REPORT

TAYAKADIN WIND POWER PLANT PROJECT-DRAFT ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

TAYAKADIN-DRAFT ESIA

Submitted to:

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Altunizade Mahallesi Kısıklı Caddesi No:4/A Kat:2
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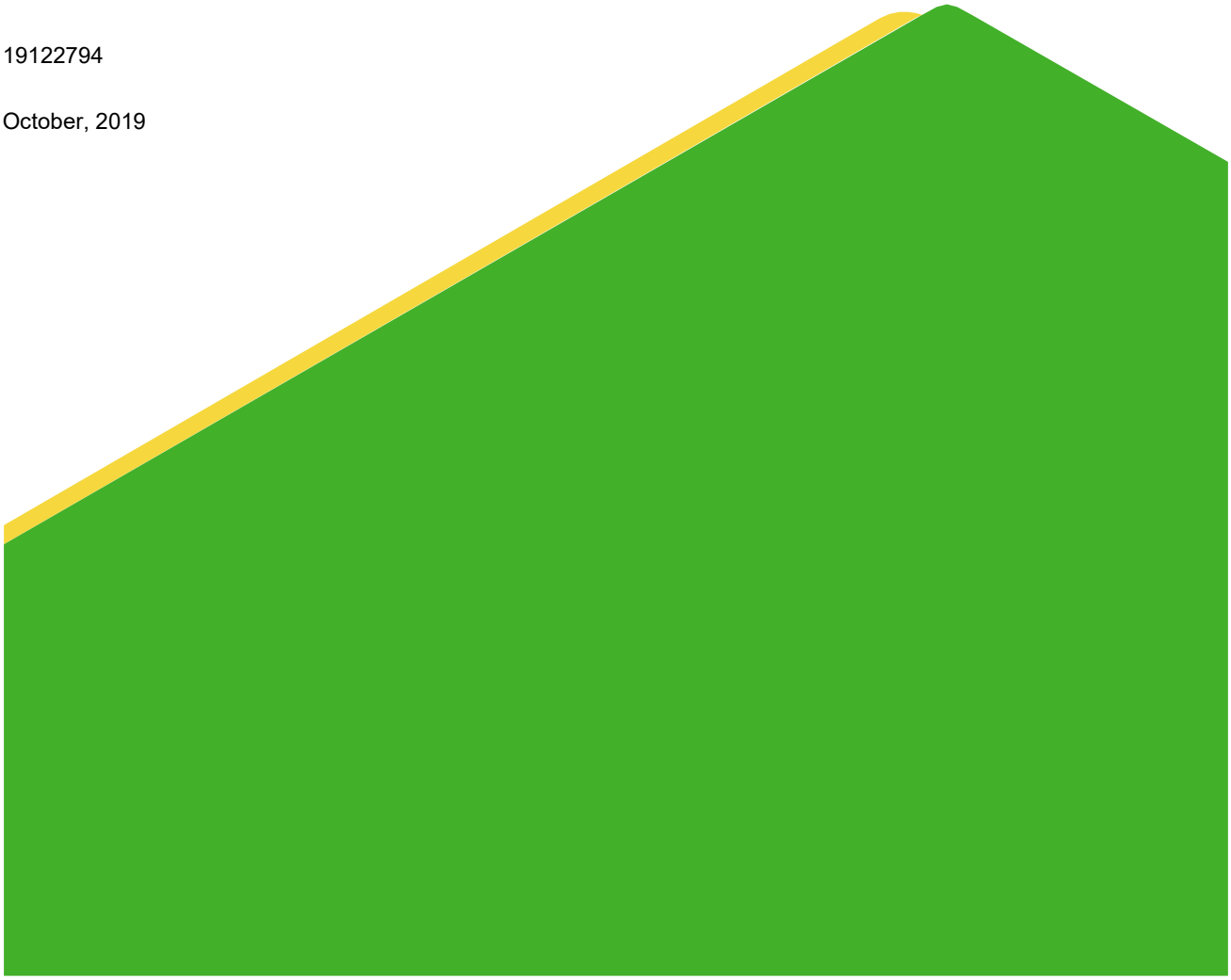

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Executive Summary

İstres Elektrik Üretim A.Ş. is planning to develop Tayakadın Wind Power Plant Project in Çatalca and Silivri Districts of İstanbul.

İstres Elektrik Üretim A.Ş. (“Client”), retained Golder Associates Turkey Ltd. Şti. (“Golder”) to prepare the Environmental and Social Impact Assessment (“ESIA”) for the Tayakadın Wind Power Plant Project (“Project”), in compliance with the national and international requirements (World Bank (“WB”) Environmental and Social Standards, EBRD Performance Requirements, IFC Performance Standards and EHS Guidelines Wind Energy, 2015).

This ESIA Report has been prepared by Golder for the following objectives:

- Identification and assessment of social and environmental impacts, both adverse and beneficial, in the project’s area of influence;
- Evaluation of the main environmental and social risks and potential impacts of the Project;
- Presentation of Environmental and Social Management Plan (ESMP), Environmental and Social Management System (ESMS), Stakeholder Engagement documentation, and grievance mechanism against the Applicable Standards;
- Description of the management, mitigation, monitoring and compensation measures, including the ESMS, the ESMP, and the thematic action or management plans (e.g. corrective action plan, resettlement action plan);
- Cumulative impact assessment (as required by the Applicable Standards);
- Assessment of associated facilities.
- Main components of the assessment include:
- the potential environmental and social impacts of the Project throughout the full life cycle;
- a public consultation to ensure that local communities and other key stakeholders are informed of the Project and have an opportunity to express their opinions concerning the Project;
- proposed mitigation activities to minimize adverse environmental impacts;
- the nature and significance of residual impacts (those adverse impacts that occur after mitigation has been applied) and ongoing monitoring and management plans to address them;
- the nature and significance of cumulative impacts.

Based on the findings of on the potential environmental and social impacts and risks of the projects were identified during that phase. The project is categorised as B in accordance with IFC Sustainability Framework, EBRD and KFW.

The potential environmental and social impacts and risks of the projects were identified based on the project screening information and the additional information collected during the scoping phase. These impacts and risks are:

- Site specific
- Readily identifiable and

- Can be readily addressed by standard industry practice mitigation measures (as also detailed in the following sections)
- Largely reversible

An Environmental and Social Impact Assessment evaluates a project's potential environmental and social risks and impacts in its area of influence; examines project alternatives; and includes the process of mitigating and managing adverse environmental and social impacts throughout project implementation.

A specific Stakeholder Engagement Plan has been prepared for the project. The overall objectives of the Stakeholder Engagement Plan are:

- Continuously informing the local community about the Project related development activities;
- Ensuring that the local community is informed about the hazards associated with construction, operation activities of the Project and mitigation measures implemented to reduce impacts where possible;
- Minimizing potential disputes between Contractor's and Subcontractors' and the local community;
- Incorporating local knowledge during the entire Project life cycle, by taking into account bottom up information and feedback provided by local communities; and
- Timely and effectively responding to community concerns regarding the issues such as employment of the local workforce reserve in the construction and operation phases, disruption to daily activities, safety issues, disturbances due to noise or dust, and other environmental and social issues.

A Grievance Mechanism has been set up for communities and individuals to formally communicate their concerns, complaints and grievances to the company and facilitate resolutions that are mutually acceptable by the parties.

As a key step in the Environmental and Social Impact Assessment process; various studies have been conducted to collect information on the existing environmental and social baseline conditions. Apart from the desktop and relevant literature review the following activities were performed for the collection of information on social and environmental baseline condition.

- For social baseline qualitative baseline information was collected through key informant interviews
- Air quality measurement activities were conducted,
- Soil quality measurement activities were conducted,
- Ambient noise measurements were done at selected points in the project area and surroundings,
- Traffic count study was done on the possible approach routes to the project area,
- Site visit was performed for identification of biodiversity concerns,
- Site visit performed for the baseline bat survey,
- Site visit performed for the baseline bird survey.
- Site visit performed for the assessment of the archaeological survey.

Impact Assessment Results

Main features of Current Situation	Potential impacts	Mitigation Measures
Geology and Seismology		
The project area is in 1st degree earthquake zone.	Changes in the local morphology	Compliance of design with the provisions of the "Regulation on the Buildings to be Constructed on Earthquake Zones" (06.03.2007 O.G. No: 26454).
Soils		
The Project Area is considered as Greenfield. Geological and geotechnical investigations were carried out at the Project Area. Based on these investigation CLAY with some sand has been observed as the dominant formations.	Topsoil and lower soil removal Pollutant emissions to the soil Occupation of land	Removed topsoil will be stored in an appropriate area in the Project Area, to be used for landscaping after the construction. Prevention of leaks and spills. Spill response arrangements.
Hydrogeology and Groundwater Quality		
The regional groundwater level is deeper than 15 m and no major pollution risk is foreseen.	Hydrogeological change Groundwater pollution	Prevention of leaks and spills.
Hydrology and Surface Water Quality		
According to Geotechnical Report: there are no flowing or dry streams observed within the Study Area. Project is located in the medium and long-distance protection area of the Karamandere Dam Basin. There is a naturally occurring wetland -which is not known about seasonal or not- in the dense forest in the Project Area. The closest turbine from the wetland is T8 with the distance of 450 m. There are no large capacity rivers within the boundaries of İstanbul. However, there are	Surface water pollution. Sediment pollution.	Engineering and design practices will be in place for the collection and disposal of wastewater from all sources during construction and operation of the project. There will not be any construction activity occurred and transportation route across the wetland. This wetland will not be used as a water resource during the construction and operation phase.

Main features of Current Situation	Potential impacts	Mitigation Measures
streams, which supply drinking and potable water, that feed into the lakes and ponds or pour into the sea.		
Air Quality		
PM_{10}, settled dust and SO_2&NO_2 measurement values are in compliance with Project standards.	Calculations on the estimated amount of air emissions during construction indicate no significant contribution to the ambient air quality.	Measures will be in place to minimise the air emissions during construction.
Noise		
Ambient noise levels are in compliant with the standards. Except from N-3, all night time noise values slightly exceed the night time IFC noise limit of 45 dBA.	Noise modelling shows the construction activities will not create additional noise values higher than the regulatory limit. For the operation phase, all values comply with both national and international standards according to the noise modelling. Therefore operation of turbines will not have any adverse effect on the sensitive locations.	Engineering controls. There will not be any construction activities during the night time. During the operation, a monitoring programme will be in place.
Traffic		
Approximately 1.9 km of new roads will be opened to provide access between the turbines and approximately 5.9 km of existing roads will be extended.	During construction phase impacts will be mainly associated with the increased road traffic.	Scheduling of traffic to avoid peak hours on local roads. Adopting traffic control and operations devices and emphasizing safety aspects among project drivers. Regular maintenance of vehicles should be undertaken to ensure that vehicles are safe and emissions and noise are minimized.
Visual Impact		
The possible visual impact of the project during the operation phase will be the presence and view of the vertical structures and rotating blades. The visual effect of the proposed project are assessed by using ZVI (Zones of Visual Influence) tool of the windPRO software program. Visual impact is a subjective issue, a significant number of people in Turkey, who has been interact with the wind power plants, thinks that wind farms are clean energy and view of the towers as a symbols of modern		

Main features of Current Situation	Potential impacts	Mitigation Measures
and civilized living. According to the preliminary social survey conducted for the project during the site visit, there is not any negative opinion for potential visual of the turbines.		
Shadow Flicker		
Shadow flicker is one of the most important effect of the wind turbines to the sensitive receptors located within the close vicinity of the project area. A specific software program “windPRO” is used for the assessment of the shadow flicker. Shadow is the windPRO calculation module that calculates how often and at which times of the day a specific neighbour or area will be affected by shadows generated by one or more wind turbines. According to the model results, point B (The closest settlement in Aydınlar Quarter to the nearest turbine (T14)) will have the maximum hours per year in a year which is approximately 27hours. This value is under the limit value of 30 hours per year.		
Biological Components		
The assessment in accordance with the WB ESS6, IFC PS 6 is not completed within the scope of this report since the baseline field studies are currently ongoing and have not yet been finalized		
Social Components		
The settlements located in the vicinity of project are determined as Aydınlar Village and Binkılıç Quarter (Atatürk and Fatih Neigbourhoods). The main livelihood activity in these affected settlements are animal husbandry. There are private parcels in Atatürk and Fatih Neighbourhoods. Plots of two turbines (T1 and T2) in 4 parcels belong to private premises, EMRA Public Welfare decision is taken for these parcels. The expropriation process is still in progress. Negotiation process with landowners will be initiated by the Project Owner, accordingly. T1 and T2 lands belong to the same person; which are identified as “idle” and not being actively used for any purpose.	The need of workforce that can be considered a positive impact. Increased traffic and transportation requirements. Community health and safety concerns in relation to Project construction and operation.	A continuous stakeholder engagement process and grievance mechanism will be in place • to exchange information on the project with the local community and other stakeholder and • to record and respond any complaints and concerns raised by the local community members and other stakeholders Maximising of local employment and procurement in order to increase the positive socio-economic impact of the project on the local community. Coordination with the local community for the arrangements of accommodation and establishment of the construction camps. Majority of the project area belongs to the Forestry premises and the rest (4 immovables in 2 turbine areas) is private plots. These plots are planned to be leased. The Public Welfare

Main features of Current Situation	Potential impacts	Mitigation Measures
		Decision has been obtained from EMRA at 02.09.2019.

Environmental and Social Management System

The Environmental and Social Management System (ESMS) will be implemented to ensure that the Project:

- complies with all applicable Turkish legislation as well as relevant IFC guidelines provided in this report;
- implements Good International Industry Practices (GIIP) to minimize potential environmental and social impacts during the construction, operation and decommissioning phases;
- is executed in compliance with the commitments addressed in this report for the minimization of potential environmental and social impacts;
- works in accordance with high standards of safety;
- cares for the protection of own employees and public;
- promotes its policies through training, supervision, regular reviews and consultation;
- generates local socio-economic benefits by using local and regional labour forces;
- engages and communicates with the local community and other stakeholders through a stakeholder engagement programme.

The minimum requirements of an ESMS have been defined and will be established for the project in order to mitigate the risks associated with;

- Environmental aspects
- Labour Issues
- Community Health & Safety aspects
- Stakeholder management and social aspects
- Waste Management

Study Limitations

This report has been prepared based on the documentation provided to Golder by the Investor. Golder cannot confirm the accuracy of the information provided by third parties during this due diligence process.

IMPORTANT: This section should be read before reliance is placed on any of the opinions, advice, recommendations or conclusions herein set out.

a) The purpose of this report was to undertake ESIA pursuant to the appointment of Golder to act as Consultant.

b) The assessment in accordance with the WB ESS6, IFC PS 6 is not completed within the scope of this report since the baseline field studies are currently ongoing and have not yet been finalized.

c) Except for İstres Elektrik Üretim A.Ş. (“Investor”) and Lenders (existing and future), any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third parties. Should additional parties require reliance on this report, written authorization from Golder will be required. Golder disclaims responsibility of consequential financial effects on transactions or property values, or requirements for follow-up actions and costs. No duty is undertaken, nor warranty nor representation made to any party in respect of the opinions, advices, recommendations or conclusions herein set out.

d) The report is based on data and information collected up to issue date. It is based solely on a review of information and data obtained by the Investor as described in this report, and discussion with representatives of the Investor, as reported herein.

e) In evaluating the Project, Golder has relied in good faith on information provided by other individuals noted in this report. Golder has assumed that the information provided is factual and accurate. In addition, the findings in this report are based, to a large degree, upon information provided by the Investor. Golder accepts no responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of omissions, misinterpretations or fraudulent acts of persons interviewed or contacted.

f) Golder makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation. These interpretations may change over time, thus the client should review these issues with appropriate legal counsel.

g) In the Conclusions section of this report and in the Executive Summary, Golder has set out its key findings and provided a summary and overview of its advice, opinions, and recommendations. However, other parts of this report will often indicate limitations of the information obtained by Golder and therefore any advice, opinions or recommendations set out in the Conclusions section and in the Executive Summary should not to be relied upon until considered in the context of the entire report.

CRNYMS AND ABBREVIATIONS

µg: Microgram

CO: Carbon monoxide

dBA: A-weighted decibels

DPSIR: Drivers-Pressures-State-Impact-Response

EA: Environmental Assessment

EBRD: European Bank for Reconstruction and Development

EEA: European Environmental Agency

EHS: Environmental, Health, and Safety

EIA: Environmental Impact Assessment

EPFI: Equator Principles Financial Institutions

EPs: Equator Principles

ESAP: Environmental and Social Action Plan

ESIA: Environmental and Social Impact Assessment

ESMP: Environmental and Social Management Plan

ESMS: Environmental and Social Management System

EU: European Union

GIIP: Good International Industry Practice

Golder: Golder Associates Turkey Ltd. Şti

Ha: Hectare

Hr: Hour

IEEP: Institute for European Environmental

IFC: International Finance Corporation

IUCN: International Union for Conservation of Nature

Kg: Kilogram

kVA: Kilovolt Ampere

L: Liter

L&FS: Life and Fire Safety

Leq: Equivalent continuous sound level

LV: Low voltage

M: Meter

Mg: Milligram

Ml: Millilitre

Mm: Millimetre

MoEU: Ministry of Environment and Urbanization

MoFWA: Ministry of Forestry and Water Affairs

MoH: Ministry of Health

MV: Medium voltage

NGOs: Non-governmental organizations

NO_2: Nitrogen dioxide

NO_x: Nitrogen oxides

O.G.: Official Gazette

OECD: Organization for Economic Co-operation and Development

PDoEU: Provincial Directorate of Environment and Urbanization

PDF: Project Description File

PM: Particulate matter

PM_{10}: Particulate matter with diameter less than or equal to 10 micron

PPE: Personal Protective Equipment

PRs: Performance Requirements

PS: Performance Standard

QA/QC: Quality Assurance/Quality Control

S: Second

SA: Study Area

SO_2: Sulphur dioxide

SSA: Social Study Area

ToC: Table of Contents

TOX: Total organic halogens

TPH: Total petroleum hydrocarbons

TÜİK: Türkiye İstatistik Kurumu (Turkish Statistical Institute)

WHO: World Health Organization

WMP: Waste Management Plan

WWF: World Wide Fund for Nature

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1.0 INTRODUCTION

1.1 Background and Objectives

İstres Elektrik Üretim A.Ş. (“Client”), retained Golder Associates Turkey Ltd. Şti. (“Golder”) to prepare the Environmental and Social Impact Assessment (“ESIA”) for the Tayakadın Wind Power Plant Project (“Project”), in compliance with the national and international requirements (World Bank (“WB”) Environmental and Social Standards, EBRD Performance Requirements, IFC Performance Standards and EHS Guidelines Wind Energy, 2015).

The Project’s Environmental Impact Assessment (“EIA”) Process was completed on 25.02.2016 in accordance with the Environmental Impact Assessment Regulation (Official Gazette No: 29186, Date: 25.11.2014) and EIA positive decision was obtained on 23.05.2016. Initially, the Project was designed to have 30 turbines with the total capacity of 50.5 MW_m/50 MW_e, however the design has been changed after the EIA positive decision to include 15 turbines which have the total capacity of 51 MW_m/50 MW_e without any change at turbine connection point. Previously obtained permits are still conditionally valid for the Project although the number and the location of the turbines are changed and also, the capacity of the Project is increased. Client requested for the validity of EIA positive decision to the İstanbul Provincial Directorate of Environment and Urbanization and took the official letter (dated: 30.06.2016 and numbered: E.10992) with regard to EIA decision is still valid. The Ministry of Environment and Urbanization approved the requested revision of 15 turbine locations with the official letter (dated: 14.04.2017 and numbered 6043). Client requested for the validity of the change for Turbine 9 due the Technical Interaction Analysis Report decision. The location change of the Turbine 9 got the approval from the Ministry of Environment and Urbanisation with the official letter dated 06.10.2017 and numbered: 15760.

The Project is located in Çatalca and Silivri Districts of İstanbul. The targeted annual energy production of the Tayakadın Wind Power Plant Plant is 175,000,000 kWh and it is planned that the energy to be produced will be connected to 154 kV Gaziosmanpaşa WPP TM connection point. The construction period is 9 months and license period will last for 49 years. The Project will be financed by International Finance Institutions (“Lender”) and therefore requires comprehensive assessment of certain environmental and social issues as a Lender requirement.

This ESIA Report has been prepared by Golder for the following objectives:

- Identification and assessment of social and environmental impacts, both adverse and beneficial, in the project’s area of influence;
- Evaluation of the main environmental and social risks and potential impacts of the Project;
- Presentation of Environmental and Social Management Plan (ESMP), Environmental and Social Management System (ESMS), Stakeholder Engagement documentation, and grievance mechanism against the Applicable Standards;
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- Main components of the assessment include:
- the potential environmental and social impacts of the Project throughout the full life cycle;
- a public consultation to ensure that local communities and other key stakeholders are informed of the Project and have an opportunity to express their opinions concerning the Project;

- proposed mitigation activities to minimize adverse environmental impacts;
- the nature and significance of residual impacts (those adverse impacts that occur after mitigation has been applied) and ongoing monitoring and management plans to address them;
- the nature and significance of cumulative impacts.

1.2 Project Rationale

Tayakadın Wind Power Plant Project is planned to be carried out in İstanbul Province to generate electricity by using the renewable resource of wind power. The Project will consist of 15 turbines [(14 x (3.40 MW_m/3.35 MW_e) + 1 x (3.40 MW_m/3.10 MW_e)].

Energy is an essential need of modern society. It is the cornerstone of all activities, particularly in industry, technology, transportation and communication. As well as the limited and depletion of available resources, a constant increase in energy demand forces humankind to find alternative energy sources. Therefore, environmentally, sustainable and renewable energy sources should be developed for the protection and sustainability of the world.

As can be seen from the graph below showing the world's energy outlook in 2018, energy requirement of the world increases day by day and the most of the world's energy demand is met from non-renewable energy sources such as oil, coal and natural gas, respectively. Unfortunately, use of renewable energy sources such as wind and solar power are not at the levels they should be yet.

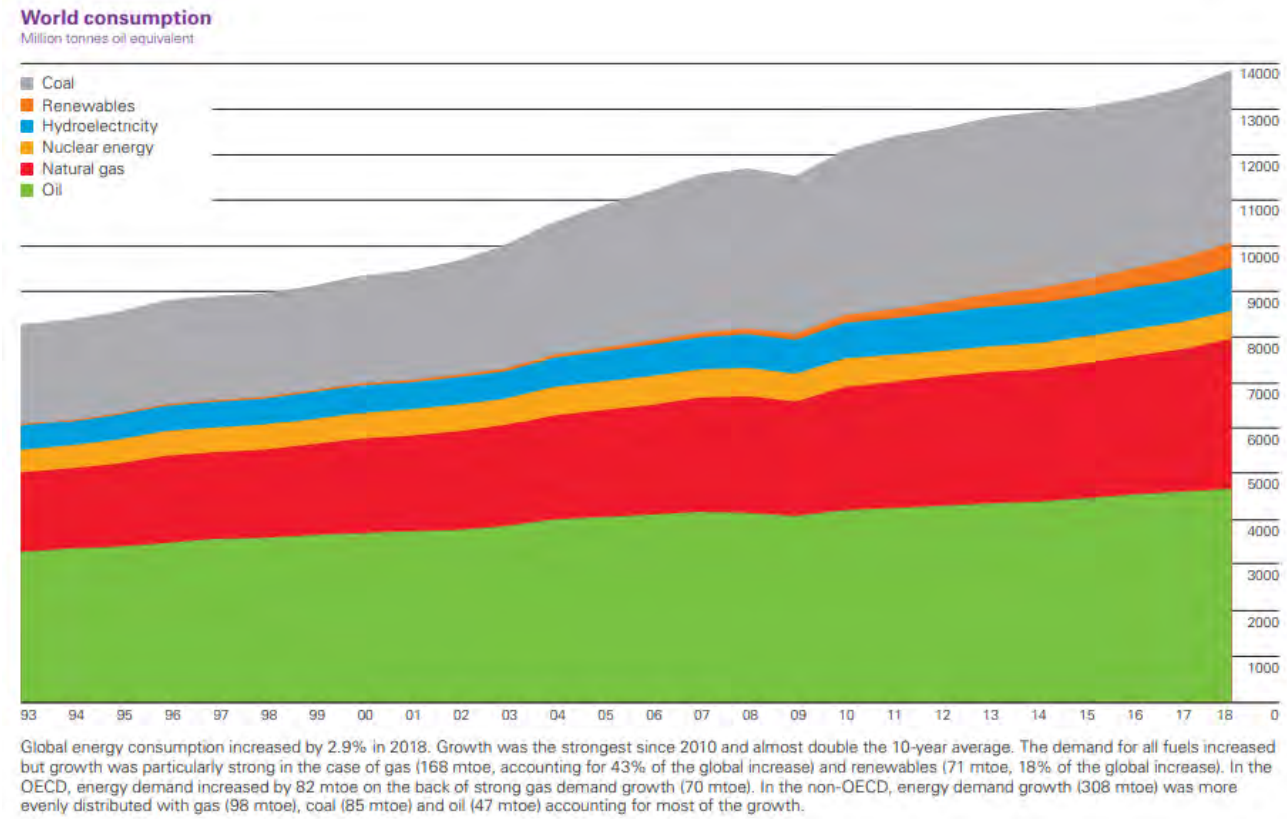


Figure 1: Global Energy Consumption by Sources[1]

[1] Full Report - BP Statistical Review of World Energy, 2019

As a solution for climate change and global warming, renewable energy sources come into prominence and therefore, countries try to invest more and more renewable energy projects to generate cleaner electricity.

Turkey's situation in electricity generation and shares by energy sources between 2007 and 2017 are given in below table. Turkey has been using natural gas as the main energy source for the last 10 years.

Table 1: Electricity Generation and Shares by Energy Resources in Turkey[2]

Year	Total (GWh)	Coal (%)	Liquid fuels (%)	Natural Gas (%)	Hydro (%)	Renewable Energy and wastes (%)
2007	**191,558**	27.9	3.4	49.6	18.7	0.4
2008	**198,418**	29.1	3.8	49.7	16.8	0.6
2009	**194,813**	28.6	2.5	49.3	18.5	1.2
2010	**211,208**	26.1	1.0	46.5	24.5	1.9
2011	**229,395**	28.8	0.4	45.4	22.8	2.6
2012	**239,497**	28.4	0.7	43.6	24.2	3.1
2013	**240,154**	26.6	0.7	43.8	24.7	4.2
2014	**251,963**	30.2	0.9	47.9	16.1	4.9
2015	**261,783**	29.1	0.9	37.9	25.6	6.5
2016	**274,408**	33.6	0.7	32.5	24.5	8.7
2017	**297,278**	32.8	0.4	37.2	19,6	10.0

According to 2017 statistics of Turkey's electricity production from renewable sources (10.0%) is relatively low compared to natural gas (37.2%), coal (32.8%) and hydro (19.6%). However, the highest share increase was observed in the use of renewable sources where the share was increased from 0.4% to 10.0% in 10 years. According to the Electricity Market and Supply Security Strategy Document published in 2009, it is aimed that the share of renewable energy resources in energy production will be at least 30% in 2023.[3]

In 2018, the installed capacity of Turkey has reached 88,551 MW. The installed power is distributed by sources as 31.9% from hydro, 25.6% from natural gas, 21.5% from coal, 7.9% from wind, 5.7% from solar, 1.4 % from geothermal and 5.9% from other sources.[4]

Domestic energy sources of Turkey are given in below table.

[2] Türkiye Elektrik Enerjisi Üretiminin Kaynaklara Göre Dağılımı, TEİAŞ Türkiye Elektrik Üretim-İletim İstatistikleri, 2007-2017

[3] Enerji ve Çevre Dünyası Dergisi, Mart 2017

[4] https://www.enerji.gov.tr/tr-TR/Sayfalar/Elektrik

Table 2: Energy Sources Potential of Turkey[5]

Source	Potential
Lignite	10.4 million tons
Coal	1,3 billion tons
Asphaltite	82 million tons
Petrol	6.7 billion tons
Hydro	130 billion kWh/year
Natural gas	21.9 billion m^3
Wind	High efficient: 8,000 MW Medium efficient: 40,000 MW
Geothermal	31500 MW (1500 MW is suitable for electricity production)
Biomass	16.9 Mtoe
Solar energy	80 Mtoe (380 billion kWh/year electricity)

Wind energy is one of the most advanced and fastest developing renewable energy source. Wind power arises from the uneven heating of the parts of the Earth and the interrelation of the low and high pressure centers formed accordingly. Wind turbines use that wind to convert the kinetic energy into mechanical energy which is then converted into electricity by a generator. As the wind speed increases, there will be more pressure on the turbine blades, so that it can rotate faster and obtain higher amounts of energy. Wind is also referred as a “clean energy” since the electricity generation process from wind energy is independent of carbon and thus, not causing any atmospheric pollution.

Advantages of wind energy can be listed as:

- Wind plants do not cause air pollution unlike other conventional power plants.
- The source does not exhaust, it is reliable.
- The price is constant over time.
- Operational and maintenance costs are relatively low.
- Operation and technology are relatively simple.
- Investment cost has decreased so that it can compete with other power plants.
- It provides national benefit since it eliminates import dependency.
- It provides employment and regional development.

[5] Energy Production Sector Report, EÜAŞ, 2008

- Wind power plant components require relatively less space than fossil fuel power plants.

Turkey is a rich country in terms of wind. Even when the most reliable winds and technological difficulties which is based on consideration of the wind energy potential in Turkey is reported to be around 12 billion kWh/year.[6]

According to Turkey Wind Energy Association statistic report in January 2019 (in below figure), investments in the wind power plants in Turkey shows a continuous increase. The total installed capacity for 180 wind power plants located in Turkey is nearly 7,369 MW in this year as can be seen in the figure below. Turkey ranks seventh in Europe and twelfth in the world considering the total installed wind capacity in 2019.[7] According to Electricity Market and Supply Security Strategy Document published in 2009, it is aimed to produce 100,000 MW electricity from renewable sources where 20,000 MW is aimed to be produced from wind in 2023.[8]

Figure 2: Cumulative Installation for Wind Power Plants in Turkey[9]

As can be seen in the regional distribution chart of wind power plants in Turkey below figure, Aegean region has the highest potential location for wind power plants with nearly 2,832 MW total installed capacity.[9]

[6] Hayli, Selçuk. (2001). Rüzgâr Enerjisinin Önemi, Dünya'da Ve Türkiye'deki Durumu - The Importance of Wind Energy, The Situation in the World and Turkey.

[7] https://www.enerjiatlasi.com/ulkelere-gore-ruzgar-enerjisi.html

[8] Enerji ve Çevre Dünyası Dergisi, Mart 2017

[9] Turkey Wind Energy Association Statistic Report, TWEA, January 2019

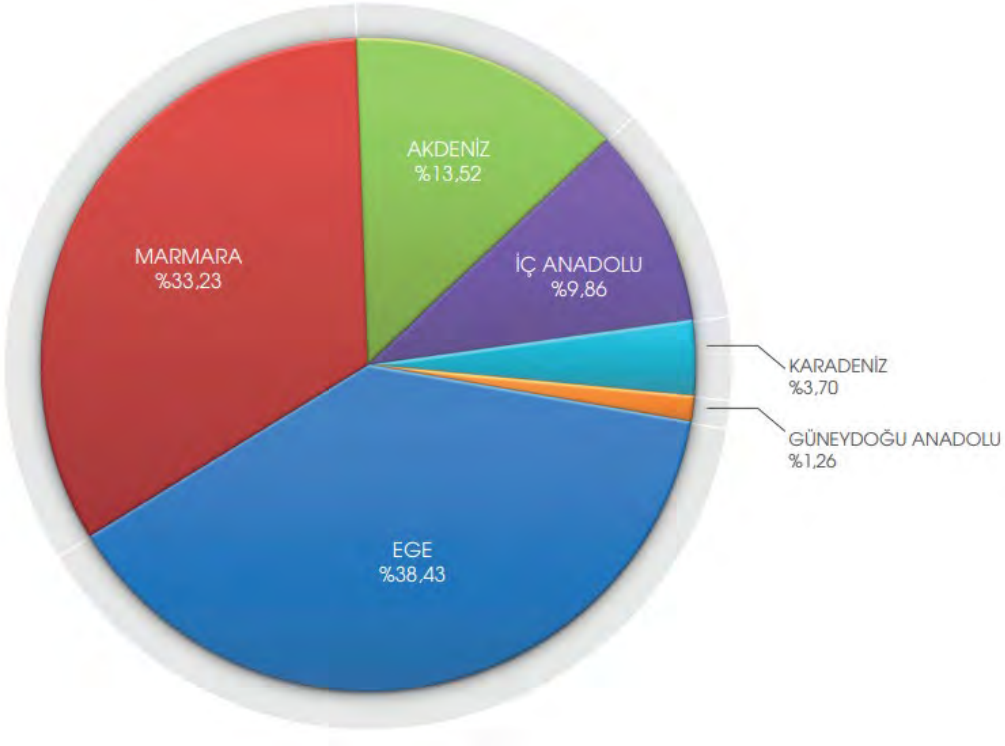


Figure 3: The regional distribution of operational wind power plants in Turkey[9]

The wind power plant map of Turkey in 2016 is given in below figure and the installed capacity per city is given in the following figure. While the highest number of wind power plant exists in Balıkesir, followed by İzmir, Manisa, Hatay and Çanakkale; the highest installed capacity of wind power plant exists in İzmir, followed by Balıkesir.

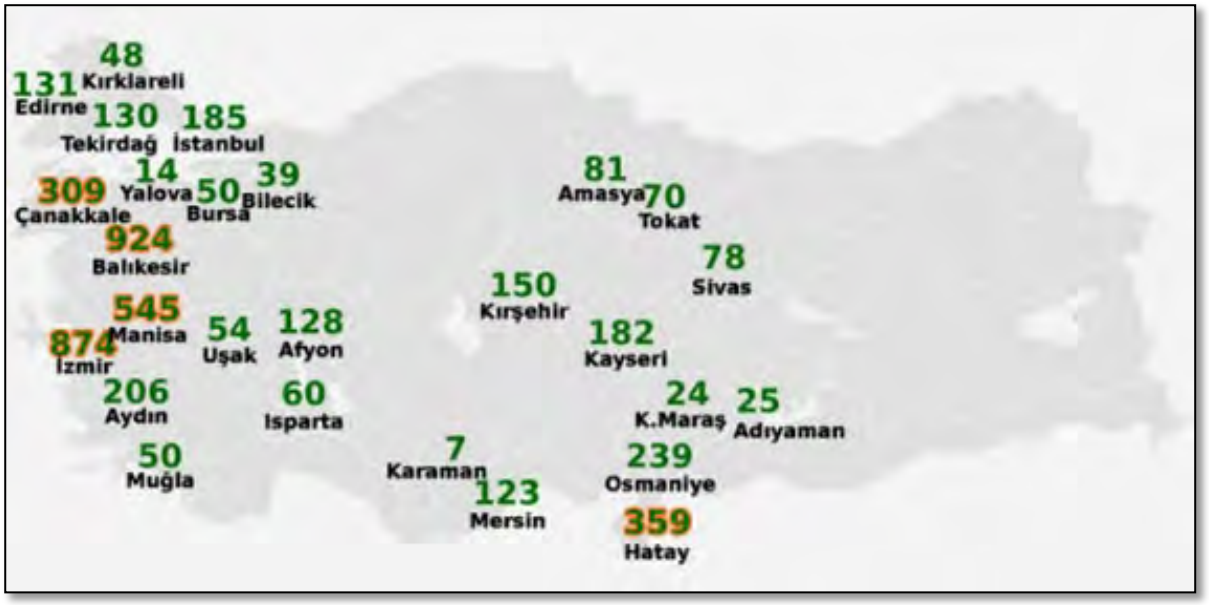


Figure 4: Turkey Wind Power Plant Map of 2016[10]

[10] https://www.enerjiatlasi.com/haber/illere-gore-ruzgar-santrali-kurulu-gucu

Figure 5: The Distribution of Operational Wind Power Plants in Turkey by Cities11

In this context, Tayakadın Wind Power Plant Project aims to install a wind power plant in İstanbul providing clean, sustainable and reasonable energy by contributing to the regional and national benefits.

[11] Turkey Wind Energy Association Statistic Report, TWEA, January 2019

1.3 Project Categorisation

The requirements from IFC, EBRD and KFW regarding the Environmental and Social Assessment process and outcomes differ depending on the category of the project. Projects are categorized as follows:

Table 3: Project Categorisation

Category	Description of the Project		
	IFC	**EBRD**	**KFW**
Category A	Projects with potential significant adverse environmental and social risks and/or impacts that are diverse, irreversible or unprecedented	Project that could result in potentially significant adverse future environmental and/or social impacts which, at the time of categorisation, cannot readily be identified or assessed, and which, therefore, require a formalised and participatory environmental and social impact assessment process.	Potentially diverse significant adverse or irreversible impacts or risks to human health, the environment or the climate.
Category B	Projects with potential limited adverse environmental and social risks and/or impacts those are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures.	Projects with potential adverse future environmental and/or social impacts that are typically site-specific, and/or readily identified and addressed through mitigation measures.	Significant adverse environmental or social impacts or risks are less severe and can usually be mitigated with state-of-the-art measures or standard solutions.

The potential environmental and social impacts and risks of the projects were identified based on the project screening information and the additional information collected during the scoping phase. These impacts and risks are:

- Site specific
- Readily identifiable and
- Can be readily addressed by standard industry practice mitigation measures (as also detailed in the following sections)
- Largely reversible

Thus, the project is determined to be category B.

1.4 Key Steps in the ESIA Process

1.4.1 Screening & Scoping

Golder conducted a site visit in July 2019. The purpose of the site visit was to identify the key environmental and social issues associated with the Project and requiring detailed evaluation as part of the ESIA process to establish the most appropriate approach to the assessment and the categorisation of the project.

The site visit was based on the review of the characteristics of the Project and the associated releases to the environment and a walkover survey of the site and of the surrounding area. Major potential environmental and social issues associated with the Project are identified together with the requirement for additional studies on specific issues during that phase.

1.4.2 Baseline Data Collection

Baseline information has been obtained from the Project specific social and environmental baseline studies that have been carried out as part of this ESIA, utilising both desktop and field-based approaches. These studies have been compiled through specifically commissioned surveys, collated from a range of sources including publicly available information and through consultation. Relevant information used to support the assessment process is referenced in the relevant sections.

1.4.3 Stakeholder Engagement

WB IFC and EBRD recommend that the project sponsor consults with the relevant stakeholders at least twice:

a) During scoping and before the terms of reference for the ESIA are finalized, and

b) Once a draft ESIA report is prepared. The ESIA report must be made accessible to the public once completed, however it is recommended to consult and inform local stakeholders in earlier phases of the process.

Preliminary engagement activities during the site visit were performed, whereas additional consultations with local people have been implemented during the ESIA process.

Detailed information is provided about the Stakeholder Engagement in Section 5.0 of this report.

1.4.4 Impact Assessment

Impact assessment was performed for main issues for each Environmental and Social component (discipline). The common impact assessment methodology consists of five main steps:

- identification of Project activities that could contribute to environmental or social change;
- evaluation of the potential effects;
- description of mitigations for potential effects;
- analysis and characterization of **residual effects**; and
- as necessary, identification of monitoring to evaluate and track performance.

The general methodology adopted by Golder for Environmental and Social Impact Assessment Studies is consistent with the **DPSIR framework** (Drivers-Pressures-State-Impact-Response) developed by the European Environmental Agency (“EEA”). The methodology has been designed to be highly transparent and allow a semi-quantitative analysis of the impacts on the various environmental and social components. The details of the impact assessment methodology is presented in Appendix E.

1.4.5 Physical and Biological Components

The study area and methods for the collection of baseline information on physical and biological components are presented in Sections 7.1 and 7.2. The baseline characteristics were collected through both desktop and field studies. The impact assessments for both components are presented in Sections 8.1 and 8.2.

1.4.6 Social Components

As part of the ESIA studies, the social component study area has been defined based on the distance of the turbines to the nearest settlements, considering that statistical information is usually aggregated and presented according to these boundaries. Collecting information for the project has been conducted with a specific focus on the neighbouring settlements around the project site for primary data collection. The settlements located in the vicinity of project area are Aydınlar Village and Binkılıç Quarter (Atatürk and Fatih Neighbourhoods).

Social impact assessment (SIA) studies have been conducted by the Golder's senior social experts and ESIA experts Merve Birgül, Caner Şahin and Ilgın Atalar and data collection phase of SIA fieldwork has been initiated 9th-10th of July, 2019.

The social components of the Project is presented in Section 7.3 and impact assessment is presented in Section 8.3.

1.4.7 Identification of Mitigation Measures

Mitigation measures were identified through the application of the mitigation hierarchy of avoid, minimize, or, where residual impacts remain, compensate/offset providing the framework for developing a checklist of mitigations measures for risks and adverse environmental and social impacts. This approach implies that priority have been given to preventive actions mainly related to Project design, location and implementation rather than curative interventions that handle adverse outcomes after the emergence of the anticipated problems.

Realistic and affordable (cost-effective) mitigating measures have been proposed to prevent, reduce or minimise environmental impacts to acceptable levels and address other issues such as the need for e.g. worker health and safety improvements, community engagement, institutional involvement.

Given the fact that changes would be possible in the course of the development of the Project, mitigation measures have been designed to adapt to the changes readily through an adaptive management in which the implementation of mitigation and management measures are responsive to changing conditions and the results of monitoring throughout the Project's lifecycle. With this flexibility of the proposed mitigation measures sufficiently considered, it would prevent any unnecessary delay due to further assessment.

1.4.8 Uncertainties

This ESIA is prepared based on the Project information provided by the Client (refer to Section 3.0) and the information collected during the site visits. Like most ESIAs, the current ESIA faced a number of challenges in terms of retrieving baseline information, the level of accuracy of predicting impacts, and developing appropriate mitigation. Furthermore, even with a firm Project design and an unchanging environment, predictions are by definition uncertain.

In order to facilitate decision-making, then areas of uncertainty, data gaps and deficiencies, during further stages of Project development have been highlighted within the ESIA report. In order to address the uncertainties, monitoring will be undertaken by the Client to understand whether the identified mitigation measures are sufficient or there is a need for any refinements.

1.4.9 Environmental and Social Management System

The general framework for the environmental and social management system to be developed and implemented by the Project through the project lifecycle has been defined in Section 10.0.

1.4.10 Environmental and Social Action Plan

The Environmental and Social Action Plan (ESAP) has included in Appendix A.

1.5 Outline of the ESIA Report

This document is the ESIA Report for Tayakadın Wind Power Plant Project in compliance with the national and international requirements. This document presents the following sections:

- Introduction (Section 1),
- Regulatory Framework (Section 2),
- Project Description (Section 3),
- Analysis of Alternatives (Section 4),
- Stakeholder Engagement (Section 5),
- Impact Screening and Definition of the Valued Environmental and Social Components (Section 6),
- Environmental and Socio-Economic Baseline (Section 7),
- Impact Assessment (Section 8),
- Cumulative Impact Assessment (Section 9)
- Environmental and Social Management System (Section 10),
- Conclusions (Section 11),
- References (Section 12).
- Appendices (Section 13)

2.0 REGULATORY FRAMEWORK

2.1 Current National Environmental and Social Legislation

The Turkish legal framework for environmental protection was developed in line with national and international initiatives and standards, and some of them have been revised recently to be harmonized with the EU Directives in the scope of pre-accession efforts of Turkey to the EU. In the following sections, related institutions, legislation, processes and procedures that are related to the environmental and social aspects of the proposed project are described.

The Ministry of Environment and Urbanization (“MoEU”) is the responsible organization for the issuing and implementation of policies and legislation adopted for protection and conservation of the environment and for sustainable development and management of natural resources.

The Ministry of Forestry and Water Affairs (“MoFWA”) is the responsible organization for the issuing and implementation of policies and legislation adopted for the protected areas.

The Turkish Environment Law No. 2872, which came into force in 1983, deals with environmental issues on a very broad scope. According to the basic principles that govern the application of the Environment Law, and as stated in the Constitution, citizens as well as the state bear responsibility for the protection of environment. Complementary to the Environment Law and its regulations, other laws also govern the

protection and conservation of the environment, the prevention and control of pollution, and the implementation of measures for the prevention of pollution.

The Environment Law of 1983 has a comprehensive structure that has a holistic and integrated vision for the environment. ”Polluter pays” and “user pays” principles and carrying capacity concepts form the basis of regulatory tools in the Environmental Law. The Law is supported by numerous Regulations and decrees prepared or updated in the process of alignment with EU legislation, thus contributing significantly in compensating the gaps within the former legislative system of Turkey.

The main relevant Turkish legislation applicable to the Project are provided in Appendix C.

2.2 International Requirements

For the preparation of the present document, international conventions and agreements, ESIA International Standards (i.e. Equator Principles, IFC Performance Standards and guidelines, EBRD Performance Requirements) have been analysed and considered together with national standards.

2.2.1 International Conventions and Agreements

Turkey has ratified several international conventions and agreements for environmental protection. The main conventions and agreements for environmental protection are given in Appendix C.

2.2.2 Current European Union Environmental and Social Legislation

The EU legal instruments, interest approximately 300 directives covering environmental protection, polluting and other activities, production processes, procedures and procedural rights as well as products, and cross-cutting issues (e.g. EIAs, access to information on the environment and combating climate change). Quality and related emissions standards are set for air, waste management, water, nature protection, industrial pollution control, chemicals and genetically modified organisms, noise and nuclear safety and radiation protection. The EIA Directive of 1985 has been amended three times, in 1997, in 2003 and in 2009. The initial Directive of 1985 and its three amendments have been codified by Directive 2011/92/EU of 13 December 2011. Directive 2011/92/EU has been amended in 2014 by Directive 2014/52/EU.

The main relevant European Directives applicable to the Project are provided in Appendix C.

2.3 Requirements of International Financial Institutions

2.3.1 Requirements of Equator Principles

The Equator Principles are a set of voluntary environmental and social guidelines that have been adopted by a significant number of financial institutions influential in the project finance market (collectively the Equator Principles Financial Institutions, “EPFI”s). The EPs comprise a set of ten broad principles that are underpinned by the environmental and social policies, standards and guidelines.

Among other contents, the Equator Principles endorse the environmental and social policies and guidelines of the World Bank and the International Finance Corporation. Thus, with the adoption of the Equator Principles, commercial lending institutions are also formally accepting IFC Performance Standards.

The EPFIs emphasize that they will not provide loans to projects where the borrower will not or is unable to comply with the EPFIs social and environmental policies and procedures that implement the Equator Principles.

The EPFIs have ten (10) principles:

- **Principle 1**: Review and Categorization
- **Principle 2**: Environmental and Social Assessment
- **Principle 3**: Applicable Social and Environmental Standards

- **Principle 4**: Environmental and Social Management System and Equator Principles
- **Principle 5**: Stakeholder Engagement
- **Principle 6**: Grievance Mechanism
- **Principle 7**: Independent Review
- **Principle 8**: Covenants
- **Principle 9**: Independent Monitoring and Reporting
- **Principle 10**: Reporting and Transparency

In addition, the Equator Principles endorse the applicable IFC Performance Standards, IFC General EHS Guidelines and IFC Industry Specific EHS Guidelines. The Performance Standards establish the standards that the project is to meet throughout the life of an investment by IFC or other relevant financial institution. General and Industry Specific EHS Guidelines provide implementation guidelines and environmental quality limits that projects should comply with.

2.3.2 World Bank Environmental and Social Standards

The World Bank Environmental and Social Standards set out the requirements for Borrowers relating to the identification and assessment of environmental and social risks and impacts associated with projects supported by the Bank through Investment Project Financing. The application of these standards, by focusing on the identification and management of environmental and social risks, will support Borrowers in their goal to reduce poverty and increase prosperity in a sustainable manner for the benefit of the environment and their citizens . The standards will: (a) support Borrowers in achieving good international practice relating to environmental and social sustainability; (b) assist Borrowers in fulfilling their national and international environmental and social obligations; (c) enhance non-discrimination, transparency, participation, accountability and governance; and (d) enhance the sustainable development outcomes of projects through ongoing stakeholder engagement.

The ten Environmental and Social Standards establish the standards that the Borrower and the project will meet through the project life cycle, as follows:

- **Environmental and Social Standard 1:** Assessment and Management of Environmental and Social Risks and Impacts;
- **Environmental and Social Standard 2:** Labor and Working Conditions;
- **Environmental and Social Standard 3:** Resource Efficiency and Pollution Prevention and Management;
- **Environmental and Social Standard 4:** Community Health and Safety;
- **Environmental and Social Standard 5:** Land Acquisition, Restrictions on Land Use and Involuntary Resettlement;
- **Environmental and Social Standard 6:** Biodiversity Conservation and Sustainable Management of Living Natural Resources;
- **Environmental and Social Standard 7:** Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities; (not applicable for this Project)
- **Environmental and Social Standard 8:** Cultural Heritage;
- **Environmental and Social Standard 9:** Financial Intermediaries;

- **Environmental and Social Standard 10:** Stakeholder Engagement and Information Disclosure.

2.3.3 IFC Performance Standards and Guidelines

The World Bank - IFC has developed performance standards, policies, general environmental, health and safety guidelines, and industry-specific environmental, health and safety guidelines on social and environmental sustainability, to minimize negative environmental and social impacts of the development projects it supports, and to optimize benefits.

IFC 2012 Performance Standards (IFC 2012 PS) have been considered the main reference as they are the most recent environmental and social standards issued by an International Financial Institution. IFC 2012 PS comprises 8 documents:

- **Performance Standard 1**: Assessment and Management of Environmental and Social Risks and Impacts
- **Performance Standard 2**: Labour and Working Conditions
- **Performance Standard 3**: Resource Efficiency and Pollution Prevention
- **Performance Standard 4**: Community Health, Safety, and Security
- **Performance Standard 5**: Land Acquisition and Involuntary Resettlement
- **Performance Standard 6**: Biodiversity Conservation and Sustainable Management of Living Natural Resources
- **Performance Standard 7**: Indigenous Peoples (not applicable for this Project)
- **Performance Standard 8**: Cultural Heritage

Performance Standard 1 establishes the importance of:

- integrated assessment to identify the environmental and social impacts, risks and opportunities of projects;
- effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and
- the proponent's management of environmental and social performance throughout the life of the project.

Performance Standards 2 through 8 establish objectives and requirements to avoid, minimize, and where residual impacts remain, to compensate/offset for risks and impacts to workers, Affected Communities, and the environment. While all relevant environmental and social risks and potential impacts should be considered as part of the assessment, Performance Standards 2 through 8 describes potential environmental and social risks and impacts that require particular attention.

The key principles stated in the performance standards that are relevant for this methodology can be summarized as follows:

- principles of non-discrimination and equal opportunity;
- principles of non-discrimination apply to migrant workers;
- principles of pollution prevention;
- the principle of "like-for-like or better";

- principle of proportionality and good international practice;
- the holistic and ecosystem approaches;
- the participatory approach (social);
- the management and conservation principle;
- the preventive, precautionary and anticipatory principle.

2.3.3.1 IFC EHS Guidelines

The Environmental, Health and Safety (“EHS”) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (“GIIP”). The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs.

The General EHS Guidelines are organized as follows:

1. Environmental

1.1 Air Emissions and Ambient Air Quality

1.2 Energy Conservation

1.3 Wastewater and Ambient Water Quality

1.4 Water Conservation

1.5 Hazardous Materials Management

1.6 Waste Management

1.7 Noise

1.8 Contaminated Land

2. Occupational Health and Safety

2.1 General Facility Design and Operation

2.2 Communication and Training

2.3 Physical Hazards

2.4 Chemical Hazards

2.5 Biological Hazards

2.6 Radiological Hazards

2.7 Personal Protective Equipment (PPE)

2.8 Special Hazard Environments

2.9 Monitoring

3. Community Health and Safety

3.1 Water Quality and Availability

3.2 Structural Safety of Project Infrastructure

3.3 Life and Fire Safety (L&FS)

3.4 Traffic Safety

3.5 Transport of Hazardous Materials

3.6 Disease Prevention

3.7 Emergency Preparedness and Response

4. Construction and Decommissioning

4.1 Environment

4.2 Occupational Health & Safety

4.3 Community Health & Safety

2.3.3.2 IFC EHS Guidelines for Wind Energy

The EHS Guidelines are technical reference documents with general and industry specific examples of GIIP. When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards. These industry sector EHS guidelines are designed to be used together with the General EHS Guidelines document, which provides guidance to users on common EHS issues potentially applicable to all industry sectors.

The EHS Guidelines for wind energy include information relevant to environmental, health, and safety aspects of onshore and offshore wind energy facilities. It should be applied to wind energy facilities from the earliest feasibility assessments, as well as from the time of the environmental impact assessment, and continue to be applied throughout the construction and operational phases. Annex A contains a full description of industry activities for this sector. This document is organized in the following manner:

1. Industry-Specific Impacts and Management
   1.1 Environment
   1.2 Occupational Health and Safety
   1.3 Community Health and Safety
2. Performance Indicators Monitoring
   2.1 Environment
   2.2 Occupational Health and Safety
3. References

   Annex A. General Description of Industry Activities

2.3.4 EBRD Performance Requirements

The 2014 Environmental and Social Policy of the EBRD is a document which details the commitments of the agreement establishing the Bank particularly for the "promotion of environmentally sound and sustainable development".

In order to translate this objective into successful practical outcomes, the Bank has adopted a comprehensive set of specific Performance Requirements (“PRs”) that clients are expected to meet, covering key areas of environmental and social impacts and issues. The Bank is committed to promoting EU environmental standards as well as the European Principles for the Environment, to which it is a signatory, which is reflected in the PR 3. The Bank expects clients to assess and manage the environmental and social issues associated with their projects so that projects meet the PRs.

The breadth, depth, and type of analysis required for Environmental Assessment (“EA”) depend on the nature, scale, and potential environmental impact of the proposed project. EA evaluates potential environmental risks and impacts in the project impact zone; examines alternatives; identifies ways of

selection, siting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and includes the process of mitigating and managing adverse environmental impacts throughout project implementation.

According to the EBRD's environmental and social policy, the following requirements have to be taken into consideration:

- preparation of an ESIA;
- compliance with its PRs (where applicable) including:
  - **Performance Requirement 1:** Assessment and management of environmental and social impacts and issues
  - **Performance Requirement 2:** Labour and working condition
  - **Performance Requirement 3:** Resource efficiency, pollution prevention and control
  - **Performance Requirement 4:** Health and safety
  - **Performance Requirement 5:** Land acquisition, involuntary resettlement and economic displacement
  - **Performance Requirement 6:** Biodiversity conservation and sustainable management of living resources
  - **Performance Requirement 7:** Indigenous peoples (not applicable for this Project)
  - **Performance Requirement 8:** Cultural heritage
  - **Performance Requirement 9:** Financial intermediaries (not applicable for this Project)
  - **Performance Requirement 10:** Information disclosure and stakeholder engagement
- adherence to the UNECE Convention on Access to Information, Public Participation in Decision-Making and Access to Justice (Aarhus Convention) that the Project meets good international environmental practice, such that:
  - EU standards (where applicable,); and
  - World Bank Group EHS Guidelines (where EU standards do not suffice).

The Project should also meet International Labour Organization ("ILO") core labour standards on:

- Forced Labour (C105)
- Child Labour (C182)
- Discrimination (C111)
- Freedom of Association and the Right to Organize (C87)
- Equal Remuneration (C100)
- Minimum Age (C138).

2.4 Requirements of Environmental Limits in Turkish Regulations, European Regulations, IFC Guidelines

A review of applicable IFC guidelines, European Regulations and National legislation for air quality, water quality, soil quality, noise and vibration was performed and is presented in Appendix D.

According to the recommendations of the IFC guidelines, when national regulations differ from levels and measures presented in the international standards, the Project is expected to achieve whichever is more stringent.

3.0 PROJECT DESCRIPTION

3.1 Project Overview

Tayakadın Wind Power Plant Project consisting of 15 turbines with the total capacity of 51 MW_m/50 MW_e is planned to be constructed by İstres Elektrik Üretim A.Ş. in Çatalca and Silivri Districts of İstanbul. The project schedule is given in below table.

Table 4: Project Schedule

TASK	START DATE	FINISH DATE
Basic Design	10.05.2017	30.01.2018
Detailed Engineering	30.12.2017	25.05.2018
Procurement	06.08.2019	08.09.2020
Land Clearing	15.08.2019	01.12.2019
Construction	30.01.2020	25.09.2020
Turbine Montage	09.09.2020	30.12.2020
Commissioning	26.09.2020	07.01.2021
Operation	03.10.2020	…

The Project had several design revisions previously which are explained in chronological order below:

- İstres Elektrik Üretim A.Ş. started the national Environmental Impact Assessment process in 2009 with the initial project design of 25 turbines with a total capacity of 50 MW. In line with the Environmental Impact Assessment Regulation, Project Description File (“PDF”) was prepared and the EIA not required decision was obtained on 02.09.2009.
- On 21.07.2011, production license was given to the Project by Energy Market Regulatory Authority (“EMRA”) for 49 years.
- On 28.06.2012, the Project design was revised by increasing the number of turbines to 31 with a total capacity of 50.5 MW_m/50 MW_e. In line with this change, PDF was prepared and the EIA not required decision was obtained again on 25.04.2012.
- İstres Elektrik Üretim A.Ş. applied to EMRA again on 21.04.2015 for license modification and requested a field change and mechanical capacity increase. However, in the letter written by EMRA on 18/06/2015, it was stated that no action can be taken regarding mechanical capacity increase in accordance with the Electricity Market License Regulation. Then, İstres reapplied to EMRA on 01.07.2015 in order to request for the field change considering 50.5 MW_m/50 MW_e installed capacity. As a result of these, opinions of the relevant institutions were received for the new Project site in question and a new EIA process was initiated.
- On 08.08.2015, field studies were carried out in order to determine the floristic and faunistic characteristics of the site, geological, hydrogeological and hydrological characteristics, and the current environmental characteristics of the region. Performed field study were reported to the Istanbul Provincial Directorate of Environment and Urbanization.
- Afterwards, EIA report was prepared on 25.02.2016 and accordingly, EIA positive decision was obtained on 23.05.2016.
- After EIA positive decision, again the Project revised such that turbine locations were changed and the number of turbines was decreased to 15 with a total capacity of 51 MW_m/50 MW_e. The validity of EIA positive decision was checked by the İstanbul Provincial Directorate of Environment and Urbanization on 30.06.2016 (numbered: E.10992) and it is learned that EIA positive decision is still valid.

- On 26.12.2016, an application was made to the Ministry of Environment and Urbanization for the revision of the 15 turbine locations. The requested amendment of 15 turbine locations were approved on 11.01.2017 (numbered 665).
- Finally, the Ministry of Environment and Urbanization approved the revised layout plan for those 15 turbines on 09.08.2018 and opinions from other relevant authorities were taken.
- According to the latest information obtained from İstres, the location of Turbine 3, 11 and 12 will be changed. The official letter from General Directorate of State Airports Operations has been obtained for the approval of the location change of these turbines at 23.09.2019.

3.2 Project Area

3.2.1 Project Location

The Project Site is located in Aydınlar Village, Yaylacık Village and Binkılıç Atatürk Neighbourhood in Çatalca and Silivri Districts of İstanbul Province. Access to the project area can be provided via the old Istanbul-Kırklareli road, Aydınlar-Hallaçlı road and Sayalar road. Moreover, existing secondary roads will be used to provide access to turbine locations and new roads will be opened and, if necessary, existing roads will be improved. Within the scope of the Project, a new road with a length of 1900 m and a width of 6 m (excluding canals) will be opened to reach the turbine locations.

The nearest village is to the turbine is Aydınlar Village which is 1 km away from T14 and Yaylacık Village which is 1.7 km away from T15 and Binkılıç Quarter which is 5 km away from T11.

Project location and nearest settlements maps are given in below figures. The Site Photographs are provided in the Appendix B. The Licence area was given by the Republic of Turkey Energy Market Regulatory Authority which is a permitting area that the Client can develop a project within that given boundary. Project area is determined in accordance with the project components (location of turbines, access roads and switchyard) established by the Client.

The coordinates of the project area and the turbines are presented in below table.

Table 5: Turbine Coordinates

ID	UTM ED50	
	X	Y
T1	594.908,00	4.581.061,00
T2	595.507,00	4.580.977,00
T3	595.023,00	4.580.660,00
T4	596.060,00	4.580.749,00
T5	595.365,00	4.581.403,00
T6	595.805,00	4.581.556,00
T7	595.845,00	4.580.157,00
T8	596.288,00	4.581.343,00
T9	598.819,00	4.579.928,00

ID	UTM ED50	
	X	Y
T10	599.299,00	4.579.785,00
T11	595.310,00	4.581.779,00
T12	598.875,00	4.580.420,00
T13	599.425,00	4.580.479,00
T14	599.869,00	4.580.519,00
T15	600.250,00	4.580.281,00
Switchyard	595.654,00	4.579.357,00

3.2.2 Land Use

Golder met with a member of community council (*muhtar azası*) in Aydınlar Village, Binkılıç Forest Sub-Directorate, and the mukhtar of Atatürk neighbourhood. Based on this pre-engagement results and according to the information gathered from the Project Owner and the interviewed people, majority of the project area belongs to the Forestry premises and the rest (4 immovables in 2 turbine areas) is private plots.

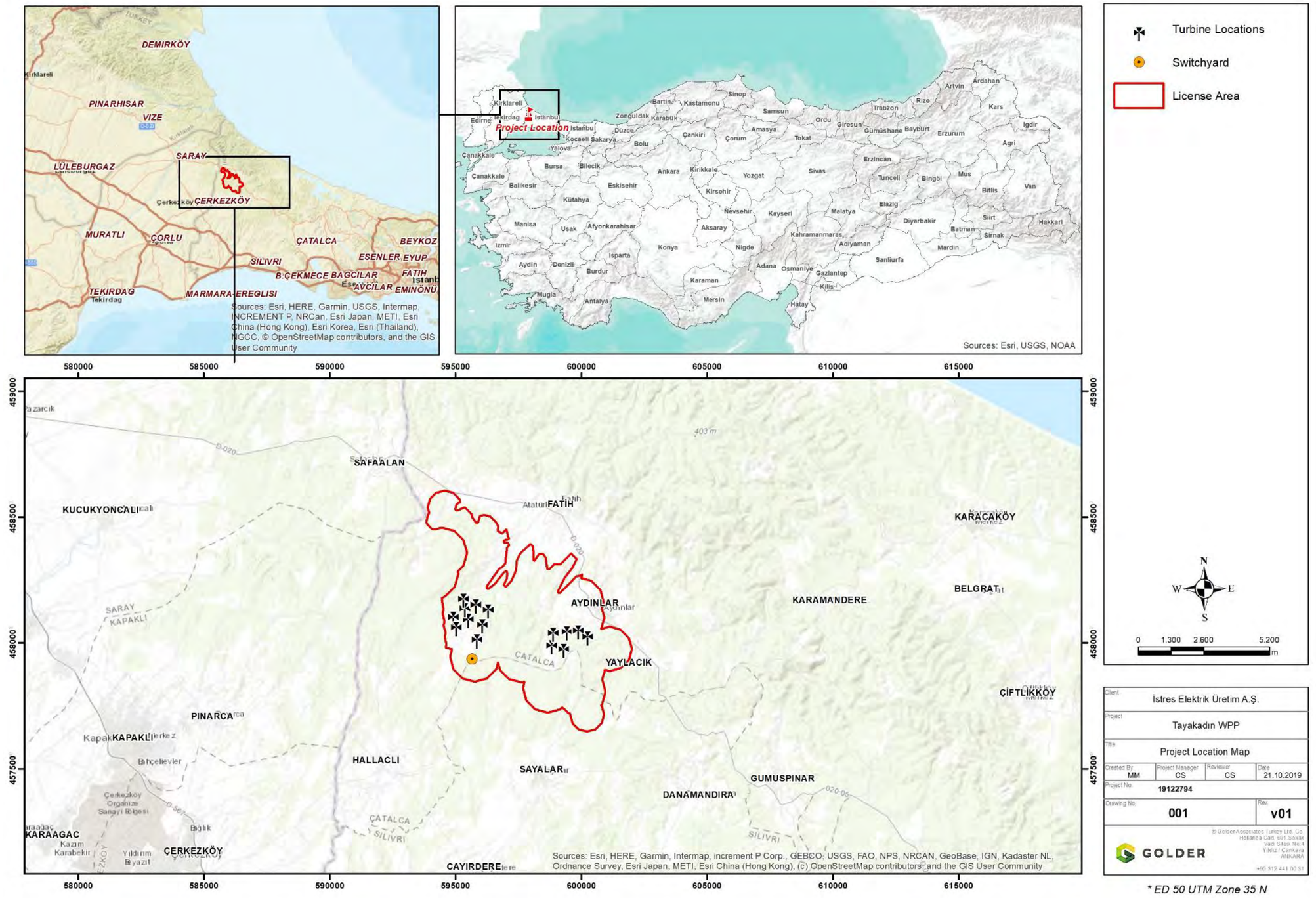


Figure 6: Project Location Map

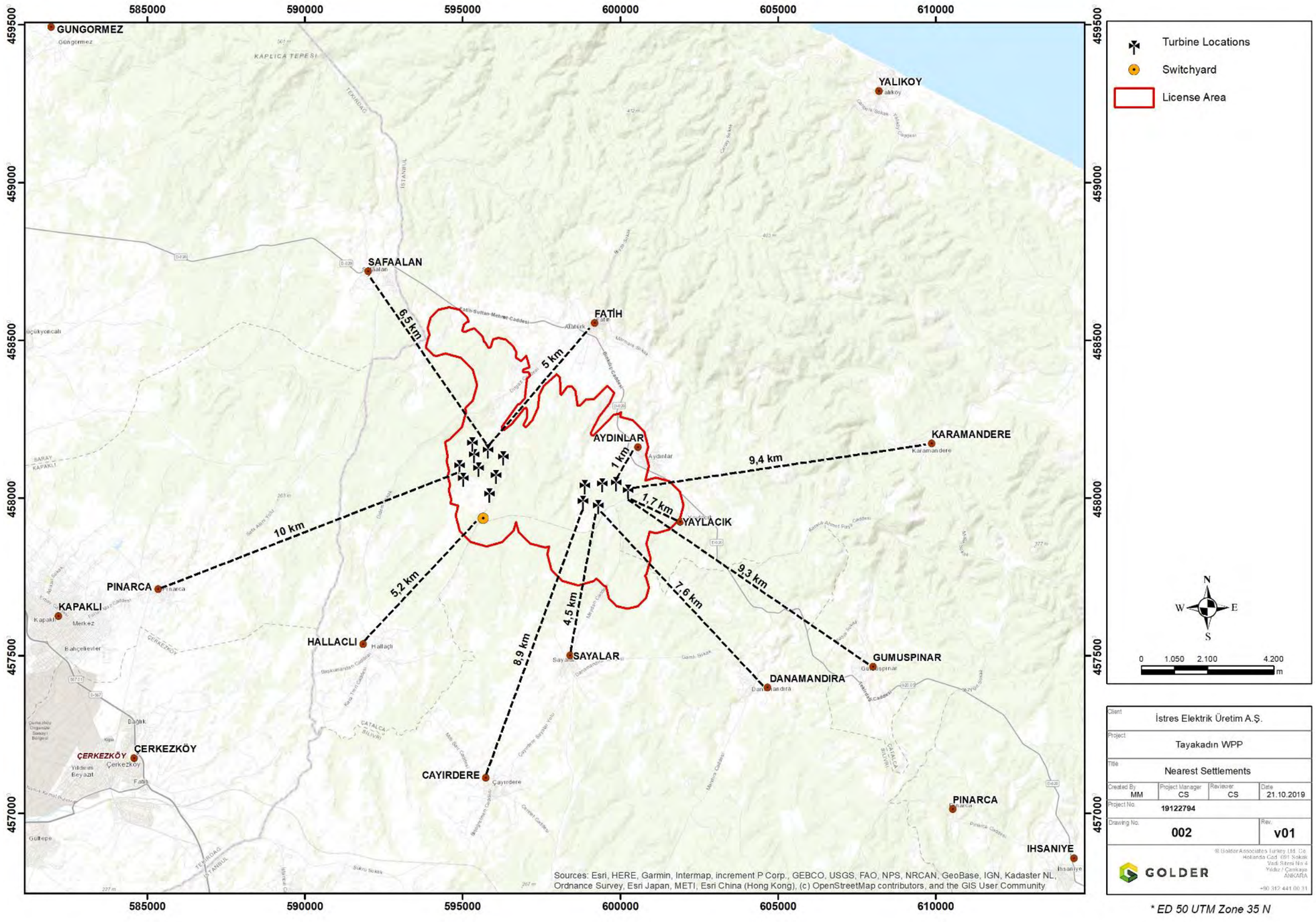


Figure 7: Nearest Settlements

3.3 Project Components

The Project will consist of 15 turbines [(14 x (3.40 MW_m/3.35 MW_e) + 1 x (3.40 MW_m/3.10 MW_e)]. The model of the turbines will be GE 3.4-130 which is a three-bladed, upwind, horizontal-axis wind turbine with a rotor diameter of 130 meters. Technical specifications and performance data of the proposed turbine model is given in table below. Locally produced tower and blades will be planned to used in the Project and the rest of the turbine parts will be supplied from Germany.

Approximately 1.9 km of new roads will be opened to provide access between the turbines and approximately 5.9 km of existing roads will be extended. The remaining roads are existing forest roads will be improved if necessary. Road widths are planned to be 6 m wide. Below figure indicates the Tayakadın WPP planned roads (red lines) and existing lines (green lines).

