for the monitoring data), after the boiler flue gas is treated by activated carbon adsorption and bag filter, the emission concentration of heavy metals and dioxin can meet the Standard for Pollution Control on the Municipal Solid Waste Incineration (GB18485-2014).

6.2.2.4 烟囱设置合理性分析

6.2.2.4 Rationality analysis of chimney setting

（1）烟囱设置情况

(1) Chimney setting

本项目碱回收锅炉、220t/h固废综合利用锅炉、2×280t/h燃煤锅炉、850t/d石灰窑废气、臭气焚烧器废气、化学浆车间漂白废气分别设废气净化处理设施处理后经同一根高150米多管式集束烟囱排放，多管式集束烟囱总内径为12.9米，设置情况见图6.2-1。

The alkali recovery boiler, 220t/h solid waste comprehensive utilization boiler, 2 × 280 t/h coal-fired boiler, 850t/d lime kiln waste gas, stink incinerator waste gas and bleaching waste gas of chemical pulp workshop of this Project are respectively equipped with waste gas purification treatment facilities and then discharged through the same 150-meter-high multi-tube cluster chimney. The total inner diameter of the multi-tube cluster chimney is 12.9 meters. Refer to Figure 6.2-1 for the settings.

二氧化氯车间氯酸钠电解槽过量氢气排空尾气、二氧化氯车间盐酸合成尾气、二氧化氯车间罐槽尾气分别设置25米、42米和30米的排气筒排放。

Excessive hydrogen exhaust gas from sodium chlorate electrolytic cell in chlorine dioxide workshop, hydrochloric acid synthesis tail gas from chlorine dioxide workshop and tank tail gas from chlorine dioxide workshop are respectively provided with exhaust funnels of 25m, 42m and 30m.

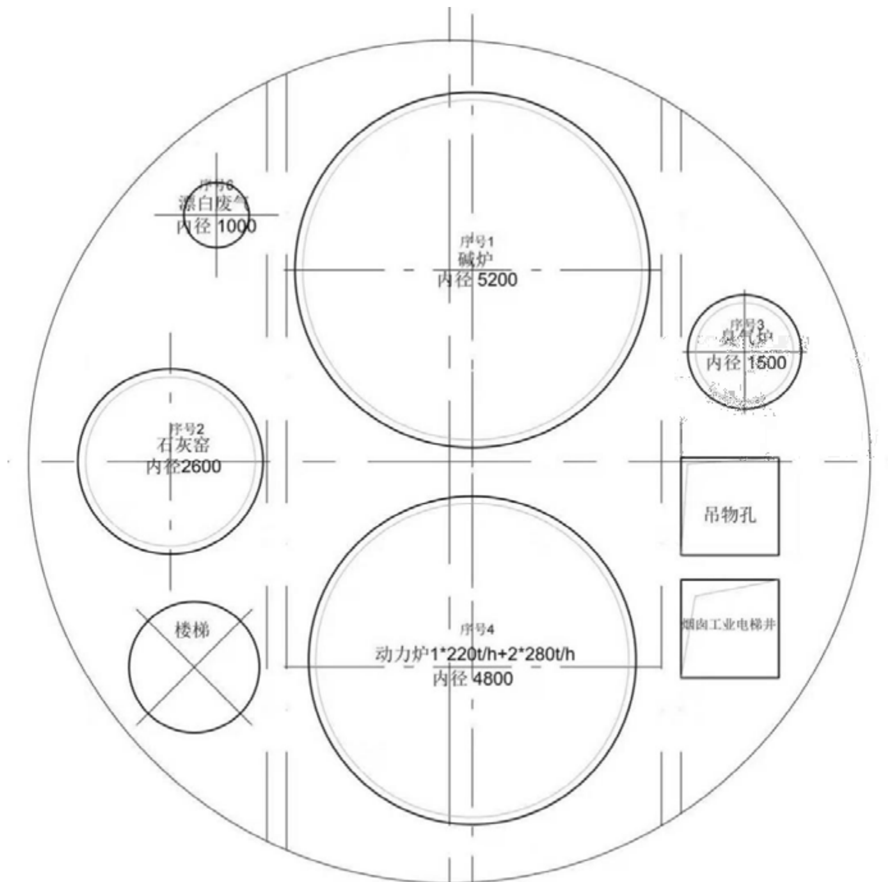


图 6.2-1　项目多管集束烟囱示意图

Figure 6.2-1 Multi-pipe Cluster Chimney of the Project

（2）排气筒高度合理性分析

(2) Rationality analysis of exhaust funnel height

根据《制定地方大气污染物排放标准的技术方法》（GB/T3840 -1991）：排放各种生产工艺过程中产生的气态大气污染物的排气筒，其高度一般不得低于15m。

According to the Technical Methods for Making Local Emission Standards of Air Pollutants (GB/T3840-1991), the height of the exhaust funnel for discharging gaseous air pollutants generated in various production processes shall generally not be less than 15m.

根据《恶臭污染物排放标准》（GB 14554-93）：排气筒的最低高度不得低于 15m。

According to the Discharge Standard of Odor Pollutants (GB 14554-93), the minimum height of the exhaust funnel shall not be less than 15m.

根据《工业炉窑大气污染物排放标准》（GB 9078-1996）：

According to the Emission Standard of Air Pollutants for Industrial Kiln and Furnace (GB 9078-1996):

①4.6.1：各种工业炉窑烟囱（或排气筒）最低允许高度为15m。

① 4.6.1: The minimum allowable height of the chimney (or exhaust funnel) of various industrial furnaces and kilns is 15m.

②4.6.2：1997 年1 月1 日起新建、改建、扩建的排气烟（粉）尘和有害污染物的工业炉窑，其烟囱（或排气筒）最低允许高度除应执行4.6.1 和4.6.3 规定外，还应按批准的环境影响报告书要求确定。

② 4.6.2: The minimum allowable height of the chimney (or exhaust funnel) of industrial furnaces and kilns with exhaust smoke (powder) dust and harmful pollutants newly built, rebuilt or expanded from January 1, 1997, shall be determined according to the requirements of the approved EIA report in addition to the provisions of 4.6.1 and 4.6.3.

③4.6.3：当烟囱（或排气筒）周围半径200m 距离内有建筑物时，除应执行4.6.1和4.6.2 规定外，烟囱（或排气筒）还应高出最高建筑物3m 以上。

③ 4.6.3: When there are buildings within a radius of 200m around the chimney (or exhaust exhaust), in addition to the provisions of 4.6.1 and 4.6.2, the chimney (or exhaust funnel) shall be 3m higher than the highest building.

④4.6.4：“各种工业炉窑烟囱（或排气筒）高度如果达不到4.6.1、4.6.2、4.6.3 的任何一项规定时，其烟（粉）尘或有害污染物最高允许排放浓度，应按相应区域排放标准值的50%执行”。

④ 4.6.4: "If the height of the chimney (or exhaust funnel) of various industrial furnaces and kilns does not reach any of the provisions of 4.6.1, 4.6.2 and 4.6.3, the maximum allowable emission concentration of smoke (powder) dust or harmful pollutants shall be implemented according to 50% of the emission standard value of the corresponding area".

根据《无机化学工业污染物排放标准》（GB31573-2015）：所有排气筒高度应按环境影响评价要求确定，至少不低于 15m（排放含氯气的排气筒不低于 25m）。

According to the Emission Standards of Pollutants for Inorganic Chemical Industry (GB31573-2015), the height of all exhaust funnels shall be determined according to the requirements of environmental impact assessment, at least not lower than 15m (exhaust funnels emitting chlorine gas shall not be lower than 25m).

根据《大气污染物综合排放标准》（GB16297-1996）：

According to the Integrated Emission Standard of Air Pollutants (GB16297-1996):

①新污染源的排气筒一般不应低于15m。

① The exhaust funnels of new pollution sources should not be lower than 15m in general.

②排气筒高度除须遵守表列排放速率值外，还应高出周围 200 米半径范围的建筑 5m 以上，不能达到该要求的排气筒，应按其高度对应的表列排放速率标准值严格 50%执行。

② The height of exhaust funnels shall not only comply with the listed emission rate value, but also be 5m higher than the surrounding buildings with a radius of 200 meters. For exhaust funnels that cannot meet the requirements, the standard value of the listed emission rate corresponding to the height shall be strictly implemented by 50%.

项目设置的烟囱（排气筒）高度均大于15m，排放含氯气的排气筒不低于25m，且烟囱（排气筒）高出周围200m半径范围的建筑5m以上，项目设置的烟囱（排气筒）高度均符合执行的《工业炉窑大气污染物排放标准》（GB 9078-1996）、《大气污染物综合排放标准》（GB16297-1996）、《恶臭污染物排放标准》（GB 14554-93）、《无机化学工业污染物排放标准》（GB31573-2015）等标准要求。

The chimneys (exhaust funnels) set up in the Project shall be higher than 15m, the exhaust funnels for discharging chlorine gas shall not be lower than 25m, and the chimneys (exhaust funnels) shall be 5m higher than the surrounding buildings with a radius of 200m. The height of the chimneys (exhaust funnels) set by the Project all meets the requirements of the Emission Standard of Air Pollutants for Industrial Kiln and Furnace (GB 9078-1996), Integrated Emission Standard of Air Pollutants (GB16297-1996), Emission Standard for Odor Pollutants (GB 14554-93), and Emission Standards of Pollutants for Inorganic Chemical Industry (GB31573-2015), etc.

（3）排气筒出口烟气速度合理性分析

(3) Rationality analysis of flue gas velocity at the outlets of exhaust funnels

烟气出口速度和排气筒出口直径的平方成反比，是影响烟气抬升高度的重要因素之一。在烟气量为定值的情况下过高的烟气流速将不利于排气筒的安全和使用寿命，如果烟气流速过低则可能造成烟气无法将粉尘带出而使排气筒底部的出现过多积灰。

The flue gas outlet velocity is inversely proportional to the square of the outlet diameter of the exhaust funnel, which is one of the important factors affecting the flue gas lifting height.

Under the condition that the flue gas volume is fixed, too high a flue gas flow rate will not be conducive to the safety and service life of the exhaust funnel. If the flue gas flow rate is too low, it may cause the flue gas to be unable to bring out dust and cause excessive dust accumulation at the bottom of the exhaust funnel.

根据《制定地方大气污染物排放标准的技术方法》（GB/T3840-1991）中规定：新建、改建和扩建工程的排气筒出口处烟气速度不得小于按照《制定地方大气污染物排放标准的技术方法》（GB/T3840-1991）计算出的风速 Vc 的 1.5 倍。

According to the Technical Methods for Making Local Emission Standards of Air Pollutants (GB/T3840-1991), the flue gas velocity at the outlet of the exhaust funnel for new construction, renovation and expansion projects shall not be less than 1.5 times of the wind speed Vc calculated in accordance with the Technical Methods for Making Local Emission Standards of Air Pollutants (GB/T3840-1991).

$$Vc=V\times(2.303)^{(1/K)}/\Gamma(1+1/K)$$

$$K=0.74+0.19\times V$$

V—排气筒出口高度处环境多年平均风速；

V-Average wind speed of the environment for many years at the outlet height of the exhaust funnel;

K—韦伯斜率。

K-Weber slope.

本项目污染源排放烟囱烟气出口速度按照《制定地方大气污染物排放标准的技术方法》（GB/T3840-1991）进行核算，集束烟囱等效内径根据各个烟囱横截面积之和计算得出，计算结果见表 6.2-2。

The outlet velocity of chimney flue gas discharged by pollution sources in this Project is calculated according to the Technical Methods for Making Local Emission Standards of Air Pollutants (GB/T3840-1991). The equivalent inner diameter of cluster chimneys is calculated according to the sum of cross-sectional areas of each chimney. The calculation results are shown in Table 6.2-2.

表 6.2-2 项目排气筒烟气速度计算结果一览表
Table 6.2-2 Calculation Results of Flue Gas Velocity in the Exhaust Funnel of the Project

排气筒 Exhaust funnel	标况烟气流量（Nm^3/s）Standard flue gas flow (Nm3/s)	工况烟气流量（m^3/s）Working condition flue gas flow (m3/s)	烟囱高度 Chimney height（m）(m)	烟囱内径 Inner diameter of the chimney（m）(m)	Vs	1.5Vc
4600tds/d 碱回收炉 4600tds/d alkali recovery furnace	564.15	801.20	150	7.8（等效）7.8 (equivalent)	16.78	13.35
850t/d 石灰窑 850t/d lime kiln			150			
220t/h 固废锅炉、2×280t/h 燃煤锅炉烟气 220t/h solid waste boiler, 2 × 280 t/h coal-fired boiler flue gas			150			
臭气焚烧器 Odor incinerator			150			
漂白车间漂白塔尾气 Bleaching tower tail gas in bleaching workshop			150			
二氧化氯车间氯酸钠电解槽过量氢气排空尾气 Excessive hydrogen tail gas in sodium chlorate electrolytic cell of chlorine dioxide workshop	0.56	0.61	25	0.2	19.43	11.89
二氧化氯车间盐酸合成尾气 Tail gas from hydrochloric acid synthesis in chlorine dioxide workshop	0.69	0.76	42	0.25	15.49	12.6
二氧化氯车间罐槽尾气 Tank tail gas from chlorine dioxide workshop	1.25	1.36	30	0.3	19.25	12.12

项目烟囱出口处烟气速度大于按照《制定地方大气污染物排放标准的技术方法》（GB/T3840-1991）计算出风速 Vc 的 1.5 倍，符合标准的要求。

The flue gas velocity at the chimney outlet of the Project is 1.5 times higher than the wind speed Vc calculated according to the Technical Methods for Making Local Emission Standards of Air Pollutants (GB/T3840-1991), which meets the requirements of the standard.

6.2.2.5 臭气处理措施可行性分析

6.2.2.5 Feasibility analysis of stink treatment measures

硫酸盐法制浆过程产生的气体排入大气形成独特的硫酸盐浆厂的气味。主要的臭气成份为 H_2S、甲硫醇、二甲硫醇和二甲二硫醚，统称为总还原硫（TRS，其量以 H_2S 的相当量表示）。TRS 物质具有酸性、可燃的特点，因此可通过碱液洗涤、燃烧来处理。根据工程分析可知，项目臭气污染源主要是：化学浆车间蒸煮系统、洗选系统、蒸发站、苛化工段，碱回收炉、石灰窑。

The gas produced by sulfate pulping will form special odor of sulfate pulp mill after being emitted to the atmosphere. The main stink components are H2S, methyl mercaptan, dimethyl mercaptan and dimethyl disulfide, collectively referred to as total reduced sulfur (TRS, the amount of which is expressed as an equivalent amount of H2S). TRS is acidic and combustible, so it can be treated by alkali liquor washing and combustion. According to the engineering analysis, the stink pollution sources of the Project are mainly cooking system, washing and separation system, evaporation station, caustic chemical section, alkali recovery furnace and lime kiln in chemical pulp workshop.

项目各生产工段臭气气体产生节点及污染防治措施见 2.2.1.14 章。

Refer to 2.2.1.14 for stink gas generation nodes and pollution control measures in each production section of the Project.

（1）蒸煮、洗选、蒸发、苛化系统

（1）Cooking, washing, evaporation, and causticization system

拟建项目硫酸盐木浆蒸煮采用连续蒸煮技术。黑液蒸发采用降膜式蒸发器，目设臭气收集系统，包括高浓度不凝气（CNCG）系统、低浓度不凝气（DNCG）系统和汽提气（SOG）系统三套处理系统，分别将蒸煮、洗涤及碱回收蒸发、燃烧、苛化过程中产生的不凝气全部收集起来，高浓臭气和汽提气经处理后直接送到碱回收炉燃烧，低浓臭气经碱液洗涤后送碱回收炉作二次送风。

Sulfated wood pulp cooking of the proposed project adopts a continuous cooking technology. The black liquor evaporation adopts a falling film evaporator. Currently, a stink collection system is established, including three treatment systems: High concentration non-condensable gas (CNCG) system, low concentration non-condensable gas (DNCG) system and stripper off-gas (SOG) system. The non-condensable gas generated in the processes of cooking, washing and alkali recovery evaporation, combustion and causticization are collected respectively, the high-concentration stink and stripper off-gas are directly sent to the alkali recovery furnace for combustion after treatment, and the low-concentration stink is sent to the alkali recovery furnace for secondary air supply after being washed by alkali liquor.

臭气收集系统均为密闭收集系统，通过控制收集风机，保证收集点位置为负压状态，废气全部进行收集。封闭制浆车间、碱炉工段厂房，使其车间内部微负压，废气与全厂低浓臭气经处理后一起作为碱回收炉二次风。为避免臭气处理系统事故时直接排放，在碱回收炉北侧安装 1 套臭气焚烧器，在事故工况下，高浓臭气、低浓臭气通过臭气备用焚烧器燃烧后排放，以避免臭气直接排空。

Odor collection systems are all closed collection systems; through controlling the collection fans, and ensuring the negative pressure at the collection points, all flue gases can be collected. The pulping workshop and the alkali furnace workshop are closed so that the micro negative pressure inside the workshop, the waste gas and the low-concentration stink of the whole plant are treated together as the secondary air of the alkali recovery furnace. To avoid direct emission of the stink treatment system in case of an accident, a set of stink incinerators is installed on the north side of the alkali recovery furnace. In case of any accident, high-concentration stink and low-concentration stink are discharged after combustion by stink standby incinerator to avoid direct emission of stink.

（2）碱回收炉

(2) Alkali recovery furnace

碱回收炉采用低臭炉，蒸发站来的浓度为 80%左右的浓黑液与补充芒硝混合后送碱炉燃烧，减少了直接蒸发时产生的含硫臭气。蒸煮和蒸发等过程中产生的高浓度不凝气、低浓度不凝气、汽提气中恶臭物质在碱回收炉中经充分燃烧，减少了恶臭物质的量，存在的少量恶臭物质被碱回收炉中碱吸收，类比湛江晨鸣项目监测结果，碱炉烟气中总还原硫的浓度小于 2.3mg/Nm^3。

The alkali recovery furnace adopts a low stink furnace, and the concentrated black liquor with a concentration of about 80% from the evaporation station is mixed with supplementary mirabilite and then sent to the alkali furnace for combustion, thus reducing sulfur-containing stink generated during direct evaporation. The repugnant substances in concentrated non-condensable gas, diluted non-condensable gas, stripper off-gas produced during cooking and evaporation will be fully combusted in the alkali recovery furnace, which can reduce the amount of repugnant substances; a small amount of repugnant substances remained will be absorbed by alkali in the alkali recovery furnace; referring to the monitoring results of the Zhanjiang Chenming Project, the concentration of total reduced sulfur in flue gas of the alkali furnace is less than 2.3mg/Nm^3.

（3）石灰窑

(3) Lime kiln

石灰窑用天然气作燃料，石灰窑排放的 H_2S 是由白泥中残留的 Na_2S 所引起，白泥在石灰窑的低温部分进行干燥，部分 Na_2S 的硫以 H_2S 放出，白泥充分洗涤、脱水，在进石灰窑煅烧之前干燥到80~85％，可降低 H_2S 的排放量。类比湛江晨鸣项目监测结果，石灰窑烟气中总还原硫的浓度小于 2.9mg/Nm^3。

The lime kiln takes natural gas as fuel, H_2S emitted from the lime kiln is generated by Na_2S remained in white mud, which is first dried in the low-temperature part of the lime kiln, and part of sulfur in Na_2S is emitted from H_2S; the white mud is fully washed, dewatered and dried to 80~85％ before calcination in the lime kiln, which can reduce the emission of H_2S. Referring to the monitoring results of Zhanjiang Chenming Project, the concentration of total reduced sulfur in lime kiln flue gas is less than 2.9mg/Nm^3.

（4）污水处理站

(4) Sewage treatment plant

项目对污水处理站产生臭气的构筑物进行加盖密封，并配置一套碱洗除臭系统，臭气经抽风管送至除臭系统，经喷淋洗涤后，送至生产区碱炉内燃烧分解后，经过碱炉烟囱排放。

The Project covers and seals the structures of the sewage treatment plant that may produce odor, and arranges a alkali washing deodorization system; the odor is sent to the deodorization system through the exhaust column, and then to the alkali furnace for combustion in the production area after spray washing; finally, it will be emitted through the alkali furnace chimney.

碱洗涤主要化学反应：

Main chemical reactions of alkali washing:

氢氧化钠少量：$NaOH+H_2S==NaHS+H_2O$

Small amount of sodium hydroxide: $NaOH+H_2S==NaHS+H_2O$

氢氧化钠过量：$2NaOH+H_2S==Na_2S+2H_2O$

Excess sodium hydroxide: $2NaOH+H_2S==Na_2S+2H_2O$

焚烧化学方程式如下：

The chemical equations of incineration are as follows:

$2H_2S+3O_2=2SO_2+2H_2O$

$4NH_3+7O_2=4NO_2+6H_2O$

臭气与氧气充分接触的条件下利用高温将臭气分解为 SO_2、NO_2，与碱炉烟气经过碱炉配套的烟气脱硫脱硝系统处理后排放。

Under the condition that the stink is in full contact with oxygen, the stink is decomposed into SO2 and NO2 by high temperature, and then discharged after being treated with the flue gas of the alkali furnace by the flue gas desulfurization and denitration system.

①污水处理站加盖密封系统

① Capping and sealing system of the sewage treatment plant

项目对污水处理站产生臭气的构筑物采用不锈钢或反吊膜进行加盖密封，需进行加盖密封的构筑物见表 6.2-3。

In the Project, stainless steel or reverse hanging film is used to cover and seal the structures that generate stink in the sewage treatment plant. Refer to Table 6.2-3 for the structures that need to be covered and sealed.

表 6.2-3 污水处理站加盖密封系统设置情况

Table 6.2-3 Setting of Capping and Sealing System for the Sewage Treatment Plant

序号 S.N.	构筑物名称 Name of structure	截面积 Cross-sectional area		直径 Diameter	数量 Quantity	投影面积 Projected area	规格参数 Specification parameters	密封形式 Sealed form
		长 (m)	宽(m) Width	(m)	(个) (pcs)	（m^2） (m2)		

		Length (m)	(m)					
1	调制池 Conditioning tank	65.5	35	/	1	0.64	全封闭带检修口，1个0.8×0.8m的检修口 Fully enclosed with an access hole of 0.8 × 0.8 m	不锈钢 Stainless steel
2	预酸化池 Pre-acidification pool	14.5	35	/	1	0.64	全封闭带检修口，1个0.8×0.8m的检修口 Fully enclosed with an access hole of 0.8 × 0.8 m	不锈钢 Stainless steel
3	厌氧脱气池 Anaerobic degassing tank	40	20	/	1	0.64	全封闭带检修口，1个0.8×0.8m的检修口 Fully enclosed with an access hole of 0.8 × 0.8 m	不锈钢 Stainless steel
4	厌氧沉淀池 Anaerobic sedimentation tank	/	/	22	6	3.84	全封闭带检修口，6个0.8×0.8m的检修口 Fully enclosed with six access holes of 0.8 × 0.8 m	不锈钢 Stainless steel
5	生物选择池 Biological selection pool	12	6	/	4	2.56	全封闭带检修口，4个0.8×0.8m的检修口 Fully enclosed with four access holes of 0.8 × 0.8 m	不锈钢 Stainless steel
6	污泥浓缩池 Sludge thickener	/	/	22	4	1520	敞开式 Open type	反吊膜密封 Reverse hanging film seal
7	污泥调理池 Sludge conditioning tank	/	/	8	3	1.92	全封闭带检修口，3个0.8×0.8m的检修口 Fully enclosed with three access holes of 0.8 × 0.8 m	不锈钢 Stainless steel
8	预酸化罐 Pre-acidification tank	/	/	21	6	3.84	全封闭带检修口，6个0.8×0.8m的检修口 Fully enclosed with six access holes of 0.8 × 0.8 m	不锈钢 Stainless steel
9	厌氧反应器 Anaerobic	/	/	11	2	1.28	全封闭带检修口，2个0.8×0.8m的检修口	不锈钢 Stainless

	reactor						Fully enclosed with two access hole of 0.8 × 0.8 m	steel

②污水处理站各构筑物臭气收集系统设置情况

② Setting of the stink collection system for each structure of the sewage treatment plant

项目污水处理站各构筑物臭气收集系统设置情况见表 6.2-4。

Refer to Table 6.2-4 for the setting of the stink collection system for each structure of the sewage treatment plant.

6.2-4 污水处理站臭气收集系统设置情况

6.2-4 Setting of Stink Collection System in the Sewage Treatment Plant

序号 S. N.	构筑物名称 Name of structure	方形池体 Square pool		圆形池体 Circular pool	超高高度 Ultra high height	数量 Quantity	换气次数 Ventilation rate	风量 Air volume	备注 Remarks
		长 (m) Length (m)	宽 (m) Width (m)	直径 (m) Diameter (m)	(m)	(个) (pcs)	（次/h） (times/h)	（m^3/h） (m^3/h)	
1	调制池 Conditioning tank	65.5	35	/	0.5	1	3	3439	区域一，风量为 4546m³/h Area 1, with an air volume of 4546m³/h
2	预酸化池 Pre-acidification pool	14.5	35	/	0.5	1	3	761	
3	生物选择池 Biological selection pool	12	6	/	0.8	2	3	346	
4	厌氧沉淀池 Anaerobic sedimentation tank	/	/	22	0.5	6	3	3419	区域二，风量为 3765m³/h Area 2, with an air volume of 3765m³/h
5	生物选择池 Biological selection pool	12	6	/	0.8	2	3	346	
6	污泥浓缩池 Sludge thickener	/	/	22	2.5	4	1	8359[2]	区域三风量为 8585m³/h Area 3, with an air volume of 8585m³/h
7	污泥调理池 Sludge conditioning	/	/	8	0.5	3	3	226	

序号 S. N.	构筑物名称 Name of structure	方形池体 Square pool		圆形池体 Circular pool	超高高度 Ultra high height	数量 Quantity	换气次数 Ventilation rate	风量 Air volume	备注 Remarks
		长(m) Length (m)	宽(m) Width (m)	直径(m) Diameter (m)	(m)	(个) (pcs)	（次/h） (times/h)	（m^3/h） (m^3/h)	
	tank								
8	厌氧脱气池 Anaerobic degassing tank	40	20	/	0.5	1	/	5280[1]	区域四，风量为8681m³/h Area 4, with an air volume of 8681m³/h
9	预酸化罐 Pre-acidification tank	/	/	21	0.5	6	3	3116	
10	厌氧反应器 Anaerobic reactor	/	/	11	0.5	2	3	285	
11	污泥脱水间 Sludge dewatering room	112	36	/	5	1	0.7	14112	区域五，风量为39312m³/h Area 5, with an air volume of 39312m³/h
12	污泥堆场 Sludge storage yard	100	40	/	9	1	0.7	25200	
13	初沉池 Primary settling tank	/	/	42	2.5	4	1	30464[2]	区域六，风量为30464m³/h Area 6, with an air volume of 30464m³/h
合计 Total								95352	

根据本项目的实际情况，由于污水站场地较大，故将表2-1中的构筑物分成6个区域进行集气，各个区域的集气量加上一定裕量后分别为5000m^3/h、4500m^3/h、9500m^3/h、9500m^3/h、40000 m^3/h、30000 m^3/h。区域一~四所有构筑物共用一套除臭设备，利用风机将各区域的构筑物的气体集中送至除臭系统，除臭系统设计的总处理量为：28500m^3/h。处理后的臭气区域六的臭气一同送入厂区预留管，输送至碱炉焚烧。区域五直接送入厂区另一条预留管，输送至碱炉焚烧。

According to the actual situation of the Project, due to the large size of the sewage treatment plant, the structures in Table 2-1 are divided into 6 areas for gas gathering, and the gas gathering volume of each area is 5000m3/h, 4500m3/h, 9500m3/h, 9500m3/h, 40000 m3/h and 30000 m3/h respectively after adding a certain tolerance. All structures in areas 1 ~ 4 share a set of deodorization equipment, and the gas from the structures in each area is centrally sent to the deodorization system by a fan. The designed total treatment capacity of the deodorization system is 28500m3/h. The treated stink in stink area 6 is sent to the reserved pipe in the plant area and transported to the alkali furnace for incineration. The stink of area 5 is directly sent to another reserved pipe in the plant area and transported to the alkali furnace for incineration.

根据环境保护科学2018年第44卷第4期《碱液喷淋在污水处理废气治理中的应用与影响》对某制药厂污水处理废气采用碱液喷淋去除H_2S，去除效率可达66%。

According to Iss.4, Vol. 44 of 2018 Environmental Protection Science, Application and Influence of Alkali Liquor Spray in Sewage Treatment and Waste Gas Treatment, H2S is removed by alkali liquor spray in waste gas treatment of a pharmaceutical factory, and the removal efficiency can reach 66%.

根据东莞顺裕废水站焚烧除臭项目实际运行情况，该项目造纸污水处理系统产生的臭气采取加盖密封+热力焚烧除臭工艺，NH_3和H_2S进口浓度为300 mg/m^3，臭气收集后引入锅炉燃烧，锅炉烟气SO_2、NO_2增量分别小于10 mg/m^3、50mg/m^3，污染物经过锅炉配套的脱硫脱硝系统处理后，可满足火电厂大气污染物排放标准》（GB13223-2011）及《恶臭污染物排放标准》（GB14554-93）。

According to the actual operation of the incineration deodorization project of Shunyu Wastewater Station in Dongguan, the stink generated by the papermaking sewage treatment system of the Project adopts the process of capping and sealing + thermal incineration deodorization. The inlet concentration of NH3 and H2S is 300 mg/m3. Stink is collected and introduced into the boiler for combustion. The increment of SO2 and NO2 in boiler flue gas is less than 10 mg/m3 and 50mg/m3 respectively. After the pollutants are treated by the desulfurization and denitration system matched with the boiler, they can meet the Emission Standard of Air Pollutants for Thermal Power Plants (GB13223-2011) and Emission Standard for Odor Pollutants (GB14554-93).

根据工程分析，污水处理站 NH_3 和 H_2S 产生量 1.291kg/h，0.006 kg/h，项目臭气经收集后先经过碱洗，去除率取 60%，经碱洗后进入碱炉的 NH_3 和 H_2S 的量分别为 0.516 kg/h，0.0024 kg/h，折算排放浓度分别为 18 mg/m^3，0.08 mg/m^3，远小于东莞顺裕废水站热力焚烧除臭系统进口浓度，类比可知项目污水处理站臭气经碱洗后进入碱炉焚烧处理后排放，对碱炉影响很小，臭气经碱炉燃烧处置后，污染物排放浓度能够满足《火电厂大气污染物排放标准》（GB13223-2011）及《恶臭污染物排放标准》（GB14554-93）。

Based on engineering analysis, the production of NH3 and H2S in the sewage treatment plant is 1.291 kg/h and 0.006 kg/h. The stink of the Project is collected and then washed with alkali, with a removal rate of 60%. The amounts of NH3 and H2S entering the alkali furnace after alkali washing are 0.516 kg/h and 0.0024 kg/h, respectively. The converted emission concentrations are 18 mg/m3 and 0.08 mg/m3, much less than the inlet concentration of the thermal incineration deodorization system in Dongguan Shunyu Wastewater Station. Through analogy, it can be known that the stink from the sewage treatment plant of the Project is washed by alkali and then discharged into the alkali furnace for incineration, which has little impact on the alkali furnace. After the stink is burned and disposed of by the alkali furnace, the pollutant emission concentration can meet the Emission Standard of Air Pollutants for Thermal Power Plants (GB13223-2011) and the Emission Standard for Odor Pollutants (GB14554-93).

（5）臭气运行管理措施

(5) Stink operation management measures

根据国内硫酸盐制浆厂的运行管理经验，除确保臭气收集治理正常运行设施外，避免臭气的跑冒滴漏也至关重要。主要的管理措施还包括：①每次全厂性检修时，将可能出现异常或故障的设备维修或更换，做到预防性维保。②使用便携式仪器定期在厂区内监测臭气情况，及时发现臭气无组织来源并立即改善。③臭气相关设备或管路维修前，制定先期吹扫、清理程序，避免维修期间产生臭气逸散。

According to the operation and management experience of domestic kraft pulping plants, it is also important to avoid stink evaporation, emission, drip or leakage besides ensuring the normal operation facilities for stink collection and treatment. The main management measures also include: ① Repair or replace the equipment that may have abnormalities or faults during each plant-wide overhaul to achieve preventive maintenance. ② Use portable instruments to regularly monitor the stink situation in the plant area, identify the unorganized source of stink in time and make immediate improvement. ③ Formulate early purging and cleaning procedures before maintenance of stink-related equipment or pipelines to avoid stink emission during maintenance.

6.2.2.6 其他大气污染防治强化措施及建议

6.2.2.6 Other measures and suggestions for strengthening air pollution prevention and control

（1）二氧化氯车间尾气

(1) Tail gas from chlorine dioxide workshop

根据工程分析结果，二氧化氯制备车间氯酸钠电解槽过量氢气排空尾气经稀碱液洗涤、二氧化氯车间罐槽尾气经海波塔洗涤、盐酸合成尾气经软化水洗涤后，Cl_2 和 HCl 可满足《无机化学工业污染物排放标准》（GB31573-2015）表 3 标准要求（Cl_2≤8mg/m^3、HCl≤20 mg/m^3）。

According to the results of engineering analysis, Cl2 and HCl can meet the standard requirements in Table 3 of Emission Standards of Pollutants for Inorganic Chemical Industry (GB31573-2015) (Cl2 ≤ 8 mg/m3, HCl ≤ 20 mg/m3) after the excess hydrogen tail gas from sodium chlorate electrolysis cell in chlorine dioxide preparation workshop is washed by dilute alkali liquor, the tail gas from tank cell in chlorine dioxide workshop is washed by sea wave tower, and the tail gas from hydrochloric acid synthesis is washed by demineralized water.

为确保吸收塔尾气中氯气稳定达标排放，并尽可能小的降低总氯对环境影响，提出以下强化建议和措施：

To ensure the stable discharge of chlorine in the tail gas of the absorption tower and minimize the impact of total chlorine on the environment, the following strengthening suggestions and measures are put forward:

①严格控制二氧化氯制备反应温度，提高 $C1O_2$ 转化率，减少副产物 Cl_2 和 HCl 的产生；

① Strictly control the reaction temperature of the preparation of chlorine dioxide, improve the conversion rate of C1O2, and reduce the production of by-products Cl2 and HCl;

②采购合格优质制备原料，减少其它有害气体排放；

② Purchase qualified and high-quality preparation raw materials to reduce the emission of other harmful gases;

③为避免因停电或水泵故障原因导致吸收塔无法及时补充二氧化氯吸收冷冻水，导致二氧化氯事故排放，建议吸收冷冻水入吸收塔前设置高位冷冻水水箱，保证事故时临时供给需要。

③ To avoid chlorine dioxide accidents caused by failure of the absorption tower to supplement chlorine dioxide to absorb chilled water in time due to power failure or water pump failure, it is recommended to set up a high-level chilled water tank before absorbing chilled water into the absorption tower to ensure temporary supply needs in case of accidents.

（2）化学浆车间漂白工段尾气

(2) Tail gas from bleaching section of chemical pulp workshop

化学浆车间漂白工段产生的 Cl_2 经碱液洗涤后通过排气筒排放，类比湛江晨鸣项目，漂白工段氯气排放浓度在 1.94~3.79 mg/m^3，能达到《大气污染物综合排放标准》（GB16297-1996）表 2 二级标准要求（Cl_2≤65mg/m^3）。

Cl2 produced in the bleaching section of the chemical pulp workshop is washed by alkali liquor and then discharged through the exhaust funnel. Compared with Zhanjiang Chenming Project, the chlorine emission concentration in the bleaching section is 1.94 ~ 3.79 mg/m3, which can meet the requirements of Table 2 grade II standard (Cl2 ≤ 65 mg/m3) of the Integrated Emission Standard of Air Pollutants (GB16297-1996).

（3）污水处理站恶臭

(3) Stink in the sewage treatment plant

污水处理站恶臭散发单元主要为污水系统中生物反应池、污泥脱水机房等，项目对污水处理站产生臭气的构筑物进行加盖密封，并配置一套碱洗除臭系统，臭气经抽风管送至除臭系统，经喷淋洗涤后，送至生产区碱炉内燃烧分解后，经过碱炉烟囱排放，少量未收集的恶臭物质通过无组织排放。污水处理站恶臭气体排放方式为连续式，排放去向为环境空气。通过合理设置污水处理站的建设位置，优化污水处理站内各处理单元的布置，在污水处理站四周种植绿化带，可进一步减少恶臭无组织排放对周围环境影响。

Stink emission units of the sewage treatment plant are mainly biological reaction tank and sludge dewatering machine room in the sewage system. The Project covers and seals the structures producing stink of the sewage treatment plant, and arranges an alkaline washing deodorant system, which can send the stink to the deodorant system through the exhaust tube;

the stink, after spray washing, will be sent to the alkali furnace in the production area for combustion and decomposition, and then discharged through the chimney of the alkali furnace. A small amount of uncollected stink substances are discharged through unorganized discharge. The stink of the sewage treatment plant is discharged in a continuous manner into the ambient air. Efforts should be made to reasonably set the construction location of the sewage treatment plant, optimize the arrangement of each treatment unit in the sewage treatment plant, and plant green belts around the sewage treatment plant so as to further reduce the impact of stink unorganized discharge on the surrounding environment.

（4）干煤棚及贮煤场无组织排放

(4) Unorganized emission from dry coal shed and coal storage yard

项目设有一个干煤棚储存原煤，3 台渣仓及 3 座灰库储存锅炉灰渣。煤棚及灰渣库为全封闭式，粉尘主要产生于煤的运输、装卸。燃煤由汽车直接运至封闭煤场进行卸煤，并采取洒水降尘。全封闭煤棚及灰渣库受环境气象条件影响不大，定期洒水以保持一定水分，并对裸露的灰面及时洒水，即可有效减少扬尘，基本不会对煤棚及灰渣库外产生不利影响。

The Project has a dry coal shed to store raw coal, 3 slag bins and 3 ash storages to store boiler ash and slag. The coal shed and ash storage are fully enclosed, and dust is mainly generated in the transportation and loading and unloading of coal. Coal is directly transported by vehicles to the closed coal yard for unloading and water is sprayed to reduce dust. Fully enclosed coal shed and ash slag storehouse are rarely affected by environmental meteorological conditions. Regular watering should be carried out to maintain a certain amount of water and timely watering on the exposed ash surface can effectively reduce dust, so as to avoid negative impact on the coal shed and ash slag storehouse.

（5）原料堆场及备料车间无组织排放

(5) Unorganized emission from raw material storage yard and material preparation workshop

木片堆场及备料车间的粉尘主要产生于木片堆存、转运、筛分及再碎过程。由于由于木片含水量较大，不易起尘，木片堆场通过洒水降尘，水炮喷雾抑尘措施后，产生的扬尘量很小；备料车间的扬尘主要产生于木片筛，木片筛位于封闭车间内。项目在场地周边种植高大植物、加强绿化，堆场设置大型自动远程雾炮设备装置，对运输车辆加盖

篷布，车辆进场前要经过洗泥水池润湿轮胎，生产作业间隙及时清扫场地等措施来进一步减少原料堆场扬尘影响。

The dust in the wood chip stockyard and material preparation workshop is mainly generated from the process of wood chip storage, transfer, screening and re-crushing. Due to the large water content of the wood chips, dust is rarely seen. Water is sprayed in the wood chip stockyard to reduce dust. After adopting the water cannons to suppress generation of dust, the amount of dust generated is small. Dust from the material preparation workshop is mainly generated from the wood screen, which is located in the closed workshop. The Project plants tall plants around the site to enhance greening, sets up large-scale automatic remote water cannon equipment and devices in the storage yard, covers transport vehicles with tarpaulins, wets tires of vehicles in mud washing pools before they enter the site, and cleans the site in time during production operations to further reduce the impact of dust on the raw material storage yard.

6.2.2 废水污染防治措施及其可行性分析

6.2.2 Wastewater pollution control measures and feasibility analysis

6.2.2.1 废水特性分析

6.2.2.1 Analysis of wastewater properties

拟建项目废水主要为制浆废水。制浆废水的主要污染物有：①还原性物质，主要来自漂白工段，如木质素及其衍生物、无机盐等，以 COD 为指标；②可生物降解物质，为半纤维素、树脂酸、低分子糖、醇、有机酸和腐败性物质等，主要来自碱回收车间，以 BOD_5 为指标；③悬浮物，如纤维、无机原料等，以 SS 为指标。制浆废水较难处理的原因是废水中含有难以生化降解的木质素及其衍生物。对于拟建项目来说，木质素及其衍生物主要来自制浆的漂白工段，漂白工段废水是制浆废水的主要组成部分。

The wastewater of the proposed Project is mainly pulping wastewater. The main pollutants of pulping wastewater are: ① reducing substances, mainly from the bleaching section, such as lignin and its derivatives, inorganic salts, etc., using COD as an index; ② biodegradable substances, such as hemicellulose, resin acid, Low-molecular sugars, alcohols, organic acids and spoilage substances, etc., mainly come from the alkali recovery workshop, with BOD5 as the index; ③ suspended matter, such as fiber, inorganic raw materials, etc., with SS as the index. The reason why pulping wastewater can hardly be treated is that it contains lignin and derivatives that are difficult to be biodegraded. For the proposed Project, lignin and its derivatives are mainly from the pulping bleaching section and the bleaching section wastewater is the main component of the pulping wastewater.

软化水车间、循环水站排水、碱炉热电站排水中污染物浓度较低。

The concentration of pollutants in the drainage of demineralized water workshop, circulating water station and alkali furnace thermal power station is relatively low.

6.2.2.2 污水处理站工艺

6.2.2.2 Process of the sewage treatment plant

根据项目污水的水质特性，本工程好氧处理单元采用卡鲁塞尔氧化沟工艺；由于生产污水负荷较高，拟在好氧处理单元前设置厌氧处理单元，厌氧处理拟采用 EGSB 厌氧反应器，带有三相分离器截留厌氧污泥以维持恒定的厌氧生物量；三级处理单元拟采用化学氧化处理工艺。

According to the water quality characteristics of the Project sewage, the aerobic treatment unit of this Project adopts Carrousel oxidation ditch process. Due to the high load of production sewage, an anaerobic treatment unit is to be set up in front of the aerobic treatment unit. EGSB anaerobic reactor is to be used for anaerobic treatment, with a three-phase separator to intercept anaerobic sludge to maintain a constant amount of anaerobe; the three-stage treatment unit will adopt a chemical oxidation treatment process.

根据本项目生产生活污水的水质和水量，建设处理规模为 100000m^3/d 的混合污水处理系统，拟采用预处理+厌氧处理+好氧处理相结合的处理工艺。各污水处理系统的处理工艺如下：

According to the quality and quantity of production and domestic sewage in this Project, a mixed sewage treatment system with a treatment scale of 100000m3/d will be built, and a treatment process combining pretreatment, anaerobic treatment and aerobic treatment will be adopted. The treatment processes of each sewage treatment system are as follows:

（1）初沉池

(1) Primary settling tank

从各生产车间排出的混合污水经初沉池配水井均匀配送至各个初沉池。初沉池设计为辐流沉淀池，废水在初沉池中静置沉淀，去除废水中细小悬浮物。初沉池出水通过提升泵送至热交换器强制降温。初沉池沉淀污泥经刮吸泥机收集后泵送至污泥浓缩池。

The mixed sewage discharged from each production workshop is evenly distributed to each primary settling tank through the distribution well of the primary settling tank. The primary settling tank is designed as a radial flow settling tank, and the wastewater is settled in the primary settling tank to remove fine suspended substances in the wastewater. The effluent from the primary settling tank is pumped to the heat exchanger for forced cooling through lifting. The sludge deposited in the primary settling tank is collected by a sludge scraper and pumped to the sludge thickener.

事故池

Emergency pool

为了避免来水异常时废水直接进入生化系统对系统造成冲击，设置一座事故池，当来水异常时，经过初沉池重力沉降水中杂质悬浮物后，暂进入事故池中储存，等系统运行正常后再缓慢均匀的泵入初沉池出水收集水池进行后续处理。

To prevent the wastewater from directly entering the biochemical system and causing impact to the system when the incoming water is abnormal, an emergency pool is set up. When the incoming water is abnormal, the impurities suspended in the water after gravity sedimentation in the primary settling tank are temporarily stored in the emergency pool for storage. Until the system operates normally, the incoming water will be pumped slowly and evenly into the effluent collection tank of the primary settling tank for subsequent treatment.

（2）热交换器

(2) Heat exchanger

车间来水温度约为50℃，利用热交换器对废水降温，以免温度过高废水影响后续构筑物的处理效率。

The temperature of the incoming water from the workshop is about 50 ℃, and the heat exchanger is used to cool the wastewater so as not to affect the treatment efficiency of subsequent structures due to excessive temperature.

（3）预酸化池

(3) Pre-acidification tank

预酸化池提供预酸化时间，起到稳定废水有机负荷，调节波动的效果，同时预酸化池给污水创造了一定的兼氧环境进行水解酸化，发生厌氧处理的酸化过程，将难降解的物质分解成容易降解的有机底物。为了准确保证废水进入厌氧反应器所需要的 pH 条件，根据在线监测反馈回的池内的 pH 值情况，通过变频控制碱的投加量调节 pH 在 6.5 左右，同时在该工序投加厌氧反应所需的营养盐。在池中设置搅拌机，以使废水预酸化反应均匀、充分。

The pre-acidification tank provides pre-acidification time to stabilize the organic load of wastewater and adjust the fluctuation. Also, it creates a certain facultative environment for wastewater to carry out hydrolytic acidification, resulting in an acidification process of anaerobic treatment, which decomposes nonbiodegradable substances into easily degradable organic substrates. To accurately ensure the pH conditions required for wastewater to enter the anaerobic reactor, according to the pH value in the tank provided by on-line monitoring, the pH is adjusted to about 6.5 by controlling the alkali dosage through frequency conversion. Meanwhile, nutrients required for anaerobic reaction are added in this process. A mixer is arranged in the tank to make the wastewater pre-acidification reaction uniform and sufficient.

（4）厌氧反应器

(4) Anaerobic reactor

厌氧反应器采用 EGSB 厌氧反应器。EGSB 厌氧反应器是世界上较为先进的厌氧处理技术，反应器由污泥反应区、气液固三相分离器和气液分离器三部分组成。具有良好沉淀性能和凝聚性能的厌氧污泥在厌氧反应器下部形成污泥层，待处理的污水从厌氧反应器底部进入，与污泥层中的厌氧污泥进行混合接触，污泥中的微生物分解污水中的有机物，把它转化为沼气。沼气以微小气泡形式不断放出，微小气泡在上升过程中，不断合并，逐渐形成较大的气泡，由于沼气的搅动，厌氧反应器上部会形成一个污泥浓度较小的悬浮污泥层，当沼气、悬浮污泥和水一起上升进入三相分离器时，沼气碰到分离器下部的反射板时，折向反射板的四周，然后穿过水层进入气液分离器，集中在气液分离器的沼气通过管道排出，固液混合液经过反射进入三相分离器的沉淀区，污水中的污泥发生絮凝，絮体逐渐增大，并在重力作用下沉降。沉淀至斜壁上的污泥沿着斜壁滑回厌氧反应器的反应区内，使反应区内积累大量的污泥，与污泥分离后的出水从沉淀区溢流堰上部溢出，然后排出厌氧反应器。

The anaerobic reactor adopts EGSB anaerobic reactor. EGSB anaerobic reactor is an advanced anaerobic treatment technology in the world. It consists of sludge reaction zone, gas-liquid-solid three-phase separator and gas-liquid separator. Anaerobic sludge with good sedimentation performance and coagulation performance forms a sludge layer at the lower part of the anaerobic reactor. Sewage to be treated enters from the bottom of the anaerobic reactor and is mixed and contacted with anaerobic sludge in the sludge layer. Microorganisms in the sludge decompose organic matters in the sewage and convert it into biogas. Biogas is continuously released in the form of tiny bubbles, which will rise, merge and gradually form larger bubbles. Due to the agitation of biogas, a sludge layer with low sludge concentration will be formed in the upper part of the anaerobic reactor. When biogas, suspended sludge and water rise together into the three-phase separator and when the biogas encounters the reflection plate at the lower part of the separator, it folds around the reflection plate, then passes through the water layer and enters the gas-liquid separator. The biogas concentrated in the gas-liquid separator is discharged through the pipeline. The solid-liquid mixed liquid enters the sedimentation area of the three-phase separator through reflection. The sludge in the sewage flocculates and the flocs gradually increase and settle under the action of gravity. The sludge deposited on the inclined wall slides back to the reaction zone of the anaerobic reactor, so that a large amount of sludge accumulates in the reaction zone, and the effluent separated from the sludge overflows from the upper part of the overflow weir in the precipitation zone, and then is discharged out of the anaerobic reactor.

厌氧反应器在处理厌氧处理过程中产生沼气，产生的沼气量取决于施加于厌氧反应器的 COD 负荷。沼气在厌氧反应器顶部的气液分离器收集以进一步处理利用。厌氧反应器和沼气处理设施皆为封闭系统，沼气在沼气处理设施中燃烧而不会散发进入周围环境中，没有二次污染。沼气具有巨大的经济价值,可以替代天然气回收利用。

The anaerobic reactor produces biogas during the treatment of anaerobic treatment and the amount of biogas generated depends on the COD load applied to the anaerobic reactor. Biogas is collected in a gas-liquid separator at the top of the anaerobic reactor for further treatment and utilization. Anaerobic reactor and biogas treatment facilities are both closed systems. Biogas is burned in biogas treatment facilities and will not be emitted into the surrounding environment to avoid secondary pollution. Biogas has great economic value and can replace natural gas.

沼气流量是厌氧反应器内部生物反应过程的指征，厌氧反应器负荷增加时，沼气流量增加。参照同类水质且结合厌氧反应器的性质，去除 1kgCOD 约产 $0.4m^3$沼气，如果

在有事故发生的情形下，COD 负荷过高，可以从沼气流量反馈出来，自动报警。

Biogas flow rate is an index of the biological reaction process in the anaerobic reactor. When the load of the anaerobic reactor increases, the biogas flow rate increases. Referring to similar water quality and combining with the properties of the anaerobic reactor, removing 1kgCOD produces about 0.4m³ of biogas. If the COD load is too high in the event of an accident, it can be known from the biogas flow rate and an automatic alarm will be triggered.

（5）沼气处理系统

(5) Biogas treatment system

厌氧反应器在处理厌氧处理过程中产生沼气，产生的沼气量取决于施加于厌氧反应器的 COD 负荷。沼气在厌氧反应器顶部的气液分离器收集以进一步处理利用。厌氧反应器和沼气处理设施皆为封闭系统，沼气在沼气处理设施中燃烧而不会散发进入周围环境中，没有二次污染。沼气具有巨大的经济价值,可以替代天然气或者燃煤回收利用。

The anaerobic reactor produces biogas during the treatment of anaerobic treatment and the amount of biogas generated depends on the COD load applied to the anaerobic reactor. Biogas is collected in a gas-liquid separator at the top of the anaerobic reactor for further treatment and utilization. Anaerobic reactor and biogas treatment facilities are both closed systems. Biogas is burned in biogas treatment facilities and will not be emitted into the surrounding environment to avoid secondary pollution. Biogas has great economic value and can replace natural gas or coal.

沼气流量是厌氧反应器内部生物反应过程的指征，厌氧反应器负荷增加时，沼气流量增加。参照同类水质且结合厌氧反应器的性质，去除 1kgCOD 约产 0.4m³沼气，如果在有事故发生的情形下，COD 负荷过高，可以从沼气流量反馈出来，自动报警。

Biogas flow rate is an index of the biological reaction process in the anaerobic reactor. When the load of the anaerobic reactor increases, the biogas flow rate increases. Referring to similar water quality and combining with the properties of the anaerobic reactor, removing 1kgCOD produces about 0.4m³ of biogas. If the COD load is too high in the event of an accident, it can be known from the biogas flow rate and an automatic alarm will be triggered.

A、沼气稳压柜

A. Biogas pressure stabilizing cabinet

厌氧反应器顶部的气液分离器收集的沼气将流向沼气稳压柜，稳压柜使气体系统产

生一个25-30mbar的表压。这样沼气稳压柜的体积可增大或减小而无需改变气体系统的内压。沼气稳压柜采用干式，其气位由超声波物位计连续监测。

The biogas collected by the gas-liquid separator at the top of the anaerobic reactor will flow to the biogas pressure stabilizing tank, which will generate a gauge pressure of 25-30mbar in the gas system. In this way, the volume of the biogas pressure stabilizing cabinet can be increased or decreased without changing the internal pressure of the gas system. The biogas pressure stabilizing cabinet adopts dry type and its gas level is continuously monitored by an ultrasonic level meter.

B、沼气燃烧器

B. Biogas combustor

来自于沼气稳压柜的沼气流向沼气燃烧器。燃烧器的操作由沼气稳压柜的气位自动控制。当沼气稳压柜的气位达到某个水平时，点火阀自动打开，点火器自动启动。如检测到高温，则说明点火火苗在燃烧。如沼气稳压柜气位达到某个较高水平，燃烧器主阀自动打开，沼气由点火火苗点燃，随着沼气稳压柜气位缓慢下降到某个水平，燃烧器主阀会自动关闭，而点火火苗继续燃烧。

Biogas from the biogas pressure stabilizing cabinet flows to the biogas combustor. The combustor is automatically controlled by the gas level of the biogas pressure stabilizing cabinet. When the gas level of the biogas pressure stabilizing cabinet reaches a certain level, the ignition valve opens automatically and the igniter starts automatically. If a high temperature is detected, it indicates that the ignition flame is burning. If the gas level of the biogas pressure stabilizing cabinet reaches a certain higher level, the main valve of the combustor will automatically open and the biogas will be ignited by the ignition flame. As the gas level of the biogas pressure stabilizing cabinet slowly drops to a certain level, the main valve of the combustor will automatically close and the ignition flame will continue to burn.

（6）厌氧沉淀池

(6) Anaerobic sedimentation tank:

厌氧反应器出水经脱气池后自流至厌氧沉淀池，厌氧沉淀池设计为带刮泥机的斜板沉淀池，废水在厌氧沉淀池中静置沉淀，去除废水中细小悬浮物。厌氧沉淀池出水自流至生物选择池。厌氧沉淀池污泥收集至池底后泵送至预酸化池。

The effluent from the anaerobic reactor flows to the anaerobic sedimentation tank after passing through the degassing pool. The anaerobic sedimentation tank is designed as an inclined plate sedimentation tank with a mud scraper. The wastewater is settled in the anaerobic sedimentation tank to remove fine suspended substances in the wastewater. The effluent from the anaerobic sedimentation tank flows to the biological selection pool. Sludge from the anaerobic sedimentation tank is collected to the bottom of the tank and pumped to the pre-acidification tank.

（7）生物选择池

(7) Biological selection pool

生物选择池出水自流进入生物选择池。在池内将进水和回流污泥迅速混合，使其内的生态环境有利于选择性的发展絮状菌，运用生物竞争机制抑制丝状菌的过度生长和繁殖，从而控制污泥膨胀现象的发生。同时，起到反硝化作用对废水进行脱硝处理。

The effluent from the biological selection pool flows into the biological selection pool. The influent and return sludge are quickly mixed in the pool to make the ecological environment in the pool conducive to the selective development of flocculent bacteria, and the biological competition mechanism is used to inhibit the overgrowth and reproduction of filamentous bacteria, thus controlling the occurrence of sludge bulking. Meanwhile, it plays a denitrification role to denitrify wastewater.

（8）卡鲁塞尔氧化沟

(8) Carrousel oxidation ditch

卡鲁塞尔氧化沟使用定向控制的曝气和搅动装置，向混合液传递水平速度，从而使被搅动的混合液在氧化沟闭合渠道内循环流动。因此氧化沟具有特殊的水力学流态，既有完全混合式反应器的特点，又有推流式反应器的特点，沟内存在明显的溶解氧浓度梯度。氧化沟断面为矩形，平面形状为椭圆形。

Carrousel oxidation ditch uses directionally controlled aeration and agitation devices to transfer horizontal velocity to the mixed liquid, thus circulating the agitated mixed liquid in the closed channel of the oxidation ditch. Therefore, the oxidation ditch has a special hydraulic flow pattern, which has the property of both a fully mixed reactor and a push-flow reactor. There is an obvious dissolved oxygen concentration gradient in the ditch. The section of the oxidation ditch is rectangular and the plane is oval.

（9）二沉池

(9) Secondary settling tank

经卡鲁塞尔氧化沟处理的废水自流至二沉池。本设计为辐流式沉淀池，在此进行泥水分离，部分污泥回流至生物选择池，剩余污泥泵送至初沉池，二沉池上清液至中间水池。

The wastewater treated by Carrousel oxidation ditch flows to the secondary settling tank. It is designed as a radial flow settling tank, where sludge and water are separated. Some sludge flows back to the biological selection pool, excess sludge is pumped to the primary settling tank, and supernatant from the secondary settling tank is sent to the intermediate pool.

（10）中间水池

(10) Intermediate pool

为确保进入高级氧化池的废水水质的进水要求，设置中间水池。在中间水池投加浓硫酸将废水 pH 值调节至 5-5.5，调节 pH 后废水通过高级氧化池供料泵输送至高级氧化池中。

To ensure the quality of wastewater entering the advanced oxidation tank, an intermediate pool is set up. Concentrated sulfuric acid is added into the intermediate pool to adjust the pH value of the wastewater to 5-5.5, and the pH-adjusted wastewater is transported to the advanced oxidation pool through a feed pump of the advanced oxidation tank.

（11）高级氧化池

(11) Advanced oxidation tank

高级氧化池对污水进行深度氧化处理，该技术的主要原理是外加的 H_2O_2 氧化剂与 Fe^{2+}催化剂，两者在适当的 pH 值下反应产生羟基自由基(OH•)，而羟基自由基的强氧化能力与污水中的有机物反应分解氧化有机物，进而降低污水中生物难降解的有机物。高级氧化池出水自流至中和脱气池。

The advanced oxidation tank carries out deep oxidation treatment on sewage. The main principle of this technology is that the added H2O2 oxidant and Fe2+ catalyst react at an appropriate pH value to generate hydroxyl radicals (OH). The strong oxidation capacity of hydroxyl radicals reacts with organic matters in sewage to decompose and oxidize organic matters, thus reducing biologically refractory organic matters in sewage. The effluent from the advanced oxidation tank flows to the neutralization degassing pool.

（12）中和脱气池

(12) Neutralization degassing pool

废水在高级氧化池的 pH 保持在 3~5，因此在中和脱气池中需投加液碱对废水的 pH 进行调节，以满足出水 pH 要求。高级氧化池产生较多的气体，中和脱气池还起到脱去废水中气体的作用。由于 Fe^{3+}本身就是非常好的絮凝剂，所以在该池中只需投加 PAM，即可使废水中的铁泥发生絮凝反应。在这个过程中除了发生絮凝反应，同时对色度、SS 及胶体也具有非常好的去除效果。

The pH of the wastewater in the advanced oxidation tank is kept at 3 ~ 5, so liquid caustic soda should be added into the neutralization degassing pool to adjust the pH of the wastewater to meet the pH requirements of the effluent. The advanced oxidation tank produces more gas and the neutralization degassing pool also plays a role in removing gas from wastewater. Since Fe3+ itself is a good flocculant, only PAM needs to be added to the tank to make the iron mud in the wastewater flocculate. In this process, besides flocculation reaction, it also has good removal effect on chroma, SS and colloid.

（13）终沉池

(13) Final settling tank

终沉池设计为辐流式沉淀池，经絮凝后的废水在该池中经静置沉淀进行泥水分离，出水流经生态景观池达标排放。在池内设置刮吸泥机，以便收集沉积于池底的铁泥，并用污泥泵送至污泥浓缩池。

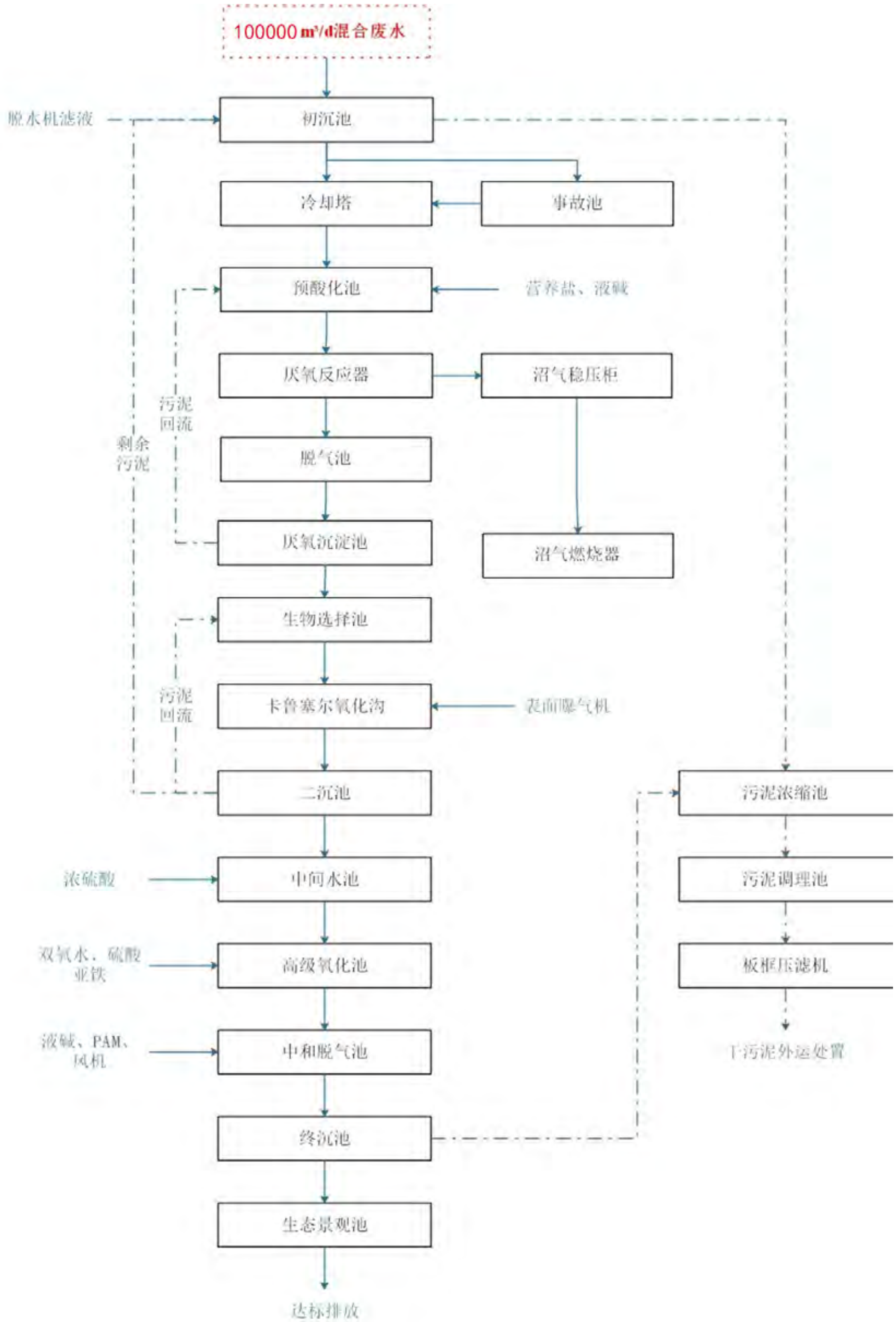
The final settling tank is designed as a radial flow settling tank, in which the flocculated wastewater is subjected to static sedimentation for mud-water separation, and the effluent flows through the ecological landscape tank for up-to-standard discharge. A sludge scraper is arranged in the tank to collect the iron sludge deposited at the bottom of the tank and pump it to the sludge thickener with sludger.

（14）污泥处理系统

(14) Sludge treatment system

初沉池、厌氧沉淀池、终沉池的污泥通过污泥泵送至污泥浓缩池，经浓缩后泵送至污泥调理池，加药剂调理后再用泵将污泥泵送至板框压滤机进行脱水，脱水后的干污泥干度达到 42%以上，干泥饼经破碎后再送至锅炉房焚烧处理，污泥浓缩池上清液、污泥脱水压滤液回流至集水池进行再处理。

The sludge from the primary settling tank, the anaerobic sedimentation tank and the final settling tank is pumped to the sludge thickener. After concentration, the sludge is pumped to the sludge conditioning tank. After being conditioned with chemicals, the sludge is pumped to the plate-and-frame filter press for dehydration. The dryness of the dehydrated dry sludge reaches over 42%. After being crushed, the dry sludge cake is sent to the boiler room for incineration treatment. The supernatant of the sludge thickener and the sludge dehydration pressure filtrate return to the collection tank for retreatment.


100000 m³/d混合废水
脱水机滤液
初沉池
冷却塔
事故池
预酸化池
营养盐、液碱
厌氧反应器
沼气稳压柜
污泥回流
剩余污泥
脱气池
厌氧沉淀池
沼气燃烧器
生物选择池
污泥回流
卡鲁塞尔氧化沟
表面曝气机
二沉池
污泥浓缩池
浓硫酸
中间水池
污泥调理池
双氧水、硫酸亚铁
高级氧化池
板框压滤机
液碱、PAM、风机
中和脱气池
干污泥外运处置
终沉池
生态景观池
达标排放

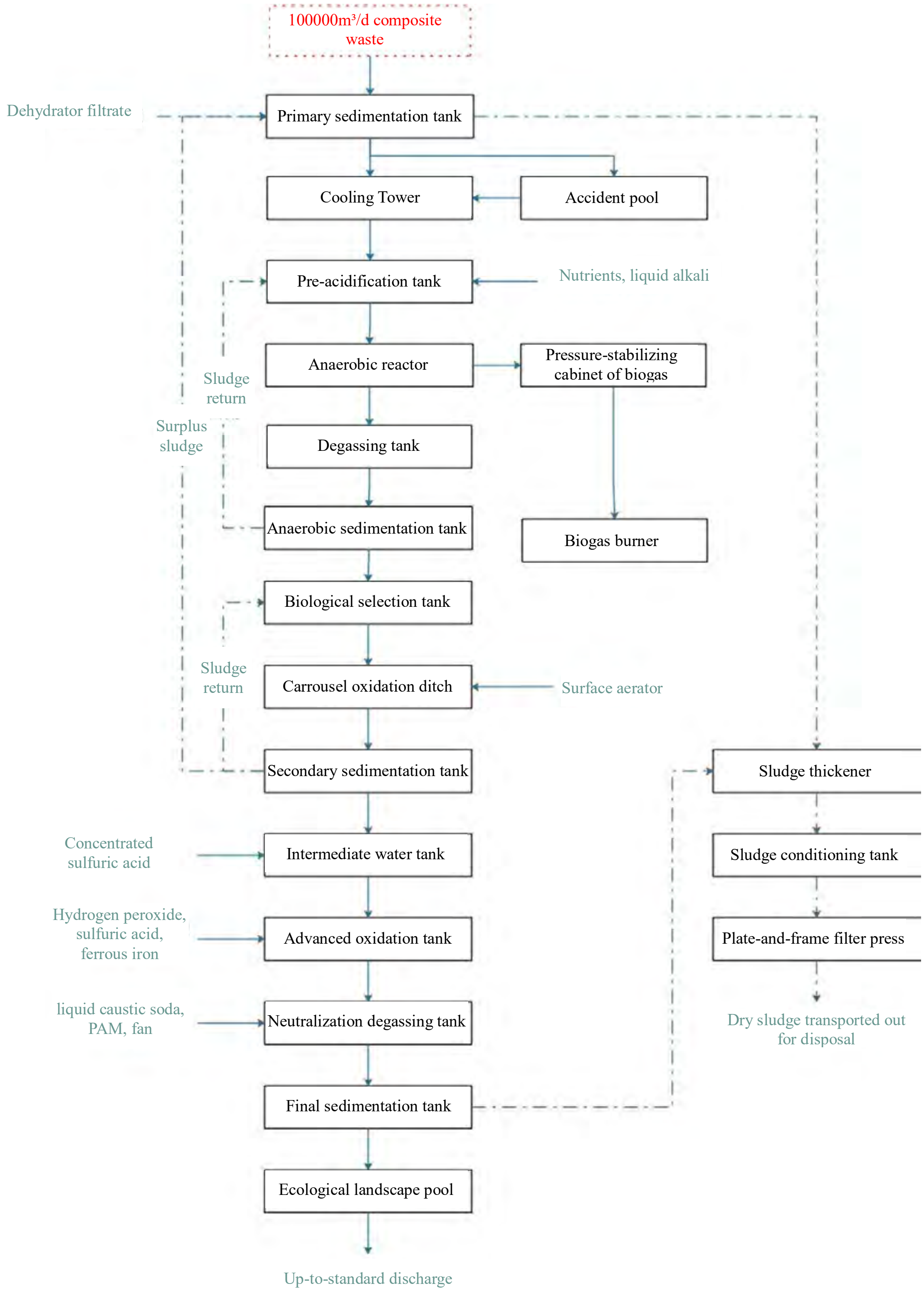


图 6.2-2 项目污水处理工艺流程图

Figure 6.2-2 Sewage Treatment Process Flow Diagram of the Project

6.2.2.3 污水处理站工艺可行性分析

6.2.2.3 Process feasibility analysis of the sewage treatment plant

根据《制浆造纸工业污染防治可行技术指南》（HJ2302-2018），项目采取三级处理处理工艺，各处理单元处理效率见表 6.2-5。

According to the Guideline for Available Techniques of Pollution Prevention and Control for Pulp and Paper Industry (HJ2302-2018), the Project adopts a three-stage treatment process, and the treatment efficiency of each treatment unit is shown in Table 6.2-5.

表 6.2-5 污水处理各单元处理效率

Table 6.2-5 Treatment Efficiency of Sewage Treatment Units

序号 S.N.	处理单元 Treating units	处理效率 Treatment efficiency
一 I	一级处理 First-stage treatment	
1	初沉池 Primary settling tank	COD_{cr}去除率为 15%~30%，BOD_5去除率为 5%~20%，SS 去除率为 40%~55% The removal rates of CODcr, BOD5 and SS are 15% ~ 30%, 5% ~ 20% and 40% ~ 55%, respectively
二 II	二级处理 Second-stage treatment	
1	厌氧处理 EGSB 反应器 EGSB reactor for anaerobic treatment	COD_{cr}去除率为 50%~60%，BOD_5去除率为 60%~80%，SS 去除率为 50%~70% The removal rates of CODcr, BOD5 and SS are 50% ~ 60%, 60% ~ 80% and 50% ~ 70%, respectively
2	卡鲁赛尔氧化沟 Carusel oxidation ditch	COD_{cr}去除率为 50%~60%，BOD_5去除率为 60%~80%，SS 去除率为 50%~70% The removal rates of CODcr, BOD5 and SS are 50% ~ 60%, 60% ~ 80% and 50% ~ 70%, respectively
三 III	三级处理 Three-stage treatment	
1	高级反应池 Advanced reaction tank	COD_{cr}去除率为 70%~90% The removal rate of CODcr is 70% ~ 90%
2	中和脱气池 Neutralization degassing pool	COD_{cr}去除率为 70%~90% The removal rate of CODcr is 70% ~ 90%

综上所述，本项目污水处理站COD_{cr}综合去除率可达 98.85~99.97%，本项目取 95.5%；BOD_5综合去除率可达 88.6~98.4%，本项目取 97%；SS 综合去除率可达 91~99%，本项目取 98%。

To sum up, the comprehensive removal rate of CODcr in the sewage treatment plant of this Project can reach 98.85 ~ 99.97%, and 95.5% is taken for this Project. The comprehensive removal rate of BOD5 can reach 88.6 ~ 98.4%, and 97% is taken for this

Project. The comprehensive removal rate of SS can reach 91 ~ 99%, and 98% is taken for this Project.

类比江苏王子项目，类比可行性分析见2.2.7.1章节。江苏王子项目污水处理规模为60000m^3/d，处理工艺采用三级处理工艺，主要为“初沉池+纯氧曝气+化学处理”，根据江苏王子项目监测数据显示，COD_{cr}排放浓度为56~80mg/L，BOD_5排放浓度为12.3~13.3mg/L，SS排放浓度为5~11mg/L，氨氮排放浓度为0.518~0.646mg/L，总氮排放浓度为2.9~4.6mg/L，总磷排放浓度为0.04~0.09mg/L，采用该工艺处理废水，出水稳定达到《制浆造纸工业水污染物排放标准》（GB3544-2008）制浆和造纸联合企业标准要求。

This Project is compared with the Jiangsu Wangzi Project and the analogy feasibility analysis is shown in 2.2.7.1. The sewage treatment scale of Jiangsu Wangzi Project is 60000m3/d and the treatment process adopts a three-stage treatment process, mainly "primary settling tank + pure oxygen aeration + chemical treatment". According to the monitoring data of Jiangsu Wangzi Project, the CODcr emission concentration is 56 ~ 80mg/L, BOD5 emission concentration is 12.3 ~ 13.3 mg/L, SS emission concentration is 5 ~ 11mg/L, ammonia nitrogen emission concentration is 0.518 ~ 0.646 mg/L, total nitrogen emission concentration is 2.9 ~ 4.6 mg/L, and total phosphorus emission concentration is 0.04 ~ 0.09 mg/L. The wastewater treated by this process stably meets the standard requirements of pulping and papermaking enterprises in the Discharge Standard of Water Pollutants for Pulp and Paper Industry (GB3544-2008).

表 6.2-6 类比项目与本项目污水处理效果对比表

Table 6.2-6 Comparison of Sewage Treatment Effect between Analogy Project and Current Project

污染物 Pollutant	江苏王子项目 Jiangsu Wangzi Project			本项目取值 Value of the Project			HJ2302-2018
	产生浓度 mg/L Generation concentration (mg/L)	排放浓度 mg/L Emission concentration (mg/L)	去除效率% Removal efficiency (%)	产生浓度 mg/L Generation concentration (mg/L)	排放浓度 mg/L Emission concentration (mg/L)	去除效率% Removal efficiency (%)	去除效率% Removal efficiency (%)
COD_{cr}	680~784	56~80	89.2~92	1656	73.0	95.6	98.85~99.97
BOD_5	336~357	12.3~13.3	98.7~99.1	592	17.8	97.0	88.6~98.4
SS	51~61	5~11	84.6~85.2	1256	25.1	98.0	91~99
NH_3-N	7.9~9.69	0.518~0.646	93.3~93.5	14	4.9	65.0	/

TN	8.68~14.1	2.9~4.6	84.3~90.3	15	7.5	50.0	/
TP	10.0~12.7	0.04~0.09	99.3~99.5	17	0.7	96.0	/

本项目较江苏王子项目在二级处理增加了厌氧处理，三级处理增加中和脱气池，中和脱气池对色度、SS 及胶体具有非常好的去除效果，项目工艺优于江苏王子项目，类比可知本项目工艺技术可行，项目出水可达到《制浆造纸工业水污染物排放标准》（GB3544-2008）制浆和造纸联合企业标准要求。

Compared with Jiangsu Wangzi Project, this Project adds anaerobic treatment in the second-stage treatment and neutralization degassing pool in the third-stage treatment. The neutralization degassing pool has sound removal effect on chroma, SS and colloid. The processes of the Project are superior to those of Jiangsu Wangzi Project. Through analogy, it can be seen that the process technology of the Project is feasible and the effluent meets the standard requirements of pulping and papermaking enterprises in the Discharge Standard of Water Pollutants for Pulp and Paper Industry (GB3544-2008).

6.2.2.4 深海排放管网工程可行性分析

6.2.2.4 Feasibility analysis of deep sea discharge pipe network project

项目生产废水在厂内处理达标后依托铁山港区深海排放管网工程在 B3 排污口深海排放。排海管沿园区三号明渠布设，与三号明渠深海排放井处接入海域管段排入海里。

The sewage of the Project is discharged into the deep-sea discharge pipe network system of Tieshangang District after being processed by the plant at sewage draining exit B3. The discharge pipe is laid along the No. 3 open channel in the park, which is connected to the sea section at the deep-sea discharge well, for discharging sewage to the sea.

深海排放井共设置有 4 个接口，目前已使用 3 个，分别为铁山港区污水处理厂、中石化北海炼化项目、斯道拉恩索林浆纸项目使用，预留一个接口经跟铁山港（临海）工业区管理委员会及北海市路港建设投资开发有限公司协商，预留的深海排放井接入口调剂供本项目使用。故本项目排放尾水在深海排放井处与其余几股废水混合后，经排放管在 B3 排污口深海排放。

The deep-sea discharge well is provided with 4 inlets. Currently, 3 have been used, namely Tieshangang sewage treatment plant, Sinopec Beihai Refining and Chemical Project and Storaenso Pulp and Paper Project, and 1 has been reserved for use in this Project after negotiation with Tieshan Port (Linhai) Industrial Zone Management Committee and Beihai Lugang Construction Investment and Development Co., Ltd. The reserved deep-sea discharge well inlet has been adjusted for this Project. Therefore, the tail water discharged from this Project is mixed with other wastewater at the deep-sea discharge well and then discharged in the deep sea of B3 sewage outlet through the discharge pipe.

铁山港区深海排放管网工程目前已投入使用，依托可行。

The deep sea discharge pipe network project in Tieshangang District has been put into use and is feasible.

6.2.2.4 初期雨水及堆场淋滤水处置措施分析

6.2.2.4 Analysis of disposal measures for initial rainwater and leaching water from the storage yard

项目木材原料采用先筛后存储工艺，采购木片含水率约 40~50%，堆场自然通风，木片在堆存过程被一定程度风干，根据企业多年生产运行经验，正常情况下木片堆存过程几乎不产生渗滤液。当遇到降雨时，雨水淋湿堆存的木材，部分雨水被木材吸收，由于木材的吸水性能一般，过饱和后的雨水不再被木材吸收，流入堆场四周的集水沟，初期雨水经收集后送项目污水处理站处理，后期清净雨水经雨水排放口排放。降雨结束后，堆场表面木材吸收的水份在日照和风吹的情况下大部分挥发进入大气，只有少部分在长期堆存后渗滤出来，经堆场地面流入淋滤水收集池。本项目木片原料周转较快，一般堆存时间不超过 1 个月，淋滤液的产生量较小，除少量流入淋滤液收集池外，部分随下一次降雨的初期雨水进入初期雨水收集池。

The raw materials of the Project will first be screened and then stored, the water content of the purchased wood chips is about 40~50%; the stockyard adopts natural ventilation, so the wood chips can be air-dried to a certain degree during storage; according to years of production and operation experience, the storage of wood chips will almost produce no leachate under normal circumstances. In the case of rain, the stocked wood will be wet; part of rainwater will be absorbed by wood, but due to the general water absorption performance, the over-saturated rainwater will not be absorbed by the wood, and flow to the catchment ditch around the stockyard; the initial rainwater shall be collected and sent to the sewage treatment plant, and the later clean rainwater can be discharged through the rainwater discharge outlet. After the rainfall, most of the water absorbed by the wood on the surface of the stockyard will evaporate into the atmosphere under sunshine and wind, and only a small amount will leach out after long-term storage and flow into the leaching water collection pool from ground of the stockyard. Considering the rapid turnover, the wood chips are generally stored for less than a month, so there will be only a small amount of leachate; in addition to the part flowing into the leachate collection pool, the rest part will flow to the initial rainwater collection tank along with the initial rainwater of the next rainfall.

根据工程分析，本项目最大初期雨水量约5102m³/次。项目设的初期雨水收集池容积为5200m³，能容纳项目收集的最大初期雨水量。初期雨水收集池设置电动闸门，收集池的容积满足一次降雨产生的初期雨水量，初期雨水经过管道收集进入初期雨水收集池，收集池达到一定液位以后，自动关闭进水闸，清洁雨水进入园区雨水管网系统。收集至雨水池的初期雨水主要污染物为SS，泵入厂区污水处理站处理。

According to engineering analysis, the maximum initial rainwater volume of this Project is about 5102m³/time. The initial rainwater collection tank set up by the Project has a volume of 5200m³, which can accommodate the maximum initial rainwater collected by the Project. The initial rainwater collection tank is equipped with electric gates. The volume of the collection tank meets the initial rainwater volume generated by one rainfall. The initial rainwater is collected into the initial rainwater collection tank through pipelines. After the collection tank reaches a certain liquid level, the intake gate is automatically closed and the clean rainwater enters the rainwater pipe network system of the park. The main pollutant of the initial rainwater collected to the rainwater tank is SS, which is pumped into the sewage treatment plant for treatment.

6.2.3 噪声污染防治措施及其可行性分析

6.2.3 Noise pollution control measures and feasibility analysis

工程采取如下噪声控制与防治措施可最大限度减轻污染影响。

The following noise control measures are adopted in the Project to minimize the pollution impact.

（1）噪声区域与其它生产区域完全隔开，将噪声控制在一定范围内。

(1) The noise area is completely separated from other production areas to control the noise within a certain range.

（2）设置能观察生产的操作值班室，避免工人连续8小时长期在高噪声区域工作。

(2) Set up an operation duty room that can observe production to prevent workers from working in high-noise areas for 8 consecutive hours.

（3）建筑上采用吸音材料进行处理（消声量可达8～15dB）。

(3) Adopt sound-absorbing building materials (the noise reduction volume can reach 8 ~ 15dB).

（4）高噪声设备采取有效的减震措施。

(4) Take effective shock absorption measures for high noise equipment.

（5）各大型风机均有高效消声器（消声量可达 10～30dB）。

(5) Equip each large fan with a high-efficiency silencer (the noise reduction volume can reach 10 ~ 30dB).

（6）汽轮机组布设齿轮减速器，选用与发电机直连机组，以减少运行噪音，为了减少锅炉和汽轮机启动时的蒸汽排空噪声，在锅炉过热器放空管和汽轮机放空管上加装排汽消声器。

(6) The steam turbine unit shall be equipped with gear reducers, and the unit directly connected with the generator shall be selected to reduce the operation noise. To reduce the steam discharging noise when the boiler and steam turbine are started, steam discharging silencers shall be installed on the boiler superheater escape pipe and the steam turbine escape pipe.

（7）动力消耗较大的鼓风机、引风机及水泵等布置在底层平面，上述各设备采用防振基础，送风机进口布置在车间高位，送风机进风管加装消声器，送风机出口加装波形补偿器防止噪声传播。引风机布置在车间外的单层引风机房内。排粉风机出口管加装波形补偿器防止噪声传播。为了减少锅炉启动时的蒸汽排空噪声，在锅炉过热器放空管上加装排汽消声器。

(7) Blowers, induced draft fans and water pumps with large power consumption are arranged at the bottom plane. The above-mentioned equipment adopts an anti-vibration foundation. The inlet of the blower is arranged at the high level of the workshop. The inlet pipe of the blower is equipped with silencers and the outlet is equipped with waveform compensators to prevent noise transmission. The induced draft fan is arranged in the single-storey induced draft fan room outside the workshop. The outlet pipe of the powder exhaust fan is equipped with a waveform compensator to prevent noise transmission. To reduce the noise of steam discharging when the boiler is started, a steam discharging silencer is installed on the escape pipe of the boiler superheater.

（8）其它设备尽量采用减震，隔声，消声等有效措施。

(8) Other equipment shall adopt effective measures such as shock absorption, sound insulation and noise elimination as far as possible.

（9）尽量采取自动化生产，远程操作等手段，减少工人与噪声源的接触。

(9) Try to adopt automatic production, remote operation and other means to reduce the contact between workers and noise sources.

（10）建筑上尽量采取吸音处理。在总图布置上考虑减少噪声对办公区、生活区及周边居民区等环境的影响，留出一定的防护距离，设置绿化隔声带；

(10) Sound absorption treatment shall be adopted as far as possible on buildings. In the general layout, consideration should be given to reducing the impact of noise on the environment of office areas, living areas and surrounding residential areas, leaving a certain protective distance for green sound insulation belts.

（11）对于运输噪声，合理规划运输路线和运输时间，尽量避开居民区、学校、医院等噪声敏感区域，以及居民午休和夜间休息时间；机动车辆应定期保养，及时维修，保持其技术性能良好，避免噪声污染。

(11) For transportation noise, it is necessary to reasonably plan transportation routes and transportation time, and avoid noise sensitive areas such as residential areas, schools and hospitals, as well as residents' lunch break and night rest time; motor vehicles should be regularly maintained and repaired in time to maintain good technical performance and avoid noise pollution.

通过有效的噪音控制措施，厂界外 1m 处的受声点的噪音影响可控制在《工业企业厂界环境噪声排放标准》（GB12348-2008）3 类标准，即昼间 65dB(A)、夜间 55dB(A)。

Through effective noise control measures, the noise influence of the sound receiving point 1m outside the plant boundary can be controlled in Class 3 standard in the Emission Standards for Industrial Enterprises Noise at Boundary (GB12348-2008), i.e. 65dB (A) in daytime and 55dB (A) at night.

6.2.4 固体废物染防治措施及其可行性分析

6.2.4 Solid waste control measures and feasibility analysis

项目固体废物处置措施见表 2.2.7.5 章。

Refer to Table 2.2.7.5 for solid waste disposal measures of the Project.

6.2.2.1 木屑处置可行性分析

6.2.2.1 Feasibility analysis of sawdust disposal

木屑主要成分是纤维和木质素，具有较高的热值，送至固废锅炉作燃料。

The main components of sawdust are fiber and lignin, which have high calorific value and are sent to solid waste boilers as fuel.

6.2.2.2 浆渣处置可行性分析

6.2.2.2 Feasibility analysis of slurry disposal

浆料洗选过程产生一定量的浆渣，主要成分为纤维渣等，经脱水后送至固废锅炉作燃料。

The slurry washing process produces a certain amount of slurry slag, the main component of which is fiber slag, etc., which is dehydrated and sent to solid waste boilers as fuel.

6.2.2.3 锅炉飞灰、锅炉灰渣、脱硫石膏

6.2.2.3 Boiler fly ash, boiler ash and desulfurized gypsum

固废锅炉飞灰含少量重金属及二噁英，本项目焚烧的燃料成分主要为造纸废弃物、造纸渣浆及污泥，考虑到造纸废弃物的成分相对简单，其原生燃料里重金属等有害物质含量本身较低。对照国家危险废物名录，HW18 焚烧处置残渣中未明确规定一般固废和污泥焚烧产生的飞灰属于危险废物。类比山东太阳纸业已建成的造纸固废焚烧发电资源综合利用工程，该项目设有 1 台 180t/h 固废锅炉，燃料为造纸污泥、木屑、浆渣、煤。山东省环科院环境检测有限公司对该锅炉烟气除尘产生的飞灰的腐蚀性、易燃性、反应性、急性毒性、浸出毒性、物质毒性进行鉴别，采集飞灰样品 100 个，采样周期为一个月，鉴定结果显示，飞灰样品不具有 GB5085-2007 规定的危险特性（见附件 19）。本项目固废锅炉燃料与山东太阳纸业固废锅炉燃料种类一致，飞灰性质基本相近，属于一般工业固体废物，但考虑燃料组分和比例的差异性，评价要求本项目建成投产后，定期对固废锅炉的飞灰进行浸出毒性检测，如检测具有危险特性需委托有资质的单位进行处置。

The fly ash of solid waste boiler may contain a small amount of heavy metals and dioxins, and the fuel of the Project mainly includes paper-making waste, pulp slag and sludge; considering the simple composition of paper-making waste, the content of harmful substances, such as heavy metals, in parent fuel, is relatively low. Referring to the *National Catalog of Hazardous Wastes*, the fly ash generated through incineration of general solid waste and sludge not clearly specified in incineration by HW18 belongs to hazardous waste. Referring to the established papermaking solid waste incineration power generation comprehensive utilization project of Shandong Sun Paper, the Project is set with a 180t/h solid waste boiler, with the fuel of papermaking sludge, wood chippings, pulp slag, and coal. Shandong Academy of Environmental Sciences Environmental Testing Co., Ltd. has identified the corrosivity, flammability, reactivity, acute toxicity, leaching toxicity, and substance toxicity of fly ash generated by dedusting of flue gas of this boiler, and collected 100 fly ash samples, with the sampling period of one month. The results showed that fly ash samples do not have the hazardous characteristics specified in GB5085-2007 (see Appendix 19). The type of fuel for solid waste boiler in the Project is the same as that in Shandong Sun Paper. With similar properties of fly ash, solid waste thereunder is general industrial solid waste. But given the differences in fuel composition and proportion, the assessment requires that the fly ash from solid waste boilers shall be regularly tested for extraction toxicity toxicity after the Project is completed and put into operation. If hazardous characteristics are found upon such tests, a qualified unit shall be entrusted for disposal.

锅炉灰渣属一般工业固废，综合利用价值高，用途较广，可作制砖和铺路，本项目锅炉灰渣可外售给制砖厂进行综合利用，对环境影响不大。

Boiler ash and slag, as general industrial solid waste with high comprehensive utilization value and wide application, can be used for brick-making and paving. The boiler ash and slag of the Project can be sold to brick making factories for comprehensive utilization, with little impact on the environment.

锅炉烟气处置措施设有炉外石灰石/石膏湿法脱硫工艺脱硫，此措施会产生副产物脱硫石膏，主要成分为碳酸钙，属一般工业固废，可外售水泥厂作为水泥的缓凝剂或者建材厂制成石膏板、石膏砌块等建材材料，对环境影响不大。

Boiler flue gas disposal measures include limestone/gypsum WFGD outside the boiler. This will produce by-product desulfurized gypsum, mainly composed of calcium carbonate and falling under the category of general industrial solid waste. So such desulfurized gypsum can be sold to cement plants as retarders for cement or to building material factory for building materials such as gypsum boards and gypsum blocks, with little impact on the environment.

6.2.2.4 废分子筛处置可行性分析

6.2.2.4 Feasibility analysis of waste molecular sieve disposal

制氧站用分子筛需定期更换，主要材料为铝硅酸盐、氧化铝，定期交由厂家回收再利用。

Molecular sieves for oxygen generation stations need to be replaced regularly. The main materials are aluminosilicate and alumina, which are regularly recycled by manufacturers.

6.2.2.5 污水处理站污泥处置可行性分析

6.2.2.5 Feasibility analysis of sludge disposal in the sewage treatment plant

污泥主要来自污水处理站的各级沉淀池，主要成分为细小纤维、微生物、腐殖质胶体等。各种污泥混合后经污泥脱水机脱水，送至固废锅炉作燃料。少量化学处理段污泥不宜燃烧，拟送铁山港工业区一般工业固体废物集中处置场填埋处置。

Sludge mainly comes from settling tanks at all levels of the sewage treatment plant, and its main components are fine fibers, microorganisms, humus colloid, etc. All kinds of sludge are mixed and dehydrated by sludge dewatering machine, and sent to solid waste boilers as fuel. A small amount of sludge from the chemical treatment section is not suitable for combustion and is sent to the Tieshangang Industrial Park General Industrial Solid Waste Centralized Disposal Site for landfill disposal.

6.2.2.6 白泥处置可行性分析

6.2.2.6 Feasibility analysis of white mud disposal

山东省造纸工业研究设计院赵广锡等人《造纸白泥在烟气脱硫中的应用》对山东泰山纸业有限公司造纸白泥成分分析，造纸白泥其主要化学成分为 $CaCO_3$，另含有少量的残碱和 CaO 等物质，由于白泥 $CaCO_3$ 含量较高，是很好的脱硫剂。因此，本项目的白泥一部分作为锅炉脱硫剂使用，剩余部分送石灰窑回收处置。

The Application of Paper White Mud in Flue Gas Desulfurization by Zhao Guangxi et al from Shangdong Paperamking Industry Research and Design Institute analyzed the composition of paper white mud from Shandong Taishan Paper Co., Ltd. The main chemical composition of paper white mud is CaCO3, and it also contains a small amount of residual alkali, CaO and other substances. Due to the high content of CaCO3 in white mud, it is a good desulfurizing agent. Therefore, part of the white mud of this Project is used as boiler desulfurizing agent, and the rest is sent to the lime kiln for recovery and disposal.

6.2.2.7 绿泥、石灰渣、化学污泥处置可行性分析

6.2.2.7 Feasibility analysis of green mud, lime slag and chemical sludge disposal

一期项目产生的绿泥 8500t/a、石灰渣 1831t/a 及不宜焚烧的化学污泥 9200t/a。二期项目达产后产生的绿泥 9500t/a、石灰渣 1918t/a 及不宜焚烧的化学污泥 17000t/a。

Phase I of the Project produces 8500t/a of green mud, 1831t/a of lime slag and 9200t/a of chemical sludge that is not suitable for incineration. Phase II of the Project will produce 9500t/a of green mud, 1918t/a of lime slag and 17000t/a of chemical sludge that is not suitable for incineration.

绿泥是碱回收车间产生的固体废物，主要来自苛化时绿液中的沉淀物，绿泥主要成分为硅酸钙、碳酸钙、有机物和少量碱等，此外还含有少量铝铁镁氧化物等，绿泥主要化学成分参见表 6.2-7。

Green mud is a solid waste generated by the alkali recovery workshop, mainly from sediment in green liquid during causticization. The main components of green mud are calcium silicate, calcium carbonate, organic matter, a small amount of alkali, etc. It also contains a small amount of aluminum, iron, magnesium oxide, etc. Refer to Table 6.2-7 for the main chemical components of green mud.

表 6.2-7 绿泥主要化学组成

Table 6.2-7 Main Chemical Composition of Green Mud

组分	有机物	硅酸钙	碳酸钙	铝、铁、镁的氧化物	碳酸钠	苛性钠
百分比%	14.35	21.3	42.1	4.3	6.9	9.3

本项目绿泥性质参照同类企业制浆（化学浆）腐蚀性及浸出毒性试验分析结果确定，见表 6.2-8。

The properties of green mud in this Project are determined according to the corrosion and extraction toxicity test and analysis results of pulping (chemical pulp) of similar enterprises, as shown in Table 6.2-8.