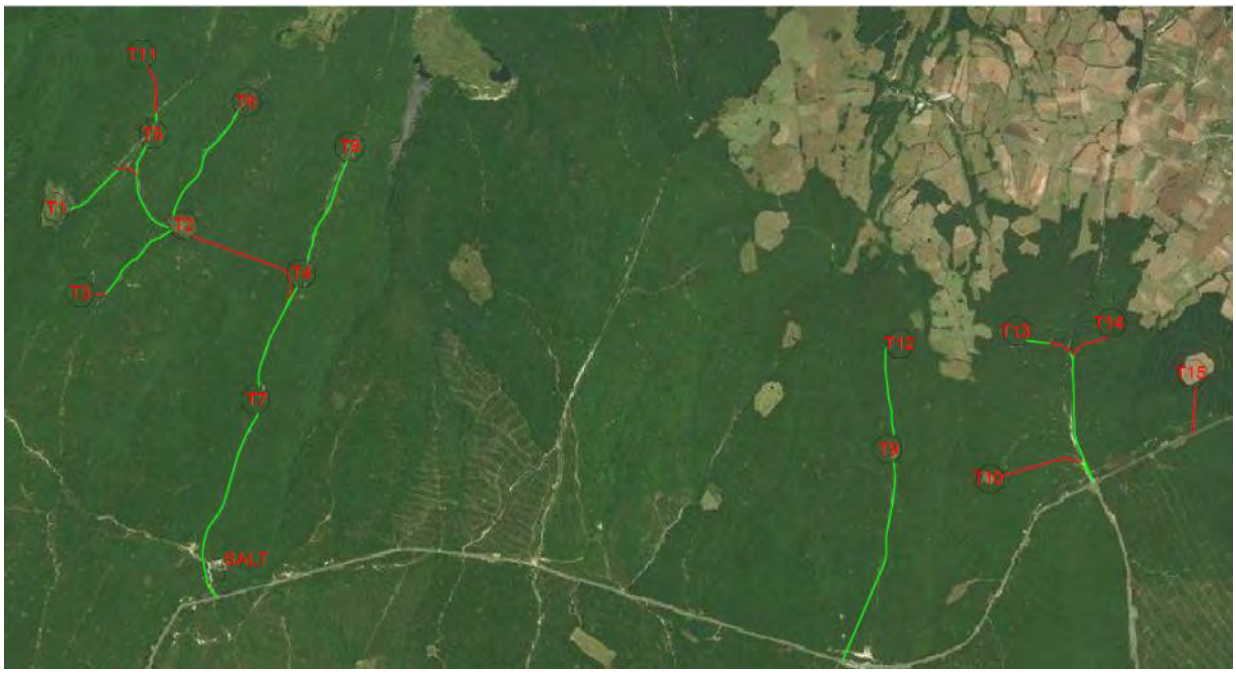


Figure 8 Tayakadın WPP Proposed Roads (red lines: new roads; green lines: existing roads)

The route of the Energy Transmission Line (ETL) is presented in Section 6.1. The route of the ETL has been determined by TEİAŞ. The approval letter from TEİAŞ was obtained at 25.09.2019.

Technical description of the GE 3.4-130 turbines and major components are explained below and summarized in below table.

Rotor

The regulation of the rotor speed is achieved by a combination of a blade pitch angle adjustment and generator/converter torque control. The rotor will spin in clockwise direction. The full blade pitch angle range is approximately 90 degrees which helps to accomplish aerodynamic braking of the rotor, thus reduces the rotor speed.

Blades

There will be three rotor blades on the GE 3.4-130 wind turbines. In order to optimize the noise emissions, it is possible to equip the rotor blades with Low-Noise-Trailing-Edges (LNTEs) at the pressure side of the blade's rear angle (below figure).

Figure 9: View of Rotor Blades

Blade Pitch Control System

The purpose the blade pitch control system is to regulate the speed of the turbine rotor when above rated wind speed. Independent back up is provided to drive each blade and shut down the wind turbine in case of a grid line outage or other fault. Blade pitch control system will be provided for all three blades.

Hub

Three rotor blades are connected to turbine main shaft by the hub and it directly mounted to the main shaft. It can be entered by one of the three hatches at the area close to the nacelle roof.

Gearbox

It is mounted on the wind turbine bedplate and designed to transmit torsional power between the low rpm turbine rotor and high rpm electric generator. The gearbox mounting is designed to reduce the vibration and noise transfer to the bedplate.

Bearings

The blade pitch bearing is designed to allow the blade to pitch about a span-side pitch axis.

Brake System

The blade pitch system is designed to act as the main braking system for the wind turbine.

Generator

Generator is mounted to the bedplate and designed to reduce vibration and noise transfer to the bedplate. It will be a doubly fed induction generator.

Gearbox/Generator Coupling

To protect the drive train from excessive torque loads, a special coupling including a torque limiting device is provided between the generator and gearbox output shaft.

Yaw System

A bearing that is located between the nacelle and tower facilities yaw motion. The system contains an automatic yaw brake which engages when the yaw drive is not operating and prevents the yaw drives from being loaded due to the turbulent wind conditions.

Tower

The tower will be mounted on the top of a tabular steel tower (110 m hub height). There will be; a door at the base of the tower for access, internal service platforms and interior lightning and ladder to access to the nacelle and also supports a fall arrest system.

Nacelle

It is the main component of the wind turbine generator. Access from the tower to the nacelle is through the bottom of the nacelle. Ventilation and illumination is provided. A hatch provides access to the blades and hub.

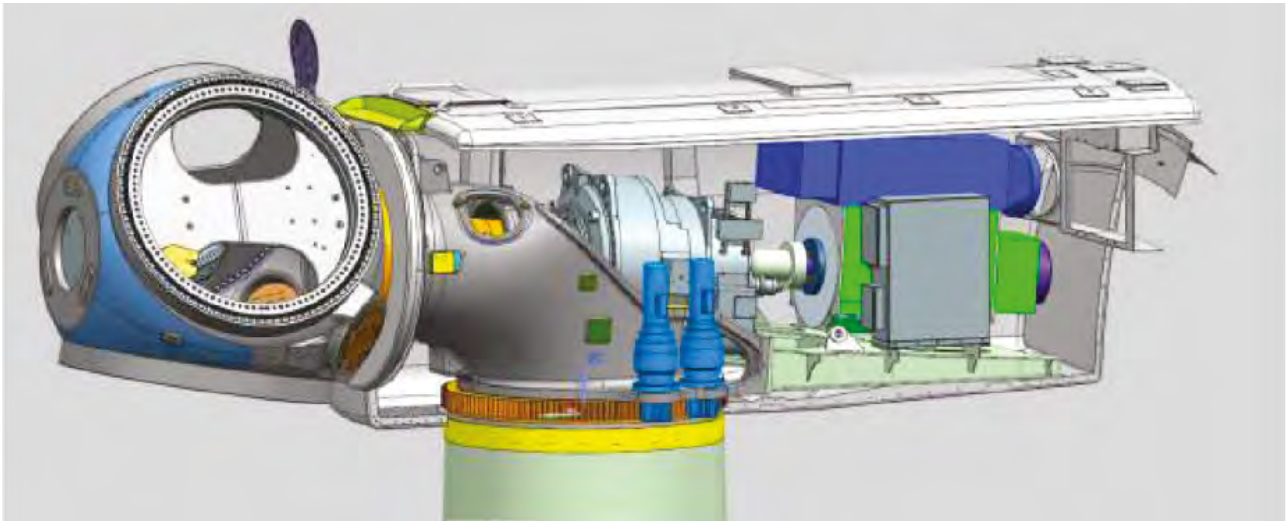


Figure 10: Wind Turbine Nacelle View with Hub Access Hatch Open

Wind Sensor and Lightning Hub

Wind sensor and lightning hub will be mounted on top of the nacelle housing. Access will be though the hatch in the nacelle.

Lightning Protection (According to IEC 61400-24 Level I)

Lightning protection will be mounted on each rotor blade.

Wind Turbine Control System

Wind turbine can be controlled locally. Control signals can also be sent from a remote computer via a Supervisory Control and Data Acquisition System (SCADA) with local lockout capability provided at the turbine controller. Emergency stop buttons will also be placed in the tower base for emergency cases.

Power Converter

The wind turbine uses a power converter system consisting of a converter on the rotor side, a DC intermediate circuit and a power inverter on the grid site.

Medium Voltage Transformer and Switch Gear

Medium voltage transformer and switch gear is used to connect each turbine to the collector.

Table 6: Technical Data of 3.4-130 Wind Turbine

Turbine	GE 3.4-130
Rated output (MW)	3.4
Rotor diameter (m)	130
Number of blades	3
Swept area (m^2)	13273
Nominal rotor speed (rpm)	6.4-12.1
Rotational direction (viewed from an upwind location	Clockwise
Maximum speed of the blade tips (m/s)	82.4
Orientation	Upwind
Speed regulation	Pitch control
Aerodynamic brake	Full feathering
Colour of outer component	RAL 7035 (light grey)
Reflection degree/Gloss degree Steel tower	30 - 60 units measured at 60° per ISO 2813
Reflection degree/Gloss degree Rotor blades, Nacelle, Hub	60 - 80 Gloss Units measured at 60° as per ISO 2813
Reflection degree/gloss degree Hybrid Tower	15-30 Gloss Units measured at 60° per ISO 2813
Tower type	Tubular steel
Tower hub height (m)	110
Tower tip height (m)	175
Switchyard	-
Access roads	1.9 km distance of new access roads to the turbines and switchyard.

3.4 Construction Phase

The construction period of the Project will consist of the following steps:

- Site preparation, mobilization and excavation works for turbines and access roads.
- Assembling of turbines
- Ground cabling

The construction period of the Tayakadın Wind Power Plant Project is planned to be 9 months. The information on machinery and equipment to be used in the construction of the Project is given in below table.

There are already access roads to the turbine and switchyard locations. However, some extension works might be performed in case of need.

It is predicted that approximately 100 people will be employed during the construction phase of the Project.

Table 7: Estimated Number and Type of Equipment to be used in the Construction Phase

Equipment	Total Quantity
Truck	10
Grader	1
Dozer	1
Excavator	8
Crane	7
Water truck	1

For the foundation works, approximately 625 m^2 (25 m x 25 m) of area will be excavated for each turbine. Construction camp is planned to be established near the switchyard area. It is not planned to do any other construction activity other than site access road preparations, turbine area foundation works and administrative building.

The impact assessment of the Project construction phase on physical, biological and social components are explained in Section 8.0.

3.5 Commissioning/Operation Phase

The License period of the Project is 49 years.

Estimated number of employees to be employed during the operation phase is 18 people.

The maintenance process for turbines can be divided in two by planned and unplanned. All planned maintenance works are carried out by the suppliers. On the other hand, unplanned maintenance are carried out instantaneous malfunctions. Planned maintenance is carried out between 3^{rd} – 6^{th} months, 12^{th} – 24^{th} months and 48^{th} months.

Wind power plants do not normally generate process emissions and effluents during the operation phase. Waste production may be expected due to maintenance works. The impact assessment of the Project commissioning/operation phase on physical, biological and social components are explained in Section 8.0.

3.6 Decommissioning/Closure Phase

Decommissioning/closure will not occur for at least 49 years. After the completion of this period, turbines, machineries and equipment will be removed and the used land will be reclaimed. Vegetation of restored areas will be similar to surrounding natural vegetation.

The impact assessment of the Project decommissioning/closure phase on physical, biological and social components are explained in Section 8.0.

3.7 Waste Management

3.7.1 Water Use and Wastewater

Construction

The water supply for construction activities will be from the water tankers of Çatalca or Silivri Municipality.

During the construction phase of the project, maximum 100 workers will be employed, and water demand would be used from these workers. Assuming that daily water demand per capita is 150 L/day (State Planning Organization, 2007), the maximum daily amount of water to be used will be as follows:

Total number of employees: 100

Maximum amount of water to be used by employees: 100 people x 150 L/day/person = 15 m^3/day.

For the dust emission raising from the construction activities, sprinkler (water truck) will be used. Maximum amount of water required for the dust suppression is calculated assuming that 1.5 L of water is required for 1m^2 of surface. Total length of the stabilized roads from the main road to the turbines and switchyard is about 3000 m which will require dust suppression during construction activities. The average width of the stabilized roads was assumed as 5 m. Therefore, the maximum amount of water required for the dust suppression is:

Maximum amount of water to be used for dust suppression: 3000 m x 5 m x 1.5 L/day/m^2 ≈ 22 m^3/day.

Total daily water requirement during construction period: 15 m^3/day + 22 m^3/day = 37 m^3/day.

Drinking water needs of personnel will be supplied by water bottles.

The domestic wastewater generated during construction will be collected in an impermeable septic tank. Maximum daily amount of domestic wastewater will be approximately 15 m^3/day (assuming worst case of; the supplied amount of water is converted to wastewater at a ratio of 1/1 and water used for dust suppression is not converted to wastewater). Wastewater will be collected by sewage truck of Çatalca Municipality or authorised company from the municipality in case of need. For construction phase impermeable temporary septic tank will be used and prior to operation phase permanent septic tank will be designed according to the provisions set in the Regulation on Pits to be Built in Non-Places of Sewage Construction. The design of the septic tank is shown in below figure.

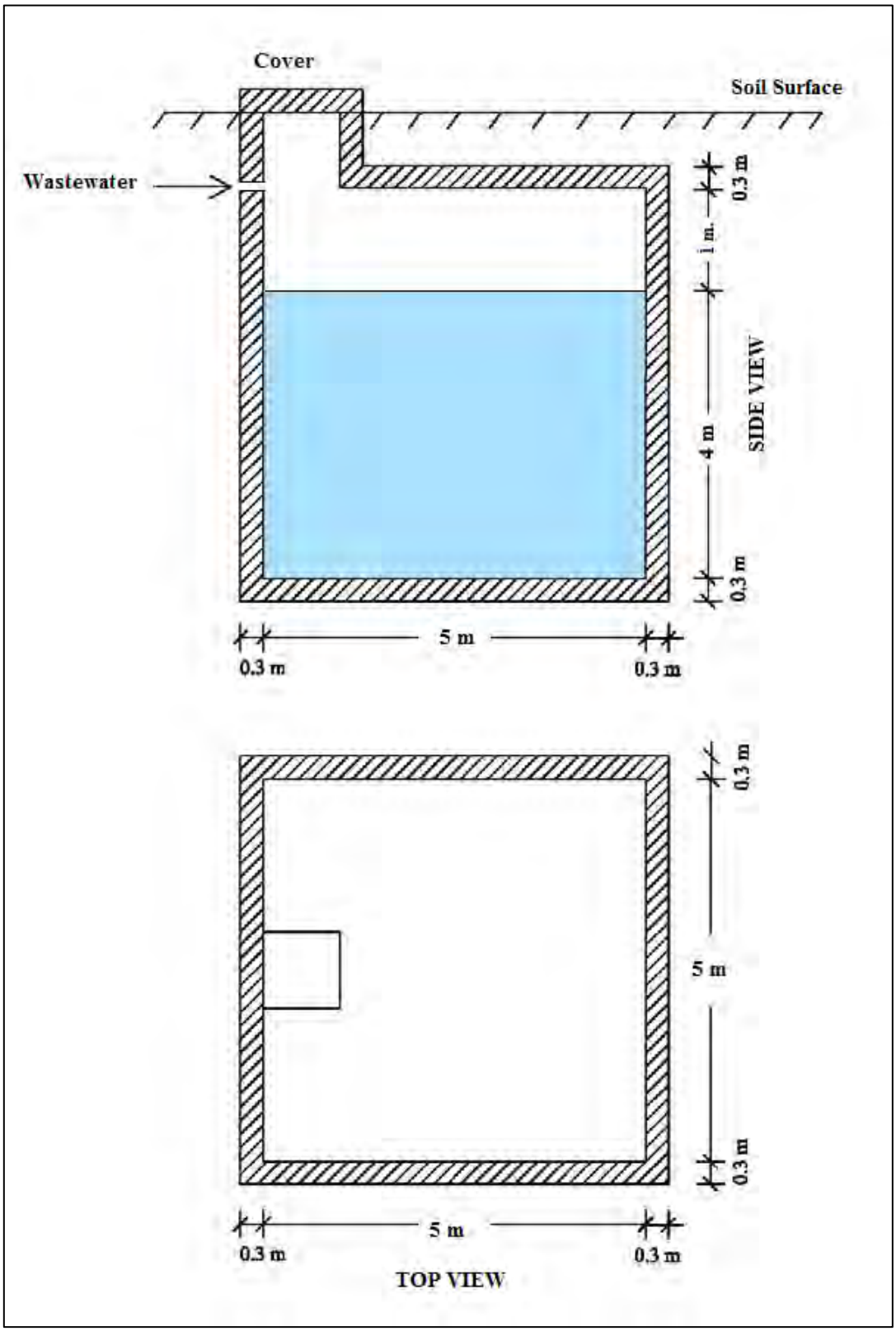


Figure 11: Septic Tank Design

Operation

Wind power plant projects do not require process water. The water requirement during the operation period will only be from personnel needs. It is planned to employ 18 employees during operation period. Assuming that daily water demand per capita is 150 L/day (State Planning Organization, 2007):

Total number of employees: 18

Maximum amount of water to be used: 18 people x 150 L/day/person = 2.7 m^3/day.

Drinking water of personnel will be supplied by water bottles.

Assuming that all daily water consumption will be converted into wastewater, maximum daily amount of domestic wastewater will be approximately 2.7 m^3/day. Wastewater will be collected in the septic tank and will be collected by the sewage truck of Çatalca Municipality or authorised company from the municipality on a regular basis.

Decommissioning

During decommissioning phase, approximately same number of employees of construction phase is planned to be employed. Dust suppression will also be required during the decommissioning phase and it is assumed that same amount of water will be required as in the construction phase. Same control measures of construction phase will be applied during the decommissioning phase for wastewater management.

3.7.2 Solid Waste

Domestic Solid Waste

During all phases of the project, domestic solid waste generation is expected from the daily activities of personnel. During the construction and operation phases, maximum number of employees planned to be employed are 100 workers and 18 workers, respectively. Assuming that daily domestic solid waste per capita is 1.2 kg/person/day[12], the amount of daily expected solid waste production will be as follows:

Maximum amount of solid waste generation (construction) = 100 people x 1.2 kg/person/day = 120 kg/day

Maximum amount of solid waste generation (operation) = 18 people x 1.2 kg/person/day = 21.6 kg/day

During decommissioning phase, approximately same number of employees of construction phase is planned to be employed, therefore similar amounts of waste generation is expected.

Domestic solid waste from the workers will be collected in closed containers located at various points of the construction site area. These solid wastes will be transported to the solid waste collection system belonging to closest Municipality be at certain intervals and be disposed of. Any recyclable solid waste such as plastics, papers, glass etc. will be collected separately on site for recycling purposes. Principles set in the Regulation on Waste Management will be followed in the Project.

Packaging Waste

There would be packaging waste generation from the packaging materials used in the transport of equipment, from the packaging of the materials used and from the personnel in all phases of the project. The packaging wastes e.g. packing paper, plastic and glass bottles will be collected separately from other wastes

[12]Turkish Statistical Institute, 2018 İstanbul Municipality Solid Waste Statistics

without considering material used and the source of the material and should be sent to licensed recycling facilities according to the Regulation on Control of Packaging Waste.

Construction Waste

Recyclable construction wastes such as woods, cement bags, metal scraps are expected to be generated during the construction phase of the project. All recyclable construction wastes will be segregated and collected separately on site and will be disposed by the Municipality or authorized company from municipality.

Excavation Wastes

Excavation soil will be reused on site for the backfilling purposes, therefore additional waste is not expected during the construction phase of the Project.

Hazardous Wastes

The hazardous wastes that are possibly occurred within the scope of the project during construction phase of the project are fluorescent tubes, cartridges, print toners, transformers, paints/varnishes, waste lubricants. These wastes are occurred as a result of machine and equipment usage and hazardous waste produced by domestic usage and other wastes contaminated with these kinds of wastes.

The quantity of the hazardous wastes would be dependent on the activities in the construction sites and it is not possible to give exact information on the amount of the waste at this stage.

According to the provisions in the Regulation on Waste Management, the hazardous wastes would be stored temporarily within the construction site separate from other wastes in a closed environment preventing any chemical reaction. After that, these wastes would be sent via licensed transportation vehicles to hazardous waste disposal companies licensed by the Ministry of Environment and Urbanization.

During the storage of hazardous wastes following provisions will be implemented:

- A record shall be kept on the amount of the waste and packaging and labelling of the waste shall be according to the internationally accepted standards required by the environmentally licensed recycling or disposal facility which will receive the waste.
- The Waste Declaration Form indicated in the Regulation on Waste Management shall be filled and approved every year by the end of March with the previous year's information using the web-based program prepared by the Ministry of Environment and Urbanization and a copy shall be stored for five years.
- The waste would be temporarily stored in durable, leak-proof, safe containers at international standards placed on a concrete or impermeable area away from the buildings of the construction site, there will be hazardous waste labels on the containers, the quantity and the stored date would be indicated on the container, if the containers are damaged, the waste would be transferred to other containers having the same specifications, containers would always be kept closed, and they would be stored so that the waste does not chemically react.
- Hazardous wastes are stored in the temporary storage area for a maximum of 6 months according to Article 13 of the Regulation on Waste Management.
- Regardless of the quantity of hazardous waste temporary storage areas / containers, Dangerous Goods and Hazardous Waste Compulsory Financial Liability Insurance shall be insured in accordance with the provisions of Article 16 of the Regulation on Waste Management.

- All the measures shall be taken for the health and safety of the employees responsible for the collection, transportation and temporary storage of the waste within the facility.
- In order to prevent pollution that happens as a result of accidental spill or by deliberate actions, depending on the type of the waste, location of the incident would be brought to its original condition by latest within a month from the time of the incident. Provincial Directorate shall be informed and a report detailing the accident date, accident location, type and quantity of the waste, cause of the accident, the waste disposal action and rehabilitation of the accident location shall be submitted to the office of the governor.

Waste Batteries and Accumulators

The maintenance process of the vehicles to be used in construction period of the project would be done in authorized services. However, in cases where the maintenance process of the vehicles used in the project are carried out within the construction site area, possible waste accumulators and batteries that come out during construction activities would be stored in a closed containers with a leak-proof floor according to the Regulation on Control of Waste Batteries and Accumulators and batteries shall be delivered to the collection points established by Çatalca Municipality or by the companies distributing or selling batteries and waste accumulators shall be delivered to the temporary storage areas established by the companies distributing or selling accumulator products and maintenance companies.

Within the scope of the project, provisions of the Regulation on Control of Waste Batteries and Accumulators and amendments of this regulation shall be complied with.

Medical Wastes

It is planned to construct an infirmary at the Project Site for first aid treatments. For emergency cases the nearest hospital, medical centres will be used. In case of any medical waste generated in the infirmary will be collected separately in accordance with the Regulation on Control of Medical Wastes. Medical wastes will be collected from site according to the Medical Waste Protocol that will be signed with the Municipality. At a minimum the following control measures will be implemented for the management of medical wastes at Site.

- Medical wastes will be placed inside the red plastic bags which are resistant to tearing, piercing, bursting and carrying; originally from moderate density polyethylene material, with double bottom seam and without pleats, with double ply thickness of 100 microns, with at least 10 kg holding capacity, carrying on both sides the warning symbol of "International Biohazard" and "ATTENTION! MEDICAL WASTE" with at an easily readable size. The bags will be filled at a maximum of 3/4 capacity and closed tightly and when necessary double bagging having the same specifications will be made in order to ensure absolute leak-proofing.
- Medical wastes that have cutting and piercing properties will be collected separately from the other waste in a plastic or laminated cardboard having the same specification as piercing, tearing, breaking and bursting resistant, waterproof and leak-proof, could not be opened or tampered with, having the warning symbol of "International Biohazard" and warning of "ATTENTION! CUTTING AND PIERCING MEDICAL WASTE". These collection containers will be filled at a maximum of 3/4, closed tightly and put into red plastic bags.
- The amount of medical waste that are produced under the scope of the project will be recorded regularly according to the Regulation on Control of Medical Waste, sent to the Provincial Directorate of Environment and Urbanization. This information will be kept for at least three years and kept open to examination of the Ministry upon request.

Waste Oils

The maintenance process of the vehicles to be used in the project would be done in authorized services. If any waste oil is produced in the construction site area, the waste oil shall be collected in a closed temporary waste storage area with leak-proof floor and covered with a shelter. The oil collected would be given to a licensed waste oil recovery company according to the Regulation on Control of Waste Oil.

Gear oil will be used for the maintenance purposes of the turbines during the operation phase. Waste oil drums, barrels will be considered as hazardous waste and will be disposed of in line with the hazardous waste control measures of the Regulation on Waste Management.

The recording of the waste of transported to the licensed facilities shall be in accordance with the legislation including:

- tracking the records of the waste management portal of the Ministry of Environment and Urbanisation.,
- record the amounts produced and fill the Waste Oil Declaration Form in Annex-2 of the Regulation
- send to the PDoEU until the end of February of the following year

Waste Vegetative Oils

Food needs of the Project personnel will be provided by an agreement with a catering company. It is not planned to cook food at the construction site. Therefore, vegetative waste oil generation is not expected at the Site.

Waste Tires

During lifecycle of the project, the maintenance activities of the vehicles and construction machines would be done in authorized services. If there is a need to change the tires of these vehicles and machines in the construction site area, the end of life tires that come out would be sent to tire distribution companies or to the authorized transporters. All provisions in the Regulation on the Control of End of Life Tires would be respected.

Waste Electrical and Electronic Goods

Any waste electrical and electronic good deriving from the project activities shall be taken to the collection places of the distributors, related municipalities, producers or processing facilities in accordance with the provisions of the Regulation on Control of Waste Electrical and Electronic Goods.

4.0 ANALYSIS OF ALTERNTATIVES

4.1 No Project Option

The “No project option” implies that Project will not be realized (i.e. the no go alternative) no construction activities will occur and therefore there will be no positive and negative environmental and social risks connected to the Project. Furthermore no socio-economic benefits would accrue to the nearby communities and the government.

- The Project is planned to provide clean energy in a sustainable and cost effective way which will contribute to the regional and national benefits. A development activity in an area inevitably involves its alteration from the environmental point of view. However, to manage this alteration, an analysis of the Project also considered all the socio-economic elements in question in addition to ensuring the maximum protection of environment by use of latest, state-of-the-art technologies.

Failure to implement the proposed Project would involve the following:

- loss of opportunity to produce clean energy which do not emit any air pollution or greenhouse gases,

- loss of opportunity to create new investment for renewable energy,
- loss of opportunity to create direct employment to workers,
- loss of opportunity to contribute to the national goal of producing 100,000 MW electricity from renewable sources where 20,000 MW is aimed to be produced from wind in 2023.
- The Project is anticipated to contribute to meeting the national electricity demand by approximately 175 GWh electricity on an annual basis with renewable energy.

4.2 Technology Selection

The primary sources of energy production in the world in the order of consumption rates are petrol, coal and natural gas. However, together with the increased population, highly preferred energy sources in the world lead to environmental concerns. The importance of renewable energy sources has started to increase in line with the increased tendency and sensitivity on reducing global warming.

Wind power which is the proposed energy production technology in this Project is one of the renewable energy sources (e.g. solar, geothermal, hydro and some forms of biomass). The reasons of the wind power technology selection in the Project can be listed as follow,

- The wind potential of Turkey is very valuable and it plays an important role in fighting global warming.
- According to Electricity Market and Supply Security Strategy Document published in 2009, it is aimed to produce 100,000 MW electricity from renewable sources where 20,000 MW is aimed to be produced from wind in 2023.
- Investment on wind power will reduce the import dependency and provides national benefit.
- Wind power plant projects do not emit any air pollutants unlike fossil-fuel power plants.
- The technology and operation are relatively simple.
- Investment cost is competing with fossil-fuel power plants.
- Maintenance and operation cost are relatively low.
- Wind turbines do not require too much space compared to fossil fuel plants. Therefore, the technology minimizes the land usage.

Considering the above mentioned advantages, the technology preferred in the production of energy in the Project is wind power.

4.3 Location Selection

The amount of available wind is the determining factor of potential maximum energy that can be generated on a specific site since wind, as a resource, varies both geographically and temporarily.

According to the natural wind energy potential data of State Meteorological Directorate, the Project site is located in the moderate wind range (wind speed distribution of 5.5-6.5 m/s) on the Wind Map of Turkey. In addition to the national data, additional wind assessment studies have been conducted at the Project site and has showed that the long-term mean wind speed is suitable for the construction of the wind turbines at the Project location. Therefore, based on the national data and site specific studies, the Project site was selected in İstanbul Province near Çatalca and Silivri District to utilize the potential wind energy in this region.

5.0 STAKEHOLDER ENGAGEMENT

5.1 Stakeholder Engagement Plan

A specific Stakeholder Engagement Plan has been prepared for the Project.

5.2 Stakeholder Management Activities Realised

As a part of the engagement activities, a public participation meeting was held on 13.10.2015 by İstres in the wedding saloon in Aydınlar Village in İstanbul. Participants did not raise any major concerns during this meeting. Participants asked about any studies conducted about noise.

During the site visit conducted in July 2019 Golder met with a member of community council (*muhtar azası*) in Aydınlar Village, Binkılıç Forest Sub-Directorate, and the mukhtar of Atatürk neighbourhood.

As the first step, Golder will combine the site visit information gathered on the visit conducted in July 2019 and incorporate with desktop-based research data and verify accordingly.

As the second step and primary part of the ESIA studies, consultation meetings will be held during baseline data collection studies in October 2019. During these activities, in-depth and stakeholder interviews, as well as focus group discussions (FGDs) will be held. A household-based survey will not be required for the following reasons:

- The project site is in a forest area that is not used for any livelihood activities or access to ecosystem services.
- There are only 4 parcels in two turbine areas belonging to private premises. Owners and/or heirs of these 4 parcels will be already included in the field study and following monitoring activities.
- The nearest settlements are too far in vicinity to be directly impacted from the WPP.

Details of the questionnaires are given in the Stakeholder Engagement Plan prepared for the project.

6.0 IMPACT SCREENING AND DEFINING OF THE VALUED ENVIRONMENTAL AND SOCIAL COMPONENTS

6.1 Identification of Area of Influence

The Project Site is located in İstanbul Province in the north-western region of Turkey. The area of influence of the Project is the area in which a direct or indirect impact on the biological, physical and social components might occur. A Study Area (“SA”) is defined for each environmental and social component.

The terrestrial SA is defined as follow for different components (See figure in below):

The SA is expected to encompass the area affected by all potential environmental impacts (e.g. noise, terrestrial flora and fauna and air quality impacts), and it is consistent with the methodologies adopted by other studies of similar projects.

Physical components’ area of influence is determined in accordance with the closest sensitive areas like Binkılıç, Aydınlar and Yaylacık Quarters. Study area of shadow flicker and visual impacts are determined as 5 km x 5 km buffer zone of the project area. The area of influence for Soil, hydrogeology and geology is determined as the footprint area of the project. Study area of noise and air components are 6 km x 6 km and 6 km x 6 km buffer zone of the project area respectively.

With reference to the Social components a Social Study Area is identified based on socio-economic and administrative considerations and includes the province of İstanbul, the Çatalca and Silivri districts and more specifically Binkılıç, Aydınlar and Yaylacık Quarters. For some components like the visual impacts, the SA is identified and have a size depending on the landscape features.

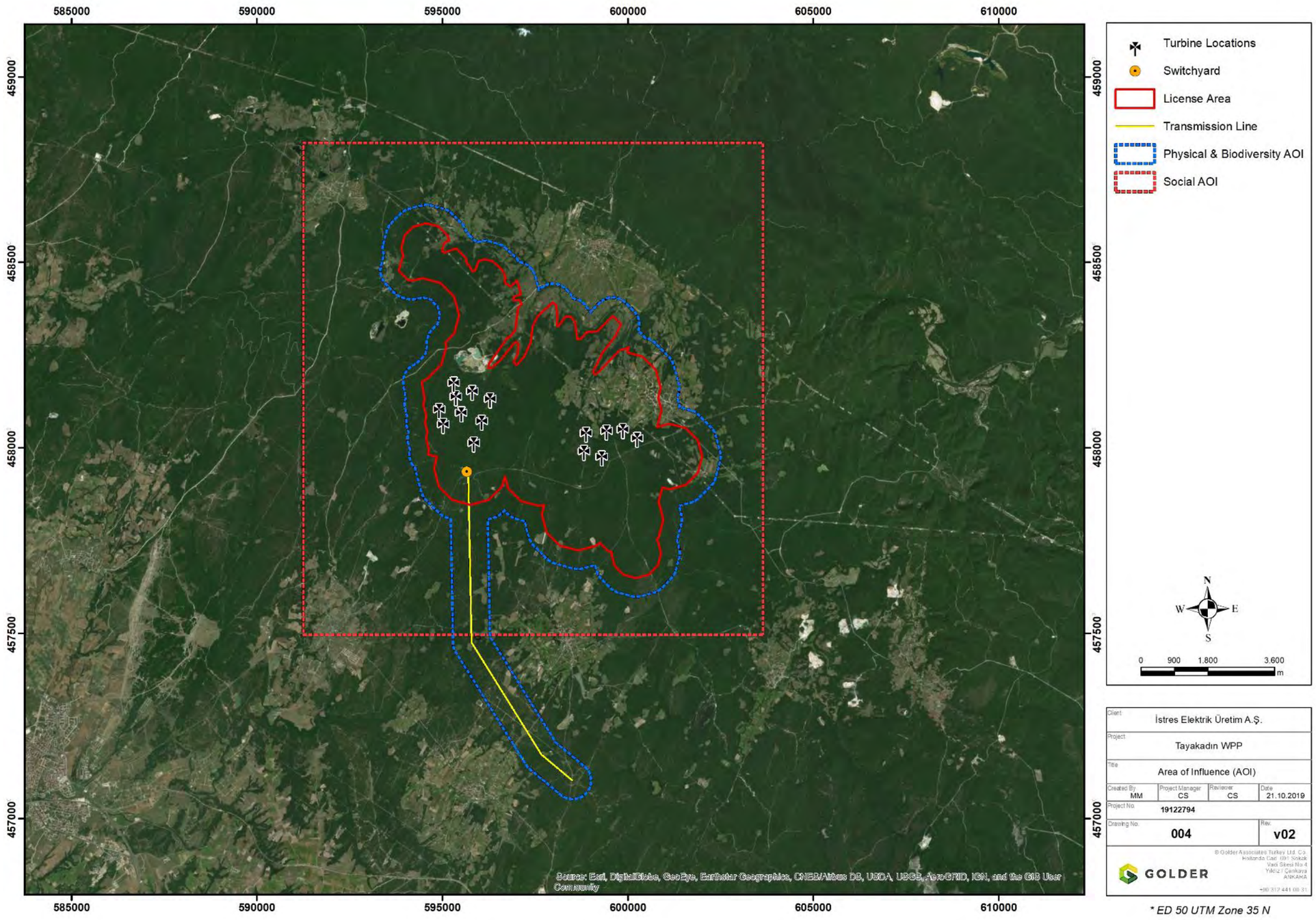


Figure 12: Area of Influence

6.2 Identification of the Project Actions

Activities or project actions that could potentially contribute to environmental or social changes during the construction, operational and decommissioning phases have been identified from the project description and from the documents provided by the Client. Project actions which can interfere significantly with the environment are listed below for each phase.

Construction phase

- Surface levelling and grading
- Temporary stockpiling of material
- Transport of construction material
- Assembling
- Disposal of waste deriving from construction

Operation phase

- Disposal of waste
- Operation of the facilities

Decommissioning/Closure phase

- Disassembling
- Disposal of waste deriving from disassembling
- Transport of dismantled material
- Land reclamation and restoration

6.3 Identification of the Components

After the identification of the Project actions, in order to identify the components potentially impacted by the project actions, matrixes have been created to link environmental, biological and social components to Project actions. Based on information made available from the Client or coming from the public consultations during the ESIA preparation, the matrices would have been revised and reported below.

Table 8: Matrix for Physical Components

Project Phases	Actions	Geology and Geomorphology	Air quality	Noise and vibration	Hydrogeology and groundwater quality	Soil and subsoil	Hydrology and surface water quality	Traffic and infrastructures
Construction phase	Surface levelling and grading	■	■	■		■		■
	Temporary stockpiling of material	■				■		
	Transport of construction material	■	■	■		■		■
	Assembling of turbines			■				■
	Disposal of waste deriving from construction		■	■	■			■
	Increase of water needs and wastewater generation				■		■	■
Operational phase	Disposal of waste		■	■	■			■
	Operation of the facilities			■				■
Decommissioning/Closure phase	Disassembling			■				■
	Disposal of waste deriving from disassembling			■				■
	Transport of dismantled material		■	■				■

Table 9: Matrix for Biological Components

Project Phases	Actions	Terrestrial Flora	Terrestrial Fauna	Terrestrial habitats	Protected Areas and internationally recognized areas
Construction phase	Surface levelling and grading				
	Temporary stockpiling of material				
	Transport of construction material				
	Assembling of turbines				
	Disposal of waste deriving from construction				
Operational phase	Disposal of waste				
	Operation of the facilities				
Decommissioning /Closure	Disassembling				
	Disposal of waste deriving from disassembling				
	Transport of dismantled material				
	Land reclamation and restoration				

Table 10: Matrix for Social Components

Project Phases	Actions	Demographic profile and land use, Employment and socio-economic conditions, Social capital	Health issues and facilities, Education issues and facilities	Cultural Heritage
Construction phase	Surface levelling and grading			
	Temporary stockpiling of material			
	Transport of construction material			
	Assembling of turbines			
	Disposal of waste deriving from construction			
Operational phase	Disposal of waste			
	Operation of the facilities			
Decommissioning/Closure	Disassembling			
	Disposal of waste deriving from disassembling			
	Transport of dismantled material			

6.4 Identification of the Impact Factors

Project actions could potentially determinate, during the construction and operational phases, impacts factors able to interfere positively or negatively, in a direct or indirect way, on the components. Based on the components and Project actions previously listed, the preliminary main impact factors identified as:

- Changes in the local morphology
- hydrological and hydrogeological change
- surface water pollution and surface water run-off
- groundwater pollution
- topsoil and lower soil removal
- pollutant emissions to the soil
- increasing of artificial surface
- pollutant and dust emission in the atmosphere;
- emission of noise and vibrations;
- occupation of land;
- need of workforce;
- use of goods and services;
- demand for housing;
- unsatisfied occupational expectations;
- use of local infrastructures;
- increased road traffic;
- landscape features alteration;
- changes to land property and land use;
- introduction of alien species
- creation of waste; storage, transportation and disposal;
- shadow flicker;
- blade/ice throw;
- presence of vertical structures and rotating blades.

In order to show the correlation among the project actions, the impact factors for different phases and the single components potentially impacted, the correlation matrices have been created and presented in below.

The correlation between impact factors and the components are given in below table.

Table 11: Matrix for Physical Components and Impact Factors

Components	Impact Factors
Geology and Geomorphology	Changes in the local morphology
Seismology	-
Hydrology and Surface Water Quality	Hydrological change Surface water pollution Surface water run-off
Hydrogeology and Groundwater Quality	Hydrogeological change Groundwater pollution
Soil and Subsoil	Topsoil and lower soil removal Pollutant emissions to the soil Occupation of land
Climate and Meteorology	-
Air Quality	Pollutant and dust emission to the atmosphere
Noise and Vibration	Emission of noise and vibration
Traffic and Infrastructure	Increased road traffic

Table 12: Matrix for Biological Components and Impact Factors

Components	Impact Factors
Terrestrial flora	Vegetation and top soil removal Disruption of natural morphology and hydrology Emission of gaseous pollutants and dust in the atmosphere Introduction of alien species
Terrestrial fauna	Vegetation and top soil removal Disruption of natural morphology and hydrology Emission of gaseous pollutants and dust in the atmosphere Introduction of alien species Emission of noise and vibration
Terrestrial habitats	Vegetation and top soil removal Disruption of natural morphology and hydrology Emission of gaseous pollutants and dust in the atmosphere Introduction of alien species Emission of noise and vibration
Protected and internationally recognized areas	-

Table 13: Matrix for Social Components and Impact Factors

Components	Impact Factors
Demographic profile, socio economic conditions and employment issues, land use	changes to land property and land use increased road traffic demand for housing use of goods and services
Social services and facilities	unsatisfied occupational expectations
Infrastructure	increased road traffic use of goods and services
Cultural heritage	-
Visual aesthetics	presence of vertical structures and rotating blades

7.0 ENVIRONMENTAL AND SOCIAL BASELINE

As a first step of the overall impact analysis methodology a definition of the current state or quality of the different environmental and social components potentially impacted based on the results of the baseline studies is required.

According to IFC guidelines and EBRD's Environmental and Social Policy (2014), baseline studies should identify any relevant condition associated with existing project that could be impacted by the project to be financed and could lead to cumulative impacts. Baseline studies of biodiversity resources provide a reference point against which any future changes associated with a project can be assessed and offer information for subsequent monitoring of biodiversity performance.

The baseline data are collected through literature survey and desktop studies and be supported by data collection at site. The literature sources that is to be referred are (but not limited to);

- Turkish Statistical Institute
- Ministry of Environment and Urbanization database
- Related Municipalities

Additional site data collection is performed for physical, biological and social components. The methodology of the baseline data collection and the analysis of baseline data for each component are explained in sections below.

7.1 Physical Components

7.1.1 Study Area

The study area of physical components is presented in Section 6.1.

7.1.2 Sensitivity Assessment

Based on the information collected with the methodology described in each physical component section, the sensitivity of the component was determined according to the following definitions. A physical component, as general approach, has:

- **high sensitivity** when it has an attribute with a high quality and rarity on an international, regional or national scale with little or no potential for substitution;
- **medium sensitivity** when it has an attribute with a high quality and rarity on a local scale with little or no potential for local substitution, or with a medium quality or rarity on a regional or national scale with limited potential for substitution;
- **low sensitivity** when it has an attribute with a medium quality and rarity on a local scale with limited potential for substitution, or an attribute of low quality and rarity on a regional or national scale;
- **negligible sensitivity** when it has an attribute of low quality and rarity on a local scale with potential for substitution locally

7.1.3 Geology and Geomorphology

Study area for this component is chosen as the licence area and presented in Section 6.1.

Geology and geomorphology baseline conditions have been assessed through desktop studies and literature data review.

A Geological and Geotechnical Investigation Report (herein after called as Geotechnical Report) prepared for the Project in May 2019. The geotechnical investigation was conducted for the 35.22 ha area in the Çatalca District of the İstanbul Province. This investigation carried out to register the Project Area as wind power plant area. The field and laboratory studies were carried out in the Project Area.

The geological and geotechnical information given in the following sections (regional and project area geological characteristics) are mainly derived from Geological and Geotechnical Investigation Report prepared for the Project.

The study area is located in Çatalca District of Istanbul Province and is located between Hallaçlı and Sayalar neighbourhoods. The study area covers a total area of 35.22 hectares and is one of the western settlements of Istanbul. The surrounding settlement are:

- East: Arnavutköy
- West: Çerkezköy
- South: Silivri and Büyükçekmece

The field survey was conducted between 05-08 May 2019 and drillings and test pits were opened and seismic refraction-masw and microtremor measurements were carried out in the Study Area.

7.1.3.1 Regional Geology

Project area is located in Çatalca District of İstanbul Province.

The 1/100.000 Scale Geological Map of the Study Area and description of units are presented in Figure 13.

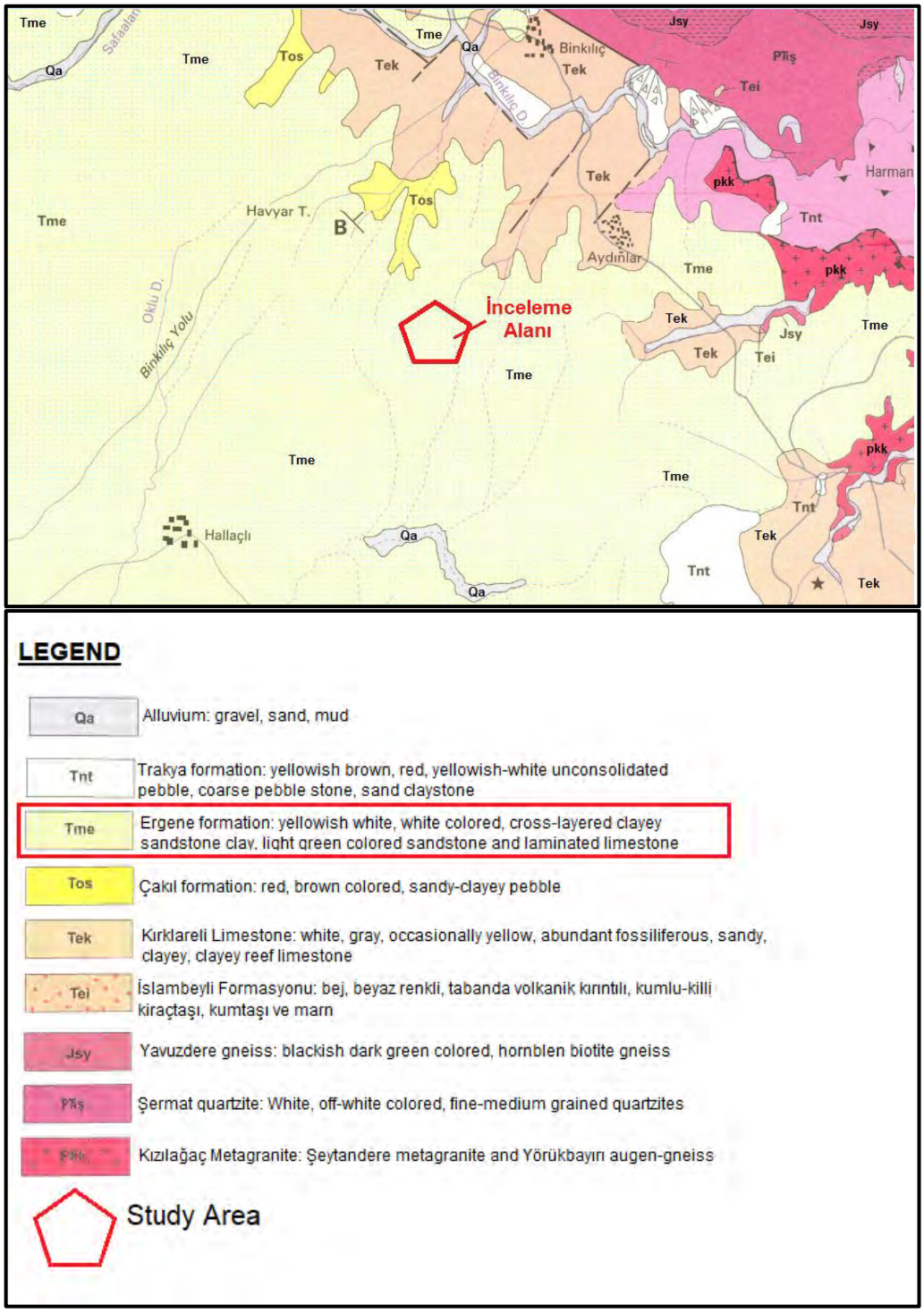


Figure 13: 1/100.000 Scale Geological Map of the Study Area[13]

Kızılağaç Metagranite (Pkk)

Gneissic-granite; pinkish-grey or pinkish-white coloured, containing sparsely distributed coarse-grained microcline crystals and K-feldspar porphyroblasts. Disorderly foliated, cataclastic sections are similar to texture of Schist from Şeytandere Metagranite.

[13] Geological and Geotechnical Investigation Report, May 2019

Since characteristic outcrops can be observed along Kömürköy-Kızlıağaç road, Kızılağaç name was given to the unit. Kızılağaç Metagranite has pinkish-grey or orangish-white colour and mostly gneissic character. The amount of pink coloured K-feldspar crystals decides its colour. Some parts where intensely contain biotite minerals, appear greenish-black banded colour. Gneissic-leucogranite and lineation can be observed from place to place. Fresh granitic texture consists of microcline, quarts with rare biotite and white mica. Most of the primary contacts cannot be observed, it is tectonic.

Şermat Quartzite (PTrş)

Quartzite; white or light grey or tattletale grey coloured, weathered to grey. Slip surfaces contain white mica, quartzite with rare feldspar. Regions with distinct foliations can be observed. Some parts where catalysis does not occur, are light green or light grey coloured, massive, grainless and plate shaped.

Some sections of outcrops of Şermat Quartzites located in north-western part of Çamlıköy (Kastro) are white coloured, easily degradable, well sorted Quartzites containing schists and others are light green or bluish green coloured plate shape Quartzite with feldspar.

Şermat Tepe is the best place where Şermat Quartzite can be observed. It is located 6 km east of Bahçeköy and 12 km (air distance) away from Safaalan village. Quartzites have transitive relation with Çiftlikköy Quartz-schist, which is red, orange, purplish, greenish grey coloured in west of Çiftlikköy and Binkılıç village.

Yavuzdere Gneiss (Jsy)

Yavuzdere Gneiss is one of the three members of Sivriler Meta-granodiorite. Gneiss; mostly formed by quartz, albite, perlite, hornblende and biotite. Epidotization, serizitization of feldspars and neomineralization of chlorite, muscovite and felsic minerals can be observed due to intense shearing. The unit is Jurassic aged.

Contact Metamorphic Rocks

Istranca Massif is the Istranca group of Metamorphic rocks. Cross-cutting relationship can be observed with Lower-cretaceous aged intrusive rocks. Contact metamorphic rocks are formed by metamorphism of narrow and wide regions at the contact zone. Intrusion of magmatic rocks causes skarn zones, silicifications, garnet and epidote feldspars, recrystallization at marble contacts and skarn deposits.

Contact zones of Mahya Schist comprise of hornfels, baked zones, red soil zones with limonitization and silicification and Karayokuş Schist with andalusite and cordierite (Çağlayan et. al., 1990). A sample taken from Karayokuş Schist has poorly developed foliations, idiomorph andalusite porphyroblasts and pyritized cordierite. Contact zone of Dolapdere formation with Dereköy intrusion presents coarse grained marbles and skarns with saccharoidal texture. On the other hand, hornfels, garnetfels and epidotefels can be observed contact zone of Mahya Schists with Dereköy intrusion.

Granites, epidotefels, garnetfels, hornfels and variegated schists are formed in contact zones of Dolapdere formation and Mahya Schists with Demirköy intrusion. These formations can be observed in north-western side of Gökyaka village.

Epidotefels and hornfels are located in east of İncesırt village, whereas epidotefels, garnetfels, baked zones with red soil are presented along the road between Balaban and Demirköy. Contact zone between intrusion and Mahya Schists, there are hornfels, silicified banded hornfels.

İslambeyli Formation (Tei)

İslambeyli Formation comprises of alternations of conglomerate, sandstone, clayey-limestone and sandy-limestone; sandstone and marl. İslambeyli formation was named by Keskin (1996) for the first time. It overlies metamorphic and granitic bedrock by transgression. Formation is overlain by Kırklareli Limestone along the

bottom of Tertiary Basin. Thickness of the formation is variable; while it is thick in the valley, it is very thin or not visible at the edges of the basin.

Bottom of İslambeyli Formation is fluvial sediments which are poorly sorted, angular gravels or coarse sands. These fluvial sediments underlie alternations of yellow, grey coloured, carbonated cemented, hard sandstone, claystone, clayey-limestone, marl and limestone.

The age of the formation is accepted as Upper Eocene.

Kırklareli Claystone (Tek)

Kırklareli Limestone which has interference with sandstone and claystone was identified by Keskin (1996). It contains macro and micro fossils in abundance. Kırklareli Limestone is represented by reefal limestone at surroundings of Domuzdere and Muratbey villages which are situated north of Çatalca.

Kırklareli Limestone overlies İslambeyli formations around Kıyıköy, Akalın, İhsaniye, whereas it overlies Çukurpınar Calc-Schist member and Clayey-Schists of Mahya Schist at north of Çukurpınar.

The age of the formation is accepted as Mid-Upper Eocene.

Çakıl Formation (Toç)

Çakıl formation are comprised of conglomerates which have channel fill properties, including claystone-sandstone lenses. It can be observed at north of Silivri and Güzelce village and south of Kurfalı and Akören villages. It is overlying or interfering with Danişmen formation.

Conglomerate; yellowish-brown coloured, poorly sorted, rounded, including quartzite, granite, gneiss, chert, rhyolite and tuff, medium-well laminated, hard, carbonate cemented. It has yellow coloured, cross bedded sandstone and greenish yellow coloured claystone lenses.

Ergene Formation (Tme)

Ergene formation involves cross-bedded loose sandstones with clay, claystone and limestone lenses. It is common in Trakya basin, especially middle of the basin. Ergene formation discordantly overlies metamorphites at the north of Karamandere; İhsaniye formation at the west of İhsaniye and south of Yalıköy; İslambeyli formation at the south of Yalıköy; Süloğlu formation at the south of Bekirli village; Danişmen formation at the north of Kurfallı. Ergene formation overlain by Trakya formation at the north of Çiftlikköy.

Ergene formation consists of generally white, yellowish white coloured, cross-bedded sandstones and partly clayey-sandstone, reddish-greenish claystone, clay and conglomerate lenses. It is porous and medium-well sorted.

The age of the formation is accepted as Upper Miocene.

Trakya Formation (Tnt)

Trakya formation comprises of loose and coarse gravel, sandstone and sparse claystone.

The age of the formation is possibly Upper-Miocene according to its stratigraphic position.

Alluvial Deposits (Qa)

Small and shallow outcrops of alluvial deposits are situated in the bottom and the entrance of the valley. It can be observed commonly in basins of İğneada, Mert Gölü and Erikli Gölü.

The largest alluvial deposit areas are located in the east of the field such as Karamandere, Karacaköy, Ormanlı and Terkos Gölü basins. Another large alluvial deposits area, Büyükçekmece basin, is situated at the east of Çatalca.

Generalized Stratigraphic Sequence of the Study Area derived from MTA F-20 map sheet is presented in Figure 14.

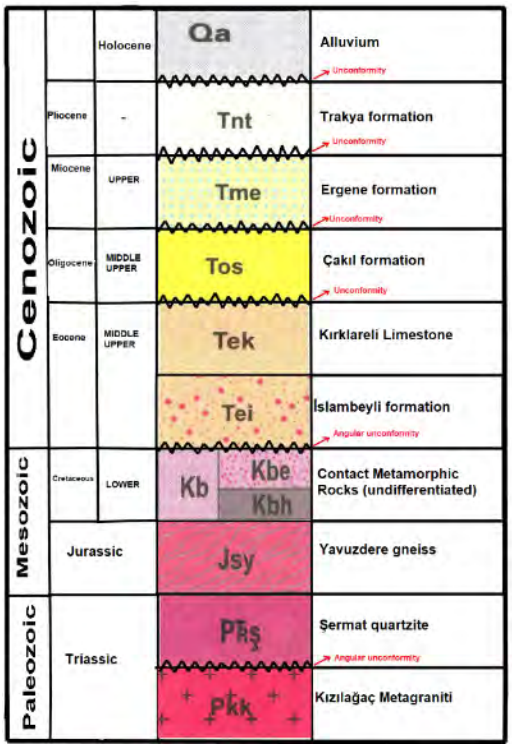


Figure 14: Generalized Stratigraphic Sequence of the Study Area[14]

Structural Geology[15]

In the Jurassic, left-lateral rotational movements can be observed in the areas between the NE-SW trending right-lateral Doğu Trakya Fault and Çatalca Fault that are strike-slip faults. As a results of this right-lateral force pair, basement rocks, granite and gneiss, which are located in western and southwestern side of the Istranca Massif thrusted over north/northeast and the cover rocks which are located in eastern and north-eastern side of the massif thrusted over south/southwest. The thrust planes extending approximately parallel to the fold axis plane of the basement rocks in the western part of the massif lead to the development of cataclastic deformation specific to the shallow area and resulting in curved structures in the deeper parts of the massif.

Parallel to the mentioned two faults, there are three more faults located in north of the Sergen Fault. First, the fault which controls southern side of the Demirköy intrusion. Secondly, a multi-fault system which directs Miocene and Plio-Quaternary sediments located in extensive areas of Mert lake and its northern side. Finally, the northernmost fault of the NW-SE faults specifies the boundary between Upper Cretaceous units and the older rock units. This fault is mostly a normal fault which has steep slope and dipping towards south. The southernmost part of the massif, around Çatalca, there exists two parallel faults. The one, which is located in the north, controls development of Büyükçekmece Lake.

[14] Geological and Geotechnical Investigation Report, May 2019

[15] Geological and Geotechnical Investigation Report, May 2019

NE-SW Trending Normal Faults

The second fault system which affects the massif is NE-SW faults which are perpendicular to NW-SE step fault system. These faults caused the massif to take its present for and lead to the formation of the Black Sea and the development of the Trakya Basin (Çağlayan et. al. 1988, 1992; Çağlayan, 1996). The most important of these faults are Kırklareli Fault (Çağlayan et. al. 1988, 1992) and Çatalca Fault (Çağlayan, 1996).

Kırklareli Fault

Kırklareli Fault starts from the Bulgarian border and disappears under Tertiary aged rocks in Kırklareli. It is not in the form of single fault but rather in the form of multi-faults spread over the area between Kulaköy, east of Erikler village, Dereköy and Kadıköy. It shows continuous interruptions and jumps. The fault system caused abrupt discontinuations of the units, rotation of foliations, descending and ascending of fold axes, rotation and translation. It has ductile characteristic (Ramsay and Graham, 1970). The most important data about the fault is the presence of the gulf which was determined under favour of Eocen aged sediments near west of Kırklareli, Dolhan village. (Sancar Kasar verbal statement, 1988).

The presence of this fault can also be observed in Dereköy Intrusion. The early stage rocks of Dereköy Intrusion; tonalite-porphyry, granodiorite-porphyry and quartzdiorite-porphyry, intruded between the fracture zones (N30-40W). Monzonite and porphyry dikes have intruded in N-W direction during the final stage. The predominant slip of the fault system is right lateral.

Çatalca Fault

The second most important fault of the system is the Çatalca Fault which breaks the Çatalca Massif from the Istrance Massif and shifts it towards southwest. The net slip which has steep slope, is about 3 km long. The age of the fault is determined as Jurassic (Çağlayan 1996).

Çatalca Faults and other parallel faults have shaped the Black Sea and Trakya Basin. There are several NE-SW directional parallel minor faults in between Çatalca Fault and Kırklareli Fault, especially around İğneada, Serves Burnu, Keçikaya, Kıyıköy and Podima. Most of them are right-lateral faults and have 5-10 m net slip. Intrusion of Mesozoic aged granitoids and Jura aged flishoids which are belonged to Demirköy Intrusion, were controlled by the mechanism of these faults.

NW-SE Trending Normal Faults

Starting from the Bulgarian border and extending up to the Çatalca area, the NW-SE trending fault system, which contains five parallel step faults, caused the Palaeozoic basement to disintegrate and the sea to deepen towards north-northeast. The direction components of these faults could not be determined in the field. However, occurrence of translational movement and right-lateral component can be expected as a result of NE-SW trending strike slip faults which are kinematically second fault system. The most important of the NW-SE trending normal faults is the Sergen fault.

Sergen Fault

Sergen Fault starts from Bulgaria and it is firstly observable around Malkoçlar Köyü in Turkey border. There is no trace of the fault in Kocayazı village only small fragments of it. It appears again in the vicinity of Kapaklı and then disappears under the Tertiary units around Kömürköy. The distance to Sergen fault is about 66.6 km from the border. It has the militonic zone about 50 metres around Sergen. It is a normal fault and its lateral component has not been clearly identified.

The Sergen Fault divides the Istrance Massif into two parts which are stratigraphically, structurally and morphologically different than each other. Although, the basement rocks of Istranca Massif are situated in

western side of the fault, Mesozoic rocks are situated in eastern part of the fault and they are almost parallel to the fault. In the western side of the fault, direction of thrusts in the massif and the between the massif and surrounding rocks are towards north; In the eastern side, except Dubnisa cave, direction of the thrusts are towards south/southwest.

Moreover, Mesozoic aged magmatic intrusions were not observed in the western part of Sergen Fault. As a result of descending of the eastern section of the Sergen fault or relatively ascending of the massif in the western section, watershed was identified. While streams located in eastern side of the fault flow generally towards Black Sea Region in the east, streams located in western side of the fault flow Trakya Basin in the west.

Another fault system parallel to the Sergen Fault is situated in 8km south/south west of Sergen Fault, between Devletliağaç and Koruköy. This fault system which disappears locally due to translation, has a characteristic of thrusting with high angle between Erikler and Koruköy.

7.1.3.2 Baseline

Project Area Geology

The geological and geotechnical investigations carried out in the Project Area to determine its geological characteristics and geotechnical parameters. It included field works and laboratory test. The geological and geotechnical investigations were carried out by Vadi Jeoteknik Sondaj Müh. Müş. İnş. San. ve Tic. Ltd. Şti in May 2019.

Total of 8 boreholes with 120 m of total depth (15m each) were drilled during the geotechnical investigation. Additionally, 7 test pits were opened in mainly forestry areas where drilling activities could not be carried out. In the test pits and drillings, light brown coloured sandy clay belongs to Upper Miocene aged Ergene Formation (Tme) was encountered down to 15 m under the 0.5 m tick vegetable soil (topsoil).

Ergene formation involves cross-bedded loose sandstones with clay, claystone and limestone lenses. The name Ergene was first used by Beer and Wright (1960). It is common in Trakya basin, especially middle of the basin. Ergene river and its distributaries flows in this formation. It has outcrops in a large area containing Ormanlı, Karacaköy and Yalıköy. Ergene formation consists of generally white, yellowish white coloured, cross-bedded sandstones and partly clayey-sandstone, reddish-greenish claystone, clay and conglomerate lenses. It is porous and medium-well sorted. The age of the formation is accepted as Upper Miocene.

Details related to the test pits and drillings are presented in the Table 14 and Table 15, respectively.

Table 14: Details related to the Test Pits[16]

Test Pit No	Coordinates		Depth (m)	Lithology	Formation
	(y)	(x)			
AÇ-1	594951	4582698	0.00-0.50	Topsoil (vegetable soil)	Ergene Formation (Tme)
			0.50-3.00	CLAY with some sand	
AÇ-2	595408	4583029	0.00-0.50	Topsoil	Ergene Formation (Tme)
			0.50-3.00	CLAY with some sand	

[16] Geological and Geotechnical Investigation Report, May 2019

Test Pit No	Coordinates		Depth (m)	Lithology	Formation
	(y)	(x)			
AÇ-3	595555	4582620	0.00-0.50	Topsoil	Ergene Formation (Tme)
			0.50-3.00	CLAY with some sand	
AÇ-4	595850	4583192	0.00-0.50	Topsoil	Ergene Formation (Tme)
			0.50-3.00	CLAY with some sand	
AÇ-5	598276	4580975	0.00-0.50	Topsoil	Ergene Formation (Tme)
			0.50-3.00	CLAY with some sand	
AÇ-6	599468	4582115	0.00-0.50	Topsoil	Ergene Formation (Tme)
			0.50-3.00	CLAY with some sand	
AÇ-7	600298	4581924	0.00-0.50	Topsoil	Ergene Formation (Tme)
			0.50-3.00	CLAY with some sand	

Table 15: Details related to the Drillings[17]

Drilling No	Coordinates		Depth (m)	Lithology	Formation
	(y)	(x)			
SK-1	595679	595679	0.00-0.50	Topsoil (vegetable soil)	Ergene Formation (Tme)
			0.50-15.00	CLAY with some sand	
SK-2	595721	595721	0.00-0.50	Topsoil	Ergene Formation (Tme)
			0.50-15.00	CLAY with some sand	
SK-3	595882	595882	0.00-0.50	Topsoil	Ergene Formation (Tme)
			0.50-15.00	CLAY with some sand	
SK-4	596104	596104	0.00-0.50	Topsoil	Ergene Formation (Tme)
			0.50-15.00	CLAY with some sand	
SK-5	596329	596329	0.00-0.50	Topsoil	

[17] Geological and Geotechnical Investigation Report, May 2019

Drilling No	Coordinates		Depth (m)	Lithology	Formation
	(y)	(x)			
			0.50-15.00	CLAY with some sand	Ergene Formation (Tme)
SK-6	598785	598785	0.00-0.50	Topsoil	Ergene Formation (Tme)
			0.50-15.00	CLAY with some sand	
SK-7	599336	599336	0.00-0.50	Topsoil	Ergene Formation (Tme)
			0.50-15.00	CLAY with some sand	
SK-8	599336	599336	0.00-0.50	Topsoil	Ergene Formation (Tme)
			0.50-15.00	CLAY with some sand	

7.1.4 Seismology

Study area for this component is chosen as a licence area.

Seismology baseline conditions have been assessed from desktop studies and literature data review.

- Main sources reviewed are listed below:
  - İstanbul Provincial Environmental Status Report, 2017;
  - Geological and Geotechnical Investigation Report, May 2019

7.1.4.1 Regional Seismology

The structural geology details related to Project Area derived from Geological and Geotechnical Report is presented in Section 7.1.3

The first Earthquake Zoning Map of Turkey was prepared by the Ministry of Public Works and Settlement considering the latest knowledge, approved by the Government of Turkey and published in 1996. This Map was revised in 2018 and the latest Turkey Earthquake Hazard Map is prepared by Disaster & Emergency Management Authority, Presidential of Earthquake Department and published in the 30364 numbered official gazette on March 8th, 2018.

In the new map, unlike the previous map, the maximum ground acceleration values are shown instead of earthquake zones and the concept of “earthquake zone” is eliminated. “Turkey Building Earthquake Regulation (Official Gazette Date: 18.03.2018 Number: 30364)" refers to this map for the calculation of acceleration values that will affect the construction. The project area is in 1st degree earthquake zone.

The earthquake hazard map of İstanbul Province according to the Map of Turkey Earthquake Hazard Map is given in the Figure 15.

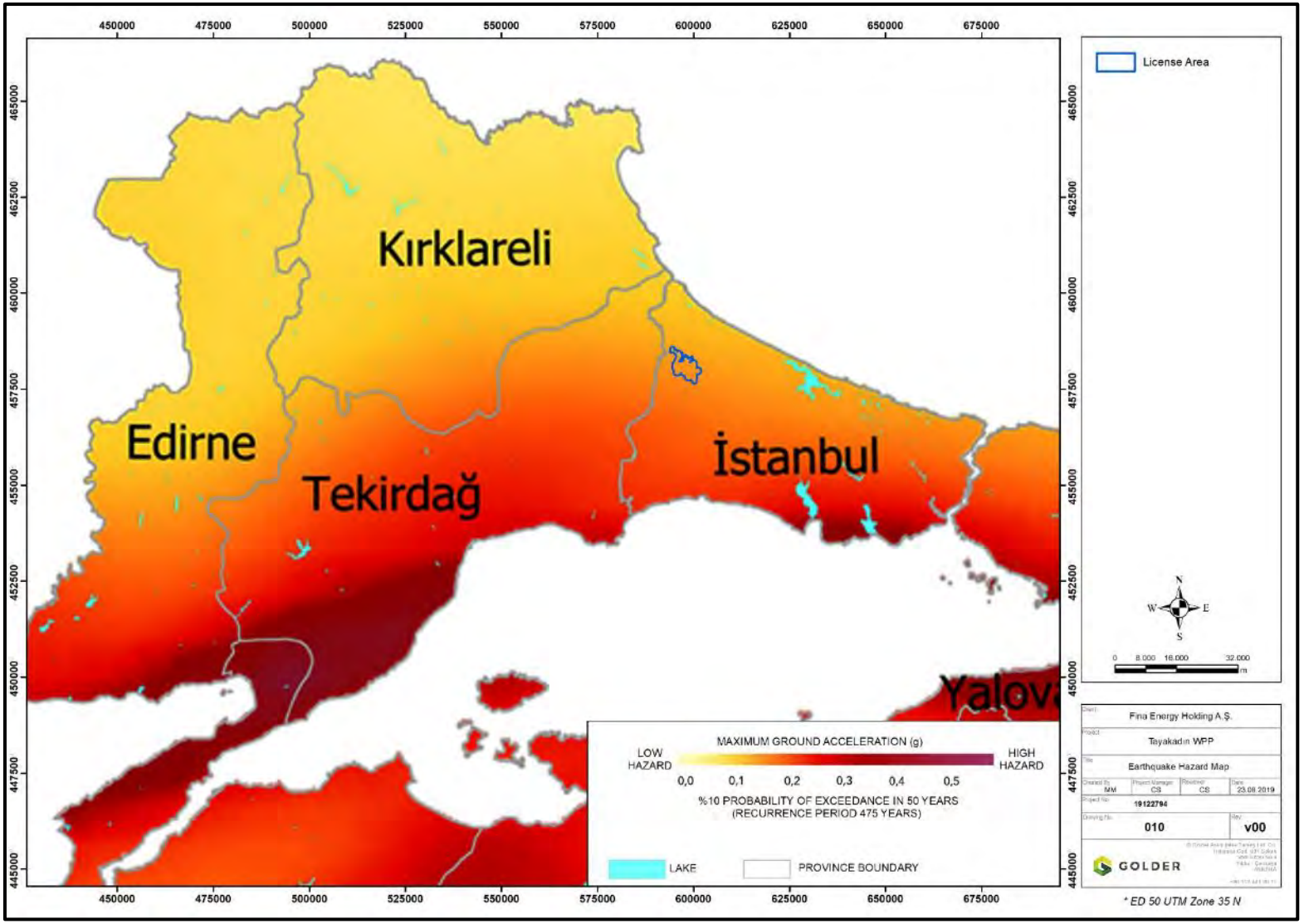


Figure 15: The Earthquake Hazard Map of İstanbul Province and Surroundings

7.1.4.2 Baseline

With the geotechnical investigations, the largest ground acceleration is found as 0.247 in the Study Area and this is corresponding to the medium hazard class according to the Turkey Earthquake Hazard Map.

Active Faults Around 100 km radius of the Study Area is presented in the figure below.

Figure 16: Active Faults Around 100 km radius of the Study Area[18]

The activity of faults in the region is shown by numerous historical earthquakes. Earthquakes which have magnitudes higher than 4.5M and within the 100km radius from the Study Area (centre: 41.357284 Latitude, 28.14031 longitude) between the years of 1900-2019 were listed in the Geotechnical Report. Magnitude measures the energy released at the source of the earthquake and is determined from measurements on seismographs. The earthquakes which have magnitudes higher than 4.5M and between the years of 1900-2019 are listed in the Table 16.

[18] Geological and Geotechnical Investigation Report, May 2019

Table 16: Earthquakes greater than 4.5M and within the 100km radius from the Study Area [19]

No	Date	Time	Latitude	Longitude	Depth	M	Location (Region)	Location
1	28.10.2015	16:20:02,020	40.822	27.764	14.3	4.5	MARMARA	SEA
2	27.11.2013	4:13:37,520	40.846	27.919	10.8	4.7	MARMARA	EREĞLİSİ
3	7.6.2012	20:54:25,830	40.854	27.924	14.9	5.1	MARMARA	EREĞLİSİ
4	25.7.2011	17:57:20,810	40.811	27.738	17	5.2	MARMARA	SEA
5	12.3.2008	18:53:31,310	40.616	29.007	10	4.8	ŞENKÖY-ÇINARCIK	(YALOVA)
6	20.10.2006	18:15:24,190	40.262	27.985	10.9	5.2	YENİSIGIRCI-BANDIRMA	(BALIKESİR)
7	23.3.2002	2:36:10,600	40.81	27.84	12	4.8	MARMARA	SEA
8	20.9.1999	21:28:00,000	40.69	27.58	16	5	MARMARA	SEA
9	9.9.1999	1:32:08,000	40.71	29.14	11	4.6	KORU-ÇINARCIK	(YALOVA)
10	19.8.1999	15:17:44,900	40.59	29.08	11	5	TEŞVİKİYE-ÇINARCIK	(YALOVA)
11	19.8.1999	14:15:58,400	40.6	29.06	12	4.5	TEŞVİKİYE-ÇINARCIK	(YALOVA)
12	12.12.1993	17:21:26,200	41.51	28.82	28	4.8	OSMANLI	ISTANBUL
13	8.3.1991	9:23:13,000	40.85	27.91	11	4.5	MARMARA	EREĞLİSİ
14	3.3.1991	8:39:25,500	40.63	29	10	4.6	ŞENKÖY-ÇINARCIK	(YALOVA)
15	12.2.1991	9:54:58,900	40.8	28.82	10	5	MARMARA	SEA
16	24.4.1988	20:49:33,300	40.88	28.24	11	5.1	MARMARA	SEA
17	27.10.1987	3:15:30,600	40.42	28.46	18	4.7	BOĞAZ-KARACABEY	(BURSA)

[19] Geological and Geotechnical Investigation Report, May 2019

No	Date	Time	Latitude	Longitude	Depth	M	Location (Region)	Location
18	26.10.1986	4:49:29,900	40.8	28.99	10	4.6	MARMARA	SEA
19	27.4.1985	12:33:06,900	40.74	27.38	9	4.6	GAZİKÖY-ŞARKÖY	(TEKİRDAĞ)
20	30.1.1984	5:58:25,800	40.5	27.49	10	4.5	AVSA-MARMARA	(BALIKESİR)
21	12.7.1982	14:46:14,000	41	27.83	25	4.6	YENİÇİFTLİK- MARMARA	(TEKİRDAĞ)
22	12.3.1981	4:06:00,600	40.8	28.09	12	4.7	MARMARA	SEA
23	15.6.1978	0:26:45,000	40.79	27.68	28	4.6	MARMARA	SEA
24	1.5.1971	13:45:27,400	40.95	27.99	13	4.9	MARMARA EREĞLİSİ	(TEKİRDAĞ)
25	24.12.1969	8:41:32,000	40.5	28.4	10	4.7	BAYRAMDERE	BURSA
26	6.5.1968	9:38:47,000	40.33	28.63	4	4.6	EMİRLERYENİCESİ-MUDANYA	(BURSA)
27	6.8.1967	14:09:33,000	41	28.8	10	4.5	KÜÇÜKÇEKMECE	(ISTANBUL)
28	31.7.1967	7:12:05,000	40.6	27.62	4	4.5	MARMARA	SEA
29	21.12.1964	0:50:01,000	40.5	27.5	10	4.7	AVSA-MARMARA	(BALIKESİR)
30	6.10.1964	14:31:23,000	40.3	28.23	34	7	OKÇULAR-KARACABEY	(BURSA)
31	6.10.1964	14:29:57,900	40.24	28.16	23	5.7	TOPHİSAR-KARACABEY	(BURSA)
32	24.9.1963	2:10:44,400	40.84	28.9	10	4.9	MARMARA	SEA
33	18.9.1963	16:58:14,800	40.77	29.12	40	6.3	ADALAR	(ISTANBUL)
34	19.4.1962	8:22:18,600	40.75	28.84	10	4.6	MARMARA	SEA
35	26.7.1959	17:07:06,200	40.91	27.54	10	5.5	BARBAROS-	(TEKİRDAĞ)
36	26.10.1954	10:34:28,600	40.56	27.52	10	4.8	EKİNLİK-MARMARA	(BALIKESİR)

No	Date	Time	Latitude	Longitude	Depth	M	Location (Region)	Location
37	24.10.1954	23:37:19,100	40.46	27.53	10	4.9	AVSA-MARMARA	(BALIKESİR)
38	3.6.1953	16:05:31,300	40.28	28.53	20	5.5	SUBAŞI-KARACABEY	(BURSA)
39	13.3.1952	6:30:01,800	41.02	28.14	11	5.2	MARMARA	SEA
40	16.6.1942	5:42:34,400	40.8	27.8	20	5.7	MARMARA	SEA
41	4.1.1935	15:19:24,000	40.5	27.5	5	4.7	AVSA-MARMARA	(BALIKESİR)
42	4.1.1935	15:18:57,000	40.5	27.5	5	4.8	AVSA-MARMARA	(BALIKESİR)
43	4.1.1935	14:41:30,400	40.4	27.49	30	6.4	ERDEK	ERDEK GÜLF
44	10.10.1929	23:00:54,800	41.11	27.46	15	4.7	YEŞİLSIRT-MURATLI	(TEKİRDAĞ)
45	10.6.1925	4:45:00,000	41	29	8	4.6	KADIKÖY	(ISTANBUL)
46	26.10.1923	12:13:16,000	41.2	28.6	24	5.3	YASSIÖREN-ARNAVUTKÖY	(ISTANBUL)
47	13.10.1919	7:54:10,000	41.5	28	12	4.7	GÜNGÖRMEZ-SARAY	(TEKİRDAĞ)
48	22.1.1907	2:41:00,000	41	29	12	4.7	KADIKÖY	(ISTANBUL)

According to the Geotechnical Report:

- As a result of the geotechnical investigations carried out in the study area; Earthquake Ground Movement Level identifies as DD-2: 10% probability of exceedance in 50 years, recurrence period 475 years, and sparse earthquake. This earthquake ground movement, also called the standard design earthquake ground movement.
- There is no risk of liquefaction as the clayey unit consists of approximately 70% clay, 8% gravel and 22% sand. The topographic slope of the study area varies between 0-10% and there are no mass movements were observed like runoff, landslide, rock fall. However, stability problems can be expected in deep excavations in the study area.
- There is no risk of artificial and natural collapse in the study area. In addition, medical geological hazards, tsunami hazards and associated collapse risk are not expected.
- The study area is classified as “Önlemli Alan-5.1: problematic areas in terms of swelling, sitting and bearing capacity” according to 19.08.2008 dated and 10337 numbered Notice of the Ministry of Environment and Urbanisation.
  - In Ergene formation member clays; engineering parameters (swelling, sitting and bearing capacity) should be examined in detail by considering the type of structure and structure load to be planned before construction for the sitting-swelling problems that may develop and, if necessary, ground improvement should be made.
  - Detailed suggestions made in the Geotechnical Report according to construction activities in the areas where classified as Önlemli Alan-5.1.

During the local EIA process, 26/06/2015 dated and 1437 numbered official letter was taken from the İstanbul Provincial Directorate of Disaster and Emergency. Additionally, in the Geotechnical Report it was stated that other official letter (25.01.2017 dated and 12103 number) also gathered from İstanbul Provincial Directorate of Disaster and Emergency. According to local EIA and the Geotechnical Report, these both official letters indicated that; there is no “area subject to disaster” decision within the scope of 7269 Numbered Law for the Project Area.

Based on the above baseline results, the **sensitivity of the component is considered to be low to medium**.

7.1.5 Hydrology and Surface Water Quality

Study area for this component is chosen as a licence area and presented in Section 6.1.

Hydrology and Surface Water Quality baseline conditions have been assessed from desktop studies and literature data review.

- Main sources reviewed are listed below:
  - İstanbul Provincial Environmental Status Report, 2017;
  - Geological and Geotechnical Investigation Report, May 2019.

7.1.5.1 Regional Hydrology and Surface Water Quality

There are no large capacity rivers within the boundaries of İstanbul. However, there are streams, which supply drinking and potable water, that feed into the lakes and ponds or pour into the sea. Numerous rivers and streams within the borders of İstanbul feed 7 major catchment basins used for drinking water. These basins

are: Ömerli, Elmalı and Darlık Dams located on the Anatolian side of İstanbul; Alibey, Terkos, Sazlıdere and Büyükçekmece Dams are located on the European side,

The main streams on the Çatalca Plateau are; Istranca, Karasu, Çakıl, Sazlıdere, Nazlıdere, Nakkaş, Alibey, Kağıthane streams and branches. Streams in İstanbul Province is given in the table below.

Table 17: Streams in İstanbul Province[20]

Stream Name	Total Length (km)	Total Length within İstanbul Province (km)	Purpose
Istranca Stream	-	-	It feeds Terkos Lake Drinking water
Karasu	70	-	It feeds Büyükçekmece Lake Drinking water
Sarısu	25	-	It feeds Büyükçekmece Lake Drinking water
Çakıl Stream	-	-	It feeds Büyükçekmece Lake Drinking water
Sazlıdere	40	-	It feeds Sazlıdere Dam Lake Drinking water
Nakkaş Stream	-	-	It is poured into Küçükçekmece Lake.
Alibeyköy Stream	50	-	It is poured into Alibeyköy Dam-Haliç
Kağıthâne Stream	-	-	It is poured into Haliç
Göksu	-	25	It feeds İsaköy Regulator Drinking water It is poured into Black Sea
Riva Stream	100	-	Ömerli Dam Drinking water It is poured into Black Sea
Hiciv Stream	50	-	It is poured into Marmara Sea

The low and irregular flow rates of the streams feeding lakes, ponds and dams in Istanbul prevent activities such as transportation and water sports. Some of the streams dry completely in summer and some of them cause floods after heavy rains in spring. Existing irrigation ponds in İstanbul are given in the table below.

[20] İstanbul Provincial Environmental Status Report, 2017

Table 18: Existing irrigation ponds in İstanbul[21]

Pond/Dam Name	Location	Purpose	Type	Precipitation area (km^2)	Water Level (m)	Minimum Water Level (m)	Storage volume (hm^3/year)	Useful storage volume (hm^3/year)	Annual Safe Yields (hm^3/year)
Ömerli Dam	Beykoz-İstanbul	Drinking and potable water supply	Soil filling	634.00	62	46	357.05	235.38	188
Terkos Dam	Çatalca-İstanbul	Drinking and potable water supply	Concrete cover	619.00	4.50	-1.00	186.70	144.69	134
Büyükçekmece Dam	Büyükçekmece - İstanbul	Drinking and potable water supply	Zoned soil filling	620.00	6.30	0.75	161.60	138.10	82
Darlık Dam	Şile- İstanbul	Drinking and potable water supply	Rock filling	207.00	52.00	21.50	113.00	107.50	92
Alibey Dam	Eyüp-İstanbul	Drinking/potable water supply, flood protection	Zoned soil filling	160.00	26.00	11.25	34.87	34.00	33
Sazlıdere Dam	K. Çekmece - İstanbul	Drinking and potable water supply	Clay core rock fill	165.00	22.40	6.85	91.30	90.00	51
Istranca Streamsi (İSKİ)	Kırklareli	Drinking and potable water supply	-	-	-	-	-	-	235.
Yeşilçay Regulator	İstanbul	Drinking and potable water supply	-	-	-	-	-	-	145
Melen I.Merhale (DSİ)	Sakarya-Düzce	Drinking and potable water supply	-	-	-	-	-	-	268
Elmalı Dam	İstanbul	Drinking and potable water supply	Concrete	-	-	-	-	-	15
Kemerburgaz – Alibey	İstanbul	Drinking and potable water supply	-	-	-	-	-	-	5
Yeşilvadi – Darlık	İstanbul	Drinking and potable water supply	-	-	-	-	-	-	10
Other historical embankments	İstanbul	Drinking and potable water supply	-	-	-	-	-	-	5

[21] İstanbul Provincial Environmental Status Report, 2017

Istanbul Drinking Water Resources are presented in the table below.

Table 19: Istanbul Drinking Water Resources[22]

Name of the Facility	Service Year	Yield (million m^3/year)
Elmalı I ve II Dams	1893 – 1950	15
Terkos Dam	1883	142
Alibeyköy Dam	1972	36
Ömerli Dam	1972	220
Darlık Dam	1989	97
Büyükçekmece Dam	1989	100
Yeşilvadi Regulator	1992	5
Istrancalar (Düzdere, Kuzuludere, Büyükdere, Sultanbahçedere, Elmalıdere)	1995-1997	75.2
Kuyular	1996-2007	25.7
Kazandere Dam	1997	100
Sazlıdere Dam	1998	55
Pabuçdere Dam	2000	60
Yeşilçay Regulator	2004	145
Melen Regulator	2007	268
Melen Regulator II	2014	307
Embankments	1620-1839	2.5
Total	**1653.4**	

7.1.5.2 Baseline

The elevation of the survey area ranges from 199 to 241 meters from sea level at the turbine locations and slope direction is towards to the northwest, slope value ranges from 0-10%.

According to Geotechnical Report: there are no flowing or dry streams observed within the Study Area. State Hydraulic Works (“SHW”) opinion was requested during the Project planning phase and 09.08.2018 dated and 56304114 numbered official letter from Regional Directorate of SHW obtained. The official letter stated that: Project is located in the medium and long-distance protection area of the Karamandere Dam Basin, there is no objection to the Project from SHW side if all relevant legislation is complied. The surface water bodies within the close vicinity of the Project Area are presented in the figure below.

There is a naturally occurring wetland -which is not known about seasonal or not- in the dense forest in the Project Area. The closest turbine from the wetland is T8 with the distance of 450 m. There will not be any

[22] İstanbul Provincial Environmental Status Report, 2017

construction activity occurred and transportation route across the wetland. This wetland will not be used as a water resource during the construction and operation phase.

Based on the above baseline results, the **sensitivity of the component is considered to be low.**

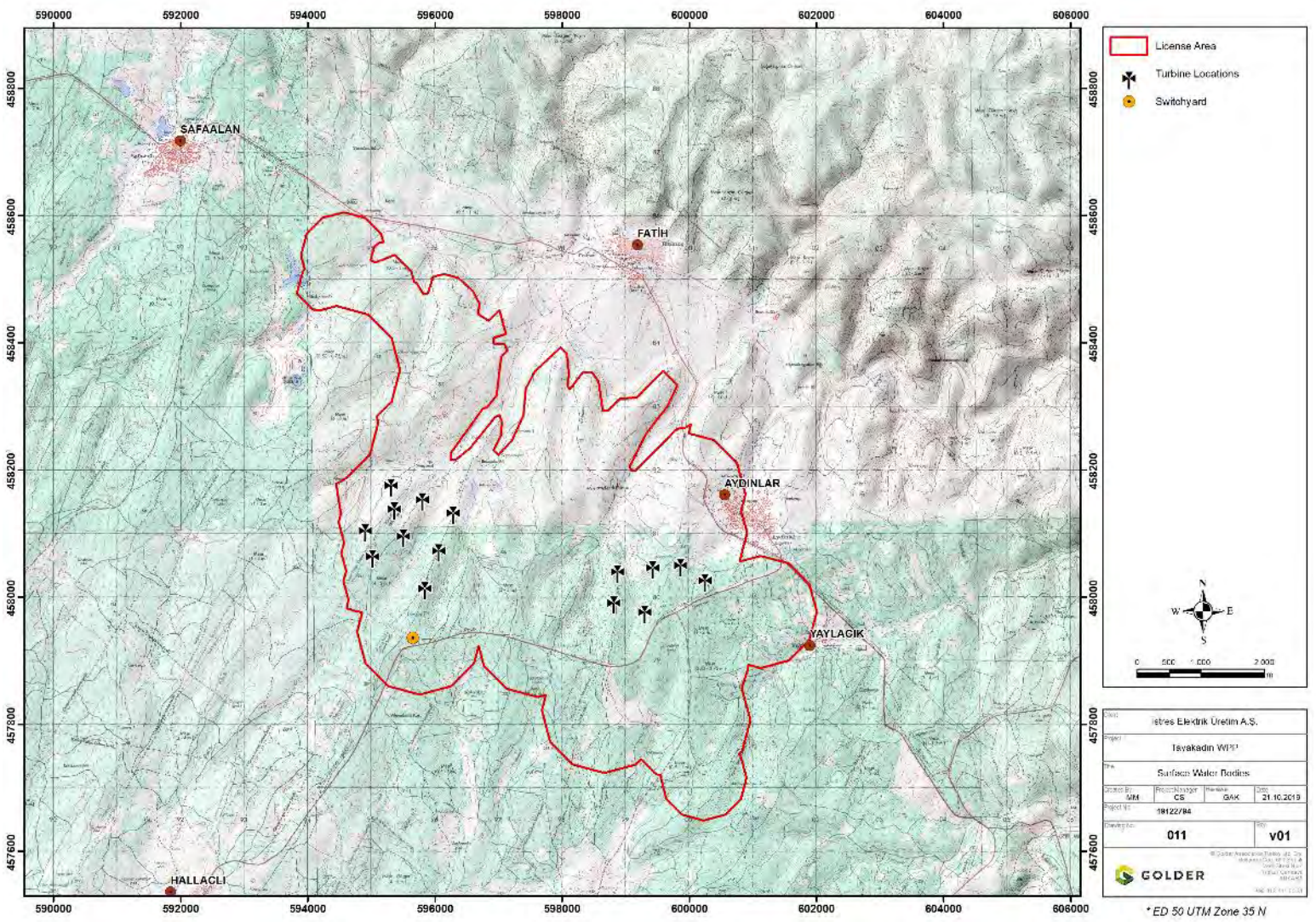


Figure 17: The surface water bodies within the close vicinity of the Project Area

7.1.6 Hydrogeology and Groundwater Quality

Study area for this component is chosen as a licence area and presented in Section 6.1.

Hydrogeology and Groundwater Quality baseline conditions have been assessed from desktop studies and literature data review.

- Main sources reviewed are listed below:
  - İstanbul Provincial Environmental Status Report, 2017;
  - Geological and Geotechnical Investigation Report, May 2019.

7.1.6.1 Regional Hydrogeology and Groundwater Quality

In the Istanbul region, the groundwater aquifers are limited and the Silivri and Çatalca regions are important on the Çatalca Peninsula.

The annual potential for groundwater in Istanbul is given in the table below.

Table 20: Groundwater supply of Istanbul[23]

No	Resource Name	Water Supplied in 2017 (m^3/year)
1	Hallaçlı Wells	4,802,996
2	Çerkezköy-Gümüşyaka	3,359.,01
3	Çatalca Wells	2,066,784
Total		**10,229,381**

7.1.6.2 Baseline

The geological and geotechnical investigations carried out in the Project Area. Total of 8 boreholes with 120 m of total depth (15m each) were drilled during the geotechnical investigation. In the test pits and drillings; light brown coloured sandy clay belongs to upper Miocene aged Ergene formation (Tme) was encountered down to 15 m under the 0.5 m tick vegetable soil (topsoil).

According to the Geotechnical Report, groundwater was not encountered in the borings drilled down to 15 bgl. It is expected that the regional groundwater level is deeper than 15 m.

The elevation of the survey area ranges from 199 to 241 meters from sea level at the turbine locations and slope direction is towards to northwest, slope value ranges from 0-10%.

The excavation depth for the turbine foundation is planned as 3 m.

Based on the above baseline results, the **sensitivity of the component is considered to be low.**

7.1.7 Soil and Subsoil

Study area for this component is chosen as a licence area and presented in Section 6.1.

[23] İstanbul Provincial Environmental Status Report, İSKİ, 2017

Information regarding soil and land use had been collected through desktop studies and available reports.

Soil baseline conditions have been assessed from desktop studies, literature data review and also baseline studies including soil sampling.

- Main sources reviewed are listed below:
  - İstanbul Provincial Environmental Status Report, 2017;
  - Geological and Geotechnical Investigation Report, May 2019;
  - "Technical Instructions for the Classification Standards of the Soil and the Land Use" prepared by the Ministry of Food, Agriculture and Livestock;
  - Soil Groups, Land Use and Land Use Capability Classification Maps published by the Ministry of Food, Agriculture and Livestock;
  - Regulation on Soil Pollution Control and Point Source Contaminated Sites "("Soil Regulation") originally published in the Official Gazette number 27605, dated 8 June 2010;
  - Helvacı, Cahit, "Relationships between boron and arsenic elements in nature", Dokuz Eylül Uni., Geological Engineering Dept., International Medical Geology Symposium, 2008;
  - Kocaman (2016), Determination of Various Heavy Metal Pollution Levels with Soil And Plant Analyses In Some Farms Close To Some Factories Near Çorlu-Çerkezköy Province, Namık Kemal University Graduate School of Natural and Applied Sciences Department of Soil Science and Plant Nutrition.
- Soil sampling
  - Observations were made during the site walk over to identify any visual indications of contamination or potential contamination sources;
  - Soil samples were collected from the topsoil layer (upper 30 cm);
  - During sampling, the collected samples were observed for any visual and olfactory signs of contamination;
  - The samples were stored in a sealed glass jar and preserved in cooler boxes at around 4°C for shipping to the laboratory;
  - After the samples were collected, the locations were recorded using a hand-held GPS instrument;

7.1.7.1 Regional Soil and Subsoil Characteristics

Land use status of Istanbul Province between the years of 1990-2012 is presented in the Table 21.

Table 21: Land use status of Istanbul Province[24]

İSTANBUL	TOTAL AREA							
	1990		2000		2006		2012	
Land Use Type	ha	%	ha	%	ha	%	ha	%
Artificial lands	72,657.97	13.31	102,365.76	18.75	109,825.14	20.15	114,012.08	20.91

[24] İstanbul Provincial Environmental Status Report, 2017

İSTANBUL	TOTAL AREA							
	1990		2000		2006		2012	
Agricultural lands	176,282.72	32.30	157,669.19	28.89	164,206.97	30.12	160,531.26	29.44
Forest and semi-natural areas	284,453.36	152.11	272,338.00	49.89	257,701.7	47.27	257,104.48	47.16
Wetlands	346.64	0.06	400.31	0.07	285.920	0.05	285.92	0.05
Water structures	12,104.18	2.22	13,071.53	2.39	13,108.16	2.40	13,295.69	2.44
Total	545,844.87	100.00	545,844.89	100.00	545,127.89	100	545,229.43	100

According to the above table, the total agricultural land is corresponding approximately 30% of the total area of İstanbul Province. Classification of agricultural land use in Istanbul for 2017 is presented in Table 22.

Table 22: Agricultural land use in Istanbul[25]

Land Use Type	Area (ha)	Percentage (%)
Absolute Agricultural Land	84,343	73
Special Product Land	1,541	1.33
Planted Agricultural Land	2,551	2.21
Marginal Agricultural Land	26,938	23.31
Greenhouse Area	169	0.15
Total	115,542	100

The “Land Use Capability Classification” was defined by the Ministry of Agriculture and Forestry. There are eight classifications for the “Land Use Capability Classification”. The land of İstanbul Province is mainly classified as Class II type based on the “Land Use Capability Classification”. The explanation for the classes is provided in table below.

Table 23: Land Use Capability Classification

Land Use Capability Classification	Class Characteristic
Class I	There is no factor present that limits the land use. These lands are composed of well-qualified soil. High production amounts can be gathered with normal agricultural methods. These lands can be used for cultivated plants, meadow-pasture, forest or wildlife with very dense soil culvation. The soils are deep, medium bodied and well drained. The land is flat or nearly flat.
Class II	These lands have some limitations that restrict plant selection or require moderate protection. These limitations depend on slope, erosion, age (drainage). Taking necessary precautions, it can be used for cultivated plants, meadow-pasture, forest or wildlife.

[25] İstanbul Provincial Environmental Status Report, 2017

Land Use Capability Classification	Class Characteristic
Class III	These lands are established from soil that requires special protection applications due to soil characteristics such as slope, erosion, drainage, etc. and also restricts plant selection, or the soil that requires intensive precautions to take good agricultural production and to protect the soil especially from erosion. If age becomes an adverse factor, drainage may be needed.
Class IV	These lands have one or more of the following problems: steep slopes, severe erosion, shallow profile development, salinity, alkalinity, low water retention capacity and also they restrict plant selection but can that can be used in agriculture with very intensive precautions. Usually these lands are suitable for pasture lands and should not be processed for a long time; special care should be taken when it is handled in some special cases. Some of the soil in this class may be suitable for growing bushes, shrubs, trees or ornamental plants
Class V	These lands are mostly flat and do not have the problem of indirect erosion; However, it is composed of soil which has intense drainage problem, frequent flooding, unsuitable agriculture due to rocky or stony cultivation. These lands, which is seen in the riverside, is considered to be more meadow land. In some special cases the trees can grow.
Class VI	These types of lands include lands that are not used in cultivated agriculture and are affected by factors such as steep slope, severe erosion, shallowness, drainage, stiffness or aridity. They can be used as meadows, forests and for wildlife. Forestry cultivation depends on the conditions of the land and climate.
Class VII	These lands are not suitable for cultivation due to very severe limitations and can be used for large scale grazing, forest and wildlife. The very steep slopes, very severe erosion, shallow profile development, stoniness, wetness, infertility and climate are the factors that has an effect on the classification of these lands.
Class VIII	These lands are not suitable for the cultivation of crop plants and trees. It is considered as a wildlife and recreation area. These are the areas of severe erosion, bare rocks, sand dunes, excavated mining areas, salt-covered areas and swamp areas.

The “Land Use Profile” and “Land Use Capability Classification” for İstanbul Province is given in the Figure 18. The “Soil Groups” were also classified by the Ministry of Agriculture and Forestry. The soil groups present in the İstanbul Province is also presented in Figure 19.

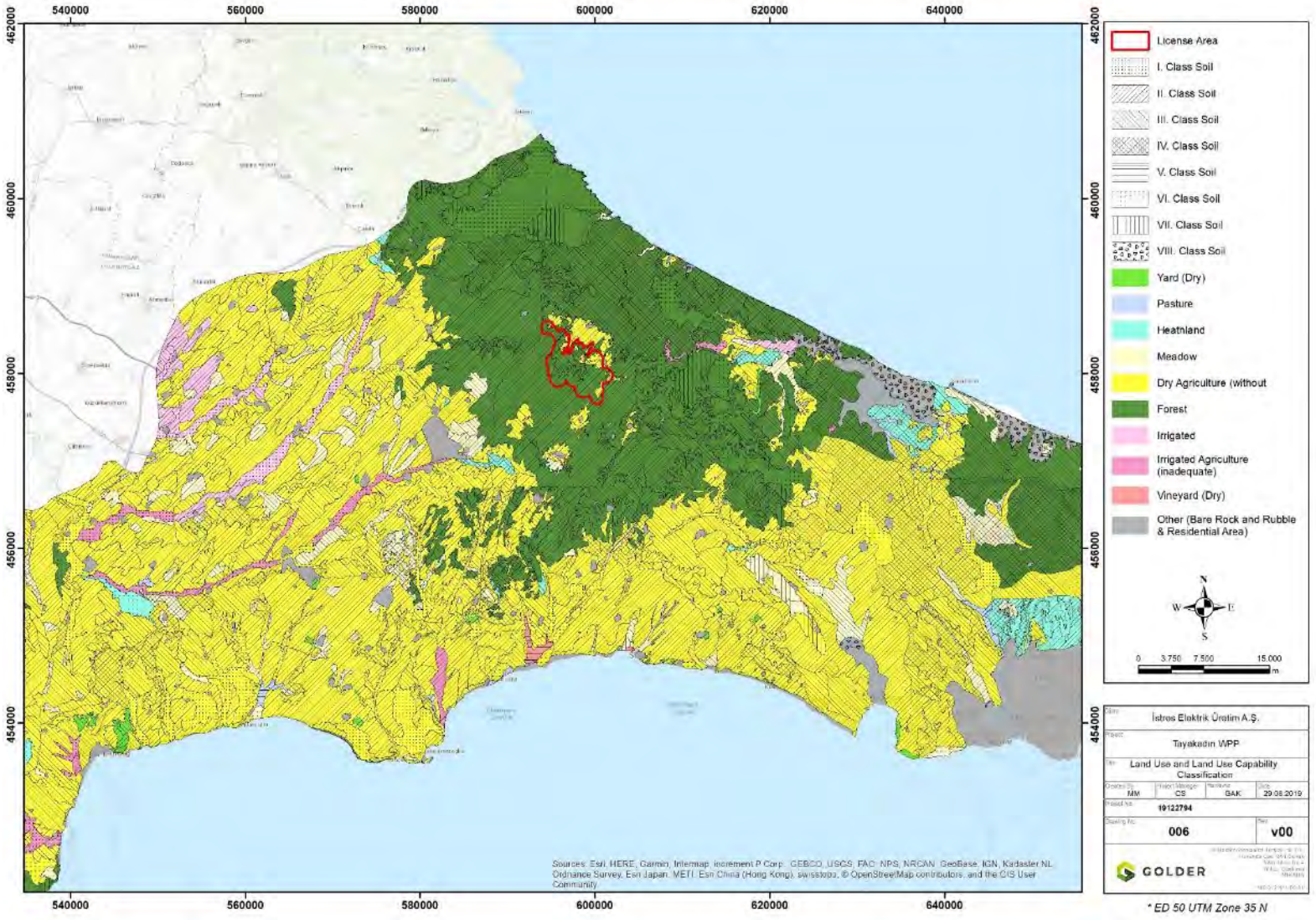


Figure 18: Land Use and Land Use Capability Classification for İstanbul Province

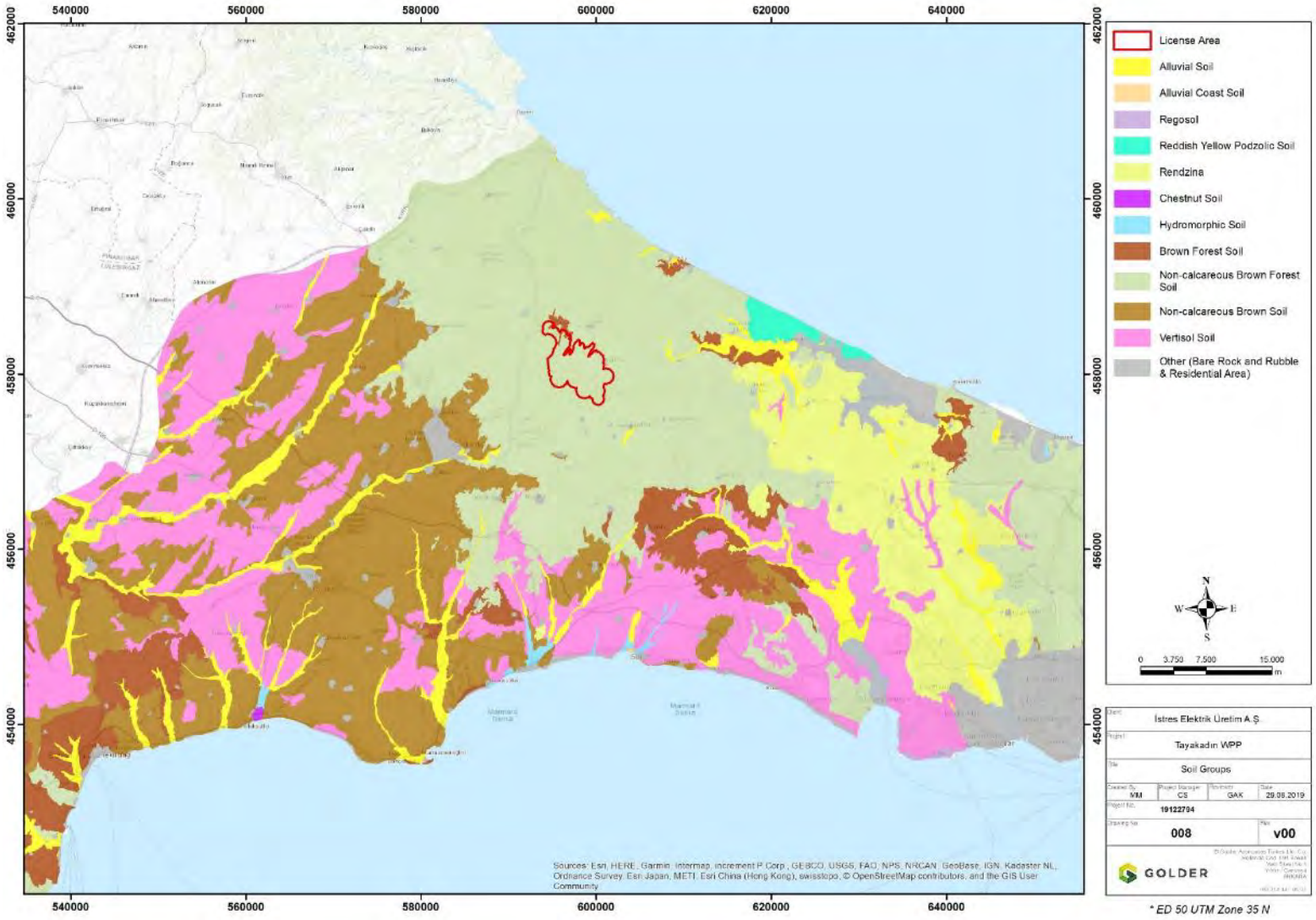


Figure 19: Soil Groups in İstanbul Province

7.1.7.2 Baseline

The Project Area is considered as Greenfield. Geological and geotechnical investigations (mentioned before) were carried out at the Project Area. Based on these investigation CLAY with some sand has been observed as the dominant formations.

The “Land Use Profile” for the Project Area, based on the classification assigned by the Ministry of Agriculture and Forestry is mainly forest land (Figure 20) and “Land Use Capability Classification” is mainly Class II. As seen in Figure 21, the dominant soil group in the Project Area is non-calcareous brown forest soil.

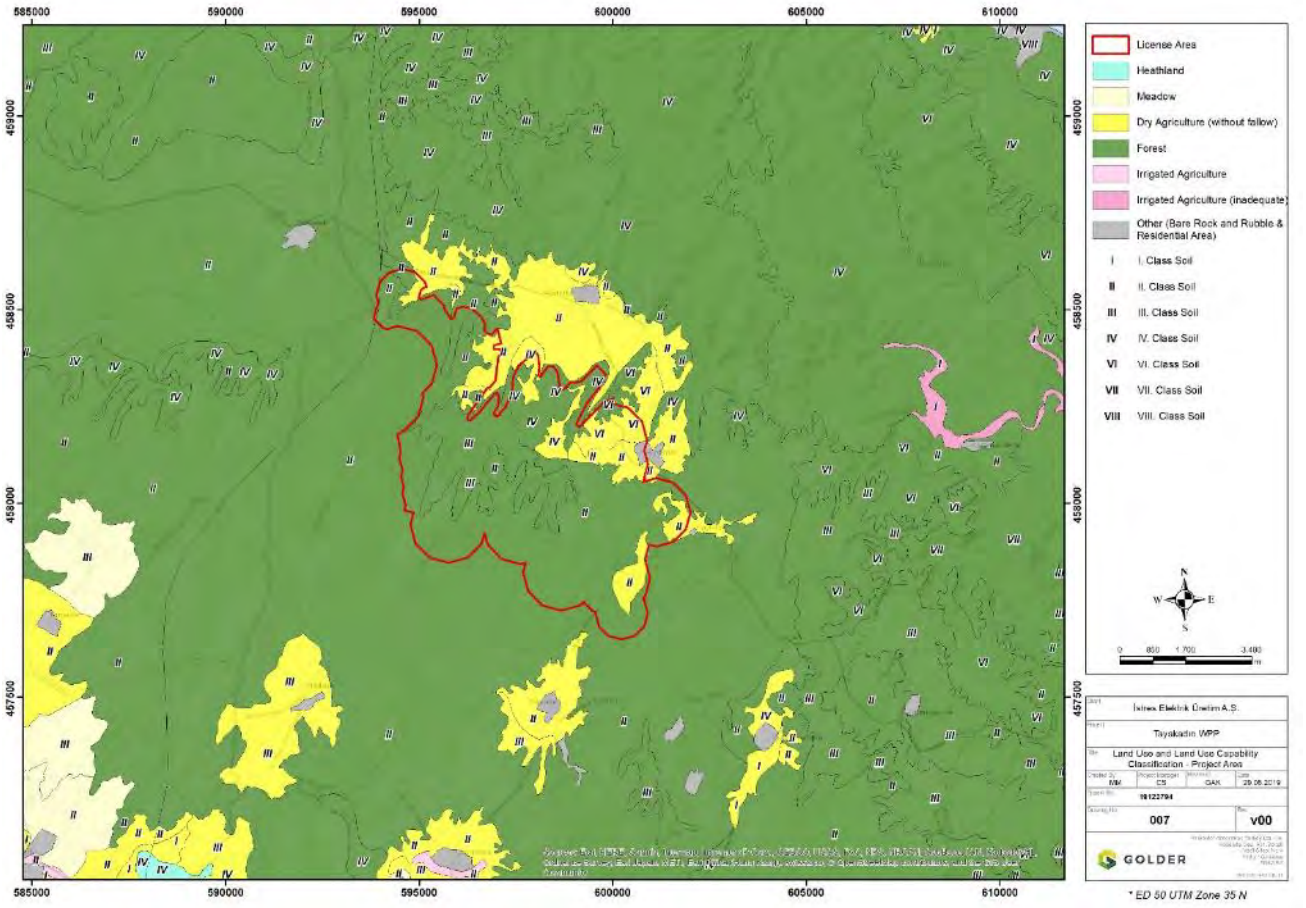


Figure 20: Land Use Profile of the Project Area

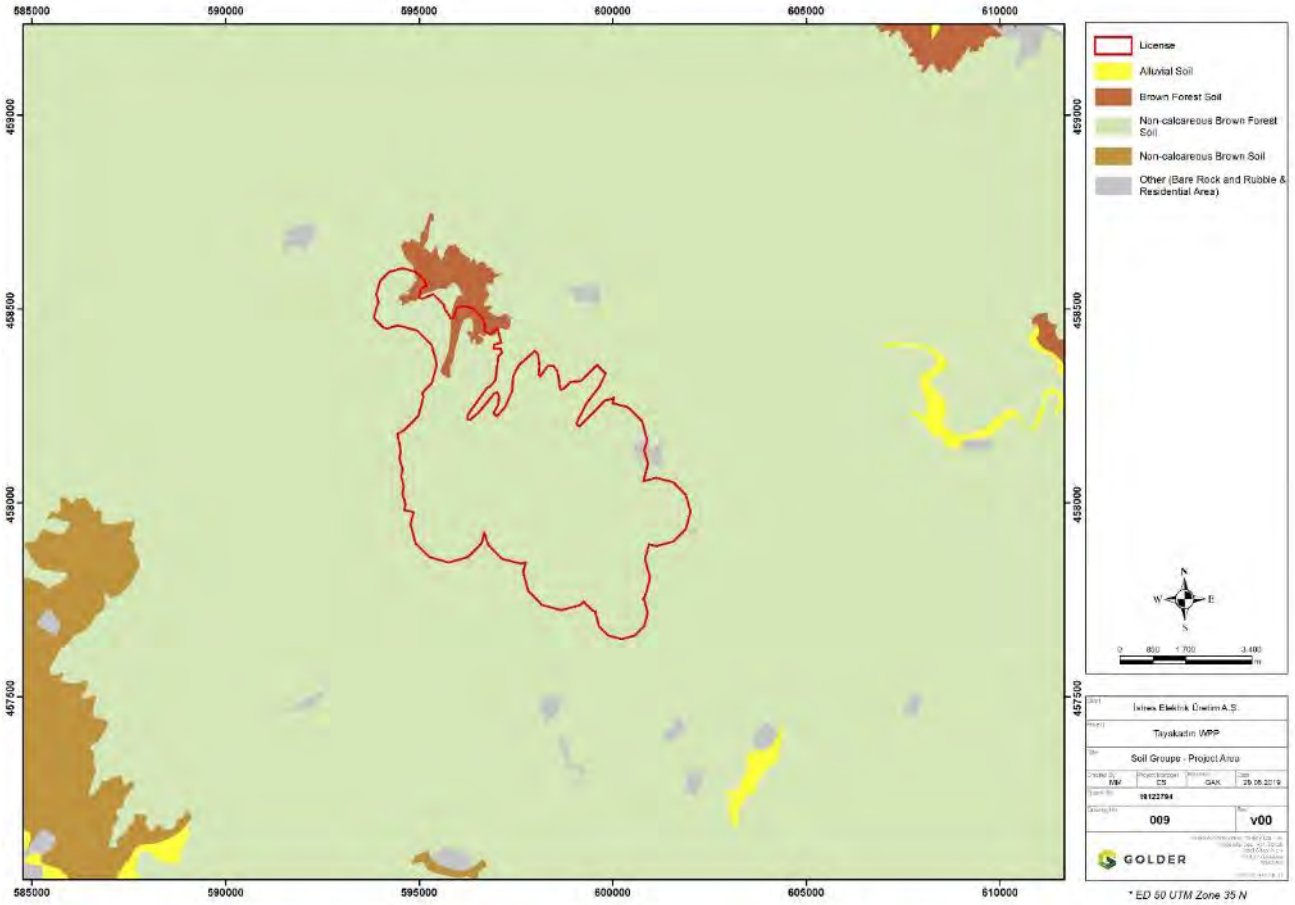


Figure 21: Soil Groups of the Project Area

No visual indications of contamination or potential contamination sources were observed at the Project Area during the site visit conducted by Golder experts. In the light of this observation, in order to describe the baseline soil quality, 3 soil samples were decided to collect from the Project Area.

The samples collected by “Segal Çevre Ölçüm ve Analiz Laboratuvarı” on 31 July 2019 from the topsoil layer (upper 30 cm). The soil sampling locations and the relevant sample information (coordinates, names and sampling date) given in the Table 24.

Table 24: Soil Sampling Details

Sampling ID	Coordinates (UTM ED50)			Date
	Zone	Easting	Northing	
N-43495/19	35	594806	4580874	31.07.2019
N-43496/19	35	597113	4579222	31.07.2019
N-43497/19	35	598768	4579695	31.07.2019

The map showing the soil sampling locations are given in Figure 22.

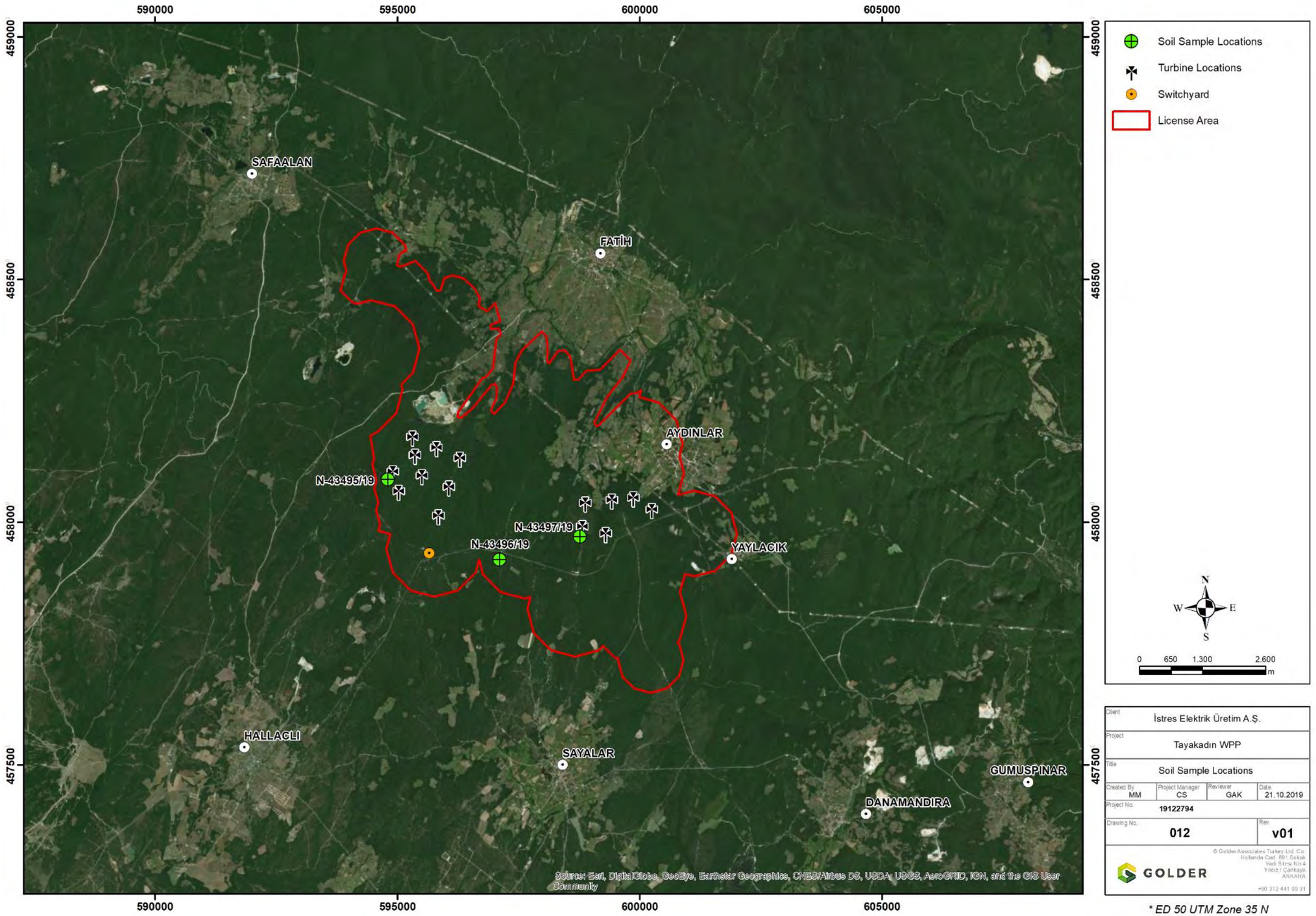


Figure 22: Soil Sampling Locations

In Turkey, the assessment of soil is carried out based on the “Regulation on Soil Pollution Control and Point Source Contaminated Sites“(“Soil Regulation”) originally published in the Official Gazette number 27605, dated 8 June 2010; and amended on 14 June 2012 (Official Gazette Number: 28323) and 11 July 2013 in the Official Gazette number 28704.

In accordance with the regulation, it is obligatory to prevent pollution, stop pollution release in the polluted areas and determine the extent of pollution.

The soil concentrations measured for the purposes of this study were compared to the generic pollutant limit values mentioned in the Annex I of the Regulation.

Annex I of the regulation contains different generic pollutant limit values dependent on the exposure routes (pathways):

- Generic Pollutant Limit Value-1: Soil ingestion and absorption through skin contact,
- Generic Pollutant Limit Value-2: Inhalation of volatile matter in external environment,
- Generic Pollutant Limit Value-3: Inhalation of fugitive dust in the external environment, and
- Generic Pollutant Limit Value-4: Transport of pollutants into groundwater and drinking of groundwater (Safety Factor (SF) = 1 or 10).

The Generic Pollutant Limit Value-1 and Generic Pollutant Limit Value-3 are used for the surface soil samples (0-30 cm) and Generic Pollutant Limit Value-2 and Generic Pollutant Limit Value-4 are used for sub-soil samples (>30 cm).

The activities within the Site would be covered by Annex 2, Table 2 of the Soil Regulation as table below.

Table 25: The activity specific contamination indicator parameters

NACE Code	Industrial Activity	Activity specific contamination indicator parameters
3511	Electrical Energy Production	TOX, TPH, As, B, Ba, Cd, Cr, Cu, Hg, Mo, Pb, Sb, Se, Zn

The list of analytical parameters that need to be analysed in the samples, per the regulation, is referred to as “the activity-specific contamination indicator parameters”. Activity-specific contamination indicator parameters for the Project Area listed in the above table are: Total Organic Halogens (TOX), Total Petroleum Hydrocarbons (TPH), Antimony (Sb), Arsenic (As), Copper (Cu), Barium (Ba), Boron (B), Zinc (Zn), Mercury (Hg), Cadmium (Cd), Lead (Pb), Molybdenum (Mo), Selenium (Se), Chromium (Cr).

The three soil samples collected were analysed in accordance with the Turkish legislation by “Segal Çevre Ölçüm ve Analiz Laboratuvarı” which is accredited by Turkish Accreditation Agency (“TAA”). The official analysis reports are provided in Appendix F.

As the samples were collected from the top soil, in accordance with the Soil Regulation and its Guidance Documents, the results were compared with the generic pollutant limit values listed in ANNEX 1: List of Generic Pollutant Limit Values: “Generic Pollutant Limit Value-1: Soil ingestion and absorption through skin contact” and “Generic Pollutant Limit Value-3: Inhalation of fugitive dust in the external environment”.

The Generic Pollutant Limit Values have the following description in the Soil Regulation: “Generic Pollutant Limit Value (GPLV): Refers to the Limit Value for a Pollutant, given in Annex 1 Generic Pollutant Limit Values List, calculated or determined by considering that intended use of the polluted area is or will be residential

area and that it will pose risks on human health, and by assuming that humans are exposed to the pollutant at maximum level for a reasonable period."

The comparison of the soil chemical analysis results to the Turkish Regulatory Limits is presented in Table 26 below. The results exceeding the limit values in the column "Generic Pollutant Limit Value-1" are indicated in red while the results exceeding the limit values are shown in the column "Generic Pollutant Limit Value-3" are indicated in blue.

Table 26: Comparison of the soil chemical analysis results with the Generic Pollutant Limit Values

Parameter	Unit	Soil ingestion and absorption through skin contact (mg/kg oven dry soil)	Inhalation of fugitive dust in the external environment (mg/kg oven dry soil)	N-43495/19 (S-01)	N-43496/19 (S-02)	N-43497/19 (S-03)
Antimony	mg/kg	31	-	<1.25	<1.25	<1.25
Arsenic	mg/kg	0.4	471	7.25	3.5	<1.25
Cupper	mg/kg	3129	-	23	4.8	2.8
Barium	mg/kg	15643	433702	53.75	30	59.5
Boron	mg/kg	-	-	25.75	11.75	3.25
Mercury	mg/kg	23	-	<0.25	<0.25	<0.25
Zinc	mg/kg	23464	-	51	31.75	12.68
Cadmium	mg/kg	70	1124	<0.25	<0.25	<0.25
Chromium	mg/kg	235	24	46.75	25.25	7.5
Lead	mg/kg	400	-	3.25	11	8.0
Molybdenum	mg/kg	391	-	<2.5	<2.5	<2.5
Selenium	mg/kg	391	-	<1.25	<1.25	<1.25
TPH	mg/kg	-	-	22.8	<10	13
TOX	mg/kg	-	-	<20	31.13	<20

Sample S-01 and S-02 have concentrations of Arsenic exceeding the Regulation Limit (this can be also the case for the S-03 because the threshold value is higher than the regulatory limit). There are trace concentrations of TPH in samples S-01 and S-03 and TOX in S-02. Additionally, S-01 and S-02 have chromium concentrations exceeding the regulatory limit.

Naturally occurring soil in the region is known to have elevated Arsenic concentrations[26]. Chromium occurs naturally in volcanic rocks as a mineral in combination with sulphurs of other metals (Fe, Cu, etc.) in andesite. In contact with atmospheric oxygen and water sulphuric acid is formed which produces a rapid degradation of the andesite into clay and the release of metals. If chromium, nickel and lead are in the range of 10-100 mg/kg and cadmium is below 1 mg/kg in soil, these amounts are accepted as normal levels (Mattigod ve Page 1983[27]). The total amount of chromium in the soil varies depending on the main material but is usually between 7 - 750 mg/kg (Bowen, 1966[28] derived from Kocaman 2016).

Undefined human activities may also have contributed to the concentrations found, but these cannot be defined.

Soil sampling activities conducted to establish the baseline of the Project Area and investigate existing soil conditions. These measurements can be used as reference measurements (baseline) in the future to determine whether the Project has any impact on the soil.

The results of the chemical analyses performed on the soil samples do not show significant soil impact on the Project Area. Some presences of concentrations may be due to natural and anthropogenic causes.

Based on the above baseline results, **the sensitivity of the component is considered to be low.**

7.1.8 Climate and Meteorology

The climate of İstanbul is under the influence of the Mediterranean, Black Sea, Balkan and Anatolian continental climate. While the Southern parts of the Province, where the settlement is denser, have characteristics closer to the Mediterranean climate, the climatic characteristics evolve towards the Black Sea climate as moving to the North. 40% of precipitation occurs in winter and 20% of precipitation occurs in spring. Precipitation in summer is about half of the precipitation in fall. In general, summers are hot and dry, winters are rainy and mild. During the summer months, air temperature can go up to 30°C whereas the temperature is around 10°C during winter months with much colder nights. The number of snowy days normally does not exceed 10 days in a total winter period. In a year, average temperature in Istanbul is around 14°C with an average relative humidity of 76%.[29]

Although İstanbul does not have a significant elevation, Istanbul is a province with high rainfall variability in the North-South direction. While the total annual precipitation in the South is around 650 mm, it increases above 1000 mm in the middle parts. It decreases again towards the Black Sea coast and goes down to 850 mm.[13]

Since the closest meteorological station to the Project Site is Çorlu Meteorological Station, the meteorological bulletin of this station for 1960-2014 period were used for determining general meteorological and climatic conditions.

Temperature

In Çorlu Meteorological Station, the lowest temperature was recorded as -17.5ºC on 21 February 1985 and the highest temperature was recorded as 40.0ºC in 27 June 2000. Annual average temperature was recorded as 12.9 ºC.

[26] Helvacı, Cahit, “Relationships between boron and arsenic elements in nature”, Dokuz Eylül Uni., Geological Engineering Dept., International Medical Geology Symposium, 2008

[27] Mattigod SV ve Page AL (1983). Assesment of Metal Pollution in Soils. Pages 355 - 394 in I. Thornton, Ed. Applied Environmental Geochemistry. Acedemic Press. London

[28] Bowen HJM (1966). Trace Element in Biochemistry, Academic Press, London

[29] http://www.cografya.gen.tr/tr/istanbul/iklim.html

Precipitation

Distribution, quantity and type of precipitation are important since these factors affect pollutants' wet deposit quantities. Precipitation normal, precipitation changes and average and daily maximum precipitation values by seasons are presented below.

Annual average amount of precipitation in Çorlu is 543.5 mm and daily maximum amount of precipitation is 111.3 mm.

Relative Humidity

According to the information obtained from Çorlu Meteorological Station, annual average relative humidity and minimum humidity values are 76.7% and 15%, respectively.

Local Pressure

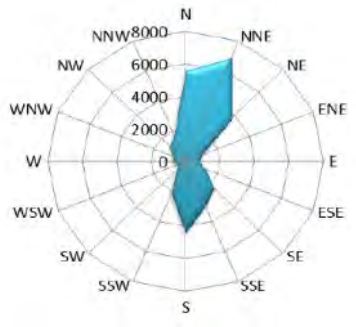
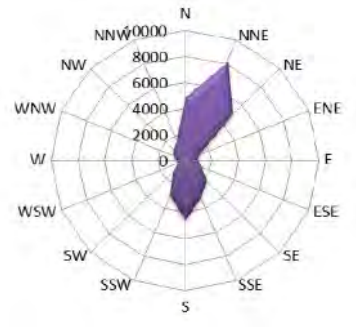
Annual average pressure recorded at Çorlu Meteorological Station is 994.4 hPa. The highest observed pressure is 1022.5 hPa whereas the lowest pressure value was observed in January with 962.7 hPa.

Distribution of the Counted Days in the Area

Counted day distribution values for additional weather parameters of the region are also obtained from data recorded at Çorlu Meteorological Station. According to Çorlu Meteorological Station observation records, the annual average number of snowy days and snow cover days are 17.7 and 10.7, respectively. The annual average number of foggy and hail days are 20.9 and 1.4, respectively. The annual average number of frosty days is 22.5. The annual average number of thunder stormy days is 19.6.

Wind

According to the Çorlu Meteorological Station data, numbers of wind directions (monthly) were used to determine seasonal numbers corresponding to wind directions. The monthly wind roses, the seasonal wind roses and the annual wind rose are shown in the figures below. According to these data, the most dominant wind direction is NNE (North of Northeast), the dominant wind direction in the second degree is N (North) and the dominant wind direction in the third degree is NE (Northeast).

January	February	March
		
April	**May**	**June**

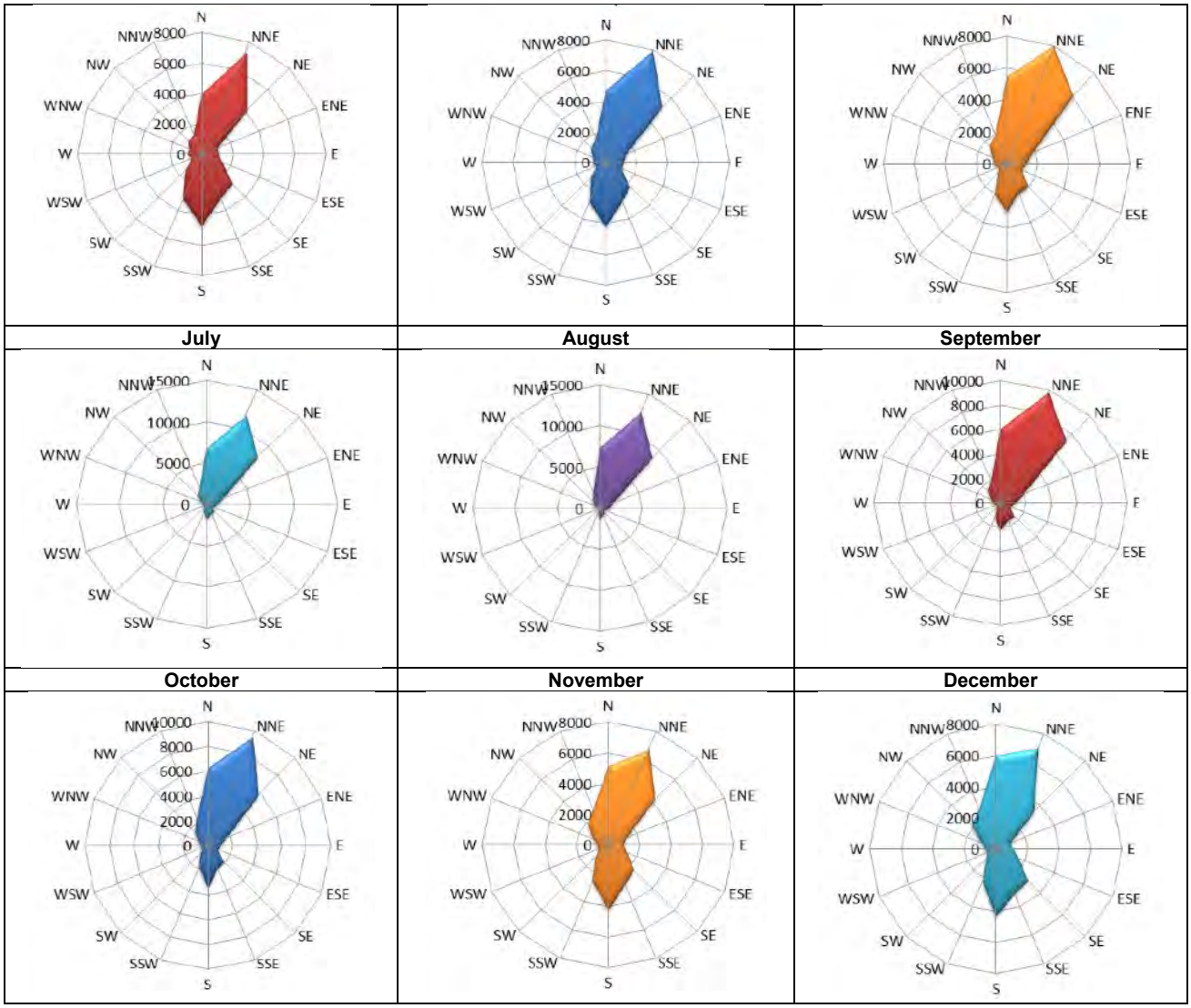
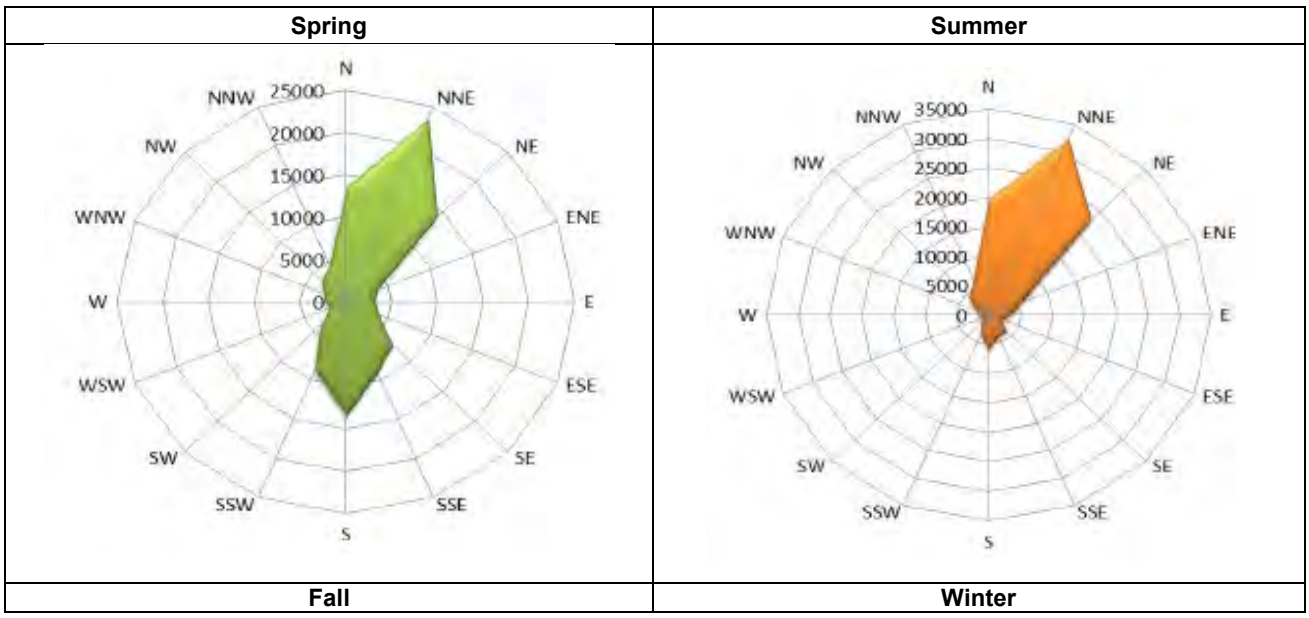


Figure 23. Monthly number of winds at Çorlu Meteorological Station



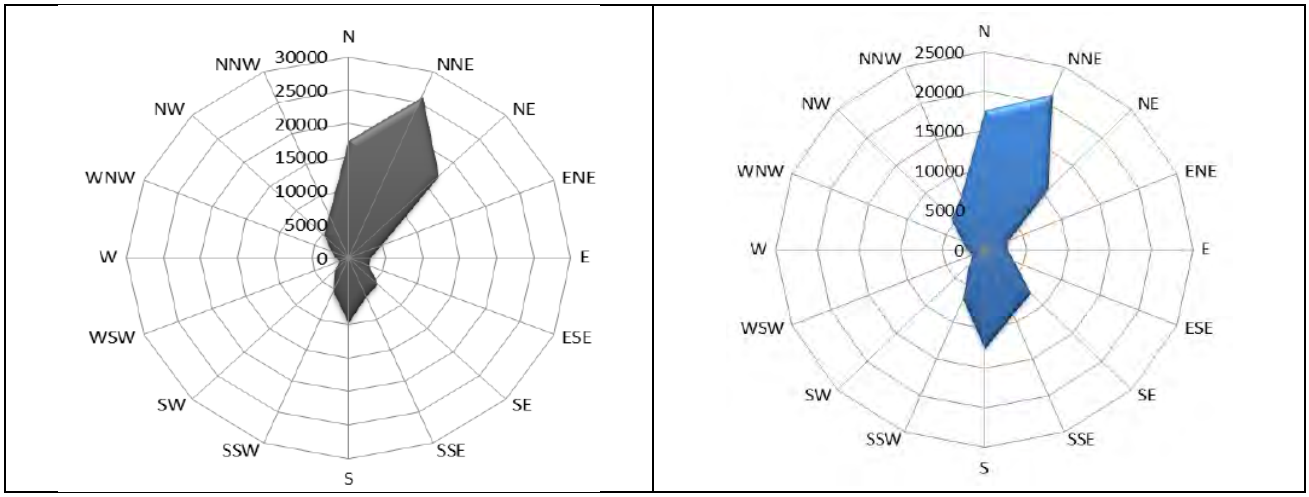


Figure 24. Seasonal number of winds at Çorlu Meteorological Station

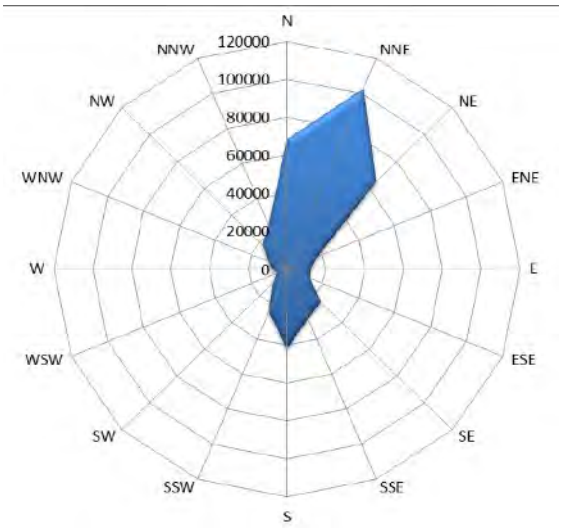


Figure 25. Annual number of winds at Çorlu Meteorological Station

According to Çorlu Meteorological Station data, the maximum mean annual wind speed is 4.1 m/sec towards NNE (North of Northeast).

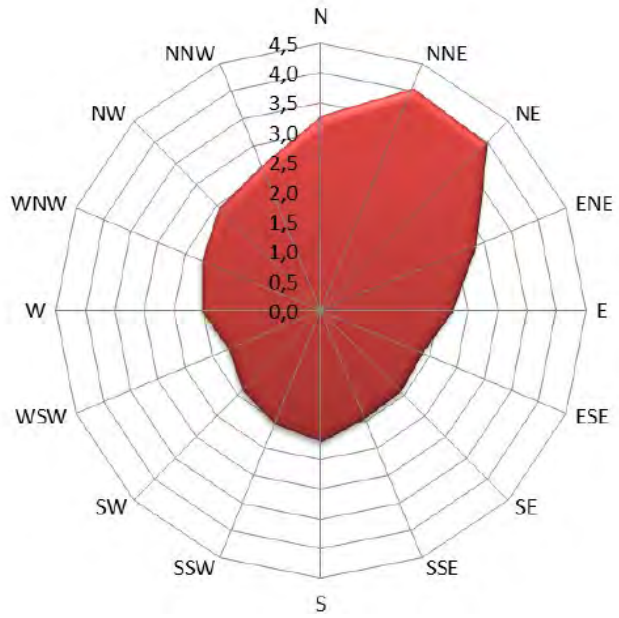


Figure 26. Annual mean wind speed at Çorlu Meteorological Station

7.1.9 Air Quality

Study Area for this component is presented in Section 6.1.

Set of results of emission measurements, ambient air quality measurements and quality assessment studies, which were conducted by various parties in the region were summarized here for determination of the existing air quality.

Methodologies used for the ambient air quality measurements are listed below:

- Particulate matter sampling was conducted according to the gravimetrical method in compliance with EPA 40 CFR Part 50 National Ambient Air Quality Standards for Particulate Matter as recommended by World Bank and Ministry of Environment and Urbanization.
- Settled dust measurements were conducted by using the BS: 1747 Air Quality Measurements Methods Chapter 5, Settled Dust by 4 Directions.
- The SO_2&NO_2 diffusion tubes were analysed at the Gradko U.K. laboratory by UV Spectrophotometry and Ion Chromatography for NO_2 and SO_2, respectively.

There are two sources of potential impacts on air quality during the construction phase. These are:

- The excavation works and movement of vehicles and
- The release of engine emissions from the construction equipment and vehicles.

Dust produced during the excavations could be important during the dry weather conditions and may cause negative effects to nearby settlements, public areas and institutions. The exhaust from construction equipment and vehicles may cause nitrogen oxides (NO_x) and sulphur dioxide (SO_2). The mitigation measures are presented in Section 8.1.7.

The ambient air quality measurements were conducted by an accredited firm named Gradko for the SO_2&NO_2 diffusion tubes measurements between June 13-July 11, 2019 and July 11-August 10, 2019.

PM_{10} measurements were conducted by Batı Laboratory on 17th of June 2019. Settled dust measurements were also conducted by Batı Laboratory between 13th of June 2019 and 10th of August 2019.

In total within the ESIA studies, the field measurements listed below were conducted to support the baseline data:

- 24 hour PM_{10} measurements at 6 locations.
- Settled dust measurements at 6 locations.
- SO_2&NO_2 measurements at 4 locations.