表 6.2-8 绿泥腐蚀性及浸出毒性试验结果 单位：mg/L（pH 值除外）

Table 6.2-8 Test Results of Corrosion and Extraction Toxicity of Green Mud Unit: mg/L (except pH value)

样品	pH 值	铁	锰	铝	总铬	铜	砷	镉
化学浆绿泥	9-11	0.101	ND	1.023	ND	0.295	ND	ND
GB5085.1-2007 GB5085.3-2007	≥12.5 or ≤2.0	/	/	/	15	100	5	/
GB8978-1996 一级	6～9	/	2.0	/	1.5	0.5	0.5	/

注：ND 为未检出。
Note: ND means "not detected".

试验结果各项指标均未超过《危险废物鉴别标准 浸出毒性 鉴别》（GB5085.3-2007）和 《危险废物鉴别标准 腐蚀性鉴别》（GB5085.1-2007），确定绿泥为一般工业固体废物；但 pH 值已超过《污水综合排放标准》（GB8978-1996）一级标准，因此绿泥属于第Ⅱ类一般工业固体废物。

The test results showed that all indexes did not exceed the Identification Standards for Hazardous Wastes-Identification for Extraction Toxicity (GB5085.3-2007) and the Standards for Hazardous Wastes-Identification for Corrosion (GB5085.1-2007), and green mud was determined to be a general industrial solid waste. However, the pH value has exceeded the Class I standard of the Integrated Wastewater Discharge Standard (GB8978-1996), so green mud is a Class II general industrial solid waste.

石灰渣的主要成分是碳酸钙、硅酸钙、有机物、砾石等，与绿泥成分相似，参照绿泥腐蚀性及浸出毒性试验分析结果，石灰渣属于第Ⅱ类一般工业固体废物。

The main components of lime slag are calcium carbonate, calcium silicate, organic matter, gravel, etc., which are similar to the components of green mud. According to the analysis results of corrosion and extraction toxicity tests of green mud, lime slag is a Class II general industrial solid waste.

本项目配套一般固体废物填埋场目前正在进行选址及前期工作，铁山港（临海）工业区管理委员会计划于 2020 年 6 月前完成选址（见附件 10），建设单位承诺于 2022 年底建成投入运行，本项目一期生产线计划于 2021 年 8 月建成投入试生产，在本项目配套一般固体废物填埋场正常运行前，依托铁山港区一般固体废物集中处置场过渡使用 5~12 个月。本项目产生的固体废物在铁山港区一般固体废物集中处置场严格按环评及批复要求完成建设、相关环保验收手续齐全后方进入填埋处置。项目配套一般固体废物填埋场投入使用后，项目产生的一般工业固体废物将不再依托铁山港区一般固体废物集中处置场处置。

The site of the supporting general solid waste landfill is being selected at present, and the preliminary work is being carried out; Tieshangang (Linhai) Industrial Park Management Committee plans to complete the site selection before June 2020 (see Appendix10). The construction unit promises to complete and put it into operation at the end of 2021. The Phase I production line is planned to be completed and put into trial operation in August 2021. Prior to the operation of the supporting general solid waste landfill, the General Solid Waste Disposal Site of Tieshangang District is planned to be used for 5~12 months as transition. Solid waste generated by the Project can only be subject to the landfill disposal after the construction of general solid waste centralized disposal site in Tieshangang District is completed in strict accordance with the EIA and approval, and the relevant environmental protection acceptance procedures are complete. After the supporting general solid waste landfill site of the Project is put into use, general industrial solid waste generated by the Project will no longer be disposed of by the general solid waste centralized disposal site of Tieshangang District.

铁山港工业区一般工业固体废物集中处置场位于北海市铁山港工业区中石化配套道路以南，中石化火炬区以东，服务范围为铁山港工业区及北海市工业企业产生的第II类一般工业固体废物。填埋区库容 45.08 万 m^3，有效容积 40.07 万 m^3，设计服务年限 15 年，年运营天数为 365 天，设计填埋废物规模为 26713m^3/a，73.20m^3/d，处置场的废物处置主要处置绿泥、石灰渣、脱硫废渣等第 II 类一般工业废物，综合各处置废物性质，填埋废物密度暂按 1.36 吨/m^3 计算，项目可平均填埋经预处理后的固体废物 36329.68t/a，约 100t/d。项目服务范围为铁山港工业区及北海市工业企业，主要优先处置铁山港工业区内斯道拉恩索（广西）林浆纸项目、中国石化北海炼化有限责任公司产生的第 II 类一般工业固体废物。

Tieshangang Industrial Park General Industrial Solid Waste Centralized Disposal Site is located in the south of Sinopec supporting road and east of Huoju District in Tieshangang Industrial Park, Beihai City, which is mainly used to dispose Class II general industrial solid waste produced by Tieshangang Industrial Park and industrial enterprises in Beihai. The storage capacity of the landfill site is 450,800m^3, with an effective volume of 407,700m^3, a design service life of 15 years, and annual operation days of 365 days; the designed waste landfilling scale of 26,713m^3/a and 73.20m^3/d. Waste disposal in the disposal site mainly includes Class II general industrial wastes such as green mud, lime slag and desulfurization waste residue. Considering the properties of various wastes disposed of, the landfill waste density is temporarily counted at $1.36t/m^3$, and the Project can accommodate the landfilling of 36,329.68t/a and about 100t/d of pretreated solid waste averagely. Service scope of the Project is Beihai Tieshangang Industrial Park and Beihai industrial enterprises; and the priority is given to the disposal of Class II general industrial solid waste generated respectively by Stora Enso (Guangxi) Forest-Pulp-and-Paper Project and Sinopec Beihai Refining and Chemical Co., Ltd. in Beihai Tieshangang Industrial Park.

本项目拟依托铁山港工业区一般工业固体废物集中处置场的时间为 2021 年 8 月~2022 年 8 月，根据调查中国石化北海炼化有限责任公司需填埋固体废物量为脱硫废渣 514t/a，斯道拉恩索（广西）林浆纸项目目前只建成 20 万吨化机浆项目和年产 45 万吨高档包装卡纸板，需填埋固体废物量为绿泥、石灰渣 1500 t/a（含水率 60%），斯道拉恩索（广西）林浆纸项目在本项目依托期间建成投产的可能性较小。综上分析，本项目依托期间，入场填埋的废物量为 2014t/a，剩余设计填埋量约 34316t/a。

The Project is proposed to rely on the Tieshangang Industrial Park General Industrial Solid Waste Centralized Disposal Site from August 2021 to August 2022. Upon the investigation, the amount of solid waste to be buried in Sinopec Beihai Refining and Chemical Co., Ltd. is 514t/a desulfurization waste residue. At present, only 200,000t chemi-machanical pulp project and 450,000t/a high-grade packaging cardboard have been completed in Stora Enso (Guangxi) Forest-Pulp-and-Paper Project, and the solid waste to be buried is 1500t/a green mud and lime residue (water content: 60%). So Stora Enso (Guangxi) Forest-Pulp-and-Paper Project is less likely to be completed and put into operation during the said period. To sum up, during the relying-on period, the amount of waste sent into the site for landfilling is 2014t/a, and the remaining designed landfill amount is about 34316t/a.

本项目需要填埋处置的一般固体废物为绿泥（绝干）8500t/a、石灰渣 1831t/a、污泥（化学处理段）9200 t/a，根据铁山港工业区一般工业固体废物集中处置场环评报告分析，石灰渣直接入场填埋，污泥经稳定干化系统预处理及堆放自然蒸发后，入场填埋含水率为 45%，故本项目污泥含水率按 65%（26286t/a）进场，污泥与石灰的配比为 1:0.35 进行干化，处理后污泥含水率 50%（18400t/a），经堆放自然蒸发后，入场填埋含水率为 45%（16727t/a）。项目产生的绿泥经厂内预处理至含水率 45%后直接进填埋场填埋，

入场量为 15455t/a。故本项目依托期间，入场填埋的一般固体废物总量为 34013t/a。未超出铁山港工业区一般工业固体废物集中处置场剩余处置能力。项目依托托铁山港工业区一般工业固体废物集中处置场可行。

General solid wastes to be disposed of in the Project are 8500t/a green mud (oven dry), 1831t/a lime slag, 9200t/a sludge (at chemical treatment section), According to the analysis of EIA report on Tieshangang Industrial Park General Industrial Solid Waste Centralized Disposal Site, lime slag is directly sent into the site for landfilling. After the sludge is pretreated by a stable drying system and piled up for natural evaporation, the water content of sludge sent into the site for landfilling is 45%. Therefore, the water content of sludge sent into the site in the Project is 65% (26286t/a); and the ratio of sludge to lime is 1:0.35 for drying, the water content of treated sludge is 50% (18400t/a), and the water content of the sludge sent into the site for landfilling is 45% (16727t/a) After piled up for natural evaporation. Green mud produced by the Project is pretreated to 45% water content in the plant and then directly sent into the landfill site for landfilling, with an admission volume of 15455t/a. Therefore, during the relying-on period of the Project, the total amount of general solid waste sent into the site for landfilling is 34013t/a, which does not exceed the remaining disposal capacity of the Tieshangang Industrial Park General Industrial Solid Waste Centralized Disposal Site . It is feasible for the Project to rely on the Tieshangang Industrial Park General Industrial Solid Waste Centralized Disposal Site.

6.2.2.8 危险废物

6.2.2.8 Hazardous wastes

根据《国家危险废物名录》（环境保护部令第 39 号），废离子交换树脂（HW13）、储油罐残渣（HW08）、隔油池污泥（HW08）、废活性炭（HW18）、废催化剂（HW50）、废机油（HW08）属于危险废物，生产工段产生的危险废物定期委托有资质的单位上门进行更换和收运，大部分做到即产即收，少量不能马上清运离场的危废送项目危废暂存库暂存，项目在热电站西北面设 1 座危险废物暂存库，主要暂存废活性炭、废催化剂、废机油等，占地面积 96 平方米，满足 20 吨以上危险废物暂存。按《危险废物贮存污染控制标准》（GB18597-2001）及其修改单标准要求建设，贮存区按照规定设置警示标志，储存区进行防雨、防腐、防渗漏处理。危险废物转运需委托有资质的单位进行，且严格

按《危险废物转移联单制度》要求执行。

According to the Directory of National Hazardous Wastes (Decree No.39 of the Ministry of Environmental Protection), waste ion exchange resin (HW13), oil storage tank residue (HW08), oil separation tank sludge (HW08), spent activated carbon (HW18), waste catalyst (HW50) and waste engine oil (HW08) are hazardous wastes. Hazardous wastes generated in the production section are regularly replaced and collected and transported by qualified units on site. Most of them can be collected as soon as they are produced, and a small number of hazardous wastes that cannot be removed immediately are sent to the Project's hazardous waste temporary storage warehouse for temporary storage. The Project has a hazardous waste temporary storage warehouse in the northwest of the thermal power station, which mainly temporarily stores spent activated carbon, waste catalyst, waste engine oil, etc. It covers an area of 96 sqm and meets the temporary storage of over 20 tons of hazardous wastes. According to the requirements of the Standard for Pollution Control on Hazardous Waste Storage (GB18597-2001) and its amendment form standards, the storage area shall be equipped with warning signs in accordance with regulations, and the storage area shall be treated with rainproof, anticorrosion and leakage prevention. The hazardous waste transfer shall be entrusted to qualified units and shall be carried out in strict accordance with the Hazardous Waste Transfer Registration Sheet System.

通过上述措施，项目产生的固体废物全部得到综合利用或安全处置，项目固体废物在暂存、转运和处置过程对环境的影响较小。

Through the above measures, all the solid wastes generated by the Project are comprehensively utilized or safely disposed of, and the Project solid wastes have little impact on the environment during temporary storage, transportation and disposal.

6.2.5 地下水染防治措施及其可行性分析

6.2.5 Groundwater pollution control measures and feasibility analysis

6.2.5.1 控制原则

6.2.5.1 Control principles

针对项目可能发生的地下水污染，地下水污染防治措施按照“源头控制、末端防治、

污染监控、应急响应”相结合的原则，从污染物的产生、入渗、扩散、应急响应全阶段进行控制。

In view of the groundwater pollution that may occur during the Project, the groundwater pollution prevention and control measures shall be taken to control from the whole stage of pollutant generation, infiltration, diffusion and emergency response according to the principle of combining "source control, end prevention, pollution monitoring and emergency response".

（1）源头控制措施

(1) Source control measures

主要包括在工艺、管道、设备、污水储存及处理构筑物采取相应措施，防止和降低污染物跑、冒、滴、漏，将污染物泄漏的环境风险事故降到最低程度；管线敷设尽量采用“可视化”原则，即管道尽可能地上敷设，做到污染物“早发现、早处理”，减少由于埋地管道泄漏而造成的地下水污染。

It mainly includes taking corresponding measures in processes, pipelines, equipment, sewage storage and treatment structures, to prevent and reduce the evaporation, emission, drip and leak of pollutants and to minimize the environmental risk accidents of pollutant leakage. The principle of "visualization" shall be adopted as far as possible for pipeline laying, i.e. pipelines shall be laid on the ground as much as possible, to achieve "early detection for early treatment" of pollutants and reduce groundwater pollution caused by leakage of buried pipelines.

（2）末端控制措施

(2) End control measures

主要包括建设区域污染区地面的防渗措施和泄漏、渗漏污染物收集措施，即在污染区地面进行防渗处理，防止洒落地面的污染物渗入地下，并把滞留在地面的污染物收集起来，集中送至污水处理场处理；末端控制采取分区防渗，按重点污染防治区、一般污染防治区和非污染区防渗措施有区别的防渗原则。

It mainly includes seepage prevention measures for the ground in the polluted area of the construction area and collection measures for leakage and leakage pollutants, i.e. anti-infiltration treatment is carried out on the ground in the polluted area to prevent pollutants scattered on the ground from infiltrating into the ground, and pollutants stranded on the ground are collected and sent to the sewage treatment plant for treatment. As for end control, infiltration prevention shall be carried out in different areas, and infiltration prevention measures shall be differentiated according to key pollution prevention and control areas, general pollution prevention and control areas and non-pollution areas.

（3）污染监控体系

(3) Pollution monitoring system

实施覆盖生产区的地下水污染监控系统，建立完善的监测制度，配备先进的检测仪器和设备，科学合理设置地下水监控井，及时发现污染、控制污染。

A groundwater pollution monitoring system covering the production area is implemented, including establishing a sound monitoring system, providing advanced detection instruments and equipment, scientifically and reasonably setting groundwater pollution monitoring wells, timely detecting pollution for prompt control.

（4）应急响应措施

(4) Emergency response measures

包括一旦发现地下水污染事故，立即启动应急预案、采取应急措施控制地下水污染，并使污染得到治理。

Once the groundwater pollution accident is found, the emergency plan shall be launched immediately, and emergency measures shall be taken to control the groundwater pollution and govern the pollution.

6.2.5.2 地下水分区防渗

6.2.5.2 Groundwater seepage prevention

根据《环境影响评价技术导则 地下水环境》（HJ610-2016），结合项目场地污染控制难易程度和天然包气带防污性能，场区各生产功能单元可能泄漏至地面区域的污染物性质和生产单元构筑方式，将场区划分为重点防渗区、一般防渗区和简单防渗区。

According to the Technical Guidelines for Environmental Impact Assessment-Groundwater Environment (HJ610-2016), the site is divided into key seepage prevention area, general seepage prevention area and simple seepage prevention area in combination with the difficulty of pollution control of the project site and the anti-pollution performance of natural aeration zones, the nature of pollutants that each production functional unit in the site may leak to the ground area and the construction mode of production units.

①重点防渗区

① Key seepage prevention area

主要为生产运行过程中可能发生废水泄漏到地面或地下区域，包括项目化学浆车间、化机浆车间、碱回收车间（蒸发工段）、二氧化氯制备车间、MVR 蒸发工段、污水处理站、事故应急池、化工库及储罐区、加油站、危废暂存库，以及各类下设管道或废水收集池的区域，划为重点防渗区。重点防渗区防渗要求为等效黏土防渗层厚度≥6m，渗透系数小于 1.0×10^{-7}cm/s，或参照《危险废物填埋污染控制标准》（GB18598-2001）进行设计。

Wastewater may leak to the ground or underground area during production and operation, including chemical pulp workshop, chemical mechanical pulp workshop, alkali recovery workshop (evaporation section), chlorine dioxide preparation workshop, MVR evaporation section, sewage treatment plant, emergency pool, chemical warehouse and storage tank area, gas station, hazardous waste temporary storage warehouse, and various areas with pipelines or wastewater collection tanks, which are designated as key seepage prevention areas. The seepage prevention requirements for key anti-infiltration areas are equivalent clay seepage prevention layer thickness ≥ 6 m, permeability coefficient less than 1.0 × 10-7cm/s, or design according to the Standard for Pollution Control on the Security Landfill Site for Hazardous Wastes (GB18598-2001).

②一般防渗区

② General seepage prevention area

主要为生产运行中可能发生含有污染物介质泄漏到地面的区域，主要为碱回收（苛化、燃烧车间）、文化纸车间、特种纸车间、生活用纸车间、白卡纸车间、浆板车间、热电站、成品库、综合仓库等。对于一般防渗区，参照《一般工业固体废物贮存、处置场污染控制标准》（GB18599-2001）II 类场进行设计。应采用天然或人工材料构筑防渗层，防渗层的厚度应相当于渗透系数 1.0×10^{-7}cm/s 和厚度 1.5m 的粘土层的防渗性能。

It mainly includes areas where the medium containing pollutants may leak to the ground during production and operation, mainly alkali recovery (causticization and combustion workshop), cultural paper workshop, specialty paper workshop, domestic paper workshop, white cardboard workshop, pulp board workshop, thermal power station, finished product warehouse, comprehensive warehouse, etc. For the general seepage prevention areas, the design shall be carried out according to the Class II site of the Standard for Pollution Control on the Storage and Disposal Site for General Industrial Solid Wastes (GB18599-2001). Natural or artificial materials should be used to construct the impermeable layer, and the thickness of the impermeable layer should be equivalent to the seepage prevention performance of clay layer with a permeability coefficient of 1.0 × 10-7cm/s and thickness of 1.5 m.

③简单防渗区：项目办公和生活区划为简单防渗区，进行一般地面硬化处理。

(3) Simple seepage prevention area: The office and living areas of the Project are simple seepage prevention areas, and general ground hardening treatment is carried out.

项目防渗分区及要求见表 6.2-9，分区防渗图见附图 4。

Refer to Table 6.2-9 for seepage prevention areas and requirements of the Project, and refer to Figure 4 for seepage prevention drawing.

表 6.2-9　各工作区防渗要求

Table 6.2-9 Seepage Prevention Requirements for Each Working Area

防渗级别 **Seepage prevention grade**	工作区 **Working area**	防渗要求 **Seepage prevention requirements**
重点防渗区 Key seepage prevention area	化学浆车间 Chemical pulp workshop	等效黏土防渗层厚度≥6m，渗透系数小于 1.0×10^{-7}cm/s，或参照 GB GB18598-2001《危险废物填埋污染控制标准》进行设计。 Equivalent clay seepage prevention layer thickness ≥ 6 m, permeability coefficient less than 1.0 × 10-7cm/s, or design according to the Standard for Pollution Control on the Security Landfill Site for Hazardous Wastes (GB18598-2001).
	化机浆车间 Chemimechanical pulp workshop	
	碱回收车间（蒸发工段） Alkali recovery workshop (evaporation section)	
	二氧化氯制备车间 Chlorine dioxide preparation workshop	
	MVR 蒸发工段 MVR evaporation section	
	污水处理站 Sewage treatment plant	
	事故应急池 Emergency pool	
	化工库及储罐区 Chemical warehouse and tank farm	
	危废暂存库 Hazardous waste temporary storage room	
	加油站 Gas station	

<table>
<tr><th>防渗级别
Seepage prevention grade</th><th colspan="2">工作区
Working area</th><th>防渗要求
Seepage prevention requirements</th></tr>
<tr><td rowspan="7">一般防渗区
General seepage prevention area</td><td rowspan="2">碱回收
Alkali recovery</td><td>苛化工段
Causticization section</td><td rowspan="7">一般污染区防渗要求：当天然基础层的渗透系统大于1.0×10^{-7}cm/s，应采用天然或人工材料构筑防渗层，防渗层的厚度应相当于渗透系数 1.0×10^{-7}cm/s 和厚度1.5m 的粘土层的防渗性能。
Requirements for seepage prevention in general polluted areas: When the permeability system of natural foundation layer is greater than 1.0 × 10-7cm/s, natural or artificial materials shall be used to construct the impermeable layer, and the thickness of the impermeable layer should be equivalent to the seepage prevention performance of clay layer with permeability coefficient of 1.0 × 10-7cm/s and thickness of 1.5 m.</td></tr>
<tr><td>燃烧工段
Combustion section</td></tr>
<tr><td colspan="2">文化纸车间、特种纸车间、生活用纸车间、白卡纸车间、浆板车间
Cultural paper workshop, specialty paper workshop, household paper workshop, white cardboard workshop, pulp board workshop</td></tr>
<tr><td colspan="2">热电站
Thermal power plant</td></tr>
<tr><td colspan="2">综合仓库
Comprehensive warehouse</td></tr>
<tr><td colspan="2">成品库
Finished product warehouse</td></tr>
<tr><td colspan="2">木片堆场及备料车间
Wood chip stockyard and preparation workshop</td></tr>
<tr><td>简单防渗区
Simple seepage prevention area</td><td colspan="2">对厂区地下水基本不存在风险的办公管理区、物流用地以及厂区道路等部分
The office management area, logistics land and roads in the plant area that basically do not have risks to groundwater, etc.</td><td>一般地面硬化处理。
General ground hardening treatment.</td></tr>
</table>

6.2.5.4 地下水污染监控

6.2.5.4 Groundwater pollution monitoring

根据《环境影响评价技术导则 地下水环境》（HJ610-2016），项目根据区域水文地质条件，在厂区上游、项目区地下水径流下游设置监测井，以监控全厂地下水污染扩散情况。地下水监控计划见表 6.2-10 和图 6.2-3。

According to the Technical Guidelines for Environmental Impact Assessment-Groundwater Environment (HJ610-2016), the Project will set up monitoring wells upstream of the plant area and downstream of groundwater runoff in the project area according to regional hydrogeological conditions to monitor the diffusion of groundwater pollution in the whole plant. Refer to table 6.2-10 and figure 6.2-3 for groundwater monitoring plan.

表 6.2-10 地下水监控计划

Table 6.2-10 Groundwater Monitoring Plan

跟踪监测井 Tracking monitoring well / 项目 Item	山心村民井 Wells of Shanxin Village	项目东南厂界 Southeast plant boundary of the Project	厂区内化工库外道路旁 Beside the road outside the chemical warehouse in the plant area	污水处理站南侧厂界 Plant boundary on the south side of the sewage treatment plant	坡尾底民井 Poweidi well
监测井坐标 Coordinates of monitoring wells	109.5256721E，21.5305478N	109.5487103E，21.5349842N	109.5475554E，21.5235032N	109.5461475E，21.5341259N	109.5508386E，21.5181954N
与建设项目位置关系 Location relationship with the construction project	项目上游 Upstream of the Project	项目下游 Downstream of the Project	化工库车间旁（下游方向） Workshop of the chemical warehouse (downstream direction)	项目下游 Downstream of the Project	项目下游 Downstream of the Project
监测井功能 Function of monitoring wells	背景值监测点 Background value of monitoring points	污染扩散监测点（兼污染控制点） Pollution diffusion monitoring point (also pollution control point)	污染扩散监测点（兼污染控制点） Pollution diffusion monitoring point (also pollution control point)	污染扩散监测点（兼污染控制点） Pollution diffusion monitoring point (also pollution control point)	污染扩散监测点 Pollution diffusion monitoring point
监测内容 Monitoring contents	水质 Water quality				
跟踪监测因子 Tracking monitoring factor	pH 值、色度、总硬度、耗氧量（COD_{Mn}）、溶解性总固体、硫化物、氨氮、氯化物、硫酸盐、挥发性酚类、阴离子合成洗涤剂、硝酸盐（NO_3^-）、亚硝酸盐（NO_2^-）共 13 项。A total of 13 items, including pH value, chromaticity, total hardness, oxygen consumption (CODMn), total soluble solids, sulfide, ammonia nitrogen, chloride, sulfate, volatile phenols, anionic synthetic detergent, nitrate (NO3-), nitrite (NO2-).				
监测频率 Monitoring frequency	每年一次 Once a year	丰、枯水期各一次 Once in the wet season and once in the dry season			每年一次 Once a year
监测单位 Monitoring unit	委托具有监测资质的机构对地下水进行监测，监测机构、监测人员必须取得相关监测资质。Entrust institutions with monitoring qualifications to monitor groundwater. Monitoring institutions and monitoring personnel must obtain relevant monitoring qualifications.				


海山铺
谢家
亚细
新铺
陂头村
山心
竹儿根
邓屋
百班
对面垌
猪血塘
老妗垌
城尾底
项目位置
U1
U2
U3
U4
U5
U6
U7
图例
运营期地下水水质跟踪监测点
地下水水质监测点
地下水流向
项目下游敏感点
场地内敏感点
邓屋
项目周边敏感点
0m
700m

图 6.2-3 项目地下水敏感点及跟踪监测点示意图

Figure 6.2-3 Schematic Diagram of Groundwater Sensitive Points and Tracking Monitoring Points

（2）数据管理

(2) Data management

上述监测结果应按项目有关规定及时建立档案，并定期向厂内安全环保部门汇报，对于常规监测数据应该进行公开。若发现水质异常，应及时加密监测频次，并分析污染原因，确定泄漏污染源，并立即启动应急响应，上报环境保护部门，同时检测相应地下水风险源的防渗措施是否失效或遭受破坏，及时处理被污染的地下水，确保影响程度降到最低。

The above monitoring results shall be filed in a timely manner in accordance with the relevant provisions of the Project, and shall be reported to the safety and environmental protection department in the plant on a regular basis. Routine monitoring data shall be made public. In the event of any abnormal water quality, it is necessary to increase the monitoring frequency in time, analyze the pollution sources, determine the leakage pollution source, start the emergency response immediately, and report to the environmental protection department.

Also, efforts should be made to detect whether the seepage prevention measures of the corresponding groundwater risk source are ineffective or damaged, and treat the polluted groundwater in time to minimize the impact degree.

6.2.6 海洋生态环境影响减缓措施

6.2.6 Mitigation measures for the impact on the marine ecological environment

本项目废水纳污海域涉及山口国家级红树林保护区、合浦儒艮国家级自然保护区等海洋生态敏感目标，需按海洋生态红线划定方案、海洋环境保护规划等相关要求，减缓项目排污对海洋生态环境的影响。首先，严格实行入海污染物总量控制制度，加强对各排污单位和深海总排口的实时监测，在确保废水达标排放的前提下，在生产中不断优化生产工艺，尽可能从源头上减少废水及污染物的产生量，同时通过加大废水循环回用、优化污水处理设施等手段进一步提高污染物去除效率，减少污染物的排放，特别是持久性有机物的排放，减缓污染物排放对海洋生物的长期累积影响。其次，需严格落实海洋环境质量跟踪监测，定期对海水水质、海洋沉积物及海洋生物进行监测，及时根据海洋环境变化趋势情况，查找原因采取对策，确保山口国家级红树林保护区、合浦儒艮国家级自然保护区海水水质、海洋沉积物质量和海洋生物质量均不劣于一类标准。项目实施后及时开展后评价，全面评估项目实施对海洋生态环境的影响程度。此外，还应定期实施渔业资源补偿和生态放流计划，会同园区管委会及各排污单位共同实施人工增殖放流，缓解和减轻废水排放对海洋生态环境和水生生物的影响。

The wastewater receiving sea area of this Project involves marine ecological sensitive targets such as Shankou National Mangrove Reserve and Hepu Dugong National Nature Reserve. It is necessary to mitigate the impact of sewage discharge on the marine ecological environment according to relevant requirements such as the marine ecological red line delineation plan and marine environmental protection plan. First of all, efforts should be made to strictly implement the total amount control system for pollutants entering the sea, strengthen real-time monitoring of all pollutant discharge units and deep sea total discharge outlets, continuously optimize the production process in production while ensuring that the wastewater is discharged up to the standard, reduce the amount of wastewater and pollutants generated from the source, and further improve the removal efficiency of pollutants by increasing the recycling of wastewater and optimizing sewage treatment facilities, so as to reduce the discharge of pollutants, especially persistent organic substances, and slow down the long-term cumulative impact of pollutant discharge on marine organisms. Secondly, it is necessary to strictly implement the tracking and monitoring of marine environmental quality, regularly monitor seawater quality, marine sediments and marine organisms, and take timely measures to find out the causes according to the change trend of marine environment, so as to ensure that the seawater quality, marine sediment quality and marine biological quality of Shankou National Mangrove Reserve and Hepu Dugong National Nature Reserve are not inferior to Class I standards. Post-assessment shall be carried out in a timely manner after the implementation of the Project to comprehensively assess the impact of the Project on the marine ecological environment. In addition, fishery resources compensation and ecological stock enhancement plans should be regularly implemented, and artificial stock enhancement should be jointly implemented with the park management committee and various pollutant discharge units to mitigate and reduce the impact of wastewater discharge on the marine ecological environment and aquatic organisms.

6.3 环保投资估算

6.3 Environmental investment estimate

拟建项目环保投资主要包括施工期污染防治及项目污水处理、废气处理、固体废弃物处理与处置、噪声控制以及厂区绿化等费用，环保工程投资情况具体见表13.3.1。环保投资301726万元人民币，环保投资占项目总投资2259145万元人民币的13.36%。

The environmental investment of the proposed Project mainly includes the expenses of pollution prevention and control, project sewage treatment, waste gas treatment, solid waste treatment and disposal, noise control and plant greening during construction. Refer to Table 13.3.1 for details of the investment in environmental protection engineering. Environmental investment is RMB3,017.26 million, accounting for 13.36% of the total project investment of RMB22,591.45 million.

表 **6.3-1** 项目环保投资估算表

Table 6.3-1 Environmental Investment Estimate of the Project

时期 **Period**	项目 **Item**	环保措施 **Environmental protection measures**	环保投资 **Environment protection investment** （万元） **(RMB10,000)**
施工期 Construction period	废气 Exhaust gas	扬尘处理措施 Dust treatment measures	85
	废水 Waste water	废水污染防治措施 Wastewater pollution prevention and control measures	50
	噪声 Noise	噪声控制措施 Noise control measures	20
	固体废物 Solid waste	固体废物控制措施 Solid waste control measures	10
运营期 Operation period	废气 Exhaust gas	4600tds/d 碱回收炉+三列四电场的静电除尘器+废气在线监测系统 4600tds/d alkali recovery furnace + three-row four-electric-field electrostatic precipitators + waste gas on-line monitoring system	205326
		850t/d 石灰窑：一列四电场静电除尘器+废气在线监测系统 850t/d lime kiln waste gas: One-row four-field electrostatic precipitator + waste gas on-line monitoring system	1200
		220t/h 固废锅炉：SNCR/SCR 联合脱硝+布袋除尘器+活性炭吸附+炉外石灰石/石膏湿法脱硫+高效除雾器+废气在线监测系统 220t/h solid waste boiler: SNCR/SCR combined denitration+bag-type dust collector +activated carbon adsorption+limestone outside the boiler/gypsum wet desulfurization +high efficiency demister + waste gas on-line monitoring system	26729
		2×280t/h 燃煤锅炉：SNCR/SCR 联合脱硝+电袋除尘器+炉外石灰石/石膏湿法脱硫+高效除雾器+废气在线监测系统 2× 280t/h coal-fired boiler: SNCR/SCR combined denitration+electrostatic-bag type dust collector +limestone outside the boiler/gypsum wet desulfurization +high efficiency demister + waste gas on-line monitoring system	5000
		漂白车间漂白废气：碱洗 Waste gas from bleaching workshop: alkali wash	50
		1 根 150m 高，内径 12.9m 集束烟囱 1 cluster chimney with a height of 150m and an inner diameter of 12.9m	4000
		臭气焚烧器 Odor incinerator	1000

时期 Period	项目 Item	环保措施 Environmental protection measures		环保投资 Environment protection investment （万元） (RMB10,000)
		木料堆场洒水降尘 Sprinkle water to reduce dust in the wood storage yard		50
		二氧化氯车间 Chlorine dioxide workshop	过量氢气排空尾气：碱洗+25mH×Φ0.2m 排气筒 Exhaust gas from excess hydrogen: Alkali wash +25mH×Φ0.2m exhaust funnel	100
			盐酸合成尾气：软化水洗涤+42mH×Φ0.25m 排气筒 Hydrochloric acid tail gas: Demineralized water wash +42mH×Φ0.25m exhaust funnel	
			二氧化氯储槽尾气：碱洗+30mH×Φ0.3m 排气筒 Tail gas from chlorine dioxide storage tank: Alkali wash +30mH×Φ0.3m exhaust funnel	
	废水 Waste water	生产生活污水：1 座采用“初沉池+厌氧反应器+生物选择池+卡鲁塞尔氧化沟+高级氧化池”工艺的 10 万 m³/d 废水污水处理站；废水在线监测系统。 Production and domestic sewage: One 100,000 m³/d wastewater and sewage treatment plant adopting the process of "primary settling tank + anaerobic reactor + biological selection tank + Carrousel oxidation ditch + advanced oxidation tank"; wastewater on-line monitoring system.		51720
		初期雨水池 5200m³、原料堆场排水沟、淋滤液收集池 Initial rainwater tank 5200m3, drainage ditch of raw material storage yard and leachate collection tank		300
		分区防渗、地下水跟踪监测井 Seepage prevention and groundwater tracking monitoring well		2500
	固体废物 Solid waste	固废收集系统、锅炉渣仓、灰库、危废暂存库、垃圾清运 Solid waste collection system, boiler slag bin, ash warehouse, hazardous waste temporary storage warehouse, garbage removal and transportation		300
	噪声 Noise	消声、减振、隔声设施 Noise elimination, vibration reduction and sound insulation facilities		600
	环境风险 Environmental risk	40000m³ 事故应急池及收集系统，初期雨水池，雨水沟闸阀 40000m3 emergency pool and collection system, initial rainwater pool and rainwater ditch sluice valve		650
		有毒有害气体监测报警系统和喷淋系统 Toxic and harmful gas monitoring and alarm system and spraying system		50
		危险化学品围堰；应急预案 Dangerous chemical cofferdam; emergency plan		500
	绿化	厂区绿化、植树、草坪		986

时期 **Period**	项目 **Item**	环保措施 **Environmental protection measures**	环保投资 **Environment protection investment** （万元） **(RMB10,000)**
	Greening	Plant greening, tree planting and lawn	
	环境管理 Environmental management	环评等相关材料费用；环境监理 Cost of EIA and other related materials; environmental supervision 加强管理，健全制度，保证环保设施有效运行； Strengthen management, improve the system and ensure the effective operation of environmental protection facilities; 污染源及环境监测，环保人员培训等。 Pollution sources and environmental monitoring, environmental protection personnel training, etc.	500
合计 Total			301726

7 环境影响经济损益分析

7 Economic profit and loss analysis of environmental impact

以建设项目实施后的环境影响预测与环境质量现状进行比较，从环境影响的正负两方面，以定性与定量相结合的方式，对建设项目的环境影响后果（包括直接和间接影响、不利和有利影响）进行货币化经济损益核算，估算建设项目环境影响的经济价值。

Based on the comparison between the prediction of environmental impact and the current situation of environmental quality after the implementation of the construction project, from the positive and negative aspects of environmental impact, the monetization economic profit and loss accounting is carried out on the environmental impact consequences (including direct and indirect impacts, adverse and favorable impacts) of the construction project by combining qualitative and quantitative methods to estimate the economic value of environmental impact of the construction project.

7.1 社会效益分析

7.1 Social benefit analysis

（1）有助于北海市积极参与国家"一带一路"建设

(1) Boost Beihai to actively participate in the construction of the "Belt and Road Initiative"

当前，广西太阳纸业有限公司正在积极对接国家“一带一路”倡议，沿着“一带一路”开展重点项目布局和建设。公司在老挝实施的“林浆纸一体化”项目已初具规模，并且显现出特殊优势，广西北海市是“一带一路”重要节点城市，新设公司的投资项目将和老挝“林浆纸一体化”项目相互融合、相互补充，有助于公司打造完备的原料供应体系和实现企业转型升级，提高公司市场竞争力，提升公司的可持续发展能力。

At present, Guangxi Sun Paper Co., Ltd., in line with the "Belt and Road Initiative", is actively carrying out the layout and construction of key projects along the "Belt and Road". The "forest-pulp-paper integration" project implemented by the Company in Laos has begun to take shape and showed special strengths. Beihai City in Guangxi is a vital node city of the "Belt and Road Initiative". The investment projects of the newly established company will merge and complement with the Lao "forest-pulp-paper integration" project, which will help the Company to build a complete raw material supply system and realize its transformation and upgrading, improve the Company's market competitiveness and enhance its sustainable development capacity.

（2）有助于实现产业转型升级

(2) Realize industrial transformation and upgrading.

项目的运营建设将太阳纸业的资金、技术优势同广西丰富的林木资源、北海市铁山港区的物流优势相结合，拟按照“林浆纸一体化”模式走绿色、低碳、可循环发展的路子。在国家发展战略转型升级、倡导“绿色GDP”大背景下，新设公司将就造纸业加快向绿色产业发展进行有益的探索，实现产业转型升级。

The operation and construction of the Project will combine the capital and technical advantages of Sun Paper with the rich forest resources in Guangxi and the logistics advantages of Tieshangang District in Beihai City. It is planned to embark on the path of green, low-carbon and recyclable "forest-pulp-paper integration" mode. Under the background of the transformation and upgrading of the national development strategy and the advocacy of "green GDP", the newly established company will make useful explorations on accelerating the development of the paper industry to a green industry to realize the transformation and upgrading of the industry.

（3）促进北海市的经济发展，拉动就业需求

(3) Promote the economic development of Beihai and stimulate the employment demand

项目位于广西北海市铁山港区，其地理位置、交通、资源及社会条件较优越，充分利用当地资源优势，通过引进国内外先进的技术和装备，它的建成投产，势必促进当地造纸工业和其它相关行业的迅速发展。且项目运输量大，可促进当地交通运输业的发展，并将进一步带动当地其他行业，如能源、机械加工维修及第三产业的发展，有利于促进当地经济的发展。

The Project is located in Tieshangang District, Beihai City, Guangxi. With superior geographical location, transportation, resources and social conditions, it may make full use of local resources and introduce advanced technologies and equipment at home and abroad. Its completion and operation will certainly promote the rapid development of the local paper industry and other related industries. Moreover, the large transportation volume of the Project can promote the development of the local transportation industry, and will further drive other local industries, such as energy, mechanical processing and maintenance and the tertiary industry, which is conducive to boosting the development of the local economy.

同时项目的投产将会为社会提供就业工作机会，增加一定的劳动岗位，可直接解决部分当地社会人员就业问题，亦能为社会提供间接就业机会，制浆造纸行业每使用一名

工人，上溯农业、运输业，下联包装工业、印刷工业等，可创造约 5～8 个就业机会。有利于减轻社会负担和就业压力，有利于社会主义和谐社会的构建。

Meanwhile, the operation of the Project will provide employment opportunities for the society, which can directly solve the employment problems of some local social personnel and also provide indirect employment opportunities for the society. For every worker employed in the pulp and paper industry, about 5-8 employment opportunities can be created for agriculture, transportation, lower-level packaging industry, printing industry, etc. It is conducive to reducing social burden and employment pressure and to the construction of a socialist harmonious society.

7.2 经济效益分析

7.2 Economic benefit analysis

7.2.1 经济效益

7.2.1 Economic benefits

本项目总投资 2259145.00 万元，直接用于环保内容的建设投资 301726 万元，占总投资的 13.36%。

The total investment of this Project is RMB22591.45 million, and the construction investment directly used for environmental protection content is RMB3017.26 million, accounting for 13.36% of the total investment.

项目投产后，年均利润总额 266170 万元，年平均净利润 199628 万元。项目建成后，能够获取合理利润并能持续运行，具有一定的财务效益，建设规模合理、经济，企业抗风险能力较好。因此，本项目具有较好的综合经济效益，在经济上是可行的。

After the Project is put into operation, the average annual profit is RMB2661.7 million and the average annual net profit is RMB1996.28 million. After the completion of the Project, it can obtain reasonable profits and continue to operate, featuring certain financial benefits, reasonable construction scale and good anti-risk ability. Therefore, this Project has good comprehensive economic benefits and is economically feasible.

7.2.2 环保投资及环保成本

7.2.2 Environmental protection investment and environmental protection cost

（1）环保投资

(1) Environmental protection investment

项目环境保护投资总额约 301726 万元，包括环保基础设施投资、环评和竣工验收费、绿化及环境监测费等，环保投资估算详见表 6.3-1。

The total investment in environmental protection of the Project is about RMB3017.26 million, including investment in environmental protection infrastructure, EIA and completion acceptance fees, greening and environmental monitoring fees, etc. Refer to Table 6.3-1 for the estimate of environmental protection investment.

环保投资在工程投资总额中所占的比例计算公式：

Formula for calculating the proportion of environmental protection investment in the total project investment:

HJ=(T/JT)×100%

式中：HJ—环保投资在基建投资总额中所占的比例（%）

Where: HJ-Proportion of environmental protection investment in total infrastructure investment (%)

T—环保投资总额（万元）

T-Total investment in environmental protection (RMB10,000)

JT—工程投资总额（万元）

JT-Total project investment (RMB10,000)

（2）环保成本

(2) Environmental protection costs

本项目的环保年运行费用指防止二次环境污染的费用，包括废气治理、废水治理等，设备折旧费、环境监测费、药剂费、水电费、绿化养护费、环保设施管理人员工资福利等，主要费用的预测见表 7.2-1，项目环保年运行费为 34975.4 万元。

The annual environmental protection operating expenses of this Project refer to the expenses for preventing secondary environmental pollution, including waste gas treatment, wastewater treatment, equipment depreciation expenses, environmental monitoring expenses, pharmaceutical expenses, utilities, greening maintenance expenses, salaries and benefits of environmental protection facilities management personnel, etc. The main expenses are estimated in Table 7.2-1, and the annual environmental protection operating expenses of the Project are RMB349.754 million.

表 7.2-1　环保年运行费用预测一览表

Table 7.2-1 Estimate of Annual Environmental Protection Operating Expenses

序号 S.N.	项目 Item	费用估算(万元) Cost estimate (RMB10,000)
1	环保设施折旧及检修费（不包括环境绿化和前期环保手续费，设施折旧费按工程服务 15 年无残值计） Depreciation and maintenance fees for environmental protection facilities (excluding environmental greening and preliminary environmental protection fees, depreciation fees for facilities shall be calculated according to the 15-year no residual value of engineering service)	16880
2	环保人员工资及福利 Wages and benefits of environmental protection personnel	2000
3	环境监测费 Environment monitoring fees	150
4	环保设施运行费（取环保投资 5%） Operating expenses of environmental protection facilities (5% of environmental protection investment)	12660
5	环保税 Environmental protection tax	3035.4
6	环境管理和环境风险管理费 Environmental management and environmental risk management fees	250
合计 Total		34975.4

7.2.3 环保投资效益

7.2.3 Environmental protection investment benefit

环保工程的运行减少了大气污染物、水污染物、固废排放量。本项目的环境保护经济效益可用因环保工程运行而挽回的经济损失来表示。

The operation of environmental protection projects has reduced the emissions of air pollutants, water pollutants and solid wastes. The economic benefits of environmental protection of this Project can be expressed by the economic losses recovered due to the operation of environmental protection projects.

环境保护的投资，减少了污染物的排放，直接减少了环境保护税的缴纳，同时还取得间接的环境效益。减少环境保护税费用根据《中华人民共和国环境保护税法》（2016 年 12 月 25 日通过）进行估算。应税大气污染物、水污染物的污染当量数，以该污染物的排放量除以该污染物的污染当量值计算。每一排放口或没有排放口的应税大气污染物，按照污染当量数从大到小排序，对前三项污染物征收环境保护税。每一排放口的应税水污染物，区分第一类水污染物和其他类水污染物，按照污染当量数从大到小排序，对第一类水污染物按照前五项征收环境保护税，对其他类水污染物按照前三项征收环境保护税。根据广西壮族自治区人民代表大会常务委员会《关于大气污染物和水污染物环境保护税适用税额的决定》（2017 年 12 月 1 日通过），广西大气污染物环境保护税适用税

额为每污染当量 1.8 元，水污染物环境保护税适用税额为每污染当量 2.8 元。

Investment in environmental protection has reduced the emission of pollutants, directly reduced the payment of environmental protection tax, and achieved indirect environmental benefits. The reduction of environmental protection taxes and fees is estimated according to the Environmental Protection Tax Law of the People's Republic of China (passed on December 25, 2016). The pollution equivalents of taxable air pollutants and water pollutants shall be calculated by dividing the discharge amount of the pollutants by the pollution equivalent value of the pollutants. For taxable air pollutants at each discharge outlet or without discharge outlets, environmental protection tax shall be levied on the first three pollutants according to the order of pollution equivalent from large to small. For taxable water pollutants at each discharge outlet, the first type of water pollutants and other types of water pollutants shall be distinguished, and the first type of water pollutants shall be subject to environmental protection tax according to the first five items, while the other types of water pollutants shall be subject to environmental protection tax according to the first three items. According to the Decision of the Standing Committee of the Guangxi Zhuang Autonomous Region People's Congress on the Applicable Tax Amount of Environmental Protection Tax for Air Pollutants and Water Pollutants (passed on December 1, 2017), the applicable tax amount of environmental protection tax for air pollutants in Guangxi is RMB1.8 per pollution equivalent and the applicable tax amount of environmental protection tax for water pollutants is RMB2.8 per pollution equivalent.