The coordinates of the measurement points are shown in below table:

Table 27: Air Measurement Points

No	X	Y
1	600805	4581253
2	601984	4579143
3	601121	4581644
4	599910	4583841
5	593393	4581201
6	598877	4579119

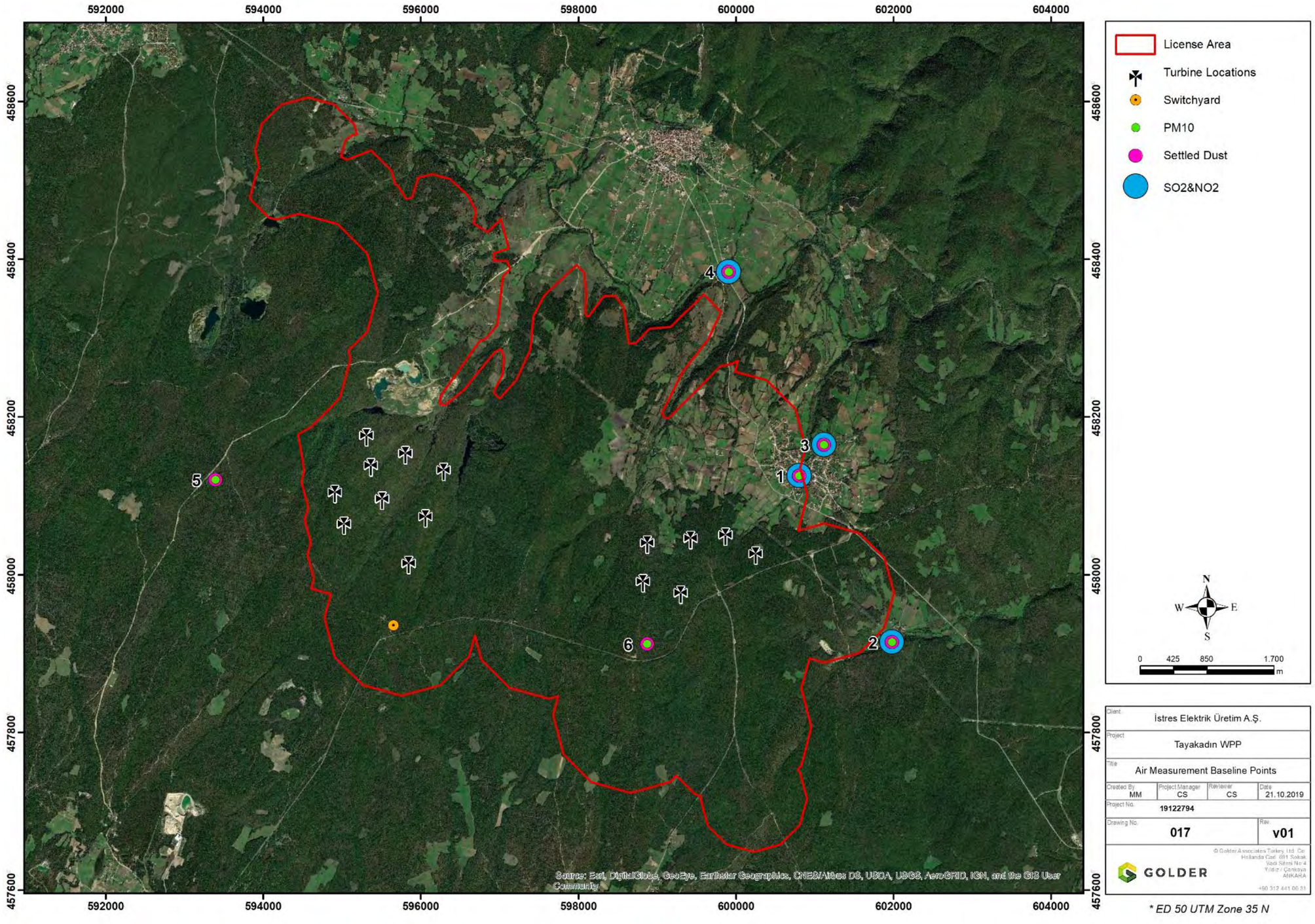


Figure 27 Air Quality Measurement Locations

7.1.9.1 Baseline

Ambient air quality measurement results with respect to relevant Turkish and International standard limits are given in Table 28, Table 30 and Table 31. As seen from the measurement summary table PM_{10}, SO_2&NO_2 and settled dust measurement results comply with both national and international standards.

Table 28: PM10 Measurement Summary

Measurement No	Measurement Date	Measurement Results (µg/m³)	Turkish Limit Value (µg/m³)*	IFC, WHO Limit Value (µg/m³)**
PM10-1	17.06.2019	21.61	50	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
PM10-2	17.06.2019	20.43		
PM10-3	17.06.2019	15.25		
PM10-4	17.06.2019	16.12		
PM10-5	17.06.2019	14.62		
PM10-6	17.06.2019	17.84		

*Regulation on Control of Industrial Air Pollution (03.07.2009. OG No. 27277). App.1. Item 2.2

**World Health Organization, (WHO), IFC Environmental Health and Safety Guidelines

During the ESIA studies, $PM_{2.5}$ measurements were not conducted. PM_{10} (24 hr) measurements reflect the particulate matter situation of the Project Site. However, the special experiment conducted in South Korea by Dr. Sarath K. Guttikunda[30] presents the following conversion table could be used[31]:

Measured PM10 AQI	5	10	15	20	25	30	35	40	45	50	55	60	65	100
Deducted PM2.5 AQI	9	26	40	54	61	68	76	83	92	99	116	132	149	175

According to the table, PM2.5 values (with range) at the baseline PM10 measurement locations are summarised in below table:

Table 29: Estimated PM2.5 Values

Measurement No:	Measurement Date	Measurement Results (µg/m³)	Measurement Results (PM2.5) (µg/m³)[32]
PM10-1 (µg/m³)	17.06.2019	21.61	54-61
PM10-2 (µg/m³)	17.06.2019	20.43	54-61
PM10-3 (µg/m³)	17.06.2019	15.25	40-54

[30] http://www.dri.edu/directory/4902-sarath-guttikunda

[31] http://agicn.org/experiments/south-korea-pm25-air-quality/

[32] The first interim target limit value of PM2.5 for IFC is 75 µg/m3

Measurement No:	Measurement Date	Measurement Results (µg/m^3)	Measurement Results (PM2.5) (µg/m^3)[32]
PM10-4 (µg/m^3)	17.06.2019	16.12	40-54
PM10-5 (µg/m^3)	17.06.2019	14.62	26-40
PM10-6 (µg/m^3)	17.06.2019	17.84	40-54

Table 30: Settled Dust Measurement Summary

Measurement No	Measurement Date	Measurement Results (mg/m^2-day)	Turkish Limit Value (mg/m^2-day)*	IFC, WHO Limit Value (mg/m^2-day)**
SD-1	13.06.2019-10.08.2019	175.90	390	-
SD-2	13.06.2019-10.08.2019	171.99		
SD-3	13.06.2019-10.08.2019	167.17		
SD-4	13.06.2019-10.08.2019	168.20		
SD-5	13.06.2019-10.08.2019	164.63		
SD-6	13.06.2019-10.08.2019	168.81		

*Regulation on Control of Industrial Air Pollution (03.07.2009. OG No. 27277). App.1. Item 2.2

**World Health Organization, (WHO), IFC Environmental Health and Safety Guidelines

Table 31: SO2&NO2 Measurement Summary

Measurement No	Measurement Results (µg/m^3) 13.06.2019-11.07.2019	Measurement Results (µg/m^3) 11.07.2019-10.08.2019	Measurement Results (µg/m^3) Average	Turkish Limit Value (µg/m^3)*	IFC, WHO Limit Value (µg/m^3)**
P-1	SO_2: 1.61 NO_2: 17.27	SO_2: 1.59 NO_2: 17.13	SO_2: 1.6 NO_2: 17.2	SO_2: 20 NO_2: 40	SO_2: 20 NO_2: 40
P-2	SO_2: 1.68 NO_2: 17.65	SO_2: 1.51 NO_2: 17.10	SO_2: 1.60 NO_2: 17.38		
P-3	SO_2: 1.53 NO_2: 17.11	SO_2: 1.60 NO_2: 17.22	SO_2: 1.57 NO_2: 17.17		
P-4	SO_2: 1.55 NO_2: 17.83	SO_2: 1.63 NO_2: 17.43	SO_2: 1.59 NO_2: 17.63		

*Regulation on Control of Industrial Air Pollution (03.07.2009. OG No. 27277). App.1. Item 2.2

**World Health Organization, (WHO), IFC Environmental Health and Safety Guidelines

Based on the above baseline results, the **sensitivity of the component is considered to be low.**

7.1.10 Noise

Study Area for this component is presented in Section 6.1.

The following methodology was applied:

- The standards used are TS 9315 ISO1996-1 Definition of Acoustic-Environmental Noise, Measurement and Assessment Section 1: Standard of Basic Quantities and Assessment Procedures
- The measurements are done at 1/3 octave band. The frequency values between 63 Hz and 8000 Hz are recorded.
- Noise measurements were conducted by using a Cesva SC310 Type 1 Model noise measurement device and Cesva CB006 Type 1 noise calibrator.

Noise measurements were conducted on 13-14 June 2019 at 6 locations (N-1, N-2, N-3, N-4, N-5, N-6) in the Project area and in close vicinity. The locations of the measurement points are shown in below table:

Table 32: Noise Measurement Points

No	X	Y
1	600805	4581253
2	601984	4579143
3	601121	4581644
4	599910	4583841
5	593393	4581201
6	598877	4579119

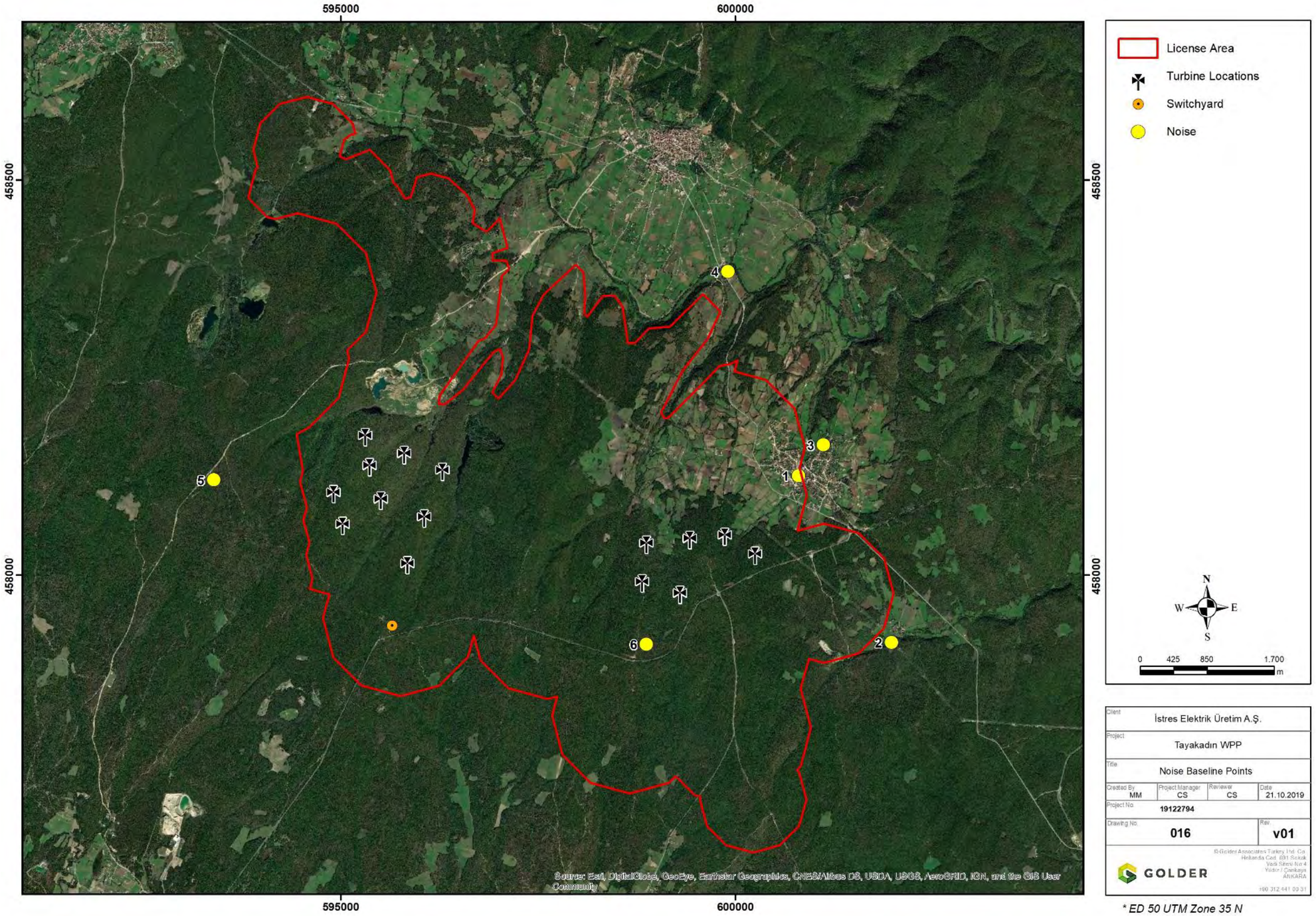


Figure 28: Noise Quality Measurement Locations

7.1.10.1 Baseline

The Project Site itself is classified within “Noise sensitive areas where education, culture and health facilities and recreational areas are densely located” in Turkish limits. In this respect, the noise level national standards which set limits for daytime, evening time and night time are given in Table 33.

Table 33: Turkish Ambient Noise Standards

Receptor Areas	L_{day} (dBA)	$L_{evening}$ (dBA)	L_{night} (dBA)
Noise sensitive areas where education, culture and health facilities and recreational areas are densely located	60	55	50
Areas where commercial buildings and noise sensitive areas are located but residential houses are densely located	65	60	55
Areas where commercial buildings and noise sensitive areas are located but business buildings are densely located	68	63	58
Industrial areas	70	65	60

Source: Regulation on Assessment and Management of Environmental Noise

The Project Site is classified within “residential areas” in IFC limits. Noise level limits of IFC are 55 dBA and 45 dBA for daytime and night time, respectively (Table 34).

Table 34: Ambient Noise Standards in IFC General EHS Guidelines

Receptor	One Hour L_{Aeq} (dBA)	
	Day time 07:00 - 22:00	**Night time 22:00 - 07:00**
Residential; institutional; educational	55	45
Industrial; commercial	70	70

Noise measurement results are presented in Table 35 for both Turkish and IFC standards. Considering the Turkish limits, all of the measurement points comply with the Turkish limits of day time (60 dBA), evening time (55 dBA) and night (50 dBA). According to IFC standards, all day time values comply with the day time noise limit value of 55 dBA. Except from N-3, all night time noise values slightly exceed the night time IFC noise limit of 45 dBA.

Table 35: Background Noise Levels Observed at 24 Hours Measurement Points

Point No.	Date	Leq (Total A) dB					Duration
		Measurement Result as per Turkish Regulation*			Measurement Result as per IFC **		
		L_{day} (07:00 - 19:00)	$L_{evening}$ (19:00 - 23:00)	L_{night} (23:00 - 07:00)	L_{day} (07:00 - 22:00)	L_{night} (22:00 - 07:00)	
N-1	13.06.2019-14.06.2019	47.3	48.1	45.0	47.5	**45.1**	24 hours
N-2	13.06.2019-14.06.2019	47.2	47.6	45.0	47.4	**45.1**	24 hours
N-3	13.06.2019-14.06.2019	42.3	41.6	39.1	42.3	39.2	24 hours
N-4	13.06.2019-14.06.2019	47.9	48.3	45.2	48.1	**45.3**	24 hours
N-5	13.06.2019-14.06.2019	49.6	49.5	48.0	49.7	**48.0**	24 hours
N-6	13.06.2019-14.06.2019	48.0	48.9	45.5	48.3	**45.6**	24 hours

*Time durations for L_{day}, $L_{evening}$ and L_{night} are described in Turkish Regulation on Assessment and Management of Environmental Noise.

**Time durations for L_{day} and L_{night} are described in IFC General EHS Guidelines - Environmental Noise Management.

Based on the above baseline results, the **sensitivity of the component is considered to be medium**. (Please see Section 8.1.8.1.3)

7.1.11 Traffic and Infrastructure

The traffic study has been made in order to assess the traffic impact of Project to the current infrastructure and traffic. The scope of the study is:

- Research and observation of existing transportation, infrastructure and traffic condition on Project site
- Determination of the traffic load of Project
- Projection of traffic volume in the future

On July 9th, 2019 a specific traffic count study was conducted to assess the vehicular traffic at Yaylacık – Aydınlar – Binkılıç Quarter road.

Information about actual traffic flow data based on the vehicle category (light vehicle or heavy vehicle) was collected; the number of average hourly passages was counted on roadways. The road indicated in the figure below were investigated.

The study was conducted between 12:30 and 13:30.

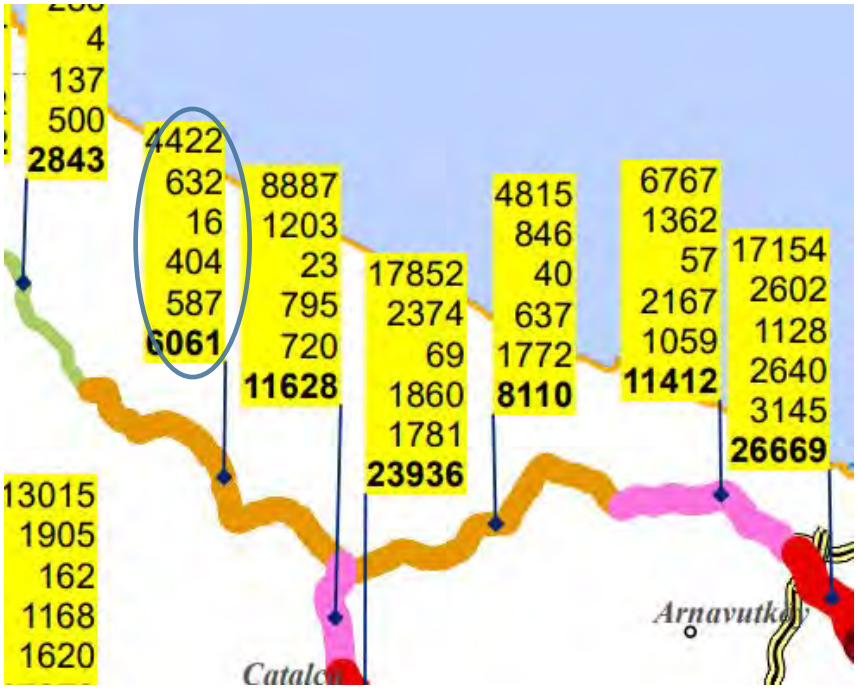


Table 36: Average number of vehicles recorded per day on Yaylacık-Aydınlar-Binkılıç road

Vehicle	Number
Car	4422
Medium weight commercial vehicle	632
Bus	16
Truck	404
Truck + Trailer + Semi-trailer	587
Total	**6061**

Based on the specific study conducted on July 9th, 2019 the traffic flow of study area is estimated as 15 heavy vehicles and 85 light vehicles per hour for the route.

The land traffic in the construction phase will be generated by the machinery, equipment, material and staff to be transported to the Project Site. During the construction phase an increase especially of trucks is expected.

Based on the above baseline results, the **sensitivity of the component is considered to be low**.

7.2 Biological Components

Baseline conditions of the biological components will be conducted by Golder Experts Ecologist Cecilia Amosso and Roberto Mezzalama after the completion of the baseline studies.

The biodiversity Regional Study Area (RSA) is an area containing a geographically distinct assemblage of species, natural communities, and environmental conditions. The RSA is defined in order to assess, based on literature review, the species and habitats potentially occurring within and in the vicinity of the wind power plant.

Local Study Area

The biodiversity Local Study Area (LSA) includes the Project area, all associated facilities (switchyard, access roads, powerline and areas temporarily occupied during construction.tc.) and the Project expected Area of Influence.

This area was outlined by experts (Prof. Dr. Hayri Duman) that performed the baseline survey considering the physical and biological characteristics of the area and the ecological requirements of the species of conservation concern identified.

The project local study area is shown in Section 6.1.

7.2.1 Methodology

The methodology for the preparation of the baseline assessment included the following steps:

- literature review;
- field studies;
- desktop analysis.

Literature review

The literature review focused on the RSA area in order to document available information on local and global distribution, conservation status, ecological niche, phenology, life cycle etc. of species and ecological features determining Priority Biodiversity Features (PBF) and Critical Habitats (CH). Scientific literature and “grey” literature was considered in order to give an overview of the biodiversity sensitive elements potentially present in the area.

The literature review included the following:

- publications:
  - Byfield A. Ataay S. Ozhatay N., 2010. Important Plant Areas in Turkey: 122 Key Turkish Botanical Sites. WWF Türkiye, Istanbul.
  - Demirsoy, A. (2002). Genel ve Turkiye Zoocografyasi (General and Turkish Zoogeography). ISBN. 975-7746-18-5 Meteksan A.S. Ankara.
  - Davis, P.H. (ed.). Flora of Turkey and the East Aegean Islands. Vol.VI:43-44,497. Edinburgh University Press (1978).
  - Eken G., Bozdogan M., Isfendiyaroglu S., Kilic DT., Lise Y. (editors) 2006. Key Biodiversity Areas of Turkey, Nature Society, Ankara.
  - Ekim, T. et al. (2000). Turkiye Bitkileri Kirmizi Kitabı (Red Data Book of Turkish Plants). Turkiye Tabiatını Koruma Dernegi. Yayın No:18.
  - Baytop, T. (1994). Turkiye Bitki Adları Sozlugu (Turkish Dictionary for Plant Names). Ataturk Kultur, Dil ve Tarih Yuksek Kurumu, Turkiye Dil Kurumu Yayınları: 578: Ankara.
  - Davis, P.H. (ed.). (1965-1988). Flora of Turkey and the East Aegean Islands, vol. 1-10, Edinburgh Univ. Press: Edinburgh.
  - Yıldız, B., Şahin, A., Dirmenci, T., Arabacı, T., Çelenk, S., kelch, D. Türkiye’de Yetişen Cirsium Mill. (Asteraceae) Türleri Üzerinde Taksonomik, Moleküler, Karyolojik ve Palinolojik Araştırmalar. TÜBİTAK, Proje No: TBAG-106T167 nolu proje (2010).

  - Kirwan, G.M, K.A. Boyla, P. Castell, B. Demirci, M. Ozen, H. Welch and T. Marlow., 2008. The birds of Turkey: a study of the distribution, taxonomy and breeding of Turkish birds. Christopher Helm. London.
  - Kiziroglu, I. (2008). Red Data Book for Birds of Turkey. Desen Print., Ankara, TR.
  - Kiziroglu, I. (2009). The Pocket Book for Birds of Turkiye, ISBN: 975-7460-01-X, Ankamat Matbbası, Ankara, 564 s
- web sources:
  - Bird Life International, 2015. Country profile: Turkey. Available from: http://www.birdlife.org/datazone/country/turkey. Checked: 2015-08-18.
  - European Environmental Agency (EEA), 2012. European Nature Information System (EUNIS). Retrieved from: http://eunis.eea.europa.eu.
  - Global Biodiversity Information Facility: http://www.gbif.org/.
  - International Union for Conservation of Nature (IUCN) 2012. Red List of Threatened Species. Version 2012.2. Retrieved from: http://www.iucnredlist.org.
  - The Global Ecoregions: http://www.worldwildlife.org/biomes.
  - Turkish Plants Data Service (TÜBİVES): http://www.tubives.com/.
  - www.dogalhayat.org/
  - www.bizimbitkiler.org.tr/
  - The plant list database: www.theplantlist.org

Field studies

The field studies have been initiated in order to assess the baseline conditions within the study area are listed and described below:

- flora and vegetation field study;
- fauna field study;
- bird field study;
- bat field study.

The flora and vegetation study has been conducted by Prof. Dr. Hayri Duman.

Fauna field study has been conducted by Prof. Dr. Şakir Önder Özkurt.

Bird field study will be conducted by Bird Specialist Kerem Ali Boyla for minimum 36 hours for each vantage point during the Autumn, 2019 season and Spring, 2020 season with the total of 72 hours. There are minimum 2 vantage points determined by Kerem Ali Boyla.

Bat field study has been conducted for 6 nights by Prof. Dr. Şakir Önder Özkurt.

Detail information related to field study methodologies will be given after the completion of biodiversity baseline studies. Please note that Golder has not get the evaluation reports of the biodiversity field studies from the experts mentioned above yet.

Desktop analysis

The data collected during the literature review and the review field survey were analysed in order to:

- define a list of flora and fauna species potentially present within the LSA;

- define and map Natural and Modified Habitats present within LSA according to EUNIS classification;
- identify protected and internationally recognized areas of biodiversity importance present within 20 km from the LSA;
- assess the presence of potential Critical Habitats (CH) within the LSA.
- Lists of flora and fauna species potentially present or observed within the LSA were created. Information on the species taxonomy, national and global protection and conservation status were also added.

7.2.2 Sensitivity Assessment

Based on the information collected with the methodology described above, the sensitivity of the component will be determined according to the following definitions. A biological component, as general approach, has:

- high sensitivity when it has an attribute with a high quality and rarity on an international, regional or national scale with little or no potential for substitution;
- medium sensitivity when it has an attribute with a high quality and rarity on a local scale with little or no potential for local substitution, or with a medium quality or rarity on a regional or national scale with limited potential for substitution;
- low sensitivity when it has an attribute with a medium quality and rarity on a local scale with limited potential for substitution, or an attribute of low quality and rarity on a regional or national scale;
- negligible sensitivity when it has an attribute of low quality and rarity on a local scale with potential for substitution locally

7.2.3 Terrestrial Flora

The baseline assessment of the terrestrial flora will be completed after completion of the baseline studies.

7.2.4 Terrestrial Fauna

The baseline assessment of the terrestrial fauna will be completed after completion of the baseline studies.

The terrestrial fauna studies will be focused on the following taxa:

- amphibian species;
- reptiles species;
- bird species;
- mammal species.

7.2.5 Terrestrial Habitat

Baseline terrestrial habitat assessment will be conducted after the completion of the baseline studies.

7.2.6 Protected and Internationally Recognized Areas

Baseline protected and internationally recognized areas will be assessed after the completion of the baseline studies.

7.2.7 Critical Habitat

The potential presence of critical habitats, based on five criteria defined in IFC Performance Standard 6 (IFC, 2012) will be discussed below accordingly.

Criterion I: habitat of significant importance to Critically Endangered and/or Endangered species

Criterion II: habitat of significant importance to endemic and/or restricted-range species

Criterion III: habitat supporting globally significant concentrations of migratory species and/or congregatory

Criterion IV: highly threatened and/or unique ecosystems

Criterion V: areas associated with key evolutionary processes.

Critical habitat assessment will be conducted after the completion of the baseline studies.

7.3 Social Components

7.3.1 Study Area

Determining on the Area of Influence (AoI) is an essential component of Social Impact Assessment (SIA).

The area of influence may include one or more of the following, as appropriate:

(i) *"The assets and facilities directly owned or managed by the client that relate to the project activities to be financed (such as production plant, power transmission corridors, pipelines, canals, ports, access roads and construction camps).*

(ii) *Supporting/enabling activities, assets and facilities owned or under the control of parties contracted for the operation of the client's business or for the completion of the project (such as contractors).*

(iii) *Areas and communities potentially impacted by cumulative impacts from further planned development of the project or other sources of similar impacts in the geographical area, any existing project or condition, and other project-related developments that can realistically be expected at the time due diligence is undertaken.*

(iv) *Areas and communities potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location. The area of influence does not include potential impacts that would occur without the project or independently of the project".*

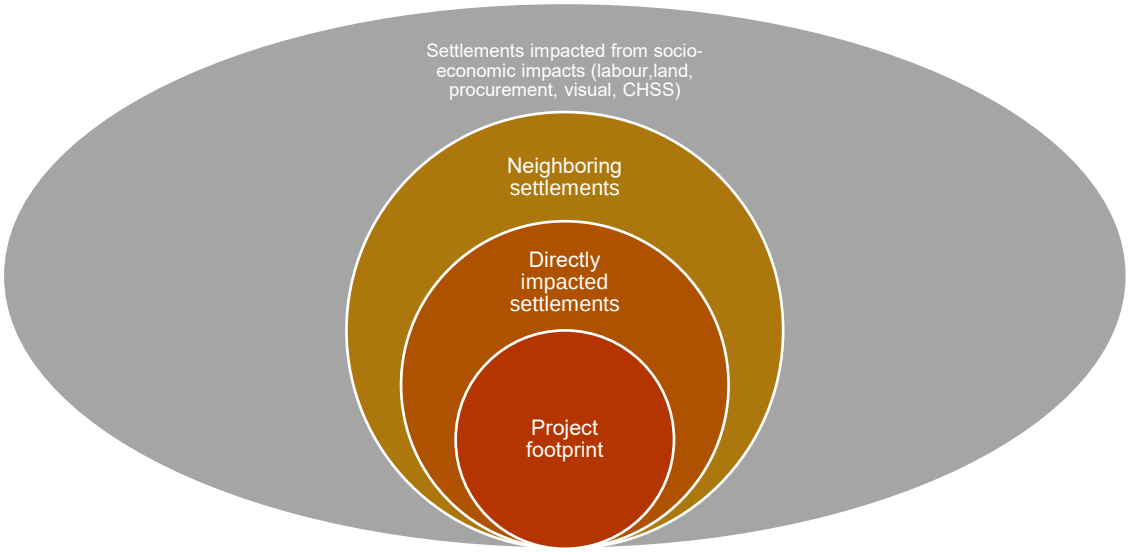


Figure 29: Project Area of Influence

The study area for social components is decided based on the distance of the turbines to the nearest settlements, considering that statistical information is usually aggregated and presented according to these boundaries. Study area for this component is presented in the Section 6.1.

Collecting information for the project has been conducted with a specific focus on the neighbouring settlements around the project site for primary data collection. The settlements located in the vicinity of project are determined as follows:

- Aydınlar Village
- Binkılıç Quarter (Atatürk and Fatih Neigbourhoods)

Data collection for social impact assessment (SIA) studies were conducted by Golder on 9th-10th of July, 2019. Within the scope of the SIA; Binkılıç Chief of Forest Sub-Directorate, Aydınlar Village Community Council member and Atatürk Neighbourhood mukhtar were in-depth interviewed.

7.3.2 Methodology

SIA studies were conducted in line with the World Bank Environmental and Social Standards (ESSs). The methodology used to conduct social impact assessment is classified as both qualitative and quantitative:

Quantitative:

- Statistical data obtained from official resources such as Turkish Statistical Institute.

Qualitative:

- Local information about the Neighbourhoods obtained through mukhtar interviews
- Basic socio-economic indicators from Address-Based Population Registration System TÜİK (2017).

7.3.3 Demographic Profile, Socio-economic Conditions and Employment Issues

İstanbul is Turkey's most populous city as well as its cultural and financial hub. Located on both sides of the Bosphorus, the strait between the Black Sea and the Marmara Sea, Istanbul bridges Asia and Europe both physically and culturally. Istanbul's population is presented below, making it also one of the largest cities in Europe and the world.

Table 37: Istanbul City Population

CITY	TOTAL			TOWN AND DISTRICTS		
	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE
İSTANBUL	15,067,724	7,542,231	7,525,493	15,067,724	7,542,231	7,525,493

Çatalca is a city and a rural district in Istanbul, Turkey in East Thrace, on the ridge between the Marmara and the Black Sea. Çatalca has a surface area of 1,715 km² and 135 kilometers of coastline. It neighbours Çatalca to the south, Silivri and Tekirdağ Province to the west. Avcılar, Küçükçekmece, and Arnavutköy lie to the east. Fresh water for Istanbul is provided from by lakes Durusu and Çatalca.

Table 38: Çatalca District Population

CITY	TOTAL		
	TOTAL	MALE	FEMALE
ÇATALCA	72,966	37,675	35,291

7.3.4 Economic Structure

Istanbul is a distinguished region, having the same borders at all three levels: TR1, TR10 and TR100 according to NUTS. The City of Istanbul, comprising a metropolitan municipality and 39 district municipalities, accounts for close to one fifth of Turkey's population and one third of economic output[33]:

- 367,772 Companies Registered in Istanbul Chamber of Commerce

  (Istanbul Chamber of Commerce - May 2015)
- 49,945 Companies Newly Founded

  (Union of Chambers and Commodity Exchanges of Turkey - 2014)
- Housing Sector Comes #1 with 30,180 Companies

  (Istanbul Chamber of Commerce - May 2015)
- 24,612 Companies with Foreign Partners (59% of Turkey)
- (Ministry of Economy - January 2015)

In the late 1990s, the economy of Turkey, and Istanbul in particular, suffered several major depressions. The Asian financial crisis between July 1997 and the beginning of 1998, as well as the crisis in Russia between August 1998 and the middle of 1999 had negative effects in all areas of the economy, particularly on exports. Following this setback, a slow reorganization of the economy of Istanbul was observed in 1999. The major earthquake, which was epicentered in nearby Kocaeli on 17 August 1999, triggered one of the largest economic shocks for the city. Apart from the capital and human losses caused by the disaster, a decrease in GDP of approximately two percent occurred. Despite these downturns, Istanbul's economy has strongly improved and recovered in following years.

Çatalca, compared to other districts of Istanbul, is distant rural area from Istanbul. Majority of the population is retired and residents in rural places of Çatalca is inclined with husbandry and agriculture.

Majority of the Project area belongs to the Forestry with some private parcels (which will be elaborated in the Land Use section), that will require amicable purchase or expropriation.

Aydınlar Village

The distance between Aydınlar Village and the nearest turbine (T14) is approximately 1 km.

The number of households in the village is 450, approximately 1000 and around 1200 in summer. Average age is 35-40. In Aydınlar, the majority is elder and retired. Youngsters migrate to Çerkezköy, Çatalca and

[33] Istanbul fact Sheet, https://www.istka.org.tr/media/1253/istanbul-fact-sheet-en.pdf

Silivri, to work in factories on textile, manufacture and plastics. Reasons of out-migration is either employment or education. 35-40 households are women headed. 60-65 people rely on social aid.

Main livelihoods are forestry and wood products, 12 months a year. There is newfound up cooperative and village development. There used to be husbandry as a livelihood, but people gave up in time: There is only a few families inclined with husbandry, currently.

The perception of the Mukhtar was positive, with requests of employment, benefits and additional information on the potential effects.

There used to be an elementary school in the village, but it will be closed soon permanently, and mobile teaching will start to Binkılıç Neighbourhood.

There is a primary health care center in the village where the medical doctor offers services twice a week, 2 hours each session. Nearest healthcare institutions in vicinity are in Çatalca (of 40 km distance) and Çerkezköy (of 25 km distance). Transportation to Çatalca is not easy, public transportation is accessible only 3-4 times a day.

As a whole, cumulative impact might be considered due to the magnesium mine and other WPP projects in vicinity.

Atatürk Neighbourhood

Atatürk Neighbourhood is one of the neighbourhoods of Binkılıç together with Fatih Neighbourhood. As these two settlements carry alike features in terms of socio-economy and location, it is recommended by the interviewed parties not to think of these neighbourhoods as two separate settlements.

1600 people reside in the village, 970 voters and in 500 households. Main livelihoods are forestry and wood products, as far as the weather conditions allow. 14 people rely on social aid. Majority of the residents are retired. There is a newly found up milk cooperative aiming to increase husbandry. Porchino mushroom collecting is a common livelihoods practice performed by the majority of the village. People migrate from here go to İstanbul and Çatalca mostly for work.

Nearest healthcare institutions in vicinity are in Çerkezköy (of 20 km distance). There are plenty of women headed households.

3 owners of 4 required parcels reside here, there are also parcel owners in Fatih Neighbourhood too. Fina's strategy is to pay for the easement or leasing first while expropriation decision is awaiting, and after the decision is taken, pay for the expropriation price and fully acquire the land.

There is a primary healthcare institution, a secondary school and a mosque in Fatih Neighbourhood, which are being used jointly, due to close proximity. There is no distinct disease in the neighbourhood.

The perception was positive against the project, stating that anyone can be supressed in case of opposition, and no one should be brought to work for the project, but Atatürk neighbourhood residents. There is a serious potential for blue collar and security works. It is stated by İstres representative that 5-6 certified security personnel can be provided locally in case of any need. The status of road usage is also asked by the residents, as it is important for wood cutting and mushroom collecting. İstres representative stated that, the road will be renewed, and new roads will be constructed, which will ease the access to ecosystem services. Roads belong to public property and limitation on access to roads will not be an issue under any terms.

The presented baseline data for socioeconomic conditions and employment issues point out that;

- The project site is bounded by Aydınlar village and Atatürk&Fatih Neighbourhoods, the latter with similar socioeconomics characteristics.

- The main livelihood activity in these affected settlements are animal husbandry.
- There are private parcels in Atatürk and Fatih Neighbourhoods.
- The sensitivity of the socio-economic and employment context is considered to be medium.

7.3.5 Land Use

Golder met with a member of community council (*muhtar azası*) in Aydınlar Village, Binkılıç Forest Sub-Directorate, and the mukhtar of Atatürk neighbourhood. Based on this pre-engagement results and according to the information gathered from the Project Owner and the interviewed people, majority of the project area belongs to the Forestry premises: The strategy of the Owner is to rent these premises from Forest Administration (Ministry of Agriculture and Forestry) within the license duration and run expropriation process for private plots. These plots are planned to be leased after issuing EMRA Public Welfare decision.

- Total area of the village is 35-40 hectares.
- As the husbandry is not performed inside the village, of 450 m distance to T13, there is an ovine barn. Normally, any construction activity is forbidden in the vicinity. There are 450 ovine and 4 shepherds accommodating in the barn in season and out season. The continuous engagement with the user needs to be considered during the expropriation period of the project.
- Plots of two turbines (T1 and T2) in 4 parcels belong to private premises, EMRA Public Welfare decision is taken for these parcels. The expropriation process is still in progress. Negotiation process with landowners will be initiated by the Project Owner, accordingly. T1 and T2 lands particularly belong to the same person; which are identified as “idle” and not being actively used for any purpose.
- Plots of T12 and T15 will be requested from the National Estate. The official letter about the status non-agricultural land of these plots is requested from the Ministry of Agriculture and Forestry.

Details of private parcels are presented below:

Table 39: Tayakadın WPP Expropriation List

İSTRES ELEKTRİK ÜRETİM A.Ş. TAYAKADIN WIND POWER PLANT LIST OF IMMOVABLE PROPERTIES TO BE EXPROPRIATED														
NO	CITY	DISTRICT	NEIGHBOURHOOD	LOCATION	NO OF SECTION	PLOT NUMBER	NO. OF PARCEL	OCCUPANTS		TYPE OF PROPERTY	SURFACE AREA OF THE IMMOVABLE (m2)		REMAINING AREA AFTER EXPROPRIATION (m2)	AIM OF EXPROPRIATION
								NAME-SURNAME	SHARE PERCENTAGE		TITLE DOMAIN	CALCULATED AREA		
1	İSTANBUL	ÇATALCA	BİNKILIÇ	DIRĞAZ SARAY YOLU	15	0	2845	MUSTAFA KUMRAL	SOLE	CROPLAND	14.800,00	15.071,88	7.738,73	TURBINE LOCATION
2	İSTANBUL	ÇATALCA	BİNKILIÇ	DIRĞAZ SARAY YOLU	14	0	2846	MEHMET BÜYÜK	SOLE	CROPLAND	12.000,00	10.960,85	6.267,69	TURBINE LOCATION
3	İSTANBUL	ÇATALCA	BİNKILIÇ	DIRĞAZ KÜÇÜK MEKANI	14	0	2854	MEHMET BÜYÜK	SOLE	CROPLAND	6.600,00	6.396,40	6.600,00	TURBINE LOCATION

4	İSTANBUL	ÇATALCA	BİNKILIÇ	DIRĞAZ KÜÇÜK MEKANI	14	0	2855	MUSTAFA MERMUTLUOĞLU	SOLE	CROPLAND	7.100,00	6.982,84	7.100,00	TURBINE LOCATION
													TOTAL	**27.706,42**

- There is a barn located in 450 m vicinity of T13, being used for ovine grazing purpose: As any construction activity is within the parcel is forbidden, this building is illegal, and any action is not planned to be done for this barn. However, concerning community health, safety and security issues; this barn and residents should be monitored for any adverse impacts.

The sensitivity of the land use context is considered to be medium.

7.3.6 Cultural Heritage

The studies, which were conducted for identifying possible archaeological and immovable cultural assets within the boundaries of the Tayakadın Wind Power Plant Project construction site and assessing the impact of the project activities on these sites were conducted by REGIO (REGIO Cultural Heritage Management Consultancy) Team. The studies composed of three phases:

- Desktop Study
- Field Survey
- Reporting

Publications on archaeological, ethnographic and intangible cultural heritage related to the project area and its immediate surroundings have been compiled in order to determine the cultural heritage potential of the site. It has been researched whether there is an existence of archaeological or cultural heritage which has already been recorded in the area of study or in nearby area by interviewing İstanbul Regional Directorate of Cultural Assets Protection No.1. staff. Resources used during desktop study are as follows:

- Academic Publications
- Historical Maps
- Reports from previous Cultural Heritage Studies and Surface Survey Results
- Inventory Records of the Ministry of Culture and Tourism.
- Documentary films about the region

The field research was conducted separately for tangible and intangible cultural heritage elements, and these studies were conducted by the REGIO Cultural Heritage Assessment Team on May 30-31, 2019 in areas where the project will be implemented.

During the field study for evaluation of the tangible cultural heritage, locations of 15 turbines planned to be erected and access roads planned to be constructed within the scope of Tayakadın Wind Power Plant Project were examined. In addition, archaeological traces and qualities of the registered sites, which are researched using resources of İstanbul Regional Directorate of Cultural Assets Protection No.1. and previous archaeological field surveys were documented during field studies.

Field research studies regarding intangible cultural heritage were conducted using face to face interviews in 5 settlements near the Project license area. The participants were encouraged to submit their own responses without any limitation during interviews. It was aimed to understand the cultural structures of the society groups or individuals and the behaviours and experiences that constitute these structures using the survey method.

In order to choose the participants for the survey, a purposeful sampling strategy was employed. Priority was given to persons who have accurate and reliable information about the history of the region from each profession group, mainly have been living in the region for at least 3 generations and with an average age of 80 and above. However, people who have extensive information regarding history, traditions, customs and geography of the region were also interviewed. In addition, observations during the studies were used as part of field survey regarding intangible cultural heritage.

During the reporting phase data obtained about tangible and intangible cultural heritage located in the project license and impact area was analysed. Tangible cultural heritage data are evaluated in GIS environment, where cultural heritage assets are located in the project license area, the effects of the Project activities on these assets are evaluated and suggestions are developed to minimise the impact of the project and to develop methods for protection / rescue of these areas. Surveys of interviews conducted on intangible cultural heritage were taken into consideration one by one to collect information that would affect the intangible cultural heritage and remain within the scope of the project license and impact area.

7.3.6.1 Baseline Study Results

Desktop Study Results

The project is located in Silivri and Çatalca district of İstanbul province. There's no registered archaeological site within the Project license area[34]. During field survey studies, no tangible cultural assets have been encountered. There are archaeological sites registered by the decision[35] of İstanbul No.1 Regional Board for Conservation of Cultural Assets within the boundaries of Silivri/Danamandıra and Çatalca/Gümüşpınar neighbourhoods near the Project license area (Table 40). Archaeological areas have been found in Aydınlar, Halaçlı and Yaylacık neighbourhood within and around the Project license area during previous archaeological field surveys carried out[36]. İstanbul (Byzantine) ancient water supply system[37] is in the northern border of the project license area. Detailed information regarding these archaeological areas is given in Table 40.

[34] Decision numbered 2114 dated 10.11.2016 of İstanbul No.1 Regional Board for Conservation of Cultural Assets; Decision numbered 3658 dated 13.09.2018 of İstanbul No.1 Regional Board for Conservation of Cultural Assets

35 Decision numbered 2114 dated 10.11.2016 of İstanbul No.1 Regional Board for Conservation of Cultural Assets; numbered 2538 dated 15.06.2017; numbered 4310 dated 17.05.2019

36 They are defined within the scope of İstYA Project carried out during 2014-2015 years within the boundaries of Çatalca district.

[37] These are found as result of investigation carried out during 2007-2010 by Prof. Dr. Derya Maktav and Prof. Dr. James Crow within the scope of the Project of Investigation of Water Supply System of Ancient İstanbul (Byzantine) Using Spatial Technology and Terrestrial Archaeological Survey Methods.

Table 40: List of Tangible Cultural Heritage both in and around the Project License Area

No	Name of Area	Province	District/Neighbourhood	Distance to Project License Area	Decision of Registration
1	Su Kemeri 1	İstanbul	Silivri/Danamandıra	5 km	Decision numbered 2114 dated 10.11.2016 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
2	Su Kemeri 2	İstanbul	Silivri/Danamandıra	5 km	Decision numbered 2114 dated 10.11.2016 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
3	Su Kemeri 3	İstanbul	Silivri/Danamandıra	5.1 km	Decision numbered 2114 dated 10.11.2016 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
4	Su Kemeri 4	İstanbul	Silivri/Danamandıra	5.1 km	Decision numbered 2114 dated 10.11.2016 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
5	Su Kemeri 5	İstanbul	Silivri/Danamandıra	5.1 km	Decision numbered 2114 dated 10.11.2016 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
6	Antık1	İstanbul	Silivri/Danamandıra	6.69 km	Decision numbered 2538 dated 15.06.2017 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
7	Antiktas	İstanbul	Silivri/Danamandıra	6.72 km	Decision numbered 2538 dated 15.06.2017 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
8	Ayla Pınarı	İstanbul	Silivri/Danamandıra	6.87 km	Decision numbered 2538 dated 15.06.2017 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
9	Mağaram	İstanbul	Silivri/Danamandıra	5.64 km	Decision numbered 2538 dated 15.06.2017 of İstanbul No.1 Regional Board for Conservation of Cultural Assets

No	Name of Area	Province	District/Neighbourhood	Distance to Project License Area	Decision of Registration
10	Magstu2	İstanbul	Silivri/Danamandıra	6.39 km	Decision numbered 2538 dated 15.06.2017 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
11	Magasuka	İstanbul	Silivri/Danamandıra	6.25 km	Decision numbered 2538 dated 15.06.2017 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
12	Sunak	İstanbul	Silivri/Danamandıra	6.01 km	Decision numbered 2538 dated 15.06.2017 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
13	Sunak2	İstanbul	Silivri/Danamandıra	5.99 km	Decision numbered 2538 dated 15.06.2017 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
14	Tumus 1	İstanbul	Silivri/Danamandıra	5.49 km	Decision numbered 2538 dated 15.06.2017 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
15	Tumus 2	İstanbul	Silivri/Danamandıra	5.49 km	Decision numbered 2538 dated 15.06.2017 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
16	Tumus 3	İstanbul	Silivri/Danamandıra	5.50 km	Decision numbered 2538 dated 15.06.2017 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
17	Tumus 4	İstanbul	Silivri/Danamandıra	5.37 km	Decision numbered 2538 dated 15.06.2017 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
18	Tumus 5	İstanbul	Silivri/Danamandıra	5.35 km	Decision numbered 2538 dated 15.06.2017 of İstanbul No.1 Regional Board for Conservation of Cultural Assets

No	Name of Area	Province	District/Neighbourhood	Distance to Project License Area	Decision of Registration
19	Tumus 6	İstanbul	Silivri/Danamandıra	5.30 km	Decision numbered 2538 dated 15.06.2017 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
20	Tumus 7	İstanbul	Silivri/Danamandıra	5.31 km	Decision numbered 2538 dated 15.06.2017 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
21	Tumus 8	İstanbul	Silivri/Danamandıra	5.43 km	Decision numbered 2538 dated 15.06.2017 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
23	Tumus 10	İstanbul	Silivri/Danamandıra	5.40 km	Decision numbered 2538 dated 15.06.2017 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
24	Tumus 11	İstanbul	Silivri/Danamandıra	5.72 km	Decision numbered 2538 dated 15.06.2017 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
25	Tumus 12	İstanbul	Silivri/Danamandıra	5.68 km	Decision numbered 2538 dated 15.06.2017 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
26	Tumus 13	İstanbul	Silivri/Danamandıra	5.66 km	Decision numbered 2538 dated 15.06.2017 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
27	Tumus 14	İstanbul	Silivri/Danamandıra	5.63 km	Decision numbered 2538 dated 15.06.2017 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
28	Tumus 15	İstanbul	Silivri/Danamandıra	5.65 km	Decision numbered 2538 dated 15.06.2017 of İstanbul No.1 Regional Board for Conservation of Cultural Assets

No	Name of Area	Province	District/Neighbourhood	Distance to Project License Area	Decision of Registration
28	Tumus 16	İstanbul	Silivri/Danamandıra	5.66 km	Decision numbered 2538 dated 15.06.2017 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
29	Tumus 17	İstanbul	Silivri/Danamandıra	5.73 km	Decision numbered 2538 dated 15.06.2017 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
29	Tumus 18	İstanbul	Silivri/Danamandıra	5.12 km	Decision numbered 2538 dated 15.06.2017 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
30	Su Kemeri	İstanbul	Çatalca/Gümüşpınar	Exact location has unknown	Decision numbered 4310 dated 17.05.2019 of İstanbul No.1 Regional Board for Conservation of Cultural Assets
31	Halaçlı Höyüğü	İstanbul	Çatalca/Halaçlı	Exact location has unknown	No registration decision has found
32	Su Kemeri	İstanbul	Çatalca/Aydınlar	Exact location has unknown	No registration decision has found
33	Bobadar Mağarası	İstanbul	Çatalca/Aydınlar	Exact location has unknown	No registration decision has found
34	Yaylacık Mağarası	İstanbul	Çatalca/Yaylacık	Exact location has unknown	No registration decision has found
35	Yaylacık Kilisesi	İstanbul	Çatalca/Yaylacık	Exact location has unknown	No registration decision has found
36	İsale Hattı	İstanbul	Çatalca/Atatürk	Exact location has unknown	No registration decision has found

Field Survey Results

A big part of the Project license area where field survey studies were carried out has plantation of oak, hornbeam, beech trees and small clearing areas in the forest. Agricultural activity lands are also available in a small part of the area. As the field survey opportunities in the area are limited due to plantation and obstacles and as there are archaeological sites nearby the project area, it is regarded that the tangible cultural assets could be encountered during construction activities.

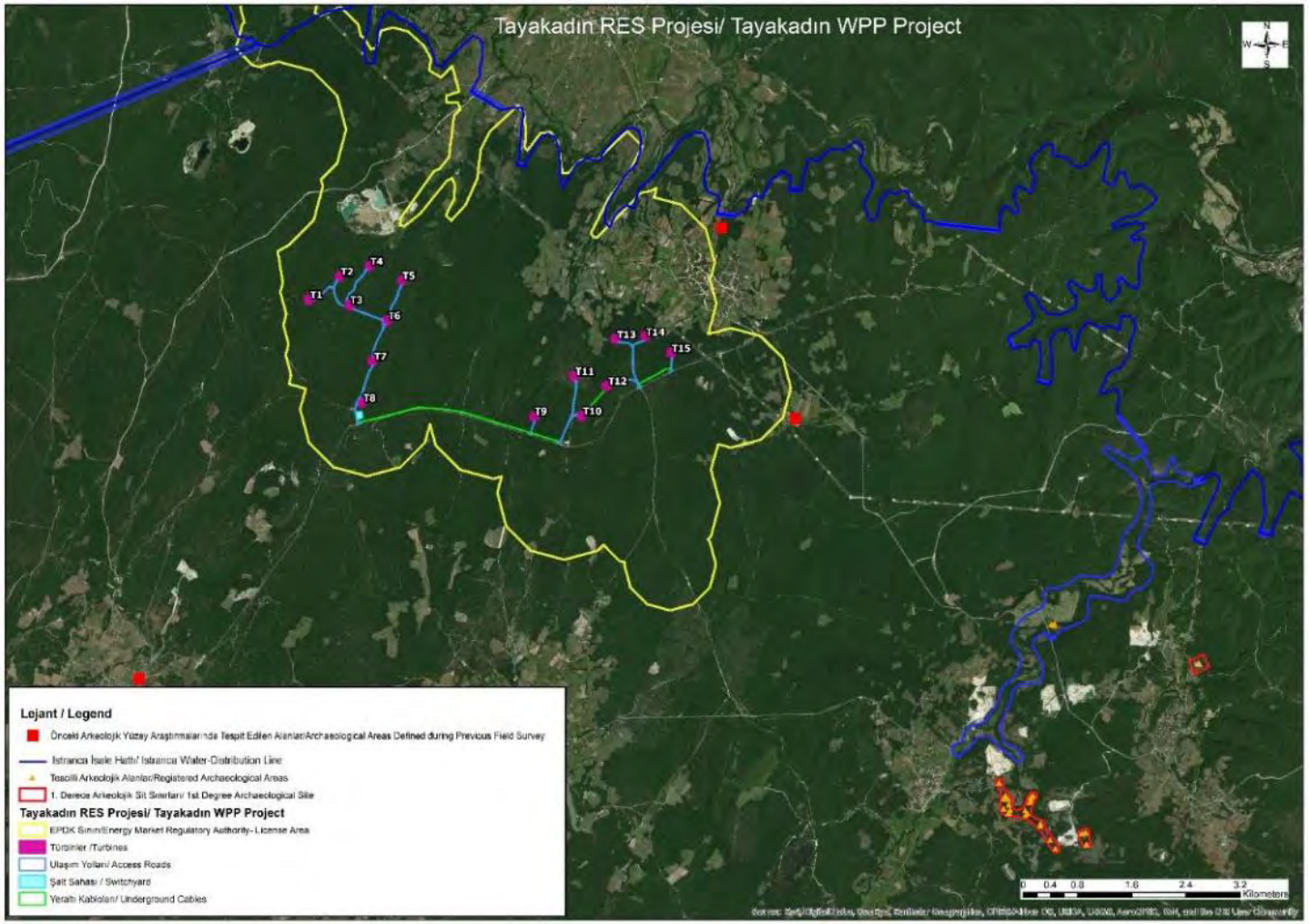


Figure 30: Tayakadın Wind Power Plant Project License Area, Archaeological Sites near the Project, Archaeological Areas and Istranca Water Supply Line Found During Previous Field Survey

Fieldwork regarding intangible cultural heritage was conducted by using face-to-face survey technique in 5 rural settlements near the Project site. The research aimed to identify the existing cultural structures for society, groups or individuals and the behaviours and experiences that constitute these structures. The sampling of the survey included 26 residents living in the project area. The distribution of participants between the settlements are as follows; 6 persons from Aydınlar, 5 persons from Sayalar, 7 persons from Binkılıç (Fatih), 5 persons from Safaalan and 3 persons from Yaylacık settlement (Table 41). The participants were asked open ended questions and they were encouraged to express their own views and responses without any intervention.

Detailed information about rural settlements where the field studies carried out is displayed in the Table 41 below.;

Table 41: Details of Settlements where Studies Regarding Intangible Cultural Heritage Carried Out

Province	District	Neighbourhood	Distance to Project License Area (km)
İstanbul	Çatalca	Aydınlar	0 km
İstanbul	Silivri	Sayalar	2,38 km
İstanbul	Çatalca	Binkılıç (Fatih)	1,92 km
Tekirdağ	Saray	Safaalan	2,39 km
İstanbul	Çatalca	Yaylacık	0,1 km

While Balkan immigrants live in Aydınlar, Sayalar, Binkılıç (Fatih) and Safaalan settlement, Erzurum immigrants live in in Yaylacık settlement located near the Project license area. People who live in these five rural settlements knows about migration stories and memories. There were people from these settlements who have joined Çanakkale as soldiers and some of whom became martyred. Stories about their heroism are still known and recalled today. In addition, oral traditions such as fairy tales, lullabies, legends, beliefs, heroic stories, idioms, proverbs, folk songs, etc. are still preserved.

There is an agricultural development cooperative and an aid association in Aydınlar settlement. The cooperative carries out activities and trainings about livestock, forestry and endemic plant species. The aid association of grants scholarships to young people studying at the university. The irrigation cooperative, which is in the settlement of Sayalar, carries out agricultural activities of beans, peppers and corn, which are produced in a small scale. The cooperative organizes water transportation from the Sayalar pond to these agricultural lands. Participants living in the Binkilic (Fatih), Safaalan and Yaylacık settlements have stated that there is no cooperative in these three settlements.

Local people in these five settlements near the Project site are gathering herbs and plants such as thyme, mushroom, linden, rosehip, blackberries, nettle, tetra herb, kaldırık and madımak herbs in the nearby mountains and forests to be used for traditional medicine and healer purposes. During the field work the people stated that in past there were osteopaths, bone setters and healers in the villages but today such practices are not available anymore.

The production and consumption based local economic activities carried out by the local people in order to sustain their lives are mainly animal husbandry, lumbering and coal manufacturing based on the inherited knowledge from their ancestors.

The only traditional day that is celebrated in the region except for religious and official holidays is Hıdırellez. However, it was stated that in past Hıdırellez was a more collective and excited celebration in village squares while the importance is diminishing under today’s conditions.

It is indicated that in both five settlement areas, as a traditional handicraft practice, the sheep wool is turned into yarn which is then used to produce materials such as sweater, socks, rugs, sack. However, the participants also added that younger generations are not interested in pursuing these traditional practices.

The Greek houses that were preserved until today are representing the traditional architecture in the settlement of Binkılıç (Fatih). These houses with oriel, and were built by using wood material, clayey mud and straw, were continued to be used by Balkan immigrants who settled in the area after leaving of the Greeks. For the rest four settlements, adobe is the main material for the traditional house architecting.

No archaeological site was found during the archaeological field survey studies carried out within the project license area. A large part of the area is covered with dense vegetation and forest. This coverage made it difficult to identify the archaeological heritage. In past, several archaeological sites have been identified in the area as the result of archaeological field surveys conducted in the region. In this regard, the project should be implemented with caution in consideration of the "Cultural Heritage Management Plan" and its "Chance Find Procedure" during activities to be carried out within the Project license area which will need physical intervention to the land.

It was determined that the project license area, in some locations, is related to intangible cultural heritage in the region. In the interviews carried out with people who live in Aydınlar settlement, it was understood that the people are using the forests, which are part of the project license area, for traditional healer practices. Participants stated that they are using some herbs and fruits collected from this region, such as oregano, mushroom, linden, rosehip and blueberries for treatment of various diseases and for traditional foods. The people who live in this area should be informed by the Project authorities with informative booklets to which extent the turbines will affect the area and their practices.

The sensitivity of the cultural heritage context is considered to be low.

7.3.7 Visual Aesthetics

Depending on the location, wind power plant projects may have an impact on viewscapes, especially if visible from or located near residential areas or tourism sites. Visual impacts associated with wind power

plant projects typically concern the installed and operational turbines themselves (e.g., color, height, and number of turbines)[38].

Impacts may also arise in relation to operational wind power plants' interaction with the character of the surrounding landscape and/or seascape. Impacts on Legally Protected and Internationally Recognized Areas of importance to biodiversity and cultural heritage features are also a consideration. Zone of visual influence map of the proposed project was presented in Section 8.3.5.

Visual impact is a subjective issue, a significant number of people in Turkey, who has been interact with the wind power plants, thinks that wind farms are clean energy and view of the towers as a symbols of modern and civilized living. According to the preliminary social survey conducted for the project during the site visit, there is not any negative opinion for potential visual of the turbines.

8.0 IMPACT ASSESSMENT

8.1 Physical Component

8.1.1 Geology and Geomorphology

8.1.1.1 Impact Analysis

8.1.1.1.1 Construction Phase

According to geotechnical investigations, the dominant rock unit is CLAY with some sand and the groundwater was not encountered in the geotechnical borings. According to Geotechnical Report there is no risk of liquefaction. Ergene formation is the only formation observed in the Study Area.

For the foundation works, approximately 625 m^2 (25 m x 25 m) of area will be excavated for each turbine.

During the construction phase, impacts will be mainly associated to the following ***impact factor***:

- changes in the local morphology.

The ***project actions*** related to the abovementioned impact factor are the following: surface levelling and grading, temporary stockpiling of material and construction of the turbines and facilities.

Additional impacts on geology and geomorphology also related to hydrology, hydrogeology and soil are discussed in the Sections 7.1.3, 7.1.5, 7.1.6 of this report.

The impact is mainly related to the changes inflicted on the current morphology of the area due to the earthworks and excavations, and for the site preparation (scarified, excavated, filled with proper material, and flattened) and the construction of the buildings' foundations.

8.1.1.1.2 Commissioning and Operation Phase

As a result of the impact screening no impacts on the geology and the geomorphological components are expected during the commissioning and operation phase.

8.1.1.1.3 Decommissioning and Closure Phase

In general, the decommissioning activities would comprise the removal of the plants and the associated facilities. Also, the foundations of the structures would be removed. The site is expected to be restored for its future use.

As a result of the impact screening no impacts on the geology and the geomorphological components are expected during the decommissioning and closure phase.

[38] IFC, Environmental, Health and Safety Guidelines for Wind Energy, 2015

Decommissioning of infrastructures could have a ***positive impact*** if the natural state of the land is recovered.

8.1.1.2 Mitigation Measures

The mitigation measures, for the impacts on the geology and geomorphology are listed below for the construction phase:

- worksite will be minimized to the smallest extent possible in order to meet Project's works and activities;
- the foundations' footprints and depths have been properly dimensioned; hence the excavations and the consequent physical-mechanical disturbances will be minimized;
- construction site will be minimized to the smallest extent possible in order to meet Project's works and activities;
- the flattening and excavation operation will be minimized to the extent possible in order to limit the morphological disturbances;
- part of the removed material might be re-used as fill at the Project Area, if it presents the suitable geotechnical characteristics, in order to limit the use of raw material.

8.1.1.3 Residual Impacts

8.1.1.3.1 Construction Phase

The residual impact on the geology and geomorphology component after the application of the above-mentioned mitigation measures during construction phase is presented in the following table.

Table 42: Impact Assessment Matrix for Geology and Geomorphology During Construction Phase After Mitigation

IMPACT ASSESSMENT MATRIX - GEOLOGY AND GEOMORPHOLOGY - CONSTRUCTION PHASE		Changes in the local morphology
Duration (D)	short	
	medium-short	
	medium	
	medium-long	
	long	
Frequency (F)	concentrate	
	discontinuous	
	continuous	
Geographic extent (G)	local	
	regional	
	beyond regional	
Intensity (I)	negligible	

IMPACT ASSESSMENT MATRIX - GEOLOGY AND GEOMORPHOLOGY - CONSTRUCTION PHASE		Changes in the local morphology
	low	
	medium	
	high	
Reversibility (R)	short-term	
	long-term	
	irreversible	
Probability of occurrence (P)	low	
	medium	
	high	
	certain	
Mitigation (M)	high	
	medium	
	low	
	none	
Sensitivity (S)	negligible	
	low	
	medium	
	high	
		Negligible

8.1.1.3.2 Commissioning and Operation Phase

As stated before, during the commissioning and operation phase, no impacts are expected on the geology and geomorphology component.

8.1.1.3.3 Decommissioning and Closure Phase

As a result of the impact screening no impacts on the geology and the geomorphological components are expected during the decommissioning and closure phase.

8.1.1.4 Monitoring

No specific monitoring activities are required for this component.

8.1.2 Seismology

8.1.2.1 Impact Analysis

As a result of the impact screening no impacts on the seismology component is expected during the construction, commissioning and operation and decommissioning and closure phase.

The major geo-hazard, expected during the all phases of the Project, would be an earthquake. According Geotechnical Report, with the geotechnical investigations, the largest ground acceleration is found as 0.247 in the Study Area and this is corresponding to the medium hazard class according to the Turkey Earthquake Hazard Map. The design and construction activities will be conducted in accordance with the geological structure.

During the local EIA process, 26/06/2015 dated and 1437 numbered official letter was taken from the İstanbul Provincial Directorate of Disaster and Emergency. Additionally, In the Geotechnical Report it was stated that other official letter (25.01.2017 dated and 12103 number) also gathered from İstanbul Provincial Directorate of Disaster and Emergency. According to local EIA and the Geotechnical Report, these both official letters indicated that; there is no “area subject to disaster” decision within the scope of 7269 Numbered Law for the Project Area.

In the event of earthquakes, during the all phases of the Project, significant impact on the community and the workers’ health and safety, such as accidents, fire etc., may arise. Additionally, an earthquake may cause adverse impacts on the environment, such as spills, leaks and erosion.

In the Geotechnical Report; the study area is classified as “Önlemli Alan-5.1: problematic areas in terms of swelling, sitting and bearing capacity” according to 19.08.2008 dated and 10337 numbered Notice of the Ministry of Environment and Urbanisation.

8.1.2.2 Mitigation Measures

During the construction activities in the Project Area, the project design and engineering will comply with the provisions of the "Turkey Building Earthquake Regulation” published in the 30364numbered and 18.03.2018 dated Official Gazette. The Regulation requires certain parameters to be determined prior to the construction. These parameters were determined by the geological and geotechnical investigations for the Project Area.

- The study area is classified as “Önlemli Alan-5.1: problematic areas in terms of swelling, sitting and bearing capacity” according to 19.08.2008 dated and 10337 numbered Notice of the Ministry of Environment and Urbanisation.
  - In Ergene formation member clays, engineering parameters (swelling, sitting and bearing capacity) should be examined in detail by considering the type of structure and structure load to be planned before construction for the sitting-swelling problems that may develop and, if necessary, ground improvement should be made.
  - Detailed suggestions made in the Geotechnical Report according to construction activities where the areas classified as Önlemli Alan-5.1.

8.1.3 Hydrology and Surface Water Quality

8.1.3.1 Impact Analysis

8.1.3.1.1 Construction Phase

Impacts on the hydrology and surface water quality component during the construction phase are related to the following ***impact factors***:

- hydrological change,
- surface water pollution, and
- surface water run-off.

Impacts could be due to the following ***project actions***: increase of water needs, wastewater generation, disposal of waste deriving from construction (including excavated soil), suspended sediments in surface water run-off and construction of the facilities.

Hydrological change: During construction phase, there will be water needs for the construction activities such as dust suppression. This need can be supplied from water bodies close to the Project Area.

Surface water pollution: Surface water pollution can be cause by the not properly managed wastewater and construction wastes.

*Wastewater generatio*n; wastewater during the construction phase will consist of the domestic wastewater from the worksite and wastewater from the construction works. During the construction phase, domestic wastewater would be collected in impermeable septic tanks and disposed according to the provisions of the Water Pollution Control Regulation (WPCR, Issued on 31.12.2004 in the Official Gazette No: 25687) and other relevant regulations. Domestic wastewater would be collected in leak-proof septic tanks and the septic tanks would be emptied periodically by a vacuum truck and disposed of to the wastewater sewage system. The wastewater generation and water requirements during the construction and operation phases of the project given in the Section 3.7.

Waste deriving from construction; can lead to surface water pollution if it is not properly managed. The temporary storage of waste and/or hazardous substances deriving from the construction activities, if not properly managed, could induce a release of pollutants onto the soil surface/ground. Accidental leakages from the use of hazardous substances or refuelling or maintenance operations of machineries are also potential hazards. During construction, pollution may reach groundwater through soil. No particularly hazardous material is predicted to be used during construction; accidental spills of pollutants from machinery/vehicles would reach groundwater only if the spilled material is in large quantities and the material is spilled over a period of time.

Surface water run-off: The surface water runoff patterns in the Project Area would be impacted by the Project with the changes in the characteristics of the surface and the topography.

8.1.3.1.2 Commissioning and Operation Phase

Impacts on the hydrology and surface water quality component during the commissioning and operation phase are related to the following ***impact factors***:

- surface water pollution, and
- surface water run-off.

Impacts could be due to the following ***project actions***: wastewater generation and disposal of waste deriving from operation, suspended sediments in surface water run-off and presence of the facilities.

Abovementioned project actions for the operation phase are same as the construction phase.

The wastewater generation are detailed in the previous section (construction phase). The only difference is that, there would be a storm water (rainwater) collection system constructed at the worksite office area once the facility is commissioned. The storm water will be collected to reservoirs where it would be stored, filtered and reused for irrigation.

The waste deriving from operation is mainly composed of domestic wastes, hazardous wastes from maintenance works, gear oil used in the turbines and the transformer oil which is used in the switchyard.

8.1.3.1.3 Decommissioning and Closure Phase

The impacts during the decommissioning phase are likely to be similar to the construction phase hence the activities will be similar to construction activities. The same considerations described for this component during the construction phase would be applicable to the decommissioning phase for the all three impact factors.

In general, the decommissioning activities would comprise the removal of the plants and the associated facilities. Also, the foundations of the structures would be removed. The site is expected to be restored for its future use. Decommissioning of infrastructures could have a ***positive impact*** if the natural state of the land is recovered.

8.1.3.2 Mitigation Measures

The mitigation measures related to hydrology and surface water quality for the construction, the commissioning/operation and decommissioning/closure phase are as follow:

Measures incorporated in the Project Design:

- the Project will comply with safety requirements to avoid leakages from hazardous chemicals/material and liquids (diesel fuel, oil etc.) stored on-site;
- the areas, where the diesel/fuel storage tanks located (can be named as hazardous material storage areas), will be designed and constructed to avoid potential contamination into the soil (paved areas with sufficient secondary containment, proper drainage systems , collection ponds etc.);
- the temporary waste storage areas will be constructed based on the requirements listed in the Regulation on Regular Storage of Wastes issued on March 26, 2010, at Official Gazette no:27533 and Regulation on Waste Management issued on April 02, 2015 Official Gazette no: 29314.

General mitigation measures:

- during the construction phase, the surface drainage and site runoff, particularly in heavy rainy seasons will be properly managed;
- at the construction areas without cover, ground will be seeded and the areas with highest slopes will be flattened to prevent erosion and sediment transport with surface run-off water;
- surface improvement will be considered during the construction phase such as paving or spreading gravel to the road surface (unpaved areas);
- during the operation phase, the grids of the drainage system will be controlled and cleaned on a periodical basis, in order to prevent possible blockages during heavy rains;
- regular maintenance of vehicles and machinery/equipment will be undertaken to ensure that leakages of oil/fuel or any other hazardous material is prevented;
- use of machinery/vehicles will be strictly limited within the construction sites and along the appropriate access roads;
- impervious (concrete etc.) surfaces will be designated for the refuelling of the machinery/vehicles, if it is not possible according to the nature of the Project, all refuelling tankers and all heavy machinery used at

the Site will have an iron plate trays, and these trays will be placed under the pipe connection points to prevent accidental leakage to the soil during refuelling operations;

- according to the information obtained from Client, there will not be any maintenance and repair activity occurred in the project area. The maintenance of the vehicles and machinery/equipment (if needed) will be conducted with secondary containment measures;
- portable spill containment and clean-up materials (spill kits) will be made available and easily accessible at the construction site, instructions on how to use spill containment and clean-up materials will be included in the kits;
- training on spill response, use of containment and clean-up material (spill kits) will be provided to works (including the subcontractor workers);
- adequate and properly maintained tanks, paved ground, spill containment materials and proper secondary containment systems with sufficient volume will be provided for fuel/oil storage and for the storage of other fluids and hazardous substances;
- wastewater flows from any field activities (i.e. excavations, drillings, re-fuelling and vehicle/equipment washing) will be properly managed;
- polluted water (if any generated as a result of accidental leakages) will be properly collected or managed to prevent mixing with any water body;
- the new road will be constructed for the Project. Concerning potential surface water run-off due to dust and traffic, during the construction phase, mitigations measures could consist in the following:
  - Vehicle restrictions; such as limiting the speed, weight, or number of vehicles;
  - Surface improvement; such as paving or spreading gravel to the road surface;
  - Surface treatment; periodic wetting of the roads;
  - For trucks; covering powdery materials transported on trucks.
- Project Specific mitigation measures:
  - There is a naturally occurring wetland in the dense forest. No activity should be carried out in this area and its immediate vicinity;

Water needed for the construction phase for dust suppression should not be supplied from this naturally occurring wetland and all subcontractors and workers should be communicated with this issue.

8.1.3.3 Residual Impacts

8.1.3.3.1 Construction Phase

The residual impact on the hydrology and surface water quality component after the application of the abovementioned mitigation measures during construction phase is presented in the following table.

Table 43: Impact Assessment Matrix for Hydrology and Surface Water Quality During Construction Phase After Mitigation

IMPACT ASSESSMENT MATRIX - HYDROLOGY AND SURFACE WATER QUALITY CONSTRUCTION PHASE		Hydrological change	Surface water pollution	Surface water run-off
Duration (D)	short			

IMPACT ASSESSMENT MATRIX - HYDROLOGY AND SURFACE WATER QUALITY CONSTRUCTION PHASE		Hydrological change	Surface water pollution	Surface water run-off
	medium-short			
	medium			
	medium-long			
	long			
Frequency (F)	concentrate			
	discontinuous			
	continuous			
Geographic extent (G)	local			
	regional			
	beyond regional			
Intensity (I)	negligible			
	low			
	medium			
	high			
Reversibility (R)	short-term			
	long-term			
	irreversible			
Probability of occurrence (P)	low			
	medium			
	high			
	certain			
Mitigation (M)	high			
	medium			
	low			
	none			

IMPACT ASSESSMENT MATRIX - HYDROLOGY AND SURFACE WATER QUALITY CONSTRUCTION PHASE		Hydrological change	Surface water pollution	Surface water run-off
Sensitivity (S)	negligible			
	low			
	medium			
	high			
		Negligible	**Negligible**	**Negligible**

8.1.3.3.2 Commissioning and Operation Phase

The residual impact on the hydrology and surface water quality component after the application of the abovementioned mitigation measures during commissioning and operation phase is presented in the following table.

Table 44: Impact Assessment Matrix for Hydrology and Surface Water Quality During Commissioning and Operation Phase After Mitigation

IMPACT ASSESSMENT MATRIX - HYDROLOGY AND SURFACE WATER QUALITY OPERATION PHASE		Surface water pollution	Surface water run-off
Duration (D)	short		
	medium-short		
	medium		
	medium-long		
	long		
Frequency (F)	concentrate		
	discontinuous		
	continuous		
Geographic extent (G)	local		
	regional		
	beyond regional		
Intensity (I)	negligible		
	low		
	medium		

IMPACT ASSESSMENT MATRIX - HYDROLOGY AND SURFACE WATER QUALITY OPERATION PHASE		Surface water pollution	Surface water run-off
	high		
Reversibility (R)	short-term		
	long-term		
	irreversible		
Probability of occurrence (P)	low		
	medium		
	high		
	certain		
Mitigation (M)	high		
	medium		
	low		
	none		
Sensitivity (S)	negligible		
	low		
	medium		
	high		
		Negligible	**Negligible**

8.1.3.3.3 Decommissioning and Closure Phase

Decommissioning phase activities are likely to be very similar to the construction phase. Decommissioning of infrastructures could have a ***positive impact*** if the natural state of the land is recovered. Same considerations describe for the construction phase are applicable here as well.

8.1.3.4 Monitoring

Following monitoring activities are foreseen to ensure the implementation and effectiveness of the proposed mitigation measures:

- Design checks, to ensure the measures listed above are in place (like concrete pavement in storage areas, collection pond underneath, gravel spread to the unpaved areas etc.) will be undertaken;
- Routine site inspections will be carried out and reported to identify any possible leakages;

- Routine site inspections will be carried out for the road construction and dust suppression activities and these inspections should be recorded;
- The provided trainings on spill response, use of containment and clean-up material for the workers (including the subcontractors' workers) will be recorded;
- Routine site inspections will be carried out to ensure adequate amount of spill-response material such as spill-kits and metal trays will be present at the site and in each heavy machinery and records will be kept;
- Routine maintenance programme will be or asked to be set-up and maintenance records will be kept for all vehicles and machinery/equipment.

8.1.4 Hydrogeology and Groundwater Quality

8.1.4.1 Impact Analysis

8.1.4.1.1 Construction Phase

Impacts on this component, during the construction phase are related to the following ***impact factors:***

- hydrogeological change, and
- groundwater pollution.

Impacts could be due to the following ***project actions:*** increase of water needs, wastewater generation, disposal of waste deriving from construction (including excavated soil) and construction of the facilities.

Construction of a groundwater well and groundwater abstraction for the Project is not planned. Excavation depth of the turbine construction will be assumed as 3 m. Contact with groundwater is not expected since groundwater was not encountered in the borings drilled down to depth 15 m based on the Geotechnical Report. However; it is expected that localized perched groundwater and groundwater originating from fractures may be encountered at the Project Area during rainy seasons. Based on these findings, it is expected that the regional groundwater level is deeper than 15 m and no major pollution or hydrogeological changes risk is foreseen.

Hydrogeological change: During the construction phase; drinking and potable water for the workers would be provided from the city water network or external sources. In addition to these, there will be water needs for the construction activities such as dust suppression.

Construction of a groundwater well and groundwater abstraction for the Project is not planned hence impacts on the groundwater potential or quantity are not foreseen due to the Project. The construction and operation phases could have a very little potential impacts on the local hydrogeology if drilling at a depth below the water table or dewatering will be inevitable.

Groundwater pollution: Groundwater pollution can be cause by the not properly managed wastewater and construction wastes.

*Wastewater generatio*n; during the construction phase will consist of the domestic wastewater from the worksite and wastewater from the construction works. During the construction phase, domestic wastewater would be collected in impermeable septic tanks and disposed according to the provisions of the Water Pollution Control Regulation (WPCR, Issued on 31.12.2004 in the Official Gazette No: 25687) and other relevant regulations. Domestic wastewater would be collected in leak-proof septic tanks and the septic tanks would be emptied periodically by a vacuum truck and disposed of to the wastewater sewage system. The wastewater generation and water requirements during the construction and operation phases of the project given in the Section 3.7.

Waste deriving from construction; can lead to groundwater pollution if it is not properly managed. The temporary storage of waste and/or hazardous substances deriving from the construction operations, if not properly managed could induce a release of pollutants onto the soil surface/ground. Accidental leakages from the use of hazardous substances or refuelling or maintenance operations of machineries are also potential hazards. During construction, pollution may reach groundwater through soil if the effectiveness of the taken mitigation measures cannot be ensured. No particularly hazardous material is predicted to be used during construction; accidental spills of pollutants from machinery/vehicles would reach groundwater only if the spilled material is in large quantities and the material is spilled over a period of time.

In case groundwater is encountered during the construction, groundwater should be abstracted from the work area; treatment, storage and disposal should be done according to the regulatory requirements after necessary analyses have been performed and relevant permits are obtained.

8.1.4.1.2 Commissioning and Operation Phase

Impacts on this component during the commissioning and operation phase will be same as the construction phase and are related to the following ***impact factors:***

- hydrogeological change, and
- groundwater pollution.

Impacts could be due to the following ***project actions***: increase of water needs (construction of groundwater well), wastewater generation and disposal of waste deriving from operation.

The details related to this project actions detailed in the previous section (construction phase).

8.1.4.1.3 Decommissioning and Closure Phase

The impacts during the decommissioning phase are likely to be similar to the construction phase hence the activities will be similar to construction activities. The same considerations described for this component during the construction phase would be applicable to the decommissioning phase for the groundwater pollution impact factor.

The impact factor hydrogeological changes will not be related to the decommissioning phase, hence if there will be any impact on this factor, it will already have occurred during construction or operation phase

In general, the decommissioning activities would comprise the removal of the plants and the associated facilities. Also, the foundations of the structures would be removed. The site is expected to be restored for its future use. Decommissioning of infrastructures could have a ***positive impact*** if the natural state of the land is recovered

8.1.4.2 Mitigation Measures

The mitigation measures related to hydrogeology and groundwater quality for the construction, the commissioning/operation and decommissioning/closure phase are as follow:

- Measures incorporated in the Project Design:
  - worksite will be minimized to the smallest extent possible in order to meet Project's works and activities;
  - the foundations' footprints and depths have been properly dimensioned; hence the excavations and the consequent physical-mechanical disturbances will be minimized;
  - the Project will comply with safety requirements to avoid leakages from hazardous chemicals/materials and liquids stored on-site;

- the areas, where the diesel/fuel storage tanks located (can be named as hazardous material storage areas), will be designed and constructed to avoid potential contamination into the soil (paved areas with sufficient secondary containment, proper drainage systems etc.);
- the temporary waste storage areas will be constructed based on the requirements listed in the Regulation on Regular Storage of Wastes issued on March 26, 2010, at Official Gazette no:27533 and Regulation on Waste Management issued on April 02, 2015 Official Gazette no: 29314.

- General mitigation measures:
  - regular maintenance of vehicles and machinery/equipment will be undertaken to ensure that leakages of oil/fuel or any other hazardous material is prevented;
  - use of machinery/vehicles will be strictly limited within the construction sites and along the appropriate access roads;
  - impervious (concrete etc.) surfaces will be designated for the refuelling of the machinery/vehicles, if it is not possible according to the nature of the Project, all refuelling tankers and all heavy machinery used at the Site will have an iron plate trays, and these trays will be placed under the pipe connection points to prevent accidental leakage to the soil during refuelling operations;
  - maintenance of the vehicles and machinery/equipment (if needed) will be conducted in designated area where there is impermeable surface (concrete floor etc.) and if needed secondary containment system present;
  - portable spill containment and clean-up materials (spill kits) will be made available and easily accessible at the construction site, instructions on how to use spill containment and clean-up materials will be included in the kits;
  - training on spill response, use of containment and clean-up material (spill kits) will be provided to works (including the subcontractor workers);
  - adequate and properly maintained tanks, paved ground, spill containment materials and proper secondary containment systems with sufficient volume will be provided for fuel/oil storage and for the storage of other fluids and hazardous substances to prevent loss into the soil;
  - wastewater flows from any field activities (i.e. excavations, drillings, re-fuelling and vehicle/equipment washing) will be properly managed;
  - polluted water (if any generated as a result of accidental leakages) will be properly collected or managed to prevent mixing with any water body and the topsoil/soil pollution.

8.1.4.3 Residual Impacts

8.1.4.3.1 Construction Phase

The residual impact on the hydrogeology and groundwater quality component after the application of the abovementioned mitigation measures during construction phase is presented in the following table.

Table 45: Impact Evaluation Matrix for Hydrogeology and Groundwater Quality Component During Construction Phase After Mitigation

IMPACT ASSESSMENT MATRIX - HYDROGEOLOGY AND GROUNDWATER QUALITY CONSTRUCTION PHASE		Hydrogeological change	Groundwater pollution
Duration (D)	short		
	medium-short		

IMPACT ASSESSMENT MATRIX - HYDROGEOLOGY AND GROUNDWATER QUALITY CONSTRUCTION PHASE		Hydrogeological change	Groundwater pollution
	medium		
	medium-long		
	long		
Frequency (F)	concentrate		
	discontinuous		
	continuous		
Geographic extent (G)	local		
	regional		
	beyond regional		
Intensity (I)	negligible		
	low		
	medium		
	high		
Reversibility (R)	short-term		
	long-term		
	irreversible		
Probability of occurrence (P)	low		
	medium		
	high		
	certain		
Mitigation (M)	high		
	medium		
	low		
	none		
Sensitivity (S)	negligible		
	low		

IMPACT ASSESSMENT MATRIX - HYDROGEOLOGY AND GROUNDWATER QUALITY CONSTRUCTION PHASE		Hydrogeological change	Groundwater pollution
	medium		
	high		
		Negligible	**Negligible**

8.1.4.3.2 Commissioning and Operation Phase

The residual impact on the hydrogeology and groundwater quality component after the application of the abovementioned mitigation measures during commissioning and operation phase is presented in the following table.

Table 46: Impact Evaluation Matrix for Hydrogeology and Groundwater Quality Component During Commissioning and Operation Phase After Mitigation

IMPACT ASSESSMENT MATRIX - HYDROGEOLOGY AND GROUNDWATER QUALITY COMMISSIONING AND OPERATION PHASE		Hydrogeological change	Groundwater pollution
Duration (D)	short		
	medium-short		
	medium		
	medium-long		
	long		
Frequency (F)	concentrate		
	discontinuous		
	continuous		
Geographic extent (G)	local		
	regional		
	beyond regional		
Intensity (I)	negligible		
	low		
	medium		
	high		
Reversibility (R)	short-term		

IMPACT ASSESSMENT MATRIX - HYDROGEOLOGY AND GROUNDWATER QUALITY COMMISSIONING AND OPERATION PHASE		Hydrogeological change	Groundwater pollution
	long-term		
	irreversible		
Probability of occurrence (P)	low		
	medium		
	high		
	certain		
Mitigation (M)	high		
	medium		
	low		
	none		
Sensitivity (S)	negligible		
	low		
	medium		
	high		
		Negligible	**Negligible**

8.1.4.3.3 Decommissioning and Closure Phase

Decommissioning phase activities are likely to be very similar to the construction phase. The same considerations described for hydrogeology and groundwater quality during the construction phase would be applicable to the decommissioning phase for the groundwater pollution impact factor.

Decommissioning of infrastructures could have a ***positive impact*** if the natural state of the land is recovered.

8.1.4.4 Monitoring

Following monitoring activities are foreseen for ensuring the implementation and effectiveness of the proposed mitigation measures:

- Design checks, to ensure the measures listed above are in place (like concrete pavement in storage areas, collection pond underneath etc.) and, will be undertaken;
- The provided trainings on spill response, use of containment and clean-up material for the workers (including the subcontractors' workers) will be recorded;

- Routine site inspections will be carried out to ensure adequate amount of spill-response material such as spill-kits and metal trays will be present at the site and in each heavy machinery and records will be kept;
- Routine maintenance programme will be set-up and maintenance records will be kept for all vehicles and machinery/equipment.

8.1.5 Soil and Subsoil

8.1.5.1 Impact Analysis

8.1.5.1.1 Construction Phase

During the construction phase, impacts on the soil and subsoil characteristics component will be mainly associated to the following ***impact factors:***

- topsoil and lower soil removal;
- pollutant emissions to the soil, and
- the occupation of land.

The ***project actions*** related to the abovementioned impact factors are the following: surface levelling and grading, temporary stockpiling of material, transport of construction material, construction of the facilities and disposal of waste deriving from construction (including excavated soil).

Topsoil and lower soil removal: In the construction phase, activities related to civil engineering will involve excavation and removal of top and lower soil. The excavation depth will be 3 m for the turbine foundation. For the foundation works, approximately 625 m^2 (25 m x 25 m) of area will be excavated for each turbine. The main impact will be due to the soil removal for the foundations of the turbines and soil removal which has to be done for lowering/flattening of the natural areas (around turbine foundations) and also for the construction of new road. The total amount of excavated material is estimated to be 3000 tons. It is planned to re-use the excavated material as much as possible, when technically feasible, and approximately 90% of the excavated soil planned to be used at site for refilling. There will be no on-site worker accommodations hence there will be no worker's camp for the Project.

Pollutant emissions to the soil: Potential pollutant emissions to the soil can be caused by;

- pollution from vehicles such as oil spills;
- accidental spill of any chemicals or hazardous materials that might be used during the construction;
- runoff from area where chemical, oil and fuel are temporarily stored (i.e. areas where paving and covers are not present);
- runoff from the re-fuelling and vehicle/equipment washing areas (if such areas are present; i.e. area where paving and covers are not present);
- pollution caused by temporary storage of hazardous materials and/or wastes;
- disposal of wastes, wastewater and liquid wastes;
- emissions from truck traffic and transport of construction materials and excavated materials.

Occupation of land: Although, worker's camp will not be constructed for the Project, a temporary occupation of land during the construction activities will be necessary for the worksite office area and to store excavation or construction material. The planned temporary stockpiling areas will be located within the boundaries of the Project Area. Additionally, new roads will be constructed for the Project.

8.1.5.1.2 Commissioning and Operation Phase

During the commissioning and operation phase, impacts on the soil and subsoil characteristics component will be mainly associated to the following ***impact factors:***

- occupation of land/ increase of artificial land use, and
- pollutant emissions to the soil.

The ***project actions*** related to the abovementioned impact factors are the following: temporary storage and disposal of waste (including hazardous wastes such as diesel, oil and gear oil), presence of fuel storage tanks, presence of the new roads, presence of the turbines, switchyard and operation building and also operations of the facilities.

Occupation of land/ increase of artificial land: The presence of buildings and facilities will increase the artificial surfaces, as the structures are planned to be constructed on undeveloped land. Occupation of land/ increase of artificial land will occur due to the construction of new infrastructure (turbines, switchyard, operation building) and new roads.

Pollutant emissions to the soil: Impacts on soil/topsoil might arise from pollution due to:

- accidental leakages from areas where chemicals, oil and fuel (hazardous materials) are not properly stored (i.e. areas where properly maintained paving, closed interception drains and covers are not present);
- accidental leakages of hazardous materials/products or chemicals from the machinery/equipment;
- runoff from waste storage areas (especially hazardous waste storage area);
- leaks or spills of chemicals, oil and fuel from the diesel/fuel storage tanks, pipes and operations;
- accidental oil leakage from the transformers in the switchyard.

8.1.5.1.3 Decommissioning and Closure Phase

In general, the decommissioning activities would comprise the removal of the plants and the associated facilities. Also, the foundations of the structures would be removed. The site is expected to be restored for its future use.

The impacts during the decommissioning phase are likely to be similar to the construction phase hence the activities will be similar to construction activities. The same considerations described for soil and subsoil during the construction phase would be applicable to the decommissioning phase for the pollutant emissions to the soil. Traffic load will increase in the decommissioning and closure phase like in the construction phase and heavy trucks will cause emission of dust and pollutants on soil. The dust emissions will be increased during the demolition of the buildings, surface levelling, grading and temporary stockpiling of the material.

At the end of the decommissioning phase, the soil restoration in the areas, once occupied by buildings and infrastructures might have an overall ***positive impact*** on the component. The impact factors; occupation of land and topsoil and lower soil removal will not be related to the decommissioning phase.

For the restoration activities; import soil from outside of the Project Area may be needed. If this will be the case;transportation of polluted soil and import of polluted soil is considered as a negative impact. In order to avoid such situations related mitigation measures (listed in the next section such as soil quality measurement before the transport of the soil from outside sources) should be taken into consideration.

8.1.5.2 Mitigation Measures

The mitigation measures for the construction, the commissioning/operation and decommissioning/closure phase are as follow:

- Measures incorporated in the Project Design:
  - worksite will be minimized to the smallest extent possible in order to meet Project's works and activities;
  - the foundations' footprints and depths have been properly dimensioned; hence the excavations and the consequent physical-mechanical disturbances will be minimized;
  - excavations and soil/subsoil abstractions will be minimized as possible in order to meet the building design and construction requirements;
  - part of the removed/excavated material might be re-used for fillings when it has the proper geotechnical characteristics in order to limit the use of raw material;
  - the areas, where the diesel/fuel storage tanks located (can be named as hazardous material storage areas), will be designed and constructed to avoid potential contamination into the soil (paved areas with sufficient secondary containment, proper drainage systems etc.);
  - the temporary waste storage areas will be constructed based on the requirements listed in the Regulation on Regular Storage of Wastes issued on March 26, 2010, at Official Gazette no:27533 and Regulation on Waste Management issued on April 02, 2015 Official Gazette no: 29314.
- General mitigation measures:
  - the Project will comply with relevant legal and project safety requirements to avoid leakages from hazardous materials (chemicals, liquids etc.) storage facilities on-site;
  - regular maintenance of vehicles and machinery/equipment will be undertaken to ensure that leakages of oil/fuel or any other hazardous material is prevented;
  - use of machinery/vehicles will be strictly limited within the construction sites and along the appropriate access roads;
  - impervious (concrete etc.) surfaces will be designated for the refuelling of the machinery/vehicles, if it is not possible according to the nature of the Project, all refuelling tankers and all heavy machinery used at the Site will have an iron plate trays, and these trays will be placed under the pipe connection points to prevent accidental leakage to the soil during refuelling operations;
  - maintenance of the vehicles and machinery/equipment (if needed) will be conducted in designated area where there is impermeable surface (concrete floor etc.) and if needed secondary containment system present;
  - portable spill containment and clean-up materials (spill kits) will be made available and easily accessible at the construction site, instructions on how to use spill containment and clean-up materials will be included in the kits;
  - training on spill response, use of containment and clean-up material (spill kits) will be provided to works (including the subcontractor workers);

- adequate and properly maintained tanks, paved ground, spill containment materials and proper secondary containment systems with sufficient volume will be provided for fuel/oil storage and for the storage of other fluids and hazardous substances to prevent loss into the soil;
- wastewater flows from any field activities (i.e. excavations, drillings, re-fuelling and vehicle/equipment washing) will be properly managed;
- polluted water (if any generated as a result of accidental leakages) will be properly collected or managed to prevent the topsoil/soil pollution;
- if some construction areas need to be located onto vegetated and uncontaminated land, in order to reduce loss of topsoil due to project actions during the construction phase, the topsoil will be temporarily removed and properly stockpiled to be used for landscaping in the stripped areas upon completion of the works as required by the Regulation on Excavation, Construction and Demolition Wastes issued on March 18, 2004 at Official Gazette no.25406;
- if some vegetated/uncontaminated land is expected to be permanently removed (e.g. onto the new buildings' footprints and the roads), the topsoil should be properly stored (as required by the Regulation on Excavation, Construction and Demolition Wastes issued on March 18, 2004 at Official Gazette no.25406) and re-used for reclamation of nearby artificial sites;
- the new road will be constructed for the Project. Concerning potential emission of dust and accumulation of pollutants in topsoil due to settled dust and traffic emissions, during the construction phase, mitigations measures could consist in the following:
  - Vehicle restrictions; such as limiting the speed, weight, or number of vehicles;
  - Surface improvement; such as paving or spreading gravel to the road surface;
  - Surface treatment; periodic wetting of the roads;
  - For trucks; covering powdery materials transported on trucks.

- Specific mitigation measures for contaminated soil:
  - If soil contamination is suspected during construction related excavation, a detailed assessment should be conducted in order to determine if there are any contaminants sources present within the site or in the near vicinity and the provisions of "Regulation on Soil Pollution Control and Point Source Contaminated Sites" originally published in the Official Gazette number 27605, dated 8 June 2010; and amended on 11 July 2013 in the Official Gazette number 28704, and became effective as of 08 June 2015, should be implemented;
  - In case that results of a soil assessment show the compliance with site-specific soil quality limits set by the regulation, materials coming from levelling activities could be excavated, transported, and used in the construction of embankments and/or backfill, after an assessment of physical properties;
  - If the soil is contaminated, it is recommended to work with the local regulatory agencies to select solutions for treatment or disposal, follow the provision of the abovementioned regulation and in general to follow a standard practice:
    - avoid or minimize temporary stockpiling of contaminated soils or hazardous material;
      - if temporary stockpiling is necessary:
        - isolate the stockpile with impermeable liner or tarps;

- install a berm around the stockpile to prevent runoff, from leaving the area;
- do not stockpile in or near storm drains or water bodies or unconfined aquifer zones with high groundwater elevation.

8.1.5.3 Residual Impacts

8.1.5.3.1 Construction Phase

The residual impact on the soil and subsoil component after the application of the abovementioned mitigation measures during construction phase is presented in the following table.

Table 47: Impact Evaluation Matrix for Soil and Subsoil Characteristics During Construction Phase After Mitigation

IMPACT ASSESSMENT MATRIX - SOIL AND SUBSOIL CHARACTERISTICS QUALITY - CONSTRUCTION PHASE		Topsoil and lower soil removal	Pollutant emissions to the soil	Occupation of land
Duration (D)	short			
	medium-short			
	medium			
	medium-long			
	long			
Frequency (F)	concentrate			
	discontinuous			
	continuous			
Geographic extent (G)	local			
	regional			
	beyond regional			
Intensity (I)	negligible			
	low			
	medium			
	high			
Reversibility (R)	short-term			
	long-term			
	irreversible			
Probability of occurrence (P)	low			

IMPACT ASSESSMENT MATRIX - SOIL AND SUBSOIL CHARACTERISTICS QUALITY - CONSTRUCTION PHASE		Topsoil and lower soil removal	Pollutant emissions to the soil	Occupation of land
	medium			
	high			
	certain			
Mitigation (M)	high			
	medium			
	low			
	none			
Sensitivity (S)	negligible			
	low			
	medium			
	high			
		Low	**Negligible**	**Negligible**

8.1.5.3.2 Commissioning and Operation Phase

The residual impact on the soil and subsoil component after the application of the abovementioned mitigation measures during commissioning and operation phase is presented in the following table.

Table 48: Impact Evaluation Matrix for Soil and Subsoil Characteristics During Commissioning and Operation Phase After Mitigation

IMPACT ASSESSMENT MATRIX - SOIL AND SUBSOIL CHARACTERISTICS QUALITY - COMMISSIONING AND OPERATION PHASE		Pollutant emissions to the soil	Occupation of land/ increase of artificial land use
Duration (D)	short		
	medium-short		
	medium		
	medium-long		
	long		
Frequency (F)	concentrate		

IMPACT ASSESSMENT MATRIX - SOIL AND SUBSOIL CHARACTERISTICS QUALITY - COMMISSIONING AND OPERATION PHASE		Pollutant emissions to the soil	Occupation of land/ increase of artificial land use
	discontinuous		
	continuous		
Geographic extent (G)	local		
	regional		
	beyond regional		
Intensity (I)	negligible		
	low		
	medium		
	high		
Reversibility (R)	short-term		
	long-term		
	irreversible		
Probability of occurrence (P)	low		
	medium		
	high		
	certain		
Mitigation (M)	high		
	medium		
	low		
	none		
Sensitivity (S)	negligible		
	low		
	medium		
	high		

IMPACT ASSESSMENT MATRIX - SOIL AND SUBSOIL CHARACTERISTICS QUALITY - COMMISSIONING AND OPERATION PHASE	Pollutant emissions to the soil	Occupation of land/ increase of artificial land use
	Negligible	**Low**

8.1.5.3.3 Decommissioning and Closure Phase

Decommissioning phase activities are likely to be very similar to the construction phase. The same considerations described for soil and subsoil during the construction phase would be applicable to the decommissioning phase for the pollutant emissions to the soil.

At the end of the decommissioning phase, the soil restoration in the areas, once occupied by buildings and infrastructures might have an overall ***positive impact*** on the component if the natural state of the land is recovered.

8.1.5.4 Monitoring

Following monitoring activities are foreseen to ensure the implementation and effectiveness of the proposed mitigation measures:

- Routine site inspections will be carried out and reported to identify any possible leakages;
- Routine site inspections will be carried out to ensure that the planned construction site boundaries are not expanded;
- Routine site inspections will be carried out for the road construction and dust suppression activities and these inspections should be recorded;
- The provided trainings on spill response, use of containment and clean-up material for the workers (including the subcontractors' workers) will be recorded;
- Routine site inspections will be carried out to ensure adequate amount of spill-response material such as spill-kits and metal trays will be present at the site and in each heavy machinery and records will be kept;
- Routine maintenance programme will be set-up and maintenance records will be kept for all vehicles and machinery/equipment;
- Soil quality measurements will be conducted if any complaint received from local community and/or authorities, and the result will be compared with the baseline measurement conducted in the scope of ESIA.

8.1.6 Climate and Meteorology

8.1.6.1 Impact Analysis

8.1.6.1.1 Commissioning and Operational Phase

This section presents the assessment of the impacts that the project is envisioned to generate on meteorological and climatic characteristics by the emission of greenhouse gases during the operation phase.

Greenhouse gases (GHGs) include atmospheric gases that absorb and emit radiation in the thermal infrared spectrum, thus causing a warming effect on earth (greenhouse effect).

The greenhouse effect is primarily from CO_2 and water vapour, along with other trace gases in the atmosphere. A number of gases are typically considered as anthropogenic GHGs, including carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons (e.g., CF compounds), and sulphur hexafluoride. Changes in the atmospheric concentration of GHGs may affect the energy balance between the land, the seas, the atmosphere, and space. A measure of such changes in the energy available to the system from a gas is termed “radiative forcing”, and, holding everything else constant, atmospheric increase of a GHG produces positive radiative forcing.

GHGs can contribute to the greenhouse effect both directly and indirectly. A “direct” contribution is from a gas that is itself a greenhouse gas, while indirect radiative forcing occurs when the original gas under goes chemical transformations in the atmosphere to produce other greenhouse gases, when a gas influences the atmospheric lifetimes of other gases, and/or when a gas affects processes that alter the atmospheric radiative balance of the earth.

Effects of GHG emissions are generally not relevant on a local scale, except in cases of massive uncontrolled or fugitive emissions, but are rather global in nature as the various gases are rapidly dispersed in the atmosphere where they reside for varying periods of time, from months to thousands of years, and they continue to exert their effects.

Wind farm projects do not produce any greenhouse gases unlike fossil-fuelled power plants. Therefore the greenhouse effect on the atmosphere due to the proposed project is not expected.

8.1.7 Air Quality

8.1.7.1 Impact Analysis

Air quality emissions have been assessed by taking into consideration to exhaust gases and dust emissions.

8.1.7.1.1 Construction Phase

During the construction phase impacts will be mainly associated to air pollutants and dust emission to the atmosphere.

The project actions related to the abovementioned impact factor are the following: surface levelling and grading, temporary stockpiling of the material, transport of construction material, assembling, disposal of waste deriving from construction and heating systems of the camping area. The construction is planned to complete in 9 months.

Exhaust Gases

In general, diesel oil will be used as fuel for the construction machinery. However, the pollution created by the emission of vehicles in the project area is considered not to affect the existing air quality negatively when it is taken into account that such vehicles will be operated for 10 hours a day and they will not be in use continuously.

The assumptions are stated in below for exhaust gases emission assessment:

- At the same time, maximum 10 vehicles will be operated;
- Fuel consumption will be 20 L/hour for one vehicle;
- Total diesel consumption will be 200 L.

To calculate diesel fuelled vehicles’ emissions, EPA AP-42 Emission Factors are used. NOx, CO, SOx, PM10 and TOC are the parameters generated by the vehicles. Hourly mass flow of these parameters are assessed as below:

Calorific values of diesel: 137,000 BTU/gal[39] x 1gal/3.785L = 36,195.5 BTU/L

Nitrogen oxides: 4.41 lb/(10^6BTU) x 36,195.5 BTU/L x 200 L/hour x 0.453 kg/lb = 14.4 kg/hour

Carbon monoxide: 0.95 lb/(10^6BTU) x 36,195.5 BTU/L x 200 L/hour x 0.453 kg/lb = 3.0 kg/hour

Sulphur oxides: 0.29 lb/(10^6BTU) x 36,195.5 BTU/L x 200 L/hour x 0.453 kg/lb = 0.94 kg/hour

PM10: 0.31 lb/(10^6BTU) x 36,195.5 BTU/L x 200 L/hour x 0.453 kg/lb = 1.0 kg/hour

Total organic carbon: 0.35 lb/(10^6BTU) x 36,195.5 BTU/L x 200 L/hour x 0.453 kg/lb = 1.14 kg/hour

There are two regulations related to exhaust gases which are the Regulation on Exhaust Gases Emission Control and Gasoline and Diesel Oil Quality (Official Gazette No. 28873 dated November 30, 2013) and the Regulation on Control of Exhaust Emissions of Motorized Vehicles (Official Gazette No. 25869 dated August 7, 2005). By establishing the methods and principles to protect air pollution from living organisms and the environment and by measuring the pollutants and reducing exhaust gas pollutants caused by motor vehicles in traffic, the regulation of Exhaust Gas Emission Control and Gasoline and Diesel Oil Quality was published. This regulation does not cover the construction vehicles.

Exhaust emissions generated by the construction vehicles will generate the fugitive dust emission during the construction phase. There is not any limit values regarding to the heavy construction vehicles in Turkish Legislation.

Dust Emissions

During the construction activities the emission scenario will be mainly related to the dust suspension generated by the surface levelling and grading, the vehicles movement to transport construction material to the construction areas and assembling of turbines.

The phases construction activities are stated in below:

- Construction of access roads
- Construction of switchyard and administrative building
- Construction of crane pad
- Assembling of turbines

During the excavation and filling operations within the scope of the project, dust emission shall be created. In dust emission calculations the soil density is assumed as 1.6 ton / m^3.

Dust emission shall be resulting from, transferring and unloading the material during the excavation within the scope of the project. Emission factors specified in the Articles d.1 and d.2 of the Annex-12 of the Regulation on the Control of Industrial Air Pollution published on 03.07.2009 in Official Gazette No.27277, have been accepted in order to calculate the amount of dust emission. All measures given in the Annex 1 of the Regulation on the Control of Industrial Air Pollution shall be taken in order to minimize dust emission during the construction period.

Considering the working principles and emission factors below, hourly mass flow of dust emission to be released during the filling operations is calculated on the basis of this formula:

Dust Emission Amount = Production Amount x Emission Factor

[39] EPA AP-42 App. A Miscellaneous Data and Conversion Factors

	Emission Factor
Dismantling (excavation) Emission Factor (kg/ton)	0.0125 kg/ton
Loading Emission Factor (kg/ton)	0.005 kg/ton
Unloading Emission Factor (kg/ton)	0.005 kg/ton
Transporting Emission Factor (kg/km-trip)	0.35 kg/km-trip

Considering the new opened roads (1.9 km) and extended roads, approximately 3 km of new roads is assumed to be opened for the air quality calculations.

The excavation will be performed by removal of topsoil. The length of the excavation is assumed as 25 m for one hour excavation. The width and depth of the excavation will be 6 m and 0.2 m (extension dimensions).

Construction of Access Roads

Amount of excavation : Length x Depth x Width

Amount of excavation : 25 x 0.2 x 6

Duration of excavation: 1 hour

Amount of excavated material per hour (volume): 30 m^3/hour

Density of the soil is assumed as 1.6 ton/m^3

Total amount of excavated material (mass): 30 m^3/hour x 1.6 ton/m^3 = 48 tons/hour

Dust emission (Controlled) = 48 tons/hour x 0,0125 kg/ton = **0.6 kg/hour**

Construction of Switchyard and Administrative Building

The construction of switchyard and administrative building will consist of the removal of top soil, excavation, loading, transportation and unloading. The total area of the switchyard and administrative building are taken as 200 m^2 and 100 m^2 respectively. The depth of the excavation is assumed as 3 m and the distance of the stabilised transportation of the excavated material is assumed as 750 m (max).

Amount of excavation (volume) : (200 m^2 + 100 m^2) x 3 m = 900 m^3

Amount of excavation (mass): 900 m^3 x 1.6 ton/m^3 = 1,440 tons

Duration of excavation: 20 days

Total amount of hourly excavated material: 1,440 tons / (20 days x 8 hour/day) = 9 tons/hour

Emission Values:

Dust Emission During Dismantling

Dust emission (Controlled) = 9 tons/hour x 0,0125 kg/ton = 0.11 kg/hour

Dust Emission During Loading

Dust emission (Controlled) = 9 tons/hour x 0,005 kg/ton = 0.045 kg/hour

Dust Emission During Unloading

Dust emission (Controlled) = 9 tons/hour x 0,005 kg/ton = 0.045 kg/hour

Dust Emission During Transportation

The distance of the stabilised transportation of the excavated material is assumed as 1000 m (max). The capacity of the truck is assumed as 20 ton. There will be 10 trucks. There will be 7 rounds for transportation (1,440 tons/day / (20 tons/trip x 10 trucks).

Dust emission (Controlled) = (7 trip/day x 0.35 kg/km x 1 km) / 8 hour/day = 0.3 kg/hour

Table 49: Total Dust Emissions

	Controlled (kg/hour)
Dust Emission During Dismantling	0.11
Dust Emission During Loading	0.045
Dust Emission During Unloading	0.045
Dust Emission During Transportation	0.30
Total	**0.50**

Construction of Crane Pad

Crane pads will be located nearby the each turbine. The area of each crane pad will be about 3,000 m^2. The area of each crane pad will be excavated. The depth of excavation will be assumed as 0.2 m. Duration of the excavation for crane pad construction is assumed as 3 days. Daily working duration for construction of crane pads will be 12 hours per day.

Amount of excavation (volume) : 3,000 m^2 x 0.2 m = 600 m^3

Amount of excavation (mass): 600 m^3 x 1.6 ton/m^3 = 960 tons

Duration of excavation: 3 days

Total amount of hourly excavated material: 960 tons / (3 days x 12 hour/day) = 26.6 tons/hour

Dust emission (Controlled) = 26.6 tons/hour x 0,0125 kg/ton = **0.33 kg/hour**

Construction of Foundation of Turbines

The excavation area of each turbine foundation will be 625 m^2 (25 m x 25 m). The depth of excavation is assumed as 3 m and duration of each turbine assembling will be 10 days. Daily working duration for construction of assembling of turbines will be 12 hours per day

Amount of excavation (volume) : 625 m^2 x 3 m = 1,875 m^3

Amount of excavation (mass): 1,875 m^3 x 1.6 ton/m^3 = 3,000 tons

Duration of excavation: 10 days

Total amount of hourly excavated material: 3,000 tons / (10 days x 12 hours/day) = 25 tons/hour

Emission Values:

Dust Emission During Dismantling

Dust emission (Controlled) = 25 tons/hour x 0.0125 kg/ton = 0.3 kg/hour

Dust Emission During Loading

Dust emission (Controlled) = 25 tons/hour x 0.005 kg/ton = 0.12 kg/hour

Dust Emission During Unloading

Dust emission (Controlled) = 25 tons/hour x 0.005 kg/ton = 0.12 kg/hour

Dust Emission During Transportation

The distance of the stabilised transportation of the excavated material is assumed as 1000 m (max). The capacity of the truck is assumed as 20 ton. There will be 10 trucks. There will be 15 rounds for transportation (3,000 tons/day / (20 tons/trip x 10 trucks).

Dust emission (Controlled) = (15 trip/day x 0.35 kg/km x 1 km) / 12 hour/day = 0.4 kg/hour

Table 50: Total Dust Emissions

	Controlled (kg/hour)
Dust Emission During Dismantling	0.3
Dust Emission During Loading	0.12
Dust Emission During Unloading	0.12
Dust Emission During Transportation	0.4
Total	**0.94**

Total dust emissions resulted from each construction phase are presented in below table.

All construction activities will be conducted under the controlled conditions. All necessary mitigation measures which is presented in below sections will be applied.

Total amount of dust emission to be released due to the operations to be performed during the each excavation phases are below the limit value (1kg/h) specified in (Annex-2 Table 2.1) the Regulation on the Control of Industrial Air Pollution. Therefore, no additional modelling studies were performed.

8.1.7.1.2 Commissioning and Operational Phase

Wind power plant projects are not such a process in which fossil fuels are used. Mechanical energy is transformed into electrical energy directly. During the operation of the turbines, no fossil fuels will be used. and electrical heaters will be used for heating purposes. Therefore, no emissions will be expected. It is planned to use one emergency generator in operation phase of the project. The emissions related to temporary operation of the emergency generator will not be negatively effect to the air quality. When considering all these aspects, during the operation there will not be any adverse effect to the air quality.

8.1.7.1.3 Decommissioning and Closure Phase

In general, the decommissioning activities would comprise the removal of the plants and the associated facilities. Also, the foundations of the structures would be removed. The site is expected to be restored for its future use. The impacts during the decommissioning phase are likely to be similar to the construction phase and the same considerations described for air quality during the construction phase would be applicable to the decommissioning phase as well.

8.1.7.2 Mitigation Measures

The following mitigation measures are considered relevant during construction phase to mitigate dust dispersion during construction activities:

- wetting and covering powdery materials transported on trucks;
- reduce trucks and vehicle speed;
- washing facilities, such as hose-pipes and ample water supply, should be provided at site exits, including mechanical wheel spinners where practicable;
- if necessary, all vehicles should be washed down before existing the construction site;
- periodic wetting of the construction areas;
- use of working machinery with low emissions; and good levels of maintenance;
- vehicles will be maintained in good condition to ensure they are no louder than other, similar vehicles on the roadways;
- use of diesel with low sulphur content;
- periodic maintenance of machinery with combustion engine.

All measures given in the Regulations on the Control of Industrial Air Pollution, published on 03.07.2009 in Official Gazette No.27277, shall be taken in order to minimize dust emission during the construction period.

During the operation phase, the emissions related to heating purposes will not be expected.

8.1.7.3 Residual Impacts

8.1.7.3.1 Construction Phase

The residual impact on the air quality component after the application of the abovementioned mitigation measures during construction phase is presented in the following table.

Table 51: Impact Assessment Matrix for Air Quality During the Construction Phase After Mitigation

IMPACT ASSESSMENT MATRIX - [AIR QUALITY] [CONSTRUCTION PHASE]		[pollutant and dust emission in the atmosphere]
Duration (D)	short	
	medium-short	
	medium	
	medium-long	
	long	

IMPACT ASSESSMENT MATRIX - [AIR QUALITY] [CONSTRUCTION PHASE]		[pollutant and dust emission in the atmosphere]
Frequency (F)	concentrate	
	discontinuous	
	continuous	
Geographic extent (G)	local	
	regional	
	beyond regional	
Intensity (I)	negligible	
	low	
	medium	
	high	
Reversibility (R)	short-term	
	long-term	
	irreversible	
Probability of occurrence (P)	low	
	medium	
	high	
	certain	
Mitigation (M)	high	
	medium	
	low	
	none	
Sensitivity (S)	negligible	
	low	
	medium	
	high	

IMPACT ASSESSMENT MATRIX - [AIR QUALITY] [CONSTRUCTION PHASE]	[pollutant and dust emission in the atmosphere]
	Negligible

8.1.7.3.2 Commissioning and Operational Phase

The residual impact on the air quality component after the application of the above mentioned mitigation measures during commissioning and operational phase is presented in the following table.

Table 52: Impact Assessment Matrix for Air Quality Component During the Operational Phase After Mitigation

IMPACT ASSESSMENT MATRIX - [AIR QUALITY] [OPERATION PHASE]		[pollutant and dust emission in the atmosphere]
Duration (D)	short	
	medium-short	
	medium	
	medium-long	
	long	
Frequency (F)	concentrate	
	discontinuous	
	continuous	
Geographic extent (G)	local	
	regional	
	beyond regional	
Intensity (I)	negligible	
	low	
	medium	
	high	
Reversibility (R)	short-term	
	long-term	
	irreversible	
Probability of occurrence (P)	low	

IMPACT ASSESSMENT MATRIX - [AIR QUALITY] [OPERATION PHASE]		[pollutant and dust emission in the atmosphere]
	medium	
	high	
	certain	
Mitigation (M)	high	
	medium	
	low	
	none	
Sensitivity (S)	negligible	
	low	
	medium	
	high	
		Negligible

8.1.7.3.3 Decommissioning and Closure Phase

Decommissioning phase activities are likely to be very similar to the construction phase. Decommissioning of infrastructures could have a positive impact if the natural state of the land is recovered. Same considerations describe during construction are applicable here as well.

8.1.7.4 Monitoring

Exhaust emissions from construction and transportation vehicles should be periodically monitored along with the requirements in the Regulation on Control of Exhaust Gas Emission both in construction and operation period of the project.

Please refer to ESAP air quality related items for the monitoring aspect.

8.1.8 Noise

Noise to be generated during the construction phase of the Project is local and temporary and it will finish at the end of construction. The noise to be generated during Project operation will be expected to be caused by the operation of the turbines.

Effect of vibration is not expected to go beyond the construction site considering the machinery and equipment to be used in construction.

Impact factor that could possibly affect this component during the construction phase and operational phase is the emission of noise.

8.1.8.1 Impact Analysis

8.1.8.1.1 Construction Phase

Construction activities will affect the ambient noise levels mainly through emissions of noise from the construction equipment and vehicles traffic.

This section presents the baseline information and calculations/modelling results of the noise modelling study. Noise calculations are undertaken to predict noise levels due to the proposed project works at the closest noise sensitive receptors which are the residential buildings (Binkılıç Quarter, Aydınlar and Yaylacık settlements). The predicted sound levels were compared with the measured ambient noise levels in the project area and at the sensitive receptors. Noise modelling study has been conducted using SoundPLAN Essential 3.0 software and according to ISO 9313-2:1996.[40]

The area of influence for noise is used as the noise modelling calculation area of the construction phase which has dimensions of 6 x 6 km and covers the receptors (see Section 6.1).

To run the model, it is necessary to provide some input information about meteorological conditions, source details and receptors. The data used in the SoundPLAN Essential 3.0. software to create the model is given in below table.

Table 53: Model Inputs

Model Input	Data Source
Receptor Locations	Established from aerial photo of the surrounding area (Google Earth view) and site visits
Machinery and Equipment	Number and type of the machinery/equipment are provided from the project owner and sound levels of them are determined from SoundPLAN software (see Section 3.4 and below table).
Topography	1/25,000 scaled topographical map from General Command of Mapping
Calculation Method	ISO 9613-2: 1996
Temperature (ºC)	12.9[41]
Relative Humidity (%)	76.7[42]
Air Pressure (hPa)	994.4[43]

Following conditions are assumed during modelling study:

- The model provides for the prediction of sound pressure levels based on down-wind (worst-case) conditions and other conditions favourable for noise distribution according to the ISO standard. In case of a

[40] ISO 9613-2: Acoustics -- Attenuation of sound during propagation outdoors - Part 2: General method of calculation, ISO, 1996

[41] Annual average temperature of the Çorlu Meteorological Station, ESIA Report Section 7.1.7.

[42] Annual average humidity of the Çorlu Meteorological Station, ESIA Report Section 7.1.7.

[43] Annual average air pressure of the Çorlu Meteorological Station, ESIA Report Section 7.1.7.

wind blowing from the receptor towards the noise source, noise levels will be significantly lower than the calculated level;

- Weather conditions which may create additional noise (rain, wind etc.), existing trees or buildings are not considered during the model.

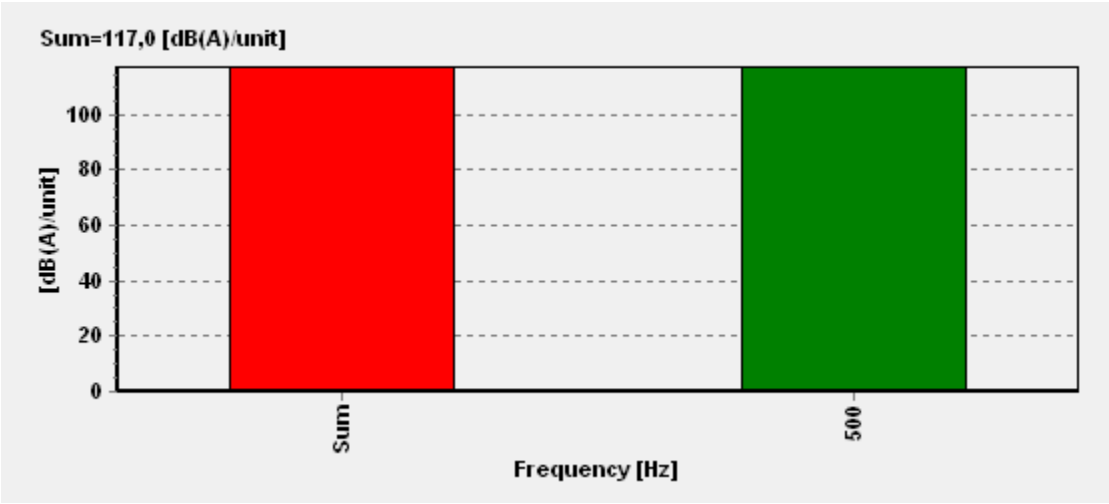
- It is assumed that all noise sources will be operating continuously with a 100% on-time. Consequently, the noise level predictions are considered to be conservative, that is, levels higher than what would be expected from actual operations.

As mentioned above, topographical information of the project area and surrounding are entered to the model. Each noise source is used as single point source in the noise model. The closest residential buildings to the project area are entered as receptor in the model to calculate sound level there.

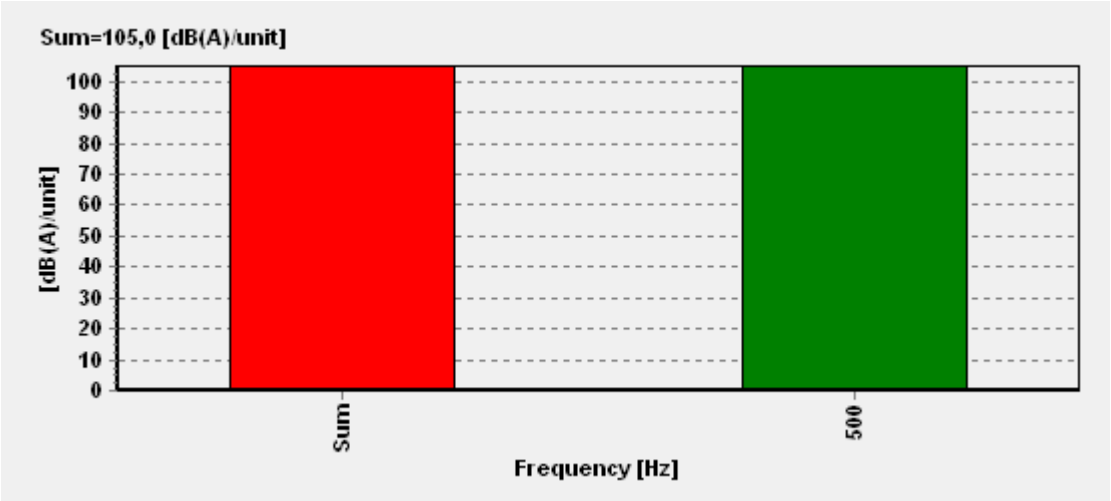
The sound power levels of construction machinery are obtained from library of the SoundPLAN Essential 3.0 software as given below table and figures.

Table 54: Equipment List

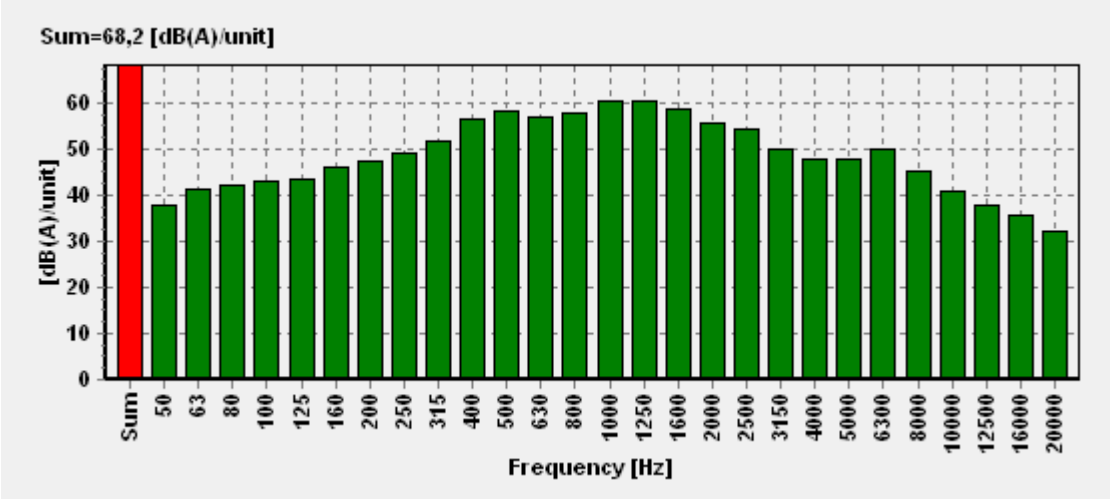
Equipment	Total Quantity	Sound Level (dBA)
Truck	10	68.2
Grader	1	112
Dozer	1	117
Excavator	8	105
Crane	7	105
Water Truck	1	68.2



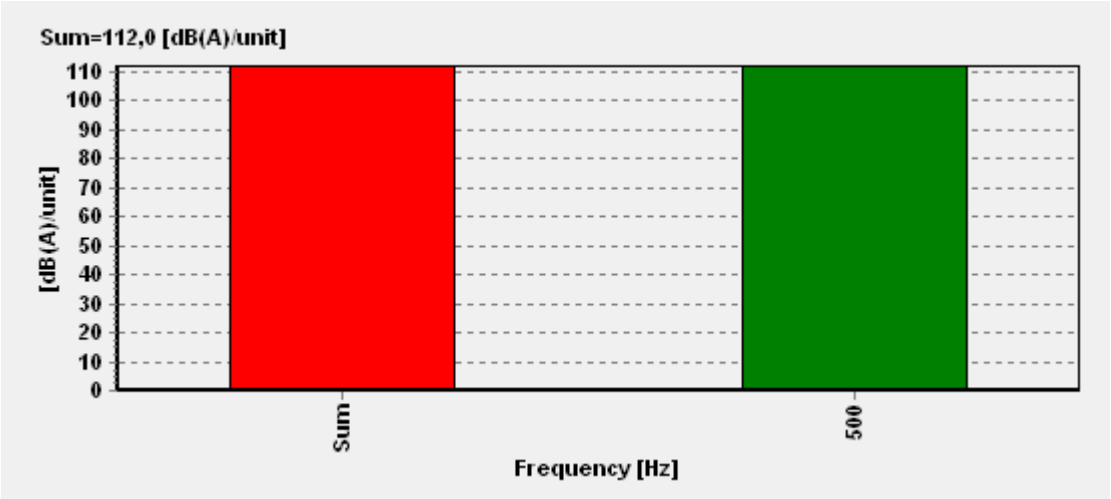
Sound Power Level Frequency Analysis of Dozer



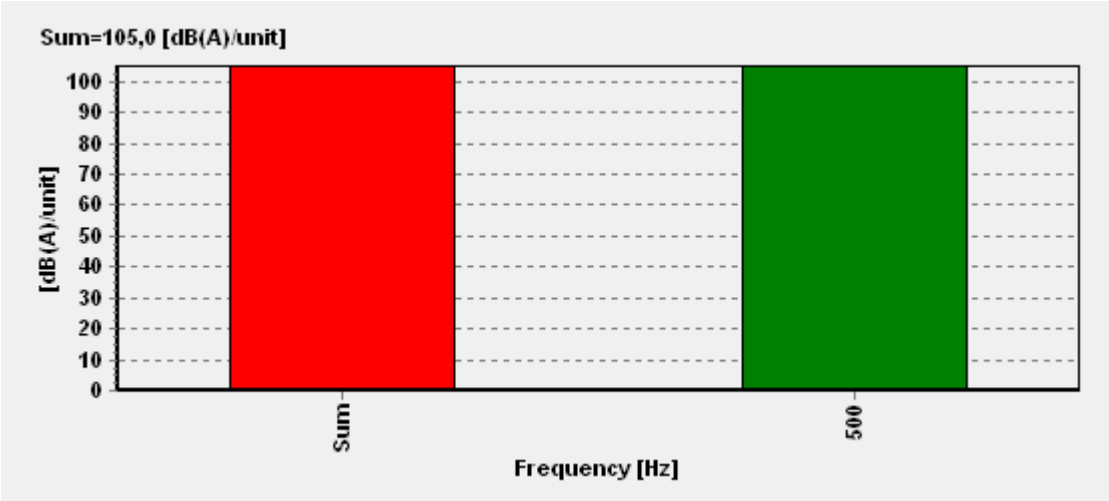
Sound Power Level Frequency Analysis of Excavator



Sound Power Level Frequency Analysis of Truck



Sound Power Level Frequency Analysis of Grader



Sound Power Level Frequency Analysis of Crane

Model Results

Based on the calculations, the highest noise level at the receptor points is about 50.2 dBA at Aydınlar Village. The noise levels calculated in the closest residential buildings in the Binkılıç Quarter and Yaylacık Neighbourhoods are 40.1 dBA and 40.8 dBA, respectively. The actual noise levels at Project Site is expected to be lower than the calculated value since all equipment/machinery will not be operated at the same time in the project area and natural noise barriers like trees, vegetation or meteorological conditions will prevent noise to be dispersed.

Noise modelling results at the closest sensitive receptor (Aydınlar) is comply with both Turkish (65 dBA) and IFC (55dBA) standards. There will not be any construction activities during the night time.

8.1.8.1.2 Commissioning/Operation Phase

Only project units having possibility to create noise are the 15 turbines located in the proposed project area.

Noise measurement results are presented in Table 35 for both Turkish and IFC standards. Considering the Turkish limits, all of the measurement points comply with the Turkish limits of day time (60 dBA), evening time (55 dBA) and night (50 dBA). According to IFC standards, all day time values comply with the day time noise limit value of 55 dBA. Except from N-3, all night time noise values slightly exceed the night time IFC noise limit of 45 dBA.

The noise effect of the proposed project are assessed by using DECIBEL tool of the windPRO software program.

DECIBEL is the name of the windPRO program module, which calculates the noise emission and checks if the noise requirements are met at neighbours and noise-sensitive areas.

The noise to be generated during Project operation is expected to be caused by the 15 turbines located for the project.

GE 3.4-130 model turbines will be used in the Project. The noise levels generated by the models (GE 3.4-130) are obtained from the turbine manufacturer.

Sensitive Receptors

The receptors of the proposed project are shown in below table. The coordinates of the given receptors are UTM – ED 50 datum.

Table 55: Noise Sensitive Receptors

Receptor	Information	Coordinates (X – Y)
A	The closest settlement to the T4 (Binkılıç)	596514 – 4583851
B	The closest settlement in Aydınlar Quarter to the nearest turbine (T14)	600714 – 4581044
C	The closest settlement in Yaylacık Quarter to the nearest turbine (T15)	601942 – 4579090

Model Methodology and Results

The following information was used for the calculation of the noise impact generated by the new and the existing turbines.

- The position of the turbines
- Turbine hub height and noise emission values at one or more wind speed at different frequencies.
- Location for the noise sensitive locations
- Terrain data

Contour map used in the windPRO has 24-31 m cell dimensions and obtained from the SRTM: Shuttle DTM 1 arc-second (http://srtm.usgs.gov/ at the U.S. Geological Survey).

The potential noise impact of the wind turbines on sensitive receptors is determined by noise modelling. Commercially available windPro version 3.1, which is based on ISO 9613-2, is used in this Project.

The output of modelling with windPRO software programme includes main report and map demonstrations. These reports are given in Appendix G and model map is shown in below.

The modelling results are given in below table.

Table 56: Noise Modelling Results for Receptors

Turbines	Receptors		
	A	**B**	**C**
Model Results (dBA)	24.9	32.1	24.8

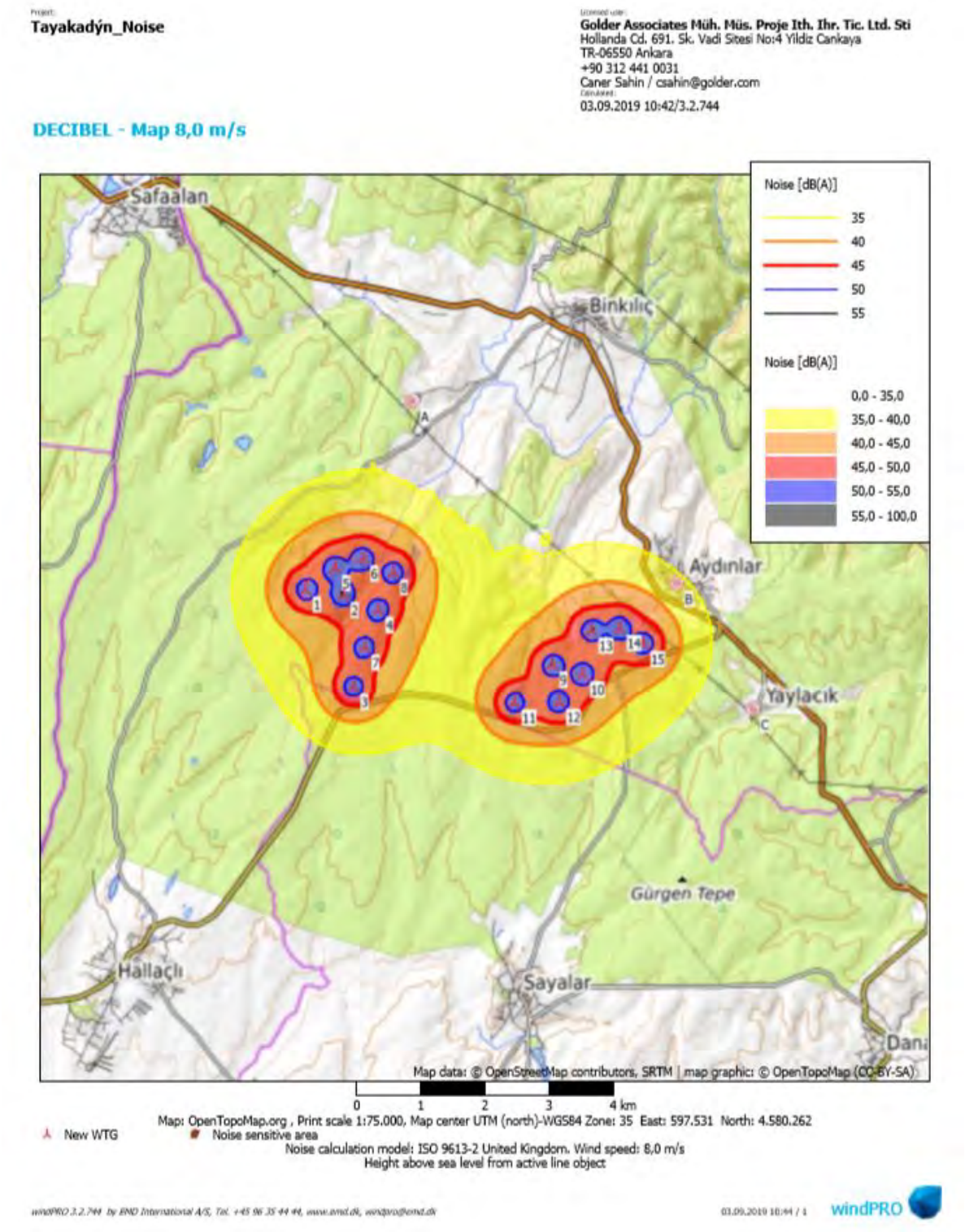


Figure 31: Location of the Turbines and Noise Receptors

According to the model results, all values comply with both national and international standards. The calculated noise levels are below the baseline (background) noise levels (presented in Section 7.1.9). Therefore operation of turbines will not have any adverse effect on the sensitive locations.

8.1.8.1.3 Decommissioning and Closure Phase

It is assumed that decommissioning phase of the project will not generate higher noise levels than calculated noise levels in the construction phase of the project. Similar machinery with construction phase will be used in decommissioning activities; therefore the noise impact of the decommissioning will be similar to impact of construction phase.

8.1.8.2 Mitigation Measures

During the construction stage, provisions of the “Regulation on Assessment and Management of Environmental Noise” and “Regulations on Work Health and Safety" will be followed with the purpose of protecting health of employees with respect to noise. Accordingly:

- Appropriate personal protective equipment and materials such as helmet, ear protector or ear plug will be provided to protect workers from noise.
- There would not be any construction activities during the night time.

The following control measures recommended by IFC will be applied where possible:

- Selection of equipment with lower sound power levels;
- Installing suitable mufflers on engine exhausts and compressor components;
- Installing acoustic enclosures for equipment casing radiating noise;
- Installing vibration isolation for mechanical equipment;
- Limiting the hours of operation for specific pieces of equipment or operations, especially mobile sources operating through community areas;
- Reducing project traffic routing through community areas wherever possible; and
- Developing a mechanism to record and respond to complaints.

In addition, regular maintenance will be made for the construction equipment to ensure decreasing the possible high noise levels generated by the equipment.

No additional mitigation measures are proposed during the operation phase.

8.1.8.3 Residual Impacts

8.1.8.3.1 Construction Phase

The residual impact on the noise and vibration component after the application of the abovementioned mitigation measures during construction phase is presented in the following table.

Table 57: Impact Evaluation Matrix for Noise and Vibration Component During Construction Phase

IMPACT ASSESSMENT MATRIX - [NOISE and VIBRATION] [CONSTRUCTION PHASE]		[emission of noise and vibration]
Duration (D)	short	
	medium-short	
	medium	
	medium-long	

IMPACT ASSESSMENT MATRIX - [NOISE and VIBRATION] [CONSTRUCTION PHASE]		[emission of noise and vibration]
	long	
Frequency (F)	concentrate	
	discontinuous	
	continuous	
Geographic extent (G)	local	
	regional	
	beyond regional	
Intensity (I)	negligible	
	low	
	medium	
	high	
Reversibility (R)	short-term	
	long-term	
	irreversible	
Probability of occurrence (P)	low	
	medium	
	high	
	certain	
Mitigation (M)	high	
	medium	
	low	
	none	
Sensitivity (S)	negligible	
	low	
	medium	

IMPACT ASSESSMENT MATRIX - [NOISE and VIBRATION] [CONSTRUCTION PHASE]		[emission of noise and vibration]
	high	
		Negligible

8.1.8.3.2 Commissioning and Operational Phase

The residual impact on the noise and vibration component after the application of the abovementioned mitigation measures during operation phase is presented in the following table.

Table 58: Impact Evaluation Matrix for Noise and Vibration Component During Operation Phase

IMPACT ASSESSMENT MATRIX - [NOISE and VIBRATION] [OPERATION PHASE]		[emission of noise and vibration]
Duration (D)	short	
	medium-short	
	medium	
	medium-long	
	long	
Frequency (F)	concentrate	
	discontinuous	
	continuous	
Geographic extent (G)	local	
	regional	
	beyond regional	
Intensity (I)	negligible	
	low	
	medium	
	high	
Reversibility (R)	short-term	
	long-term	
	irreversible	

IMPACT ASSESSMENT MATRIX - [NOISE and VIBRATION] [OPERATION PHASE]		[emission of noise and vibration]
Probability of occurrence (P)	low	
	medium	
	high	
	certain	
Mitigation (M)	high	
	medium	
	low	
	none	
Sensitivity (S)	negligible	
	low	
	medium	
	high	
		Negligible

8.1.8.3.3 Decommissioning and Closure Phase

Decommissioning phase activities are likely to be very similar to the construction phase. Decommissioning of infrastructures could have a positive impact if the natural state of the land is recovered. Same considerations describe during construction are applicable here as well

8.1.8.4 Monitoring

A monitoring programme of noise at the residential area during construction and the commissioning and operational phase will be in place in ESAP (Appendix A).

8.1.9 Traffic and Infrastructure

8.1.9.1 Impact Analysis

8.1.9.1.1 Construction Phase

During construction phase impacts will be mainly associated to the impact factor increased road traffic.

The project actions related to the abovementioned impact factor are the surface levelling and grading, the transport of construction material, the construction of the turbine components and the disposal of waste deriving from construction.

The activities related to the construction phase will require the movement of trucks entering and leaving the project area for the transportation of machinery, equipment, construction material (e.g., concrete, building materials) and staff. Transportation of oversized and heavy turbine components will be a part of the

construction phase. During transportation, existing roads will be used. Expected increase in traffic load is calculated and given in table below.

Table 59: Traffic Load Increase in Construction Phase

Vehicle Type	Number of Vehicles at Counting Point	Number of Vehicle Increase with the Project's Construction	Traffic Load Increase (%)
Heavy vehicle	1007*	**27	1
Light vehicle	5054	-	-

*Total amount of bus, truck and others for D-120 road

**Total amount of construction vehicles

During the construction activities, approximately %1 increase will be expected in terms of heavy vehicle flow rate per day.

Expected impacts of the traffic load during the construction phase can be listed as below:

- Increase in traffic load will cause an increase in the noise along the access roads to the project area.
- Dust formation in the stabilized roads especially due to heavy vehicle movements.
- Increased road traffic could lead to accidental wildlife losses.
- Usage of existing roads can cause damage on the roads due to heavy vehicles.
- High speed of heavy vehicles is a concern for local communities.

8.1.9.1.2 Commissioning and Operational Phase

No impact is expected due to traffic load as indicated in the construction phase.

8.1.9.1.3 Decommissioning and Closure Phase

A new impact is not expected other than those listed in the construction and operation phases in the decommissioning and closure phase of the Project.

8.1.9.2 Mitigation Measures

- Referring to Section 5, a continuous stakeholder engagement process and grievance mechanism will be in place:
  - to exchange information on the project with the local community and other stakeholder and
  - to record and respond any complaints and concerns raised by the local community members and other stakeholders
- Enclosure measures will be taken to prevent animals entering to the construction sites.
- Traffic Management Plan will be implemented and all drivers will be trained on project driving rules including speed limits. Sufficient number of proper safety signs and signals will be placed on the roads. Residents will be informed about the frequency and time span of the usage of the roads during the construction phase.
- İstres Elektrik Üretim A.Ş is committed to compensate any loss or harm to the animals of residents.

- Before the transportation of abnormal loads, logistics, traffic will be assessed. In case of potential delays on the use of roads to local communities, deliveries will be arranged outside of peak hours (especially times of school busses), traffic management will be arranged in advance and escorts will be arranged when required.
- İstres Elektrik Üretim A.Ş will aim to increase awareness about the project in the local settlements. Public consultations will be arranged to inform local residents about the wind turbines and ETL (when the route will be accurate) especially focusing on peoples' concerns on health.
- All roads that were damaged by the heavy vehicles due to the project activities will be recovered.

8.1.9.3 Residual Impacts

8.1.9.3.1 Construction Phase

The residual impact on traffic and infrastructure component after the application of the abovementioned mitigation measures during construction phase is presented in the following table.

Table 60: Impact Assessment Matrix for Traffic and Infrastructure Component During the Construction Phase After Mitigation

IMPACT ASSESSMENT MATRIX - [TRAFFIC AND INFRASTRUCTURE] [CONSTRUCTİON PHASE]		[increased road traffic]
Duration (D)	short	
	medium-short	
	medium	
	medium-long	
	long	
Frequency (F)	concentrate	
	discontinuous	
	continuous	
Geographic extent (G)	local	
	regional	
	beyond regional	
Intensity (I)	negligible	
	low	
	medium	
	high	

IMPACT ASSESSMENT MATRIX - [TRAFFIC AND INFRASTRUCTURE] [CONSTRUCTİON PHASE]		[increased road traffic]
Reversibility (R)	short-term	
	long-term	
	irreversible	
Probability of occurrence (P)	low	
	medium	
	high	
	certain	
Mitigation (M)	high	
	medium	
	low	
	none	
Sensitivity (S)	negligible	
	low	
	medium	
	high	
		Negligible

8.1.9.3.2 Commissioning and Operational Phase

No impact is expected due to traffic load as indicated in the operation phase.

8.1.9.3.3 Decommissioning and Closure Phase

A new impact is not expected other than those listed in the construction and operation phases in the decommissioning and closure phase (after the mitigation) of the Project

8.1.9.4 Monitoring

Monitoring activities are required to verify the effectiveness of the mitigation measures proposed. They are listed below:

- Investigation of the incidents and accidents and use of lesson's learned to improve traffic mitigations.
- Driver education monitoring to ensure it takes place.

- Comments and/or complaints incoming from grievances to improve traffic mitigations and to prevent air quality and noise impacts, if any.

Monitoring should in particular be designed to identify failure or ineffectiveness of mitigation measures in terms of road safety and nuisance prevention.