表 7.2-2 污染物排放减少量及环保投资收益

Table 7.2-2 Pollutant Emission Reduction and Environmental Protection Investment Income

污染物 **Pollutant**		污染物削减量（t/a） **Pollutant reduction (t/a)**	污染当量值（kg） **Pollution equivalent (kg)**	税额（元/污染当量） **Tax amount (RMB/pollution equivalent)**	挽回环保税 **Recovered environmental protection tax** （万元/年） **(RMB10,000/year)**
一期 Phase I					
水污染物 Water pollutants	COD	34924.72	1	2.8	9778.92
	BOD_5	13638.46	0.5	2.8	7637.54
	SS	28354.78	4	2.8	1984.84
大气污染物 Atmospheric pollutants	烟尘 Smoke dust	305452.55	2.18	1.8	25220.85
	SO_2	4555.40	0.95	1.8	863.13
	NO_x	957.58	0.95	1.8	181.44
固体废物 Solid waste	废木屑、树皮 Waste sawdust,	81600	/	25（元/吨） 25 (RMB/ton)	204

污染物 **Pollutant**		污染物削减量（t/a） **Pollutant reduction (t/a)**	污染当量值（kg） **Pollution equivalent (kg)**	税额（元/污染当量） **Tax amount (RMB/pollution equivalent)**	挽回环保税 **Recovered environmental protection tax** （万元/年） **(RMB10,000/year)**
	bark				
	浆渣、节子 Pulp slag, knot	10200			25.5
	白泥 White mud	207200			518
	污泥 Sludge	81600			204
合计 Total		/	/	/	46618.2
一期+二期 Phase I + Phase II					
水污染物 Water pollutants	COD	51151.69	1	2.8	14322.47
	BOD_5	18561.14	0.5	2.8	10394.24
	SS	39770.13	4	2.8	2783.91
大气污染物 Atmospheric pollutants	烟尘 Smoke dust	369104.71	2.18	1.8	30476.54
	SO_2	8839.56	0.95	1.8	1674.86
	NO_x	1676.47	0.95	1.8	317.65
固体废物 Solid waste	废木屑、树皮 Waste sawdust, bark	102000	/	25（元/吨） 25 (RMB/ton)	255
	浆渣、节子 Pulp slag, knot	17000			42.5
	白泥 White mud	229600			574
	污泥 Sludge	108800			272
合计 Total		/	/	/	61113.2

7.3 环境经济损益分析

7.3 Analysis of environmental economic profit and loss

通过对本项目生产工艺的分析，本项目因环保治理能带来的直接的经济效益和间接的环境效益。直接的经济效益来自污染治理而减少的环保税。

Through the analysis of the production process, the Project has direct economic benefits and indirect environmental benefits brought about by environmental protection. The direct economic benefits come from the reduction of environmental protection taxes due to pollution control.

一、环境经济损益系数

I. Environmental economic profit and loss coefficient

环境经济损益一般用环境经济损益系数表示：

Environmental economic profit and loss are generally expressed by environmental economic profit and loss coefficient:

$$R＝R_1/R_2$$

式中：R——损益系数；R_l——经济收益，以企业经营期内（15年）的纯利润计；R_2——环保投资，以项目一次性环保投资和项目营运期（15年）污染治理费用之合计。

Where: R-profit and loss coefficient; RL-economic income, calculated as the net profit during the operating period (15 years) of the enterprise; R2-environmental protection investment, which is the total of one-time environmental protection investment of the Project and pollution control expenses during operation (15 years) of the Project.

计算结果：R=199628*15/（301726+34975.4*15）=3.62，说明本项目经济收益良好。

Calculation result: R=199628*15/(301726 34975.4*15) = 3.62, indicating that the economic benefits of this Project are good.

二、环保费用的经济效益分析

II. Economic benefit analysis of environmental protection expenses

环保措施的经济损益分析可由年环保费用的经济效益来表示，计算公式如下：

The economic profit and loss analysis of environmental protection measures can be expressed by the economic benefits of annual environmental protection expenses. The calculation formula is as follows:

$$E=S/H$$

式中：E——环保费用的经济效益；

Where: E-economic benefits of environmental protection expenses;

S——采取环保措施后每年可挽回的经济损失；

S-Recoverable economic losses every year after environmental protection measures are taken;

H——年均环保投资费用。

H-Average annual environmental protection investment cost.

根据上述环境经济效益分析，全年防治污染而挽回的经济损失S为61113.2万元，每年投入的环保费用H为34975.4万元，则本项目的环保费用经济效益E为1.75，说明环保投资与环保费用的经济效益是良好的。

According to the above analysis of environmental and economic benefits, the economic loss S recovered from pollution prevention and control in the whole year is RMB611.132 million, and the environmental protection cost H invested every year is RMB349.754 million, then the economic benefit E of environmental protection cost of this Project is 1.75, indicating that the economic benefits of environmental protection investment and environmental protection cost are good.

7.4 小结

7.4 Summary

综合上述，项目环保投资为301726万元，占总投资2259145万元的13.36%，环保费用经济效益为1.75，项目的环境保护投资费用不仅拥有较为显著的经济效益，而且还有环境效益和社会效益，保护了当地的环境。因此，拟建程度的减项目环保投资经济合理，所采取的环保措施在经济上是合理可行的，各项环保措施不仅较大缓解项目对环境产生的不利影响，还可以产生一定的经济效益。

To sum up, the environmental protection investment of the Project is RMB3017.26 million, accounting for 13.36% of the total investment of RMB22,591.45 million, and the economic benefit of the environmental protection cost is 1.75. The environmental protection investment of the Project not only achieves relatively significant economic benefits, but environmental and social benefits, thereby protecting the local environment. Therefore, the environmental protection investment of the proposed Project is economical and reasonable, and the environmental protection measures adopted are economically reasonable and feasible. Each environmental protection measure not only greatly alleviates the adverse impact of the Project on the environment, but produces certain economic benefits.

8 环境管理和监测计划

8 Environmental management and monitoring plan

环境管理和环境监测是污染防治的重要内容之一，是实现污染总量控制和治理措施达到预期治理的有效保证。项目的建设及投产，除了依据环评中所评述和建议的环境保护措施实施的同时，还需要加强环境管理和环境监测工作，以便及时发现建设及运营过程中存在的问题，尽快采取处理措施，减少或避免污染和损失。

Environmental management and environmental monitoring is a vital part of pollution prevention and control, and are the effective guarantee to realize the total pollution control and control measures to achieve the expected control. During construction and operation, the Project should not only implement the environmental protection measures commented and suggested in the EIA, but strengthen environmental management and environmental monitoring, so as to find out the problems existing in the construction and operation process in time and take treatment measures as soon as possible to reduce or avoid pollution and losses.

以下针对本项目在施工期和运营期的环境污染特征，提出了施工期和运营期的环境管理和环境监测计划等内容。

According to the environmental pollution characteristics of the Project during the construction and operation period, the following contents such as environmental management and environmental monitoring plan during the construction and operation period are put forward.

8.1 环境管理

8.1 Environment management

8.1.1 环境管理要求

8.1.1 Requirements for environmental management

8.1.1.1 废气污染防治措施

8.1.1.1 Waste gas pollution control measures

（1）通用要求

（1）General requirements

1）废气治理设施在高效脱除单一污染物的同时，应加强协同控制，提高多污染物联合脱除、协同减排的功能。

1）While removing a single pollutant efficiently, waste gas treatment facilities should strengthen coordinated control to improve the functions of joint removal and coordinated emission reduction of multiple pollutants.

2）应加强管理，强化臭气排放的收集措施，提高处理效率。

2）Efforts should be made to enhance management, strengthen the collection measures of stink emission and improve the treatment efficiency.

3）禁止在非指定区域内堆放原辅材料及燃料。

3）It is forbidden to pile up raw and auxiliary materials and fuels in non-designated areas.

4）严格执行启停和维修管理规定，启停机超过规定时长或锅炉机组大修后启动应在规定时间内向地方环境保护主管部门报告。

4）It is necessary to strictly implement the start-up and stop and maintenance management regulations. Startup or shutdown exceeding the prescribed time or startup after boiler unit overhaul should be reported to the local environmental protection department within the prescribed time.

5）严格执行相关管理规定和规范，消除安全隐患，避免发生环境污染事故。

5）It is necessary to strictly implement relevant management regulations and norms and eliminate potential safety hazards to avoid environmental pollution accidents.

6）按照地方环保主管部门的重污染天气应急管理规定，加强厂内部环保管理，配合落实重污染天气分级预警下的污染物排放控制要求。

6）In accordance with the regulations of the local environmental protection department in charge of emergency management of heavy pollution weather, efforts should be made to strengthen the internal environmental protection management of the plant and comply with the pollutant discharge control requirements under the classification and early warning of heavy pollution weather.

（2）有组织排放管理

（2）Organized emission management

1）主要排放口通用要求

1）General requirements for main discharge outlets

本项目涉及的主要排放口共有 8 个，各排放口均设置有环保设施，须执行以下要求。

There are 8 main discharge outlets involved in this Project. Each discharge outlet is equipped with environmental protection facilities. The following requirements must be implemented.

①启停机要求

① Requirements for startup and shutdown

对每次启停的过程进行记录，包括启停时刻、启停时长、超出规定时长的影响因素、相应的控制措施等。

Record the process of each startup and shutdown, including startup and shutdown time, startup and shutdown duration, influencing factors exceeding the specified duration, corresponding control measures, etc.

严格执行启停和维修管理规定，发生以下情形时应向地方环保主管部门报告：A.启停超过规定时长；B.遇到妨碍启停的小缺陷、受自然灾害（如台风、暴雨、地震）、战争等不可控因素需适当延长启停时间。

Strictly implement the regulations on startup and shutdown and maintenance management, and report to the local environmental protection department in case of any of the following circumstances: A. Startup and shutdown exceeds the specified duration; B. In case of minor defects that hinder the startup and shutdown, the startup and shutdown time shall be appropriately extended due to uncontrollable factors such as natural disasters (such as typhoons, rainstorms, earthquakes) and wars.

②脱硝设施运行管理要求

② Requirements for operation and management of denitration facilities

A. 应按企业内部脱硝装置运行规程操作，并记录烟气温度、烟气流量、喷氨量等运行参数、维持设备处于正常稳定运行状态。

A. The operation procedures of denitration devices within the Company shall be followed, and the operation parameters such as flue gas temperature, flue gas flow rate and ammonia injection amount shall be recorded to maintain the normal and stable operation of the equipment.

B. 要求运行温度一般在设计区间内，脱硝装置达到运行温度区间时应在10分钟（最长30分钟）内启动投运。

B. It is required that the operating temperature is generally within the design range, and the denitration plant should be started and put into operation within 10 minutes (up to 30 minutes) when reaching the operating temperature range.

C. 脱硝装置故障不能正常启动时，机组锅炉不能单独启动。

C. When the denitration plant fails and cannot be started normally, the unit boiler cannot be started separately.

③除尘设施运行管理要求

③ Requirements for operation and management of dust removal facilities

A. 静电除尘器应严格按照环保运行规程操作，监视和记录除尘器运行情况。

A. The electrostatic precipitator shall be operated in strict accordance with the environmental protection operation procedures and the operation of the precipitator shall be monitored and recorded.

B. 静电除尘器除锅炉燃油期间外，其他正常运行时间与锅炉同步投运。

B. Except for the boiler oil period, the electrostatic precipitator is put into operation simultaneously with the boiler during other normal operation times.

C. 除尘装置存在问题不能随锅炉同步启动，锅炉不能单独启动。

C. In case of any problems with the dust removal plant, it cannot be started synchronously with the boiler and the boiler cannot be started separately.

④脱硫设施运行管理要求

④ Requirements for operation and management of desulfurization facilities

A. 应严格按照运行规程操作，并维持和记录吸收塔浆液 pH 值、浆液密度等设备运行参数，维持设备处于正常稳定运行状态。

A. The operation shall be strictly in accordance with the operation procedures and the equipment operation parameters such as pH value and slurry density of the absorption tower shall be maintained and recorded to maintain the equipment in a normal and stable operation state.

B. 定期对 pH 计、密度计、液位计等进行校检和对比记录。pH 计每月校检和对比 1 次，其他仪器每年校检对比 1 次。

B. Regularly check and compare pH meter, density meter, liquid level meter, etc. The pH meter is checked and compared once a month and other instruments are checked and compared once a year.

C. 脱硫设施存在问题不能不能随锅炉同步启动，锅炉不能单独启动。

C. In case of any problems with the desulfurization facilities, it cannot be started synchronously with the boiler and the boiler cannot be started separately.

（3）无组织排放管理

（3）Unorganized emission management

1）木片堆场及备料车间

1）Wood chip stockyard and preparation workshop

禁止在非指定区域（厂区平面布置图中非相应物品堆放区域）堆放木片等可能产生扬尘的物质。在干燥起风时对堆场洒水，减少扬尘的产生。并且应记录木片堆场的入、出场量。

It is forbidden to pile up wood chips and other substances that may generate dust in non-designated areas (areas where non-corresponding articles are piled up in the plant floor plan). Sprinkle water on the storage yard when the wind blows to reduce the generation of dust. In addition, the entry and exit quantities of wood chip storage yard shall be recorded.

2）储罐

2）Storage tank

固定储罐应安装密闭排气系统对废气进行回收和处理。

Fixed storage tanks shall be equipped with a closed exhaust system to recover and treat waste gas.

3）污水收集和处理系统

3）Sewage collection and treatment system

建议对污水处理厂的格栅间、调节池和储泥池加盖密封，通过合理设置污水处理站的建设位置，优化污水处理站内各处理单元的布置，在污水处理站四周种植绿化带，进一步减少恶臭无组织排放对周围环境影响。

It is suggested that the grid room, regulating tank and mud storage tank of the sewage treatment plant should be sealed, the construction location of the sewage treatment plant should be reasonably set, the arrangement of each treatment unit in the sewage treatment plant should be optimized, and green belts should be planted around the sewage treatment plant to further reduce the impact of stink unorganized discharge on the surrounding environment.

8.1.1.2 废水污染防治措施

8.1.1.2 Wastewater pollution control measures

（1）通用要求

（1）General requirements

1）所有污水、雨水排放口应按照规范进行标识。排放口的布设应符合《地表水和污水监测技术规范》（HJ/T91-2002）、《水污染排放总量监测技术规范》（HJ/T92-2002）的有关规定，标志牌的设置符合《环境保护图形标志》（GB15562.1-1995）要求。

1）All sewage and rainwater discharge outlets shall be marked according to the specifications. The layout of discharge outlets shall conform to the relevant provisions of the Technical Specification Requirements for Monitoring of Surface Water and Waste Water (HJ/T91-2002) and the Technical Specification for Monitoring of Total Amount of Pollutants in Waster Water (HJ/T92-2002), and the setting of signs shall conform to the requirements of the Graphical Signs for Environmental Protection (GB15562.1-1995).

2）所有雨水、污水井盖和管网进行清晰标识，并定期检查雨水排水沟及污水管道等，确保其排水顺畅。

2）All rainwater, sewage manhole covers and pipe networks shall be clearly marked and rainwater drainage ditches and sewage pipes shall be regularly checked to ensure smooth drainage.

3）应对污水处理设施及雨水、污水管网进行定期维护保养，使污水处理设施运行参数保持在设计指标范围，并记录相关设计参数，确保其正常运行。

3）Regular maintenance shall be carried out on sewage treatment facilities and rainwater and sewage pipe networks to keep the operating parameters of sewage treatment facilities within the design index range, and relevant design parameters shall be recorded to ensure their normal operation.

4）应进一步提高清洁水平，提高水循环利用率，降低污染物排放量。

4）Efforts should be made to further improve the cleaning level, improve the utilization rate of water circulation and reduce the emission of pollutants.

5）应该按规定定期监测各车间废水排放口的污染物浓度。

5）The pollutant concentration at the wastewater discharge outlet of each workshop should be monitored regularly according to regulations.

6）所有雨水经过雨水管网排放，并对雨水排放口进行定期监测，记录加成呢结果，确保未受到其他废水污染。

6）All rainwater is discharged through the rainwater pipe network and the rainwater discharge outlets are regularly monitored to record the addition results to ensure that they are not polluted by other wastewater.

7）木片堆场初期雨水应送往污水处理站处理，不得通过雨水排放口外排。

7）The initial rainwater from the wood chip storage yard shall be sent to the sewage treatment plant for treatment and shall not be discharged through the rainwater discharge outlets.

8）循环冷却水通过收集处理达标排放。

8）Circulating cooling water is collected and treated to meet the discharge standards.

9）在非正常工况或废水处理设施故障情况下，废水应进入污水处理站事故池暂存，与正常工况下的废水混合后逐批进入污水处理站处理，确保废水经过处理后达标排放。

9）In case of abnormal working conditions or failure of wastewater treatment facilities, the wastewater shall enter the emergency pool of the sewage treatment plant for temporary storage, mix with the wastewater under normal working conditions and then enter the sewage treatment plant batch by batch for treatment to ensure that the wastewater reaches the standard for discharge after treatment.

8.1.1.3 固体废物污染防治措施

8.1.1.3 Solid waste pollution control measures

（1）一般工业固体废物

（1）General industrial solid waste

1）必须分类妥善贮存在符合《一般工业固体废物贮存、处置污染控制标准》（GB18599-2013）要求的贮存设施中，禁止混合堆放，禁止将危险废物或生活垃圾混入一般工业固体废物。

1）General industrial solid waste shall be properly stored in storage facilities that meet the requirements of the Pollution Control Standard for Storage and Disposal of General Industrial Solid Waste (GB18599-2013). Mixed stacking is prohibited, and hazardous waste or domestic waste is prohibited from being mixed into general industrial solid waste.

2）贮存设施必须设置符合《环境保护图形标志-固体废物贮存（处置）场》（GB 15562.2-1995）中一般工业固体废物提示图形符号和警告图形符号样式的标识。

2）Storage facilities must be equipped with marks conforming to the general industrial solid waste prompt graphic symbols and warning graphic symbols in the Graphic Signs for Environmental Protection Solid Waste Storage (Disposal) Site (GB 15562.2-1995).

3）鼓励对绿泥、石灰渣、污水处理污泥、锅炉灰渣、脱硫石膏等一般工业固体废物进行综合利用，无法综合利用时，应当妥善贮存或处置，防止泄露或爆仓造成环境污染。

3）Efforts should be made to encourage the comprehensive utilization of green mud, lime slag, sewage treatment sludge, boiler ash, desulfurized gypsum and other general industrial solid wastes. When comprehensive utilization cannot be made, they shall be properly stored or disposed of to prevent environmental pollution caused by leakage or warehouse explosion.

4）锅炉灰渣及其他易扬散的一般工业固体废物在贮存运输时应采取密闭防扬散措施，绿泥、石灰渣、污水处理污泥、锅炉灰渣、脱硫石膏等一般工业固体废物运输时车辆应当有遮挡措施，防止洒落。

4）Boiler ash and other general industrial solid wastes that are easy to be scattered shall be sealed and prevented from being scattered during storage and transportation. Vehicles transporting green mud, lime slag, sewage treatment sludge, boiler ash and desulfurized gypsum shall be equipped with shielding measures to prevent spilling.

5）应当建立一般工业固体废物产生、贮存、处置台账，清晰准确记录各类一般工业固体废物产生、贮存、处置情况，准确反映全厂固体废物污染防治情况。

5）A general industrial solid waste generation, storage and disposal ledger shall be established to clearly and accurately record the generation, storage and disposal of all kinds of general industrial solid waste and accurately reflect the prevention and control of solid waste pollution in the whole plant.

6）应每年在全国固体废物管理信息系统上对上一年度所有一般工业固体废物的产生、贮存、处置情况进行申报登记。

6）The generation, storage and disposal of all general industrial solid wastes in the previous year shall be declared and registered on the national solid waste management information system every year.

（2）危险废物

（2）Hazardous waste

1）应当制定责任明确的危险废物防治管理责任制度，并在显著位置张贴污染责任信息。

1）A responsibility system for hazardous waste prevention and control management with clear responsibilities should be formulated and pollution responsibility information should be posted in conspicuous positions.

2）所有危险废物必须使用适宜的包装袋（桶）等容器盛装后，分类妥善贮存在符合《危险废物贮存污染控制标准》（GB 18597-2013）要求的贮存设施中，禁止混合堆放，禁止将一般工业固体废物或生活垃圾混入危险废物。

2）All hazardous wastes must be properly stored in storage facilities that meet the requirements of the Standard for Pollution Control on Hazardous Waste Storage (GB 18597-2013) after being packaged in suitable packaging bags (barrels) and other containers.

Mixed stacking is prohibited and general industrial solid waste or domestic waste is prohibited from being mixed into hazardous wastes.

3）危险废物贮存设施必须符合《环境保护图形标志-固体废物贮存（处置）场》（GB 15562.2-1995）中危险废物警告图形符号样式的标识，每个危险废物包装容器上必须粘贴符合《危险废物贮存污染控制标准》（GB 1897-2013）附录 A 样式的标签，标签上所有信息必须如实填写完全。

3）Hazardous waste storage facilities must conform to the identification of hazardous waste warning graphic symbol style in the Graphic Signs for Environmental Protection Solid Waste Storage (Disposal) Site (GB 15562.2-1995). Each hazardous waste packaging container must be pasted with a label conforming to Appendix A style of the Standard for Pollution Control on Hazardous Waste Storage(GB 1897-2013). All information on the label must be truthfully filled in.

4）必须定期将危险废物交由具有相应危险废物处置资质的持证经营单位进行利用和处置，不得委托给无证或资质不符的单位利用处置，严禁倾倒或丢弃危险废物。

4）Hazardous wastes must be regularly handed over to licensed business units with corresponding hazardous waste disposal qualifications for utilization and disposal, and shall not be entrusted to unlicensed or unqualified units for utilization and disposal. Dumping or discarding hazardous wastes is strictly prohibited.

5）应当建立危险废物产生、贮存、处置台账，清晰准确记录所有危险废物产生、贮存、处置全过程管理情况。台账应当能够准确清晰反映危险废物产生量、贮存时间、处置去向等全过程管理信息。

5）A ledger for the generation, storage and disposal of hazardous wastes shall be established to clearly and accurately record the management of the whole process of the generation, storage and disposal of all hazardous wastes. The ledger shall be able to accurately and clearly reflect the whole process management information such as hazardous waste production, storage time and disposal destination.

6）在转移运输危险废物时应当委托具有危险废物运输资质的运输单位运输，运输过程中应当采取防扬散、防遗撒的措施，防止运输过程中遗撒丢失危险废物。

6）When transferring and transporting hazardous waste, a transportation unit with hazardous waste transportation qualification shall be entrusted. During the transportation process, measures shall be taken to prevent the scattering and spilling of hazardous waste during the transportation process.

7）在转移危险废物时必须依法落实危险废物转移联单制度，转移联单所有信息必须清晰准确，能够反映危险废物转移全过程管理情况，联单至少保持 5 年以上。

7）When transferring hazardous waste, the hazardous waste transfer list system must be implemented in accordance with the law. All information in the transfer list must be clear and accurate to reflect the management of the whole process of hazardous waste transfer. The list must be kept for at least 5 years.

8）应每年制定当年年度危险废物管理计划，并报送所在地环保部门备案，管理计划应该包含上年度危险废物产生处置情况、本年度危险废物产生情况预测、危险废物减量化措施及本年度危险废物处置去向德国内容。当危险废物处置去向发生变更时，应对管理计划进行相应变更，并将变更后的管理计划报所在地环保部门备案。

8）The annual hazardous waste management plan for the current year shall be formulated every year and submitted to the local environmental protection department for the record. The management plan shall include the hazardous waste generation and disposal situation for the previous year, the hazardous waste generation forecast for the current year, hazardous waste reduction measures and the hazardous waste disposal destination for the current year. When the disposal destination of hazardous waste changes, the management plan shall be changed accordingly and the changed management plan shall be reported to the local environmental protection department for the record.

9）应每年在全国固体废物管理信息系统上对上一年度所有一般工业固体废物的产生、贮存、处置情况进行申报登记。

9）The generation, storage and disposal of all general industrial solid wastes in the previous year shall be declared and registered on the national solid waste management information system every year.

10）应编制危险废物突发环境事件应急预案并报送环保部门备案，定期开展危险废物环境应急演练和危险废物管理培训，妥善保存演练的文字和图片材料。

10）Emergency plans for hazardous waste environmental emergencies shall be prepared and submitted to the environmental protection department for the record, hazardous waste environmental emergency drills and hazardous waste management training shall be regularly carried out, and the text and picture materials of the drills shall be properly kept.

8.1.1.4 噪声污染防治措施

8.1.1.4 Noise pollution control measures

（1）厂界噪声应满足《工业企业厂界环境噪声排放标准》（GB12348-2008）中 3 类声环境功能区排放限值。

（1）The noise at the plant boundary shall be subject to emission limit of Class III acoustic environment functional areas in the EMission Standards for Industrial Enterprises Noise at Boundary (GB12348-2008).

（2）当出现厂界噪声环境超标情况时，要分析原因，制定执行整改方案并及时报告当地环保主管部门。

（2）When the noise environment at the plant boundary exceeds the standard, the reason shall be analyzed, the rectification plan shall be formulated and implemented, and the local environmental protection department shall be promptly notified.

（3）应采取措施减少突发噪声排放，若不可避免，应把易于产生突发噪声的生产过程安排在白昼时间，在进行这类操作前，通过公众媒体告知受影响人群。

（3）Measures should be taken to reduce sudden noise emissions. If it is inevitable, the production process prone to sudden noise should be arranged at daytime and the affected population should be informed through the public media before such operations are carried out.

8.1.1.5 环境风险预防管理措施

8.1.1.5 Environmental risk prevention and management measures

（1）认真贯彻落实“安全第一，预防为主”的方针，各级领导和生产管理人员必须重视环境工作。

(1) Conscientiously implement the policy of "safety first, prevention first". Leaders and production management personnel at all levels must attach importance to environmental work.

（2）加强应急能力建设，开展突发环境事件应急演练工作。加强突发环境事件应急监测、应急科研和应急响应系统建设，及时配备各类应急装备，如监测仪器、设备器材、个人安全防护器材等。做好设备、设施及安全防护设施的维护、保养，按设备管理的要求，保障设备完好率符合要求，并稳定在一定的水平。

(2) Strengthen the construction of emergency response capacity and carry out emergency drills for environmental emergencies. Strengthen the emergency monitoring, emergency scientific research and emergency response system construction of environmental emergencies, and timely equip all kinds of emergency equipment, such as monitoring

instruments, equipment, personal safety protection equipment, etc. Repair and maintain equipment, facilities and safety protection facilities and ensure that the equipment intact rate meets the requirements and is stable at a certain level according to the requirements of equipment management.

（3）加强宣传、培训、演练工作，对从业人员进行安全生产教育和培训，保证从业人员具备必要的环境安全生产知识，熟悉有关环境安全生产规章制度和操作规程，掌握本岗位的安全操作技能。未经环境生产教育和培训合格的从业人员不得上岗作业，做好应对突发环境事件的各项准备工作。

(3) Enhance publicity, training and drills, carry out safety production education and training for employees and ensure that employees have necessary environmental safety production knowledge, are familiar with relevant environmental safety production rules and regulations and operating procedures, and master the safety operation skills of their posts. Employees who have not been educated and trained in environmental production are not allowed to take up their posts and make various preparations to address environmental emergencies.

（4）建立完善的巡回检查（值守）记录和监控措施，确保巡检人员按时、按要求进行检查巡视。早预防、早发现、早解决。

(4) Establish perfect inspection tour (on duty) records and monitoring measures to ensure that inspection personnel conduct inspection tour on time and as required. Early prevention, early detection and early solution.

（5）建立完善的突发环境应急体系，对职工经常进行环境应急知识和器材使用培训，并定期组织演习。应急装备建立档案，设专人负责保管，定期检查，及时更换，确保有效。

(5) Establish a sound environmental emergency system, regularly train employees on environmental emergency knowledge and equipment use, and regularly organize exercises. Emergency equipment shall be archived, and special personnel shall be assigned to keep it. Regular inspection and timely replacement shall be carried out to ensure equipment effectiveness.

（6）强化事故废水三级风险防范体系的运行管理，避免事故废水直接通过雨水系统进入厂外水体。

(6) Enhance the operation and management of the three-level risk prevention system for accident wastewater to prevent accident wastewater from directly entering the water body

outside the plant through the rainwater system.

8.1.1.6 环境管理台账要求

8.1.1.6 Requirements for environmental management ledger

（1）一般原则

(1) General principles

《排污单位环境管理台账及排污许可证执行报告技术规范总则（试行）》（HJ944-2018）中指出，标准所指环境管理台账记录要求为基本要求，排污单位可自行增加和加严记录要求，环境保护主管部门也可依据法律法规、标准规范增加和加严记录要求。排污单位应建立环境管理台账记录制度，落实环境管理台账记录的责任单位和责任人，明确工作职责，并对环境管理台账的真实性、完整性和规范性负责。一般按日或按批次进行记录，异常情况应按次记录。

The General Provisions for Technical Specifications for Environmental Management Ledger and Implementation Report of Pollutant Discharge Permit of Pollutant Discharge Units (Trial) (HJ944-2018) points out that the record requirements of environmental management ledger referred to in the standard are basic requirements. Pollutant discharge units can increase and tighten the record requirements on their own and the competent environmental protection department can also increase and tighten the record requirements according to laws, regulations, standards and specifications. Pollutant disposal units should establish an environmental management ledger record system, assign responsible units and persons to take charge of environmental management ledger records and clarify their job duties and responsibilities for the authenticity, integrity and standardization of environmental management ledgers. Generally, records shall be made on a daily basis or in batches, and abnormal situations shall be recorded on a per-time basis.

（2）记录形式

(2) Record form

记录形式可分为电子台账及纸质台账两种形式。

Records can be divided into electronic ledger and paper ledger.

（3）记录内容

(3) Record contents

记录内容应包括基本信息、生产设施运行管理信息、污染防治设施运行管理信息、监测记录信息及其他环境管理信息等，参照《排污单位环境管理台账及排污许可证执行报告技术规范总则（试行）》（HJ944-2018）附录 A。生产设施、污染防治设施、排放

口编码应与排污许可证副本中载明的编码一致。

The contents of the records shall include basic information, operation management information of production facilities, operation management information of pollution prevention and control facilities, monitoring record information and other environmental management information, etc. Please refer to Appendix A of the General Provisions for Technical Specifications for Environmental Management Ledger and Implementation Report of Pollutant Discharge Permit of Pollutant Discharge Units (Trial) (HJ944-2018). The codes of production facilities, pollution prevention and control facilities and discharge outlets shall be consistent with the codes stated in the copy of the pollutant discharge permit.

（4）记录频次

（4）Record frequency

1）基本信息

1) Basic information

对于未发生变化的基本信息，按年记录，1 次/年；对于发生变化的基本信息，在发生变化时记录 1 次。

For the basic information that has not changed, it shall be recorded once per year; for the basic information that has changed, it shall be recorded once when the change occurs.

2）生产设施运行管理信息

2）Operation management information of production facilities

①正常工况

① Normal working conditions

A. 运行状态：一般按日或批次记录，1 次/日或批次。

A. Operation status: Generally recorded by day or batch, once/day or batch.

B. 生产负荷：一般按日或批次记录，1 次/日或批次。

B. Production load: Generally recorded by day or batch, once/day or batch.

C. 产品产量：连续生产的，按日记录，1 次/日。非连续生产的，按照生产周期记录，1 次/周期；周期小于 1 天的，按日记录，1 次/日。

C. Product output: For continuous production, it shall be recorded by day, once/day. For discontinuous production, it shall be recorded according to the production cycle, once/cycle; if the period is less than 1 day, it shall be recorded by day, once/day.

D. 原辅料：按照采购批次记录，1 次/批。

D. Raw and auxiliary materials: Recorded according to the purchase batch record, once/batch.

E. 燃料：按照采购批次记录，1 次/批。

E. Fuel: Recorded according to the purchase batch record, once/batch.

②非正常工况

② Abnormal working conditions

按照工况期记录，1 次/工况期。

Recorded according to the operating period, once/operating period.

3）污染防治设施运行管理信息

3）Operating management information for pollution control facilities

①正常工况

① Normal working conditions

A. 运行情况：按日记录，1 次/日。

A. Operation status: Recorded by day, once/day.

B. 主要药剂添加情况：按日或批次记录，1 次/日或批次。

B. Addition of main drugs: Recorded by day or batch, once/day or batch.

C. DCS 曲线图：按月记录，1 次/月。

C. DCS graph: Recorded by month, once/month.

②异常情况：按照异常情况期记录，1 次/异常情况期。

② Abnormal situation: Recorded according to the abnormal situation period, once/abnormal situation period.

4）监测记录信息

4）Monitoring record information

按照 HJ819 及各行业自行监测技术指南规定执行。

Recorded according to HJ819 and the technical guidelines for self-monitoring in various industries.

5）其他环境管理信息

5）Other environment management information

A. 废气无组织污染防治措施管理信息：按日记录，1 次/日。

A. Management information of waste gas unorganized pollution prevention and control measures: Recorded by day, once/day.

B. 特殊时段环境管理信息：按照 1）~2）规定频次记录；对于停产或错峰生产的，

原则上仅对停产或错峰生产的起止日期各记录1次。

B. Environmental management information for special time period: Recorded according to the specified frequency in 1) ~ 2); for production stoppage or off-peak production, in principle, only the starting and ending dates of stoppage or off-peak production shall be recorded once each.

C. 其他信息：依据法律法规、标准规范或实际生产运行规律等确定记录频次。

C. Other information: Determine the recording frequency according to laws and regulations, standards and specifications or actual production and operation rules.

（5）记录及储存

（5）Record and storage

A.纸质存储：应将纸质台账存放于保护袋、卷夹或保护盒等保存介质中；由专人签字、定点保存；应采取防光、防热、防潮、防细菌及防污染等措施；如有破损应及时修补，并留存备查；保存时间原则上不低于3年。

A. Paper storage: Paper ledgers shall be stored in storage media such as protective bags, rollers or protective boxes; signed by a special person and kept at a fixed point; measures such as light prevention, heat prevention, moisture prevention, bacteria prevention and pollution prevention should be taken. In case of any damage, such ledgers should be repaired in time and kept for future reference. In principle, the preservation time shall not be less than 3 years.

B.电子化存储：应存放于电子存储介质中，并进行数据备份；可在排污许可管理信息平台填报并保存；由专人定期维护管理；保存时间原则上不低于3年。

B. Electronic storage: Ledgers should be stored in electronic storage media and backed up with data and filled in and saved in the sewage permit management information platform. Special personnel shall be assigned for regular maintenance and management. In principle, the preservation time shall not be less than 3 years.

8.1.2 环境管理体系及管理计划

8.1.2 Environmental management system and management plan

环境管理机构分为外部环境管理机构和内部环境管理机构。企业外部环境管理机构指政府性环境管理机构，主要有广西壮族自治区生态环境厅、北海市生态环境局、铁山港区生态环境局等；内部环境管理机构是指工程投资建设方所建立的环境保护专门机构。

Environmental management agencies are divided into external environmental management agencies and internal environmental management agencies. External environmental management agencies refer to government environmental management agencies, mainly including Department of Ecological Environment of Guangxi Zhuang Autonomous Region, Beihai Ecological Environment Bureau, Tieshangang District Ecological Environment Bureau, etc.; internal environmental management agencies refer to the specialized environmental protection agencies established by the project investment and construction parties.

根据本项目的建设规模和环境管理的任务，项目建设期应设一名环保专职或兼职人员，负责工程建设期的环境保护工作；工程建成后应在公司设专职环境监督人员 2～3 名，负责环境监督管理及各项环保设施的运行管理工作。环境保护管理机构人员的主要职责如下：

According to the construction scale of the Project and the task of environmental management, a full-time or part-time environmental protection personnel shall be assigned during construction of the Project to be responsible for the environmental protection work during construction of the Project. Upon completion of the Project, 2 ~ 3 full-time environmental supervisors shall be assigned in the Company to be responsible for environmental supervision and management and the operation and management of various environmental protection facilities. The main responsibilities of the personnel of environmental protection management agencies are as follows:

（1）负责整个企业的环境保护管理工作。即贯彻执行国家和地方的环保政策、法规，对内宣传国家的环保法规和政策，并对有关操作人员进行技术培训和考核，以提高职工的环保意识和专业素质。

(1) Responsible for the environmental protection management of the Company. Implement the national and local environmental protection policies and regulations, publicize the national environmental protection laws and policies internally, and carry out technical training and assessment for relevant operators, so as to improve the environmental protection awareness and professional quality of employees.

（2）建立和健全企业各种环境管理规章制度、环境管理台账制度，领导和协调环境监测计划的落实，确保监测工作正常运行。

(2) Establish and improve various environmental management rules and regulations and environmental management ledger systems of the Company, lead and coordinate the implementation of environmental monitoring plans, and ensure the normal operation of monitoring work.

（3）制定各项环境保护设施和措施的建设、运行及维护费用保障计划。

(3) Formulate the construction, operation and maintenance cost guarantee plan for various environmental protection facilities and measures.

（4）与政府环保部门密切配合，接受各级政府环境保护管理部门的检查和指导，协同当地环境保护管理部门解答和处理公众提出的意见和问题。

(4) Cooperate closely with the environmental protection departments of the government, accept the inspection and guidance of the environmental protection management departments of all levels of government, and cooperate with the local environmental protection management departments to answer and address public opinions and questions.

（5）监督全厂的环保设施运行情况，严格做到污染物达标排放；组织环保设施改造、环保科研等计划的编制和实施工作。

(5) Supervise the operation of environmental protection facilities in the whole plant and strictly ensure that pollutants meet the discharge standards; organize the preparation and implementation of plans for the renovation of environmental protection facilities and environmental protection scientific research.

（6）负责组织突发性环境事故的应急处理及善后事宜，及时报告上级环保管理部门。

(6) Organize the emergency treatment and aftermath of sudden environmental accidents and promptly report to the superior environmental protection management department.

8.1.3 施工期环境管理计划

8.1.3 Environmental management plan during construction

建设项目施工期现场环境管理对建设期环境保护具有重要作用。建设单位应按照环境保护基本要求建立施工期环境管理相关规定，预防施工期土石方堆放、施工废水、施工噪声等对周围环境的破坏，监督临时用地的及时恢复。施工单位应针对项目所在地区的环境特点及周边敏感保护目标的情况，制定相应的措施，确保施工作业对周围敏感目标的影响降至最低。

On-site environmental management during construction of construction projects plays a significant role in environmental protection during construction. The Employer shall, in accordance with the basic requirements of environmental protection, establish relevant regulations on environmental management during construction, prevent the damage to the surrounding environment caused by earth and stone stacking, construction wastewater, construction noise, etc. during construction, and supervise the timely recovery of temporary land. The construction contractor shall formulate corresponding measures according to the environmental characteristics of the area where the project is located and the situation of the surrounding sensitive protection targets to ensure that the impact of construction operations on the surrounding sensitive targets is minimized.

在施工期间，项目工程建设单位应组织人员进行施工期的环境管理与监控工作，主要工作内容包括：

During construction, the Employer shall organize personnel to carry out environmental management and monitoring during construction. The main work contents include:

（1）根据国家有关的施工管理条例和操作规程，按照施工期环境保护要求，制定本项目的施工环境保护管理方案；

(1) Formulate the construction environmental protection management plan for this Project according to the relevant national construction management regulations and operating procedures and the environmental protection requirements during construction;

（2）监督施工单位执行施工环境保护管理方案的情况，对不符合该管理方案的施工行为及时予以制止；

(2) Supervise the implementation of the construction environmental protection management plan by the construction contractor, and promptly stop the construction behavior that does not conform to the management plan;

（3）向北海市生态环境局提交施工期的环境保护工作阶段报告。

(3) Submit the environmental protection work phase report during construction to Beihai Ecological Environment Bureau.

8.1.4 项目运营期环境管理计划

8.1.4 Environmental management plan during operation

企业应建立环境管理机构，负责运行期的环境保护工作。环境管理机构的主要职责如下：

Enterprises should establish environmental management agencies to be responsible for environmental protection during operation. The main responsibilities of the environmental management agencies are as follows:

（1） 认真贯彻国家有关环保法规、规范，健全各项规章制度；

（1） Conscientiously implement the relevant national environmental protection laws and regulations, standardize and improve various rules and regulations;

（2） 监督环保设施运行情况，监督企业各污染物排放口的排放情况；

（2） Supervise the operation of environmental protection facilities and supervise the discharge of pollutants from various pollutant discharge outlets;

（3） 建立企业环境保护档案；

（3） Establish environmental protection files;

（4） 加强环境监测仪器、设备的维护，确保企业的环境监测工作的正常进行；

（4） Strengthen the maintenance of environmental monitoring instruments and equipment to ensure the normal operation of environmental monitoring;

（5） 参加本企业的环境事件的调查、处理、协调工作。

（5） Participate in the investigation, handling and coordination of environmental events in the Company.

项目运营期环境管理计划详见表 8.1-1。

Please refer to Table 8.1-1 for details of the environmental management plan during the project operation period.

表 8.1-1 项目营运期环境管理计划

Table 8.1-1 Environmental Management Plan for Project Operation Period

项目 Item	**环境管理要求 Environmental management requirements**	**执行机构 Implementation agency**	**监督管理机构 Supervision and management agency**
废水 Waste water	加强公司污水处理站的管理，确保污水处理装置稳定运行，确保企业生产废水正常排放。 Enhance the management of the Company's sewage treatment plant to ensure the stable operation of the sewage treatment device and the normal discharge of the Company's production wastewater.	广西太阳纸业有限公司环保管理部门 Environmental protection management department of Guangxi Sun Paper Co., Ltd.	北海市生态环境局 Beihai Ecological Environment Bureau
废气 Exhaust gas	制定设备维护管理责任制，维修人员定期检修废气治理设施，确保正常运行，保证废气达标排放。 Formulate the responsibility system for equipment maintenance and management and assign maintenance personnel regularly overhaul waste gas treatment facilities to ensure normal operation and emission of waste gas up to standard.		
噪声 Noise	选用低噪声设备，做好减震、隔声措施，确保厂界噪声达标，防止生产作业噪声扰民。 Select low noise equipment, and take shock absorption and sound insulation measures to ensure that the noise at the plant boundary reaches the standard and prevent noise from production operations from disturbing the public.		
固废 Solid waste	集中管理，堆存场地按有关工程规范建设，做好防渗、定期清理等。 Carry out centralized management and storage site construction shall be subject to relevant engineering		

项目 **Item**	环境管理要求 **Environmental management requirements**	执行机构 **Implementation agency**	监督管理机构 **Supervision and management agency**
	specifications, seepage prevention control, regular cleaning, etc.		
环境风险管理 Environmental risk management	①制定污染事故应急预案，并落实相关措施；②当发生污染事故时，应根据具体情况采取污染控制措施，增加监测频次，并进行跟踪监测。 ① Formulate emergency plans for pollution accidents and implement relevant measures; ② when pollution accidents occur, pollution control measures should be taken according to specific conditions, monitoring frequency should be increased, and tracking monitoring should be carried out.		
环境监测 Environment monitoring	按照环境监测技术规范和国家相关部门颁布的监测标准、方法执行。 Implement in accordance with the Technical Specifications for Environmental Monitoring and the monitoring standards and methods promulgated by relevant national departments.	有资质的监测单位 Qualified monitoring unit	

8.1.5 排污口规范化建设

8.1.5 Standardized construction of sewage outlets

排放口是企业污染物进入环境、污染环境的通道，强化排放口的管理是实施污染物总量控制的基础工作之一，也是区域环境管理初步实现污染物排放的科学化，定量化手段。根据国家标准《环境保护图形标志－排放口(源)》（GB/T 15562.1-1995）、国家环保总局《排污口规范化整治要求(试行)》的技术要求，企业所有排放口(包括水、气、声、渣)必须按照“便于采集样品、便于计量监测、便于日常现场监督检查”的原则和规范化要求，设置与之相适应的环境保护图形标志牌，绘制企业排污口分布图，同时对污水排放口安装流量计，对治理设施安装运行监控装置、排污口的规范化要符合有关要求。

Discharge outlet is the channel for enterprise pollutants to enter and pollute the environment. Strengthening the management of discharge outlets is one of the basic tasks for implementing total pollutant control, and is also a scientific and quantitative means for pollutant discharge in regional environmental management. According to the technical requirements of the national standard Graphic Signs for Environmental Protection-Discharge Outlets (Sources) (GB/T 15562.1-1995) and the Requirements for Standardized Treatment of Sewage Outlets (Trial) issued by State Environmental Protection Administration, all discharge outlets (including water, gas, sound and slag) of the enterprise must comply with the principle and standardization requirements of "convenient sample collection, convenient measurement and monitoring, convenient daily on-site supervision and inspection". Corresponding environmental protection graphic signs shall be set up, the distribution map of sewage outlets of enterprises shall be drawn, flowmeters at sewage outlets shall be installed, operation monitoring devices for treatment facilities shall be installed, and sewage outlets shall be standardized to meet relevant requirements.

1、废水

1. Wastewater

在不同排水口设置相应环保图形标志牌，便于管理、维修以及更新，且应具备采样条件，便于采样分析水质状况，以确保处理废水水质满足排放标准要求，该部分依托现有工程。

Corresponding environmental protection graphic signs shall be set up at different drainage outlets to facilitate management, maintenance and renewal, and sampling conditions shall be met to facilitate sampling and analysis of water quality conditions, so as to ensure that the water quality of treated wastewater meets the requirements of discharge standards. This part relies on the existing project.

2、废气

2. Waste gas

废气排放口必须符合规定的高度和按《污染源监测技术规范》便于采样、监测的要求，烟囱或烟道应设置永久采样孔，并安装采样监测平台，并设置醒目的环保标志牌。

The waste gas discharge outlets must meet the specified height and the requirements of convenient sampling and monitoring according to the Technical Specification for Pollution Source Monitoring. The chimney or flue shall be provided with permanent sampling holes, a sampling and monitoring platform shall be installed, and conspicuous environmental protection signs shall be set up.

3、固定噪声排放源

3. Fixed noise emission source

按规定对各场内噪声源进行治理，并在制浆车间、制氧站、热电站等噪声较大区域设置环境保护图形标志牌。

According to regulations, the noise sources in each yard shall be controlled and environmental protection graphic signs shall be set up in areas with high noise such as pulping workshop, oxygen generation station and thermal power station.

4、固体废物贮存场

4. Solid waste storage site

固体废物贮存场做好防扬散、防流失、防渗漏、防雨的工作，并应在存放场边界和进出口位置设置环保标志牌。

The solid waste storage site shall prevent dispersion, loss, leakage and rain, and shall set up environmental protection signs at the boundary of the storage site and the entrance and exit positions.

项目建成后，应对厂区内所有污染排放口的名称、位置、数量以及排放污染物名称、数量等内容进行统计，在线监控并登记上报当地环保部门，以便进行验收和排放口规范化管理。

Upon completion of the Project, efforts should be made summarize statistics including name, location and quantity of all pollutant discharge outlets in the plant area, as well as the name and quantity of discharged pollutants, etc., conduct online monitoring and report to the local environmental protection department for acceptance and standardized management of discharge outlets.