8.2 Biological Components

The impact assessment of biological components will be assessed for construction, operation and decommissioning phase separately in accordance with the below mentioned project actions.

8.2.1 Construction Phase

The main **project actions** expected to create potential impacts that could affect terrestrial biodiversity components during construction are: surface levelling and grading, temporary stockpiling of material, transport of construction material, assembling of turbines and disposal of waste deriving from construction. The duration of the construction activities is expected to be of six months.

The potential impacts that could affect terrestrial biodiversity during construction are associated to the following **impact factors**:

- vegetation and top soil removal;
- disruption of natural morphology and hydrology;
- emission of gaseous pollutant and dust in the atmosphere;
- introduction of alien species;
- emission of noise and vibration.

The impact factors identified above will be described and discussed after the completion of the baseline studies.

8.2.2 Operation Phase

The main **project actions** expected to create potential impacts that could potentially affect terrestrial biodiversity components during operation are: disposal of waste and operation of the facilities. The duration of the license period is 49 years.

The potential impacts that could affect terrestrial biodiversity during operation are associated to the following **impact factors**:

1) increase of artificial surfaces and modified habitats;
2) presence of wind turbines
3) presence of powerline;
4) emission of noise and vibration.

The impact factors identified above will be described and discussed after the completion of the baseline studies.

8.2.3 Decommissioning/Closure Phase

The main **project actions** expected to create potential impacts that could potentially affect terrestrial biodiversity components during decommissioning and closure are: disassembling of turbines, disposal of waste deriving from disassembling, transport of dismantled material, land reclamation and restoration.

The potential impacts that could affect terrestrial biodiversity during decommissioning and closure are associated to the following **impact factors**:

- accidental contamination of soil and surface water
- emission of gaseous pollutant and dust in the atmosphere;
- emission of noise and vibration;
- introduction of alien species;
- modification of morphology and hydrology (positive);
- revegetation of disturbed areas (positive).

Given that the decommissioning will not occur for about at least 49 years, it is not possible to comment in detail possible closure and reclamation activities since the future area designation is currently unknown. Such planning will occur closer the decommissioning period once the objectives of the decommissioning activity are defined.

Closure activities could have a negative impact on biodiversity components. However, if the area is rehabilitated to its natural state, positive impact factors, such as restoration of local morphology and hydrology and restoration of natural vegetation, are expected to outbalance the negative impact deriving from closure activities with a net positive effect on all onshore biological components

8.3 Social Components

8.3.1 Demographic Profile, Socio-economic Conditions and Employment Issues

8.3.1.1 Impact Analysis

8.3.1.1.1 Construction Phase

The construction phase is planned to last for 9 months. During the construction phase, wind energy projects and associated facilities require employees such as construction workers, security staff, cleaning workers, operators etc. It is predicted that maximum 100 people will be employed during the construction phase of the Project.

In the Project, workers who have the necessary vocational training and experience will be employed in the Project. Besides, other Project needs such as materials, workmanship, food, housing etc. will be supplied locally as much as possible.

During the construction phase of the project, a container will be placed at the project site and it will be removed at the end of the construction period. The exact location of the site area will be determined before the construction works. If there are available rental houses or hotels close to the construction site during the construction period, accommodation need for employees is planned to be met from these places. However, accommodation issue is under the scope of the sub-contractor and it is not certainly determined yet.

The Project area is heavily Forestry land but still there are private plots. The project will not induce any physical resettlement. There is going to be an expropriation process. The forest land is used to collect wood or other forest products by villagers.

8.3.1.1.2 Commissioning and Operational Phase

The license period is planned to last for 49 years. Estimated number of employees to be employed during the operation phase is 18 people.

According to the modelling studies conducted within the scope of this ESIA, there is not any adverse impact of noise and visual.

8.3.1.1.3 Decommissioning and Closure Phase

A new impact is not expected in the decommissioning and closure phase of the Project other than those listed in the construction and operation phases.

8.3.1.2 Mitigation Measures

For the negative impacts identified for this component, following general mitigation measures will be in place;

- Referring to Section 5, a continuous stakeholder engagement process and grievance mechanism will be in place:
  - to exchange information on the project with the local community and other stakeholder and
  - to record and respond any complaints and concerns raised by the local community members and other stakeholders
- If Project requires renting houses during the construction phase, special consideration will be given to the residents' concerns about the accommodation of Project staff
- Concerns regarding the noise and visual impacts, grievances will be monitored including the following:
  - Noise measurement to be performed in the facility.
- Required workforce qualifications will be first searched in the nearest settlements and priority will be given to the local residents.
- Istres Elektrik Üretim A.Ş will aim to increase awareness about the project in the local settlements. Public consultations will be arranged to inform local residents about the wind turbines and ETL especially focusing on peoples' concerns on health.

8.3.1.3 Residual Impacts

The residual impact on this component will be low.

8.3.1.4 Monitoring

Following general monitoring activities will be in place;

- Monitoring of the implementation of grievance mechanism with recorded and responded grievances and complaints.

8.3.2 Land Use

8.3.2.1 Impact Analysis

Majority of the project area belongs to the Forestry premises and the rest (4 immovables in 2 turbine areas) is private plots. These plots are planned to be leased. The Public Welfare Decision has been obtained from EMRA at 02.09.2019.

8.3.2.1.1 Construction Phase

According to the latest information obtained from İstres, the location of Turbine 3, 11 and 12 will be changed. The official letter from General Directorate of State Airports Operations has been obtained for the approval of the location change of these turbines at 23.09.2019.

As the husbandry is not performed inside the village, of 450 m distance to T13, there is an ovine barn being used for grazing purposes. As Istres does not have any plans with this barn, the residents will not be disturbed.

Plots of two turbines (T1 and T2) in 4 parcels belong to private premises, T1 and T2 lands particularly belong to the same person; which are identified as "idle" and not being actively used for any purpose. Plots of T12

and T15 will be requested from the National Estate. The official letter about the status non-agricultural land of these plots is requested from the Ministry of Agriculture and Forestry.

As there are a few private parcels to be acquired, which are “idle”, project roads will be renewed and residents has no intense access to ecosystem services, there is no direct negative impact being expected in this phase.

8.3.2.1.2 Commissioning and Operational Phase

The license period is planned to last for 49 years. There is not any adverse impact of in the commissioning and operational phase.

8.3.2.1.3 Decommissioning and Closure Phase

Any adverse impact is not expected in the decommissioning and closure phase of the Project other than those listed in the construction and operation phases.

8.3.2.2 Mitigation Measures

- Referring to Section 5, a continuous stakeholder engagement process and grievance mechanism will be in place:
  - to exchange information on the project with the local community and other stakeholder and
  - to record and respond any complaints and concerns raised by the local community members and other stakeholders

As İstres does not have any plans with the barn mentioned previously, the residents will not be disturbed. However, concerning community health, safety and security issues; this barn and residents should be monitored in the following for any adverse impacts.

8.3.2.3 Residual Impacts

The residual impact on this component will be low.

8.3.2.4 Monitoring

Following general monitoring activities will be in place;

- Monitoring of the implementation of grievance mechanism with recorded and responded grievances and complaints, in order to assess land use related problems.

8.3.3 Cultural Heritage

The literature survey and desktop study indicated that there’s no registered archaeological site within the Project license area. During field survey studies, no tangible cultural assets have been encountered.

Although no cultural assets have been identified during baseline studies the following control measures will be implemented in the Project:

- The archaeological immovable assets that are located within the project site and its impact area may be buried or covered entirely with vegetation. For this reason, during the deforestation activities in the project site, a systematic field survey should be conducted by experienced archaeologists. The investigation should be conducted under the supervision of the İstanbul Regional Directorate of Cultural Assets and a collaborative working environment with the Regional Board for Conservation of Cultural Assets should be established. In compliance with the laws no: 5226 and 3386 and the 4th article of the revised law no: 2863, in case any movable-immovable cultural asset is to be encountered as a result of the activities conducted during the field preparation and construction stages, the activities should be stopped and İstanbul Regional Directorate of Cultural Assets should be notified immediately.

- Cultural Heritage Management Plan and Chance Find Procedure, which are necessary for the management of the “chance finds”, will be prepared in compliance with the project organization. All operators, who are to be engaged in the soil works, and project workers should receive training related to “project requirements, protection of cultural and archaeological heritage, laws and legislations related with the archaeological and cultural heritage and cultural heritage management plan and chance find procedures”.
- In case any chance to find to be encountered during the construction activities, the further steps should be taken in accordance with the plans and procedures and the relevant bodies and the Directorate of the Museum will be notified immediately. In cases where any find or information associated with archaeological potential of the site is already discovered, relevant instructions about the sensitivity of the site will be shared with all construction teams few days before the construction activities. The construction activities will be conducted with convenient equipment and methods. The convenient equipment which will be identified together with the directorate of the museum and the construction teams.

8.3.4 Visual Aesthetics

8.3.4.1 Impact Analysis

8.3.4.1.1 Construction Phase

The construction machinery and equipment for earth works and foundation of the turbines will be used during the construction phase. The construction period of the Project is planned to be 9 months. The information on machinery and equipment to be used in the construction of the Project is given in Section 3.4.

There will not be any permanent and irreversible impacts on the landscape of the project area due to the construction activities. Wastes originated from the construction activities will be collected disposed in accordance with the national legislations. The contractor will provide the camp will be maintained in a good condition. Therefore, there will not be any adverse visual effect during the construction activities.

8.3.4.1.2 Commissioning/Operation Phase

The possible visual impact of the project during the operation phase will be the presence and view of the vertical structures and rotating blades. The visual effect of the proposed project is assessed by using ZVI (Zones of Visual Influence) tool of the windPRO software program.

ZVI is a windPRO module that calculates and documents the visual impact of the turbines on the landscape (identifying the locations from where a sensitive receptor will be able to see one or more turbines). For the proposed project, ZVI is calculated cumulatively by taking into consideration of the existing project.

Visual Receptors

The receptors of the proposed project are shown in below table and figure (sensitive receptors are located as radars in the map). The coordinates of the given receptors are UTM – ED 50 datum.

Table 61: Visual Receptors

Receptor	Information	Coordinates (X – Y)
A	The closest settlement to the T4 (Binkılıç)	596514 – 4583851
B	The closest settlement in Aydınlar Quarter to the nearest turbine (T14)	600714 – 4581044
C	The closest settlement in Yaylacık Quarter to the nearest turbine (T15)	601942 – 4579090

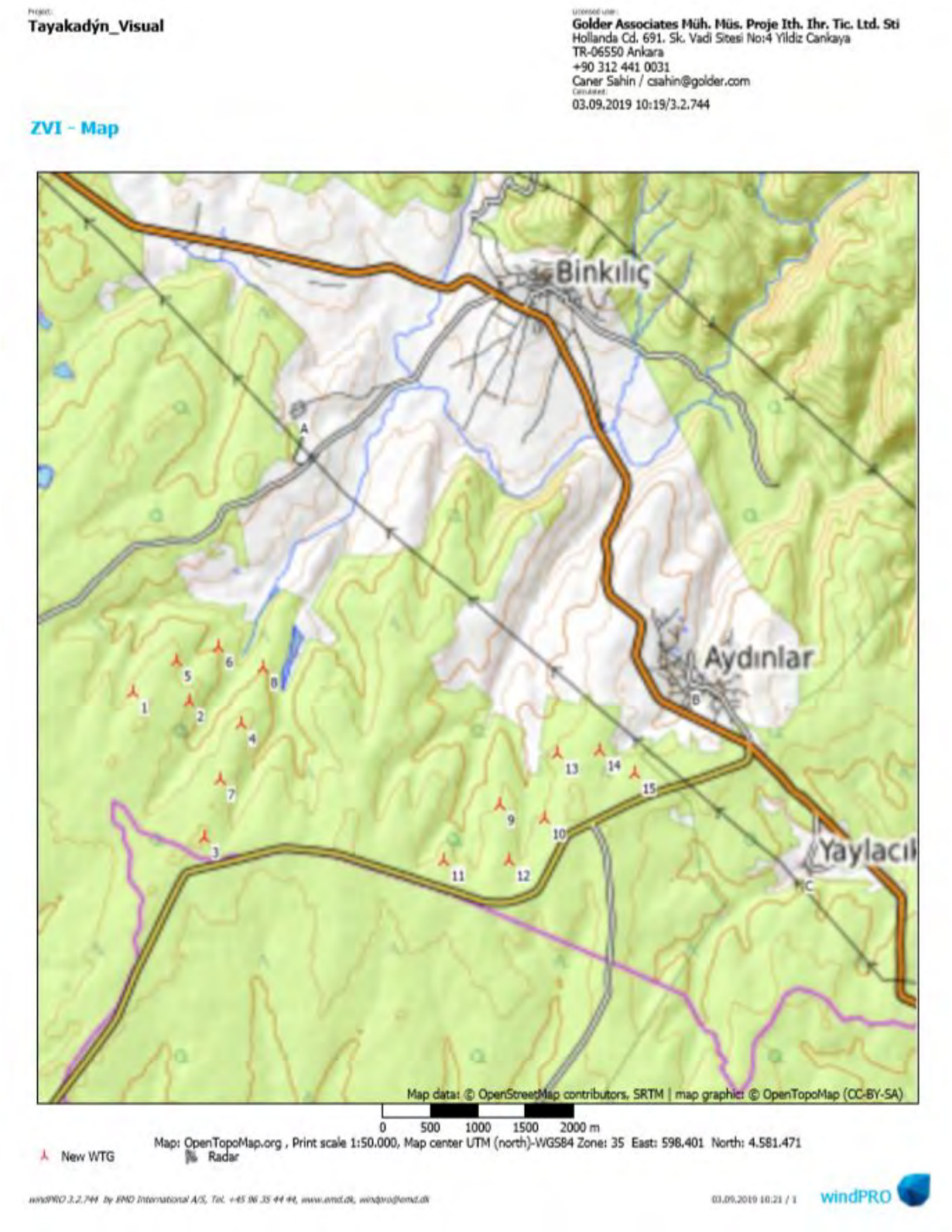


Figure 32: Location of the Turbines and Visual Receptors

Model Methodology and Results

The calculations are based on a digital 3D model of the landscape established from digital height contours or an elevation grid. Furthermore, local obstacles and surfaces (e.g. forest areas) will be included. ZVI module of WindPRO software requires several parameters for the calculation of the visual impact. These parameters are terrain data (contour map), position and properties of turbines and the position of visual receptors.

Contour map used in the windPRO has 24-31 m cell dimensions and obtained from the SRTM: Shuttle DTM 1 arc-second (http://srtm.usgs.gov/ at the U.S. Geological Survey).

In general, there are no acceptance criteria regarding the maximum allowable visibility of WTGs and indeed, it would be very difficult to make operational definitions on the matter.

The output of modelling with windPRO software programme includes main report and map demonstrations. These reports are given in Appendix G.

The modelling results are given in below table where “+” is visible and “–“ is invisible from the receptors.

Table 62: ZVI Modelling Results for Visual Receptors

Turbines	Receptors		
	A	B	C
T1	+	-	-
T2	+	-	-
T3	+	-	-
T4	+	-	-
T5	+	-	-
T6	+	-	-
T7	+	-	-
T8	+	-	-
T9	+	+	-
T10	+	+	-
T11	+	+	-
T12	+	+	-
T13	+	+	-
T14	+	+	-
T15	+	+	+

9.0 CUMULATIVE IMPACT ASSESSMENT

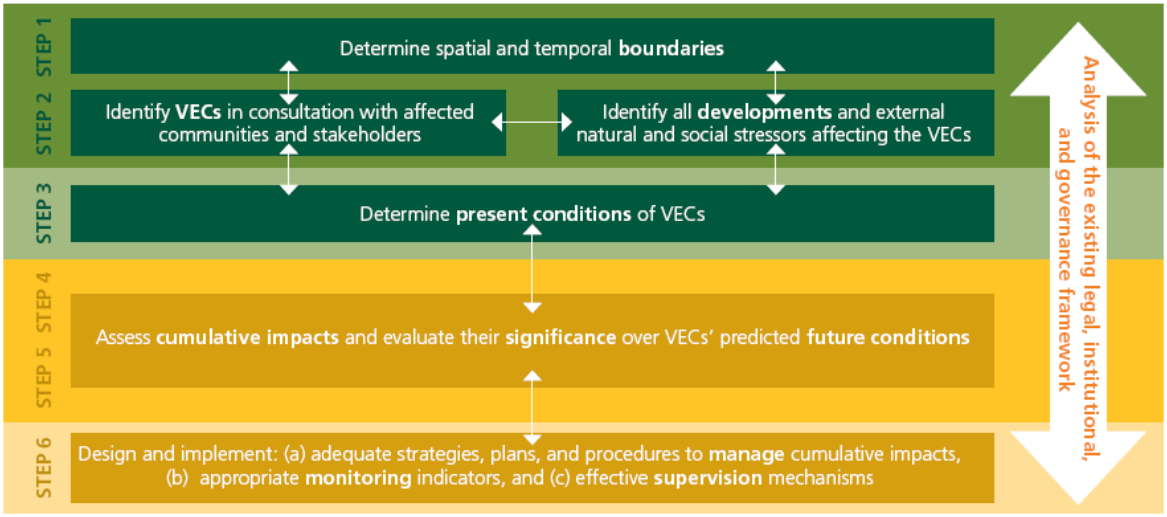
Cumulative impacts are defined as *"… those that result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones."* (IFC Good Practice Handbook: Cumulative Impact Assessment and Management).

Cumulative impacts can result from various types of interaction among different impact factors:

1. Impacts arising from the accumulation of different impact factors at a specific location or over a specific receptor; as an example the concurrent presence of the emission of noise, visual impact and shadow flicker during construction and operation at the same location;
2. Impacts arising from the same impact factor over the same receptor in a different geographic location; as an example the degradation of the same habitats in different locations may harm the population of associated species across their entire distribution area.
3. Impacts arising from the concurrent presence of impact factors caused by the Project and other development projects; as an example we can consider the emission of dust from the construction of the Project and the concurrent construction of a new road or industrial development at the same location.

In the context of the Project, the closest planned wind power plant projects are Kemerburgaz and Şile Projects which has a distance of 4 and 6 km respectively.

The process followed for the assessment is consistent with the framework provided by IFC and illustrated in the figure below, as described in the following paragraphs.



Spatial and temporal boundaries

The analysis of projects with potential cumulative impacts has been extended within the Social components Study Area that extends to neighbouring settlements to the Project Area including Çatalca and Silivri District. The projects considered were the projects likely to have a construction phase overlapping with the proposed project.

Valued environmental components identification

The VECs considered are the same considered for the project, as described in Section and analysed in detail in Section 7.

Present condition of the VECs

The present conditions of the VECs has been analysed in the course of the baseline studies, whose results are described in Section 7. The Area of Influence (AoI) considered is sufficient to determine the present conditions in the areas where there is potential interaction between the Tayakadın WPP Project and the other projects considered. Within the scope of this Project, cumulative impact assessment in accordance with the air, noise, shadow, visual components are not applicable.

10.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM (ESMS)

10.1 Environmental and Social Management System Structure

The Environmental and Social Management System (ESMS) will ensure that the Project:

- complies with all applicable Turkish legislation as well as Equator Principles, World Bank Environmental and Social Standards, EBRD requirements and IFC Standards;
- implements Good International Industry Practices (GIIP) to minimize potential environmental and social impacts during the construction, operation and decommissioning phases;
- is executed in compliance with the commitments addressed in the ESIA for the minimization of potential environmental and social impacts;
- works in accordance with high standards of safety;
- cares for the protection of own employees and public;
- promotes its policies through training, supervision, regular reviews and consultation;
- generate local socio-economic benefits by using local and regional labour forces;
- engages and communicates with the local community and other stakeholders through a stakeholder engagement program.

The ESMS addresses more in detail the following environmental and social aspects:

- Environmental aspects
- Stakeholder management and social aspects
- Occupational Health and Safety, Labour Issues and community Health & Safety aspects

The ESMS included here is intended to describe the framework for the general management issues. This ESMS will be further developed and management plans will be developed to describe the minimum requirements for the implementation of the relevant management systems including:

- Organizational Requirements
- Description of the methods for the risk identification and management
- Training Requirements
- Communication
- Recording and Reporting
- Auditing, inspection

10.2 Overall Environmental and Social Management System

The following mechanisms will be in place for the implementation of the ESMS.

10.2.1 Organisation – Roles and Responsibilities

The **Project Management** will ensure that:

- the Project will be executed in line with the Environmental and Social Policy of the Project itself;
- the required resources are in place to implement the environmental and social mitigation measures identified in the ESIA.

The HSE Engineer(s)/HSE Manager will supervise the overall environmental and social management activities associated with the Project at all phases of the Project. HSE Engineer(s) will be appointed in the beginning of pre-construction activities.

The role of the HSE Engineer(s)/HSE Manager will be to:

- supervise the implementation of the environmental and social mitigation measures identified in the ESIA;
- ensure the ESMS and the associated management plans and procedures are further developed and detailed during the course of the project lifecycle;
- coordinate with Community Relations Officer the monitoring the stakeholder engagement activities being performed in line with the stakeholders programme and the public complaints are recorded and addressed.

The Community Relation Officer (CRO)[44] will supervise the overall implementation of the social management activities of the Project. He/she reports to the Management and is responsible for the implementation and operation of the Stakeholder Engagement Plan (SEP) and in this respect acts as an interface between Tayakadın Wind Power Plant Project, contractors, subcontractors and stakeholders. The CRO is responsible for implementing and organizing engagement activities described in this plan. The CRO is also responsible for monitoring the Plan implementation and for proposing corrective actions and reports to the Management. The CRO is furthermore responsible for:

- ensuring that SEP is up to date and appropriate to the nature and scale of the Project;
- proposing to the management, if necessary, amendments and/or updates to the SEP and issuing revisions;

10.2.2 Risk Assessment and Risk Register

In order to identify and manage the project risks, a risk assessment study will be conducted in the beginning of the construction works and will be repeated at the beginning of each phase. The findings of this study will be taken into consideration and a detailed risk register will be prepared identifying the potential environmental, health & safety and social risks associated with the individual work items. This will be a living document and be updated during the course of the project.

10.2.3 Training and Awareness

The project will ensure that:

- All personnel, including contractor's personnel, will receive a level of environmental and social training appropriate to their job functions.
- A training programme will be in place to include as a minimum but not limited to:
  - awareness of Project policies;
  - regulatory framework and conformance to the ESMP;

[44] The HSE Manager can act as a CRO in the absence of CRO.

- the potential environmental impacts associated with their jobs;
- occupational health and safety;
- requirements of operational policies;
- spill response and emergency response programs;
- risk assessment.

10.2.4 Emergency Response

An Emergency Preparedness and Response Plan will be developed to analyse the potential emergencies that may occur in the Project, identify the emergency response actions and determine the roles and responsibilities of allocated personnel.

10.2.5 Communication of Environmental and Social Issues

The system to communicate internally and externally regarding environmental and social issues are included in the stakeholder engagement activities.

10.2.6 Document and Record Controls

A document and record keeping procedure will be established to maintain the summary of all environmental and social activities and results. The records will include mitigation, monitoring and reporting needs, such as sampling, analytical data, incident reports, communications, etc.; and performance, training, communications and audits. These documents will be readily accessible for review and audit.

10.2.7 Corrective Actions

Procedures will be established to investigate any non-conformance with the requirements and necessary adjustment to correct and prevent further occurrence.

10.2.8 Inspections and Audits

A system will be established internally and to conduct periodic audits of the environmental and social management plans, their effectiveness, implementation and maintenance.

10.3 Environmental and Social Management Plan

10.3.1 Management Mechanism

A Site HSE Manager for the Project will be appointed in the beginning of the pre-construction activities to supervise the implementation of overall environmental and social mitigation activities defined by the ESMS.

10.3.2 Construction Phase

Risks and impacts related to environmental and social issues shall be identified and assessed throughout the Project's construction phase.

The identification and assessment of environmental issues and incidents shall be performed within scope of the Project's area of influence (as defined by WB ESS1 and IFC PS 1), including the area likely to be affected by:

- Project activities and facilities that are directly owned, operated or managed as a component of the Project;
- impacts from unplanned but predictable developments caused by the Project that may occur later or at a different location;
- indirect project impacts on biodiversity or on ecosystem services upon which Affected Communities' livelihoods are dependent.

İstres Elektrik Üretim A.Ş. will determine and sustain management plans and procedures in order to identify the environmental and social aspects of the Project, specified the mitigation measures and perform Project construction activities with minimum impact on the environment.

The significant environmental (including biological and cultural heritage) aspects of Project are analysed continuously considering environmental objectives and environmental legislation. The planning of environmental and social aspects is performed in line with national and international standards.

Environmental objectives and targets shall be set at “Management Review” meetings minimum annually and assessed by the Top Management. Corrective and preventive action shall be taken, if necessary, in the event of failure to achieve the environmental objectives and targets.

Environmental plans and programs shall be monitored annually in order to achieve the environmental objectives. Such plans and programs shall set deadlines and identify the persons responsible for achieving the relevant objectives.

If and when necessary, the environmental management programs shall be amended according to regarding legislations and laws.

- The basic environmental and social issues, which are addressed by the Management System for the construction phase as summarized below,
- Air emissions management
- Noise management
- Traffic-related risks and impacts management
- Wastewater management
- Waste management
- Management of hazardous materials
- Soil management
- Management of water/energy resources
- Biological and Cultural Heritage management
- Visual aesthetics
- Demographic profile and land use
- Emergency response management

10.3.3 Operation Phase

The appointed construction site HSE Manager during the construction of the Project will preferably continue for the operation phases. If not, a new HSE Manager will be appointed in the beginning of the operations to supervise the implementation of overall environmental and social mitigation activities defined by the ESMS.

The HSE Manager and Site Manager during the operation phase will be the point of contact for Project internal and external stakeholders.

In addition to the overall management system requirements described in Section 10, the Project will develop additional operational plan and procedures as part of the environmental management system.

The operation of the wind energy facilities does not typically involve major environmental impacts unlike conventional power plants i.e. wind plants do not emit any air pollutants or greenhouse gases. However, all potential environmental and social impacts of the operation phase and mitigation measures will be considered. These will include the following, but not limited to;

- Environmental Risk Identification and Assessment
- Noise management
- Traffic-related risks and impacts management
- Wastewater management (mainly due to maintenance activities)
- Waste management (mainly due to maintenance activities)
- Management of hazardous materials (mainly due to maintenance activities)
- Soil management (mainly due to maintenance activities)
- Biological and Cultural Heritage management
- Visual aesthetics
- Stakeholder engagement
- Emergency response management

10.4 Labour Issues and Health & Safety Management Plan

Health & Safety Management Plan will be prepared for the Project that will ensure the compliance with applicable national legislation, as well as relevant international guidelines provided in this ESIA. The following measures will be provided for all phases of the Project and relevant plans/procedures will be prepared;

- Identification of site or activity specific details of planned work procedures;
- Hazard identification, risk assessment and management;
- Preparation and implementation of H&S management plans and procedures;
- Emergency management plan/procedures and implementation of emergency drills;
- Orientation and training of employees;
- Creation of an occupational health and safety committee;
- Provision of Personnel Protective Equipment; and
- Monitoring and reporting.

10.4.1 Labour Conditions

A labour / human resources management system will be established to manage labour rights, security and health issues. An employee grievance mechanism will be established during construction and operation phases. Following points will be considered and included as a minimum into the management system to be developed;

- İstres Elektrik Üretim A.Ş. will promote equality of treatment and prohibit harassment in the workplace.

- Employment decisions, such as recruitment, dismissal, promotion, will be transparent and will not be made (directly or indirectly) on the basis of personal characteristics such as sex, race, nationality, etc., but rather on the ability to do the job.
- The employees will be provided with a written contract. The contracts as a minimum will include information on terms and conditions of employment, including the period of employment, wages, hours of work, overtime arrangements, procedures for termination of the contract and any benefits. The contract will be in the native language of the employee and it will be clear and understandable to the employee. A copy of contract will be given to the employee.
- The copies of relevant human resources policies and any collective agreements will be readily available to workers.
- There will not be forced labour and employees will be free to terminate their employment in accordance with national law.
- The Health and Safety requirements and provisions will be included in the sub-contracts and employee contracts.
- Minimum age for employment of young persons will be followed according to national legislation, and records of dates of birth verified by official documentation will be kept.
- Young people will not be employed in hazardous work as defined by Turkish national legislation.
- İstres Elektrik Üretim A.Ş. has a strict policy on not employing child workers.
- Access to adequate medical facilities and services will be provided to workers.
- Security will be guaranteed to workers and their property (personal belongings) on site, in line with indications in the Security Management Plan.
- Workers shall be made aware of the Worker's Grievance Mechanism and know that any concern or complaint regarding accommodation may be submitted.

10.4.2 Occupational Health and Safety Plan

Labour Law and Occupational Health and Safety Law requirement will be applied throughout the Project. The following but not limited to general health and safety principles will be applied:

- All employees will be adequately trained as per Regulation on Principles and Procedures for Health and Safety Training of Employees. Personnel who require vocational training will not be allowed to start working before obtaining the necessary training certification.
- Emergency Response Plan will be implemented for the Project and drills will be conducted at least on an annual basis. Emergency Response Teams will be established and appointed personnel will have appropriate training as per Regulation on Emergency Cases in Workplaces.
- Risk Assessment will be prepared including all Project tasks according to Regulation on Health and Safety Risk Assessment.
- Occupational safety specialists and occupational physicians will be appointed as per Regulation on the Duty, Authority, Responsibility and Training of Occupational Specialists and Regulation on the Duty, Authority, Responsibility and Training of Occupational Physicians.
- Employees will be provided with suitable personal protective equipment.
- Employees will be subject to medical controls before the employment and regular controls as per legal requirement.

- All accidents, incidents and near misses will be reported and employees will be encouraged to share their observations. All accidents will be investigated to prevent further reoccurrences. Accident Reporting and Investigation Procedures will be established.
- Personal exposures (noise, vibration, dust etc.) will be assessed and monitored for the employees and necessary control measures will be implemented.
- All chemicals will have Safety Data Sheets and will only be used by authorized personnel. Regulation on Health and Safety Precautions Regarding Working with Chemicals requirements will be followed.
- All equipment used at site will be periodically maintained and controlled as per Regulation on Health and Safety Conditions Regarding Use of Work Equipment.

For the Tayakadın Wind Power Plant Project primary occupational health and safety hazards include following[45]:

- Working at height
- Lifting operations
- Working in remote locations

Working at Height and Protection from Falling Objects

Working at height is one of the major hazards that exist in all phases of operation at wind power plant projects and it is especially relevant for maintenance purposes. Prevention of falls is the main focus when managing working at heights. Falling objects and adverse weather conditions should also be considered as a part of the working at height management. In this context, relevant procedures and instructions will be prepared for working at heights which will include the following main issues:

- Working at height will be eliminated or reduced where practicable. During the planning and design phases of an installation, specific tasks will be assessed with the aim of removing the need to work at height, if practicable. Examples of this would include assembling structures and carrying out ancillary works at ground level, then lifting the complete structure into position to the extent that is feasible and cost effective.
- If working at height cannot be eliminated, work equipment or other methods will be searched and used to prevent a fall from occurring. Collective protection systems, such as edge protection or guardrails, should be implemented before resorting to individual fall arrest equipment. In addition, safety nets or airbags can be used to minimize the consequences of a fall should it occur.

While implementing the hierarchy of control for the management of working at height, the following points will be considered:

- All structures should be designed and built according to the appropriate means of international working at height systems and requirements set in the Turkish Regulation on Health and Safety at Construction Sites.
- Suitable exclusion zones should be established and maintained underneath any working-at-height activities, where possible, to protect workers from falling objects.

[45] IFC Environmental Health and Safety Guidelines Wind Energy

- All employees working at height will be trained and will be competent in the use of all working at height and rescue systems.
- Workers will be provided with a suitable work-positioning device; also it will be ensured that the connectors on positioning systems are compatible with the tower components to which they are attached.
- It will be ensured that hoisting equipment is properly rated and maintained and that hoist operators are properly trained.
- When working at height, all tools and equipment should be fitted with a lanyard, where possible, and capture netting should be used if practicable. Signs and other obstructions should be removed from poles or structures prior to undertaking work.
- An approved tool bag should be used for raising or lowering tools or materials to workers on elevated structures.
- Conducting tower installation or maintenance work during poor weather conditions will be avoided and especially where there is a risk of lightning strikes.
- All working at height equipment will be controlled and maintained on a regular basis. Inappropriate equipment will not be used.
- While working at height, it will be ensured that materials/equipment will not be thrown directly to the ground from any altitude. They will be stacked in a stable and safe manner.
- An emergency rescue plan will be in place detailing the methods to be used to rescue operatives if they become stranded or incapacitated while at height.

Lifting Operations

Lifting operations are important component of the wind power plant projects especially for the construction phase. This would include lifting of large and complex equipment of varying dimensions several times and their assembly. Requirements set in the Turkish Regulation on Health and Safety at Construction Sites will be complied with during all lifting operations. Relevant procedures and instructions will be prepared for lifting operations which will include the following main areas:

- Information about the load will be considered before lifting e.g. the size, weight, method of slinging, and attachment points.
- It will be ensured that all lifting equipment (including load attachment points) is suitable, capable of supporting the load, in good condition, and in receipt of any statutory inspections required.
- All supervisors, equipment operators, and slingers will be trained and competent in the lifting equipment and intended lifting techniques.
- Exclusion zones will be established where possible and maintained in order to prevent any unauthorized access to lifting areas.
- Weather conditions will be considered and ensured that it is suitable for lifting activities.
- Safe lifting limits of the equipment will not be exceeded.
- All lifting equipment will be controlled and maintained according to the Turkish Regulation on Health and Safety Conditions Regarding Use of Work Equipment.

Working in Remote Locations

The nearest village is to the turbine is Aydınlar Village which is 1 km away from T14 and Yaylacık Village which is 1.7 km away from T15 and Binkılıç Quarter which is 5 km away from T4.

Health, safety and welfare of employees will be ensured during the whole project lifecycle. Procedures and instructions will be prepared for working in remote locations considering the following areas while working at Project locations:

- Suitable communication equipment will be available for the work team at all times.
- All necessary safety equipment will be readily available in the work site.
- Employees will be trained for working remotely.
- Competent personnel will be appointed for the supervision and making decisions based on events and conditions at the work location.
- Exact location of working crew will be tracked during the working hours.
- Emergency plan will be in place.
- There will be suitably qualified first aider personnel in the work crew.

In addition to the management of the major risks of the Tayakadın Wind Power Plant Project, additional work specific health & safety procedures and instructions will be established. The areas of concern will include but not be limited to the following:

- General Health & Safety Procedures
- Specific Health & Safety Procedures for wind turbines construction, operation and maintenance
- Personal Protective Equipment Usage
- Working at Height
- Fall Protection
- Working in Confined Space
- Working with Rotary Machinery
- Working with Chemicals
- Manual Handling
- Falling Objects
- Lifting Operations
- Hot Works
- Electrical Works
- Procedures Related to Working Environment and Industrial Hygiene (noise, vibration, heat, etc)

10.4.3 Community Health and Safety Plan

Community health and safety hazards of the wind power plant projects may apply to the structural safety of project infrastructure, life and fire safety, public accessibility, and emergency situations. Community health and safety hazards specific to Tayakadın Wind Power Plant project primarily include the following[46]:

- Blade and Ice Throw
- Aviation
- Electromagnetic Interference and Radiation
- Public Access
- Abnormal Load Transportation
- Fire Risk

Blade and Ice Throw

In wind power plant projects, rotor blade failures can result in throwing blade or ice which may affect the community members. Although the overall risk of blade throw is low in wind power plant projects, ice throw might be a potential hazard in certain weather conditions. In Çorlu Meteorological Station (1960-2014), the lowest temperature was recorded as -17.5ºC in February.

The specific blade/ice throw assessment is presented in below:

The minimum setback distance[47]: 1.5 x 175 m (tower tip height) = 262.5 m

The nearest settlement to the Project Site is Aydınlar village which is 1000 m away from the closest turbine. Therefore, the minimum setback distance of 262.5 m is met in the Project.

Fatigue resistance of wind turbines subassemblies is an important aspect of preventing structural failures. Environmental factors such as wind speed, turbulence and wind turbine operating factors can also impact the fatigue of the turbines.[48] The model of the turbines will be GE 3.4-130 which will have an independent back up to drive each blade in order to feather the blades and shut down the wind turbine in the event of a grid line outage or other fault. For the prevention of blade throw following control measures will be implemented in the project:

- Blade failure will be prevented by selecting the turbines that have been subject to independent design verification/certification (IEC 61400-1), and surveillance of manufacturing quality.
- Turbines will be maintained regularly.
- An ultrasonic wind sensor and lightning rod will be mounted on tip of the blade.
- To override any wind turbine operation, emergency-stop buttons located in the tower base and in the nacelle can be activated to stop the turbine in the event of an emergency.

[46] IFC Environmental Health and Safety Guidelines Wind Energy

[47] IFC Environmental Health and Safety Guidelines Wind Energy

[48] Study and development of a methodology fort he estimation of the risk and harm to persons from wind turbines.

Aviation

According to the location of the wind power projects, they may impact aircraft safety through potential collision or alteration of flight paths. the Project will not influence the airport that are located about 40 km west of İstanbul Airport. The correspondences between General Directorate of State Airports Operation and İstres has not been finalised yet. According to the correspondence from General Directorate of State Airports Operation, Technical Interaction Analysis Report has started to prepared.

According to the Civil Aviation Law No.2920, it is forbidden to construct building, tree or any kind of facility around airports and related facility or equipment which would pose a risk to air security, communication and endanger the navigation and court security.

Within the scope of the project, all necessary control measures will be taken to identify the turbines in a way that eliminate potential aircraft collision. According to the International Civil Aviation Organisation (ICAO), the marking and/or obstacles is intended to reduce hazards to aircrafts by indicating the presence of obstacles. The following recommendations are given by ICAO for the indication of obstacles[49]:

- In general all fixed objects to be marked shall, whenever practicable, be coloured, but if this is not practicable, markers or flags shall be displayed on or above them, except that objects that are sufficiently conspicuous by their shape, size or colour need not be otherwise marked.
- A fixed obstacle that extends above a take-off climb surface within 3,000 m of the inner edge of the take-off climb surface should be marked.
- A fixed object, other than an obstacle, adjacent to a take-off climb surface should be marked and, if the runway is used at night, lighted if such marking and lighting is considered necessary to ensure its avoidance.
- A fixed obstacle that extends above an approach or transitional surface within 3,000 m of the inner edge of the approach surface shall be marked.
- A fixed obstacle above a horizontal surface should be marked.

Electromagnetic Interference and Radiation

Wind turbines can cause interference with telecommunication systems and aviation radars. There is no aviation radar within the project area of influence.

İstres Elektrik Üretim A.Ş will aim to increase awareness about the project in the local settlements. Public consultations will be arranged to inform local residents about the wind turbines and ETL especially focusing on peoples' concerns on health.

Public Access

Adequate measures will be taken to prohibit public access to the wind turbines including construction and operation phases. Access to the turbines tower ladders will be prevented and appropriate safety boards will be placed to prevent climbing to the turbines. Emergency contact information will be available on work areas.

Abnormal Load Transportation

Transportation of heavy and oversized turbine components (such as blades, nacelle, and transformers) is integral part of the construction phases of the wind power plant projects. Locally produced tower and blades will be used in the Project and the rest of the turbine parts will be supplied from Germany. Before the transportation of abnormal loads, logistics, traffic will be assessed. In case of potential delays on the use of

[49] http://www.avaids.com/icao.pdf

roads to local communities, deliveries will be arranged outside of peak hours (especially times of school busses), traffic management will be arranged in advance and escorts will be arranged when required.

Fire Risk

Fire is an important risk factor that will be considered throughout the Project lifecycle since all of the turbines and switchyard are located in the forest land. Fire can occur due to non-allowed smoking, used chemicals, open fire etc. during the construction phase and potential malfunction is one of the major causes of a fire risk during the operation phase. In order to prevent fire risk, sufficient number and suitable type of fire extinguishers will be placed in the working area. Employees will be trained on how to use firefighting equipment. Emergency response drills will be conducted at least on an annual basis including fire extinguishing. It will be ensured that the roads to the turbines and switchyard is clear and accessible in case of a big fire by the fire truck.

10.4.3.1 Shadow Flicker

Shadow flicker is one of the most important effect of the wind turbines to the sensitive receptors located within the close vicinity of the project area.

Shadow flicker is a comfort issue rather than a health risk. Given it is a daytime event; it does not interrupt sleep patterns. On the other hand, two issues might be raised as a potential health concerns in relation to shadow flicker which can be mitigated by turbine selection and wind power plant project design. Flicker vertigo and photosensitive epilepsy are those issues which are described below:

Flicker Vertigo

Flicker vertigo is an imbalance in brain cell activity caused by exposure to low frequency flickering or flashing of a light or sunlight seen through a rotating propeller. It can result in nausea, dizziness, headache, panic, confusion and – in rare cases – loss of consciousness[50].

Photosensitive Epilepsy

Flicker from turbines that interrupt or reflect sunlight at frequencies may be poses a potential risk of inducing photosensitive seizures. The risk is maintained over considerable distances from the light source. The flicker frequency is dependent upon the rotational speed of the wind turbine. It is therefore important to keep rotation speeds below 3 hertz.

Specific Guidelines

Germany has guideline on limits and conditions for calculating shadow impact. These are found in “Hinweise zur Ermittlung und Beurteilung der optischen Immissionen von Windenergianlagen” (WEA-Shattenwurf-Hinweise).

According to these guidelines, the limit of the shadow is set by two factors:

- The angle of the Sun over the horizon must be at least 3 degrees
- The blade of the WTG must cover at least 20% of the Sun.

The limits of shadow impact for a neighbour to a wind power plant according to the German guidelines are:

- a maximum of 30 hours per year of astronomical maximum shadow (worst case);
- a maximum of 30 minutes per day of astronomical maximum shadow (worst case);

[50] Fulcrum 3D Shadow Flicker Assessment – Lord Howe Islan

Australia has also guideline under the Victoria State Government. The Victorian Planning Guideline also limit the duration of shadow flicker to a maximum of 30 hours per year. It is stated that “The impact of ‘shadow flicker’ from wind turbines on neighbour’s houses within 2 km of a proposed wind turbine should be assessed. The shadow flicker experienced at any dwelling should not exceed 30 hours per year as a result of the operation of the wind farm. Specialist modelling software should be used to model shadow flicker impacts prior to finalisation of the turbine layout”.

According to the Victorian Planning Guideline, shadow flicker should be assessed out to 2 km distance from the closest turbine.

10.4.3.1.1 Methodology

A specific software program “windPRO” is used for the assessment of the shadow flicker. Shadow is the windPRO calculation module that calculates how often and at which times of the day a specific neighbour or area will be affected by shadows generated by one or more wind turbines.

Shadow calculations are worst-case scenarios (astronomical maximum shadow, i.e. calculations which are only based on the position of the Sun relative to the turbines. Shadow impact may occur when the blades of a turbine interrupt the Sun’s rays seen from a specific location (e.g. a window in an adjacent settlement). If the weather is overcast or calm, or if the wind direction forces the rotor plane of the turbine to be parallel with the line between the Sun and the neighbour, the turbine will not produce shadow impacts, but the impact will still appear in the calculations. In other words, the calculation is a worst-case scenario, which represents the maximum potential risk of shadow impact[51].

The calculation of the potential shadow impact at a given shadow receptor is carried out simulating the situation by positioning of the Sun relative to the turbine rotor disk. The following information is required for the assessment of the shadow flicker risk:

- The position of the turbines (x, y, z coordinates)
- Properties of the turbines
- The position of the shadow receptor objects (x, y, z coordinates)
- Contour map

In the shadow calculation model used by windPRO the following parameters define the shadow propagation angle behind the rotor disk.

- The diameter of the Sun, D: 1,390,000 km
- The distance to the Sun, d: 150,000,000 km
- Angle of attack: 0.531 degrees

10.4.3.1.2 Assessment of Shadow Flicker

The position and coordinates of the turbines are stated in Section 3.2.1. The contour maps for the project areas are created by windPRO software program.

Shadow flicker for proposed Project have been assessed by takin into accounts all 15 turbines are operated at the same time.

The properties of the turbines are presented in Section 3.3. The model of the turbine is GE-3.4-130.

[51] WindPRO, Introduction to shadow

Shadow Receptors

Shadow receptors of are shown in below table. The coordinates of the given receptors are UTM – ED 50 datum.

Table 63: Shadow Receptors

Receptor	Information	Coordinates (X – Y)
A	The closest settlement to the T4 (Binkılıç)	596514 – 4583851
B	The closest settlement in Aydınlar Quarter to the nearest turbine (T14)	600714 – 4581044
C	The closest settlement in Yaylacık Quarter to the nearest turbine (T15)	601942 – 4579090

Model Results

Shadow module of WindPRO software requires several parameters for the calculation of the shadow flicker which has been mentioned in Section 4.1. These parameters are terrain data (contour map), position and properties of turbines, the position of shadow receptors.

Contour map used in the windPRO has 24-31 m cell dimensions and obtained from the SRTM: Shuttle DTM 1 arc-second (http://srtm.usgs.gov/ at the U.S. Geological Survey). The average daily sunshine hours are obtained from the windPRO database.

According to the the Victorian Planning Guidelines, “The impact of ‘shadow flicker’ from wind turbines on neighbour’s houses within 2 km of a proposed wind turbine should be assessed. However, the assessment has been conducted for more than 2 km to show the absolute theoretical worst case scenarios (the sun is shining for all day).

The output of modelling with windPRO software programme includes main report and map demonstrations. These reports are given in Appendix G and the shadow map is presented in below.

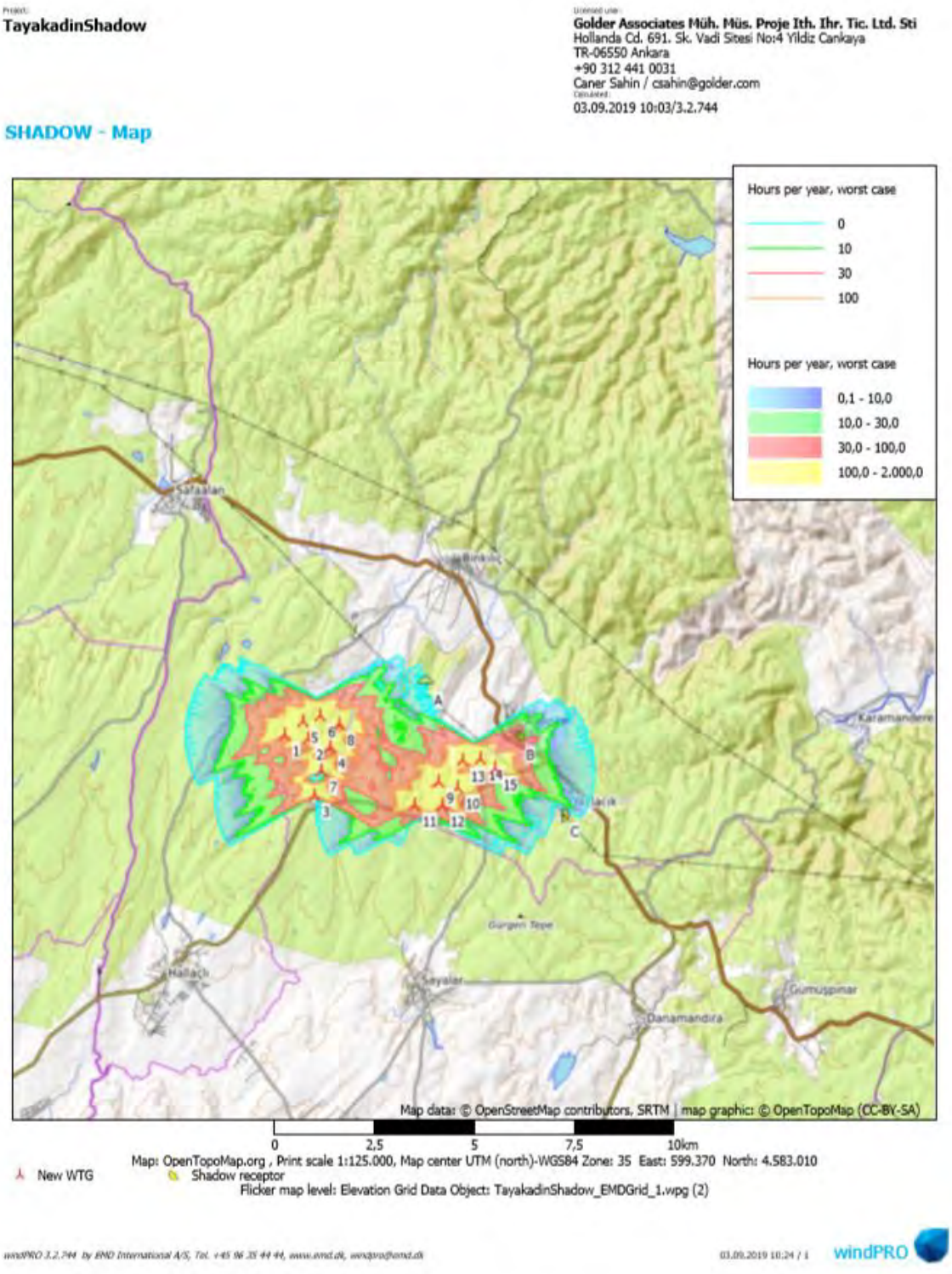


Figure 33: Shadow Flicker Map

The modelling results are given in below table.

Table 64: Shadow Modelling Results for Shadow Receptors

Receptor	Shadow, Worst Case		
	Shadow hours per year (h/year)	**Shadow days per year (days/year)**	**Max shadow hours per year (h/year)**
A	0:00	0	0:00
B	27:18	79	0:40
C	0:00	0	0:00

According to the model results, point B will have the maximum hours per year in a year which is 27:18 hours. This value is under the limit value of 30 hours per year.

10.4.3.1.3 Blade Glint

Blade glint occurs when sunlight is reflected off turbine blades. Turbine manufacturers are aware of the possibility of blade glint and use a low reflectivity gel finish to reduce any reflectivity. The moving blades are typically convex in nature which act to disperse the light rather than reflect which acts to further reduce the change of blade glint. These measures are considered sufficient to mitigate the risk of blade glint.

Blade glint is not expected to be a crucial issue since all blades for the projects will be made of and painted non reflective materials.

11.0 CONCLUSIONS

The ESIA for the project has been conducted following a series of phases including:

- Scoping
- Stakeholder engagement
- Alternative analysis
- Baseline
- Impact assessment
- Definition of Environmental and Social Management System

The ESIA complies with the relevant Turkish regulation and it is aligned with the 2012 IFC Performance Standards and EHS Guidelines Wind Energy, 2015 and EBRD Environmental and Social Policy, 2014 and guidelines. The various activities have been carried out by a working group including Turkish and International experts in environmental and social disciplines.

The general methodology for the impact assessment is based on the definition of Valued Environmental and Social Components (VECs), that are aspects of the physical, biological and social environment that are considered worthy of protection by the relevant legislation or by international standards, and of Assessment Endpoints (AE), that are specific and measurable aspects of the VECs that allow for the assessment of impacts (both positive and negative).

The process of assessing impacts has been based on the following steps:

- The identification of Project Components, as individual elements of the Project that are characterized by similar features and construction, operation and decommissioning procedures;
- The identification of Impact Factors, or factors that can change the environmental and social quality of the VECs like air emissions, water discharge etc.,
- The definition of the sensitivity of the VECs to the Impact Factors identified, based on the environmental and social data collected during baseline;
- The definition of the Impacts as a result of the interaction between Impact Factors and Sensitivity of the VECs for each of the identified Assessment Endpoints.

Each of the project components has been associated to one or more impact factor for each of the phases of construction, operation and decommissioning.

Impacts have been assessed considering the correct application of a set of standard mitigation measures that are drawn from good industry practice. Additional site or issue specific mitigation measures have been identified to address areas where high residual impacts are likely to occur, in order to ensure the impacts after additional mitigation measure are kept at an acceptable level.

Impacts have been assessed separately for the three phases of construction, operation and decommissioning, as the nature and extent of the impacts in the three phases is substantially different.

As a result of the Environmental and Social Assessment Study the following conclusion have been driven:

1) Continuous stakeholder engagement is necessary manage the social risks of the project.
2) According to the shadow flicker model results, point B (The closest settlement in Aydınlar Quarter to the nearest turbine (T14)) will have the maximum hours per year in a year which is approximately 27hours. This value is under the limit value of 30 hours per year.
3) During the operation phase of the project a noise monitoring programme will be in place for the facility to be in compliance with regulatory requirements applicable to the project.
4) The project will develop an Environmental and Social Management System in line with the minimum requirements that are defined as part of the ESIA study.
5) The assessment in accordance with the WB ESS6, IFC PS 6 is not completed within the scope of this report since the baseline field studies are currently ongoing and have not yet been finalized.

The mitigation measures to be in place for the minimisation of environmental and social impacts of the project is detailed in appropriate sections of the report.

The requirements of an Environmental and Social Management System is also provided as part of the Environmental and Social Impact Study focusing on

- Environmental and Social Management System Structure
- Environmental and Social Management Plan
- Labour Issues and Health & Safety Management Plan
    - Labour Conditions
    - Occupational Health and Safety
    - Community Health and Safety

12.0 REFERENCES

- TÜİK 2017 statistics
- http://www.enerji.gov.tr/tr-TR/Sayfalar/Temiz-Enerji
- Enerji ve Çevre Dünyası Dergisi, Mart 2017
- Energy Production Sector Report, EÜAŞ, 2008
- http://www.enerjiatlasi.com/ruzgar/
- https://www.mgm.gov.tr/arastirma/yenilenebilir-enerji.aspx?s=ruzgaratlasi
- http://www.enerjiatlasi.com/haber/illere-gore-ruzgar-santrali-kurulu-gucu
- IFC, Environmental, Health and Safety Guidelines Wind Energy
- Documents supplied by the Client
- Environmental and Social Policy, EBRD, 2014
- Tayakadın Rüzgar Enerji Santrali Proje Alanına Air İmar Planına Esas Jeolojik- Jeoteknik Etüd Raporu
- İstanbul Provincial Environmental Status Report, 2017;
- Geological and Geotechnical Investigation Report, May 2019;
- “Technical Instructions for the Classification Standards of the Soil and the Land Use” prepared by the Ministry of Food, Agriculture and Livestock;
- Soil Groups, Land Use and Land Use Capability Classification Maps published by the Ministry of Food, Agriculture and Livestock;
- Regulation on Soil Pollution Control and Point Source Contaminated Sites “(“Soil Regulation”) originally published in the Official Gazette number 27605, dated 8 June 2010;
- Helvacı, Cahit, “Relationships between boron and arsenic elements in nature”, Dokuz Eylül Uni., Geological Engineering Dept., International Medical Geology Symposium, 2008;
- Kocaman (2016), Determination of Various Heavy Metal Pollution Levels with Soil And Plant Analyses In Some Farms Close To Some Factories Near Çorlu-Çerkezköy Province, Namık Kemal University Graduate School of Natural and Applied Sciences Department of Soil Science and Plant Nutrition.

13.0 APPENDICES

APPENDIX A
Environmental and Social Action Plan

APPENDIX B
Photos

Location of a Turbine

Interview with Aydınlar Village People

Interview with Binkılıç Forestry Administration

Location of Switchyard

Location of Admin Building

Location of a Turbine

APPENDIX C
National and European Union Legislation

Current environmental laws and regulations in Turkey relevant to Project

Current environmental laws and regulations	Date and No of Issuing Official Gazette
Environment Law	11.08.1983, 18132
Permitting	
Regulation on Environmental Impact Assessment	25.11.2014, 29186
Regulation on Environmental Auditing	21.11.2008, 27061
Regulation on Environmental Permits and Licenses	10.09.2014, 29115
Air Quality	
Regulation on Control of Air Pollution caused by Heating	13.01.2005, 25699
Regulation on Assessment and Management of Air Quality	06.06.2008, 26898
Regulation on Decreasing the Ozone Depleting Materials	07.04.2017, 30031
Regulation on Control of Exhaust Gas Emission and Quality of Petrol and Diesel	30.11.2013, 28837
Regulation on Control of Industrial Air Pollution	03.07.2009, 27277
Regulation on the Reduction in the Sulphur Content of Some Fuel Types	06.10.2009, 27368
Regulation on Odor Causing Emissions	19.07.2013, 28712
Regulation on Monitoring of Green House Gases	17.05.2014, 29003
Water Quality	
Regulation on Water Pollution Control	31.12.2004, 25687
Groundwater Law (No. 167)	23.12.1960, 10688
Regulation on Protection of Groundwater Against Pollution	07.04.2012, 28257
Regulation on Protection of Wetlands	04.04.2014, 28962
Regulation on Quality of Drinking Water to be Obtained or Planned to be Obtained from Surface Water	29.06.2012, 28338
Regulation on Control of Pollution Caused by Dangerous Substances in Water and its Environment	26.11.2005, 26005
Regulation on Urban Wastewater Treatment	08.01.2006, 26047
Regulation on Water Intended for Human Consumption	17.02.2005, 25730
Regulation on Management of Surface Water Quality	30.11.2012 28483

Current environmental laws and regulations	Date and No of Issuing Official Gazette
Regulation on Water Conservation against Pollution Caused by Nitrates from Agricultural Sources	18.02.2004, 25377
Soil Quality	
Regulation on Control of Soil Pollution and Contaminated Lands by Point Sources	08.06.2010, 27605
Regulation on Use of Domestic and Urban Treatment Sludge in Soil	03.08.2010, 27661
Waste Management	
Regulation on Waste Management	02.04.2015, 29314
Regulation on Control of Excavation Soil, Construction and Demolition Wastes	18.03.2004, 25406
Regulation on Control of Waste Batteries and Accumulators	31.08.2004, 25569
Regulation on Control of Vegetative Oils	19.04.2005, 25791
Regulation on Control of Medical Wastes	25.01.2017, 29959
Regulation on Control of End of Life Tires	25.11.2006, 26357
Regulation on Control of Waste Electrical and Electronic Stuffs	22.05. 2012, 22300
Regulation on Control of Waste Oils	30.07.2008, 26952
Regulation on Control of End of Life Vehicles	30.12.2009, 27448
Regulation on Landfills (Regular Storage of Wastes)	26.03.2010, 27533
Regulation on Control of Packaging Wastes	24.08.2011, 28035
Regulation on Control of Polychlorinated Biphenyls (PCBs) and Polychlorinated Terphenyls (PCTs)	27.12.2007, 26739
Regulation on management of Radioactive Wastes	09.03.2013, 28582
Chemicals Management	
Regulation on the Prevention of Major Industrial Accidents and Reducing Their Effects	3012.2013, 28867
Regulation on the Transportation of Dangerous Goods by Road	24. 10.2013, 28801
Regulation on Classification, Package, and Labelling of the Hazardous Materials and Aids	11.12.2013, 28848
Regulation on Safety Data Sheets of Dangerous Materials and Aids	13.12.2014, 29024

Current environmental laws and regulations	Date and No of Issuing Official Gazette
Regulation on Chemicals Record, Evaluation, Perception and Restriction (hereinafter mentioned as “Chem&SDS”).	23.06.2017, 30105
Regulation on Safe Transportation of Radioactive Materials	08.07.2005, 25869
Noise Management	
Regulation on Assessment and Management of Environmental Noise	04.06.2010, 27601
Regulation Related to External Noise Emissions and Exhaust Systems of Motor Vehicles	30.11.2000, 24246
Regulation Related to Noise Emissions by Equipment for Outdoor Use	30.12.2006, 26392
Nature Conservation and Biodiversity	
Regulation on Wildlife Protection and Wildlife Enhancement Areas	08.11.2004, 25637
Law on Forestry (No: 6831)	08.09.1956, 9402
National Parks Law (No: 2873)	11.08.1983, 18132
Cultural Heritage	
Conservation of Cultural and Natural Assets Law (No. 2863)	23.07.1983, 18113
Regulation on Research, Drilling and Excavation of Cultural and Natural Assets	10.08.1984, 18485
Landscape	
Law on Ratification of European Landscape Convention (No. 4881)	17.06.2003, 25141
Regulations on Certain Activities	
Regulation on the Obtaining, Processing and Control of the Sand, Gravel and Similar Materials	08.12.2007, 26724
Resources Management	
Energy Efficiency Law (No. 5627)	02.05.2007, 26510
Regulation on the Improvement of the Energy Sources and the Efficiency in the Energy Usage	27.10.2011, 28097

Current Labour and H&S laws and regulations in Turkey

Existing Labour and H&S Law and Regulations	Date and No of Issuing Official Gazette
Laws	
The Labour Law – No. 4857 *(Aims to regulate the working conditions and work-related rights and obligations of employers and employees working within the confines of an employment contract.)*	10.06.2003, 25134
Law on Occupational Health And Safety - Law No. 6331	30.06.2012, 28339
Regulations	
Regulation on Machine Guards	03.03.2009, 27158
Regulation on Safety and Health Requirements Working With Display Screen Equipment	16.04.2013, 28620
Regulation on Protection of Workers from the Risks of Vibration	22.08.2013, 28743
Regulation on Prevention of Workers from Risks Created from Noise	28.07.2013, 28721
Regulation on Management of Dust	05.11.2013, 28812
Regulation on Health and Safety Signs	11.09.2013, 28762
Regulation on Health and Safety at Construction Sites	05.10.2013, 28786
Regulation on Protection of Workers from the risk of Explosive Media	30.04.2013, 28633
Regulation on Health and Safety Precautions Regarding Working with Asbestos	25.01.2013, 28539
Regulation on Manual Handling	24.07.2013, 28717
Regulation on Principles and Procedures for Health and Safety Training of Employees	15.05.2013, 28648
Regulation on Health and Safety Precautions Regarding Workplace Buildings and Their Annexes	17.07.2013, 28710
Regulation on Use of Personnel Protective Equipment in Workplaces	02.07.2013, 28695
Regulation on Health and Safety Conditions Regarding Use of Work Equipment	25.04.2013, 28628
Regulation on Health and Safety Regarding Temporary Works	23.08.2013, 28744
Personnel Protective Equipment Regulation	29.11.2006, 26361
Regulation on Health and Safety Precautions Regarding Working with Chemicals	12.08.2013, 28733

Existing Labour and H&S Law and Regulations	Date and No of Issuing Official Gazette
Regulation on Subcontractor	27.09.2008, 27010
Regulations on the Prevention of Biological Exposure Risks	15.06.2013, 28678
Regulation on the Employment of Pregnant or Lactating Women, children's care homes and Breastfeeding Rooms	16.08.2013, 28737
Regulation on the Procedures and Principles of the Employment of Children's and Young Workers	06.04.2004, 25425
Regulation on Health and Safety Committees	18.01.2013, 28532
Regulation on Health and Safety Services	29.12.2012, 28512
Regulation on Supporting Health and Safety Services	24.12.2013, 28861
Regulation on Health and Safety Risk Assessment	29.12.2012, 28512
First Aid Regulation	29.7.2015, 29429
Regulation on Protection of Buildings Against Fire	19.12.2007, 26735
Regulation on Work Stoppage in Workplaces	30.03.2013, 28603
Regulation on Emergency Cases in Workplaces	18.06.2013, 28681
Regulation on Health and Safety Precautions Regarding Working with Cancerogenic and Mutagenic Substances	06.08.2013, 28730

Other Applicable Legislation Relevant to Project

Other Applicable Legislation Relevant to Project	Date and No of Issuing Official Gazette
Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electrical Energy (No: 5346)	10.05.2005, 25819
Law on Protection of Cultural and Natural Heritage (No: 2863)	23.07.1983, 18113
Forestry Law (No: 6831)	31.08.1956, 9402
General Public Health Law (24 April 1930);	24.04.1930, 1489
Regulation on Work Place Establishment and Operating Licenses	10.08.2005, 25902
Law on Protection of Soil and Land Use (No: 5403)	19.07.2005, 25880
Groundwater Law (No:167)	16.12.1960, 10688

Other Applicable Legislation Relevant to Project	Date and No of Issuing Official Gazette
Regulation on the Implementation of the Law on Protection of Soil and Land Use	15.12.2005, 26024
Regulation Regarding Principles of (Urban) Plan Preparation	02.11.1985, 18916
Unplanned Areas Construction Regulation	02.11.1985, 18916
Regulation on Buildings located on the Disaster Areas	14.07.2007, 26582
Regulation on the Buildings to be Constructed in Earthquake Zones	06.03.2007, 26454

International agreements which Turkey is a Party

International Convention / Protocol	Date and No of Issuing Turkish Official Gazette
European Cultural Convention; 19.12.1954	17.06.1957, 9635
International Convention for the Establishment of the European and Mediterranean Plan Protection Organization; Paris, 1951	10.08.1965
The Convention for the Protection of Cultural Property in the Event of Armed Conflict; 14.04.1954	08.11.1965, 12145
International Convention for the Protection of Birds; Paris, 1959	17.12.1966, 12480
Convention on Legal Responsibilities about the Nuclear Energy Field; 29.1.1960, and its addendum protocol dated 28.01.1964	13.06.1967, 12620
The Agreement for the Establishment of the General Fisheries Commission for the Mediterranean (GFCM); Rome, 1949	07.07.1967, 12641
Radiation Protection Convention; Geneva, 1960	15.11.1969
Agreement on an International Energy Program; Paris, 1974	04.05.1981
Convention for the Protection of the Mediterranean Sea against Pollution; Barcelona, 1976	12.06.1981, 17368
Protocol for the Prevention of Pollution of the Mediterranean Sea by Dumping from Ships and Aircraft; Barcelona, 1976	12.06.1981, 17368
The Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention); Barcelona, adopted on 16.02.1976, entered into force 12.02.1978	12.06.1981, 17368
Convention for the Protection of the World Cultural and Natural Heritage; Paris, 1972	14.2.1983, 17959
Convention on Long-Range Transboundary Air Pollution; Geneva, 1979	23.03.1983,17996

International Convention / Protocol	Date and No of Issuing Turkish Official Gazette
The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention); Bern, opened for signature on 19.09.1979, entered into force on 01.06.1982	Ratification date: 02.05.1984 Entered into force: 01.09.1984
Protocol to the Convention on Long-Range Transboundary Air Pollution on the Financing of the Co-operative Program for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe; Geneva, 1984	23.07.1985, 18820
Protocol for the Protection of the Mediterranean Sea against Pollution from the Land-Based Sources; Athens, 1980	18.03.1987, 19404
Protocol Concerning Specially Protected Areas in the Mediterranean; Geneva, 1982 (date of signature 06.11.1986)	23.10.1988, 19968
International Convention for the Prevention of Pollution From Ships (MAR-POL 73/78); 1973, modified by the Protocol of 1978 (entered into force on 2 October 1983)	24.06.1990, 20558
Convention on the Protection of the Black Sea Against Pollution (Bucharest Convention); signed on 21.04.1992, entered into force on 15.01.1994 (PROTOCOLS SHALL ALSO BE INCLUDED)	06.03.1994, 21869
Convention on the Control of Transboundary Movements of Hazardous Waste and Disposal; Basel, 22.03.1989	15.05.1994, 21935
The Convention on Wetlands of International Importance, especially as Waterfowl Habitat (Ramsar Convention); entered into force on 21.12.1975	17.05.1994, 21937
Montreal Protocol on Substances That Deplete the Ozone Layer; Montreal, opened for signature on 16.09.1987, entered into force on 1.1.1989 (revisions: 1990,London; 1991,Nairobi; 1992,Copenhagen; 1993,Bangkok; 1995,Vienna; 1997,Montreal; and 1999,Beijing)	28.12.1994, 22155
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); opened for signature on 3.3.1973, entered into force on 1.7.1975	20.06.1996, 22672 (entered into force on 22.12.1996)
United Nations Convention to Combat Desertification; Paris, 17.6.1994, entered into force in December 1996	1997
Biodiversity Convention; opened for signature at the Earth Summit in Rio de Janeiro on 5.6.1992, entered into force on 29.12.1993	27.12.1996, 22860
Convention on the Transboundary Effects of Industrial Accidents	18.03.1992
The Stockholm Convention on Persistent Organic Pollutants	22.05.2001

International Convention / Protocol	Date and No of Issuing Turkish Official Gazette
United Nations Framework Convention on Climate Change; 2004, and Kyoto Protocol on Global Warming; 2008 *General principle of Kyoto is, the signatory parties should decrease their GHG emissions by 5.2% of the 2009 amount till the end of 2012. After 2012, a new agreement and new emission limits will come into picture.*	Turkish Parliament accepted to be a signatory of Kyoto Protocol in February 2009. However, Turkey is not a party in the Protocol, thus has no commitment, until the end of 2012.