表 8.1-2　项目废水直接排放口基本情况表
Table 8.1-2 Basic Information of Direct Wastewater Discharge Outlets of the Project

序号 S.N.	排放口编号 Discharge outlet number	排放口地理坐标 Geographical coordinates of discharge outlet		废水排放量/（万t/a） Discharge amount of wastewater/ (10,000t/a)	排放去向 Discharge destination	排放规律 Discharge rule	间歇排放时段 Intermittent discharge period	收纳自然水体信息 Receive natural water information		汇入受纳自然水体处地理坐标 Geographical coordinates of the place that receives natural water body		备注 Remarks
		经度 Longitude	纬度 Latitude					名称 Name	收纳水体功能目标 Functional objectives for receiving water bodies	经度 Longitude	纬度 Latitude	
1	DW001（总排口）DW001 (main outlet)	109°35′51.4999″	21°30′50.1855″	2452.41（一期）2452.41 (Phase I)	直接进入纳污海域 Directly enter the receiving sea area	连续排放，流量稳定 Continuous discharge and stable flow	/	铁山港西岸排污区1（GX012 DⅣ）Tieshangang west bank pollutant discharge area 1 (GX012 DⅣ)	四类 Class IV	109°33′31.1175″~109°35′53.0374″E	21°30′50.1855″~21°31′40.4499″N	深海排放，排放深度：-13m；离岸距离4km Deep sea discharge, discharge depth:-13m; offshore distance 4km
				3230.79（一、二期）3230.79 (Phase I and Phase II)								

表8.1-3　废水污染物排放执行标准表
Table 8.1-3 Executive Standards for Wastewater Pollutants

序号 No.	排放口编号 Discharge outlet number	污染物种类 Pollutant type	国家或地方污染物排放标准及其他按规定商定的排放协议[a] National or local pollutant discharge standards and other emission agreements (a)

			名称 Name	浓度限值/(mg/L) Concentration limit (mg/L)
1	DW001（总排口） DW001 (main outlet)	COD	《制浆造纸工业水污染物排放标准》（GB3544-2008）表2新建制浆和造纸联合生产企业水污染物排放浓度限值，其中，氨氮和总氮排放执行表3水污染物特别排放限值 As to the discharge concentration limits of water pollutants from newly-built pulp and paper-making joint production enterprises in the Table 2 of the Discharge Standard of Water Pollutants for Pulp and Paper Industry (GB3544-2008), the discharge of ammonia nitrogen and total nitrogen shall be subject to the special discharge limits of water pollutants in Table 3.	74
		BOD_5		20
		SS		30
		NH_3-N		5
		TN		10
		TP		0.8
	DW002（化学浆车间废水排放口） DW002 (wastewater discharge outlet of chemical pulp workshop)	AOX		12

a指对应排放口须执行的国家或地方污染物排放标准以及其他按规定商定建设项目水污染物排放控制要求的协议，据此确定的排放浓度限值。
a. The emission concentration limit determined based on the national or local pollutant discharge standards that need to be followed by corresponding discharge outlets as well as the agreements of water pollutant discharge control requirements for other construction projects.

表8.1-4　项目废气排放口基本情况及排放执行标准表
Table 8.1-4 Basic Situation of Waste Gas Discharge Outlet of the Project and Implementation Standard

序号 S.N.	排放口编号 Discharge outlet number	排放口类型 Discharge outlet type	污染源 Source of pollution	污染物种类 Pollutant type	排放口地理坐标 Geographical coordinates of discharge outlet		排气筒高度(m) Height of the exhaust funnel (m)	排气筒出口内径（m） Outlet diameter of the exhaust funnel (m)	国家或地方污染物排放标准[1] National or local pollutant emission standards (1		
					经度 Longitude	纬度 Latitude			名称 Name	浓度限值（mg/Nm^3） Concentration limit (mg/m3)	速率限值 Rate limit
1	DA001	主要排放口 Main discharge outlet	4600tds/d碱回收炉烟囱废气 Waste gas from 4600tds/d alkali recovery boiler chimney	烟尘 Smoke dust	109°33′16.41″	21°31′38.68″	150	5.2	《火电厂大气污染物排放标准》（GB 13223-2011） Emission Standard of Air Pollutants for Thermal Power Plants (GB 13223-2011)	30	-
				二氧化硫 Sulfur dioxide						400	-
				氮氧化物 Oxynitride						200	-
				硫化氢 Hydrogen sulfide					《恶臭污染物排放标准》（GB 14554-93） Emission Standard for Odor Pollutants (GB 14554-93)	-	21
2	DA002	一般排放口 General discharge outlet	850t/d石灰窑废气 850t/d lime kiln waste gas	烟尘 Smoke dust	109°33′16.41″	21°31′38.68″	150	2.6	《工业炉窑大气污染物排放标准》（GB 9078-1996） Emission Standard of Air Pollutants for Industrial Kiln and Furnace (GB 9078-1996)	200	-
				二氧化硫 Sulfur dioxide						850	-
				硫化氢 Hydrogen sulfide					《恶臭污染物排放标准》（GB 14554-93） Emission Standard for Odor Pollutants (GB 14554-93)	-	21
3	DA003	主要排放口 Main discharge	220t/h固废综合利用锅炉废气	颗粒物 PM	109°33′16.41″	21°31′38.68″	150	4.8	参照《全面实施燃煤电厂超低排放和节能改造工作方	10	-
				二氧化硫						35	-

序号 S.N.	排放口编号 Discharge outlet number	排放口类型 Discharge outlet type	污染源 Source of pollution	污染物种类 Pollutant type	排放口地理坐标 Geographical coordinates of discharge outlet		排气筒高度(m) Height of the exhaust funnel (m)	排气筒出口内径（m） Outlet diameter of the exhaust funnel (m)	国家或地方污染物排放标准[1] National or local pollutant emission standards (1		
					经度 Longitude	纬度 Latitude			名称 Name	浓度限值（mg/Nm³） Concentration limit (mg/m3)	速率限值 Rate limit
		outlet	+2×280t/h燃煤供热锅炉废气 Waste gas from 220t/h solid waste comprehensive utilization boiler + waste gas from 2 × 280t/h coal-fired heating boiler	Sulfur dioxide					案》（环发〔2015〕164号）		
				氮氧化物 Oxynitride					中锅炉废气超低排放标准限值 Refer to the ultra-low emission standard limit for boiler waste gas as stipulated in the Work Plan on Fully Implementing Ultra-low Emission and Energy Saving Transformation of Coal-fired Power Plants (HF[2015] No.164).	50	-
				汞及其化合物 Mercury and its compounds					《火电厂大气污染物排放标准》（GB 13223-2011） Emission Standard of Air Pollutants for Thermal Power Plants (GB 13223-2011)	0.03	
				一氧化碳 Carbon monoxide					《生活垃圾焚烧污染控制标准》（GB18485-2014） Standard for Pollution Control on the Municipal Solid Waste Incineration (GB18485-2014)	100	-
				氯化氢 Hydrogen chloride						50	-
				镉、铊及其化合物						0.1	-

序号 S.N.	排放口编号 Discharge outlet number	排放口类型 Discharge outlet type	污染源 Source of pollution	污染物种类 Pollutant type	排放口地理坐标 Geographical coordinates of discharge outlet		排气筒高度(m) Height of the exhaust funnel (m)	排气筒出口内径（m） Outlet diameter of the exhaust funnel (m)	国家或地方污染物排放标准[1] National or local pollutant emission standards (1		
					经度 Longitude	纬度 Latitude			名称 Name	浓度限值（mg/Nm^3）Concentration limit (mg/m3)	速率限值 Rate limit
				Cadmium, thallium and their compounds							
				锑、砷、铅、铬、钴、铜锰、镍及其化合物 Antimony, arsenic, lead, chromium, cobalt, copper manganese, nickel and compounds thereof						1.0	-
				二噁英 Dioxin						0.1（ng TEG/m^3）	-
4	DA004	一般排放口 General discharge outlet	臭气焚烧器 Odor incinerator	硫化氢 Hydrogen sulfide	109°33′16.41″	21°31′38.68″	150	1.5	《恶臭污染物排放标准》（GB 14554-93） Emission Standard for Odor Pollutants (GB 14554-93)	-	21
				臭气浓度 Stink concentration						-	6000（无量纲） 6000 (non-d

序号 S.N.	排放口编号 Discharge outlet number	排放口类型 Discharge outlet type	污染源 Source of pollution	污染物种类 Pollutant type	排放口地理坐标 Geographical coordinates of discharge outlet 经度 Longitude	纬度 Latitude	排气筒高度(m) Height of the exhaust funnel (m)	排气筒出口内径（m） Outlet diameter of the exhaust funnel (m)	国家或地方污染物排放标准[1] National or local pollutant emission standards (1 名称 Name	浓度限值（mg/Nm^3） Concentration limit (mg/m3)	速率限值 Rate limit
											imensional)
5	DA005		纸浆车间漂白尾气 Bleaching tail gas from pulp workshop	氯气 Chlorine	109°33′16.41″	21°31′38.68″	150	1.0	《大气污染物综合排放标准》（GB16297-1996） Comprehensive Emission Standards for Air Pollutants (GB16297-1996)	65	52.7
6	DA006	一般排放口 General discharge outlet	二氧化氯车间过量氢气排空尾气 Excessive hydrogen tail gas of chlorine dioxide workshop	氯气 Chlorine	109°33′03.98″	21°31′26.36″	25	0.2	《无机化学工业污染物排放标准》（GB31573-2015） *Emission Standard of Pollutants for Synthetic Resin Industry* (GB31573-2015)	8	-
7	DA007	一般排放口 General discharge outlet	二氧化氯车间盐酸合成尾气 Tail gas from hydrochloric acid synthesis in chlorine dioxide workshop	氯气 Chlorine	109°33′03.98″	21°31′26.36″	42	0.25		8	-
				氯化氢 Hydrogen chloride						20	-
8	DA008	一般排放口 General discharge outlet	二氧化氯车间槽罐尾气 Tail gas from tank of chlorine	氯气 Chlorine	109°33′03.98″	21°31′26.36″	30	0.3		8	-

序号 S.N.	排放口编号 Discharge outlet number	排放口类型 Discharge outlet type	污染源 Source of pollution	污染物种类 Pollutant type	排放口地理坐标 Geographical coordinates of discharge outlet		排气筒高度(m) Height of the exhaust funnel (m)	排气筒出口内径（m） Outlet diameter of the exhaust funnel (m)	国家或地方污染物排放标准[1] National or local pollutant emission standards (1		
					经度 Longitude	纬度 Latitude			名称 Name	浓度限值（mg/Nm^3） Concentration limit (mg/m3)	速率限值 Rate limit
			dioxide workshop								

8.1.6排污许可证申请

8.1.6 Application for pollutant discharge permit

1、新建项目的排污单位应当在投入生产或使用并产生实际排污行为之前申请领取排污许可证。

1. The pollutant discharge unit of the new project should apply for a pollutant discharge permit before the project is put into production or use and produces actual pollutant discharge behavior.

2、排污单位依法按照排污许可证申请与核发技术规范提交排污许可申请，申报排放污染物种类、排放浓度等，测算并申报污染物排放量。

2. Pollutant discharge disposal units, in accordance with the pollutant discharge permit application and the issuance of technical specifications, submit the pollutant discharge permit application, declare the type of pollutants discharged, discharge concentration, etc., calculate and declare the pollutant emissions.

3、排污单位在申请排污许可证前，应当将主要申请内容，包括排污单位基本信息、拟申请的许可事项、产排污环节、污染防治设施，通过国家排污许可证管理信息平台或者其他规定途径等便于公众知晓的方式向社会公开。公开时间不得少于5日。对实行排污许可简化管理的排污单位，可不进行申请前信息公开。

3. Before applying for a pollutant discharge permit, the pollutant discharge unit shall disclose the main application contents, including the basic information of the pollutant discharge unit, the licensing items to be applied for, the links of production and discharge, and the pollution prevention and control facilities, to the public through the National Pollutant Discharge Permit Management Information Platform or other prescribed channels and other ways that are convenient for the public to know. The time for making public shall not be less than five days. For pollutant discharge units that implement simplified management of pollutant discharge permits, information disclosure before application may not be carried out.

4、排污单位应当在国家排污许可证管理信息平台上填报并提交排污许可证申请，同时向有核发权限的环境保护主管部门提交通过平台印制的书面申请材料。排污单位对申请材料的真实性、合法性、完整性负法律责任。申请材料应当包括：

4. Pollutant discharge units shall fill in and submit the application for pollutant discharge permits on the National Pollutant Discharge Permit Management Information Platform, and submit the written application materials printed through the platform to the competent environmental protection department with the authority to issue the permit. Pollutant

discharge units shall be legally responsible for the authenticity, legality and integrity of the application materials. The application materials shall include:

（1）排污许可证申请表，主要内容包括：排污单位基本信息，主要生产装置，废气、废水等产排污环节和污染防治设施，申请的排污口位置和数量、排放方式、排放去向、排放污染物种类、排放浓度和排放量、执行的排放标准。排污许可证申请表格式见附件。

(1) Application form for pollutant discharge permit, the main contents of which include: Basic information of pollutant discharge unit, main production plants, waste gas, wastewater and other production and pollutant discharge links and pollution prevention and control facilities, location and quantity of pollutant discharge outlets applied for, discharge mode, discharge destination, type of pollutants discharged, discharge concentration and discharge amount, and discharge standards implemented. Refer to Appendix for the format of Application Form for Pollutant Discharge Permit.

（2）有排污单位法定代表人或者实际负责人签字或盖章的承诺书。主要承诺内容包括：对申请材料真实性、合法性、完整性负法律责任；按排污许可证的要求控制污染物排放；按照相关标准规范开展自行监测、台账记录；按时提交执行报告并及时公开相关信息等。

(2) A letter of commitment signed or sealed by the legal representative or actual person in charge of the pollutant discharge unit. The main commitments include: Take legal responsibility for the authenticity, legality and integrity of the application materials; control the discharge of pollutants according to the requirements of the Pollutant Discharge Permit; carry out self-monitoring and ledger records in accordance with relevant standards and specifications; submit the implementation report on time and disclose relevant information in time.

（3）排污单位按照有关要求进行排污口和监测孔规范化设置的情况说明。

(3) Pollutant discharge units describe the settings of pollutant discharge outlets and monitoring holes in accordance with the relevant requirements.

（4）建设项目环境影响评价批复文号，或按照《国务院办公厅关于加强环境监管执法的通知》（国办发〔2014〕56 号）要求，经地方政府依法处理、整顿规范并符合要求的相关证明材料。

(4) The approval document number of the environmental impact assessment of the construction project, or the relevant certification materials that have been handled, rectified,

standardized by the local government in accordance with the requirements of the Notice of the General Office of the State Council on Strengthening Environmental Supervision and Law Enforcement (GBF [2014] No.56).

（5）城镇污水集中处理设施还应提供纳污范围、纳污企业名单、管网布置、最终排放去向等材料。

(5) Urban sewage centralized treatment facilities should also provide materials such as the scope of sewage receiving, the list of sewage receiving enterprises, the layout of pipe networks, and the final discharge destination.

（6）法律法规规定的其他材料。

(6) Other materials stipulated by laws and regulations.

对实行排污许可简化管理的排污单位，上述材料可适当简化。

The above materials can be appropriately simplified for pollutant discharge units that implement simplified management of pollutant discharge permits.

8.2 污染物排放清单及管理措施

8.2 Pollutant discharge list and management measures

8.2.1 污染物排放清单

8.2.1 Pollutant discharge list

项目污染物排放清单及管理措施、排放标准等信息见下表 8.2-1。

Refer to Table 8.2-1 below for the project pollutant emission list, management measures, emission standards and other information.

表 8.2-1 污染物排放清单及管理措施
Table 8.2-1 Pollutant Discharge List and Management Measures

类别 Category	工序/生产线 Process/production line	污染源 Source of pollution	污染物 Pollutant	排放浓度 Emission concentration		一期全厂 Phase I discharge of the plant 排放量(t/a) Amount of discharge(t/a)	一期+二期全厂排放量(t/a) Phase I and Phase II discharge of the plant (t/a)	环保设施 Environmental protection facilities	主要运行参数 Main operating parameters	排污口管理 Pollutant discharge outlet management	排放标准 Discharge standard
				一期 Phase I	一期+二期 Phase I + Phase II						
有组织废气 Organized waste gas	碱回收车间 Alkaline recovery workshop	4600t/d碱炉 4600t/d alkali boiler	烟尘 Smoke dust	27.6	27.6	201.24	220.41	三列四电场静电除尘 Three-row four-electric field electrostatic precipitator	经1根150mH×Φ5.2m烟囱排放至大气环境 It is discharged to the atmosphere through a 150mH×Φ5.2m chimney	设置便于采样、监测的采样口或采样平台，并设置醒目的环保标志牌 Set up sampling outlets or sampling platforms that are convenient for sampling and monitoring, and	《火电厂大气污染物排放标准》（GB 13223-2011） Emission Standard of Air Pollutants for Thermal Power Plants (GB 13223-2011)
			SO_2	44.9	45.8	327.76	365.84				
			NO_x	200.0	200.0	1460.17	1599.23				
			H_2S	4.5	4.6	32.8	36.6				《恶臭污染物排放标准》（GB 14554-93） Emission Standard for Odor Pollutants (GB 14554-93)
		850t/d石灰窑	烟尘 Smoke dust	58.4	58.4	75.71	75.71	一列四电场静电除	经1根150mH		《工业炉窑大气污染物排放

类别 Category	工序/生产线 Process/production line	污染源 Source of pollution	污染物 Pollutant	排放浓度 Emission concentration 一期 Phase I	排放浓度 Emission concentration 一期+二期 Phase I + Phase II	一期全厂 Phase I discharge of the plant 排放量(t/a) Amount of discharge(t/a)	一期+二期全厂排放量(t/a) Phase I and Phase II discharge of the plant (t/a)	环保设施 Environmental protection facilities	主要运行参数 Main operating parameters	排污口管理 Pollutant discharge outlet management	排放标准 Discharge standard
		850t/d lime kiln	SO_2	99.7	99.7	129.20	129.20	尘 One-row four-electric field electrostatic precipitator	×Φ2.6m 烟囱排放至大气环境 It is discharged to the atmosphere through a 150mH×Φ2.6m chimney	set up conspicuous environmental protection signs.	标准》（GB 9078-1996） Emission Standard of Air Pollutants for Industrial Kiln and Furnace (GB 9078-1996)
			NO_x	419.9	419.9	544.00	544.00				
			H_2S	13.5	13.5	17.5	17.5				《恶臭污染物排放标准》（GB 14554-93） Emission Standard for Odor Pollutants (GB 14554-93)
	热电站 Thermal power plant	220t/h 固废锅炉 220t/h solid waste boiler	烟尘 Smoke dust	9.88	9.88	13.39	18.57	SNCR/SCR 联合脱硝+活性炭吸附+布袋除尘器+炉外石灰石/石膏湿法脱硫+高效除雾器 SNCR/SCR combined denitration +activated carbon adsorption+bag-type dust collector+wet desulphurization of limestone/gypsum outside the furnace+high-efficiency demister	经 1 根 150mH×Φ4.8m 烟囱排放至大气环境 It is discharged to the atmosphere through a 150mH×Φ4.8m chimney		锅炉废气超低排放标准限值 Ultra-low emission standard limits for boiler waste gas
			二氧化硫 Sulfur dioxide	34.83	34.73	47.18	65.29				
			氮氧化物 Oxynitride	49.95	49.95	67.66	93.90				
			汞 Mercury	0.0082	0.0121	0.0111	0.0227				《火电厂大气污染物排放标准》（GB 13223-2011） Emission Standard of Air Pollutants for Thermal Power Plants (GB 13223-2011)
			氯化氢 Hydrogen chloride	25	25	33.86	47.00				《生活垃圾焚烧污染控制标准》（GB18485-2014） Standard for Pollution Control on the Municipal Solid Waste Incineration (GB18485-2014)
			一氧化碳 Carbon monoxide	100	100	135.46	187.99				

类别 **Category**	工序/生产线 **Process/production line**	污染源 **Source of pollution**	污染物 **Pollutant**	排放浓度 **Emission concentration**		一期全厂 **Phase I discharge of the plant** 排放量(t/a) Amount of discharge(t/a)	一期+二期全厂排放量(t/a) Phase I and Phase II discharge of the plant (t/a)	环保设施 **Environmental protection facilities**	主要运行参数 **Main operating parameters**	排污口管理 **Pollutant discharge outlet management**	排放标准 **Discharge standard**
				一期 **Phase I**	一期+二期 **Phase I + Phase II**						
			镉 Cadmium	0.0917	0.0895	0.1242	0.1683				
			铊 Thallium	0.008	0.008	0.0108	0.0150				
			锑 Antimony	0.0011	0.0011	0.0015	0.0021				
			砷 Arsenic	0.0111	0.0107	0.0150	0.0201				
			铅 Lead	0.3743	0.3610	0.5070	0.6786				
			铬 Chromium	0.4225	0.4069	0.5723	0.7650				
			钴 Cobalt	0.00274	0.00274	0.0037	0.0052				
			铜 Copper	0.0104	0.0104	0.0141	0.0196				
			锰 Manganese	0.0489	0.0489	0.0662	0.0919				
			镍 Nickel	0.126	0.126	0.1707	0.2369				
			镉+铊 Cadmium + thallium	0.0997	0.0975	0.1350	0.1833				
			锑+砷+铅+铬+钴+铜+锰+镍	0.9971	0.9677	1.3506	1.8193				

类别 Category	工序/生产线 Process/production line	污染源 Source of pollution	污染物 Pollutant	排放浓度 Emission concentration 一期 Phase I	一期+二期 Phase I + Phase II	一期全厂 Phase I discharge of the plant 排放量(t/a) Amount of discharge(t/a)	一期+二期全厂排放量(t/a) Phase I and Phase II discharge of the plant (t/a)	环保设施 Environmental protection facilities	主要运行参数 Main operating parameters	排污口管理 Pollutant discharge outlet management	排放标准 Discharge standard
			Antimony+arsenic+lead+chromium+cobalt+copper+manganese+nickel								
			二噁英 Dioxin	0.0330ng TEG/m^3	0.0330 ng TEG/m^3	0.0447 mg/a	0.0620 mg/a				
		1×280t/h 燃煤锅炉（1#） 1×280t/h coal-fired boiler (1#)	烟尘 Smoke dust	9.87	9.87	24.41	24.41	SNCR/SCR 联合脱硝+电袋除尘器+炉外石灰石/石膏湿法脱硫+高效除雾器 SNCR/SCR combined denitration+electrostatic-bag type dust collector+limestone outside the boiler/gypsum wet desulfurization +high efficiency demister			锅炉废气超低排放标准限值 Ultra-low emission standard limits for boiler waste gas
			二氧化硫 Sulfur dioxide	34.90	34.90	86.31	86.31				
			氮氧化物 Oxynitride	49.80	49.80	123.17	123.17				
			汞及其化合物 Mercury and its compounds	0.011	0.011	0.028	0.028				《火电厂大气污染物排放标准》（GB 13223-2011） Emission Standard of Air Pollutants for Thermal Power Plants (GB 13223-2011)
		1×280t/h 燃煤锅炉	烟尘 Smoke dust	/	9.87	/	23.18	SNCR/SCR 联合脱硝+电袋除尘器+炉外石灰石/石膏			锅炉废气超低排放标准限值 Ultra-low emission standard
			二氧化硫	/	34.90	/	81.94				

类别 Category	工序/生产线 Process/production line	污染源 Source of pollution	污染物 Pollutant	排放浓度 Emission concentration 一期 Phase I	排放浓度 Emission concentration 一期+二期 Phase I + Phase II	一期全厂 Phase I discharge of the plant 排放量(t/a) Amount of discharge(t/a)	一期+二期全厂排放量(t/a) Phase I and Phase II discharge of the plant (t/a)	环保设施 Environmental protection facilities	主要运行参数 Main operating parameters	排污口管理 Pollutant discharge outlet management	排放标准 Discharge standard
		（2#）1×280t/h coal-fired boiler (2#)	Sulfur dioxide					湿法脱硫+高效除雾器 SNCR/SCR combined denitration+electrostatic-bag type dust collector+limestone outside the boiler/gypsum wet desulfurization +high efficiency demister			limits for boiler waste gas
			氮氧化物 Oxynitride	/	49.80	/	116.94				
			汞及其化合物 Mercury and its compounds	/	0.011	/	0.027				《火电厂大气污染物排放标准》（GB 13223-2011） Emission Standard of Air Pollutants for Thermal Power Plants (GB 13223-2011)
	漂白车间 Bleaching workshop	漂白塔 Bleaching tower	氯气 Chlorine	4	4	5.32	5.32	碱洗 Alkaline washing	经 1 根 150mH×Φ1.0m 烟囱放至大气环境 It is discharged to the atmosphere through a 150mH×Φ1.0m chimney.		《大气污染物综合排放标准》（GB16297-1996） Comprehensive Emission Standards for Air Pollutants (GB16297-1996)
	二氧化氯制备 Preparation of chlorine	二氧化氯车间过量氢气排空尾气 Excessi	氯气 Chlorine	6.3	6.3	0.102	0.102	碱洗 Alkaline washing	烟囱高度 25m，内径 0.2m Chimney height 25m, inner diameter 0.2 m		《无机化学工业污染物排放标准》（GB31573-2015） *Emission Standard of Pollutants for Synthetic Resin Industry* (GB31573-2015)

类别 Category	工序/生产线 Process/production line	污染源 Source of pollution	污染物 Pollutant	排放浓度 Emission concentration		一期全厂 Phase I discharge of the plant 排放量(t/a) Amount of discharge(t/a)	一期+二期全厂排放量(t/a) Phase I and Phase II discharge of the plant (t/a)	环保设施 Environmental protection facilities	主要运行参数 Main operating parameters	排污口管理 Pollutant discharge outlet management	排放标准 Discharge standard
				一期 Phase I	一期+二期 Phase I + Phase II						
	dioxide	ve hydrogen tail gas of chlorine dioxide workshop									
		二氧化氯车间	氯气 Chlorine	6.4	6.4	0.131	0.131	软化水洗涤 Washing by softened water	烟囱高度 42m，内径 0.25m Chimney height 42m, inner diameter 0.25m		
		盐酸合成尾气 Tail gas from hydrochloric acid synthesis in chlorine dioxide workshop	氯化氢 Hydrogen chloride	15.2	15.2	0.310	0.310				
		二氧化氯车间	氯气 Chlorine	7.3	7.3	0.269	0.269	海波塔洗涤 Washing by Hypo	烟囱高度 30m，内径 0.3m		

类别 **Category**	工序/生产线 **Process/production line**	污染源 **Source of pollution**	污染物 **Pollutant**	排放浓度 **Emission concentration** 一期 **Phase I**	排放浓度 **Emission concentration** 一期+二期 **Phase I + Phase II**	一期全厂 **Phase I discharge of the plant** 排放量(t/a) Amount of discharge(t/a)	一期+二期全厂排放量(t/a) Phase I and Phase II discharge of the plant (t/a)	环保设施 **Environmental protection facilities**	主要运行参数 **Main operating parameters**	排污口管理 **Pollutant discharge outlet management**	排放标准 **Discharge standard**
		槽罐尾气 Tail gas from tank of chlorine dioxide workshop						tower	Chimney height 30m, inner diameter 0.3m		
无组织废气 Unorganized emission of waste gas	木片堆场及备料车间 Wood chip stockyard and preparation workshop	木片堆存、备料过程 Wood chip stacking, material preparation	颗粒物 Particulate Matters (PM)	/	/	35.98	35.98	洒水降尘，水炮喷雾，封闭车间 Spraying water for dust reduction, spraying with water guns, closed workshop	以无组织形式排放 is discharged in a fugitive form	/	《大气污染物综合排放标准》（GB16297-1996） Comprehensive Emission Standards for Air Pollutants (GB16297-1996)
	二氧化氯车间 Chlorine dioxide worksh	二氧化氯生产、贮存过程 Produc	Cl_2	/	/	0.46	0.46	/			《无机化学工业污染物排放标准》（GB31573-2015） *Emission Standard of Pollutants for Synthetic Resin Industry* (GB31573-2015)
			HCl	/	/	0.46	0.46				

类别 **Category**	工序/生产线 **Process/production line**	污染源 **Source of pollution**	污染物 **Pollutant**	排放浓度 **Emission concentration**		一期全厂 **Phase I discharge of the plant** 排放量(t/a) Amount of discharge(t/a)	一期+二期全厂排放量(t/a) Phase I and Phase II discharge of the plant (t/a)	环保设施 **Environmental protection facilities**	主要运行参数 **Main operating parameters**	排污口管理 **Pollutant discharge outlet management**	排放标准 **Discharge standard**
				一期 **Phase I**	一期+二期 **Phase I + Phase II**						
	op	tion and storage process of chlorine dioxide									
	干煤棚 Dry coal shed	煤堆 Coal pile	颗粒物 Particulate Matters (PM)	/	/	4.57	5.14				《大气污染物综合排放标准》（GB16297-1996） Comprehensive Emission Standards for Air Pollutants (GB16297-1996)
	污水处理站 Sewage treatment plant	各污水构筑物 Various sewage structures	氨气 Ammonia	/	/	1.053	1.053				《无机化学工业污染物排放标准》（GB31573-2015） *Emission Standard of Pollutants for Synthetic Resin Industry* (GB31573-2015)
			硫化氢 Hydrogen sulfide	/	/	0.005	0.005				《恶臭污染物排放标准》（GB14554-93） Emission Standards for Odor Pollutants (GB14554-93)
	加油站 Gas station	储油罐 Oil storage tank	非甲烷总烃 Non-methane hydrocarbon	/	/	0.106	0.106				《大气污染物综合排放标准》（GB16297-1996） Comprehensive Emission Standards for Air Pollutants (GB16297-1996)

类别 Category	工序/生产线 Process/production line	污染源 Source of pollution	污染物 Pollutant	排放浓度 Emission concentration 一期 Phase I	排放浓度 Emission concentration 一期+二期 Phase I + Phase II	一期全厂 Phase I discharge of the plant 排放量(t/a) Amount of discharge(t/a)	一期+二期全厂排放量(t/a) Phase I and Phase II discharge of the plant (t/a)	环保设施 Environmental protection facilities	主要运行参数 Main operating parameters	排污口管理 Pollutant discharge outlet management	排放标准 Discharge standard
水污染物防治措施 Control measures of water pollutants	生产/生活污水处理 Production/domestic sewage treatment	污水处理站 Sewage treatment plant	COD	73.4	73.0	1799.52	2359.87	厌氧反应器+生物选择池+卡鲁塞尔氧化沟+高级氧化池 Anaerobic reactor + biological selection tank + Carrousel oxidation ditch + advanced oxidation tank	污水处理系统总处理规模为 100000m^3/d The total treatment scale of the sewage treatment system is 100000m3/d	设置相应环保图形标志牌，便于管理、维修以及更新，且应具备采样条件，便于采样分析水质状况，以确保处理废水水质满足排放标准要求。 Corresponding environmental protection graphic signs shall be set up to facilitate management, maintenance and renewal, and sampling conditions shall be met to facilitate sampling and analysis of water quality conditions, so as to ensure that the water quality of	同时满足《制浆造纸工业水污染物排放标准》（GB3544-2008）和《北海市铁山港区污水处理厂尾水排海管工程项目海洋环境影响报告书》提出的排放污水浓度控制值要求（COD 74mg/L、BOD 20 mg/L、氨氮5 mg/L、总氮10 mg/L，总磷0.8 mg/L）。 Also, the requirements of the concentration control value of discharged sewage (COD 74mg/L, BOD 20 mg/L, ammonia nitrogen 5 mg/L, total nitrogen 10 mg/L, total phosphorus 0.8 mg/L) set forth in the Discharge Standard of Water Pollutants for Pulp and Paper Industry (GB3544-2008) and the Marine Environmental Impact Report of Tail Water Discharge Submarine Pipe Project of Beihai Tieshangang District Sewage Treatment Plant, shall be met.
			BOD_5	17.2	17.8	421.79	574.06				
			SS	23.6	25.1	578.71	811.68				
			NH_3-N	4.9	4.9	120.20	158.30				
			TN	7.5	7.5	183.93	242.27				
			TP	0.7	0.7	16.65	21.95				
			AOX	3.4	2.6	83.81	83.81				

类别 **Category**	工序/生产线 **Process/production line**	污染源 **Source of pollution**	污染物 **Pollutant**	排放浓度 **Emission concentration** 一期 **Phase I**	排放浓度 **Emission concentration** 一期+二期 **Phase I + Phase II**	一期全厂 **Phase I discharge of the plant** 排放量(t/a) Amount of discharge(t/a)	一期+二期全厂排放量(t/a) Phase I and Phase II discharge of the plant (t/a)	环保设施 **Environmental protection facilities**	主要运行参数 **Main operating parameters**	排污口管理 **Pollutant discharge outlet management**	排放标准 **Discharge standard**
										treated wastewater meets the requirements of discharge standards.	
噪声污染防治措施 Noise pollution control measures	生产车间及设备 Production workshop and equipment	生产车间及设备 Production workshop and equipment	连续等效 A 声级 Continuous equivalent A sound level	/				基础减振、车阻隔 Foundation vibration reduction and vehicle blocking	/	固定噪声源附近应设置环境保护图形标志牌 Environmental protection graphic signs shall be set up near the fixed noise source.	《工业企业厂界环境噪声排放标准》（GB12348-2008）中 3 类声环境功能区排放限值 Class III acoustic environment functional areas in the EMission Standards for Industrial Enterprises Noise at Boundary (GB12348-2008)
固废防治措施 Solid waste control measures	备料车间 Material workshop	备料工段 Preparation section	废木屑（绝干） Waste wood chippings (absolute dry)	/		73100	85000	送固废锅炉作燃料 Send to solid waste boiler as fuel	/	在存放场边界和进出口位置设置环保标志牌。 Set up environmental protection signs at the boundary of the storage site and the entrance and exit positions.	《一般工业固体废物贮存、处置场污染控制标准》（GB18599-2001）及其修改单标准要求（注：固废锅炉飞灰需定期对固废锅炉的飞灰进行浸出毒性检测，如检测具有危险特性需委托有资质的单位进行处置） Standard for Pollution on the Storage and Disposal Site for
	热电站 Thermal power plant	固废锅炉 Solid waste boiler	锅炉飞灰 Boiler fly ash			13573	25154	外运综合利用 Transportation outside for comprehensive utilization			
			锅炉炉渣 Boiler slag	/		9048	16769				

类别 **Category**	工序/生产线 **Process/production line**	污染源 **Source of pollution**	污染物 **Pollutant**	排放浓度 **Emission concentration** 一期 **Phase I**	排放浓度 **Emission concentration** 一期+二期 **Phase I + Phase II**	一期全厂 **Phase I discharge of the plant** 排放量(t/a) Amount of discharge(t/a)	一期+二期全厂排放量(t/a) Phase I and Phase II discharge of the plant (t/a)	环保设施 **Environmental protection facilities**	主要运行参数 **Main operating parameters**	排污口管理 **Pollutant discharge outlet management**	排放标准 **Discharge standard**
		燃煤锅炉 Coal-fired boiler	锅炉飞灰 Boiler fly ash			32553	90986				General Industrial Solid Wastes (GB18599-2001) and its amendment (Note: Fly ash from solid waste boilers shall be subject to extraction toxicity testing on a regular basis. If the testing has hazardous characteristics, qualified units shall be entrusted for disposal)
			锅炉炉渣 Boiler slag			21702	60657				
		废气处理系统 Exhaust gas treatment system	脱硫石膏 Desulfurized gypsum	/		8787	17052	外卖综合利用 Sold for comprehensive utilization			
	制浆生产线 Pulp production line	制浆车间 Pulping workshop	浆渣（绝干）Pulp slag (absolute dry)	/		10200	17000	送固废锅炉作燃料 Send to solid waste boiler as fuel			
	碱回收车间 Alkaline recovery workshop	苛化工段 Causticization section	白泥（绝干）White mud (absolute dry)	/		207200	229600	送石灰窑回收处置 It is sent to the lime kiln for recovery			
			绿泥（绝干）Green mud (absolute dry)	/		8500	9500	填埋场填埋 Landfill			
			石灰渣	/		1831	1918				

类别 Category	工序/生产线 Process/production line	污染源 Source of pollution	污染物 Pollutant	排放浓度 Emission concentration 一期 Phase I	排放浓度 Emission concentration 一期+二期 Phase I + Phase II	一期全厂 Phase I discharge of the plant 排放量(t/a) Amount of discharge(t/a)	一期+二期全厂排放量(t/a) Phase I and Phase II discharge of the plant (t/a)	环保设施 Environmental protection facilities	主要运行参数 Main operating parameters	排污口管理 Pollutant discharge outlet management	排放标准 Discharge standard
			Lime slag								
	制氧站 Oxygen generation station	分子筛填料 Molecular sieve padding	废分子筛 Waste molecular sieve	/		7.5/5 年 7.5/5 years	7.5/5 年 7.5/5 years	厂家回收利用 Recovered and recycled by producers			
	制浆生产线 Pulp production line	制浆车间 Pulping workshop	黑液 Black liquor			658.82 万 6,588,200	704.14 万 704.14 million	进入碱回收系统回收碱，不外排 Sent to the alkali recovery system for recovering alkali, without discharging outside	/	/	危险废物贮存执行《危险废物贮存污染控制标准》（GB18597-2001）及其修改单标准要求 Hazardous waste storage shall be subject to the Standard for Pollution Control on Hazardous Waste Storage (GB18597-2001) and its amendment
	软化水车间 Softened water workshop	制备系统 Preparation system	废离子交换树脂 Waste ion exchange resin	/		12/3 年 12/3 years	12/3 年 12/3 years	委托有资质单位处理 Entrusted to a qualified unit for treatment			危险废物贮存执行《危险废物贮存污染控制标准》（GB18597-2001）及其修改单标准要求 Hazardous waste storage shall be subject to the Standard for Pollution Control on Hazardous Waste
	热电站 Thermal power	废气处理系统	废活性炭 Waste activated	70		100	废活性炭 Waste activated	厂家上门更换后综合利用或委托有资			

类别 **Category**	工序/生产线 **Process/production line**	污染源 **Source of pollution**	污染物 **Pollutant**	排放浓度 **Emission concentration** 一期 **Phase I**	排放浓度 **Emission concentration** 一期+二期 **Phase I + Phase II**	一期全厂 **Phase I discharge of the plant** 排放量(t/a) Amount of discharge(t/a)	一期+二期全厂排放量(t/a) Phase I and Phase II discharge of the plant (t/a)	环保设施 **Environmental protection facilities**	主要运行参数 **Main operating parameters**	排污口管理 **Pollutant discharge outlet management**	排放标准 **Discharge standard**
	plant	Exhaust gas treatment system	carbon				carbon	质单位处置 After replacement by the supplier, they can be recycled for comprehensive utilization, or a qualified unit can be entrusted for disposal			Storage (GB18597-2001) and its amendment
			废催化剂 Waste catalyst	20 吨/3 年 20 tons/3 years		30 吨/3 年 30 tons/3 years	废催化剂 Waste catalyst				
	加油站 Gas station	储油罐 Oil storage tank	储油罐残渣 Slag of oil storage tank	/		0.03/5 年 0.03/5 years	0.03/5 年 0.03/5 years	委托有资质单位处理 Entrusted to a qualified unit for treatment			
		隔油池 Oil separator	隔油池污泥 Sludge in the oil separator	/		0.04	0.04	委托有资质单位处理 Entrusted to a qualified unit for treatment			
	机修车间 Mechanical Repair Workshop	机器设备 Machinery equipment	废机油 Waste engine oil	/		2	3	委托有资质单位处理 Entrusted to a qualified unit for treatment			

类别 **Category**	工序/生产线 **Process/production line**	污染源 **Source of pollution**	污染物 **Pollutant**	排放浓度 **Emission concentration**		一期全厂 **Phase I discharge of the plant** 排放量(t/a) Amount of discharge(t/a)	一期+二期全厂排放量(t/a) Phase I and Phase II discharge of the plant (t/a)	环保设施 **Environmental protection facilities**	主要运行参数 **Main operating parameters**	排污口管理 **Pollutant discharge outlet management**	排放标准 **Discharge standard**
				一期 **Phase I**	一期+二期 **Phase I + Phase II**						
	污水处理站 Sewage treatment plant	污泥脱水间 Sludge dewatering room	生化污泥（绝干）Biochemical sludge (absolutely dry)	/		81600	108800	送固废锅炉作燃料 Send to solid waste boiler as fuel			《一般工业固体废物贮存、处置场污染控制标准》（GB18599-2001）及其修改单标准要求 Standard for Pollution on the Storage and Disposal Site for General Industrial Solid Wastes (GB18599-2001) and its amendments
			化学污泥（绝干）Chemical sludge (absolutely dry)	/		9200	17000	外运填埋场填埋 Transportation outside for landfill			
	机修车间 Mechanical Repair Workshop	机器设备 Machinery equipment	废机油 Waste engine oil	/		2	3	委托有资质单位处理 Entrusted to a qualified unit for treatment			
	办公生活 Office life	办公生活区 Office and living quarter	生活垃圾 Domestic waste	/		829	1087	环卫部门统一处理 Treated by environmental sanitation department			
	环境风险 Environmental risk			厂区污水处理站内应急事故池；其他风险防范设施、器具、装备等 Emergency pool in the sewage treatment plant; other risk prevention facilities, instruments and							满足风险应急要求，确保风险影响在可接受水平内

类别 **Category**	工序/生产线 **Process/production line**	污染源 **Source of pollution**	污染物 **Pollutant**	排放浓度 **Emission concentration**		一期全厂 **Phase I discharge of the plant** 排放量(t/a) Amount of discharge(t/a)	一期+二期全厂排放量(t/a) Phase I and Phase II discharge of the plant (t/a)	环保设施 **Environmental protection facilities**	主要运行参数 **Main operating parameters**	排污口管理 **Pollutant discharge outlet management**	排放标准 **Discharge standard**
				一期 **Phase I**	一期+二期 **Phase I + Phase II**						
				equipment, etc.							Meet the risk emergency requirements and ensure that the risk impact is within an acceptable level.

8.2.2 社会公开信息内容

8.2.2 Contents of public information

根据《建设项目环境影响评价信息公开机制方案》（环发〔2015〕162 号）的要求，建设单位应建立信息公开机制。

According to the requirements of the Information Disclosure Mechanism Plan for Environmental Impact Assessment of Construction Projects (HF [2015] No.162), the Employer shall establish an information disclosure mechanism.

①项目报批前：建设单位在建设项目环境影响报告书（表）编制完成后，向环境保护主管部门报批前，向社会公开环境影响报告书（表）全本。

① Before the Project is submitted for approval: After the preparation of the environmental impact report (form), the Employer shall disclose the full version of the environmental impact report (form) to the public before submitting it to the competent department of environmental protection for approval.

②建设项目开工建设前：建设单位应当向社会公开建设项目开工日期、设计单位、施工单位和环境监理单位、工程基本情况、实际选址选线、拟采取的环境保护措施清单和实施计划、由地方政府或相关部门负责配套的环境保护措施清单和实施计划等，并确保上述信息在整个施工期内均处于公开状态。

② Before the construction of the Project: The Employer shall disclose to the public the commencement date of the Project, the design unit, the construction contractor and the environmental supervision unit, the basic situation of the Project, the actual site selection and route selection, the list of environmental protection measures to be adopted and the implementation plan, and the list of environmental protection measures and the implementation plan to be supported by the local government or relevant departments, and ensure that the above information is made public throughout the construction period.

③建设项目施工过程：建设单位应当在施工中期向社会公开建设项目环境保护措施进展情况、施工期的环境保护措施落实情况、施工期环境监理情况、施工期环境监测结果等。

③ Construction process of the Project: The Employer shall disclose to the public the progress of environmental protection measures of the construction project, the implementation of environmental protection measures during construction, the environmental supervision during construction, the environmental monitoring results during construction, etc.

④建设项目建成后：建设单位应当向社会公开建设项目环评提出的各项环境保护设施和措施执行情况、竣工环境保护验收监测和调查结果。对主要因排放污染物对环境产生影响的建设项目，投入生产或使用后，应当定期向社会特别是周边社区公开主要污染物排放情况。

④ After the completion of the Project: The Employer shall disclose to the public the implementation of various environmental protection facilities and measures proposed in the EIA of the construction project, and the monitoring and survey results of the completed environmental protection acceptance. For construction projects that mainly affect the environment due to the discharge of pollutants, after being put into production or use, the discharge of major pollutants shall be regularly disclosed to the society, especially the surrounding communities.

8.3 环境监测计划

8.3 Environmental monitoring plan

环境监测，是指在项目工程施工期和运营期对工程主要污染对象进行环境样品的采集、化验、数据处理与编制报告，并积极应对项目出现的各类环境问题。环境监控计划的制定和执行，是环境管理的依据和基础，它为环境统计和环境定量评价提供科学依据，可以保证各项污染防治措施的实施与落实，可以及时发现环保措施出现的问题并进行修正和改进。

Environmental monitoring refers to the collection, testing, data processing and preparation of reports of environmental samples for the main pollution objects of the Project during the construction and operation period, and active response to various environmental problems arising from the Project. The formulation and implementation of environmental monitoring plan is the basis and foundation of environmental management. It provides a scientific basis for environmental statistics and quantitative assessment of the environment, ensures the implementation of various pollution prevention measures, and discovers problems in environmental protection measures in time and makes corrections and improvements.

《排污单位自行监测技术指南 造纸工业》（HJ821-2017）、《排污单位自行监测技术指南 总则》（HJ819-2017）提出了造纸工业企业自行监测的一般要求、监测方案制定、信息记录和报告的基本内容和要求，本评价参照造纸业监测技术指南中相关内容，结合

本项目特征，制定项目的环境监测计划。

Self-monitoring Technology Guidelines for Pollution Sources-Paper Industry (HJ821-2017) and Self-monitoring Technology Guidelines for Pollution Sources-General Rule (HJ819-2017) put forward the general requirements for self-monitoring of paper industry enterprises, the basic contents and requirements for monitoring scheme formulation and information recording and reporting. This assessment refers to the relevant contents in the self-monitoring technology guidelines of the paper industry and combines the characteristics of this Project to formulate the environmental monitoring plan of the Project.

8.3.1施工期环境监测计划

8.3.1 Environmental monitoring plan during construction

为了检查施工过程中引起的环境问题，以便及时处理，应对施工全过程进行监控。施工期环境监测计划详见表8.3-1。

The whole construction process should be monitored so as to check the environmental problems caused in the construction process and handle them in time. Refer to Table 8.3-1 for details of the environmental monitoring plan during construction.

表8.3-1 施工期环境监测方案
Table 8.3-1 Environmental Monitoring Scheme during Construction

监测类别 Monitoring category	监测内容 Monitoring contents	监测位置 Monitoring location	监测项目 Monitoring Items	监测频次 Monitoring frequency
污染源 Source of pollution 监测 Monitoring	大气污染源 Air pollution source	施工用料堆场、施工现场 Construction material storage yard, construction site	TSP、烟尘 TSP, smoke dust	每年一次 Once a year
	水污染源 Water pollution source	施工废水排放口 Construction wastewater discharge outlet	pH、SS、COD、BOD_5、石油类、氨氮等 pH, SS, COD, BOD5, petroleum, ammonia nitrogen, etc.	每年一次 Once a year
	噪声污染源 Noise pollution source	施工场地设备旁 Next to construction site equipment	等效连续A声级 Equivalent continuous A sound level	每年一次 Once a year
环境质量监测 Environmental quality monitoring	环境空气质量 Ambient air quality	主要环境空气敏感区 Main ambient air sensitive area	TSP	每年一次 Once a year
	声环境质量 Acoustic environment quality	敏感点 Sensitive points	等效连续A声级 Equivalent continuous A sound level	每年一次 Once a year

8.3.2运营期环境监测计划

8.3.2 Environmental monitoring plan during operation

8.3.2.1 运营期污染源监测计划

8.3.2.1 Pollution source monitoring plan during operation

（1）大气污染源监测计划

(1) Air pollution source monitoring plan

运营期项目大气污染源监测计划见下表 8.3-2。

Refer to Table 8.3-2 below for the monitoring plan of air pollution sources of the Project during operation.