Relevant European Regulations

Environmental Issues	
Impact assessment	■ Council Directive 2014/52/EU on the assessment of the effects of certain public and private projects on the environment
Air quality	■ Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control). Directive 2010/75/EU replaces definitively, with effect from 7 January 2014: ■ Directive 1999/13/EC on reducing emissions of volatile organic compounds (VOCs); ■ Directive 2008/1/EC concerning integrated pollution prevention and control; ■ with effect from 1er January 2016: ■ Directive 2001/80/EC on the limitation of emissions of certain pollutants from large combustion plants. ■ Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe ■ Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC ■ Regulation (EC) No 2037/2000 of the European Parliament and of the Council of 29 June 2000 on substances that deplete the ozone layer ■ Council Directive 1999/32/EC of 26 April 1999 relating to a reduction in the sulphur content of certain liquid fuels and amending Directive 93/12/EEC ■ Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants
Energy Conservation	■ 32012L0027: Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC Text with EEA relevance

Environmental Issues	
	■ Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control ■ EC/JRC 2008: IPPC Reference Document on Best Available Techniques for Energy Efficiency. June 2008
Water and Wastewater Quality	■ Council Directive 91/271/EEC of 21 May 1991 Concerning Urban Wastewater Treatment ■ Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption ■ Council Directive of 16 June 1975 concerning the quality required of surface water intended for the abstraction of drinking water in the Member States ■ Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration ■ Council Directive 80/68/EEC of 17 December 1979 on the protection of groundwater against pollution caused by certain dangerous substances ■ Directive 2006/11/EC of the European Parliament and of the Council of 15 February 2006 on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community ■ Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy, amending and subsequently repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and amending Directive 2000/60/EC of the European Parliament and of the Council
Water Conservation	■ Directive 2006/11/EC of the European Parliament and of the Council of 15 February 2006 on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community ■ Council Directive of 12 June 1986 on limit values and quality objectives for discharges of certain dangerous substances included in List I of the Annex to Directive 76/464/EEC
Hazardous Materials Management	■ Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC ■ Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 ■ Council Directive 67/548/EEC of 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances

Environmental Issues	
	■ Directive 2008/68/EC of the European Parliament and of the Council of 24 September 2008 on the inland transport of dangerous goods
Waste Management	■ Directive 2006/12/EC of the European Parliament and of the Council of 5 April 2006 on waste ■ Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste ■ Directive 94/62/EC of the European Parliament and of the Council of 20 December 1994 on packaging and packaging waste ■ Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE) ■ Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment ■ Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC ■ Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives ■ Directive 2000/53/EC of the European Parliament and of 18 September 2000 on end-of life vehicles ■ 32012L0019: Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE) Text with EEA relevance
Noise	■ Council Directive of 6 February 1970 on the approximation of the laws of the Member States relating to the permissible sound level and the exhaust system of motor vehicles ■ Directive 2000/14/EC of the European Parliament and of the Council of 8 May 2000 on the approximation of the laws of the Member States relating to the noise emission in the environment by equipment for use outdoors ■ Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise
Soil Quality	■ Council Directive of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture ■ Directive 2004/35/CE of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage
Nature Conservation and Biodiversity	■ Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora ■ Council Decision 98/145/EC of 12 February 1998 on the approval, on behalf of the European Community, of the amendments to Appendices I and II to the Bonn Convention on the conservation of migratory species of wild animals as decided by the fifth meeting of the Conference of the parties to the Convention

Environmental Issues	
	■ Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds
Occupational and Community Health and Safety Issues	
Occupational and Community Health and Safety	■ Council Directive 89/391/EEC of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work ■ Council Directive 89/654/EEC of 30 November 1989 concerning the minimum safety and health requirements for the workplace ■ Council Directive 89/655/EEC of 30 November 1989 concerning the minimum safety and health requirements for the use of work equipment by workers at work (amending directives 95/63/EC and 2001/45/EC) ■ Council Directive 89/656/EEC of 30 November 1989 on the minimum health and safety requirements for the use by workers of personal protective equipment at the workplace ■ Council Directive 83/477/EEC of 19 September 1983 on the protection of workers from the risks related to exposure to asbestos at work ■ Council Directive 90/269/EEC of 29 May 1990 on the minimum health and safety requirements for the manual handling of loads where there is a risk particularly of back injury to workers ■ Council Directive 90/270/EEC of 29 May 1990 on the minimum safety and health requirements for work with display screen equipment ■ Directive 2004/37/EC of the European Parliament and of the Council of 29 April 2004 on the protection of workers from the risks related to exposure to carcinogens or mutagens at work ■ Directive 2000/54/EC of the European Parliament and of the Council of 18 September 2000 on the protection of workers from risks related to exposure to biological agents at work ■ Council Directive 92/57/EEC of 24 June 1992 on the implementation of minimum safety and health requirements at temporary or mobile construction sites ■ Council Directive 92/58/EEC of 24 June 1992 on the minimum requirements for the provision of safety and/or health signs at work ■ Council Directive 92/85/EEC of 19 October 1992 on the introduction of measures to encourage improvements in the safety and health at work of pregnant workers and workers who have recently given birth or are breastfeeding ■ Directive 1999/92/EC of the European Parliament and of the Council of 16 December 1999 on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres ■ Directive 2002/44/EC of the European Parliament and of the Council of 25 June 2002 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (vibration)

Environmental Issues	
	■ Directive 2003/10/EC of the European Parliament and of the Council of 6 February 2003 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (noise) ■ Directive 2004/40/EC of the European Parliament and of the Council of 29 April 2004 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields) ■ Commission Directive 2000/39/EC of 8 June 2000 establishing a first list of indicative occupational exposure limit values in implementation of Council Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work ■ Council Directive 80/1107/EEC of 27 November 1980 on the protection of workers from the risks related to exposure to chemical, physical and biological agents at work ■ Council Directive 88/364/EEC of 9 June 1988 on the protection of workers by the banning of certain specified agents and/or certain work activities ■ Council Directive 96/82/EC of 9 December 1996 on the control of major-accident hazards involving dangerous substances
Other	■ Council Directive of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment ■ Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control ■ Directive 2010/75/EC of the European Parliament and of the Council of 24 November 2010 concerning industrial emissions (integrated pollution prevention and control)

APPENDIX D
Requirements of Environmental Limits in both National and International Standards

Air Quality

Ambient Air Quality Standards in IFC Guidelines, European and National Regulations

Parameter	Average Period	WHO Ambient Air Quality Guidelines- IFC General EHS Guidelines: Environmental Air Emissions and Ambient Air Quality (Section 1.1, Table 1.1.1)		Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on Ambient Air Quality and Cleaner Air For Europe	National Regulation (Regulation on Control of Industrial Air Pollution (dated: 03 July 2009, Official Gazette No: 27277)
		General Guidelines (for human health)	**Guidelines for Europe (for ecosystem)**		**Maximum Allowable Concentration Limits**
SO_2 ($\mu g/m^3$)	Hourly	500 (for 10 minutes - guideline value)		350	470 (for 2015) 440 (for 2016) 410 (for 2017) 380 (for 2018) 350 (for 2019-2023)
	24 hr	125 (Interim target-1) 50 (Interim target-2) 20 (guideline)		125	225 (for 2015) 200 (for 2016) 175 (for 2017) 150 (for 2018) 125 (for 2019-2023)
	Yearly and winter season (Oct1 – March31) (for wildlife and ecosystem)		20 (for forests and natural vegetation) 30 (for agricultural crops)		20

Parameter	Average Period	WHO Ambient Air Quality Guidelines- IFC General EHS Guidelines: Environmental Air Emissions and Ambient Air Quality (Section 1.1, Table 1.1.1)		Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on Ambient Air Quality and Cleaner Air For Europe	National Regulation (Regulation on Control of Industrial Air Pollution (dated: 03 July 2009, Official Gazette No: 27277)
		General Guidelines (for human health)	**Guidelines for Europe (for ecosystem)**		**Maximum Allowable Concentration Limits**
NO_2 ($\mu g/m^3$)	Hourly	200 (guideline)		200	290 (for 2015) 280 (for 2016) 270 (for 2017) 260 (for 2018) 250 (for 2019-2023)
	Yearly	40 (guideline)	30	40	56 (for 2015) 52 (for 2016) 48 (for 2017) 44 (for 2018) 40 (for 2019-2023)
PM_{10} ($\mu g/m^3$)	Hourly	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)		50	90 (for 2015) 80 (for 2016) 70 (for 2017) 60 (for 2018) 50 (for 2019-2023)
	Yearly	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)		40	56 (for 2015) 52 (for 2016) 48 (for 2017) 44 (for 2018)

Parameter	Average Period	WHO Ambient Air Quality Guidelines- IFC General EHS Guidelines: Environmental Air Emissions and Ambient Air Quality (Section 1.1, Table 1.1.1)		Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on Ambient Air Quality and Cleaner Air For Europe	National Regulation (Regulation on Control of Industrial Air Pollution (dated: 03 July 2009, Official Gazette No: 27277)
		General Guidelines (for human health)	**Guidelines for Europe (for ecosystem)**		**Maximum Allowable Concentration Limits**
					40 (for 2019-2023)
Settled Dust (mg/m^2day)	Short term				390
	Long term				210

Water Quality

Surface water quality criteria defined in the Regulation on Management of Surface Water Quality

Water Quality Parameters	Water Quality Classes			
	Class I	**Class II**	**Class III**	**Class IV**
General Conditions				
Temperature (^oC)	≤ 25	≤ 25	≤ 30	> 30
pH	6,5-8,5	6,5-8,5	6,0-9,0	<6.0 or >9.0
Conductivity (µS/cm)	< 400	400-1000	1001-3000	> 3000

Water Quality Parameters	Water Quality Classes			
	Class I	**Class II**	**Class III**	**Class IV**
Colour	Number of Chromaticity 436 nm: 1.5 Number of Chromaticity 525 nm: 1.2 Number of Chromaticity 620 nm: 0.8	Number of Chromaticity 436 nm: 3 Number of Chromaticity 525 nm: 2.4 Number of Chromaticity 620 nm: 1.7	Number of Chromaticity 436 nm: 4.3 Number of Chromaticity 525 nm: 3.7 Number of Chromaticity 620 nm: 2.5	Number of Chromaticity 436 nm: 5 Number of Chromaticity 525 nm: 4.2 Number of Chromaticity 620 nm: 2.8
***(A)* Oxygenating Parameters**				
Dissolved Oxygen (mg O_2/L)[a]	> 8	6-8	3-6	< 3
Oxygen Saturation (%)[a]	90	70-90	40-70	< 40
Chemical Oxygen Demand (COD) (mg/L)	< 25	25-50	50-70	> 70
Biochemical Oxygen Demand (BOD) (mg/L)	< 4	4-8	8-20	> 20
B) Nutrient Parameters				
Ammonia as N (mg NH_4^+-N/L)	< 0,2[b]	0,2-1[b]	1-2[b]	> 2
Nitrite as N (mg NO_2^--N/L)	< 0,002	0,002-0,01	0,01-0,05	> 0,05
Nitrate as N (mg NO_3^--N/L)	< 5	5-10	10-20	> 20
Total Kjeldahl Nitrogen as N (mg/L)	0.5	1.5	5	> 5
Total Phosphorus (mg P/L)	< 0,03	0,03-0,16	0,16-0,65	> 0,65

Water Quality Parameters	Water Quality Classes			
	Class I	**Class II**	**Class III**	**Class IV**
C) Trace Elements (Metals)				
Mercury (µg Hg/L)	< 0,1	0,1-0,5	0,5-2	> 2
Cadmium (µg Cd/L)	≤ 2	2-5	5-7	> 7
Lead (µg Pb/L)	≤10	10-20	20-50	> 50
Copper (µg Cu/L)	≤20	20-50	50-200	> 200
Nickel (µg Ni/L)	≤20	20-50	50-200	> 200
Zinc (µg Zn/L)	≤200	200-500	500-2000	> 2000
D) Bacteriological Parameters				
Fecal Coliform (EMS/100 mL)	≤10	10-200	200-2000	> 2000
Total Coliform (EMS/100 mL)	≤100	100-20000	20000-100000	> 100000
Hazardous Materials	Hazardous materials and pollutants that are not given in this table will be evaluated as of January 1, 2015 after the country inventory is formed.			

(a) It is sufficient to satisfy one of the parameters that are Dissolve Oxygen Concentration and Oxygen Saturation Percent
(b) Depending on the pH value the free ammonia nitrogen concentration should not exceed 0.02 mg NH3-N/L
(c) Usage of the water based on quality classes:

Class I – High Quality Water;

1. Surface waters with a high potential for drinking water
2. Recreations purposes (including swimming)
3. Trout production (fish farming)
4. Livestock raising and farming

Class II – Slightly Contaminated Water;

1. Surface waters with a potential for drinking water
2. Recreations purposes
3. Fish farming except trout farming
4. Can be used for irrigation purposes provided the irrigation water quality criteria is met

Class III – Contaminated Water;
Can be used for industrial water supply with a proper treatment except for food, textile etc. industries that require high quality water
Class IV – Heavily Contaminated Water;

Of lower quality than the quality parameters given for Class III and can be used with improving quality to the other classes

European regulation for inland water quality

DIRECTIVE 2008/105/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2008				
Name of substance	**Annual average - Environmental Quality Standards(2) Inland surface waters(3)**	**Annual average - Environmental Quality Standards(2) Other surface waters**	**Maximum Allowable Concentration - Environmental Quality Standards(4) Inland surface waters(3)**	**Maximum Allowable Concentration - Environmental Quality Standards (4) Other surface waters**
Alachlor	0.3	0.3	0.7	0.7
Anthracene	0.1	0.1	0.4	0.4
Atrazine	0.6	0.6	2.0	2.0
Benzene	10	8	50	50
Brominated diphenylether (5)	0.0005	0.0002	Not applicable	Not applicable
Cadmium and its compounds (depending on water hardness classes) (6)	≤0.08(Class1) 0.08(Class2) 0.09(Class3) 0.15(Class4) 0.25(Class5)	0.2	≤0.45(Class1) 0.45(Class2) 0.6(Class3) 0.9(Class4) 1.5(Class5)	≤0.45(Class1) 0.45(Class2) 0.6(Class3) 0.9(Class4) 1.5(Class5)
Carbon-tetrachloride (7)	12	12	Not applicable	Not applicable
C10-13Chloroalkanes	0.4	0.4	1.4	1.4
Chlorfenvinphos	0.1	0.1	0.3	0.3
Chlorpyrifos (Chlorpyrifos-ethyl)	0.03	0.03	0.1	0.1

DIRECTIVE 2008/105/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2008				
Name of substance	**Annual average - Environmental Quality Standards(2) Inland surface waters(3)**	**Annual average - Environmental Quality Standards(2) Other surface waters**	**Maximum Allowable Concentration - Environmental Quality Standards(4) Inland surface waters(3)**	**Maximum Allowable Concentration - Environmental Quality Standards (4) Other surface waters**
Cyclodiene pesticides: Aldrin (7) Dieldrin (7) Endrin (7) Isodrin (7)	Σ=0.01	Σ=0.005	Not applicable	Not applicable
DDT total(7)(8)	0.025	0.025	Not applicable	Not applicable
para-para-DDT (7)	0.01	0.01	Not applicable	Not applicable
1.2-Dichloroethane	10	10	Not applicable	Not applicable
Dichloromethane	20	20	Not applicable	Not applicable
Di(2-ethylhexyl)-phthalate (DEHP)	1.3	1.3	Not applicable	Not applicable
Diuron	0.2	0.2	1.8	1.8
Endosulfan	0.005	0.0005	0.01	0.004
Fluoranthene	0.1	0.1	1	1

DIRECTIVE 2008/105/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2008				
Name of substance	**Annual average - Environmental Quality Standards(2) Inland surface waters(3)**	**Annual average - Environmental Quality Standards(2) Other surface waters**	**Maximum Allowable Concentration - Environmental Quality Standards(4) Inland surface waters(3)**	**Maximum Allowable Concentration - Environmental Quality Standards (4) Other surface waters**
Hexachloro-benzene	0.01(9)	0.01(9)	0.05	0.05
Hexachloro-butadiene	0.1(9)	0.1(9)	0.6	0.6
Hexachloro-cyclohexane	0.02	0.002	0.04	0.02
Isoproturon	0.3	0.3	1.0	1.0
Lead and its compounds	7.2	7.2	Not applicable	Not applicable
Mercury and its compounds	0.05(9)	0.05(9)	0.07	0.07
Naphthalene	2.4	1.2	Not applicable	Not applicable
Nickel and its compounds	20	20	Not applicable	Not applicable
Nonylphenol(4-Nonylphenol)	0.3	0.3	2.0	2.0
Octylphenol((4-(1.1′.3.3′-tetramethylbutyl)-phenol))	0.1	0.01	Not applicable	Not applicable
Pentachloro-benzene	0.007	0.0007	Not applicable	Not applicable
Pentachloro-phenol	0.4	0.4	1	1

DIRECTIVE 2008/105/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2008				
Name of substance	**Annual average - Environmental Quality Standards(2) Inland surface waters(3)**	**Annual average - Environmental Quality Standards(2) Other surface waters**	**Maximum Allowable Concentration - Environmental Quality Standards(4) Inland surface waters(3)**	**Maximum Allowable Concentration - Environmental Quality Standards (4) Other surface waters**
Polyaromatic hydrocarbons(PAH)(10)	Not applicable	Not applicable	Not applicable	Not applicable
Benzo(a)pyrene	0.05	0.05	0.1	0.1
Benzo(b)fluor-anthene	Σ=0.03	Σ=0.03	Not applicable	Not applicable
Benzo(k)fluor-anthene				
Benzo(g.h.i)-perylene	Σ=0.002	Σ=0.002	Not applicable	Not applicable
Indeno(1.2.3-cd)-pyrene				
Simazine	1	1	4	4
Tetrachloro-ethylene(7)	10	10	Not applicable	Not applicable
Trichloro-ethylene(7)	10	10	Not applicable	Not applicable
Tributyltin compounds(Tributhyltin-cation)	0.0002	0.0002	0.0015	0.0015
Trichloro-benzenes	0.4	0.4	Not applicable	Not applicable
Trichloro-methane	2.5	2.5	Not applicable	Not applicable

DIRECTIVE 2008/105/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2008				
Name of substance	**Annual average - Environmental Quality Standards(2) Inland surface waters(3)**	**Annual average - Environmental Quality Standards(2) Other surface waters**	**Maximum Allowable Concentration - Environmental Quality Standards(4) Inland surface waters(3)**	**Maximum Allowable Concentration - Environmental Quality Standards (4) Other surface waters**
Trifluralin	0.03	0.03	Not applicable	Not applicable

(1) CAS: Chemical Abstracts Service.
(2) This parameter is the EQS expressed as an annual average value (AA-EQS). Unless otherwise specified. it applies to the total concentration of all isomers.
(3) Inland surface waters encompass rivers and lakes and related artificial or heavily modified water bodies.
(4) This parameter is the EQS expressed as a maximum allowable concentration (MAC-EQS). Where the MAC-EQS are marked as 'not applicable'. the AA-EQS values are considered protective against short-term pollution peaks in continuous discharges since they are significantly lower than the values derived on the basis of acute toxicity.
(5) For the group of priority substances covered by brominated diphenylethers (No 5) listed in Decision No 2455/2001/EC. an EQS is established only for congener numbers 28. 47. 99. 100. 153 and 154.
(6) For cadmium and its compounds (No 6) the EQS values vary depending on the hardness of the water as specified in five class categories (Class 1: < 40 mg CaCO3/l. Class 2: 40 to < 50 mg CaCO3/l. Class 3: 50 to < 100 mg CaCO3/l. Class 4: 100 to < 200 mg CaCO3/l and Class 5: ≥ 200 mg CaCO3/l).
(7) This substance is not a priority substance but one of the other pollutants for which the EQS are identical to those laid down in the legislation that applied prior to 13 January 2009.
(8) DDT total comprises the sum of the isomers 1.1.1-trichloro-2.2 bis (p-chlorophenyl) ethane (CAS number 50-29-3; EU number 200-024-3); 1.1.1-trichloro-2 (o-chlorophenyl)-2-(p-chlorophenyl) ethane (CAS number 789-02-6; EU number 212-332-5); 1.1-dichloro-2.2 bis (p-chlorophenyl) ethylene (CAS number 72-55-9; EU number 200-784-6); and 1.1-dichloro-2.2 bis (p-chlorophenyl) ethane (CAS number 72-54-8; EU number 200-783-0).
(9) If Member States do not apply EQS for biota they shall introduce stricter EQS for water in order to achieve the same level of protection as the EQS for biota set out in Article 3(2) of this Directive. They shall notify the Commission and other Member States through the Committee referred to in Article 21 of Directive 2000/60/EC of the reasons and basis for using this approach. the alternative EQS for water established including the data and the methodology by which the alternative EQS were derived. and the categories of surface water to which they would apply.

(10) For the group of priority substances of polyaromatic hydrocarbons (PAH) (No 28). each individual EQS is applicable. i.e. the EQS for Benzo(a)pyrene. the EQS for the sum of Benzo(b)fluoranthene and Benzo(k)fluoranthene and the EQS for the sum of Benzo(g.h.i)perylene and Indeno(1.2.3-cd)pyrene must be met.

Domestic wastewater discharge standards in National Legislation, IFC and European guidelines

PARAMETER	UNIT	Turkish Regulation on Water Pollution Control (31.12.2004 Nr. 25687)								Turkish Urban Wastewater Treatment Regulation (08.01.2006 Nr.26047)		Council Directive 91/271/EEC of 21 May 1991 Concerning Urban Wastewater Treatment		IFC General EHS Guidelines
		Table 21										*(amended by Commission Directive 98/15/EC, Regulation (EC) No 1882/2003, Regulation (EC) No 1137/2008)*		Table 1.3.1
		Domestic Wastewater Discharge Standards												Indicative Values for Treated Sanitary Sewage Discharges*
		for equivalent population of 84-2,000		for equivalent population of 2,000 – 10,000		for equivalent population of 10,000-100,000		for equivalent population greater than 100,000		(limits to be applied after 31.12.2014)				
		Composite Sample	Composite Sample	Composite Sample	Composite Sample	Composite Sample	Composite Sample	Composite Sample	Composite Sample	Concentration	Minimum Treatment Efficiency (%)	Concentration	Minimum Treatment Efficiency (%)	
		2 Hour	24 Hour	2 Hour	24 Hour	2 Hour	24 Hour	2 Hour	24 Hour	(mg/L)		(mg/L)		
Biochemical Oxygen Demand (BOD5)	mg/l	50	45	50	45	50	45	40	35	25	70-90 40	25	70-90 40*	30
Chemical Oxygen Demand (COD)	mg/l	180	120	160	110	140	100	120	90	125	75	125	75	125
Suspended Solids (SS)	mg/l	70	45	60	30	45	30	40	25	35 35 (more than 10,000 p.e.) 60 (2,000-10,000 p.e.)	90 90 (more than 10,000 p.e.) 70 (2,000-10,000 p.e.)	35 35 (more than 10,000 p.e.) 60 (2,000-10,000 p.e.)	90 90 (more than 10,000 p.e.) 70 (2,000-10,000 p.e.)	50
pH	-	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9					6-9
Total nitrogen	mg/l													10
Total phosphorus	mg/l													2

PARAMETER	UNIT	Turkish Regulation on Water Pollution Control (31.12.2004 Nr. 25687)								Turkish Urban Wastewater Treatment Regulation (08.01.2006 Nr.26047)		Council Directive 91/271/EEC of 21 May 1991 Concerning Urban Wastewater Treatment		IFC General EHS Guidelines
		Table 21										*(amended by Commission Directive 98/15/EC, Regulation (EC) No 1882/2003, Regulation (EC) No 1137/2008)*		Table 1.3.1
		Domestic Wastewater Discharge Standards												Indicative Values for Treated Sanitary Sewage Discharges*
		for equivalent population of 84-2,000		for equivalent population of 2,000 – 10,000		for equivalent population of 10,000-100,000		for equivalent population greater than 100,000		(limits to be applied after 31.12.2014)				
		Composite Sample	Composite Sample	Composite Sample	Composite Sample	Composite Sample	Composite Sample	Composite Sample	Composite Sample	Concentration	Minimum Treatment Efficiency (%)	Concentration	Minimum Treatment Efficiency (%)	
		2 Hour	24 Hour	2 Hour	24 Hour	2 Hour	24 Hour	2 Hour	24 Hour	(mg/L)		(mg/L)		
Oil and grease	mg/l													10
Total coliform bacteria	MPN** / 100 ml													400*

* Not applicable to centralized, municipal wastewater treatment systems which are included in EHS Guidelines for Water and Sanitation.

** MPN = Most Probable Number

Note:Regulation on Water Pollution Control - Table 21 and Table 22 indicate domestic wastewater discharge standards for equivalent population of 84 - 2,000 and equivalent population of 2,000 - 10,000, respectively. However, the provisions set in Turkish Urban Wastewater Treatment Regulation, of which the discharge quality standards will be valid by 31.12.2014, are exactly the same with the provisions set in EU Directive 91/271/EEC on Urban Wastewater Treatment. The EU Directive 91/271/EEC sets the general rule of; secondary treatment in all areas, and tertiary treatment with enhanced removal of nutrient is required for sensitive areas

National and European regulations for drinking water

	COUNCIL DIRECTIVE 98/83/EC of 3 November 1998 on the quality of water intended for human consumption	National Legislation (Regulation Concerning Water Intended for Human Consumption. dated: 17 Feb. 2005, Official Gazette No. 25730)
For Domestic Use (Drinking water and Tap water)		
Microbiological Parameters	**Microbiological Parameters**	
Parameter	**Parameter value/100 ml**	**Parameter value/100 ml**
Escherichia Coli (E.Coli)	0/100 ml	0/100 ml
Enterococcus	0/100 ml	0/100 ml
Coliform bacteria		0/100 ml
Coliform Index (the gut bacteria in 1 liter of water)		
Microorganisms (Colonies in 1 ml sample of water)		0/100 ml
Chemical Parameters	**Chemical Parameters**	
Parameter	**Parameter Value**	**Parameter Value**
Acrylamide	0.1 µg/l	0.1 µg/l
Antimony	5 µg/l	5 µg/l
Arsenic	10 µg/l	10 µg/l
Benzene	1 µg/l	1 µg/l
Benzopyrene	0.01 µg/l	0.01 µg/l
Boron	1 mg/l	1 mg/l
Bromate	10 µg/l	10 µg/l
Cadmium	5 µg/l	5 µg/l

	COUNCIL DIRECTIVE 98/83/EC of 3 November 1998 on the quality of water intended for human consumption	National Legislation (Regulation Concerning Water Intended for Human Consumption. dated: 17 Feb. 2005, Official Gazette No. 25730)
Chromium	50 µg/l	50 µg/l
Copper	2 mg/l	2 mg/l
Cyanide	50 µg/l	50 µg/l
1,2-Dichloracethane	3 µg/l	3 µg/l
Epichlorhydrin	0.1 µg/l	0.1 µg/l
Fluoride	1.5 mg/l	1.5 mg/l
Lead	10 µg/l	10 µg/l
Mercury	1 µg/l	1 µg/l
Nickel	20 µg/l	20 µg/l
Nitrate	50 mg/l	50 mg/l
Nitrite	0.5 mg/l	0.5 mg/l
Pesticides	0.1 µg/l	0.1 µg/l
Total pesticides	0.5 µg/l	0.5 µg/l
Polycyclic aromatic hydrocarbons	0,1 µg/l	0.1 µg/l
Selenium	10 µg/l	10 µg/l
Tetrachloroethane and Trichloroethane	10 µg/l	10 µg/l
Trihalomethanes-total	100 µg/l	100 µg/l
Vinyl chloride	0.5 µg/l	0.5 µg/l
Chlorides		250 mg/L
Phosphates		250 mg/L
Aluminium	200 µg/l	200 µg/l

	COUNCIL DIRECTIVE 98/83/EC of 3 November 1998 on the quality of water intended for human consumption	National Legislation (Regulation Concerning Water Intended for Human Consumption. dated: 17 Feb. 2005, Official Gazette No. 25730)
Iron	200 µg/l	200 µg/l
pH		6.5-9.5

Soil Quality

Allowable Concentrations of Heavy Metals in Soil in National Regulations

Heavy Metals	Maximum Allowable Concentration (mg/kg)*
Arsenic	471
Barium	433702
Cadmium	1124
Chrome	24
Cobalt	225
Copper	3129
Lead	400
Mercury	23
Nickel	1564
Vanadium	548
Cyanide	1564
Zinc	23464
Selenium	391

*Regulation on Soil Pollution Control and Point Source Contaminated Sites (Official Gazette (“O.G.”) number: 27605, dated: 8 June 2010)

Noise

National Noise Limits*

Receptor		LAeq (dBA) Day-time 07:00 – 23:00	LAeq (dBA) Night-time 23:00 – 07:00
Residential areas		65	55
Commercial areas		65	55
Industrial areas		70	60
Sensitive Areas	Schools, libraries and conference rooms, Hospitals and health centres	60	50

* Regulation on Evaluation and Management of Environmental Noise (dated: 04 June 2010, O.G. No: 27601)

National Noise Limits for Construction Site*

Activities (Construction, demolition and renovation)	LAeq (dBA) Day-time 07:00 – 23:00
Building	**70**
Road	**75**
Other sources	**70**

* Regulation on Evaluation and Management of Environmental Noise (OG dated: 04 June 2010, number: 27601)

IFC guidelines for noise

IFC General EHS Guidelines - Noise Standards based on WHO Guidelines (Section 1.7 Table 1.7.1)		
Receptor	**One Hour LAeq (dBA)**	
	Daytime 07:00 - 22:00	**Night time 22:00 - 07:00**
Residential; institutional; educational	55	45
Industrial; commercial	70	70

APPENDIX E
Impact Assessment Methodology

Impact assessment will be performed for main issues for each ESIA component (discipline). The common impact assessment methodology consists of below main steps:

- identification of Project activities that could contribute to environmental or social change;
- evaluation of the potential effects;
- description of mitigations for potential effects;
- analysis and characterization of residual effects; and

The general methodology adopted by Golder for the ESIA Studies is consistent with the Drivers-Pressures-State-Impact-Response framework ("DPSIR") developed by the European Environmental Agency ("EEA"). The methodology has been designed to be highly transparent and allow a semi-quantitative analysis of the impacts on the various environmental and social components. In the following paragraphs the methodology is described in its general terms; however the final methodology will be the result of consultation with the client and the relevant stakeholders.

The framework is based on the identification of the following elements:

- Drivers: project actions which can interfere significantly with the environment as primary generative elements of the environmental pressures;
- Pressures (impact factors): forms of direct or indirect interference produced by the project actions on the environment, able to influence the environmental state or quality;
- State (sensitivity): sum of the conditions which characterize the present quality and/or trends of a specific environmental and social component and/or of its resources';
- Impacts: changes undergone by the environmental state or quality because of the different pressures generated by the drivers;
- Responses (mitigation measures): actions adopted in order to improve the environmental conditions or to reduce pressures and negative impacts.

The overall impact analysis methodology has been developed by Golder based on its experience in the field of the environmental and social impact assessment; the methodology includes the following phases:

- definition of the current state or quality of the different environmental and social components potentially impacted based on the results of the baseline studies;
- identification of the impacts potentially affecting the environmental and social components in the different phases of the project (construction, operation and decommissioning/closure);
- definition and assessment of the effects of the planned mitigation measures.

The impact assessment on the single valued environmental and social component interfered in the different project phases is completed through the use of specific environmental impact matrices which compare the component state, expressed in terms of sensitivity, with the relevant impact factors, quantified on the basis of a series of parameters which include:

- duration (short, medium-short, medium, medium-long, long);
- frequency (concentrate, discontinuous, continuous);
- geographic extent (local, regional, beyond regional); and
- intensity (negligible, low, medium, high).

The quantification of the single impacts resulting from each factor acting on the environmental component is obtained assigning to each feature of the impact factor a score increasing in relation to the bigger entity of the impact related to it.

The features of the impact factors which are considered are hereinafter described.

The duration (“D”) defines the length of time when the impact factor is effective and it is differentiated in:

- short, within 1 year;
- medium-short, between 1 and 5 years;
- medium, between 5 and 10 years;
- medium-long, between 10 and 15 years;
- long, longer than 15 years.

The frequency (“F”) defines how often the potential impact factor occurs and is distinguished in:

- concentrate: if it presents one single and short event;
- discontinuous: if it presents an event repeated periodically or accidentally;
- continuous: if distributed uniformly over time.

The geographic extent (“G”) coincides with the area where the impact factor exerts its influence and it is defined as: local, regional, beyond regional.

The intensity (“I”) represents the entity of the impact factor, and can be represented by various physical quantities. The intensity can be also defined as: negligible, low, medium, high.

As the features of the impact factors influence in a different way the magnitude of the impact, a pondered coefficient is assigned to each of them using a pairwise comparison method.

The impact value results from the multiplication of the number resulting by a formula that connects all the parameters previously described, by the sensitivity (“S”) of the affected component to which a score has been assigned according to the evaluation carried out during the baseline activities.

Moreover the impact is assessed considering its probability of occurrence, its reversibility and its potential for mitigation.

The probability of occurrence (“P”) corresponds to the probability that the potential impact occurs, according to the evaluators experience and/or on the basis of the available bibliography. It is distinguished in low, medium, high and certain.

The reversibility (“R”) indicates the possibility to restore the qualitative state of the component following the modifications occurred because of the human intervention and/or through the component intrinsic resilience. It is distinguished in: short-term reversibility, medium-long term reversibility, irreversible.

The mitigation (“M”) corresponds to the possibility to alleviate the potential negative impact with proper design and/or management practices. The following mitigation classes are considered: high, medium, low, none.

The Impact value is assigned distinguishing if the impact itself is to be considered positive or negative with respect to the affected component, considering as positive a reduction/mitigation of the negative impacts already existing or potential future positive impacts on the environmental or social component.

The overall Impact value (negative or positive) on each valued environmental or social component is obtained adding the scores of the impacts referred to each impact factor acting on the component and valued according to the following scale:

- level 1: negligible overall impact;
- level 2: low overall impact;
- level 3: medium-low overall impact
- level 4: medium overall impact;
- level 5: medium-high overall impact;
- level 6: high overall impact

APPENDIX F
Lab Results

BATI LABORATUVARI

ÇEVRE ÖLÇÜM HİZMETLERİ BİLİŞİM MÜH. MÜŞ. SAN. VE TİC. LTD. ŞTİ

TÜRKAK
Test
TS EN ISO/IEC 17025
AB-0946-T

HAVA KALİTESİ (ÇÖKEN TOZ) ÖLÇÜMLERİ SONUÇ RAPORU

Müşterinin Adı/Adresi: Customer Name/Address	**İSTANBUL RÜZGAR ENERJİ SANTRALİ** İstanbul
Müşterinin Telefonu/Faksı: Customer Phone/Fax	-
Talep Numarası: Order No.	TP-19-212
Numunenin Adı ve Tarifi: Name And Identity Of The Test Item	Hava Kalitesi (Çöken Toz) Ölçümleri
Deneyin Yapıldığı Tarih: Date Of Test	13.06.2019 – 10.08.2019
Raporun Numarası ve Tarihi: Number And Date Of The Report	R-19-212/3 20.08.2019

BATI LABORATUVARI ANKARA

AĞUSTOS 2019

BATI LABORATUVARI

ÇEVRE ÖLÇÜM HİZMETLERİ BİLİŞİM MÜH. SAN. VE TİC. LTD. ŞTİ

R-19-212/3
20.08.2019

Deney Raporu / *Test Report*

Müşterinin adı/adresi: Customer name/address	**İSTANBUL RÜZGAR ENERJİ SANTRALİ** İstanbul
Müşterinin telefonu/faksı: Customer phone/fax	-
Talep Numarası: Order No.	TP-19-212
Numunenin adı ve tarifi: Name and identity of the test item	Hava Kalitesi (Çöken Toz) Ölçümleri
Numunenin kabul tarihi ve no: The date and number of receipt of the test item	15.08.2019 - NK-19-212/3
Açıklamalar: Remarks	-
Deneyin yapıldığı tarih: Date of test	13.06.2019 – 10.08.2019
Raporun sayfa sayısı: Number of pages of the Report	17 Sayfa (Kapak Sayfaları Hariç)

Deney ve/veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (Talep halinde) ve deney metotları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.

The test and/or measurement results, the uncertainties (if applicable) with confidence probability and test methods are given on the following pages which are part of this report.

Tarih/Mühür Date/Seal	***Deneyi Yapan*** Test Done by	***Raporu Hazırlayan*** Report Prepared by	***Onay*** Approved by
BATI LABORATUVARI ANKARA **20.08.2019**	**B. Barbaros YÜCE** Deney Sorumlusu	**B. Barbaros YÜCE** Rapor Sorumlusu	**B. Barbaros YÜCE** Laboratuvar Müdürü

İÇİNDEKİLER SAYFA NO

A. GİRİŞ

Bu rapor aşağıda lokasyonları belirtilen yerlerde gerçekleştirilen ölçümler sonucunda hazırlanmıştır.

Ölçüm Yeri	:	Aydınlar Köyü Yaylacık Köyü Santral Dışı 1 Santral Dışı 2 Santral Dışı 3 T-10 Noktası
Ölçüm Tarihi	:	13.06.2019 ve 10.08.2019
Ölçüm Türü	:	Çöken Toz

1. HAVA KALİTESİ ÖLÇÜM RAPORU ÇÖKEN TOZ TAYİNİ

i. Giriş

2872 sayılı Çevre Kanunu'nun ilgili hükümleri gereğince 03.07.2009 tarih ve 27277 sayılı Resmi Gazete'de yayınlanan "Sanayi Kaynaklı Hava Kirliliğinin Kontrolü Yönetmeliği" ve değişiklik yapılmasına dair yönetmelikler (S.K.H.K.K.Y.), her türlü sanayi ve enerji üretim tesislerinden kaynaklanan hava kirliliği seviyelerine sınırlamalar getirmekte ve bu kirletici kaynakları "Tesis" olarak tanımlayarak çevresindeki hava kirliliğinin ölçüm ve denetimini zorunlu kılmaktadır. Bu yönetmelik gereğince yukarıda verilen tarihler arasında belirlenen noktalarda çöken toz tayinleri ölçümü yapılmış ve "Sanayi Kaynaklı Hava Kirliliğinin Kontrolü Yönetmeliği" esas alınarak bu rapor hazırlanmıştır.

ii. Ölçüm Metotları

Ölçümler aşağıda verilen standartlar çerçevesinde gerçekleştirilmiştir.

TS 2342	**NATIONAL PRIMARY AND SECONDARY AMBIENT AIR QUALITY STANDARDS**

iii. İlgili Yönetmelik Maddeleri

S.K.H.K.K.Y. Ek-2 gereğince, mevcut tesislerin etki alanında Hava Kirlenmesine Katkı Değeri (H.K.K.D.)' nin dağılım modellemesi kullanılarak hesaplanması, tesis etki alanında hava kalitesinin ölçülmesi ve ölçüm metotları aşağıdaki esaslara göre yapılır:

Çöken toz ölçümü:

Çöken toz ölçümü sırasında tesis inceleme alanı içinde en az 2 (iki) ölçüm noktasında hakim rüzgar yönü dikkate alınır. Aynı bölgede toz emisyonuna neden olan başka kaynakların da bulunması durumunda ölçüm noktası sayısı tesis dışındaki diğer kaynakların katkılarının belirlenmesi için attırılabilir. Ölçüm süresi birer aylık ölçümlerdir. Aylık olarak bulunacak değerler gün sayısına bölünerek bir günde çöken ortalama toz miktarı hesaplanır.

Bir ay süre ile yapılan hava kalitesi ölçümlerinin aritmetik ortalaması, Ek-2 de belirtilen Uzun Vade Sınır Değerin %60'ının üzerinde olması durumunda ölçüm süresi yetkili merci tarafından uzatılır ve istasyon sayısı artırılabilir.

Hava kalitesi ölçümleri kural olarak yer seviyesinden, 1,5 - 4,0 metre arasındaki yüksekliklerde, binadan (veya ekili alandan) en az 1,5 metre yan mesafe tutularak yapılır. Ormanda yapılan ölçümler, ağaç yüksekliğinden daha yukarıda yapılmalıdır.

Ölçme Metotları:

Metotların kabul edilebilirlikleri TSE tarafından standartlaştırıldıktan ve Bakanlıkça tebliğ edildikten sonra tescil edilir. İlgili TSE Standardı mevcut değilse, güvenilirliği Bakanlıkça kabul edilen DIN, EPA normlarına uygun metot standartları tatbik edilir. Metotlar tebliği ile ilan edilir.

Ölçüm Yapacak Kurum ve Kuruluşlar:

Tesis etki alanında hava kalitesi ve emisyon ölçümleri, akredite edilmiş veya Bakanlıkça uygun bulunan laboratuarlara sahip olan özel veya kamu kurum kuruluşları tarafından yapılır.

A - Uzun Vadeli Sınır Değerleri (UVS) : Aşılmaması gereken, bütün ölçüm sonuçlarının aritmetik ortalaması olan değerlerdir.

B - Kısa Vadeli Sınır Değerleri (KVS) : Maksimum günlük ortalama değerler veya istatistik olarak bütün ölçüm sonuçları sayısal değerlerinin büyüklüğüne göre dizildiğinde, ölçüm sonuçlarının % 95'ini aşmaması gereken değerlerdir.

Hava kirleticileri (Çöken Toz) için uyulması gereken sınır değerler aşağıda verilmiştir.

S.K.H.K.K.Y Tablo 2.2 Tesis Etki Alanında Hava Kalitesi Sınır Değerleri

Parametre		Süre	Birimi	YIL						
				2014	2015	2016	2017	2018	2019-2023	2024 ve sonrası
SO_2		Saatlik (Bir Yılda 24 Defadan Fazla Aşılmaz)	µg/m³	500	470	440	410	380	350	350
		24 Saatlik		250	225	200	175	150	125	125
		UVS		60	60	60	60	60	60	60
		**Yıllık ve kış dönemi (1 Ekim-31 Mart)		20	20	20	20	20	20	20
NO_2		Saatlik (bir yılda 18 defadan fazla aşılmaz)	µg/m³	300	290	280	270	260	250	200*
		yıllık		60	56	52	48	44	40*	40
Havada Asılı Partikül Madde (PM 10)		24 saatlik (bir yılda 35 defadan fazla aşılmaz)	µg/m³	100	90	80	70	60	50	50
		Yıllık		60	56	52	48	44	40	40
Pb		Yıllık	µg/m³	1	0,9	0,8	0,7	0,6	0,5	0,5
CO		maksimum günlük 8 saatlik ortalama	mg/m³	16	14	12	10	10	10	10
Cd		UVS	µg/m³	0.02	0.02	0.02	0.02	0.02	0.02	0,02
HCl		KVS	µg/m³	150	150	150	150	150	150	150
		UVS		60	60	60	60	60	60	60
HF		Saatlik	µg/m³	30	30	30	30	30	30	30
		KVS		5	5	5	5	5	5	5
H_2S		Saatlik	µg/m³	100	100	100	100	100	100	100
		KVS		20	20	20	20	20	20	20
Toplam Organik Bileşikler (karbon cinsinden)		Saatlik	µg/m³	280	280	280	280	280	280	280
		KVS		70	70	70	70	70	70	70
Çöken toz		KVS	mg/m²gün	390	390	390	390	390	390	390
		UVS		210	210	210	210	210	210	210
Çöken tozda	Pb ve Bileşikleri	UVS	mg/m²gün	250	250	250	250	250	250	250
	Cd e Bileşikleri	UVS		3,75	3,75	3,75	3,75	3,75	3,75	3,75
	Tl Ve Bileşikleri	UVS		5	5	5	5	5	5	5

iv. Kullanılan Cihazlar

Çöken toz cihazları TS 2342'de belirtildiği üzere yaptırılmış, 4 yönlü çöken toz ölçüm cihazlarıdır. 4 yönlü çöken toz cihazları ve kaplarından alınan numune filtreden geçirilir. Darası alınmış 47 mm çapında quartz filtre, Pens, Petrislayt, Etüv, Soğutma işlemi sırasında nemden etkilenmemesi için şartlandırılmış oda, Örneklenen filtrelerin tartımı için hassas terazi.

v. Ölçüm Prensipleri

Emisyon sonuçlarının doğru ve hatasız olması, doğru bir ölçüm tekniği kullanılmasına bağlı olduğu kadar, ölçümün genel prensiplerine de bağlıdır.
Laboratuvarımız, emisyon raporlarının hazırlanmasında sahada yaptığı ölçümler kadar laboratuvardaki ön hazırlık ve ölçüm öncesi kontrollerle de doğru ve güvenli sonuçlara ulaşmayı sağlamaktadır. Bu sebeple emisyon analizleri üç aşamalı olarak yapılmaktadır.

vi. Ön Hazırlık

Ölçüm öncesi, cihazlar laboratuvardan çıkarılmadan Laboratuvar Müdürü gözetiminde yetkili personel tarafından kontrol edilir ve ölçüm ekibine teslim edilir.

vii. Ölçüm Noktalarının Belirlenmesi

Ölçüm noktaları seçilirken, yerin makro çevre ölçeği (deney yerinin tipi) ve mikro çevre ölçeği (doğrudan istasyonu çevreleyen alan) bakımından bütünlüğüne gereken özen gösterilir.

viii. Ölçüm ve Analiz İşlemi

Örnekleme işleminde toz filtrede toplanır ve laboratuvar şartlarında gravimetrik olarak tayin edilir.
Çöken toz kaplarında toplanan toz laboratuvar koşullarında 47 mm kuartz filtreden geçirilip kalan miktar gravimetrik olarak tayin edilir.

ix. Ölçüm Sonuçları

Belirlenen lokasyonlarda yapılan ölçümler sonucunda elde edilen günlük değerler aşağıda verilmiştir.

Tablo 1: Hava Kalitesi (Çöken Toz) Lokasyonları

NO	LOKASYON	ÖLÇÜM TARİHİ		ÖLÇÜM NOKTASI KOORDİNATLARI
		BAŞLANGIÇ	BİTİŞ	KOORDİNATLAR
1	**Aydınlar Köyü**	13.06.2019	10.08.2019	600805.75 d D 4581253.65 m K
2	**Yaylacık Köyü**	13.06.2019	10.08.2019	601983.91 d D 4579143.47 m K
3	**Santral Dışı 1**	13.06.2019	10.08.2019	601121.56 d D 4581644.36 m K
4	**Santral Dışı 2**	13.06.2019	10.08.2019	599910.82 d D 4583841.50 m K
5	**Santral Dışı 3**	13.06.2019	10.08.2019	593393.77 d D 4581201.64 m K
6	**T-10 Noktası**	13.06.2019	10.08.2019	598877.00 d D 4579119.00 m K

Tablo 2: Hava Kalitesi (Çöken Toz) Sonuçları

AYDINLAR KÖYÜ LOKASYONU

1.AY					2.AY				ORTALAMA	
Cihaz No	A	B	C	D	A	B	C	D		
15009	185,79	182,40	179,06	173,30	177,93	173,10	168,97	166,69	180,13	171,67
Tesis İçi Ortalama Çöken Toz (mg/m²-gün)									**175,90**	
Tesis İçi Ortalama Çöken Toz Sınır Değeri SKHKKY Ek-2.g (mg/m²-gün)									**450**	
A=Tesis Yönü										

YAYLACIK KÖYÜ LOKASYONU

1.AY					2.AY				ORTALAMA	
Cihaz No	A	B	C	D	A	B	C	D		
15010	180,34	176,96	174,42	170,11	174,46	171,00	166,01	162,65	175,45	168,53
Tesis İçi Ortalama Çöken Toz (mg/m²-gün)									**171,99**	
Tesis İçi Ortalama Çöken Toz Sınır Değeri SKHKKY Ek-2.g (mg/m²-gün)									**450**	
A=Tesis Yönü										

SANTRAL DIŞI 1 LOKASYONU

1.AY					2.AY				ORTALAMA	
Cihaz No	A	B	C	D	A	B	C	D		
15011	172,93	169,13	166,79	163,79	170,69	168,25	164,35	158,69	171,21	165,85
Tesis İçi Ortalama Çöken Toz (mg/m²-gün)									167,17	
Tesis İçi Ortalama Çöken Toz Sınır Değeri SKHKKY Ek-2.g (mg/m²-gün)									450	
A=Tesis Yönü										

SANTRAL DIŞI 2 LOKASYONU

1.AY					2.AY				ORTALAMA	
Cihaz No	A	B	C	D	A	B	C	D		
15012	174,29	171,48	169,11	165,78	170,58	167,79	164,82	161,74	170,16	166,23
Tesis İçi Ortalama Çöken Toz (mg/m²-gün)									168,20	
Tesis İçi Ortalama Çöken Toz Sınır Değeri SKHKKY Ek-2.g (mg/m²-gün)									450	
A=Tesis Yönü										

SANTRAL DIŞI 3 LOKASYONU

1.AY					2.AY				ORTALAMA	
Cihaz No	A	B	C	D	A	B	C	D		
15013	171,78	168,63	165,57	162,90	166,91	164,30	159,95	157,03	167,22	162,04
Tesis İçi Ortalama Çöken Toz (mg/m²-gün)									164,63	
Tesis İçi Ortalama Çöken Toz Sınır Değeri SKHKKY Ek-2.g (mg/m²-gün)									450	
A=Tesis Yönü										

T10 LOKASYONU

1.AY					2.AY				ORTALAMA	
Cihaz No	A	B	C	D	A	B	C	D		
15014	178,06	173,19	169,24	164,97	172,44	168,12	164,46	159,99	171,36	166,25
Tesis İçi Ortalama Çöken Toz (mg/m²-gün)									168,81	
Tesis İçi Ortalama Çöken Toz Sınır Değeri SKHKKY Ek-2.g (mg/m²-gün)									450	
A=Tesis Yönü										

x. Değerlendirme ve Sonuç

Proje alanı çevresinde gerçekleştirilen hava kalitesi (Çöken Toz) ölçümleri neticesinde elde edilen sonuçlara göre; **çöken toz tayini konsantrasyonları sınır değerlerin altında kalmaktadır.**

C. EKLER

EK - 1 AKREDİTASYON BELGELERİ

TÜRK AKREDİTASYON KURUMU

AKREDİTASYON SERTİFİKASI

Deney Laboratuvarı olarak faaliyet gösteren,

BATI LABORATUVARI ÇEVRE ÖLÇÜM HİZMETLERİ BİLİŞİM MÜH. MÜŞ. SAN. VE TİC. LTD. ŞTİ.

İnönü Mahallesi Yıldırımlar Sanayi Sitesi Batı Bulvarı 1738 Sokak 1-10 Kat:6 Yenimahalle 06370 ANKARA / TÜRKİYE

TÜRKAK tarafından yapılan denetim sonucunda TS EN ISO/IEC 17025:2012 Standardına göre Ek'te yer alan kapsamlarda akredite edilmiştir.

Akreditasyon No : **AB-0946**-T

Akreditasyon Tarihi : **31 Ekim 2015**

Revizyon Tarihi / No : **24 Nisan 2018 / 02**

Bu Sertifika, yukarıda açık adı ve adresi yazılı Kuruluşun TS EN ISO/IEC 17025:2012 Standardına, ilgili Yönetmelik ve Tebliğlere uygunluğunu sürdürmesi halinde , **30 Ekim 2019** tarihine kadar geçerlidir.

Dr. H. İbrahim ÇETİN
Genel Sekreter

Türk Akreditasyon Kurumu (TÜRKAK) ISO/IEC 17025 alanında Avrupa Akreditasyon Birliği (EA) ve Uluslararası Laboratuvar Akreditasyon Birliği (ILAC) ile çok taraflı anlaşma (MLA/MRA) imzalamıştır.

F701-040

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TÜRKAK AB-0946-T

Akreditasyon Sertifikası Eki (Sayfa 1/4)

Akreditasyon Kapsamı

BATI LABORATUVARI ÇEVRE ÖLÇÜM HİZMETLERİ BİLİŞİM MÜH. MÜŞ. SAN. VE TİC. LTD. ŞTİ.

Akreditasyon No: AB-0946-T
Revizyon No: 02 Tarih: 24.04.2018

Deney Laboratuvarı

Adresi : İnönü Mahallesi Yıldırımlar Sanayi Sitesi Batı Bulvarı 1738 Sokak 1-10 Kat:6 Yenimahalle 06370 ANKARA/TÜRKİYE
Tel : 0 312 250 84 85
Faks : 0 312 279 46 86
E-Posta : batilaboratuvari@yahoo.com
Website : www.batilaboratuvari.com

Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standardlar, İşletme İçi metodlar)
İş Hijyeni Gürültü	Çalışma Ortamında Maruz Kalınan Gürültünün Ölçülmesi	TS EN ISO 9612
İş Hijyeni Gürültü	Kişilerin Maruz Kaldığı Gürültü Düzeyinin Ölçülmesi ve İşitme Kayıplarının Tespiti	TS 2607 ISO 1999
İş Hijyeni Gürültü	İnmal Edilebilir Düzeydeki Çevresel Düzeltmelerle Yansıtıcı Bir Düzlem Üzerinde Esas Olarak Açık Bir Alandaki İş Mahallinde ve Belirtilen Diğer Konumlardaki Emisyon Ses Basınç Seviyelerinin Tayini	TS EN ISO 11201
İş Hijyeni Gürültü	Bir İş İstasyonundaki ve Benzer Çevresel Düzeltmeler Uygulanmış Belirtilen Diğer Konumlardaki Emisyon Ses Basınç Seviyelerinin Tayini	TS EN ISO 11202
İş Hijyeni Gürültü	Bir İş İstasyonunda ve Belirtilen Diğer Konumlarda Emisyon Ses Basınç Seviyelerinin Ölçülmesi - Çevresel Düzeltmeler Gerektiren Yöntemi	TS EN ISO 11204
İş Hijyeni Titreşim	Kişilerin Maruz Kaldığı, Elle İletilen Titreşimin Ölçülmesi ve Değerlendirilmesi	TS EN ISO 5349-1 TS EN ISO 5349-2
İş Hijyeni Titreşim	Hareketli Makinaların Deneye Tabi Tutulması ile Titreşim Emisyon Değerinin Tespiti	TS EN 1032+A1
İş Hijyeni Titreşim	Tüm Vücudun Titreşime Maruz Kalmasının Ölçülmesi ve Değerlendirilmesi	TS ISO 2631-1 (TS EN 1032+A1 ile birlikte)
İş Hijyeni Termal Konfor	Sıcak Ortamlar için WBGT (Yaş-Hazne Küre Sıcaklığı) İndeksine göre Isının Çalışan Üzerindeki Baskısı ve PMV -PPD İndislerine Göre Termal Rahatlık Şartlarının Belirlenmesi	TS EN 27243 TS EN ISO 7730
İş Hijyeni Aydınlatma	İş Yerlerindeki Aydınlatma/Işık Şiddeti Düzeyinin Ölçümü	COHSR-928-1-IPS-039

Akreditasyon Sertifikası Eki (Sayfa 2/4)

Akreditasyon Kapsamı

BATI LABORATUVARI ÇEVRE ÖLÇÜM HİZMETLERİ BİLİŞİM MÜH. MÜŞ. SAN. VE TİC. LTD. ŞTİ.

Akreditasyon No: AB-0946-T
Revizyon No: 02 Tarih: 24.04.2018

Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standardlar, İşletme İçi metodlar)
İş Hijyeni Toz Ölçümü	Çalışma Ortamında Bulunan Aerosollerin Tayini Analiz: Doğrudan Fotometrik Okuma	CEN/TR 15013-3
İş Hijyeni Toz Ölçümü	Toplam ve Solunabilir Tozun Tayini Örnekleme: Pompa ile Filtreye Numune Alma Analiz: Gravimetrik	HSE-MDHS 14/3
İş Hijyeni Toz Ölçümü	Toplam, Solunabilir ve Torasik Aerosollerin Tayini Örnekleme: Pompa ile Filtreye Numune Alma Analiz: Gravimetrik	HSE-MDHS 14/4
İş Hijyeni Toz Ölçümü	Solunabilir Tozun Tayini Örnekleme: Pompa ile Filtreye Numune Alma Analiz: Gravimetrik	ASTM D 4532
İş Hijyeni Dedektör Tüple Anlık Gaz Ölçümü	Zehirli Gaz veya Buhar Konsantrasyonlarının Tayini (Benzen, Karbondioksit, Karbonmonoksit, Etil alkol, Oksijen) Örnekleme ve Ölçüm: Dedektör Tüple Anlık Ölçüm	ASTM C 4490-96
İş Hijyeni Formaldehit Analizi	Formaldehit Tayini Örnekleme: Pompa ile Filtre+Impingere Numune Alma Analiz: Görünür Bölge (VIS) Spektrofotometresi	NIOSH-NMAM 3500
İş Hijyeni Anlık Gaz Ölçümü	Oksijen (O_2) Tayini Örnekleme ve Ölçüm: Elektrokimyasal Hücre Metodu	NIOSH-NMAM 6601
İş Hijyeni Anlık Gaz Ölçümü	Karbon Monoksit (CO) Tayini Örnekleme ve Ölçüm: Elektrokimyasal Hücre Metodu	NIOSH-NMAM 6606
İş Hijyeni Silis-Silika Kristalleri	Kristal Silika (SiO_2) Tayini Örnekleme : Pompa ile Filtreye Numune Alma Analiz: Görünür Bölge (VIS) Absorbsiyon Spektrofotometresi	NIOSH-NMAM 7603
İş Hijyeni Manyetik Alan	İnsanların Elektrik, Manyetik ve Elektromanyetik Alanlara (0 Hz - 300 GHz) Maruz Kalmasının Ölçülmesi	TS EN 50413

TÜRKAK AB-0946-T
Rapor No: R-19-211/2

Akreditasyon Sertifikası Eki (Sayfa 3/4)
Akreditasyon Kapsamı

TÜRKAK

BATI LABORATUVARI ÇEVRE ÖLÇÜM HİZMETLERİ BİLİŞİM MÜH. MÜŞ. SAN. VE TİC. LTD. ŞTİ.

Akreditasyon No: AB-0946-T
Revizyon No: 02 Tarih: 24.04.2018

Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standardlar, işletme içi metodlar)
Akustik-Gürültü	Çevresel Gürültü Düzeyinin ([illegible]) Tespiti	TS 9315 ISO 1996-1 ve TS 9315 ISO 1996-1/T1
Akustik-Gürültü	Çevresel Gürültü Düzeyinin ([illegible]) Tespiti	TS ISO 1996-2 ve TS ISO 1996- 2/T1
Akustik-Gürültü	Çoklu Gürültü Kaynağına Sahip Sanayi Tesislerinde Yapılan Ses Basıncı Düzeyi Ölçümlerinden Ses Gücü Düzeyinin (ΔL1, ΔL2, ΔL3, ΔL4, Lp, Lw) Tespiti	TS ISO 8297
Akustik-Gürültü	Hava Ulaşım Araçlarından Kaynaklanan Gürültünün Alansal Dağılımının (L..., L(x,y), L(z,d), L..., L..., ^,(b,l) Δv, Δl, Δr) Hesaplanması	ECAC. CEAC Doc 29
Akustik-Gürültü	Demiryolu Ulaşım Araçlarının Ses Gücü Düzeyinin ([illegible]) ve Demiryolu Gürültüsünün Alansal Dağılımının ([illegible]) Hesaplanması	Hollanda ulusal hesaplama yöntemi RMR SRM II
Akustik-Gürültü	Karayolu Ulaşım Araçlarının Ses Gücü Düzeyinin (E, Lw) ve Karayolu Gürültüsünün Alansal Dağılımının Hesaplanması ([illegible])	Fransız ulusal hesaplama yöntemi NMPB-96 ve Fransız standardı XPS 31-133
Akustik-Gürültü	Mühendislik Metodu Kullanılarak Gürültü Kaynaklarından Yapılan Ses Basıncı Düzeyi Ölçümlerinden Ses Gücü Düzeyinin (Lw, LwA) Tespiti	TS EN ISO 3744
Akustik-Gürültü	Gözlem Yöntemi Kullanılarak Gürültü Kaynaklarından Yapılan Ses Basıncı Düzeyi Ölçümlerinden Ses Gücü Düzeyinin ([illegible], ΔL, K1, K2, Lp, Lw) Tespiti	TS EN ISO 3746
Akustik-Gürültü	Akustik - Sesin Dışarıda Yayılırken Azalması Bölüm 1: Sesin Atmosfer Tarafından Soğurulmasının Hesaplanması	TS ISO 9613-1
Akustik-Gürültü	Sesin Dışarıda Yayılırken Azalması Bölüm 2: Genel Hesaplama Yöntemi	TS ISO 9613-2
Akustik-Gürültü	Yapılarda İçerdeki Sesin Dışarıya İletilmesinde Yapı Akustik Performansının Değerlendirilmesi ([illegible])	TS EN 12354-4

Akreditasyon Sertifikası Eki (Sayfa 4/4)
Akreditasyon Kapsamı

TÜRKAK

BATI LABORATUVARI ÇEVRE ÖLÇÜM HİZMETLERİ BİLİŞİM MÜH. MÜŞ. SAN. VE TİC. LTD. ŞTİ.

Akreditasyon No. AB-0946-T
Revizyon No: 02 Tarih: 24.04.2018

Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standardlar, işletme içi metodlar)
Akustik-Gürültü	Odalar Arasında Hava ile Yayılan Sesin Yalıtımına Ait Alan Ölçümleri ile Yapı Elemanlarının Ses Yalıtımının Tespiti	TS ISO 140-4
Titreşim	Binalarda Titreşimin Ölçülmesi ve Yapı Hasarının Tespiti (rr, a,V)	TS ISO 4866
Titreşim	Akışkan Film Yataklı Gaz Türbini Setlerinin Dönmeyen Parçalarında Titreşimin Ölçülmesi ve Değerlendirilmesi (V_{rms})	ISO 10816-4
Titreşim	Hidrolik Güç Kaynakları ve Pompa Tesisatlarındaki Makine Setlerinin Dönmeyen Parçalarında Titreşimin Ölçülmesi ve Değerlendirilmesi (V_{rms})	ISO 10816-5
Titreşim	Madencilik Faaliyetleri Sonucunda Oluşan Hava Şoku ve Yer Titreşiminin Ölçülmesi (a, v)	TS 10354
İmisyon (Çevre Havası)	Askıdaki Tanecikli Maddenin PM10 veya PM2,5 Kütle Derişimlerinin Tayini Gravimetrik Metot	TS EN 12341
İmisyon (Çevre Havası)	Askıdaki Tanecikli Maddenin PM 10 Kesrinin Tayini Gravimetrik Metot	EPA 40 CFR 50 Appj-M
İmisyon (Çevre Havası)	Çöken Toz Tayini Gravimetrik Metot	TS 2342
Baca Gazı (TSCEN/TS 15675 ve TS EN 15259 Şartlarına uygun)	Sabit Kaynak Emisyonları- Bacalarda Gaz Akışlarının Hız ve Debisinin Ölçülmesi Gaz Akışlarının Hız ve Debisinin Tayini L ve S Tipi Pitot Tüpü ile	TS ISO 10780

KAPSAM SONU

Dr. H. İbrahim ÇETİN
Genel Sekreter

TÜRKAK AB-0946-T
Rapor No: R-19-212/2

EK - 2 PERSONEL BELGELERİ

İSTANBUL TEKNİK ÜNİVERSİTESİ
SÜREKLİ EĞİTİM MERKEZİ

B. Barbaros YÜCE

Mimarlık ve Makine Fakülteleri tarafından düzenlenen

"ÇEVRESEL GÜRÜLTÜNÜN DEĞERLENDİRİLMESİ VE YÖNETİMİ (ÇGDY)"

B-1 Tipi SERTİFİKA Programını başarıyla tamamlamıştır.

Prof. Dr. Taner DERBENTLİ
Makine Fakültesi Dekanı

Prof. Dr. Orhan HACIHASANOĞLU
Mimarlık Fakültesi Dekanı

BAHÇEŞEHİR ÜNİVERSİTESİ

Sayın ***Bilal Barbaros YÜCE***

*T.C. Çevre ve Orman Bakanlığı ve Bahçeşehir Üniversitesi işbirliği ile 21 Ocak 2006 – 26 Ocak 2006 tarihleri arasında, **Bahçeşehir Üniversitesi Teknoloji Geliştirme Birimi** tarafından düzenlenen "ŞİKAYETLERİN DEĞERLENDİRİLMESİ ÖLÇÜM DENETİM İZLEME İZİN VE YAPTIRIM PROSEDÜRÜNE İLİŞKİN A TİPİ" eğitim programına katılarak bu katılım belgesini almaya hak kazanmıştır.*

Rektör
Prof.Dr. Süheyl Batum

Teknoloji Geliştirme Birimi Müdürü
Çınar Deniz Kurra

İSTANBUL TEKNİK ÜNİVERSİTESİ
SÜREKLİ EĞİTİM MERKEZİ

BAŞARI BELGESİ

Bilal Barbaros YÜCE

Mimarlık ve Makine Fakülteleri tarafından düzenlenen

"ÇEVRESEL GÜRÜLTÜNÜN DEĞERLENDİRİLMESİ VE YÖNETİMİ (ÇGDY)"

C-1 Tipi SERTİFİKA Programını başarıyla tamamlamıştır.

Dönem: 2011/01 *Toplam Süre: 30 saat*

Prof. Dr. Ata MUĞAN
Makine Fakültesi Dekanı

Prof. Dr. Orhan HACIHASANOĞLU
Mimarlık Fakültesi Dekanı

BATI LABORATUVARI

ÇEVRE ÖLÇÜM HİZMETLERİ BİLİŞİM MÜH.SAN. VE TİC. LTD. ŞTİ.

İnönü Mahallesi Batı Bulvarı 1738 Sokak No:1/10 Batıkent /ANKARA

Tel: 0 312 250 84 85 Fax: 0 312 278 48 86

A. GİRİŞ

Bu rapor aşağıda açık adresi belirtilen tesiste gerçekleştirilen **GÜRÜLTÜ** ölçümleri sonucunda hazırlanmıştır.

Ölçüm Tarihi : 13-14.06.2019

Ölçüm Yeri : İSTANBUL RÜZGAR ENERJİ SANTRALİ

Tesis Adresi : ,İSTANBUL

B. ÖLÇÜM RAPORLARI

i Kullanılan Cihazlar

Gürültü ölçümlerinde Cesva SC310 Tip 1 Model gürültü ölçüm cihazı ve Cesva CB006 Tip 1 gürültü kalibratörü kullanılmıştır.

ii Ölçüm Sonuçları ve Lokasyonlar

Belirlenen 6 ayrı ölçüm istasyonunda yapılan ölçümler sonucunda elde edilen günlük değerler aşağıda verilmiştir.

Tablo 1: Gürültü Ölçüm Noktaları

NO	TARİH	ÖLÇÜM YERİ	KOORDİNATLAR
1	13-14.06.2019	Aydınlar Köyü	600805.75 d D 4581253.65 m K
2	13-14.06.2019	Yaylacık Köyü	601983.91 d D 4579143.47 m K
3	13-14.06.2019	Santral Dışı 1	601121.56 d D 4581644.36 m K
4	13-14.06.2019	Santral Dışı 2	599910.82 d D 4583841.50 m K
5	13-14.06.2019	Santral Dışı 3	593393.77 d D 4581201.64 m K
6	13-14.06.2019	T-10 Noktası	598877.00 d D 4579119.00 m K

1. Nokta Gürültü Ölçüm Sonuçları
(24 Saatlik Değerler)

Data Number	Start Time	Leq	Lmax
1	00:00	45,2	54,1
2	00:15	45,4	53,3
3	00:30	45,6	54,4
4	00:45	46,2	52,8
5	01:00	45,7	53,9
6	01:15	45,9	55,7
7	01:30	45,6	53,7
8	01:45	45,3	54,7
9	02:00	46,1	54,3
10	02:15	46,2	53,1
11	02:30	45,1	54,4
12	02:45	46,0	53,2
13	03:00	44,8	54,9
14	03:15	45,3	53,9
15	03:30	44,5	53,1
16	03:45	45,2	54,7
17	04:00	45,7	52,7
18	04:15	44,7	54,3
19	04:30	44,4	53,5
20	04:45	44,9	52,9
21	05:00	44,4	54,6
22	05:15	43,9	52,0
23	05:30	43,7	53,2
24	05:45	43,2	51,9
25	06:00	44,0	52,1
26	06:15	44,6	53,5
27	06:30	43,8	52,2
28	06:45	44,6	52,8
29	07:00	43,8	53,8
30	07:15	44,7	54,6
31	07:30	45,6	53,1
32	07:45	44,7	54,1
33	08:00	44,8	54,8
34	08:15	44,3	55,4
35	08:30	45,4	54,1
36	08:45	44,7	55,3
37	09:00	45,5	54,9
38	09:15	46,3	54,0
39	09:30	45,7	54,2
40	09:45	46,4	55,8
41	10:00	47,4	55,0
42	10:15	46,7	53,6
43	10:30	45,9	54,8
44	10:45	45,9	55,4
45	11:00	47,1	57,0
46	11:15	46,7	56,2
47	11:30	47,5	56,6
48	11:45	47,0	55,0
49	12:00	47,1	56,0
50	12:15	48,0	54,6
51	12:30	48,0	54,0

BATI ÇEVRE LABORATUVARI ÖLÇÜM HİZ. BİLİŞİM MÜH. SAN. TİC. LTD. ŞTİ.

52	12:45	47,6	55,5
53	13:00	48,1	54,6
54	13:15	47,5	55,4
55	13:30	48,3	56,8
56	13:45	47,7	56,6
57	14:00	47,0	54,6
58	14:15	48,4	55,5
59	14:30	48,1	57,0
60	14:45	48,5	56,4
61	15:00	47,3	56,2
62	15:15	47,4	55,2
63	15:30	47,6	56,3
64	15:45	48,8	54,7
65	16:00	48,1	55,8
66	16:15	48,7	57,2
67	16:30	47,8	57,5
68	16:45	47,7	56,8
69	17:00	48,5	57,9
70	17:15	49,1	58,5
71	17:30	48,8	57,3
72	17:45	48,9	57,9
73	18:00	49,1	57,1
74	18:15	50,0	58,0
75	18:30	49,5	58,8
76	18:45	50,2	58,1
77	19:00	50,7	56,7
78	19:15	50,4	58,1
79	19:30	50,6	57,0
80	19:45	50,0	58,2
81	20:00	49,3	58,8
82	20:15	49,8	56,9
83	20:30	49,2	58,1
84	20:45	48,2	57,0
85	21:00	48,8	56,2
86	21:15	47,6	56,9
87	21:30	47,2	56,1
88	21:45	46,5	54,8
89	22:00	47,1	55,9
90	22:15	46,9	55,0
91	22:30	46,3	53,8
92	22:45	46,0	54,7
93	23:00	46,3	53,4
94	23:15	45,2	54,3
95	23:30	46,0	54,8
96	23:45	45,1	54,0

2. Nokta Gürültü Ölçüm Sonuçları
(24 Saatlik Değerler)

Data Number	Start Time	Leq	Lmax
1	00:00	45,0	53,9
2	00:15	45,3	54,7
3	00:30	45,9	55,6
4	00:45	45,6	54,1
5	01:00	45,3	55,0
6	01:15	45,8	53,7
7	01:30	45,4	55,1
8	01:45	45,0	53,9
9	02:00	45,9	52,7
10	02:15	45,7	54,0
11	02:30	45,3	55,1
12	02:45	44,8	53,6
13	03:00	45,2	54,5
14	03:15	44,5	52,7
15	03:30	45,1	53,7
16	03:45	44,6	55,3
17	04:00	45,2	56,1
18	04:15	45,8	54,6
19	04:30	45,8	53,4
20	04:45	45,8	54,5
21	05:00	45,4	52,3
22	05:15	43,1	53,2
23	05:30	43,4	51,3
24	05:45	43,6	52,3
25	06:00	44,2	53,2
26	06:15	44,9	51,9
27	06:30	45,5	51,3
28	06:45	45,0	52,4
29	07:00	45,6	51,5
30	07:15	45,3	52,8
31	07:30	45,5	53,6
32	07:45	45,9	52,2
33	08:00	45,0	53,2
34	08:15	44,8	52,2
35	08:30	45,5	53,4
36	08:45	45,1	54,3
37	09:00	45,2	52,6
38	09:15	46,1	53,8
39	09:30	47,1	52,4
40	09:45	47,5	53,8
41	10:00	47,1	55,2

42	10:15	47,2	56,1
43	10:30	46,8	54,8
44	10:45	47,3	55,7
45	11:00	47,2	54,4
46	11:15	47,9	55,8
47	11:30	47,6	55,2
48	11:45	48,0	56,8
49	12:00	48,1	55,5
50	12:15	47,1	54,5
51	12:30	48,3	55,1
52	12:45	47,6	56,2
53	13:00	47,2	54,9
54	13:15	47,5	56,2
55	13:30	47,9	55,3
56	13:45	47,5	53,6
57	14:00	48,3	55,0
58	14:15	47,5	56,1
59	14:30	47,1	55,2
60	14:45	47,9	57,0
61	15:00	47,6	56,2
62	15:15	47,0	57,9
63	15:30	47,6	56,6
64	15:45	48,8	55,4
65	16:00	47,9	56,5
66	16:15	48,5	57,1
67	16:30	48,6	56,6
68	16:45	48,0	56,0
69	17:00	47,6	57,5
70	17:15	48,2	58,5
71	17:30	47,4	56,9
72	17:45	47,8	57,9
73	18:00	48,1	57,2
74	18:15	49,3	57,4
75	18:30	48,6	58,3
76	18:45	48,0	59,6
77	19:00	48,9	59,0
78	19:15	49,3	60,0
79	19:30	48,3	59,2
80	19:45	48,5	58,4
81	20:00	49,1	59,4
82	20:15	48,5	58,0
83	20:30	48,0	57,4
84	20:45	49,0	58,2
85	21:00	48,2	57,4
86	21:15	47,0	55,9
87	21:30	47,5	56,6
88	21:45	46,9	55,9
89	22:00	47,3	55,1
90	22:15	46,2	53,7
91	22:30	46,6	54,6
92	22:45	46,1	53,6
93	23:00	45,3	54,4
94	23:15	44,5	53,7
95	23:30	45,1	52,9
96	23:45	44,9	53,8

3. Nokta Gürültü Ölçüm Sonuçları
(24 Saatlik Değerler)

Data Number	Start Time	Leq	Lmax
1	00:00	38,9	47,0
2	00:15	39,7	47,7
3	00:30	38,7	48,1
4	00:45	38,6	47,0
5	01:00	39,5	47,6
6	01:15	39,2	46,9
7	01:30	40,3	47,5
8	01:45	39,2	46,5
9	02:00	38,8	48,0
10	02:15	38,9	47,0
11	02:30	39,9	48,5
12	02:45	38,5	47,8
13	03:00	38,9	46,9
14	03:15	40,3	48,5
15	03:30	39,9	47,4
16	03:45	39,3	46,7
17	04:00	39,7	45,6
18	04:15	39,5	46,9
19	04:30	40,1	47,7
20	04:45	38,9	47,1
21	05:00	39,8	48,2
22	05:15	38,6	45,6
23	05:30	37,6	45,1
24	05:45	39,2	46,2
25	06:00	38,6	45,7
26	06:15	38,2	45,1
27	06:30	39,2	46,1
28	06:45	39,9	46,7
29	07:00	40,5	47,2
30	07:15	39,7	46,8

BATI ÇEVRE LABORATUVARI ÖLÇÜM HİZM. BİLİŞİM MÜH. SAN. TİC. LTD. ŞTİ.