表 8.3-2 运营期大气污染源监测方案
Table 8.3-2 Monitoring Scheme of Air Pollution Sources during Operation

项目 Item	监测点位 Monitoring point	监测指标 Monitoring indicators	监测频次 Monitoring frequency	执行标准 Execution Standard
有组织监测 Organized monitoring	4600t/d 碱炉废气处理系统排气口 4600t/d alkali furnace waste gas treatment system exhaust port	烟尘 Smoke dust	自动监测 Automatic monitoring	《火电厂大气污染物排放标准》（GB 13223-2011） Emission Standard of Air Pollutants for Thermal Power Plants (GB 13223-2011)
		SO_2		
		NO_x		
		烟气黑度 Blackness of flue gas		
		H_2S	每年一次 Once a year	《恶臭污染物排放标准》（GB 14554-93） Emission Standard for Odor Pollutants (GB 14554-93)
	850t/d 石灰窑排气口 850t/d lime kiln exhaust port	烟尘 Smoke dust	自动监测 Automatic monitoring	《工业炉窑大气污染物排放标准》（GB 9078-1996） Emission Standard of Air Pollutants for Industrial Kiln and Furnace (GB 9078-1996)
		SO_2		
		NO_x		
		H_2S	每年一次 Once a year	《恶臭污染物排放标准》（GB 14554-93） Emission Standard for Odor Pollutants (GB 14554-93)
	220t/h 固废锅炉+280t/h 锅炉排气口 220t/h solid waste boiler + 280t/h boiler exhaust port	烟尘 Smoke dust	自动监测 Automatic monitoring	锅炉废气超低排放标准限值 Ultra-low emission standard limits for boiler waste gas
		二氧化硫 Sulfur dioxide		
		氮氧化物 Oxynitride		
		汞及其化合物 Mercury and its compounds	每季度一次 Once per quarter	《火电厂大气污染物排放标准》（GB 13223-2011） Emission Standard of Air Pollutants for Thermal Power Plants (GB 13223-2011)

项目 Item	监测点位 Monitoring point	监测指标 Monitoring indicators	监测频次 Monitoring frequency	执行标准 Execution Standard
		氯化氢 Hydrogen chloride	每年一次 Once a year	《生活垃圾焚烧污染控制标准》（GB18485-2014） Standard for Pollution Control on the Municipal Solid Waste Incineration (GB18485-2014)
		一氧化碳 Carbon monoxide		
		汞、镉、铊、锑、砷、铅、铬、钴、铜、锰、镍、镉+铊、锑+砷+铅+铬+钴+铜+锰+镍、 Mercury, cadmium, thallium, antimony, arsenic, lead, chromium, cobalt, copper, manganese, nickel, cadmium + thallium, antimony + arsenic + lead + chromium + cobalt + copper + manganese + nickel		
		二噁英 Dioxin	每年一次 Once a year	
	纸浆车间漂白尾气排气筒 Bleaching tail gas exhaust funnel in pulp workshop	氯气 Chlorine	每季度一次 Once per quarter	《大气污染物综合排放标准》（GB16297-1996） Comprehensive Emission Standards for Air Pollutants (GB16297-1996)
	二氧化氯车间过量氢气排空尾气排气筒 Exhaust gas exhaust funnel of excess hydrogen exhaust in chlorine dioxide workshop	氯气 Chlorine	每年一次 Once a year	《无机化学工业污染物排放标准》（GB31573-2015） *Emission Standard of Pollutants for Synthetic Resin Industry* (GB31573-2015)
	二氧化氯车间盐酸合成尾气排气筒 Hydrochloric acid synthesis tail gas exhaust funnel in chlorine dioxide workshop	氯气、氯化氢 Chlorine, hydrogen chloride	每年一次 Once a year	《无机化学工业污染物排放标准》（GB31573-2015） *Emission Standard of Pollutants for Synthetic Resin Industry* (GB31573-2015)
	二氧化氯车间槽罐尾气排气筒 Tank tail gas exhaust funnel of chlorine dioxide workshop	氯气 Chlorine		
无组织监	厂界 Plant boundary	颗粒物 Particulate Matters (PM)	每月一次 Monthly	《大气污染物综合排放标准》（GB16297-1996） Comprehensive Emission Standards for Air Pollutants (GB16297-1996)

项目 Item	监测点位 Monitoring point	监测指标 Monitoring indicators	监测频次 Monitoring frequency	执行标准 Execution Standard
测 Unorganized monitoring		氯化氢 Hydrogen chloride	每年一次 Once a year	《无机化学工业污染物排放标准》（GB31573-2015） *Emission Standard of Pollutants for Synthetic Resin Industry* (GB31573-2015)
		氯气 Chlorine		
		硫化氢 Hydrogen sulfide	每年一次 Once a year	《恶臭污染物排放标准》（GB14554-93） Emission Standards for Odor Pollutants (GB14554-93)
		氨 Ammonia		
		臭气浓度 Stink concentration	每月一次 Monthly	

（2）废水污染源监测计划

(2) Wastewater pollution source monitoring plan

运营期项目废水污染源监测计划见下表 8.3-3。

Refer to Table 8.3-3 below for the monitoring plan of wastewater pollution sources during operation.

表 8.3-3 运营期废水污染源监测方案
Table 8.3-3 Monitoring Scheme for Wastewater Pollution Sources during Operation

序号 S.N.	排放口编号 Discharge outlet number	污染物名称 Name of pollutant	监测设施 Monitoring Facility	自动监测设施安装位置 Installation Position of Automatic Monitoring Equipment	自动监测设施的安装、运行、维护等相关管理要求 Management requirements related to installation, operation and maintenance of automatic monitoring facilities	自动监测是否联网 Automatic Monitoring Network Connected or Not	自动监测仪器名称 Designation of Automatic Monitoring Instrument	手工监测采样方法及个数（a） Manual monitoring sampling method and number (a)	手工监测频次（b） Manual monitoring frequency (b)	手工测定方法（c） Manual determination method (c)
1	DW001（污水处理站总排口） DW001 (Main outlet of sewage treatment plant)	废水流量 Wastewater flow	自动 Automatic	废水总排口 Wastewater main outlet	按照《污染源自动监控管理办法》执行 Implemented according to the Pollution Source Automatic Monitoring and Management Measures	是 Yes	/	/	/	/
		COD	自动 Automatic	废水总排口 Wastewater main outlet	按照《污染源自动监控管理办法》执行 Implemented according to the Pollution Source Automatic Monitoring and Management Measures	是 Yes	/	/	/	/
		BOD_5	手工 Manual	/	/		/	按照相关规范操作 Operated according to	1次/周 Once/week	水质 五日生化需氧量（BOD5）的测定 稀释与接种法HJ 505-2009

								relevant specifications		Water quality-Determination of five-day biochemical oxygen demand (BOD5)-Dilution and inoculation method HJ 505-2009
		SS	手工 Manual	/	/		/	按照相关规范操作 Operated according to relevant specifications	1次/日 Once/day	水质 悬浮物的测定 重量法GB 11901-89 Water quality-Determination of suspended matter-Gravimetric method GB 11901-89
		NH_3-N	自动 Automatic	废水总排口 Wastewater main outlet	按照《污染源自动监控管理办法》执行 Implemented according to the Pollution Source Automatic Monitoring and Management Measures	是 Yes	/	/	/	/
		TN	手工 Manual	/	/		/	按照相关规范操作 Operated according to relevant specifications	1次/周 1 time/week	水质 总氮的测定 碱性过硫酸钾消解紫外分光光度法 HJ 636—2012 Water quality-Determination of total

										nitrogen-Alkaline potassium persulfate digestion ultraviolet spectrophotometric method HJ 636-2012
		TP	手工 Manual	/	/			按照相关规范操作 Operated according to relevant specifications	1次/周 1 time/week	水质 总磷的测定 钼酸铵分光光度法 GB 11893-89 Water quality-Determination of total phosphorus-Ammonium molybdate spectrophotometric method GB 11893-89
2	DW002（化学浆车间排放口） DW002 (discharge outlet of chemical pulp workshop)	AOX	手工 Manual	/	/	/	/	按照相关规范操作 Operated according to relevant specifications	1次/年 Once/year	水质 可吸附有机卤素(AOX)的测定 微库仑法GB/T 15959-1995 Water quality-Determination of adsorbable organic halogen (AOX)-Microcoulometric method GB/T 15959-1995

a指污染物采样方法，如“混合采样（3个、4个或5个混合）”“瞬时采样（3个、4个或5个瞬时样）”。
a Pollutant sampling methods, such as "mixed sampling (3, 4 or 5 mixed)" and "instantaneous sampling (3, 4 or 5 instantaneous samples)".
b指一段时期内的监测次数要求，如1次/周、1次/月等。
b Monitoring frequency requirements within a period of time, such as once/week, once/month, etc.
c指污染物浓度测定方法，如测定化学需氧量的重铬酸钾法、测定氨氮的水杨酸分光光度法等。

c Determination method of pollutant concentration, such as potassium dichromate method for determining chemical oxygen demand, salicylic acid spectrophotometry for determining ammonia nitrogen, etc.

（3）噪声污染源监测计划

(3) Noise pollution source monitoring plan

运营期项目废水污染源监测计划见下表 8.3-4。

Refer to Table 8.3-4 below for the monitoring plan of wastewater pollution sources during operation.

表8.3-4 噪声污染源监测方案
Table 8.3-4 Monitoring Scheme for Noise Pollution Sources

项目 Item	监测点位 Monitoring point	监测指标 Monitoring indicators	监测频次 Monitoring frequency	执行标准 Execution Standard
噪声 Noise	厂界外 1m 1m outside the plant boundary	等效连续 A 声级 Equivalent continuous A sound level	每季度 1 次 Once/quarter	《工业企业厂界环境噪声排放标准》（GB12348-2008）3 类标准 Class 3 standard in Emission Standard for Industrial Enterprise Noise at Boundary (GB12348-2008)

8.3.2.2 运营期环境质量跟踪监测计划

8.3.2.2 Environmental quality tracking and monitoring plan during operation

运营期间项目周边环境质量跟踪监测计划见下表 8.3-5。

Refer to Table 8.3-5 below for the tracking and monitoring plan of environmental quality around the Project during operation.

（1）大气环境质量跟踪监测

(1) Tracking and monitoring of atmospheric environmental quality

运营期项目周边大气环境质量跟踪监测计划见下表 8.3-5。

Refer to Table 8.3-5 below for the tracking and monitoring plan of atmospheric environmental quality around the Project during operation.

表8.3-5大气环境质量监测计划一览表
Table 8.3-5 Atmospheric Environmental Quality Monitoring Plan

监测点名称 Name of monitoring point	监测点坐标/m Coordinate of monitoring point/m		监测因子 Monitoring factor	监测时段 Monitoring period	相对厂址方位 Relative position of plant site	相对厂界距离/m Relative distance from plant boundary /m
	X	Y				

川江（下风向）Chuanjiang (downwind)	109.548197222	21.516088889	TSP、SO_2、NO_2、As、Cd、HCl、NH_3、H_2S、Cl_2	每年一次 Once a year	南 South	/

（2）海洋环境质量跟踪监测计划

(2) Marine environmental quality tracking and monitoring plan

运营期项目周边海洋环境质量跟踪监测计划见下表 8.3-6。

Refer to Table 8.3-6 below for the tracking and monitoring plan of marine environmental quality around the Project during operation.

表 8.3-6 海洋环境质量监测计划一览表

Table 8.3-6 Marine Environmental Quality Monitoring Plan

项目 Item	监测位置 Monitoring location	监测指标 Monitoring indicators	监测频次 Monitoring frequency	执行环境质量标准 Executive environmental quality standard
海水水质、海洋沉积物 Seawater quality, marine sediment	铁山港东岸排污区 1（2#） Tieshangang East Coast Sewage Discharge Area 1 (2#)	海水水质：水温、盐度、pH、悬浮物、溶解氧、COD_{Mn}、无机氮（硝酸盐氮、亚硝酸盐氮、氨氮）、重金属（As、Hg、Cu、Pb、Zn、Cd、Cr）活性磷酸盐、石油类、色度、总磷、总氮、BOD_5 等 24 项。 Seawater quality: 24 items such as water temperature, salinity, pH, suspended solids, dissolved oxygen, CODMn, inorganic nitrogen (nitrate nitrogen, nitrite nitrogen, NH3-N), heavy metal (As, Hg, Cu, Pb, Zn, Cd, Cr) reactive phosphate, petroleum, chromaticity, total phosphorus, total nitrogen and BOD_5	每春、秋季各一次 Once in spring and once in autumn	海水水质四类、沉积物三类 Class IV seawater quality and Class 3 sediment
	广西合浦儒艮国家级自然保护区（8#） Guangxi Hepu Dugong National Nature Reserve (8#)			海水水质一类、沉积物一类 Seawater quality Class I, sediment Class I
	广西山口红树林生态自然保护区（14#） Guangxi Shankou National Mangrove Nature Reserve (14#)			海水水质一类、沉积物一类 Seawater quality Class I, sediment Class I
	英罗港养殖区（17#） Yingluogang Breeding Area (17#)	海洋沉积物：有机碳、硫化物、铜、铅、镉、锌、砷、油类、汞，共 9		海水水质二类、沉积物一类 Seawater quality Class II, sediment Class I

项目 **Item**	监测位置 **Monitoring location**	监测指标 **Monitoring indicators**	监测频次 **Monitoring frequency**	执行环境质量标准 **Executive environmental quality standard**
	北部湾二长棘鲷长毛对虾国家级水产种质资源保护区监测点（18#） Beibu Gulf Parargyrops Edita and Penaeus Penicillatus National Aquatic Germplasm Resource Nature Reserve monitoring point (18#)	项 Marine sediments: 9 items such as organic carbon, sulfide, copper, lead, cadmium, zinc, arsenic, oil and mercury		海水水质二类、沉积物一类 Seawater quality Class II, sediment Class I

本项目及斯道拉恩索（广西）90 万吨化学浆项目建成投入生产前分别对排污口海域及敏感保护目标进行 AOX 本底监测，项目建成后应定期对纳污海域和敏感保护目标进行 AOX 跟踪监测调查，调查内容包括海水水质、海洋沉积物及海洋生物。

Before the Project and the 900,000-ton chemical pulp project of Storaenso (Guangxi) are completed and put into production, AOX background monitoring shall be carried out on the sewage outlet sea area and sensitive protection targets respectively. After the Project is completed, AOX tracking monitoring survey shall be carried out on the sewage receiving sea area and sensitive protection targets regularly, including seawater quality, marine sediments and marine organisms.

（3）地下水环境质量跟踪监测计划

(3) Groundwater environmental quality tracking and monitoring plan

运营期项目周边地下水环境质量跟踪监测计划见下表 8.3-7。

Refer to Table 8.3-7 below for the tracking and monitoring plan of groundwater environmental quality around the Project during operation.

表 8.3-7 地下水环境质量监测计划一览表

Table 8.3-7 Groundwater Environmental Quality Monitoring Plan

监测点位 Monitoring point	坐标 Coordinate		井深 Well depth	井结构 Well structure	监测层位 Monitoring horizon	监测因子 Monitoring factor	监测频次 Monitoring Frequency	执行环境质量标准 Executive environmental quality standard	备注 Remarks
	经度 Longitude	纬度 Latitude							
项目东南厂界 Southeast boundary of the Project	109.555521800	21.525668092	30m	按《地下水监测井建设规范》（DZT 0270-2014）要求建设 Constructed in accordance with the requirements of Groundwater Monitoring Well Construction Code (DZT 0270-2014)	第四系松散岩类孔隙水 Quaternary loose rock pore water	pH 值、色度、总硬度、耗氧量（COD_{Mn}）、溶解性总固体、硫化物、氨氮、氯化物、硫酸盐、挥发性酚类、阴离子合成洗涤剂、硝酸盐（NO_3^-）、亚硝酸盐（NO^{2-}）、K^+、Na^+、Ca^{2+}、Mg^{2+}、CO_3^{2-}、HCO_3^-共 19 项。 Such 19 items including pH value, chromaticity, total hardness, oxygen consumption (COD_{Mn}), total dissolved solids, sulfide, ammonia nitrogen, chloride, sulfate, volatile phenols, anion synthetic detergent, nitrate (NO_3^-), nitrite (NO^{2-}), K^+, Na^+, Ca^{2+}, Mg^{2+}, CO_3^{2-}	丰、枯水期一次 Once in the wet season and once in the dry season	《地下水质量标准》（GB/T14848-2017）III类标准 Grade III of Quality Standards for Underground Water (GB/T14848-2017)	新设钻孔,施工时不可破坏化工库及周边车间防渗措施 For newly-built drilling holes, the seepage prevention measures of chemical warehouse and surrounding workshops shall not be damaged during construction.
污水处理站南侧厂界 Plant boundary on the south side of the sewage treatment plant	109.546147516	21.534125971	30m						
厂区内化	109.547555	21.5235032	30m						

监测点位 **Monitoring point**	坐标 **Coordinate**		井深 **Well depth**	井结构 **Well structure**	监测层位 **Monitoring horizon**	监测因子 **Monitoring factor**	监测频次 **Monitoring Frequency**	执行环境质量标准 **Executive environmental quality standard**	备注 **Remarks**
	经度 **Longitude**	纬度 **Latitude**							
工库外道路旁 Beside the road outside the chemical warehouse in the plant area	429	40				and HCO_3^-			
山心村民井 Wells of Shanxin Village	109.525672110	21.530547826	/	/			每年一次 Once a year		上游民井 Upper well
坡尾底民井 Poweidi well	109.550838663	21.518195458	/	/			每年一次 Once a year		侧下游民井 Side downstream well

（4）声环境质量跟踪监测计划

(4) Acoustic environmental quality tracking and monitoring plan

运营期项目周边声环境质量跟踪监测监测计划见下表 8.3-8。

Refer to Table 8.3-8 below for the tracking, monitoring and monitoring plan of sound environment quality around the Project during operation.

表8.3-8环境质量监测计划一览表
Table 8.3-8 Environmental Quality Monitoring Plan

项目 **Item**	监测点位 **Monitoring point**	监测指标 **Monitoring indicators**	监测频次 **Monitoring frequency**	执行环境质量标准 **Executive environmental quality standard**
声环境 Acoustic environment	川江 Chuanjiang	连续等效 A 声级 Continuous equivalent A sound level	每季度一次 Once per quarter	《声环境质量标准》（GB3096-2008）2 类标准 Grade 2 standard of Environmental Quality Standard for Noise (GB3096-2008)
	坡尾底 Poweidi			

（5）土壤环境质量跟踪监测计划

(5) Soil environmental quality tracking and monitoring plan

运营期项目周边土壤环境质量跟踪监测监测计划见下表 8.3-9。

Refer to Table 8.3-9 below for the follow-up monitoring plan of soil environmental quality around the Project during operation.

表8.3-9环境质量监测计划一览表
Table 8.3-9 Environmental Quality Monitoring Plan

项目 **Item**	监测点位 **Monitoring point**	监测指标 **Monitoring indicators**	监测频次 **Monitoring frequency**	执行环境质量标准 **Executive environmental quality standard**
土壤环境 Soil environment	川江（农用地） Chuanjiang (agricultural land)	pH、镉、汞、砷、铅、铬、铜、镍 PH, cadmium, mercury, arsenic, lead, chromium, copper, nickel	每 5 年内开展 1 次 Once/every 5 years	《土壤环境质量 农用地土壤污染风险管控标准（试行）》（GB 15618-2018） Soil Environmental Quality-Risk Control Standard for Soil Contamination of Agricultural Land (Trial) (GB 15618-2018)
	坡尾底（农用地） Poweidi (agricultural land)			
	彬定（新）（农用地） Binding (new) (agricultural land)			

8.4 竣工环境保护验收

8.4 Acceptance of environmental protection upon completion

根据中华人民共和国国务院令（第 253 号）《建设项目环境保护管理条例》以及《关于发布《<建设项目竣工环境保护验收暂行办法>的公告》（国环规环评〔2017〕4 号）、《建设项目竣工环境保护验收技术指南 污染影响类》（生态环境部公告 2018 年 第 9 号），按照国家关于建设项目环境保护设施竣工验收管理的相关要求，本项目建成试运行期间，应开展建设项目竣工环境保护验收工作，该项工作主要包括以下内容：

According to the Regulations on the Administration of Environmental Protection of Construction Projects (No.253 Decree of the State Council), and the Announcement on Issuing the Interim Measures for the Acceptance of Environmental Protection on Completion of Construction Projects (GHGHP [2017] No.4), the Technical Guidelines for the Acceptance of Environmental Protection on Completion of Construction Projects-Pollution Impact (STHJBGG [2018] No.9) and according to the relevant requirements of the State on the management of the completion and acceptance of environmental protection facilities for construction projects, during the completion and trial operation of the Project, the completion and acceptance of environmental protection for construction projects shall be carried out, which mainly includes the following contents:

（1）项目概况

(1) Project overview

（2）验收依据

(2) Acceptance basis

①建设项目环境保护相关法律、法规和规章制度；

① Relevant laws, regulations and rules and regulations on environmental protection of construction projects;

②建设项目竣工环境保护验收技术规范；

② Technical specifications for environmental protection acceptance after completion of construction projects;

③建设项目环境影响报告书（表）及其审批部门审批决定：

③ Construction project EIA report (form) and its examination and approval department approval decision;

④其他相关文件。

④ Other relevant documents.

（3）项目建设情况

(3) Construction of the Project

①地理位置及平面布置

① Geographical location and layout

②建设内容

② Construction contents

③主要原辅材料及燃料

③ Main raw and auxiliary materials and fuels

④水源及水平衡

④ Water source and water balance

⑤生产工艺

⑤ Production process

⑥项目变动情况

⑥ Project changes

（4）环境保护设施

(4) Environmental protection facilities

①污染物治理/处置设施

① Pollutant treatment/disposal facilities

废水、废气、噪声、固（液）体废物

Wastewater, waste gas, noise, solid (liquid) waste

②其他环境保护设施

② Other environmental protection facilities

环境风险防范设施、规范化排污口、监测设施及在线监测装置、其他设施

Environmental risk prevention facilities, standardized pollutant discharge outlets, monitoring facilities and on-line monitoring devices, and other facilities

（5）环境影响报告书（表）主要结论与建议及其审批部门审批决定

(5) Main conclusions and recommendations of the EIA report (form) and the examination and approval decisions of the examination and approval department

①环境影响报告书（表）主要结论与建议

① Main conclusions and suggestions of the EIA report (form)

②审批部门审批决定

② Examination and approval department examination and approval decision

（6）验收执行标准

(6) Acceptance implementation criteria

（7）验收监测

(7) Acceptance monitoring

①环境保护设施调试运行效果

① Commissioning and operation effect of environmental protection facilities

废水、废气（有组织）、废气（无组织）、厂界噪声监测、固（液）体废物监测

Monitoring of wastewater, waste gas (organized), waste gas (unorganized), noise at plant boundary and solid (liquid) waste

②环境质量监测

② Environmental quality monitoring

地表水、地下水和海水、环境空气、声环境、土壤环境质量。

Surface water, groundwater and seawater, ambient air, acoustic environment and soil environmental quality.

（9）验收监测结果

(9) Acceptance monitoring results

①生产工况

① Production conditions

②环保设施调试运行效果

② Commissioning and operation effect of environmental protection facilities

废水治理设施、废气治理设施、噪声治理设施、固体废物治理设施

Wastewater treatment facilities, waste gas treatment facilities, noise treatment facilities and solid waste treatment facilities

③污染物排放监测

③ Pollutant discharge monitoring

④污染物排放总量核算

④ Total pollutant discharge accounting

⑤工程建设对环境的影响

⑤ Impact of engineering construction on the environment

（10）填写建设项目竣工环境保护“三同时”验收登记表

(10) Fill in the "Three Simultaneities" acceptance registration form for environmental protection upon completion of construction projects

项目竣工环境保护验收内容见表 8.4-1。

Refer to Table 8.4-1 for the contents of environmental protection acceptance after project completion.

表 8.4-1 项目竣工环境保护验收内容一览表

Table 8.4-1 Environmental Protection Acceptance Contents upon Project Completion

序号 S.N.	环保设施和设备 Environmental protection facilities and equipment	验收监测项目 Acceptance monitoring items	验收监测点位 Acceptance monitoring points	验收监测标准 Acceptance monitoring standards	调查内容 Investigation contents
1	全厂生产设施、环保设施 Production facilities and environmental protection facilities of the whole plant	项目变动情况 Project changes	厂区 Plant area	不发生重大变化 No major changes	建设地点、规模、生产工艺、配套环保设施等 Construction site, scale, production process, supporting environmental protection facilities, etc.
2	污水处理站 Sewage treatment plant	单位产品基准排水量 Benchmark water discharge per unit product	污水处理站总排口 Main outlet of the sewage treatment plant	同时满足《制浆造纸工业水污染物排放标准》（GB3544-2008）和《北海市铁山港区污水处理厂尾水排海管工程项目海洋环境影响报告书》提出的排放污水浓度控制值要求（COD 74mg/L、BOD 20 mg/L、氨氮5 mg/L、总氮10 mg/L，总磷0.8 mg/L） Also, the requirements of the concentration control value of discharged sewage (COD 74mg/L, BOD 20 mg/L, ammonia nitrogen 5 mg/L, total nitrogen 10 mg/L, total phosphorus 0.8 mg/L) set forth in the Discharge Standard of Water Pollutants for Pulp and Paper Industry (GB3544-2008) and	污水处理站建设情况，处理效果、污染物处理达标情况、污染物排放总量情况 Construction of sewage treatment plant, treatment effect, pollutant treatment compliance and total pollutant discharge
		COD、BOD_5、SS、NH_3-N、TN、TP、 COD, BOD_5, SS, NH_3-N, TN, TP			
		AOX	化学浆车间排放口 Discharge outlet of chemical pulp workshop		

序号 S.N.	环保设施和设备 Environmental protection facilities and equipment	验收监测项目 Acceptance monitoring items	验收监测点位 Acceptance monitoring points	验收监测标准 Acceptance monitoring standards	调查内容 Investigation contents
				the Marine Environmental Impact Report of Tail Water Discharge Submarine Pipe Project of Beihai Tieshangang District Sewage Treatment Plant, shall be met.	
3	4600t/d 碱炉废气 4,600T/d alkali furnace waste gas	烟尘 Smoke dust	1#废气烟囱 1# waste gas chimney	《火电厂大气污染物排放标准》（GB 13223-2011） Emission Standard of Air Pollutants for Thermal Power Plants (GB 13223-2011)	"三列四电场静电除尘"设施建设情况，处理效果、污染物处理达标情况、污染物排放总量情况 Construction, treatment effect, compliance of pollutant treatment and total amount of pollutant emission of three-row four-electric-field electrostatic dust removal facilities
		SO_2			
		NO_x			
		H_2S		《恶臭污染物排放标准》 Discharge standard of odor pollutants （GB 14554-93） (GB 14554-93)	
4	850t/d 石灰窑废气 850t/d lime kiln waste gas	烟尘 Smoke dust	2#废气烟囱 2# waste gas chimney	《工业炉窑大气污染物排放标准》(GB 9078-1996） Emission Standard of Air Pollutants for Industrial Kiln and Furnace (GB 9078-1996)	一列四电场静电除尘器建设情况，处理效果、污染物处理达标情况 Construction, treatment effect and pollutant treatment standard of one-row four-electric-field electrostatic precipitator
		SO_2			
		H_2S		《恶臭污染物排放标准》 Discharge standard of odor pollutants （GB 14554-93） (GB 14554-93)	
]\5	220t/h 固废锅炉	烟尘	3#废气烟囱	参照《全面实施燃煤电厂超低排放和	SNCR/SCR 联合脱硝+活性炭吸

序号 S.N.	环保设施和设备 Environmental protection facilities and equipment	验收监测项目 Acceptance monitoring items	验收监测点位 Acceptance monitoring points	验收监测标准 Acceptance monitoring standards	调查内容 Investigation contents
	废气 220t/h solid waste boiler waste gas	Smoke dust	3# waste gas chimney	节能改造工作方案》（环发〔2015〕164 号）中锅炉废气超低排放标准限值 Refer to the ultra-low emission standard limit for boiler waste gas as stipulated in the Work Plan on Fully Implementing Ultra-low Emission and Energy Saving Transformation of Coal-fired Power Plants (HF[2015] No.164).	附+布袋除尘器+炉外石灰石/石膏湿法脱硫+高效除雾器系统建设情况，处理效果、污染物处理达标情况 Construction, treatment effect and compliance of pollutant treatment of SNCR/SCR combined denitration + activated carbon adsorption + bag dust collector + limestone/gypsum wet desulfurization outside the furnace + high efficiency demister system
		二氧化硫 Sulfur dioxide			
		氮氧化物 Oxynitride			
		汞及其化合物 Mercury and its compounds		《火电厂大气污染物排放标准》（GB 13223-2011） Emission Standard of Air Pollutants for Thermal Power Plants (GB 13223-2011)	
		氯化氢 Hydrogen chloride		《生活垃圾焚烧污染控制标准》（GB18485-2014） Standard for Pollution Control on the Municipal Solid Waste Incineration (GB18485-2014)	
		一氧化碳 Carbon monoxide			
		镉 Cadmium			
		铊 Thallium			
		锑 Antimony			
		砷			

序号 **S.N.**	环保设施和设备 **Environmental protection facilities and equipment**	验收监测项目 **Acceptance monitoring items**	验收监测点位 **Acceptance monitoring points**	验收监测标准 **Acceptance monitoring standards**	调查内容 **Investigation contents**
		Arsenic			
		铅 Lead			
		铬 Chromium			
		钴 Cobalt			
		铜 Copper			
		锰 Manganese			
		镍 Nickel			
		镉+铊 Cadmium + thallium			
		锑+砷+铅+铬+钴+铜+锰+镍 Antimony+arsenic+lead+chromium+cobalt+copper+manganese+nickel			
		二噁英 Dioxin			
6	280t/h 锅炉 280t/h boiler	烟尘 Smoke dust	3#废气烟囱 3# waste gas chimney	参照《全面实施燃煤电厂超低排放和节能改造工作方案》（环发〔2015〕164 号）中锅炉废气超低排放标准限值	SNCR/SCR 联合脱硝+电袋除尘器+炉外石灰石/石膏湿法脱硫+高效除雾器系统建设情况，处理
		二氧化硫			

序号 S.N.	环保设施和设备 **Environmental protection facilities and equipment**	验收监测项目 **Acceptance monitoring items**	验收监测点位 **Acceptance monitoring points**	验收监测标准 **Acceptance monitoring standards**	调查内容 **Investigation contents**
		Sulfur dioxide		Refer to the ultra-low emission standard limit for boiler waste gas as stipulated in the Work Plan on Fully Implementing Ultra-low Emission and Energy Saving Transformation of Coal-fired Power Plants (HF[2015] No.164).	效果、污染物处理达标情况 Construction, treatment effect and compliance of pollutant treatment of SNCR/SCR combined denitration + bag dust collector + limestone/gypsum wet desulfurization outside the furnace + high efficiency demister system
		氮氧化物 Oxynitride			
		汞及其化合物 Mercury and its compounds		《火电厂大气污染物排放标准》（GB 13223-2011） Emission Standard of Air Pollutants for Thermal Power Plants (GB 13223-2011)	
7	漂白车间 Bleaching workshop	氯气 Chlorine	4#废气烟囱 4# waste gas chimney	《大气污染物综合排放标准》（GB16297-1996） Comprehensive Emission Standards for Air Pollutants (GB16297-1996)	废气处理系统建设情况，处理效果、污染物处理达标情况 Construction, treatment effect and compliance of pollutant treatment of waste gas treatment system
8	二氧化氯制备车间 Chlorine dioxide preparation workshop	氯化氢 Hydrogen chloride	2#、3#、4#排气筒 2 #, 3 # and 4 # exhaust funnels	《无机化学工业污染物排放标准》（GB31573-2015） *Emission Standard of Pollutants for Synthetic Resin Industry* (GB31573-2015)	碱洗、软化水洗涤系统及海波塔系统建设情况，处理效果、污染物处理达标情况 Construction, treatment effect and compliance of pollutant treatment of alkali washing, demineralized water washing
		氯气 Chlorine			

序号 S.N.	环保设施和设备 Environmental protection facilities and equipment	验收监测项目 Acceptance monitoring items	验收监测点位 Acceptance monitoring points	验收监测标准 Acceptance monitoring standards	调查内容 Investigation contents
					system and wave tower system
9	废气无组织源 Unorganized source of waste gas	颗粒物 Particulate Matters (PM)	项目下风向厂界 Downwind plant boundary of the Project	《大气污染物综合排放标准》（GB16297-1996） Comprehensive Emission Standards for Air Pollutants (GB16297-1996)	是否达标 Up to standard or not
		氯气、氯化氢 Chlorine, hydrogen chloride		《无机化学工业污染物排放标准》（GB31573-2015） *Emission Standard of Pollutants for Synthetic Resin Industry* (GB31573-2015)	是否达标 Up to standard or not
		硫化氢、氨、臭气浓度 Concentration of hydrogen sulfide, ammonia and stink		《恶臭污染物排放标准》（GB14554-93） Emission Standards for Odor Pollutants (GB14554-93)	是否达标 Up to standard or not
		非甲烷总烃 Non-methane hydrocarbon		《大气污染物综合排放标准》（GB16297-1996） Comprehensive Emission Standards for Air Pollutants (GB16297-1996)	是否达标 Up to standard or not
10	高噪设备 High-noise equipment 消声减震措施	厂界噪声监测 Noise monitoring at plant boundary	项目厂界 Plant boundary of the Project	执行 GB12348-2008《工业企业厂界环境噪声排放标准》3 类标准 Class 3 standard of the Emission Standards for Industrial Enterprises	降噪措施建设情况、是否达标 Construction of noise reduction measures and whether they meet the standards

序号 S.N.	环保设施和设备 Environmental protection facilities and equipment	验收监测项目 Acceptance monitoring items	验收监测点位 Acceptance monitoring points	验收监测标准 Acceptance monitoring standards	调查内容 Investigation contents
	Noise elimination and shock absorption measures			Noise at Boundary (GB12348-2008)	
11	固体废物暂存处置设施 Temporary solid waste storage and disposal facilities	防渗要求、处置方式及相关台账、联单 Seepage prevention requirements, disposal methods and related ledgers and documents	固体废物暂存库、危废暂存库 Solid waste temporary storage warehouse, hazardous waste temporary storage warehouse	危险废物贮存执行《危险废物贮存污染控制标准》（GB18597-2001）及其修改单标准要求、《一般工业固体废物贮存、处置场污染控制标准》（GB18599-2001）及其修改单标准要求，转运按规范要求实施 Hazardous wastes shall be stored in accordance with the Standard for Pollution Control on Hazardous Waste Storage (GB18597-2001) and its amendment, and the Standard for Pollution on the Storage and Disposal Site for General Industrial Solid Wastes (GB18599-2001) and its amendments, and shall be transported in accordance with the specification requirements	建设情况及运行管理情况 Construction and operation management
12	风险防范设施 Risk prevention facilities	事故池、初期雨水池、厂区硬化、消防栓、、污水管线防渗、应急储备物资、环境风险应急预案、应急演习等		按规范要求实施 Implemented according to specification requirements	建设情况及运行管理情况 Construction and operation management

序号 **S.N.**	**环保设施和设备 Environmental protection facilities and equipment**	**验收监测项目 Acceptance monitoring items**	**验收监测点位 Acceptance monitoring points**	**验收监测标准 Acceptance monitoring standards**	**调查内容 Investigation contents**
		Emergency pool, initial rainwater pool, hardening of plant area, fire hydrants, seepage prevention of sewage pipelines, emergency material storage, environmental risk emergency plan, emergency drills, etc.			
13	地下水防渗设施 Groundwater seepage prevention facilities	分区防渗、跟踪监测井 Area seepage prevention and tracking monitoring well		按规范要求实施 Implemented according to specification requirements	建设情况 Construction situations
14	废水、废气在线监测设备 On-line monitoring equipment for wastewater and waste gas	设备安装、运行情况 Installation and operation of equipment		精度满足要求 The accuracy meet the requirements	仪器运行是否通过计量认证 Whether the operation of the instrument passes the metrological certification
15	厂区绿化 Plant area greening	/	/	/	建设情况 Construction situations
16	排污口规范化标牌 Standardized sign for pollutant	设置位置在排污口（采样点）附近醒目处，高度为标志牌上端离地面 2m。 The setting position is conspicuous near the pollutant discharge outlet (sampling point), and the height is 2m		达到规范要求 Meet the specification requirements	建设情况 Construction situations

序号 S.N.	环保设施和设备 Environmental protection facilities and equipment	验收监测项目 Acceptance monitoring items	验收监测点位 Acceptance monitoring points	验收监测标准 Acceptance monitoring standards	调查内容 Investigation contents
	discharge outlet	from the ground at the upper end of the sign.			
17	环保管理制度 Environmental protection management system	人员配置、各项环保制度建立情况、台账建立和管理情况、档案管理情况、 Personnel allocation, establishment of various environmental protection systems, establishment and management of ledgers, archives management		按要求制定 Formulated as required	制度建立情况 System establishment

9 结论

9 Conclusions

9.1 项目概况

9.1 Project overview

广西太阳纸业有限公司 350 万吨林浆纸一体化项目位于北海市铁山港（临海）工业区内，总占地面积约 3693 亩（含生产区用地 3433 亩、配套一般工业固体废物填埋场 260 亩），项目生产区用地类型为三类工业用地，总投资约 226 亿元；项目已取得铁山港工业区管理委员会建设项目备案证明，项目代码 2019-450512-22- 03-024589。

3.5 Million Tons Forest-Pulp-and-Paper Integration Project of Guangxi Sun Paper Co., Ltd. is located in Tieshangang (Linhai) Industrial Park in Beihai City, with a total area of 3,693 mu (including 3,433 mu of land in the production area and 260mu of supporting landfill site for general industrial solid wastes). Land in the production area of the Project falls under Class III industrial land with a total investment of RMB 22.6 billion. The Project has obtained the record-keeping certification of construction project from Beihai Tieshangang Industrial Park Management Committee, and the project code is 2019-450512-22-03-024589.

项目以海外林基地供应及外购桉木片、桉木原木为原料，采用硫酸盐法连续蒸煮工艺、无元素氯漂白工艺制备化学浆，采用温和盘磨化学预处理碱性过氧化氢机械磨浆法生产化机浆；同时外购部分漂白针叶浆补充进行造纸生产。项目主要建设原料场及备料车间、制浆车间、造纸车间、碱回收车间、二氧化氯制备车间、污水处理站、热电站、空压站、制氧站、净水站等，配套建设废气、噪声、固废临时贮存、环境风险等环保设施。

The Project uses eucalyptus chips and eucalyptus logs supplied and purchased from overseas forest bases as raw materials, adopts Kraft cooking process and ECF bleaching process to prepare chemical pulp, and adopts mild disc grinding chemical pretreatment alkaline hydrogen peroxide mechanical refining process to produce chemical mechanical pulp. The Project mainly constructs raw material yard and material preparation workshop, pulping workshop, paper making workshop, alkali recovery workshop, chlorine dioxide preparation workshop, sewage treatment plant, thermal power station, air compression station, oxygen generation station, water purification station, etc., as well as environmental protection facilities such as waste gas, noise, temporary storage of solid waste, environmental risks, etc.

项目拟分两期建设，第一期拟建年产 80 万吨漂白化学阔叶浆、20 万吨化机浆、55 万吨文化用纸、50 万吨特种纸生产线；第二期建设年产 40 万吨化机浆+ +90 万吨白卡纸+年产 15 万吨生活用纸，建成后总浆纸产能达到 350 万吨/年。

The Project is to be constructed in two phases. Phase I is to build a production line with an annual output of 800,000 tons of bleached chemical broadleaf pulp, 200,000 tons of chemical mechanical pulp, 550,000 tons of cultural paper and 500,000 tons of specialty paper. Phase II will produce 400,000 tons of chemical mechanical pulp, 900,000 tons of white cardboard and 150,000 tons of domestic paper per year, with a total pulp and paper production capacity of 3.5 million tons/year.

9.2 环境质量现状

9.2 Environmental quality status

9.2.1环境空气质量现状评价

9.2.1 Assessment of ambient air quality

根据北海市生态环境主管部门公开发布的 2018 年环境质量公告数据，北海市基本污染物 SO_2、NO_2、PM_{10}、$PM_{2.5}$、CO、O_3 环境质量现状数据均达到《环境空气质量标准》（GB3095-2012）二级标准，属于达标区。

According to the 2018 environmental quality announcement data publicly released by Beihai's competent department of ecological environment, the current environmental quality data of basic pollutants SO2, NO2, PM10, PM2.5, CO and O3 in Beihai all meet the Class II standard of Ambient Air Quality Standards (GB3095-2012). Thus, Beihai belongs to the standard area.

根据主导风向及敏感点目标的分布情况，共布设 2 个大气其他污染物补充监测点，分别为 1#厂区中部、2#川江（南面 500m，下风向）监测因子有氯化氢、氨、硫化氢、氯气、TSP、臭气浓度、非甲烷总烃。在厂界南北设 2 个上下风向监测点，监测硫化氢、氨和臭气浓度。引用《北部湾资源再生环保服务中心环境影响评价报告书》2018~2019 年大气环境质量监测点数据，5#中石化倒班宿舍（西面 1100m，侧下风向）监测因子有 Cr^{6+}、Pb、As、Hg、Cd、二噁英。

According to the distribution of dominant wind direction and sensitive point targets, a total of 2 supplementary monitoring points for other atmospheric pollutants are set up, namely, middle part of 1# plant area and 2# Chuanjiang (500m south, downwind direction). The monitoring factors include hydrogen chloride, ammonia, hydrogen sulfide, chlorine, TSP, odor concentration and non-methane total hydrocarbons. Two up-and-down wind direction monitoring points are set up in the north and south of the plant boundary to monitor the concentrations of hydrogen sulfide, ammonia and stink. In light of the data of atmospheric environmental quality monitoring points from 2018 to 2019 in the Environmental Impact Assessment Report of Beibu Gulf Resource Regeneration and Environmental Protection Service Center, the monitoring factors of 5# Sinopec shift dormitory (1100m to the west and downwind to the side) are Cr6 +, Pb, As, Hg, Cd and Erying.

根据监测结果，评价区域内各监测点的氨、硫化氢、氯化氢能满足《环境影响评价技术导则 大气环境》（HJ 2.2-2018）附录 D 其他污染物空气质量浓度参考限值要求；Pb（日均值）、Hg（日均值）、As（日均值）、六价铬（一次值）浓度满足参照执行的《工业企业设计卫生标准》（TJ36-79）居民区有害物质最高允许浓度要求；非甲烷总烃浓度满足《大气污染物综合排放标准详解》推荐值，臭气浓度满足《恶臭污染物排放标准》（GB14554-93）新扩改建二级标准。评价区域环境空气质量总体能满足环境功能区要求。

According to the monitoring results, ammonia, hydrogen sulfide and hydrogen chloride at each monitoring point in the assessment area can meet the air quality concentration reference limit requirements of other pollutants in Appendix D of the Technical Guidelines for Environmental Impact Assessment-Atmospheric Environment (HJ 2.2-2018); the concentrations of Pb (daily average), Hg (daily average), As (daily average) and hexavalent chromium (primary value) meet the requirements of the maximum allowable concentration of harmful substances in residential areas in the Hygienic Standards for Design of Industrial Enterprises (TJ36-79); the concentration of non-methane total hydrocarbons meets the recommended value of Detailed Explanation of Integrated Emission Standard of Air Pollutants, and the stink concentration meets the newly expanded and rebuilt Class II standard of Emission Standard for Odor Pollutants (GB14554-93). As a whole, ambient air quality of the assessment area could satisfy requirement of the environment functional zone.

9.2.2海洋质量现状评价

9.2.2 Assessment of marine quality

根据《环境影响评价技术导则 地表水环境》（HJ2.3-2018）要求，本项目开展春、

秋两季的海洋环境现状调查，报告引用《广西北部湾经济区北海市铁山港工业区环境影响跟踪评价报告书》2018 年 6 月调查数据，共设置 10 个水质监测点位；海水现状调查监测因子包括：盐度、水温、pH 值、悬浮物、COD、BOD_5、DO、石油类、无机氮、活性磷酸盐、氰化物、硫化物、挥发酚、汞、镉、铅、六价铬、砷、铜等 19 项指标。本次调查水温、悬浮物质和盐度的结果仅作为背景值保留，其余各点位各监测因子均能达到《海水水质标准》（GB3097-1997）中的相应环境功能区的标准限值要求。

According to the requirements of the Technical Guidelines for Environmental Impact Assessment-Surface Water Environment (HJ2.3-2018), this Project carries out a survey of the current situation of the marine environment in spring and autumn. The report quoted the survey data of June 2018 in the Environmental Impact Tracking Assessment Report of Tieshangang Industrial Park, Beihai City, Beibu Gulf Economic Zone, Guangxi and set up a total of 10 water quality monitoring points. The monitoring factors for seawater status survey include 19 indexes such as salinity, water temperature, pH value, suspended solids, COD, BOD5, DO, petroleum, inorganic nitrogen, active phosphate, cyanide, sulfide, volatile phenol, mercury, cadmium, lead, hexavalent chromium, arsenic and copper. The results of water temperature, suspended matter and salinity in this survey are only retained as background values, and all monitoring factors at other points can meet the standard limit requirements of corresponding environmental functional areas in Sea Water Quality Standard (GB3097-1997).

2019 年 8 月在铁山港海域设置 20 个海洋水质监测点位开展监测，监测因子包括：水温、盐度、pH、悬浮物、溶解氧、COD、无机氮（亚硝酸盐、硝酸盐、氨）、汞、镉、铅、铬、砷、铜、锌、活性磷酸盐、石油类、水色、总磷、总氮、BOD、叶绿素 a 等 24 项指标。其中盐度、总磷、总氮、叶绿素 a 末列入《海水水质标准》（GB3097-1997）中，仅作为背景值保留，其余各点位各监测因子均能达到《海水水质标准》（GB3097-1997）中的相应环境功能区的标准限值要求。

In August 2019, 20 marine water quality monitoring points were set up in Tieshangang sea area for monitoring. The monitoring factors include 24 indexes such as water temperature, salinity, pH, suspended solids, dissolved oxygen, COD, inorganic nitrogen (nitrite, nitrate, ammonia), mercury, cadmium, lead, chromium, arsenic, copper, zinc, active phosphate, petroleum, water color, total phosphorus, total nitrogen, BOD, chlorophyll a, etc. Among them, salinity, total phosphorus, total nitrogen and chlorophyll a are not listed in the Sea Water Quality Standard (GB3097-1997) and are only retained as background values. All monitoring factors at other points can meet the standard limit requirements of corresponding environmental functional areas in the Sea Water Quality Standard (GB3097-1997).

评价对铁山港海域近 3 年海水水质变化趋势进行分析，分析结果表明，除个别站点偶有超标外，大部分点位水质均为第一类或第二类海水水质，海水质量状况总体良好，变化趋势较为稳定。从时间变化上看，广西近岸海域水质污染负荷丰水期最重，枯水期其次，平水期相对较轻，从站点分布情况来看，河口、海水养殖区污染较重，距海岸越远水质相对越好。海水水质中，主要的超标因子是无机氮、活性磷酸盐，重金属等污染物变化趋势不显著。

The assessment analyzed the change trend of sea water quality in Tieshangang sea area in the past 3 years. The analysis results show that, except for some stations that occasionally exceed the standard, the water quality at most points is of Class I or Class II sea water quality. The sea water quality is generally good and the change trend is relatively stable. Judging from the time change, the water pollution load in Guangxi's coastal waters is the most serious in the high water season, followed by the low water season and the normal water season. Judging from the distribution of stations, the pollution in estuaries and mariculture areas is more serious, and the further away from the coast, the better the water quality is. In sea water quality, the main factors exceeding the standard are inorganic nitrogen, active phosphate, heavy metals and other pollutants with no significant change trend.

9.2.3海洋沉积物质量现状评价

9.2.3 Assessment of marine sediment quality

海洋沉积物质量现状评价在项目排污口铁山港海域设 12 个监测点位，监测点位与海水水质监测点位相同，监测因子包括有机质、铜、铅、砷、镉、硫化物、铬、石油类和汞。根据监测结果，评价因子有机质、铜、铅、砷、镉、硫化物、铬、石油类和汞在调查海区的标准评价指数都小于 1，未出现超标现象，符合各环境功能区《海洋沉积物质量》（GB18668-2002）标准要求。

For assessment of marine sediment quality status, 12 monitoring points were set up in Tieshangang sea area at the pollutant discharge outlet of the Project. The monitoring points are the same as the sea water quality monitoring points. The monitoring factors include organic matter, copper, lead, arsenic, cadmium, sulfide, chromium, petroleum and mercury. According to the monitoring results, the standard assessment indexes of the assessment factors, including organic matter, copper, lead, arsenic, cadmium, sulfide, chromium, petroleum and mercury in the surveyed sea area, are all less than 1 and meet the standard, which meets the requirements of the Marine Sediment Quality (GB18668-2002) for each environmental functional area.

9.2.3海洋生态现状评价

9.2.3 Assessment of marine ecology

评价引用《广西北部湾经济区北海市铁山港工业区环境影响跟踪评价报告书》2017年在铁山港海域进行的海洋生物生态现状调查结果，共布设 8 个海洋生物调查站位；环评委托广西红树林研究中心在铁山港海域进行海洋生物调查，监测时间为 2019 年 8 月，共布设 12 个海洋生物站位。

The assessment quoted the survey results of marine biological ecological status in Tieshangang sea area conducted in 2017 in the Environmental Impact Tracking Assessment Report of Tieshangang Industrial Park, Beihai City, Beibu Gulf Economic Zone, Guangxi, and set up a total of 8 marine biological survey stations. The EIA entrusted Guangxi Mangrove Research Center to carry out a marine biological survey in Tieshangang sea area. The monitoring time was in August 2019, with a total of 12 marine biological stations.

（1）叶绿素 a 和初级生产力

(1) Chlorophyll a and primary productivity

2017 年调查期间叶绿素 a 含量的平均值为 2.75 毫克/立方米，初级生产力的平均值为 337.3 毫克•C/立方•天。2019 年调查期间叶绿素 a 含量的平均值为 1.23 毫克/立方米，初级生产力的平均值为 252.3 毫克•C/立方•天。总体来说，调查海域叶绿素 a 含量和初级生产力水平均处于中等偏低水平。

During the 2017 survey period, the average chlorophyll a content was 2.75 mg/m3 and the average primary productivity was 337.3 mg·C/cm·d. During the 2019 survey period, the average chlorophyll a content was 2.75 mg/m3 and the average primary productivity was 337.3 mg·C/cm·d. Generally speaking, chlorophyll a content and primary productivity level in the surveyed sea area are at a medium to low level.

（2）浮游植物

(2) Phytoplankton

2017 年调查共鉴定浮游植物 3 门 35 属 61 种，硅藻种类最多，占总种类数的 86.89%，甲藻次之，占 9.84％。浮游植物丰度的变化范围为 56.47×10^4~201.54×10^4 cell/立方米，平均为 101.39×104 cell/立方米，丰度组成以硅藻占主要优势，且铁山港湾内的浮游植

物密度值大于湾口的密度值。角毛藻为优势种，优势度 0.202，各调查站位出现率 100%。浮游植物平均站位出现种数为 26 种，Shannon-weaver 多样性指数平均为 3.60，均匀度指数平均为 0.77，多样性指数的分布较为一致，均匀度差异不大。

In 2017, 61 species of phytoplankton under 35 genera and 3 phyla were identified, with diatoms accounting for 86.89% of the total, followed by dinoflagellates accounting for 9.84%. The phytoplankton abundance ranges from 56.47 × 104 to 201.54 × 104 cell/m³, with an average of 101.39 × 104 cell/m³. Diatoms is of great abundance and the phytoplankton density in Tieshangang Bay is higher than that in the bay mouth. Chaetoceros is the dominant species with a dominance of 0.202 and the occurrence rate of each survey station is 100%. The average number of phytoplankton species at stations is 26, the average Shannon-weaver diversity index is 3.60, and the average evenness index is 0.77. The distribution of diversity index is relatively consistent, and the evenness difference is not significant.

2019 年调查共鉴定浮游植物 3 门 54 种，硅藻种类最多，占总种类数的 83.33%，甲藻次之，占 14.82%。浮游植物丰度的变化范围为 404.5×104~2560×104 cell/立方米，平均为 1177.5×104 cell/立方米。叉状角藻为优势种，优势度 0.268，各调查站位出现率 83.3%。浮游植物平均站位出现种数为 16 种，Shannon-weaver 多样性指数平均为 2.25，均匀度指数平均为 0.82，多样性指数的分布较为一致，均匀度差异不大。

In 2019, 54 species of phytoplankton under 3 phyla were identified, with diatoms accounting for 83.33% of the total, followed by dinoflagellates accounting for 14.82%. The phytoplankton abundance ranges from 404.5×104 to 2560 × 104 cell/m³, with an average of 1177.5 × 104 cell/m³. Cheratococcus fortunei is the dominant species with a dominance of 0.268 and the occurrence rate of each survey station is 83.3%. The average number of phytoplankton species at stations is 16, the average Shannon-weaver diversity index is 2.25, and the average evenness index is 0.82. The distribution of diversity index is relatively consistent, and the evenness difference is not significant.

（3）浮游动物

(3) Zooplankton

2017 年调查表明，调查区内出现浮游动物 46 种（类），分属 10 个类群，以桡足类的种类最多，其次是毛颚类。调查区域浮游动物优势种共 2 种，分别是夜光虫和中华哲水蚤。夜光虫优势度高达 0.81，是本海域的绝对优势种。浮游动物栖息密度平均值为 220.63 个体/立方米，平均生物量为 200.03 毫克/立方米。

The 2017 survey showed that there were 46 species (classes) of zooplankton under 10 class groups in the survey area, dominated by copepods and followed by Chaetognatha. There are 2 dominant zooplankton species in the survey area, namely Noctiluca noctiluca and Daphnia sinensis. The dominant degree of Noctiluca noctiluca is as high as 0.81, which is the absolute dominant species in this sea area. The average habitat density of zooplankton is 220.63/m³, and the average biomass is 200.03 mg/m³.

2019 年调查表明，调查区内出现浮游动物 74 种（类），分属 10 个类群，以桡足类的种类最多，其次是浮游幼虫。调查区域浮游动物优势种共 3 种，分别是太平洋纺锤水蚤、长尾类糠虾幼虫和短尾类溞状幼虫，优势度 0.119~0.185。浮游动物栖息密度平均值为 226.37 个体/立方米，平均生物量为 78.36 毫克/立方米，平均种类数 20 种。

The 2019 survey showed that there were 74 species (classes) of zooplankton under 10 class groups in the survey area, dominated by copepods and followed by planktonic larvae. There are 3 dominant species of zooplankton in the survey area, namely Daphnia pacificus, Mysid shrimp larvae with long tail and Daphnia larvae with short tail, with dominance of 0.119 ~ 0.185. The average habitat density of zooplankton is 226.37/m³, the average biomass is 78.36 mg/m³, and the average number of species is 20.

（4）底栖生物

(4) Benthic organisms

2017 年调查共鉴定出底栖生物 9 门 31 科 39 种。种类组成以软体动物最高，其次是环节动物和节肢动物，各调查站位平均出现种数为 5 种。底栖生物的总平均生物量为 23.31 克/平方米，平均栖息密度为 155.63 尾/平方米。

In 2017, 39 species of benthic organisms under 31 subjects and 9 phyla were identified. Mollusk is the dominated species, followed by annelid and arthropod. The average number of species at each survey station is 5. The total average biomass of benthic organisms is 23.31 g/m2, and the average habitat density is 155.63 tails/m2.

2019 年调查共鉴定出底栖生物 6 门 39 种。以环节动物占的种类比例最多，为 43.59%，其次是软体动物和节肢动物。优势种为菲律宾蛤仔，优势度 0.353。底栖生物的平均栖息密度为 61.58 尾/平方米，平均生物量为 91.36 克/平方米。

In 2019, 39 species of benthic organisms under 31 subjects and 6 phyla were identified. Annelid accounts for the largest proportion of species, 43.59%, followed by mollusks and arthropods. The dominant species is Ruditapes philippinarum, with a dominance of 0.353. The average habitat density of benthic organisms is 61.58 tails/m2 and the average biomass is 91.36 g/m2.

（5）潮间带生物

(5) Intertidal organisms

2019 年调查共鉴定出潮间带生物 8 门 44 种。以软件动物和环节动物出现的种数最多，分别占种类的 36.36%和 31.82%，调查区平均生物种类 12.11 种。优势种主要有 2 种，分别为突畸心蛤、丽文蛤。潮间带生物平均生物量为 388.30 克/平方米，平均栖息密度为 109.16 个体/平方。生物量以铁山港东面潮间带较高，栖息密度以西南面潮间带较高，中潮区均为生物量和栖息密度较大的潮带。

A total of 44 species of intertidal organisms under 8 phyla were identified in 2019. The mollusk and annulata are the main species, accounting for 36.36% and 31.82% of the total respectively. The average number of biological species in the survey area is 12.11. There are mainly 2 dominant species, namely, anomalocardia producta and meretrix lusoria. The average biomass of intertidal organisms is 388.30 g/m2, and the average habitat density is 109.16 individuals/m2. The biomass is higher in the east intertidal zone of Tieshangang, and the habitat density is higher in the southwest intertidal zone. The middle tidal zone is the tidal zone with higher biomass and habitat density.

（6）鱼卵和仔鱼

(6) Eggs and larvae

2019 年调查共鉴定出鱼卵和仔鱼 6 个种类，本次调查出现的鱼卵和仔鱼数量较少，优势种类不明显，以小公鱼、鲾科和鲱居多，平均密度鱼卵为 4.38 粒/立方米，仔鱼为 7.19 尾 / 立方米。

A total of 6 species of fish eggs and larvae were identified in the 2019 survey. The number of fish eggs and larvae in this survey is relatively small, and the dominant species are not obvious. Most of them are stolephorus, sapsap and herring. The average density of fish eggs is 4.38 grains/m³, and the larvae is 7.19 grains/m³.

（7）海洋渔业资源

(7) Marine fishery resources

2019 年调查共捕获游泳动物 60 种，其中鱼类有 39 种，甲壳类 18 种，头足类 3 种。主要经济种类有鹿斑仰口鲾、短吻鲾、斑鰶、皮氏叫姑鱼、印度侧带小公鱼、粗纹鲾等，这些种类约占渔获量的 62%。渔业资源的平均重量渔获率为 12.01 公斤/小时，平均尾数渔获率为 760 尾/小时，平均重量资源密度约为 187.66 公斤/平方千米，尾数资源密度 11880.21 尾/平方千米。

A total of 60 species of nektons were captured in 2019, including 39 species of fish, 18 species of crustaceans and 3 species of cephalopods. The main economic species are secutor ruconius, leiognathus brevirostris, konosirus punctatus, johnius belangerii, stolephorus indicus, leiognathidae, etc. These species account for about 62% of the catch. The average weight catch rate of fishery resources is 12.01 kg/h, the average catch rate is 760 fish/h, the average weight resource density is 187.66 kg/km2, and the resource density is 11880.21 fish/km2.

（8）海洋生物质量

(8) Marine biological quality

根据 2019 年调查结果可知，本调查捕获的生物体内镉、铅、铜、锌、汞、砷、铬和石油烃全部符合相应评价标准要求，没有出现超标现象。

According to the survey results in 2019, the cadmium, lead, copper, zinc, mercury, arsenic, chromium and petroleum hydrocarbons captured in the organisms in this survey all meet the requirements of the corresponding assessment standards and do not exceed the standard.

9.2.4地下水质量现状评价

9.2.4 Assessment of groundwater quality

本次对地下水水位的监测于 2019 年 7 月进行一期水位监测，共设置 13 个地下水水位监测点。监测结果表明，厂区地下水水位埋深一般 3.30～15.83m，标高 7.7～33.6m，地下水水位 4.7~18.2m。场区地处南康盆地水文地质单元东隅的大江口次一级水文地质单元的径流区。大江口单元为相对独立的水文地质单元，该单元以西面板塘—浸谷塘—下底村—沙角咀连线的地下水分水岭为界，东、北东和南东三面均以北部湾海域为排泄边界。场地主要接受大气降水的垂直渗入和西侧同单元地下水的侧向补给，以及少量地表水和农灌水的渗漏补给，地下水大体上由北西向南东径流，以渗流的方式排泄于北部湾海域。

Phase I groundwater level monitoring was carried out in July 2019, with a total of 13 groundwater level monitoring points. The monitoring results show that the groundwater level in the plant area is generally 3.30 ~ 15.83 m, the elevation is 7.7 ~ 33.6 m, and the groundwater level is 4.7 ~ 18.2 m. The site is located in the runoff area of Dajiangkou sub-level hydrogeological unit on the east side of Nankang Basin hydrogeological unit. Dajiangkou Unit is a relatively independent hydrological unit. The Unit takes groundwater watershed of Bantang - Jingutang - Xiadi Village - Shajiaoju as its west boundary and Beibu Gulf sea as its eastern, northeastern and southern drainage boundary. The site mainly receives vertical infiltration of atmospheric precipitation and lateral recharge of groundwater of the same unit on the west side, as well as infiltration recharge of a small amount of surface water and agricultural irrigation water. Groundwater is generally runoff from north west to south east and discharged into Beibu Gulf sea area in the form of interstifial flow.

本项目地下水水质调查在 2019 年 7 月进行一期监测，共设置 7 监个地下水水质监测点。监测结果显示，各监测点位除 6#（川江）外，其他各监测见 pH 值均呈偏酸性。1#（谢家村）氯化物出现超标，超标 0.51 倍，根据现场走访调查，谢家村一带海水养殖业排污不规范，养殖污染物乱排，以及养殖海水的渗漏，村民反应地下水时有咸味。其他监测点的各项监测因子均能满足《地下水环境质量标准》（GBT14848-2017）III类标准。根据历史监测资料，北海市属于滨海平原地区，受地质条件影响，北海市地下水总体偏酸性，且 pH 值存在一定的波动，天然状态下，北海滨海平原地区地下水 pH 值为 3.33~7.0，本项目 pH 超标值在历史资料显示的波动范围内。

Phase I groundwater quality monitoring of the Project was carried out in July 2019, with a total of 7 groundwater quality monitoring points. The monitoring results show that the pH value of each monitoring point is slightly acidic except 6# (Chuanjiang). Chloride in Monitoring point 1 (Xiejia Village) had exceeded standard by 0.51 times. According to field interview and investigation, the pollution discharge of marine aquaculture industry in Xiejia Village was not normalized, cultivation pollutants were stacking everywhere, cultivation seawater was leaking and villagers said that sometimes groundwater is salty. Each monitoring factor of other monitoring points can satisfy Class III standard in Standard for Groundwater Quality (GBT14848-2017). According to historical monitoring data, Beihai City belongs to the coastal plain area. Affected by geological conditions, its groundwater is generally acidic and the pH value fluctuates to a certain extent. Under natural conditions, the pH value of the groundwater in the coastal plain area of Beihai City is 3.33 ~ 7.0, and the excessive pH value of this Project is within the fluctuation range shown by historical data.

9.2.5土壤环境质量现状评价

9.2.5 Assessment of soil environmental quality

项目土壤监测共设置 14 个环境土壤监测点，其中包括项目厂区内设置的 10 个建设用地土壤监测点和 3 个厂区外农用地土壤监测点。3 个农用地土壤监测点满足《土壤环境质量 农用地土壤污染风险管控标准（试行）》（GB 15618-2018）中的相关限值，10 个建设用地土壤采样点满足《土壤环境质量 建设用地土壤污染风险管控标准（试行）》

（GB36600-2018）建设用地土壤污染风险筛选值和管制值中第二类用地相关限值。

A total of 14 environmental soil monitoring points were set up for soil monitoring of the Project, including 10 construction land soil monitoring points set up in the Project plant area and 3 agricultural land soil monitoring points outside the plant area. The 3 agricultural land soil monitoring points meet the relevant limits in the Soil Environmental Quality-Agricultural Land Soil Pollution Risk Control Standard (Trial) (GB 15618-2018), and 10 construction land soil sampling points meet the relevant limits of Class II land in the construction land soil pollution risk screening value and control value of the Soil Environmental Quality-Construction Land Soil Pollution Risk Control Standard (Trial) (GB36600-2018).

9.2.6声环境质量现状评价

9.2.6 Assessment of acoustic environment

根据厂区周围现状，在拟建项目厂址四周布设 9 个厂界噪声监测点和 1 个敏感点噪声监测点。监测结果表明，本项目东、南、西、北面厂界，污水处理站东、西、北面，厂区东南面以及厂区西面的昼夜声环境均能满足《声环境质量标准》（GB3096-2008）中 3 类标准要求，川江敏感点噪声能满足《声环境质量标准》（GB3096-2008）中 2 类标准。

According to the current situation around the plant area, 9 noise monitoring points at the plant boundary and 1 noise monitoring point at sensitive points were arranged around the plant site of the proposed Project. The monitoring results show that the day and night sound environment in the east, south, west and north plant boundaries of the Project, the east, west and north of the sewage treatment plant, the southeast of the plant area and the west of the plant area can meet the requirements of Class 3 standards in the Acoustic Environment Quality Standards (GB3096-2008), and the noise at Chuanjiang sensitive points can meet Class 2 standards in the Acoustic Environment Quality Standards (GB3096-2008).

9.2.7生态环境现状评价

9.2.7 Assessment of ecological environment

项目所在地评价区域范围为滨海平原，土地利用现状以农用地和建设用地为主。由于长期受人类频繁活动的影响，评价区内陆生生物质量不高，原生植被已受破坏，目前主要是次生植被和人工植被，主要为农田生态系统，生态系统单一，物种多样性不高，

植被覆盖率低。铁山港海域内生物种类较丰富，数量较多，分布尚均匀，海域生态环境较好。

The assessment area of the project site is coastal plain and the current land use situation is mainly agricultural land and construction land. Due to the long-term influence of frequent human activities, the quality of terrestrial organisms in the assessment area is not high and the primary vegetation has been destroyed. Currently, it is mainly secondary vegetation, artificial vegetation and farmland ecosystem, featuring single ecosystem, low species diversity and low vegetation coverage. The Tieshangang sea area is rich in biological species and large in quantity. It is evenly distributed and has a good ecological environment.

9.3 污染物排放情况

9.3 Pollutant discharge

9.3.1废水污染物

9.3.1 Wastewater pollutants

本项目废水主要包括：木片洗涤废水、制浆中段废水、造纸白水、污冷凝水、热电站排水、净水站浓水、循环水系统排污水、地面冲洗废水、办公生活污水等。

The wastewater of this Project mainly includes wood chip washing wastewater, pulping mid-section wastewater, papermaking white water, sewage condensed water, thermal power station drainage, concentrated water from water purification station, circulating water system drainage, ground washing wastewater, office and domestic sewage, etc.

项目废水经收集后进入项目配套污水处理站处理，项目污水处理站总处理规模为100000m^3/d，采用“初沉池+厌氧反应器+生物选择池+卡鲁塞尔氧化沟+高级氧化池”工艺，废水处理达到《制浆造纸工业水污染物排放标准》（GB3544-2008）表 2 新建制浆和造纸联合生产企业水污染物排放浓度限值（其中，氨氮和总氮达到表 3 水污染物特别排放限值），排入铁山港区深海排放管网，在铁山港 B3 排污口深海排放。项目一期废水排放量为 72130 m^3/d，二期排放量为 95023m^3/d。项目生活区在厂区外另行选址建设，生活区污水排入园区污水管网，进入铁山港工业区污水处理厂。

The wastewater of the Project is collected and then treated at the supporting sewage treatment plant of the Project. The total treatment scale of the project sewage treatment plant is 100000m3/d. The process of "primary settling tank + anaerobic reactor + biological selection tank + Carrousel oxidation ditch + advanced oxidation tank" is adopted. After treatment, the pollutants reach the concentration limit of newly-built pulp and paper-making joint production enterprises in Table 2 of the Discharge Standard of Water Pollutants for Pulp and Paper Industry (GB3544-2008) (among which, ammonia nitrogen and total nitrogen reach the special discharge limit of water pollutants in Table 3), and are discharged into the deep sea discharge pipe network in Tieshangang District and the deep sea from the B3 pollutant discharge outlet of Tieshangang. The discharge amount of wastewater in Phase I of the Project is 72130 m3/d, and that in Phase II is 95023m3/d. The living area of the Project will be located outside the plant area. The sewage from the living area will be discharged into the sewage pipe network of the park and enter the sewage treatment plant of Tieshangang Industrial Park.

9.3.2大气污染物

9.3.2 Air pollutants

本项目废气主要来源于锅炉废气、碱回收炉废气、石灰窑废气、固废综合利用锅炉烟气、制浆漂白工段废气、化学品制备工段排气，制浆生产线及碱回收系统臭气、污水处理厂无组织废气，以及无组织扬尘等。

The waste gas of this Project mainly comes from boiler waste gas, alkali recovery furnace waste gas, lime kiln waste gas, solid waste comprehensive utilization boiler flue gas, pulping and bleaching section waste gas, chemical preparation section exhaust gas, pulping production line and alkali recovery system odor, sewage treatment plant unorganized waste gas, unorganized dust, etc.

①项目碱回收炉废气设一套三列四电场静电除尘器处理达到《火电厂大气污染物排放标准》（GB 13223-2011）和《恶臭污染物排放标准》（GB 14554-93）后经一根 150 米烟囱排放。

① The waste gas from the alkali recovery furnace is treated by a set of three-row four-electric-field electrostatic precipitator that meets the Emission Standard of Air Pollutants for Thermal Power Plants (GB 13223-2011) and the Emission Standard for Odor Pollutants (GB 14554-93) and then discharged through a 150-meter chimney.

②石灰窑废气设一套一列四电场静电除尘器除尘处理达到《工业炉窑大气污染物排放标准》（GB 9078-1996）和《恶臭污染物排放标准》（GB 14554-93）后经一根 150 米烟囱排放。

② The waste gas from the lime kiln is treated by a set of three-row four-electric-field electrostatic precipitator that meets the Emission Standard of Air Pollutants for Thermal Power Plants (GB 13223-2011) and the Emission Standard for Odor Pollutants (GB 14554-93) and then discharged through a 150-meter chimney.

③固废综合利用锅炉废气经 SNCR/SCR 联合脱硝+布袋除尘器+活性炭吸附+炉外石灰石/石膏湿法脱硫+高效除雾器处理达到锅炉废气超低排放标准限值和《生活垃圾焚烧污染控制标准》（GB18485-2014）后经一根 150 米烟囱与燃煤供热锅炉废气一同排放。

③ Waste gas from solid waste comprehensive utilization boilers is treated by SNCR/SCR combined denitration+bag-type dust collector +activated carbon adsorption+limestone outside the boiler/gypsum wet desulfurization +high efficiency demister + waste gas on-line monitoring system to reach the ultra-low emission standard limit of boiler waste gas and the Standard for Pollution Control on the Municipal Solid Waste Incineration (GB18485-2014), and then discharged together with the waste gas from coal-fired heating boilers through a 150-meter chimney.

④燃煤供热锅炉废气经 SNCR/SCR 联合脱硝+电袋除尘器+炉外石灰石/石膏湿法脱硫+高效除雾器处理达到锅炉废气超低排放标准限值和《火电厂大气污染物排放标准》（GB 13223-2011）后经一根 150 米烟囱与固废综合利用锅炉废气一同排放。

④ Waste gas from the coal-fired heating boilers is treated by SNCR/SCR combined denitration+bag-type dust collector +activated carbon adsorption+limestone outside the boiler/gypsum wet desulfurization +high efficiency demister + waste gas on-line monitoring system to reach the ultra-low emission standard limit of boiler waste gas and the Emission Standard of Air Pollutants for Thermal Power Plants (GB18485-2014), and then discharged together with the waste gas from solid waste comprehensive utilization boilers through a 150-meter chimney.

⑤化学品制备车间工艺废气包括：二氧化氯车间氯酸钠电解槽过量氢气排空尾气经碱液洗涤后通过一根 25 米排气筒排放；盐酸合成尾气经软化水洗涤后通过一根 42 米排气筒排放；二氧化氯罐槽尾气经海波塔洗涤后通过 30 米排气筒排放。外排废气达到《无机化学工业污染物排放标准》（GB31573-2015）。

⑤ The process waste gas of the chemical preparation workshop includes: The excessive hydrogen tail gas in sodium chlorate electrolytic cell of chlorine dioxide workshop is washed by alkali liquor and then discharged through a 25m exhaust funnel; hydrochloric acid synthesis tail gas is washed with demineralized water and discharged through a 42m exhaust funnel; the tail gas from the chlorine dioxide tank is washed by wave tower and then discharged through the 30m exhaust funnel. The discharged waste gas meets the Emission Standards of Pollutants for Inorganic Chemical Industry (GB31573-2015).

⑥纸浆车间漂白尾气经碱液洗涤后通过一根 150 米烟囱排放。

⑥ Bleaching tail gas from pulp workshop is washed by alkali liquor and then discharged through a 150-meter chimney.

⑦项目制浆系统的臭气主要来源于化学浆生产线和碱回收系统。高浓恶臭气体经收集后送碱回收炉燃烧，低浓臭气经收集处理后作为碱炉二次风入炉燃烧，事故状态下启用备用臭气焚烧器。

⑦ Stink from the pulping system of the Project mainly comes from chemical pulp production line and alkali recovery system. The high-concentration stink is collected and then sent to the alkali recovery furnace for combustion. The low-concentration stink is collected and treated as secondary air of the alkali furnace for combustion. In case of an accident, the standby stink incinerator is activated.

⑧项目对污水处理站调制池、预酸化池、厌氧脱气池、厌氧沉淀池、生物选择池、污泥调理池等产生臭气的构筑物进行加盖密封，并配置一套碱洗除臭系统，臭气经抽风管送至除臭系统，经喷淋洗涤后，送至生产区碱炉内燃烧分解后，经过碱炉烟囱排放。

The Project covers and seals the stink-generating structures such as the conditioning tank, pre-acidification tank, anaerobic degassing tank, anaerobic sedimentation tank, biological selection tank and sludge conditioning tank of the sewage treatment plant, and arranges an alkaline washing deodorant system, which can send the stink gas to the deodorant system through the exhaust tube; the stink gas, after spray washing, will be sent to the alkali furnace in the production area for combustion and decomposition.

⑨项目煤棚为封闭式，配置喷水设备，定期喷洒以保持一定水分，可有效减少煤尘飞扬，有效减小煤堆受风力作用引起的煤尘污染出现的概率。备料工序的扬尘主要产生于原料堆场和木片筛，项目木片堆场采用洒水降尘，水炮喷雾抑尘措施；木片筛置于封闭车间，减少粉尘无组织排放。

⑨ The coal shed of the Project is closed, equipped with water spraying equipment, and spraying is carried out regularly to maintain a certain amount of water, which can effectively reduce coal dust and the probability of coal dust pollution caused by wind force on coal piles. Dust from the material preparation process is mainly generated from the raw material storage yard and the wood chip screen. The wood chip storage yard of the Project adopts measures of sprinkling water and water cannon to reduce dust. Wood screen is placed in a closed workshop to reduce unorganized dust emission.

9.3.3固体废物

9.3.3 Solid waste

厂区的固体废物主要有废木屑，锅炉渣及煤灰，浆节、渣，白泥、绿泥、石灰渣，污水处理厂污泥、生活垃圾、废离子交换树脂、储油罐残渣、隔油池污泥、废催化剂、废机油等，废离子交换树脂、储油罐残渣、隔油池污泥、废催化剂、废机油为危险废物，其余全部为一般工业固体废物。需外委处置的一般固废主要为绿泥、石灰渣、污水处理化学污泥，一期产生量 19531 吨/年，二期后 28418 吨/年，项目配套一般固体废物填埋场建成前暂时依托铁山港工业区一般工业固体废物集中处置场过渡处置（约 5~12 个月）。需外委综合利用的包括锅炉灰渣、脱硫石膏，一期产生量 85663 吨/年，二期后 159774 吨/年，其中固废锅炉飞灰需在投产后重新进行固体废物类别鉴定，若属于危险废物需委托有资质单位处置。危险废物主要为废离子交换树脂、储油罐残渣、隔油池污泥、废活性炭、废催化剂、废机油，产生量为一期 82.71 吨/年，二期后 117.05 吨/年，由供货厂家回收综合利用或委托有资质单位处置。

The solid waste in the plant mainly includes waste sawdust, boiler slag and coal ash, slurry joints, slag, white mud, green mud, lime slag, sewage treatment plant sludge, domestic garbage, waste ion exchange resin, oil storage tank residue, oil separation tank sludge, waste catalyst, waste engine oil, etc. Waste ion exchange resin, oil storage tank residue, oil separation tank sludge, waste catalyst and waste engine oil are hazardous wastes and the rest are all general industrial solid wastes. The general solid waste to be disposed of by outsourcing is mainly green mud, lime slag and sewage treatment chemical sludge, with a production capacity of 19,531 tons/year in Phase I and 28,418 tons/year in Phase II. Before the completion of the general solid waste landfill site, the general solid waste will temporarily stored in the general industrial solid waste centralized disposal site in Tieshangang Industrial Park for transitional disposal (about 5-12 months). Boiler ash and desulfurized gypsum should be outsourced for comprehensive utilizatio, including 85,663 tons/year in Phase I and 159,774 tons/year in Phase II. Among them, solid waste boiler fly ash needs to be re-identified for solid waste category after the Project is put into production. If it belongs to hazardous waste, it needs to be entrusted to a qualified unit for disposal. Hazardous wastes mainly include waste ion exchange resin, oil storage tank residue, sludge from oil separation tank, waste activated carbon, waste catalyst and waste engine oil. The output is 82.71 tons/year in Phase I and 117.05 tons/year in Phase II. The supplier shall recycle and comprehensively utilize them or entrust qualified units to dispose of them.

9.3.4噪声

9.3.4 Noise

项目噪声源主要为备料工段水洗机，制浆车间的除砂器、浆泵、真空泵等，造纸车间磨浆机、纸机等，二氧化氯制备车间的药剂泵和水泵，制氧站的鼓风机、真空泵、氧压机，污水处理站鼓风机、各类泵，热电车间风机、泵等机械设备。强噪声装置设备采取相应的降噪声措施（包括隔离、隔声、消噪等）后，噪声均可降至 85d B（A）以下。

The noise sources of the Project are mainly water washing machines in the material preparation section, sand removers, pulp pumps, vacuum pumps, etc. in the pulping workshop, pulp refiners, paper machines, etc. in the papermaking workshop, chemical pumps and water pumps in the chlorine dioxide preparation workshop, blowers, vacuum pumps, oxygen compressors, blowers in the sewage treatment plant, various pumps, fans, pumps and other mechanical equipment in the thermoelectric workshop. After taking corresponding noise reduction measures (including isolation, sound insulation, noise elimination, etc.), the noise of strong noise devices and equipment can be reduced to below 85dB (A).

9.3.5污染物排放情况

9.3. 5 Pollutant discharge

本项目建成后，涉及排放的污染物包括水污染物：COD、BOD_5、SS、NH_3-N、TN、TP 等；大气污染物：烟尘、二氧化硫、氮氧化物、氯化氢、重金属（汞、镉、砷、镍、铅、铬等）、二噁英类、硫化氢、氨、非甲烷总烃、粉尘。

Upon completion of this Project, the pollutants involved in discharge include water pollutants: COD, BOD5, SS, NH3-N, TN, TP, etc.; air pollutants: smoke dust, sulfur dioxide, nitrogen oxides, hydrogen chloride, heavy metals (mercury, cadmium, arsenic, nickel, lead, chromium, etc.), dioxins, hydrogen sulfide, ammonia, non-methane total hydrocarbons, dust.

本项目主要污染物排放总量一期控制为：化学需氧量 1799.52 吨/年、氨氮 120.20 吨/年，颗粒物 314.75 吨/年、二氧化硫 590.45 吨/年、氮氧化物 2195 吨/年。二期建成后全厂主要污染物排放总量控制为：化学需氧量 2359.87 吨/年、氨氮 158.30 吨/年，颗粒

物 362.28 吨/年、二氧化硫 728.58 吨/年、氮氧化物 2477.24 吨/年。

During Phase I, the total emission control of major pollutants in this Project is: 1799.52 tons/year of chemical oxygen demand, 120.20 tons/year of ammonia nitrogen, 314.75 tons/year of particulate matter, 590.45 tons/year of sulfur dioxide and 2195 tons/year of nitrogen oxides. Upon completion of Phase II, the total emission control of major pollutants in the whole plant is: 2359.87 tons/year of chemical oxygen demand, 158.30 tons/year of ammonia nitrogen, 362.28 tons/year of particulate matter, 728.58 tons/year of sulfur dioxide and 2477.24 tons/year of nitrogen oxides.

其他污染排放总量控制详见本报告污染物排放情况清单。

For details of the total amount control of other pollution emissions, please refer to the list of pollutant emissions in this report.

9.4 环境影响预测与评价

9.4 Environmental impact prediction and assessment

9.4.1 大气环境影响

9.4.1 Impact on the atmospheric environment

项目新增污染源正常排放下 SO_2、NO_2、PM_{10}、$PM_{2.5}$、HCl、H_2S、NH_3、As、Hg、Cd、TSP、Cl_2 短期浓度贡献值的最大浓度占标率≤100%。项目新增污染源正常排放下 SO_2、NO_2、PM_{10}、$PM_{2.5}$、HCl、As、Hg、Cd、TSP 年均浓度贡献值的最大浓度占标率≤30%。

The short-term maximum concentration Pi of SO2, NO2, PM10, PM2.5, HCl, H2S, NH3, As, Hg, Cd, TSP and Cl2 under the normal emission of newly added pollution sources in the Project is ≤100%. The annual maximum concentration Pi of SO2, NO2, PM10, PM2.5, HCl, As, Hg, Cd and TSP under the normal emission of newly added pollution sources in the Project is ≤30%.

叠加现状浓度、区域拟建（在建）项目后，SO_2、NO_2、PM_{10}、$PM_{2.5}$ 的保证率日平均、年平均质量浓度满足《环境空气质量标准》（GB3095-2012）中二级标准；HCl（小时、日均）、H_2S（小时）短期浓度满足《环境影响评价技术导则 大气环境》（HJ2.2-2018）附录 D 其它污染物空气质量浓度参考限值；Hg（日均）、As（日均）短期浓度满足《工业企业设计卫生标准》（TJ36-79）居民区有害物质最高允许浓度要求，Hg、As、Cd 年

均浓度满足《环境空气质量标准》（GB3095-2012）中二级标准。

After superimposing the current concentration and the proposed (under construction) project in the region, the daily average and annual average mass concentrations of SO2, NO2, PM10 and PM2.5 meet the Class II standard in the Ambient Air Quality Standards (GB3095-2012); the short-term concentrations of HCl (hourly, daily average) and H2S (hourly) meet the air quality concentration reference limits of other pollutants in Appendix D of the Technical Guidelines for Environmental Impact Assessment-Atmospheric Environment (HJ2.2-2018); the short-term concentrations of Hg (daily average) and AS (daily average) meet the requirements of the maximum allowable concentration of harmful substances in residential areas in the Hygienic Standards for Design of Industrial Enterprises (TJ36-79), and the average annual concentrations of Hg, AS and Cd meet the Class II standard in the Ambient Air Quality Standards (GB3095-2012).

根据影响预测结果，正常及非正常排放对项目区大气环境的影响可以接受，厂界外无超标区域，无需设置大气环境防护距离。本次环评参考《造纸及纸制品业卫生防护距离 第 1 部分：纸浆制造业》（GB/T 11654.1-2012），以化学浆车间为边界，外延 800m 范围作为本项目的环境防护距离。防护距离超出项目东厂界最远距离为 400m；超出北厂界外 170m，落在广西宏大化工有限公司双氧水项目用地范围内；超出南厂界最远距离为 135m；未超出西厂界边线。根据现场调查，超出厂界部分均无环境敏感目标，不涉及居民搬迁问题。厂界外防护距离范围均为规划的工业用地和防护绿地，不涉及规划的居住用地、行政办公、商业用地等。园区后续发展不应在防护距离范围内规划建设居民区、学校、医院、行政办公和科研等敏感目标。

According to the impact prediction results, the impact of normal and abnormal emissions on the atmospheric environment in the project area is acceptable, there is no over-standard area outside the plant boundary, and there is no need to set the atmospheric environment protection zone. This EIA refers to Health Protection Zone for Paper and Paper Products Industry-Part 1: Pulp and Paper Industry (GB/T 11654.1-2012), with chemical pulp workshop as the boundary and an extension of 800m as the environment protection zone of this Project. The protection zone is as far as 400m beyond the east plant boundary and 170m beyond the north plant boundary and falls within the scope of the hydrogen peroxide project of Guangxi Hongda Chemical Co., Ltd.; 135m beyond the south plant boundary and does not exceed the west plant boundary. According to the site investigation, there are no environmental y sensitive targets beyond the plant boundary and the relocation of residents is not involved.

The range of protection distance outside the plant boundary is the planned industrial land and protective green space, and does not involve any planned residential land, administrative office, commercial land, etc. For the follow-up park development, no sensitive targets such as residential areas, schools, hospitals, administrative offices and scientific research institutes shall be planned and constructed within the protective distance.

9.4.2 海洋环境影响

9.4.2 Impact on the marine environment

评价选取化学需氧量、SS、无机氮、活性磷酸盐、AOX 五个污染因子在不同排放量情况下进行了预测分析，考虑到排污口所在海域岸线的变化性，为了充分考虑污染物的最不利影响，按照现状岸线和规划实施后港口岸线分别进行了预测分析，预测结果表明：

Five pollution factors (COD, SS, inorganic nitrogen, active phosphate and AOX) are selected in the assessment for prediction and analysis under different emission conditions. Given the varying coastline of sea area where the sewage outlet is located, and to fully consider the most adverse effects of pollutants, the current coastline and the port coastline after the planning implementation are predicted and analyzed respectively. According to prediction results:

①总体而言，现状岸线与规划岸线情况下污染物的扩散趋势基本相同，影响范围与影响程度略有差别，其对周边环境敏感目标的影响基本相近。B3 排污口位于铁山湾内湾主槽内，潮流动力强劲，落潮流速大于涨潮流速，有利于污染物向外输送，规划岸线下，东槽内落潮潮量大幅增加，再加上周边港池航道的开挖，B3 排污口周边海域扩散能力有所增加，排污影响范围有所减小。

① Generally, the diffusion trend of pollutants under the current and the planned coastlines is basically the same, with slightly different influence scope and degree; and their influence on the sensitive targets of the surrounding environment is basically similar. Sewage outlet B3 is located in the main channel of Inner Tieshan Bay. The tidal current is strong, and the ebb tide velocity is greater than the flood tide velocity, which is conducive to the outward transportation of pollutants. Under the planned coastline, the ebb tide volume in the east channel increases greatly. Coupled with the excavation of surrounding dock basins and channels, the diffusion capacity of the sea area around sewage outlet B3 increases and the influence range of sewage discharge decreases.

②通过质点追踪模拟分析表明，B3 排污口排放的污染物在涨潮时主要随潮流沿深槽进入铁山港内湾，落潮时随落潮流分别进入东、西槽内，沿其深槽向外海侧运动，主要的运动轨迹未向山口国家级红树林保护区和广西合浦儒艮保护区运动。

② Through particle tracking simulation analysis, pollutants discharged from sewage outlet B3 mainly flow into the inner bay of Tieshan Harbor along the deep trough with the tidal current at high tide, flows into the east trough and west trough with the ebb current at falling tide respectively, and then move to the open sea along the deep trough. The main movement track does not involve Shankou National Mangrove Reserve and Hepu Dugong Reserve in Guangxi.

③在考虑排污口叠加污染源的情况下，项目废水正常排放，污染物浓度增量影响主要集中在排污口附近区域，随着向外扩散浓度增量逐渐减小，叠加各海洋环境功能区水质本底浓度后，均未超过相应海洋环境功能区海水水质指标要求。

③ Given the superposition of pollution sources at sewage outlets, the project wastewater is discharged as normal, and the influence of pollutant concentration increment is mainly concentrated in the area near the sewage outlet. With the gradual decrease of outward diffusion concentration increment, the superposition of water quality background concentration in each marine environment functional zone does not exceed the seawater quality index requirements for the corresponding marine environment functional zone.

项目废水非正常排放时海域浓度增量扩散范围有所增加，但叠加各海洋环境功能区水质本底浓度后，仍能达到相应海洋环境功能区海水水质指标要求。故项目废水排放，不降低排海口周边海域海水环境功能级别。

When the project wastewater is discharged abnormally, the diffusion range of sea area concentration increment increases, but after the background concentration of water quality in each marine environment functional zone is superimposed, it can still meet the requirements of seawater quality index for corresponding marine environment functional zone. Therefore, the discharge of wastewater from the Project will not lower the functional level of seawater environment in the sea area around the outlet.

④B3 排污口排污共造成鱼苗损失 2.62×10^5 尾、渔业资源成体损失 2.25kg，浮游植物损失 0.43×10^{14} 个、浮游动物损失 0.82×10^8 个。根据广西壮族自治区渔业资源市场价格，鱼苗按 1 元/尾计算，则 B3 排污口排放造成鱼卵仔鱼折算为商品育苗损失计 26.2 万元，渔业资源损失计 0.0025 万元，以上损失共计 26.3 万元。

④ Sewage outlet B3 causes the losses of 2.62×10^5 fish fries, 2.25kg adult fishes,

0.43×10^{14} phytoplankton plants and 0.82×10^{8} zooplanktons. According to the market price of fishery resources in Guangxi Zhuang Autonomous Region, the fish fry is calculated at RMB 1 per fish fry, then the spawn and larva fish discharged from sewage outlet B3 are converted into commercial seedling losses of RMB 262,000, fishery resources losses of RMB 25, and the above losses total RMB 263,000.

⑤现状岸线条件和规划岸线条件下的各种工况 COD、SS、无机氮、活性磷酸盐、AOX 主要扩散范围均不会到达山口红树林生态自然保护区、广西合浦儒艮国家级自然保护区、北部湾二长棘鲷长毛对虾国家级水产种质资源保护区；叠加保护区本底浓度后，水质仍能达标，广西山口红树林保护区和广西合浦儒艮国家级自然保护区海水水质、海洋沉积物质量和海洋生物质量均不劣于一类标准，满足保护区生态红线管控要求。北部湾二长棘鲷长毛对虾国家级水产种质资源保护区距离排污口较远，污染物经过长距离广海域的扩散，通过累计对海水水质、海洋生物的影响很小。

⑤ The main diffusion ranges of COD, SS, inorganic nitrogen, active phosphate and AOX under various working conditions at the current shoreline conditions and the planned shoreline conditions will not reach Shankou Mangrove Ecological Nature Reserve, Guangxi Hepu Dugong National Nature Reserve, and Beibu Gulf Parargyrops Edita Penaeus Penicillatus National Germplasm Resource Nature Reserve. After the background concentration of those reserves are superimposed, the water quality can still reach the standard. Seawater quality, marine sediment quality and marine biological quality of Guangxi Shankou Mangrove Reserve and Guangxi Hepu Dugong National Nature Reserve are not inferior to the Class I standard, thus meeting the ecological red line control requirements for those reserves. The Beibu Gulf Parargyrops Edita Penaeus Penicillatus National Germplasm Resource Nature Reserve is far away from the pollutant discharge outlet. The pollutants spread through a long distance and a wide sea area, and have little impact on seawater quality and marine organisms.

⑥由于园区规划环评于 2007 年完成以来，已超过 10 年，铁山港沿海岸线及海域环境功能区划也发生了较大变化，园区跟踪环评（2019 年）依据最新的铁山港现状岸线和规划岸线，结合近年海域海水水质本底情况，对排污口环境容量进行重新数模测算分析，测算结果为 B3 排污口近期环境容量化学需氧量、无机氮、活性磷酸盐分别为 10918t/a 1002t/a 和 54t/a，远期分别为 15434t/a 和 1336t/a、68 t/a。环境容量变化主要受排污区环境功能类别由三类调整为四类，铁山港海域海水水质本底值变化，周边红树林保护区范围调整等多方项边界条件变化影响。项目建成后 B3 排污口化学需氧量、无机氮、活性

磷酸盐拟排放总量分别为 6236t/a、607t/a 和 27.7t/a，均未超出园区跟踪环评重新测算的 B3 排污口环境容量，在 B3 排污口排放符合要求。

⑥ Since the EIA was completed in 2007, great changes have also taken place in the environmental function division along the coastline and sea area of Tieshangang. According to the latest Tieshangang's coastline and planned coastline, and in combination with the background of seawater quality in recent years, the park's tracking EIA (2019) re-carried out mathematical model calculation and analysis of the environmental capacity of the pollutant discharge outlets. The calculation results show that the short-term environmental capacity chemical oxygen demand, inorganic nitrogen and active phosphate of B3 pollutant discharge outlet are 10918t/a, 1002t/a and 54t/a respectively, and the long-term environmental capacity oxygen demand, inorganic nitrogen and active phosphate are 15434t/a, 1336t/a and 68t/a respectively. The change of environmental capacity is mainly caused by the change of boundary conditions such as the adjustment of environmental function categories from Category III to Category IV in the sewage discharge area, the change of seawater quality background value in the sea area of Tieshan Harbor, and the adjustment of the scope of surrounding mangrove protection areas. Upon completion of the Project, the total amounts of chemical oxygen demand, inorganic nitrogen and active phosphate to be discharged from B3 pollutant discharge outlet are 6236t/a, 607t/a and 27.7 t/a respectively, which do not exceed the environmental capacity of B3 pollutant discharge outlet recalculated by the park tracking EIA, and the discharge at B3 pollutant discharge outlet meets the requirements.

9.4.3 地下水环境影响

9.4.3 Impact on the groundwater environment

厂区位于大江口单元之中，大江口单元以北部湾海域为最低排泄基准面，该单元的地下水亦主要靠大气降水的渗入补给，大气降水大部分以地表径流方式排泄于北部湾海域。该单元的地下水亦处在相对独立的地下水系统之中，地下水运移于松散岩类孔隙中，大体上由北西向南东径流，地下水流程较短，以渗流的方式排泄。在厂区范围内，地下水由东北向西南径流，最终排泄至北部湾海域。

Plant area is located in the large estuary unit, which takes the Beibu Gulf sea area as the lowest discharge datum; and the groundwater in such unit is also mainly recharged by the infiltration of atmospheric precipitation, most of which is discharged in the Beibu Gulf sea area by surface runoff. The groundwater in this unit is also in a relatively independent groundwater system; groundwater transports in loose rock pores and runs from northwest to southeast generally. The groundwater flow is short and is discharged by seepage. Within the plant area, groundwater flows from northeast to southwest and is finally discharged to the sea area of Beibu Gulf.

项目针对化学浆车间、化机浆车间、二氧化氯制备车间、污水处理站、事故应急池、储罐区等各类下设管道或废水收集池的区域，划为重点防渗区。重点防渗区防渗要求为等效黏土防渗层厚度≥6m，渗透系数小于 1.0×10^{-7}cm/s，可有效阻止废水渗流至地下导致地下水环境受到污染。正常工况下，项目的运营对地下水环境影响不大。

The Project is aimed at chemical pulp workshop, chemi-machanical pulp workshop, chlorine dioxide preparation workshop, sewage treatment plant, accident emergency tank, storage tank area and other areas with pipelines or wastewater collection tanks beneath, and is thus classified as a key anti-seepage area. The anti-seepage requirement for key anti-seepage areas is as follows: the thickness of equivalent clay anti-seepage layer is ≥6m and the permeability coefficient is less than 1.0×10^{-7}cm/s, which can effectively prevent wastewater from seeping into the ground and further causing groundwater environment pollution. Under normal working conditions, the operation of the Project has little impact on the groundwater environment.

项目的非正常工况情景设置为污水处理站池底破损，防渗层失效，废水下渗至地下水环境中对地下水造成污染。通过数值法模拟，由预测结果可知，废水中的 COD 及 NH_3-N 在地下水流场中的影响范围均可到达场地下游 1750m 处，最广影响范围为场地下游 0.24km^2，最终排泄进入北部湾海域。但场地下游无饮用地下水的敏感点分布，因此泄露事故发生时对周边居民的饮用水安全影响不大。

Damaged tank bottom of the sewage treatment plant, failure of anti-seepage layer, and seepage of the wastewater into the groundwater environment, causing pollution to the groundwater are set as abnormal working conditions of the Project. Through numerical simulation, it can be known from the prediction results that the influence range of COD and NH3-N in the wastewater in the groundwater flow field can reach 1750m downstream of the site, and the widest influence range is 0.24 km2 downstream of the site, which is finally discharged into the Beibu Gulf sea area. However, there is no sensitive points of drinking groundwater distributed downstream of the site, so the safety of drinking water for the surrounding residents at the time of the leakage is not significantly affected.

9.4.4 声环境影响

9.4.4 Impact on the acoustic environment

项目噪声源较多，但大部分安置在工厂厂房内或相应设备的室内，同时通过选用低噪声设备，并采取房屋隔声、基础减振等措施进行降噪处理。项目正常生产时，东、南、西、北厂界一期工程和二期达产后全厂噪声贡献值均达到《工业企业厂界环境噪声排放标准》（GB12348-2008）3 类标准要求；周边敏感点川江和坡尾底噪声预测值能满足《声环境质量标准》（GB3096-2008）中 2 类标准；表明项目正常生产对周围声环境影响不大。

The Project has multiple noise sources, but most of them are installed in the factory building or the room of corresponding equipment. Additionally, noise reduction treatment is carried out by selecting low-noise equipment and taking measures such as sound insulation of houses and vibration reduction of foundations. During the normal production of the project, noise contribution values of the whole factory after Phase I and II projects on the east, south, west and north boundaries reach design capacity all meet reach Class 3 standard stipulated in the Emission Standard for Industrial Enterprises Noise at Boundary (GB12348 - 2008). Predicted noise values of Chuanjiang Village and Powei Village at the surrounding sensitive points can meet Class 2 standards stipulated in the Environmental Quality Standard for Noise (GB 3096-2008).

项目运输物料方式主要为公路运输和海上运输，项目的建成将导致周边交通道路新增运输车辆为 275 辆/天，经预测，运输车辆对道路两侧噪声贡献值较小，不会对道路两侧声环境造成较大的影响。

Main transportation modes of materials for the Project are highway transportation and marine transportation; and after project completion, there are 275 more transportation vehicles per day on the surrounding traffic roads. It is predicted that the contribution of transportation vehicles to the noise on both sides of the road is low and will not have a great impact on the sound environment on both sides of the road.

9.4.5 固体废物环境影响

9.4.5 Impact of solid waste on the environment

厂区的固体废物主要有废木屑，锅炉渣及煤灰，浆节、渣，白泥、绿泥、石灰渣，污水处理厂污泥、生活垃圾、废离子交换树脂、储油罐残渣、隔油池污泥、废催化剂、

废机油等，废离子交换树脂、储油罐残渣、隔油池污泥、废催化剂、废机油为危险废物，其余全部为一般工业固体废物。木屑、浆渣、污泥送至固废锅炉做燃料；白泥一部分作为锅炉烟气脱硫剂，剩余部分送石灰窑处置回用； 绿泥、石灰渣、不宜焚烧的化学污泥在项目配套的一般固体废物填埋场建成前依托铁山港工业区一般工业固体废物集中处置场过渡处置 5~12 个月，后算项目配套一般固体废物填埋场填埋处置。制浆黑液全部送碱回收系统回收碱。锅炉飞灰、炉渣外售水泥厂、砖厂综合利用（固废锅炉飞灰需在投产后重新进行固体废物类别鉴定，若属于危险废物需委托有资质单位处置）。废分子筛由厂家回收利用；锅炉灰渣外售制砖和铺路；脱硫石膏外售水泥厂作为水泥的缓凝剂或者建材厂制成石膏板、石膏砌块等建材材料；废离子交换树脂、储油罐残渣、隔油池污泥、废活性炭、废催化剂、废机油为危险废物，由供货厂家回收综合利用或委托有资质单位处置；生活垃圾由环卫部门统一处理。因此，只要建设单位按规范要求采取有效的防治措施并加强管理和做好对外协调工作，项目固体废物可以得到妥善处置，对环境不会造成大的影响。

Solid wastes in the plant area mainly include waste chippings, boiler slag and coal ash, slurry knots, slag, white mud, green mud, lime slag, sludge from sewage treatment plants, domestic waste, waste ion exchange resin, residues in oil tanks, sludge in grease traps, waste catalyst, waste engine oil, etc. Waste ion exchange resin, residues in oil tanks, sludge in grease traps, waste catalyst and waste engine oil are hazardous wastes, and the rest are all general industrial solid wastes. Sawdust, slurry and sludge are sent to a solid waste boiler as fuel; part of the white mud is used as boiler flue gas desulfurizing agent, and the rest is sent to lime kiln for disposal and reuse. Green mud, lime slag and chemical sludge that are not suitable for incineration shall be disposed of for 5-12 months in the general industrial solid waste centralized disposal site in Tieshangang Industrial Park before the completion of the general solid waste landfill site, and shall be subject to landfill disposal on the general solid waste landfill site upon its completion. All pulping black liquor is sent to the alkali recovery system to recover alkali. Boiler fly ash and slag shall be sold to cement plants and brick plants for comprehensive utilization (solid waste boiler fly ash shall be re-identified for solid waste category after the Project is put into production, and qualified units shall be entrusted for disposal if it belongs to hazardous waste). Waste molecular sieves are recycled by manufacturers; boiler ash and slag are sold out to make bricks and pave roads; desulfurization gypsum is sold to cement plants as retarders for cement or building materials plants make gypsum boards, gypsum blocks and other building materials; waste ion exchange resin, oil storage tank residue, grease trap sludge, waste activated carbon, waste catalyst, and waste machine oil are hazardous wastes, which shall be recycled by the supplier for comprehensive utilization or disposed by a qualified unit; and domestic waste is uniformly treated by the sanitation department. Therefore, as long as the Employer takes effective control measures according to the specification requirements, strengthens management and completes external coordination, the solid waste of the Project can be properly disposed of without causing great impact on the environment.

9.4.6 土壤环境影响

9.4.6 Impact on the soil environment

建设项目在运营期的 10 年、20 年、30 年，排放的大气污染物铅、汞、砷及二噁英对评价范围内土壤的累积预测值能达到相关标准要求，其中铅、汞、砷能达到《土壤环境质量 农用地土壤污染风险管控标准（试行）》（GB36600-2018）筛选值标准，二噁英能达到《土壤环境质量 建设用地土壤污染风险管控标准（试行）》（GB36600-2018）二类用地筛选值标准。表明建设项目土壤环境影响为可接受。

After an operation period of 10, 20, 30 years, the cumulative predicted values of the discharged air pollutants lead, mercury, arsenic and dioxin to the soil within the assessment range can meet the requirements of relevant standards. Among them, lead, mercury and arsenic can meet the screening value standard of Soil Environmental Quality-Agricultural Land Soil Pollution Risk Control Standard (Trial) (GB36600-2018), and dioxin can meet the Class II land screening value standard of Soil Environmental Quality-Construction Land Soil Pollution Risk Control Standard (Trial) (GB36600-2018). It shows that the soil environmental impact of the construction project is acceptable.

在污水处理站发生破损时的事故工况预测结果中，AOX 在 30 天的模拟期内均对包气带土壤造成了不同程度的影响，AOX 无相关土壤环境质量标准，因此不对其进行达标评价，仅对其影响范围进行说明。本次预测范围为池底破损面至地下水潜水面（0~-4m），预测结果显示，泄露事故发生后，深度为 1m 处的土壤将会成为泄露事故前期污染物的聚集点；在 30 天时，1m 处的土壤 AOX 浓度为 6739.762mg/kg，达到预测时段内的浓度最大值，污染物的持续下渗至 4m 后的浓度为 383.7503mg/kg。达到潜水面后，污染物将会污染至区域地下水。污水处理站的持续泄露将会造成包气带的 AOX 浓度的持续上升，因此污水处理站泄露事故对于土壤环境及场地下地下水环境均会造成较大的影响，

建设单位需做到安全生产，落实本报告书提出的环境保护措施，对生态环境负责。

In the prediction results about accident conditions when any damage occurs in sewage treatment plant, AOX has caused different degrees of influence on the soil in the aeration zone within the 30-day simulation period; but there is no relevant soil environmental quality standard for AOX, it is not assessed for reaching the standard, and only its influence range is explained. This prediction ranges from the damaged surface of the pool bottom to the groundwater phreatic surface (0 to -4m); and according to prediction results, after a leakage accident occurs, the soil at a depth of 1m will become the accumulation point of pollutants in the early stage of the leakage accident. On 30^{th} days, the concentration of AOX in the soil at a depth of 1m is 6739.762 mg/kg, becoming the maximum concentration in the prediction period, and the concentration of AOX after continuous infiltration to 4m is 383.7503mg/kg. After reaching the phreatic surface, pollutants will pollute the regional groundwater. Continuous leakage from the sewage treatment plant will cause the increasing AOX concentration in the aeration zone. Therefore, leakage accidents of the sewage treatment plant will have a greater impact on the soil environment and groundwater environment beneath the site; in this regard, the employer shall ensure safe production, take environmental protection measures proposed in this report, and be responsible for the ecological environment.

9.4.7 生态环境影响

9.4.7 Impact on the ecological environment

根据项目厂址所在区域的生态环境现状调查及项目建设对生态环境的影响分析结果，项目厂址所在区域内生态环境质量一般，项目建设对生态环境的影响不大，项目排污对铁山港海域水生生物影响较小，通过采取相关污染防治措施之后工程建设所产生的生态环境影响均在可接受范围之内。

According to the survey of the ecological environment in the area where the project site is located and the analysis results of the impact of the project construction on the ecological environment, the ecological environment quality in the area where the project site is located is general, the impact of the project construction on the ecological environment is little, and the impact of the project pollutant discharge on aquatic organisms in Tieshangang sea area is little. The ecological environment impact generated by the project construction after adopting relevant pollution control measures is within the acceptable range.

9.4.8环境风险影响

9.4.8 Environmental risk impact

本项目主要危险物质为氢氧化钠、过氧化氢、硫酸、氯气、二氧化氯、氨水、柴油、汽油等。风险类型主要为泄漏和火灾、爆炸引发的伴生/次生污染物排放。根据环评预测，项目发生氨水泄露和火灾次生一氧化碳污染时各关心点的预测浓度均未超过毒性终点浓度-1 和毒性终点浓度-2，风险事故的发生对周边环境及人群造成的影响不大。

The main hazardous substances in this Project are sodium hydroxide, hydrogen peroxide, sulfuric acid, chlorine, chlorine dioxide, ammonia water, diesel oil, gasoline, etc. The risk types are mainly associated/secondary pollutant emissions caused by leakage, fire and explosion. According to the EIA forecast, the predicted concentrations of each point of concern did not exceed the toxic endpoint concentration-1 and toxic endpoint concentration-2 in case of ammonia leakage and fire secondary carbon monoxide pollution, and the occurrence of risk accidents had little impact on the surrounding environment and the population.

发生二氧化氯和氯气事故泄露时，在最不利气象条件下（风速 1.5 米/秒，稳定度 F），二氧化氯出现超大气毒性终点浓度-1 的最远距离为 2201 米，出现超大气毒性终点浓度-2 的最远距离为 3299 米，氯气出现超大气毒性终点浓度-1 的最远距离为 460 米，出现超大气毒性终点浓度-2 的最远距离为 1772 米；以最大影响范围考虑，二氧化氯超大气毒性终点浓度-1 距离范围内涉及川江、坡尾底等 10 个关心点，二氧化氯超大气毒性终点浓度-2 距离范围内涉及川江、坡尾底等 17 个关心点。超过毒性终点浓度-1 的时间在 8~36 分钟，超标持续时间在 21~25 分钟，二氧化氯最大浓度在 33 毫克/立方米（浓度最高的关心点为川江、坡尾底）。各关心点超出毒性终点浓度的持续时间较短，经预测关心点受大气伤害概率均为 0%。

In the event of chlorine dioxide and chlorine leakage, under the most unfavorable weather conditions (wind speed 1.5 m/s, stability F), the farthest distance for chlorine dioxide to have an ultra-atmospheric toxicity endpoint concentration-1 is 2201 meters, the farthest distance for chlorine to have an ultra-atmospheric toxicity endpoint concentration-2 is 3299 meters, the farthest distance for chlorine to have an ultra-atmospheric toxicity endpoint concentration-1 is 460 meters, and the farthest distance for chlorine to have an ultra-atmospheric toxicity endpoint concentration-2 is 1772 meters. Considering the maximum impact range, 10 points of concern such as Chuanjiang and Boweidi are involved in the distance range of chlorine dioxide ultra-atmospheric toxicity endpoint concentration-1, and 17 points of concern such as Chuanjiang and Boweidi are involved in the distance range of chlorine dioxide ultra-atmospheric toxicity endpoint concentration-2. The time exceeding the toxicity endpoint concentration-1 is 8-36 minutes, the duration exceeding the standard is 21-25 minutes, and the maximum concentration of chlorine dioxide is 33 mg/m3 (the highest concentration points of concern are Chuanjiang and Boweidi). The duration of each point of concern exceeding the toxicity endpoint concentration is relatively short, and the probability of atmospheric injury to each point of concern is predicted to be 0%.

在常见气象条件下（风速 3.2 米/秒，稳定度 D）二氧化氯出现超大气毒性终点浓度-1 的最远距离为 292 米，出现超大气毒性终点浓度-2 的最远距离为 152 米；氯气出现超大气毒性终点浓度-1 的最远距离为 160 米，出现超大气毒性终点浓度-2 的最远距离为 610 米。各主要关心点均不在毒性终点浓度-1 浓度范围及毒性终点浓度-2 浓度范围。

Under common meteorological conditions (wind speed 3.2 m/s, stability D), the farthest distance for chlorine dioxide to have an ultra-atmospheric toxicity endpoint concentration-1 is 292 meters, and the farthest distance for chlorine dioxide to have an ultra-atmospheric toxicity endpoint concentration-2 is 152 meters. The farthest distance for chlorine to have an ultra-atmospheric toxicity endpoint concentration-1 is 160 meters, and the farthest distance for chlorine to have an ultra-atmospheric toxicity endpoint concentration-2 is 610 meters. The main points of concern are not in the concentration range of toxicity endpoint concentration-1 and toxicity endpoint concentration-2.

项目在二氧化氯发生器和氯气管线区配备二氧化氯及氯气泄漏报警装置及碱液喷淋装置，一旦发生泄漏事故，立即启动喷淋装置，最大限度地控制二氧化氯和氯气扩散至周边大气环境中。同时，制定环境风险应急预测，划定首要疏散范围和重点疏散范围分别为事故泄漏源下风向 2201 米和 3299 米。通过加强风险管理、采取风险防范措施、应急救援措施等可将对环境的影响降到最低，环境风险可接受。

The Project is equipped with chlorine dioxide and chlorine leakage alarm devices and alkali liquor spraying devices in the chlorine dioxide generator and chlorine pipeline area. In case of leakage accident, the spraying devices will be started immediately to diffuse the chlorine dioxide and chlorine into the surrounding atmospheric environment to the maximum extent. Meanwhile, an environmental risk emergency forecast is formulated and the primary evacuation scope and the key evacuation scope are designated as 2201 meters and 3299 meters downwind of the accident leakage source respectively. By strengthening risk management and taking risk prevention measures and emergency rescue measures, the impact on the environment can be minimized and the environmental risks are acceptable.

9.5 公众意见采纳意见情况

9.5 Adoption of public opinions

根据《环境影响评价公众参与办法》（生态环境部令部令第 4 号），项目在 2019 年 7 月 22 日，在北海市人民政府门户网站进行首次公示，公示 10 个工作日；在 2019 年 10 月 9 日，在北海市人民政府门户网站进行征求意见稿公示，同步在项目周边村屯张贴公示；2019 年 10 月 19 日及 2019 年 10 月 21 日在广西日报两次登报，向公众公示。公示期间收到北海市鑫源热电有限公司的一份意见，建议生产所需蒸汽考虑使用铁山港集中供热管网供热，建设单位经与北海市铁山港（临海）工业区管理委员会及北海市鑫源热电有限公司充分沟通研究，项目蒸汽使用量较大，对蒸汽温度、压力及稳定性等要求较高，铁山港集中供热管网输送距离较远，蒸汽供应量、供应品质和稳定性等难以确保本项目长期稳定运行，综合分析本项目采用自备热电站的方式进行供热生产，本项目配套的供热锅炉均实行超低排放，尽量减小大气污染的排放。此外还收到斯道拉恩索（广西）浆纸有限公司一份公众意见，经环评单位和建设单位研究对意见中提到的环保相关合理意见均作采纳或在报告书中完善相关分析，并通过邮件对意见进行了回复。项目环评报告书报送审批前，于 2019 年 12 月 10 日在太阳纸业集团网站上公开了拟报批的环境影响报告书全文和公众参与说明。

According to the Measures for Public Participation in Environmental Impact Assessment (Decree No.4 of the Ministry of Ecological Environment), the Project was publicized for the first time on the portal website of Beihai Municipal People's Government on July 22, 2019 for 10 working day; the draft was publicized on the portal website of Beihai Municipal People's Government and posted simultaneously in villages around the Project on October 9, 2019; and then published twice on Guangxi Daily for publicity on October 19, 2019 and October 21, 2019, respectively. During the publicity period, an opinion from Beihai Xinyuan Heating-Power Co., Ltd. was received. It suggested that the central heating network of Tieshangang should be used to supply the steam needed for production. The Employer, after full communication and research with Beihai Tieshangang (Linhai) Industrial Park Management Committee and Beihai Xinyuan Heating-Power Co., Ltd., found that the Project used a large amount of steam and has high requirements on steam temperature, pressure and stability. Also, Tieshangang's central heating network has a long transportation distance, and it is difficult to ensure the long-term stable operation of the project in terms of steam supply, supply quality and stability. Thus, the Project adopts the method of the self-provided thermal power station for heating production and the equipped heating boilers all implement ultra-low emission to minimize the emission of air pollution. In addition, opinions from Storaenso (Guangxi) Pulp and Paper Co., Ltd. were received. After research by the EIA unit and the Employer, the reasonable opinions related to environmental protection mentioned in the opinion were adopted or improved in the relevant analysis of the report, and a reply was made by email. Before the EIA report of the Project is submitted for approval, the full text of the EIA report to be submitted for approval and the explanation of public participation were made public on the website of Sun Paper Group on December 10, 2019.

9.6 环境保护措施

9.6 Environmental protection measures

9.6.1水污染防治措施

9.6.1 Control measures for water pollution

项目生产废水经收集后进入项目配套污水处理站处理，项目污水处理站总处理规模为 100000m^3/d，采用“初沉池+厌氧反应器+生物选择池+卡鲁塞尔氧化沟+高级氧化池”工艺，废水处理达到《制浆造纸工业水污染物排放标准》（GB3544-2008）表 2 新建制浆和造纸联合生产企业水污染物排放浓度限值（其中，氨氮和总氮达到表 3 水污染物特别排放限值），排入铁山港区深海排放管网，在铁山港 B3 排污口深海排放。项目一期废水排放量为 72130 m^3/d，二期排放量为 95023m^3/d。项目生活区在厂区外另行选址建设，生活区污水排入园区污水管网，进入铁山港工业区污水处理厂。

The wastewater of the Project is collected and then treated at the supporting sewage treatment plant of the Project. The total treatment scale of the project sewage treatment plant is 100000m3/d. The process of "primary settling tank + anaerobic reactor + biological selection tank + Carrousel oxidation ditch + advanced oxidation tank" is adopted. After treatment, the pollutants reach the concentration limit of newly-built pulp and paper-making joint production enterprises in Table 2 of the Discharge Standard of Water Pollutants for Pulp and Paper Industry (GB3544-2008) (among which, ammonia nitrogen and total nitrogen reach the special discharge limit of water pollutants in Table 3), and are discharged into the deep sea discharge pipe network in Tieshangang District and the deep sea from the B3 pollutant discharge outlet of Tieshangang. The discharge amount of wastewater in Phase I of the Project is 72130 m3/d, and that in Phase II is 95023m3/d. The living area of the Project will be located outside the plant area. The sewage from the living area will be discharged into the sewage pipe network of the park and enter the sewage treatment plant of Tieshangang Industrial Park.

项目采取优化生产工艺、选用先进生产设备，减少制浆洗选漂过程的中段废水产生量；生产废水通过分级处理、按质回用，形成车间内部和车间之间的两级循环回用模式，提高水重复利用率；实施用水指标考核管理制度。通过上述措施，减少项目废水产生量和污染物负荷，项目清洁生产水平达到国际清洁生产领先水平。

The Project optimizes the production process and selects advanced production equipment to reduce the amount of wastewater generated in the mid-section of pulping, washing and bleaching. Production wastewater is treated in stages and reused according to quality to form a two-stage recycling mode inside and between workshops, thus improving the reuse rate of water; also, the water index assessment management system is implemented. Through the above measures, the wastewater production and pollutant load of the Project will be reduced, and the cleaner production level of the Project will reach the international leading level of cleaner production.

9.6.2大气污染防治措施

9.6.2 Control measures for air pollution

本项目废气主要来源于锅炉废气、碱回收炉废气、石灰窑废气、固废综合利用锅炉烟气、制浆漂白工段废气、化学品制备工段排气，制浆生产线及碱回收系统臭气、污水处理厂无组织废气，以及无组织扬尘等。

The waste gas of this Project mainly comes from boiler waste gas, alkali recovery furnace waste gas, lime kiln waste gas, solid waste comprehensive utilization boiler flue gas, pulping and bleaching section waste gas, chemical preparation section exhaust gas, pulping production line and alkali recovery system odor, sewage treatment plant unorganized waste gas, unorganized dust, etc.

①项目碱回收炉废气设一套三列四电场静电除尘器处理达到《火电厂大气污染物排放标准》（GB 13223-2011）和《恶臭污染物排放标准》（GB 14554-93）后经一根150米烟囱排放。

① The waste gas from the alkali recovery furnace is treated by a set of three-row four-electric-field electrostatic precipitator that meets the Emission Standard of Air Pollutants for Thermal Power Plants (GB 13223-2011) and the Emission Standard for Odor Pollutants (GB 14554-93) and then discharged through a 150-meter chimney.

②石灰窑废气设一套一列四电场静电除尘器除尘处理达到《工业炉窑大气污染物排放标准》（GB 9078-1996）和《恶臭污染物排放标准》（GB 14554-93）后经一根 150 米烟囱排放。

② The waste gas from the lime kiln is treated by a set of three-row four-electric-field electrostatic precipitator that meets the Emission Standard of Air Pollutants for Thermal Power Plants (GB 13223-2011) and the Emission Standard for Odor Pollutants (GB 14554-93) and then discharged through a 150-meter chimney.

③固废综合利用锅炉废气经 SNCR/SCR 联合脱硝+布袋除尘器+活性炭吸附+炉外石灰石/石膏湿法脱硫+高效除雾器处理达到锅炉废气超低排放标准限值和《生活垃圾焚烧污染控制标准》（GB18485-2014）后经一根 150 米烟囱与燃煤供热锅炉废气一同排放。

③ Waste gas from solid waste comprehensive utilization boilers is treated by SNCR/SCR combined denitration+bag-type dust collector +activated carbon adsorption+limestone outside the boiler/gypsum wet desulfurization +high efficiency demister + waste gas on-line monitoring system to reach the ultra-low emission standard limit of boiler waste gas and the Standard for Pollution Control on the Municipal Solid Waste Incineration (GB18485-2014), and then discharged together with the waste gas from coal-fired heating boilers through a 150-meter chimney.

④燃煤供热锅炉废气经 SNCR/SCR 联合脱硝+电袋除尘器+炉外石灰石/石膏湿法脱硫+高效除雾器处理达到锅炉废气超低排放标准限值和《火电厂大气污染物排放标准》（GB 13223-2011）后经一根 150 米烟囱与固废综合利用锅炉废气一同排放。

④ Waste gas from the coal-fired heating boilers is treated by SNCR/SCR combined denitration+bag-type dust collector +activated carbon adsorption+limestone outside the boiler/gypsum wet desulfurization +high efficiency demister + waste gas on-line monitoring system to reach the ultra-low emission standard limit of boiler waste gas and the Emission Standard of Air Pollutants for Thermal Power Plants (GB18485-2014), and then discharged together with the waste gas from solid waste comprehensive utilization boilers through a 150-meter chimney.

⑤化学品制备车间工艺废气包括：二氧化氯车间氯酸钠电解槽过量氢气排空尾气经碱液洗涤后通过一根 25 米排气筒排放；盐酸合成尾气经软化水洗涤后通过一根 42 米排

气筒排放；二氧化氯罐槽尾气经海波塔洗涤后通过 30 米排气筒排放。外排废气达到《无机化学工业污染物排放标准》（GB31573-2015）。

⑤ The process waste gas of the chemical preparation workshop includes: The excessive hydrogen tail gas in sodium chlorate electrolytic cell of chlorine dioxide workshop is washed by alkali liquor and then discharged through a 25m exhaust funnel; hydrochloric acid synthesis tail gas is washed with demineralized water and discharged through a 42m exhaust funnel; the tail gas from the chlorine dioxide tank is washed by wave tower and then discharged through the 30m exhaust funnel. The discharged waste gas meets the Emission Standards of Pollutants for Inorganic Chemical Industry (GB31573-2015).

⑥纸浆车间漂白尾气经碱液洗涤后通过一根 150 米烟囱排放。

⑥ Bleaching tail gas from pulp workshop is washed by alkali liquor and then discharged through a 150-meter chimney.

⑦项目制浆系统的臭气主要来源于化学浆生产线和碱回收系统。高浓恶臭气体经收集后送碱回收炉燃烧，低浓臭气经收集处理后作为碱炉二次风入炉燃烧，事故状态下启用备用臭气焚烧器。

⑦ Stink from the pulping system of the Project mainly comes from chemical pulp production line and alkali recovery system. The high-concentration stink is collected and then sent to the alkali recovery furnace for combustion. The low-concentration stink is collected and treated as secondary air of the alkali furnace for combustion. In case of an accident, the standby stink incinerator is activated.

⑧项目对污水处理站调制池、预酸化池、厌氧脱气池、厌氧沉淀池、生物选择池、污泥调理池等产生臭气的构筑物进行加盖密封，并配置一套碱洗除臭系统，臭气经抽风管送至除臭系统，经喷淋洗涤后，送至生产区碱炉内燃烧分解后，经过碱炉烟囱排放。

The Project covers and seals the stink-generating structures such as the conditioning tank, pre-acidification tank, anaerobic degassing tank, anaerobic sedimentation tank, biological selection tank and sludge conditioning tank of the sewage treatment plant, and arranges an alkaline washing deodorant system, which can send the stink gas to the deodorant system through the exhaust tube; the stink gas, after spray washing, will be sent to the alkali furnace in the production area for combustion and decomposition.

⑨项目煤棚为封闭式，配置喷水设备，定期喷洒以保持一定水分，可有效减少煤尘飞扬，有效减小煤堆受风力作用引起的煤尘污染出现的概率。备料工序的扬尘主要产生于原料堆场和木片筛，项目木片堆场采用洒水降尘，水炮喷雾抑尘措施；木片筛置于封

闭车间，减少粉尘无组织排放。

⑨ The coal shed of the Project is closed, equipped with water spraying equipment, and spraying is carried out regularly to maintain a certain amount of water, which can effectively reduce coal dust and the probability of coal dust pollution caused by wind force on coal piles. Dust from the material preparation process is mainly generated from the raw material storage yard and the wood chip screen. The wood chip storage yard of the Project adopts measures of sprinkling water and water cannon to reduce dust. Wood screen is placed in a closed workshop to reduce unorganized dust emission.

9.6.3固体废物防治措施

9.6.3 Control measures for solid waste

木屑、浆渣、污泥送至固废锅炉做燃料；白泥一部分作为锅炉烟气脱硫剂，剩余部分送石灰窑处置回用； 绿泥、石灰渣、不宜焚烧的化学污泥在项目配套的一般固体废物填埋场建成前依托铁山港工业区一般工业固体废物集中处置场过渡处置 5~12 个月，后算项目配套一般固体废物填埋场填埋处置。制浆黑液全部送碱回收系统回收碱。锅炉飞灰、炉渣外售水泥厂、砖厂综合利用（固废锅炉飞灰需在投产后重新进行固体废物类别鉴定，若属于危险废物需委托有资质单位处置）。废分子筛由厂家回收利用；锅炉灰渣外售制砖和铺路；脱硫石膏外售水泥厂作为水泥的缓凝剂或者建材厂制成石膏板、石膏砌块等建材材料；废离子交换树脂、储油罐残渣、隔油池污泥、废活性炭、废催化剂、废机油为危险废物，由供货厂家回收综合利用或委托有资质单位处置；生活垃圾由环卫部门统一处理。

Sawdust, slurry and sludge are sent to a solid waste boiler as fuel; part of the white mud is used as boiler flue gas desulfurizing agent, and the rest is sent to lime kiln for disposal and reuse. Green mud, lime slag and chemical sludge that are not suitable for incineration shall be disposed of for 5-12 months in the general industrial solid waste centralized disposal site in Tieshangang Industrial Park before the completion of the general solid waste landfill site, and shall be subject to landfill disposal on the general solid waste landfill site upon its completion. All pulping black liquor is sent to the alkali recovery system to recover alkali. Boiler fly ash and slag shall be sold to cement plants and brick plants for comprehensive utilization (solid waste boiler fly ash shall be re-identified for solid waste category after the Project is put into production, and qualified units shall be entrusted for disposal if it belongs to hazardous waste). Waste molecular sieves are recycled by manufacturers; boiler ash and slag are sold out to make bricks and pave roads; desulfurization gypsum is sold to cement plants as retarders for cement or building materials plants make gypsum boards, gypsum blocks and other building materials; waste ion exchange resin, oil storage tank residue, grease trap sludge, waste activated carbon, waste catalyst, and waste machine oil are hazardous wastes, which shall be recycled by the supplier for comprehensive utilization or disposed by a qualified unit; and domestic waste is uniformly treated by the sanitation department.

9.6.4噪声污染控制措施

9.6.4 Noise pollution control measures

项目噪声主要为部分设备和泵等的机械噪声及气动系统、空压机和风机的空气动力性噪声。项目噪声源较多，但声源声功率不高，大部分安置在工厂厂房内或相应设备的室内，同时通过选用低噪声设备，并采取房屋隔声、基础减振等措施进行降噪处理。

The noise of the Project mainly includes the mechanical noise of some equipment and pumps and the aerodynamic noise of pneumatic systems, air compressors and fans. There are many noise sources in the Project, but the sound power of the sound sources is not high. Most of them are placed in the plant building or the room of corresponding equipment. Besides, noise reduction treatment is carried out by selecting low noise equipment and taking measures such as sound insulation of houses and vibration reduction of foundation.

9.6.5地下水防控措施

9.6.5 Groundwater control measures

本项目按照“源头控制、分区防治、污染监控、应急响应”相结合的原则，从污染物的产生、入渗、扩散、应急响应全方位进行控制。采取分区防渗措施，对化学浆车间、化机浆车间、二氧化氯制备车间、污水处理站、事故应急池、储罐区等各类下设管道或废水收集池的区域进行重点防渗，对造纸车间、苛化车间、碱回收车间、木片堆场、热电站等进行一般防渗。同时，做好日常检修、维护和管理，避免事故性排放，防止对区域地下水环境的影响。

According to the principle of "source control, division prevention and control, pollution monitoring and emergency response", this Project controls the generation, infiltration, diffusion and emergency response of pollutants in an all-round manner. Seepage prevention measures are taken to carry out key seepage prevention in various areas with pipelines or wastewater collection tanks, such as chemical pulp workshop, chemical mechanical pulp workshop, chlorine dioxide preparation workshop, sewage treatment plant, emergency pool, storage tank farm, etc., and carry out general seepage prevention in papermaking workshop, causticization workshop, alkali recovery workshop, wood chip stockyard, thermal power station, etc. Also, it is necessary to enhance daily maintenance, maintenance and management to avoid accidental discharge and prevent impact on the regional groundwater environment.

9.6.6海洋生态环境影响减缓措施

9.6.6 Mitigation measures for the impact on the marine ecological environment

本项目废水纳污海域涉及山口国家级红树林保护区、合浦儒艮国家级自然保护区等海洋生态敏感目标，需按海洋生态红线划定方案、海洋环境保护规划等相关要求，减缓项目排污对海洋生态环境的影响。首先，严格实行入海污染物总量控制制度，加强对各排污单位和深海总排口的实时监测，在确保废水达标排放的前提下，在生产中不断优化生产工艺，尽可能从源头上减少废水及污染物的产生量，同时通过加大废水循环回用、优化污水处理设施等手段进一步提高污染物去除效率，减少污染物的排放，特别是持久性有机物的排放，减缓污染物排放对海洋生物的长期累积影响。其次，需严格落实海洋环境质量跟踪监测，定期对海水水质、海洋沉积物及海洋生物进行监测，及时根据海洋环境变化趋势情况，查找原因采取对策，确保山口国家级红树林保护区、合浦儒艮国家级自然保护区海水水质、海洋沉积物质量和海洋生物质量均不劣于一类标准。项目实施后及时开展后评价，全面评估项目实施对海洋生态环境的影响程度。此外，还应定期实施渔业资源补偿和生态放流计划，会同园区管委会及各排污单位共同实施人工增殖放流，缓解和减轻废水排放对海洋生态环境和水生生物的影响。

The wastewater receiving sea area of this Project involves marine ecological sensitive targets such as Shankou National Mangrove Reserve and Hepu Dugong National Nature Reserve. It is necessary to mitigate the impact of sewage discharge on the marine ecological environment according to relevant requirements such as the marine ecological red line delineation plan and marine environmental protection plan. First of all, efforts should be made to strictly implement the total amount control system for pollutants entering the sea, strengthen real-time monitoring of all pollutant discharge units and deep sea total discharge outlets, continuously optimize the production process in production while ensuring that the wastewater is discharged up to the standard, reduce the amount of wastewater and pollutants generated from the source, and further improve the removal efficiency of pollutants by increasing the recycling of wastewater and optimizing sewage treatment facilities, so as to reduce the discharge of pollutants, especially persistent organic substances, and slow down the long-term cumulative impact of pollutant discharge on marine organisms. Secondly, it is necessary to strictly implement the tracking and monitoring of marine environmental quality, regularly monitor seawater quality, marine sediments and marine organisms, and take timely measures to find out the causes according to the change trend of marine environment, so as to ensure that the seawater quality, marine sediment quality and marine biological quality of Shankou National Mangrove Reserve and Hepu Dugong National Nature Reserve are not inferior to Class I standards. Post-assessment shall be carried out in a timely manner after the implementation of the Project to comprehensively assess the impact of the Project on the marine ecological environment. In addition, fishery resources compensation and ecological stock enhancement plans should be regularly implemented, and artificial stock enhancement should be jointly implemented with the park management committee and various pollutant discharge units to mitigate and reduce the impact of wastewater discharge on the marine ecological environment and aquatic organisms.

9.6.7环境风险防范措施

9.6.7 Environmental risk prevention measures

项目拟采取以下风险防范措施：（1）化学品储罐设置围堰，二氧化氯车间设备、管线及车间四周配备在线监测报警装置及碱液喷淋装置，一旦发生泄漏事故，立即启动喷淋装置。（2）构建事故废水三级风险防范体系，通过第一级地沟围堰、第二级 40000 立方米事故应急池、第三级雨水废水排口闸阀，最大限度将项目事故废水控制在厂内。（3）加强危险化学品的使用管理，输送管道、阀门及设备等的维护检修。（4）制定完善的环境风险应急预案，储备足够的风险应急物资，定期开展风险事故演习。在采取以上风险防范措施后可将环境风险控制在可接受范围内。

The Project plans to take the following risk prevention measures: (1) Chemical storage tanks are equipped with cofferdams, and chlorine dioxide workshop equipment, pipelines and the surroundings of the workshop are equipped with on-line monitoring and alarm devices and alkali liquor spraying devices. In case of leakage accidents, the spraying devices will be started immediately. (2) Establish a three-level risk prevention system for accident wastewater. Through the first-level trench cofferdam, the second-level 40,000 cubic meters emergency pool and the third-level rainwater wastewater discharge gate valve, the accident wastewater of the Project will be controlled in the plant to the maximum extent. (3) Strengthen the use and management of hazardous chemicals, and maintain and repair pipelines, valves and equipment. (4) Formulate a sound environmental risk emergency plan, reserve sufficient risk emergency materials, and regularly carry out risk accident drills. After taking the above risk prevention measures, environmental risks can be controlled within an acceptable range.

9.6.8环保投资

9.6.8 Environmental protection investment

本项目总投资 2259145.00 万元，其中环保投资 301726 万元，占总投资的 13.36%。

The total investment of this Project is RMB22591.45 million, of which environmental protection investment is RMB3017.26 million, accounting for 13.36% of the total investment.

9.7 环境影响经济损益分析

9.7 Economic profit and loss analysis of environmental impact

项目环保投资占项目总投资的比例13.36%，注重项目建设运行过程的环保措施配套和环保管理，同时也为防治污染而获得较大的经济效益，避免污染物超标排放造成经济损失，经计算项目投入每元钱的环保费用可用货币统计出的挽回收益为1.54元，本项目的环保投资与环保费用的经济效益较好。

The environmental protection investment, accounting for 13.36% of the total investment, pays attention to supporting environmental protection measures and environmental protection management during the construction and operation of the Project; obtains greater economic benefits for the prevention and control of pollution and avoids economic losses caused by excessive discharge of pollutants. After calculation, it can be found that for every RMB1 of the environmental protection cost invested in the Project, the recovery income calculated by monetary statistics is RMB1.54. Thus, the environmental protection investment and environmental protection cost of the Project may achieve sound economic benefits.

9.8 环境管理与监测计划

9.8 Environmental management and monitoring plan

本项目投产后，建设单位必须严格按照相关规范及本报告书要求，落实环境管理与环境监测计划，强化基地建设、招商及承租企业的设计、建设、运营等环境管理；定期进行环境监测，尤其是严格落实地下水监测计划，并强化环境风险监控和防范措施，避

免发生污染。

After the Project is put into operation, the Employer must strictly follow the relevant specifications and the requirements of this report, implement the environmental management and environmental monitoring plan, and strengthen environmental management of base construction, investment promotion, as well as design, construction and operation of lessees; carry out regular environmental monitoring, especially the strict implementation of groundwater monitoring plan, and enhance environmental risk monitoring and preventive measures to avoid pollution.

同时，应制定完善基地的准入条件或环保规范，并应组织专家进行审查，修改和完善后，形成正式的规范文件，报当地环境保护行政管理部门和园区管委会备案。凡进入基地的企业，都必须与基地签署相应协议和合同，对规范的各条款的落实和执行，以及双方的环保责任和义务作出约定。

In addition, the access conditions or environmental protection standards for the base should be formulated and perfected, and experts should be organized to review, revise and perfect such conditions or standards to form formal standard documents and report them to the local environmental protection administrative department and the park management committee for the record. All enterprises entering the base must sign corresponding agreements and contracts with the base to make agreements on the implementation and enforcement of various provisions of the specification and the environmental protection responsibilities and obligations of both parties.

本项目需设专职环保部门，负责日常环保监督管理工作。同时按相关规定对废水、废气和固废排污口进行规范化设置。

This Project shall set up a full-time environmental protection department to be responsible for the daily environmental protection supervision and management. Also, wastewater, waste gas and solid waste sewage outlets shall be standardized according to relevant regulations.

9.9 综合结论

9.9. Comprehensive conclusions

本项目符合国家和地方相关产业政策和产业规划，用地符合当地规划。项目拟采取的污染防治措施技术成熟、可靠，能确保各类污染物稳定达标排放。虽然项目的建设和运营过程中不可避免会带来一些环境负面影响，但在采取各种污染防治措施情况下，不

会导致区域环境质量降级，满足环境功能区划要求，环境风险影响属于可以接受水平。项目建设运行能满足生态保护红线、环境质量底线、资源利用上线的要求，不属于区域环境准入负面清单禁止和限制的产业。因此，只要建设单位认真落实本环评报告中提出的各项污染防治措施、环境风险防范措施以及环境管理措施等，严格执行环保"三同时"制度，从环境保护角度分析，项目建设可行。

This Project conforms to relevant national and local industrial policies and industrial plans, and the land use conforms to local plans. Pollution control measures to be adopted in the Project are mature and reliable in technology, which can ensure the stable up-to-standard discharge of all kinds of pollutants. Though some negative environmental impacts are inevitable during the construction and operation of the Project, the regional environmental quality will not be degraded if various pollution control measures are adopted. This meets the requirements of environmental function zoning, and the environmental risk impact is acceptable. Construction and operation of the Project are compliant regarding the ecological red line, environmental quality baseline and the up limit of resource utilization, the Project does not fall under the industries prohibited and restricted by the negative list of regional environmental access. Therefore, the project construction is feasible from the perspective of environmental protection, provided that the employer earnestly implements various pollution control measures, environmental risk prevention measures and environmental management measures proposed herein, and strictly follows the "Three Simultaneities" system for environmental protection.

9.10 建议

9.10 Recommendations

（1）建议企业在未来的运行过程中，对标国内外最先进企业管理要求及标准，从源头控制和末端治理进一步提升企业的污染防控水平，进一步降低废水及废气等主要污染物排放量。

(1) It is suggested that in the future operation process, enterprises should further improve the pollution prevention and control level from source control and end treatment to meet the management requirements and standards of the most advanced enterprises at home and abroad, and further reduce the emissions of major pollutants such as wastewater and waste gas.

（2）进一步提升企业的清洁生产水平，提高水循环利用率，通过中水回用、设备工艺改进等手段不断减少单位产品新鲜水用量及废水排放量。

(2) Further improve the cleaner production level of enterprises, enhance the utilization rate of water circulation, and continuously reduce the amount of fresh water per unit product and wastewater discharge by means of reclaimed water reuse, equipment and process improvement, etc.

（3）排污海域分布有国家级自然保护区，海域生态环境较敏感，应严格控制废水非正常及超标排放，在深海排放管排海口设置水质在线监控系统，监控外排废水水质变化情况，并加强跟踪监测计划的实施，重点关注项目排污铁山港海域的水质变化情况。

(3) There is a national nature reserve distributed in the sea area of pollutant discharge and the ecological environment of the sea area is relatively sensitive. Efforts should be made to strictly control abnormal and over-standard discharge of wastewater, set up an on-line water quality monitoring system at the outlet of the deep sea discharge pipe to monitor the water quality changes of the discharged wastewater, and strengthen the implementation of the tracking monitoring plan to observe the water quality changes in the sea area of Tieshangang.

（4）严格臭气收集处理系统的建设和运行，避免臭气泄露或事故排放对周边环境的影响。

(4) Strictly build and operate the stink collection and treatment system to avoid the impact of stink leakage or accident emission on the surrounding environment.

（5）加快项目配套一般固体废物处置场的选址和建设，强化项目产生的绿泥等一般固体废物综合利用技术的研究，进一步减少固体废物的填埋处置量。

(5) Accelerate the site selection and construction of the general solid waste disposal site of the Project, enhance research on the comprehensive utilization technology of general solid waste such as green mud generated by the Project, and further reduce the landfill disposal amount of solid waste.

（6）扎实做好工业区新深海排污区的选址和论证相关工作，为园区后续发展排水预留空间。

(6) Conduct proper site selection and demonstration of the new deep sea sewage disposal area in the Industrial Park, and reserve space for the subsequent development of drainage in the Park.

（7）建设单位应重视提高经营管理人员、技术人员和操作人员素质，加强培训以保证环保设备正常运行。

(7) The Employer should attach importance to improving the quality of management personnel, technical personnel and operators, and strengthen training to ensure the normal

operation of environmental protection equipment.

（8）严格落实和执行各项环境风险防范措施及应急措施，以降低事故风险带来的环境影响及经济损失。

(8) Strictly implement various environmental risk prevention measures and emergency measures to reduce the environmental impact and economic losses caused by accident risks.

（9）本次环评提出的各项环保措施是保证项目环境可行的重要条件，在项目的建设和运行中应严格落实这些环保措施，确保项目建成后的各项环境指标达到预期效果，符合环境管理的要求。

(9) The environmental protection measures proposed in this EIA are important conditions to ensure the environmental feasibility of the Project. These environmental protection measures should be strictly implemented during the construction and operation of the Project to ensure that the environmental indexes after the completion of the Project reach the expected results and meet the requirements of environmental management.

（10）根据《建设项目环境影响后评价管理办法（试行）》（环境保护部令 第 37 号），建议项目及时开展后评价。

(10) According to the Measures for the Administration of Post-Assessment of Environmental Impact of Construction Projects (Trial) (Decree No.37 of the Ministry of Environmental Protection), it is suggested that the post-assessment of projects should be carried out in a timely manner.

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