31	07:30	40,0	45,2
32	07:45	40,4	46,3
33	08:00	40,8	46,8
34	08:15	40,1	45,6
35	08:30	39,5	47,3
36	08:45	40,5	48,1
37	09:00	41,1	49,0
38	09:15	41,5	49,4
39	09:30	42,2	50,8
40	09:45	42,9	50,4
41	10:00	42,3	49,4
42	10:15	41,6	50,8
43	10:30	42,0	50,6
44	10:45	41,5	49,4
45	11:00	42,7	49,8
46	11:15	41,9	50,3
47	11:30	42,2	49,2
48	11:45	42,1	50,8
49	12:00	42,8	50,2
50	12:15	43,4	51,5
51	12:30	42,6	52,2
52	12:45	43,7	52,4
53	13:00	42,6	51,1
54	13:15	42,5	52,2
55	13:30	43,2	50,2
56	13:45	42,1	51,0
57	14:00	41,6	49,7
58	14:15	43,0	50,5
59	14:30	43,0	51,4
60	14:45	43,4	51,9
61	15:00	42,4	50,3
62	15:15	43,5	51,6
63	15:30	42,5	51,3
64	15:45	43,1	49,8
65	16:00	43,9	51,0
66	16:15	43,8	50,7
67	16:30	44,5	51,9
68	16:45	41,9	50,5
69	17:00	41,7	49,6
70	17:15	42,5	50,7
71	17:30	43,0	51,4
72	17:45	42,3	50,6
73	18:00	43,1	51,8
74	18:15	43,2	52,1
75	18:30	44,3	51,5
76	18:45	43,8	52,8
77	19:00	44,3	53,7
78	19:15	44,3	52,6
79	19:30	43,7	51,8
80	19:45	43,9	51,1
81	20:00	43,6	51,6
82	20:15	42,9	50,6
83	20:30	41,4	51,1
84	20:45	42,5	50,1
85	21:00	42,4	49,3
86	21:15	41,2	50,4
87	21:30	40,8	49,5
88	21:45	41,7	48,3
89	22:00	40,2	49,7
90	22:15	39,9	49,2
91	22:30	39,3	47,9
92	22:45	39,3	48,6
93	23:00	40,0	47,5
94	23:15	39,4	48,4
95	23:30	38,9	47,1
96	23:45	38,4	46,4

4. Nokta Gürültü Ölçüm Sonuçları
(24 Saatlik Değerler)

Data Number	Start Time	Leq	Lmax
1	00:00	44,7	51,0
2	00:15	45,2	51,9
3	00:30	45,5	51,1
4	00:45	45,0	52,0
5	01:00	44,5	52,4
6	01:15	45,3	50,6
7	01:30	45,6	52,2
8	01:45	44,9	51,0
9	02:00	44,5	51,6
10	02:15	44,2	50,9
11	02:30	44,6	52,0
12	02:45	45,3	50,5
13	03:00	45,8	51,7
14	03:15	46,2	52,3
15	03:30	45,3	50,9
16	03:45	45,7	52,1
17	04:00	46,0	51,2
18	04:15	46,3	52,0
19	04:30	46,5	52,6

BATI ÇEVRE LABORATUVARI ÖLÇÜM HİZM. BİLİŞİM MÜH. SAN. TİC. LTD. ŞTİ

20	04:45	46,2	52,1
21	05:00	45,9	50,9
22	05:15	44,1	50,6
23	05:30	44,7	51,1
24	05:45	43,9	50,3
25	06:00	44,4	51,5
26	06:15	44,8	50,0
27	06:30	44,1	51,2
28	06:45	45,3	50,6
29	07:00	45,5	51,4
30	07:15	44,4	50,7
31	07:30	44,2	51,5
32	07:45	44,1	50,7
33	08:00	45,5	52,0
34	08:15	45,9	51,5
35	08:30	45,2	52,1
36	08:45	44,5	51,4
37	09:00	45,8	51,1
38	09:15	45,0	52,3
39	09:30	45,4	52,6
40	09:45	46,0	53,4
41	10:00	46,4	52,8
42	10:15	46,6	53,9
43	10:30	45,7	52,5
44	10:45	46,0	54,0
45	11:00	46,4	54,7
46	11:15	46,9	53,8
47	11:30	47,9	55,2
48	11:45	48,6	53,6
49	12:00	49,0	54,9
50	12:15	49,8	53,8
51	12:30	49,1	54,6
52	12:45	49,7	55,9
53	13:00	50,2	57,0
54	13:15	49,1	55,8
55	13:30	49,8	56,6
56	13:45	49,8	55,5
57	14:00	48,5	56,4
58	14:15	49,0	56,8
59	14:30	50,2	58,2
60	14:45	49,6	57,1
61	15:00	48,4	56,8
62	15:15	49,0	58,2
63	15:30	49,8	58,5
64	15:45	50,2	57,2
65	16:00	49,7	56,0
66	16:15	49,0	56,7
67	16:30	50,4	57,4
68	16:45	50,7	56,0
69	17:00	49,6	57,5
70	17:15	49,8	56,0
71	17:30	48,4	55,2
72	17:45	48,0	54,8
73	18:00	47,7	53,9
74	18:15	49,7	56,8
75	18:30	50,0	56,0
76	18:45	50,4	56,4
77	19:00	50,8	56,9
78	19:15	51,5	58,1
79	19:30	51,6	57,3
80	19:45	51,1	57,0
81	20:00	50,3	55,8
82	20:15	49,6	56,4
83	20:30	49,0	55,6
84	20:45	47,7	54,4
85	21:00	47,4	54,7
86	21:15	47,9	53,9
87	21:30	47,6	54,6
88	21:45	47,0	54,3
89	22:00	46,3	54,8
90	22:15	46,6	53,7
91	22:30	46,4	54,9
92	22:45	46,9	54,3
93	23:00	46,2	52,7
94	23:15	46,6	52,1
95	23:30	46,1	53,2
96	23:45	45,3	51,6

5. Nokta Gürültü Ölçüm Sonuçları
(24 Saatlik Değerler)

Data Number	Start Time	Leq	Lmax
1	00:00	47,8	57,2
2	00:15	49,1	57,8
3	00:30	49,3	59,1
4	00:45	49,2	57,8
5	01:00	47,8	57,3
6	01:15	47,8	56,7
7	01:30	49,1	58,2
8	01:45	47,8	57,2

BATI ÇEVRE LABORATUVARI HİZ. BİLİŞİM MÜH. SAN. TİC. LTD. ŞTİ.
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9	02:00	48,8	58,0	54	13:15	50,0	60,1
10	02:15	47,7	56,1	55	13:30	50,7	61,5
11	02:30	48,6	57,6	56	13:45	49,9	59,3
12	02:45	48,6	56,7	57	14:00	49,7	58,9
13	03:00	47,9	55,7	58	14:15	49,8	60,1
14	03:15	47,9	56,5	59	14:30	50,5	60,7
15	03:30	48,3	55,3	60	14:45	49,7	58,9
16	03:45	49,3	57,0	61	15:00	49,5	60,5
17	04:00	47,4	55,3	62	15:15	51,1	60,9
18	04:15	49,1	56,7	63	15:30	49,8	60,1
19	04:30	48,7	55,9	64	15:45	49,8	60,1
20	04:45	47,5	54,7	65	16:00	50,2	61,1
21	05:00	48,9	55,6	66	16:15	51,7	61,4
22	05:15	47,5	56,0	67	16:30	51,9	62,7
23	05:30	47,0	54,8	68	16:45	49,9	59,5
24	05:45	46,8	54,4	69	17:00	48,3	58,9
25	06:00	47,3	54,1	70	17:15	50,0	60,8
26	06:15	46,8	54,4	71	17:30	50,1	59,9
27	06:30	47,0	55,9	72	17:45	49,8	60,9
28	06:45	46,7	55,2	73	18:00	49,7	59,7
29	07:00	47,8	56,3	74	18:15	52,2	63,5
30	07:15	47,5	56,8	75	18:30	52,3	62,8
31	07:30	47,9	56,4	76	18:45	51,7	62,6
32	07:45	48,2	55,4	77	19:00	51,6	63,3
33	08:00	47,0	54,8	78	19:15	50,6	61,2
34	08:15	47,5	55,6	79	19:30	52,4	62,0
35	08:30	47,4	54,8	80	19:45	52,5	62,2
36	08:45	48,5	56,8	81	20:00	51,6	61,4
37	09:00	49,3	58,9	82	20:15	50,3	59,5
38	09:15	50,3	59,7	83	20:30	49,8	60,6
39	09:30	50,5	58,1	84	20:45	50,3	60,6
40	09:45	50,4	58,9	85	21:00	49,1	58,2
41	10:00	50,1	58,3	86	21:15	48,4	57,8
42	10:15	48,8	59,4	87	21:30	49,8	58,4
43	10:30	48,5	58,1	88	21:45	49,1	56,1
44	10:45	49,4	58,9	89	22:00	47,8	56,7
45	11:00	48,2	58,5	90	22:15	48,5	55,9
46	11:15	49,7	59,5	91	22:30	47,1	57,1
47	11:30	50,2	60,5	92	22:45	47,3	56,7
48	11:45	50,5	60,1	93	23:00	48,1	55,9
49	12:00	49,8	59,6	94	23:15	48,3	55,5
50	12:15	49,2	58,5	95	23:30	48,8	56,0
51	12:30	49,7	59,5	96	23:45	47,6	55,1
52	12:45	49,1	58,3				
53	13:00	49,2	59,5				

6. Nokta Gürültü Ölçüm Sonuçları
(24 Saatlik Değerler)

BATI ÇEVRE LABORATUVARI ÖLÇÜM HİZM. BİLİŞİM MÜH. SAN. TİC. LTD. ŞTİ. 64

Data Number	Start Time	Leq	Lmax
1	00:00	45,1	53,3
2	00:15	45,6	53,9
3	00:30	44,7	53,3
4	00:45	45,4	54,1
5	01:00	45,4	53,6
6	01:15	45,1	54,5
7	01:30	45,4	55,5
8	01:45	45,3	54,4
9	02:00	45,5	54,1
10	02:15	46,2	55,1
11	02:30	46,3	53,1
12	02:45	45,7	54,1
13	03:00	46,3	54,1
14	03:15	45,8	52,7
15	03:30	46,6	54,1
16	03:45	46,3	53,1
17	04:00	46,4	54,3
18	04:15	45,9	52,7
19	04:30	46,7	54,1
20	04:45	46,2	54,7
21	05:00	46,6	54,3
22	05:15	44,2	53,0
23	05:30	44,9	51,9
24	05:45	44,1	51,7
25	06:00	44,4	52,2
26	06:15	43,7	52,8
27	06:30	44,6	51,5
28	06:45	45,4	51,9
29	07:00	46,1	53,1
30	07:15	45,3	52,4
31	07:30	44,8	53,5
32	07:45	45,2	54,4
33	08:00	46,1	53,0
34	08:15	45,7	51,9
35	08:30	45,6	53,2
36	08:45	46,5	53,6
37	09:00	46,1	55,4
38	09:15	46,8	53,7
39	09:30	46,3	55,0
40	09:45	47,5	55,9
41	10:00	47,2	54,3
42	10:15	47,9	55,1
43	10:30	47,4	53,8
44	10:45	47,8	56,2
45	11:00	48,3	54,6
46	11:15	48,5	56,0
47	11:30	48,3	55,6
48	11:45	47,7	55,8
49	12:00	47,5	55,0
50	12:15	48,0	53,8
51	12:30	47,3	56,2
52	12:45	47,1	55,2
53	13:00	47,4	56,2
54	13:15	48,2	56,6
55	13:30	47,5	56,2
56	13:45	47,8	54,8
57	14:00	47,3	56,8
58	14:15	48,4	55,6
59	14:30	47,5	56,6
60	14:45	47,3	55,4
61	15:00	48,1	57,5
62	15:15	48,1	56,4
63	15:30	48,7	55,4
64	15:45	47,3	56,4
65	16:00	47,8	57,1
66	16:15	48,2	56,5
67	16:30	48,5	57,5
68	16:45	49,7	56,5
69	17:00	49,8	57,4
70	17:15	50,6	56,3
71	17:30	50,1	57,9
72	17:45	50,8	59,3
73	18:00	50,4	57,1
74	18:15	51,5	60,4
75	18:30	52,1	59,0
76	18:45	52,7	61,0
77	19:00	52,0	60,2
78	19:15	51,3	59,3
79	19:30	52,0	58,6
80	19:45	51,8	57,9
81	20:00	49,9	59,8
82	20:15	49,8	59,2
83	20:30	49,1	57,9
84	20:45	49,6	57,4
85	21:00	50,4	58,8
86	21:15	48,9	57,3
87	21:30	48,2	58,2
88	21:45	48,9	57,3

BATI ÇEVRE LABORATUVARI ÇEVRE ÖLÇÜM HİZ. BİLİŞİM MÜH. SAN. TİC. LTD. ŞTİ.

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89	22:00	47,9	56,1
90	22:15	47,3	55,6
91	22:30	46,3	55,3
92	22:45	46,7	56,0
93	23:00	45,2	54,9
94	23:15	45,7	53,3
95	23:30	45,4	54,2
96	23:45	45,8	53,5

Deneyi Yapan Test Done by	*Raporu Hazırlayan* Report Prepared by	*Tarih* *Date*
B. Barbaros YÜCE Deney Sorumlusu	**B. Barbaros YÜCE** Raporlama Sorumlusu	**06.08.2019**

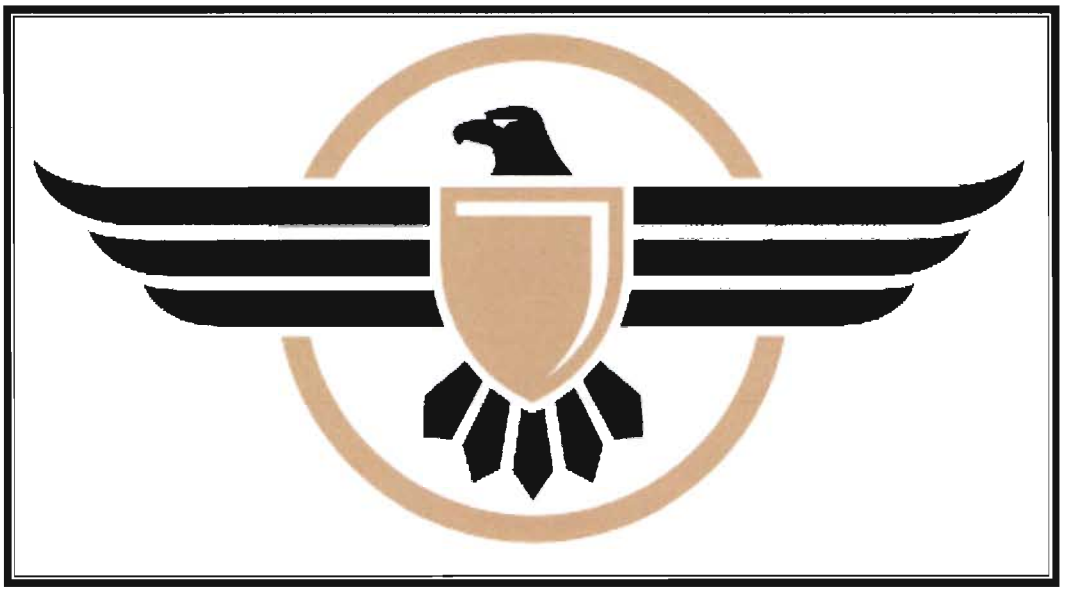
BATI LABORATUVARI ANKARA

BATI ÇEVRE LABORATUVARI ÖLÇÜM BİLİŞİM MÜH. SAN. TİC. LTD. ŞTİ.

BATI LABORATUVARI

ÇEVRE ÖLÇÜM HİZMETLERİ BİLİŞİM MÜH. MÜŞ. SAN. VE TİC. LTD. ŞTİ

TÜRKAK
Test
TS EN ISO/IEC 17025
AB-0946-T



HAVA KALİTESİ (PM 10) ÖLÇÜMLERİ SONUÇ RAPORU

Müşterinin Adı/Adresi: Customer Name/Address	**İSTANBUL RÜZGAR ENERJİ SANTRALİ** İstanbul
Müşterinin Telefonu/Faksı: Customer Phone/Fax	-
Talep Numarası: Order No.	TP-19-212
Numunenin Adı ve Tarifi: Name And Identity Of The Test Item	Hava Kalitesi (PM10) Ölçümleri
Deneyin Yapıldığı Tarih: Date Of Test	13-14.06.2019
Raporun Numarası ve Tarihi: Number And Date Of The Report	R-19-212/1 | 06.08.2019

BATI LABORATUVARI ANKARA

AĞUSTOS 2019

BATI LABORATUVARI

ÇEVRE ÖLÇÜM HİZMETLERİ BİLİŞİM MÜH. SAN. VE TİC. LTD. ŞTİ

R-19-212/1
06.08.2019

Deney Raporu / *Test Report*

Müşterinin adı/adresi: Customer name/address	**İSTANBUL RÜZGAR ENERJİ SANTRALİ** İstanbul
Müşterinin telefonu/faksı: Customer phone/fax	-
Talep Numarası: Order No.	TP-19-212
Numunenin adı ve tarifi: Name and identity of the test item	Hava Kalitesi (PM10) Ölçümleri
Numunenin kabul tarihi ve no: The date and number of receipt of the test item	17.06.2019 - NK-19-212/1
Açıklamalar: Remarks	-
Deneyin yapıldığı tarih: Date of test	13-14.06.2019
Raporun sayfa sayısı: Number of pages of the Report	15 Sayfa (Kapak Sayfaları Hariç)

Deney ve/veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (Talep halinde) ve deney metotları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.

The test and/or measurement results, the uncertainties (if applicable) with confidence probability and test methods are given on the following pages which are part of this report.

Tarih/Mühür Date/Seal	***Deneyi Yapan*** Test Done by	***Raporu Hazırlayan*** Report Prepared by	***Onay*** Approved by
BATI LABORATUVARI ANKARA			
06.08.2019	**B. Barbaros YÜCE** Deney Sorumlusu	**B. Barbaros YÜCE** Rapor Sorumlusu	**B. Barbaros YÜCE** Laboratuvar Müdürü

İÇİNDEKİLER **Sayfa No**

A. GİRİŞ

Bu rapor aşağıda açık adresi belirtilen tesiste gerçekleştirilen hava kalitesi ölçümleri sonucunda hazırlanmıştır.

Ölçüm Tarihi	:	13-14.06.2019
Ölçüm Yeri	:	İSTANBUL RÜZGAR ENERJİ SANTRALİ
Tesis Adresi	:	İSTANBUL

B. ÖLÇÜM RAPORLARI

1. Hava Kalitesi Ölçüm Raporu

PM 10

i Giriş

2872 sayılı Çevre Kanunu'nun ilgili hükümleri gereğince 03.07.2009 tarih ve 27277 sayılı Resmi Gazete'de yayınlanan "Sanayi Kaynaklı Hava Kirliliğinin Kontrolü Yönetmeliği" ve değişiklik yapılmasına dair yönetmelikler (S.K.H.K.K.Y.), her türlü sanayi ve enerji üretim tesislerinden kaynaklanan hava kirliliği seviyelerine sınırlamalar getirmekte ve bu kirletici kaynakları "Tesis" olarak tanımlayarak çevresindeki hava kirliliğinin ölçüm ve denetimini zorunlu kılmaktadır.

Bu yönetmelik gereğince yukarıda verilen tarihler arasında belirlenen noktalarda PM10 ölçümleri yapılmış ve "Sanayi Kaynaklı Hava Kirliliğinin Kontrolü Yönetmeliği" esas alınarak **Tesis işletmesi mevcut durum tespiti yapılmış** ve bu rapor hazırlanmıştır.

ii Ölçüm Metotları

Ölçümler aşağıda verilen standartlar çerçevesinde gerçekleştirilmiştir.

EPA 40 CFR PART 50:2006	NATIONAL PRIMARY AND SECONDARY AMBIENT AIR QUALITY STANDARDS

iii Faaliyetin Açık Bir Şekilde Anlatımı

Tesis inşaat aşamasındadır.

iv İlgili Yönetmelik Maddeleri

S.K.H.K.K.Y. Ek-2 gereğince, mevcut tesislerin etki alanında Hava Kirlenmesine Katkı Değeri (H.K.K.D.)' nin dağılım modellemesi kullanılarak hesaplanması, tesis etki alanında hava kalitesinin ölçülmesi ve ölçüm metotları aşağıdaki esaslara göre yapılır:

Hava kalitesi ölçümleri kural olarak yer seviyesinden, 1,5- 4,0 metre arasındaki yüksekliklerde, binadan (veya ekili alandan) en az 1,5 metre yan mesafe tutularak yapılır. Ormanda yapılan ölçümler, ağaç yüksekliğinden daha yukarıda yapılmalıdır.

A - Uzun Vadeli Sınır Değerleri (UVS) : Aşılmaması gereken, bütün ölçüm sonuçlarının aritmetik ortalaması olan değerlerdir.

B - Kısa Vadeli Sınır Değerleri (KVS) : Maksimum günlük ortalama değerler veya istatistik olarak bütün ölçüm sonuçları sayısal değerlerinin büyüklüğüne göre dizildiğinde, ölçüm sonuçlarının % 95'ini aşmaması gereken değerlerdir.

Hava kirleticileri (PM 10) için uyulması gereken sınır değerler aşağıda verilmiştir.

S.K.H.K.K.Y Tablo 2.2 Tesis Etki Alanında Hava Kalitesi Sınır Değerleri

Parametre	Süre	Birim	YIL					
			2014	2015	2016	2017	2018	2019-2023
Havada Asılı Partikül Madde (PM 10)	24 Saatlik	µg/m³	100	90	80	70	60	50

Kullanılan Cihazlar

Havada Asılı Partikül Madde (PM10) ölçümlerinde MCZ PNS-LVS 1 marka cihaz kullanılmıştır. Cihaz EPA tarafından havada asılı partikül madde örneklemeleri için belirlenen kriterlere uygun olarak örnekleme yapmaktadırlar. Cihazlar hacimsel akışa göre hava örneklemesi yapmakta ve bu işlemi EPA 40 CFR PART 50' ye göre dizayn edilmiş PM-10 başlığı ile gerçekleştirmektedir. PM-10 başlığı, rüzgâr yönü ve şiddetinden etkilenmeyecek şekilde tasarlanmıştır.

16,7 lt/dakika akış debisi ile cihazlar örnekleme yapabilmektedir. Örneklenen hava içerisinde bulunan 10 µm' nin altındaki partiküller darası alınmış filtre üzerinde toplanmaktadır. Filtre tutucuda toplanan partikül maddeler, belirli sürenin sonunda cihazdan alınarak laboratuara getirilmektedir. Burada, etüvde kurutulan filtreler terazide tartılarak meydana gelen ağırlık farkı hesaplanmaktadır. Tartımdan elde edilen fark numune alma süresi hesaba katılarak değerlendirilmektedir.

- **Ölçüm Sonuçları**

Belirlenen istasyonlarda yapılan ölçümler sonucunda elde edilen günlük değerler aşağıda verilmiştir.

Tablo 1: Hava Kalitesi (PM 10) Ölçüm Sonuçları

NO	TARİH	ÖLÇÜM YERİ	KOORDİNATLAR	KONSANTRASYON µg /m³	SINIR DEĞER KVD µg /m³
1	13-14.06.2019	Aydınlar Köyü	600805.75 d D 4581253.65 m K	21,61	50
2	13-14.06.2019	Yaylacık Köyü	601983.91 d D 4579143.47 m K	20,43	50
3	13-14.06.2019	Santral Dışı 1	601121.56 d D 4581644.36 m K	15,25	50
4	13-14.06.2019	Santral Dışı 2	599910.82 d D 4583841.50 m K	16,12	50
5	13-14.06.2019	Santral Dışı 3	593393.77 d D 4581201.64 m K	14,62	50
6	13-14.06.2019	T-10 Noktası	598877.00 d D 4579119.00 m K	17,84	50

*PM 10: EN 12341 ile tanımlanan 10 µm aerodinamik çaplı geçirgen bir girişten %50 verimle geçen partiküler madde

vi Değerlendirme ve Sonuç

Proje alanı çevresinde gerçekleştirilen hava kalitesi (PM10) ölçümleri neticesinde elde edilen sonuçlara göre;

Havada Asılı Partikül Madde (PM10) konsantrasyonları **sınır değerlerin altında kalmaktadır.**

C. EKLER

EK - 1 KALİBRASYON SERTİFİKALARI

AVL Kalibrasyon Laboratuvarı

TÜRKAK
TÜRK AKREDİTASYON KURUMU
TURKISH ACCREDITATION AGENCY
tarafından akredite edilmiştir

AVL AKUSTİK VİBRASYON
KALİBRASYON LABORATUVARI
İvedik O.S.B. 1385. Sk. No: 10 OSTİM - ANKARA

TÜRKAK Kalibrasyon TS EN ISO/IEC 17025 AB-0089-K

AB-0089-K
18F0022
01-2018

Kalibrasyon Sertifikası
Calibration Certificate

Cihazın Sahibi *Customer Name*	BATI LABORATUVARI ÇEVRE ÖLÇÜM HİZMETLERİ BİLİŞİM MÜH. MÜŞ. SAN. TİC. LTD. ŞTİ. İnönü Mh.Yıldırımlar San Sit 1738 Sk. 1/10Batıkent / ANKARA
İstek Numarası *Order No.*	T-0118-007
Makine / Cihaz *Instrument / Device*	Toz Örnekleme Cihazı - Akış Ölçer *Dust Sampling Device - Flow Meter*
İmalatçı *Manufacturer*	MCZ
Tip *Type*	: µPNS-LVS1
Seri Numarası *Serial number*	: 1412-007
Kalibrasyon Tarihi *Date of calibration*	: 11.01.2018
Sertifika Sayfa Sayısı *Number of pages*	: 4

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Bu kalibrasyon sertfikası, Uluslararası Birimler Sisteminde (SI) tanımlanmış birimleri realize eden ulusal ölçüm standardlarına izlenebilirliği belgeler.

Türk Akreditasyon Kurumu (TÜRKAK) kalibrasyon sertifikalarının tanınması konusunda Avrupa Akreditasyon Birliği (EA) ve Uluslararası Laboratuvar Akreditasyon Birliği (ILAC) ile karşılıklı tanınma antlaşmasını imzalamıştır.

Ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve kalibrasyon metodları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.

Mühür	Tarih	Kalibrasyonu Yapan	Laboratuvar Müdürü
AVL KALİBRASYON LABORATUVARI TÜRKAK AB-0089-K	11.01.2018	Veli BAYDIR	Younes NEVAYESHİRAZİ

AVL AKUSTİK VİBRASYON
KALİBRASYON LABORATUARI

AB-0089-K
18F0022
01-2018

1. Cihaza Ait Bilgiler
Device to be Calibrated

Cihazın Adı *Name of the Instrument*	Toz Örnekleme Cihazı - Akış Ölçer *Dust Sampling Device - Flow Meter*
İmalatçısı *Manufacturer*	MCZ
Seri Numarası *Serial Number*	1412-007
Bölüntüsü *Scale Division*	0.1
Tipi *Type*	µPNS-LVS1

2. Cihazın Laboratuvara Kabul Tarihi
Date of Recipt of Device 10.01.2018

3. Kalibrasyon Metodu
Calibration Method

Test cihazının kalibrasyonu karşılaştırma metodu ile yapılmıştır. PR.LBBR.201 prosedürü kullanılmıştır

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4. Çevresel Şartlar
Environmental Conditions

Ortam Sıcaklığı *Ambient Temperature*	21.9	± 3 °C
Bağıl Nem *Relative Humidity*	33.1	± 25 %
Ortam Basıncı *Ambient Pressure*	910	± 1 mbar

5. Kalibrasyonda Kullanılan Referans Cihazlar
Reference Equipments Used During Calibration

Cihaz *Device*	İmalatçı *Manufacturer*	Seri No *Serial No*	Sertifika No *Certificate No*	İzlenebilirlik *Traceability*
Akış Kalibratörü	Sierra	132548	G2AG-0134	UME
Dijital Barometrik Sensör	Sierra	132548	6 47256	UMS
Göstergeli Sıcaklık Ölçer	Sierra	132548	6 47257	UMS
Dijital Barometrik Sensör	Verth	409201-004	6 47259	UMS
Göstergeli Sıcaklık Ölçer	Verth	20140904-001	6 47258	UMS
Sıcaklık ve Nem Ölçer	Extech	12081741	7 02762	UMS

EK - 2 AKREDİTASYON BELGELERİ

TÜRK AKREDİTASYON KURUMU

AKREDİTASYON SERTİFİKASI

Deney Laboratuvarı olarak faaliyet gösteren,

BATI LABORATUVARI ÇEVRE ÖLÇÜM HİZMETLERİ BİLİŞİM MÜH. MÜŞ. SAN. VE TİC. LTD. ŞTİ.

İnönü Mahallesi Yıldırımlar Sanayi Sitesi Batı Bulvarı 1738 Sokak 1-10 Kat:6 Yenimahalle 06370 ANKARA / TÜRKİYE

TÜRKAK tarafından yapılan denetim sonucunda TS EN ISO/IEC 17025:2012 Standardına göre Ek'te yer alan kapsamlarda akredite edilmiştir.

Akreditasyon No : **AB-0946-T**

Akreditasyon Tarihi : **31 Ekim 2015**

Revizyon Tarihi / No : **24 Nisan 2018 / 02**

Bu Sertifika, yukarıda açık adı ve adresi yazılı Kuruluşun TS EN ISO/IEC 17025:2012 Standardına, ilgili Yönetmelik ve Tebliğlere uygunluğunu sürdürmesi halinde , **30 Ekim 2019** tarihine kadar geçerlidir.

Dr. H. İbrahim ÇETİN
Genel Sekreter

Türk Akreditasyon Kurumu (TÜRKAK) ISO/IEC 17025 alanında Avrupa Akreditasyon Birliği (EA) ve Uluslararası Laboratuvar Akreditasyon Birliği (ILAC) ile çok taraflı anlaşma (MLA/MRA) imzalamıştır.

F701-040 +90 312 410 82 00 - www.turkak.org.tr

Akreditasyon Sertifikası Eki (Sayfa 1/4)

Akreditasyon Kapsamı

TÜRKAK Test TS EN ISO/IEC 17025 AB-0946-T	**BATI LABORATUVARI ÇEVRE ÖLÇÜM HİZMETLERİ BİLİŞİM MÜH. MÜŞ. SAN. VE TİC. LTD. ŞTİ.** **Akreditasyon No: AB-0946-T** **Revizyon No: 02 Tarih: 24.04.2018**
Deney Laboratuvarı	
Adresi : İnönü Mahallesi Yıldırımlar Sanayi Sitesi Batı Bulvarı 1738 Sokak 1-10 Kat:6 Yenimahalle 06370 ANKARA/TÜRKİYE	**Tel** : 0 312 250 84 85 **Faks** : 0 312 278 48 86 **E-Posta** : barbarosyuce@yahoo.com **Website** : www.batilaboratuvari.com

Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standardlar, işletme içi metodlar)
İş Hijyeni Gürültü	Çalışma Ortamında Maruz Kalınan Gürültünün Ölçülmesi	TS EN ISO 9612
İş Hijyeni Gürültü	Kişilerin Maruz Kaldığı Gürültü Düzeyinin Ölçülmesi ve İşitme Kayıplarının Tespiti	TS 2607 ISO 1999
İş Hijyeni Gürültü	İhmal Edilebilir Düzeydeki Çevresel Düzeltmelerle Yansıtıcı Bir Düzlem Üzerinde Esas Olarak Açık Bir Alandaki İş Mahallinde ve Belirtilen Diğer Konumlardaki Emisyon Ses Basınç Seviyelerinin Tayini	TS EN ISO 11201
İş Hijyeni Gürültü	Bir İş İstasyonundaki ve Benzer Çevresel Düzeltmeler Uygulanmış Belirtilen Diğer Konumlardaki Emisyon Ses Basınç Seviyelerinin Tayini	TS EN ISO 11202
İş Hijyeni Gürültü	Bir İş İstasyonunda ve Belirtilen Diğer Konumlarda Emisyon Ses Basınç Seviyelerinin Ölçülmesi - Çevresel Düzeltmeler Gerektiren Yöntemi	TS EN ISO 11204
İş Hijyeni Titreşim	Kişilerin Maruz Kaldığı, Elle İletilen Titreşimin Ölçülmesi ve Değerlendirilmesi	TS EN ISO 5349-1 TS EN ISO 5349-2
İş Hijyeni Titreşim	Hareketli Makinaların Deneye Tabi Tutulması ile Titreşim Emisyon Değerinin Tespiti	TS EN 1032+A1
İş Hijyeni Titreşim	Tüm Vücudun Titreşime Maruz Kalmasının Ölçülmesi ve Değerlendirilmesi	TS ISO 2631-1 (TS EN 1032+A1 ile birlikte)
İş Hijyeni Termal Konfor	Sıcak Ortamlar için WBGT (Yaş-Hazne Küre Sıcaklığı) İndeksine göre İşinin Çalışan Üzerindeki Baskısı ve PMV -PPD İndislerine Göre Termal Rahatlık Şartlarının Belirlenmesi	TS EN 27243 TS EN ISO 7730
İş Hijyeni Aydınlatma	İş Yerlerindeki Aydınlatma/Işık Şiddeti Düzeyinin Ölçümü	COHSR-928-1-IPG-039

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Akreditasyon Sertifikası Eki (Sayfa 2/4)

Akreditasyon Kapsamı

BATI LABORATUVARI ÇEVRE ÖLÇÜM HİZMETLERİ BİLİŞİM MÜH. MÜŞ. SAN. VE TİC. LTD. ŞTİ.

Akreditasyon No: AB-0946-T
Revizyon No: 02 Tarih: 24.04.2018

Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standardlar, işletme içi metodlar)
İş Hijyeni Toz Ölçümü	Çalışma Ortamında Bulunan Aerosollerin Tayini Analiz: Doğrudan Fotometrik Okuma	CEN/TR 16013-3
İş Hijyeni Toz Ölçümü	Toplam ve Solunabilir Tozun Tayini Örnekleme: Pompa ile Filtreye Numune Alma Analiz: Gravimetrik	HSE-MDHS 14/3
İş Hijyeni Toz Ölçümü	Toplam, Solunabilir ve Torasik Aerosollerin Tayini Örnekleme: Pompa ile Filtreye Numune Alma Analiz: Gravimetrik	HSE-MDHS 14/4
İş Hijyeni Toz Ölçümü	Solunabilir Tozun Tayini Örnekleme: Pompa ile Filtreye Numune Alma Analiz: Gravimetrik	ASTM D 4532
İş Hijyeni Dedektör Tüple Anlık Gaz Ölçümü	Zehirli Gaz veya Buhar Konsantrasyonlarının Tayini (Benzen, Karbondioksit, Karbonmonoksit, Etil alkol, Oksijen) Örnekleme ve Ölçüm: Dedektör Tüple Anlık Ölçüm	ASTM D 4490-96
İş Hijyeni Formaldehit Analizi	Formaldehit Tayini Örnekleme: Pompa ile Filtre+impingera Numune Alma Analiz: Görünür Bölge (VIS) Spektrofotometresi	NIOSH-NMAM 3500
İş Hijyeni Anlık Gaz Ölçümü	Oksijen (O_2) Tayini Örnekleme ve Ölçüm: Elektrokimyasal Hücre Metodu	NIOSH-NMAM 6601
İş Hijyeni Anlık Gaz Ölçümü	Karbon Monoksit (CO) Tayini Örnekleme ve Ölçüm: Elektrokimyasal Hücre Metodu	NIOSH-NMAM 6604
İş Hijyeni Silis-Silika Kristalleri	Kristal Silika (SiO_2) Tayini Örnekleme : Pompa ile Filtreye Numune Alma Analiz: Görünür Bölge (VIS) Absorbsiyon Spektrofotometresi	NIOSH-NMAM 7601
İş Hijyeni Manyetik Alan	İnsanların Elektrik, Manyetik ve Elektromanyetik Alanlara (0 Hz - 300 Ghz) Maruz Kalmasının Ölçülmesi	TS EN 50413

Akreditasyon Sertifikası Eki (Sayfa 3/4)

Akreditasyon Kapsamı

TÜRKAK — TS EN ISO IEC 17025 — AB-0946-T

BATI LABORATUVARI ÇEVRE ÖLÇÜM HİZMETLERİ BİLİŞİM MÜH. MÜŞ. SAN. VE TİC. LTD. ŞTİ.

Akreditasyon No: AB-0946-T

Revizyon No: 02 **Tarih:** 24.04.2018

Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standardlar, işletme içi metodlar)
Akustik-Gürültü	Çevresel Gürültü Düzeyinin (L_{aeq}, L_{aeqt}, L_{regt}, L_{day}, L_{den}, $L_{evening}$, L_{AFNT}, L_{E}, L_{afmax}, L_{cenmax}, L_{rdn}, L_{rden}) Tespiti	TS 9315 ISO 1996-1 ve TS 9315 ISO 1996-1/T1
Akustik-Gürültü	Çevresel Gürültü Düzeyinin (L_{aeq}, L_{aeqt}, L_{regt}, L_{day}, L_{den}, $L_{evening}$, L_{AFNT}, L_{E}, L_{afmax}, L_{cenmax}, L_{rdn}, L_{rden}) Tespiti	TS ISO 1996-2 ve TS ISO 1996- 2/T1
Akustik-Gürültü	Çoklu Gürültü Kaynağına Sahip Sanayi Tesislerinde Yapılan Ses Basıncı Düzeyi Ölçümlerinden Ses Gücü Düzeyinin (ΔL_s, ΔL_f, ΔL_M, ΔL_α , L_{pA}, L_w) Tespiti	TS ISO 8297
Akustik-Gürültü	Hava Ulaşım Araçlarından Kaynaklanan Gürültünün Alansal Dağılımının (L_{AE}, L(x,y), L(Σd), L_x, L_d, ^,(b,!) Δ_v, Δ_L, Δ_T) Hesaplanması	ECAC. CEAC Doc 29
Akustik-Gürültü	Demiryolu Ulaşım Araçlarının Ses Gücü Düzeyinin ($E_{nr,c}$, $E_{r,c}$, L_E, $L_{E,r}$, E_s) ve Demiryolu Gürültüsünün Alansal Dağılımının (L_{Aeq}, C_{ref}, D_{drs}, D_{air}, D_{soil}, D_{meteo}) Hesaplanması	Hollanda ulusal hesaplama yöntemi RMR SRM II
Akustik-Gürültü	Karayolu Ulaşım Araçlarının Ses Gücü Düzeyinin (E, L_w) ve Karayolu Gürültüsünün Alansal Dağılımının Hesaplanması (L_{eq}, L, A_{div}, A_{atm}, $A_{grd,F}$, $A_{dif,F}$)	Fransız ulusal hesaplama yöntemi NMPB-96 ve Fransız standardı XPS 31-133
Akustik-Gürültü	Mühendislik Metodu Kullanılarak Gürültü Kaynaklarından Yapılan Ses Basıncı Düzeyi Ölçümlerinden Ses Gücü Düzeyinin (Lw, L_{WA}) Tespiti	TS EN ISO 3744
Akustik-Gürültü	Gözlem Yöntemi Kullanılarak Gürültü Kaynaklarından Yapılan Ses Basıncı Düzeyi Ölçümlerinden Ses Gücü Düzeyinin ($L_{peq,T}$, ΔL_s, K_1, K_2, L_{pf}, Lw) Tespiti	TS EN ISO 3746
Akustik-Gürültü	Akustik - Sesin Dışarıda Yayılırken Azalması: Bölüm 1: Sesin Atmosfer Tarafından Soğurulmasının Hesaplanması	TS ISO 9613-1
Akustik-Gürültü	Sesin Dışarıda Yayılırken Azalması Bölüm 2: Genel Hesaplama Yöntemi	TS ISO 9613-2
Akustik-Gürültü	Yapılarda İçerdeki Sesin Dışarıya İletilmesinde Yapı Akustik Performansının Değerlendirilmesi (L_{eq}, R_w)	TS EN 12354-4

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Akreditasyon Sertifikası Eki (Sayfa 4/4)

Akreditasyon Kapsamı

BATI LABORATUVARI ÇEVRE ÖLÇÜM HİZMETLERİ BİLİŞİM MÜH. MÜŞ. SAN. VE TİC. LTD. ŞTİ.

Akreditasyon No: AB-0946-T
Revizyon No: 02 Tarih: 24.04.2018

Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standardlar, işletme içi metodlar)
Akustik-Gürültü	Odalar Arasında Hava ile Yayışan Sesin Yalıtımına Ait Alan Ölçümleri ile Yapı Elemanlarının Ses Yalıtımının Tespiti	TS ISO 140-4
Titreşim	Binalarda Titreşimin Ölçülmesi ve Yapı Hasarının Tespiti (tr, a,V)	TS ISO 4866
Titreşim	Akışkan Film Yataklı Gaz Türbini Setlerinin Dönmeyen Parçalarında Titreşimin Ölçülmesi ve Değerlendirilmesi (V_{rms})	ISO 10816-4
Titreşim	Hidrolik Güç Kaynakları ve Pompa Tesisatlarındaki Makine Setlerinin Dönmeyen Parçalarında Titreşimin Ölçülmesi ve Değerlendirilmesi (V_{rms})	ISO 10816-5
Titreşim	Madencilik Faaliyetleri Sonucunda Oluşan Hava Şoku ve Yer Titreşiminin Ölçülmesi (a, v)	TS 10354
İmisyon (Çevre Havası)	Askıdaki Tanecikli Maddenin PM10 veya PM2,5 Kütle Derişimlerinin Tayini Gravimetrik Metot	TS EN 12341
İmisyon (Çevre Havası)	Askıdaki Tanecikli Maddenin PM 10 Kesrinin Tayini Gravimetrik Metot	EPA 40 CFR 50 AppJ-M
İmisyon (Çevre Havası)	Çöken Toz Tayini Gravimetrik Metot	TS 2342
Baca Gazı (TSCEN/TS 15675 ve TS EN 15259 Şartlarına uygun)	Sabit Kaynak Emisyonları- Bacalarda Gaz Akışlarının Hız ve Debisinin Ölçülmesi Gaz Akışlarının Hız ve Debisinin Tayini L ve S Tipi Pitot Tüpü ile	TS ISO 10780

KAPSAM SONU

Dr. H. İbrahim ÇETİN
Genel Sekreter

BATI LABORATUVARI

ÇEVRE ÖLÇÜM HİZMETLERİ BİLİŞİM MÜH.SAN. VE TİC. LTD. ŞTİ.

İnönü Mahallesi Batı Bulvarı 1738 Sokak No:1/10 Batıkent /ANKARA

Tel: 0 312 250 84 85 Fax: 0 312 278 48 86

SEGAL ÇEVRE ÖLÇÜM ve ANALİZ LABORATUARI
Aşağı Öveçler Mah. 1322.Cad (eski 6.cad) ÇANKAYA-ANKARA
Tel: 0 312 481 83 00 **Fax:** 0 312 481 83 99
mail: segal@segalanaliz.com
web: www.segalanaliz.com
www.segal.com.tr

DENEY RAPORU / Test Report

Müşterinin Adı/ Adresi Customer Name / Address	TAYAKADIN RÜZGAR ENERJİ SANTRALİ PROJESİ Çerkezköy İSTANBUL
Numuneyi Alan Kurum / Kuruluş Sampler Institution / Company	SEGAL Çevre Ölçüm ve Analiz Laboratuarı (Satılmış DOĞAN)
Numunenin Adı ve Örnekleme Tarihi Name and Sampling Date of the Sample	Toprak N-43495/19 – 31.07.2019
Numunenin Alınış Şekli Receipt of the Sample Shape	Anlık
Numuneyi Teslim Eden Deliverer of the Sample	Satılmış DOĞAN (SEGAL Çevre Ölçüm ve Analiz Laboratuarı personeli)
Proje No Number of the Project	P-21254/19
Numunenin Kabul Tarihi Date of Sample Acceptance	01.08.2019
Numunenin Teslim Koşulları Delivery Conditions of the Sample	Plastik ve cam kap, mühürlü
Açıklamalar Remarks	Proje alanı 1 nolu noktadan alanından alınan toprak numunesinin analizi
Deneyin Yapıldığı Tarih Date of the Test	01.08.2019 – 09.08.2019
Raporun Sayfa Sayısı Number of the Pages of the Report	3 sayfa

Deney laboratuvarı olarak faaliyet gösteren SEGAL Çevre Ölçüm ve Analiz Laboratuarı Müh. Müş. Proje Hizm. San. Tic. Ltd. Şti. TÜRKAK'tan AB-0425-T ile TS EN ISO IEC 17025 standardına göre akredite edilmiştir. SEGAL Çevre Ölçüm ve Analiz Laboratuarı Müh. Müş. Proje Hizm. San. Tic. Ltd. Şti. accredited by TÜRKAK under registration number AB-0425-T for TS EN ISO IEC 17025 as test laboratory"

Türk Akreditasyon Kurumu (TÜRKAK) deney raporlarının tanınırlığı konusunda Avrupa Akreditasyon Birliği (EA) ile Çok Taraflı Anlaşma ve Uluslararası Laboratuvar Akreditasyon Birliği(ILAC) ile karşılıklı tanıma anlaşması imzalamıştır. Turkish Accreditation Agency (TURKAK) is a signatory to the European co-operation for Accreditation (EA) Multilateral Agreement (MLA) and to the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA) for the recognition of test reports

Deney ve/veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve deney/ölçüm metotları takip eden sayfalarda verilmiştir. The test and /or measurements results, the uncertainties with confidence probability and test methods are given on the following pages which are part of this report.

Raporu Hazırlayan
Prepared by
Esra UZEL
Kimyager

Raporu Onaylayan
Confirm by
Fevzi KARAKAYA
Laboratuvar Müdürü

ÇEVRE ÖLÇÜM VE ANALİZ LABORATUARI SEGAL

DENEY RAPORU / Test Report

Numune Adı ve Numune No: Toprak – N-43495/19
Sample Name and Number

Parametre-Birim Parameter-Unit	**Analiz Sonucu** Test Result	**Ölçüm Belirsizliği** Uncertainties	**Analiz Metodu** Test Method
Antimon (mg/ kg)	<1,25	% ± 5,05	EPA 3051 A, EPA 200.7
Arsenik (mg/ kg)	7,25	% ± 5,07	EPA 3051 A, EPA 200.7
Bakır (mg/ kg)	23	% ± 4,70	EPA 3051 A, EPA 200.7
Baryum (mg/ kg)	53,75	% ± 5,63	EPA 3051 A, EPA 200.7
Bor (mg/ kg)	25,75	% ± 8,33	EPA 3051 A, EPA 200.7
Cıva (mg/ kg)	<0,25	% ± 12,54	EPA 3051 A, SM 3112 B
Çinko (mg/ kg)	51	% ± 5,82	EPA 3051 A, EPA 200.7
Kadmiyum (mg/ kg)	<0,25	% ± 6,14	EPA 3051 A, EPA 200.7
Krom (mg/ kg)	46,75	% ± 5,38	EPA 3051 A, EPA 200.7
Kurşun (mg/ kg)	3,25	% ± 6,84	EPA 3051 A, EPA 200.7
Molibden (mg/ kg)	<2,5	% ± 8,83	EPA 3051 A, EPA 200.7
Selenyum (mg/ kg)	<1,25	% ± 7,38	EPA 3051 A, EPA 200.7
Toplam Petrol Hidrokarbonları (mg/kg)	22,8	% ± 9,67	TS EN 14039
TPH Alifatik (C6-C8) (mg/kg)	<10	% ± 11,06	TNRCC 1005, TNRCC 1006
TPH Alifatik (C8-C10) (mg/kg)	<10	% ± 10,15	
TPH Alifatik (C10-C12) (mg/kg)	<10	% ± 10,00	
TPH Alifatik (C12-C16) (mg/kg)	12,6	% ± 12,08	
TPH Alifatik (C16-C21) (mg/kg)	<10	% ± 11,27	
TPH Alifatik (C21-C35) (mg/kg)	<10	% ± 11,38	
TPH Aromatik (C8-C10) (mg/kg)	<10	% ± 11,06	
TPH Aromatik (C10-C12) (mg/kg)	<10	% ± 10,00	
TPH Aromatik (C12-C16) (mg/kg)	<10	% ± 10,26	
TPH Aromatik (C16-C21) (mg/kg)	<10	% ± 11,27	
TPH Aromatik (C21-C35) (mg/kg)	<10	% ± 11,38	
*Toplam Organik Halojenler (mg/kg)	<20	-	EVS EN 16166

*işaretli parametre laboratuarımız kapsamında olmayıp, diğer laboratuara (Artek Mühendislik) yaptırılmıştır.
"Atıksu ve su numunesi TS ISO 5667-10, TS 6291, TS ISO 5667-18, TS ISO 5667-6 ve TS ISO 5667-11 standartlarına göre alınmaktadır."
"Deniz suyu numunesi TS ISO 5667-9 standardına göre alınmaktadır."
"Atık numunesi TS EN ISO 5667-13, TS 12090 standardına göre alınmaktadır."
"Arıtma çamuru ve sediment numunesi TS EN ISO 5667-13, TS 9547 ISO 5667-12, TS 12090 standardına göre, toprak numunesi TS 9923 standardına göre alınmaktadır."
"Atıkyağ numunesi TS 900-1 EN ISO 3170, TS 900-2 EN ISO 3171 ve TS EN 60475 standardına göre alınmaktadır."
Laboratuar, yetkili personeli tarafından alınmayan ve/veya uygun koşullarda gelmeyen numunelerden, teknik ve hukuki olarak sorumluluk kabul etmemektedir.

"Numuneler, TS EN ISO 5667-3 Su Kalitesi-Numune Alma-Bölüm 3: Numunelerin Muhafaza ve Taşıma Kuralları" çerçevesinde saklanır. Bu süre içerisinde kimyasal, mikrobiyolojik ve fiziksel açıdan bozulan veya tehlike arz eden numuneler, numune saklama süresinin bitimi beklemeden imha edilir.

Çevre Koşulları:

Hava Durumu	X	Açık	Yağış		Var	Hava Sıcaklığı 28 °C	Koordinat	E	594806
		Kapalı		X	Yok			N	4580874

Görüş ve Yorumlar:

Mühür
İmza

SEGAL ÇEVRE ÖLÇÜM ve ANALİZ LABORATUARI
Aşağı Öveçler Mah. 1322.Cad (eski 6.cad) ÇANKAYA-ANKARA
Tel: 0 312 481 83 00 **Fax:** 0 312 481 83 99
mail: segal@segalanaliz.com
web: www.segalanaliz.com
www.segal.com.tr

DENEY RAPORU / Test Report

Müşterinin Adı/ Adresi Customer Name / Address	TAYAKADIN RÜZGAR ENERJİ SANTRALİ PROJESİ Çerkezköy İSTANBUL
Numuneyi Alan Kurum / Kuruluş Sampler Institution / Company	SEGAL Çevre Ölçüm ve Analiz Laboratuarı (Satılmış DOĞAN)
Numunenin Adı ve Örnekleme Tarihi Name and Sampling Date of the Sample	Toprak N-43496/19 – 31.07.2019
Numunenin Alınış Şekli Receipt of the Sample Shape	Anlık
Numuneyi Teslim Eden Deliverer of the Sample	Satılmış DOĞAN (SEGAL Çevre Ölçüm ve Analiz Laboratuarı personeli)
Proje No Number of the Project	P-21254/19
Numunenin Kabul Tarihi Date of Sample Acceptance	01.08.2019
Numunenin Teslim Koşulları Delivery Conditions of the Sample	Plastik ve cam kap, mühürlü
Açıklamalar Remarks	Proje alanı 2 nolu noktadan alanından alınan toprak numunesinin analizi
Deneyin Yapıldığı Tarih Date of the Test	01.08.2019 – 09.08.2019
Raporun Sayfa Sayısı Number of the Pages of the Report	3 sayfa

Deney laboratuvarı olarak faaliyet gösteren SEGAL Çevre Ölçüm ve Analiz Laboratuarı Müh. Müş. Proje Hizm. San. Tic. Ltd. Şti. TÜRKAK'tan AB-0425-T ile TS EN ISO IEC 17025 standardına göre akredite edilmiştir. SEGAL Çevre Ölçüm ve Analiz Laboratuarı Müh. Müş. Proje Hizm. San. Tic. Ltd. Şti. accredited by TÜRKAK under registration number AB-0425-T for TS EN ISO IEC 17025 as test laboratory"

Türk Akreditasyon Kurumu (TÜRKAK) deney raporlarının tanınırlığı konusunda Avrupa Akreditasyon Birliği (EA) ile Çok Taraflı Anlaşma ve Uluslararası Laboratuvar Akreditasyon Birliği(ILAC) ile karşılıklı tanıma anlaşması imzalamıştır. Turkish Accreditation Agency (TURKAK) is a signatory to the European co-operation for Accreditation (EA) Multilateral Agreement (MLA) and to the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA) for the recognition of test reports

Deney ve/veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve deney/ölçüm metotları takip eden sayfalarda verilmiştir. The test and /or measurements results, the uncertainties with confidence probability and test methods are given on the following pages which are part of this report.

Raporu Hazırlayan
Prepared by
Esra UZEL
Kimyager

Raporu Onaylayan
Confirm by
Fevzi KARAKAYA
Laboratuvar Müdürü

ÇEVRE ÖLÇÜM VE ANALİZ LABORATUARI SEGAL

DENEY RAPORU / Test Report

Numune Adı ve Numune No: Toprak – N-43496/19
Sample Name and Number

Parametre-Birim Parameter-Unit	**Analiz Sonucu** Test Result	**Ölçüm Belirsizliği** Uncertainties	**Analiz Metodu** Test Method
Antimon (mg/ kg)	<1,25	% ± 5,05	EPA 3051 A, EPA 200.7
Arsenik (mg/ kg)	3,5	% ± 5,07	EPA 3051 A, EPA 200.7
Bakır (mg/ kg)	4,8	% ± 4,70	EPA 3051 A, EPA 200.7
Baryum (mg/ kg)	30	% ± 5,63	EPA 3051 A, EPA 200.7
Bor (mg/ kg)	11,75	% ± 8,33	EPA 3051 A, EPA 200.7
Cıva (mg/ kg)	<0,25	% ± 12,54	EPA 3051 A, SM 3112 B
Çinko (mg/ kg)	31,75	% ± 5,82	EPA 3051 A, EPA 200.7
Kadmiyum (mg/ kg)	<0,25	% ± 6,14	EPA 3051 A, EPA 200.7
Krom (mg/ kg)	25,25	% ± 5,38	EPA 3051 A, EPA 200.7
Kurşun (mg/ kg)	11	% ± 6,84	EPA 3051 A, EPA 200.7
Molibden (mg/ kg)	<2,5	% ± 8,83	EPA 3051 A, EPA 200.7
Selenyum (mg/ kg)	<1,25	% ± 7,38	EPA 3051 A, EPA 200.7
Toplam Petrol Hidrokarbonları (mg/kg)	<10	% ± 9,67	TS EN 14039
TPH Alifatik (C6-C8) (mg/kg)	<10	% ± 11,06	TNRCC 1005, TNRCC 1006
TPH Alifatik (C8-C10) (mg/kg)	<10	% ± 10,15	
TPH Alifatik (C10-C12) (mg/kg)	<10	% ± 10,00	
TPH Alifatik (C12-C16) (mg/kg)	<10	% ± 12,08	
TPH Alifatik (C16-C21) (mg/kg)	<10	% ± 11,27	
TPH Alifatik (C21-C35) (mg/kg)	<10	% ± 11,38	
TPH Aromatik (C8-C10) (mg/kg)	<10	% ± 11,06	
TPH Aromatik (C10-C12) (mg/kg)	<10	% ± 10,00	
TPH Aromatik (C12-C16) (mg/kg)	<10	% ± 10,26	
TPH Aromatik (C16-C21) (mg/kg)	<10	% ± 11,27	
TPH Aromatik (C21-C35) (mg/kg)	<10	% ± 11,38	
*Toplam Organik Halojenler (mg/kg)	31,13	-	EVS EN 16166

*işaretli parametre laboratuarımız kapsamında olmayıp, diğer laboratuara (Artek Mühendislik) yaptırılmıştır.
"Atıksu ve su numunesi TS ISO 5667-10, TS 6291, TS ISO 5667-18, TS ISO 5667-6 ve TS ISO 5667-11 standartlarına göre alınmaktadır."
"Deniz suyu numunesi TS ISO 5667-9 standardına göre alınmaktadır."
"Atık numunesi TS EN ISO 5667-13, TS 12090 standardına göre alınmaktadır."
"Arıtma çamuru ve sediment numunesi TS EN ISO 5667-13, TS 9547 ISO 5667-12, TS 12090 standardına göre, toprak numunesi TS 9923 standardına göre alınmaktadır."
"Atıkyağ numunesi TS 900-1 EN ISO 3170, TS 900-2 EN ISO 3171 ve TS EN 60475 standardına göre alınmaktadır."
Laboratuar, yetkili personeli tarafından alınmayan ve/veya uygun koşullarda gelmeyen numunelerden, teknik ve hukuki olarak sorumluluk kabul etmemektedir.

"Numuneler, TS EN ISO 5667-3 Su Kalitesi-Numune Alma-Bölüm 3: Numunelerin Muhafaza ve Taşıma Kuralları" çerçevesinde saklanır. Bu süre içerisinde kimyasal, mikrobiyolojik ve fiziksel açıdan bozulan veya tehlike arz eden numuneler, numune saklama süresinin bitimi beklemeden imha edilir.

Çevre Koşulları:

Hava Durumu	X	Açık	Yağış		Var	Hava Sıcaklığı 28 °C	Koordinat	E	597113
		Kapalı		X	Yok			N	4579222

Görüş ve Yorumlar:

Mühür
İmza

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mail: segal@segalanaliz.com
web: www.segalanaliz.com
www.segal.com.tr

DENEY RAPORU / Test Report

Müşterinin Adı/ Adresi Customer Name / Address	TAYAKADIN RÜZGAR ENERJİ SANTRALİ PROJESİ Çerkezköy İSTANBUL
Numuneyi Alan Kurum / Kuruluş Sampler Institution / Company	SEGAL Çevre Ölçüm ve Analiz Laboratuarı (Satılmış DOĞAN)
Numunenin Adı ve Örnekleme Tarihi Name and Sampling Date of the Sample	Toprak N-43497/19 – 31.07.2019
Numunenin Alınış Şekli Receipt of the Sample Shape	Anlık
Numuneyi Teslim Eden Deliverer of the Sample	Satılmış DOĞAN (SEGAL Çevre Ölçüm ve Analiz Laboratuarı personeli)
Proje No Number of the Project	P-21254/19
Numunenin Kabul Tarihi Date of Sample Acceptance	01.08.2019
Numunenin Teslim Koşulları Delivery Conditions of the Sample	Plastik ve cam kap, mühürlü
Açıklamalar Remarks	Proje alanı 3 nolu noktadan alanından alınan toprak numunesinin analizi
Deneyin Yapıldığı Tarih Date of the Test	01.08.2019 – 09.08.2019
Raporun Sayfa Sayısı Number of the Pages of the Report	3 sayfa

Deney laboratuvarı olarak faaliyet gösteren SEGAL Çevre Ölçüm ve Analiz Laboratuarı Müh. Müş. Proje Hizm. San. Tic. Ltd. Şti. TÜRKAK'tan AB-0425-T ile TS EN ISO IEC 17025 standardına göre akredite edilmiştir. SEGAL Çevre Ölçüm ve Analiz Laboratuarı Müh. Müş. Proje Hizm. San. Tic. Ltd. Şti. accredited by TÜRKAK under registration number AB-0425-T for TS EN ISO IEC 17025 as test laboratory"

Türk Akreditasyon Kurumu (TÜRKAK) deney raporlarının tanınırlığı konusunda Avrupa Akreditasyon Birliği (EA) ile Çok Taraflı Anlaşma ve Uluslararası Laboratuvar Akreditasyon Birliği(ILAC) ile karşılıklı tanıma anlaşması imzalamıştır. Turkish Accreditation Agency (TURKAK) is a signatory to the European co-operation for Accreditation (EA) Multilateral Agreement (MLA) and to the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA) for the recognition of test reports

Deney ve/veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve deney/ölçüm metotları takip eden sayfalarda verilmiştir. The test and /or measurements results, the uncertainties with confidence probability and test methods are given on the following pages which are part of this report.

Raporu Hazırlayan
Prepared by

Esra UZEL
Kimyager

Raporu Onaylayan
Confirm by

Fevzi KARAKAYA
Laboratuvar Müdürü

ÇEVRE ÖLÇÜM VE ANALİZ LABORATUARI SEGAL

DENEY RAPORU / Test Report

Numune Adı ve Numune No: Toprak – N-43497/19
Sample Name and Number

Parametre-Birim Parameter-Unit	**Analiz Sonucu** Test Result	**Ölçüm Belirsizliği** Uncertainties	**Analiz Metodu** Test Method
Antimon (mg/ kg)	<1,25	% ± 5,05	EPA 3051 A, EPA 200.7
Arsenik (mg/ kg)	<1,25	% ± 5,07	EPA 3051 A, EPA 200.7
Bakır (mg/ kg)	2,8	% ± 4,70	EPA 3051 A, EPA 200.7
Baryum (mg/ kg)	59,5	% ± 5,63	EPA 3051 A, EPA 200.7
Bor (mg/ kg)	3,25	% ± 8,33	EPA 3051 A, EPA 200.7
Cıva (mg/ kg)	<0,25	% ± 12,54	EPA 3051 A, SM 3112 B
Çinko (mg/ kg)	12,68	% ± 5,82	EPA 3051 A, EPA 200.7
Kadmiyum (mg/ kg)	<0,25	% ± 6,14	EPA 3051 A, EPA 200.7
Krom (mg/ kg)	7,5	% ± 5,38	EPA 3051 A, EPA 200.7
Kurşun (mg/ kg)	8,0	% ± 6,84	EPA 3051 A, EPA 200.7
Molibden (mg/ kg)	<2,5	% ± 8,83	EPA 3051 A, EPA 200.7
Selenyum (mg/ kg)	<1,25	% ± 7,38	EPA 3051 A, EPA 200.7
Toplam Petrol Hidrokarbonları (mg/kg)	13	% ± 9,67	TS EN 14039
TPH Alifatik (C6-C8) (mg/kg)	<10	% ± 11,06	TNRCC 1005, TNRCC 1006
TPH Alifatik (C8-C10) (mg/kg)	<10	% ± 10,15	
TPH Alifatik (C10-C12) (mg/kg)	<10	% ± 10,00	
TPH Alifatik (C12-C16) (mg/kg)	<10	% ± 12,08	
TPH Alifatik (C16-C21) (mg/kg)	<10	% ± 11,27	
TPH Alifatik (C21-C35) (mg/kg)	<10	% ± 11,38	
TPH Aromatik (C8-C10) (mg/kg)	<10	% ± 11,06	
TPH Aromatik (C10-C12) (mg/kg)	<10	% ± 10,00	
TPH Aromatik (C12-C16) (mg/kg)	<10	% ± 10,26	
TPH Aromatik (C16-C21) (mg/kg)	<10	% ± 11,27	
TPH Aromatik (C21-C35) (mg/kg)	<10	% ± 11,38	
*Toplam Organik Halojenler (mg/kg)	<20	-	EVS EN 16166

*işaretli parametre laboratuarımız kapsamında olmayıp, diğer laboratuara (Artek Mühendislik) yaptırılmıştır.
"Atıksu ve su numunesi TS ISO 5667-10, TS 6291, TS ISO 5667-18, TS ISO 5667-6 ve TS ISO 5667-11 standartlarına göre alınmaktadır."
"Deniz suyu numunesi TS ISO 5667-9 standardına göre alınmaktadır."
"Atık numunesi TS EN ISO 5667-13, TS 12090 standardına göre alınmaktadır."
"Arıtma çamuru ve sediment numunesi TS EN ISO 5667-13, TS 9547 ISO 5667-12, TS 12090 standardına göre, toprak numunesi TS 9923 standardına göre alınmaktadır."
"Atıkyağ numunesi TS 900-1 EN ISO 3170, TS 900-2 EN ISO 3171 ve TS EN 60475 standardına göre alınmaktadır."
Laboratuar, yetkili personeli tarafından alınmayan ve/veya uygun koşullarda gelmeyen numunelerden, teknik ve hukuki olarak sorumluluk kabul etmemektedir.

"Numuneler, TS EN ISO 5667-3 Su Kalitesi-Numune Alma-Bölüm 3: Numunelerin Muhafaza ve Taşıma Kuralları" çerçevesinde saklanır. Bu süre içerisinde kimyasal, mikrobiyolojik ve fiziksel açıdan bozulan veya tehlike arz eden numuneler, numune saklama süresinin bitimi beklemeden imha edilir.

Çevre Koşulları:

Hava Durumu	X	Açık	Yağış		Var	Hava Sıcaklığı 28 °C	Koordinat	E	598768
		Kapalı		X	Yok			N	4579695

Görüş ve Yorumlar:

Mühür
İmza

APPENDIX G
ZVI, Noise and Shadow Flicker Model Results

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TR-06550 Ankara
+90 312 441 0031
Caner Sahin / csahin@golder.com

DECIBEL - Detailed results

Noise calculation model: ISO 9613-2 United Kingdom

Assumptions

Calculated L(DW) = LWA,ref + K + Dc - (Adiv + Aatm + Agr + Abar + Amisc) - Cmet + Cvalley - Cscreen
(when calculated with ground attenuation, then Dc = Domega)

LWA,ref:	Sound pressure level at WTG
K:	Pure tone
Dc:	Directivity correction
Adiv:	the attenuation due to geometrical divergence
Aatm:	the attenuation due to atmospheric absorption
Agr:	the attenuation due to ground effect
Abar:	the attenuation due to a barrier
Amisc:	the attenuation due to miscellaneous other effects
Cmet:	Meteorological correction
Cvalley:	Valley effect
Cscreen:	Topographic screening

Calculation Results

Noise sensitive area: A Noise sensitive point: User defined (1)

WTG — Wind speed: 4,0 m/s

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	3.401	3.403	13,88	101,3	0,00	81,64	-	-	0,00	0,00	-
2	3.232	3.235	14,55	101,3	0,00	81,20	-	-	0,00	0,00	-
3	4.577	4.579	10,30	101,3	0,00	84,22	-	-	0,00	0,00	-
4	3.321	3.324	14,19	101,3	0,00	81,43	-	-	0,00	0,00	-
5	2.889	2.892	16,00	101,3	0,00	80,22	-	-	0,00	0,00	-
6	2.589	2.592	17,40	101,3	0,00	79,27	-	-	0,00	0,00	-
7	3.941	3.944	12,13	101,3	0,00	82,92	-	-	0,00	0,00	-
8	2.703	2.705	16,86	101,3	0,00	79,64	-	-	0,00	0,00	-
9	4.684	4.686	10,02	101,3	0,00	84,42	-	-	0,00	0,00	-
10	5.052	5.054	9,06	101,3	0,00	85,07	-	-	0,00	0,00	-
11	4.988	4.990	9,22	101,3	0,00	84,96	-	-	0,00	0,00	-
12	5.251	5.253	8,57	101,3	0,00	85,41	-	-	0,00	0,00	-
13	4.563	4.565	10,34	101,3	0,00	84,19	-	-	0,00	0,00	-
14	4.824	4.827	9,64	101,3	0,00	84,67	-	-	0,00	0,00	-
15	5.260	5.262	8,55	101,3	0,00	85,42	-	-	0,00	0,00	-

Sum 24,92

- Data undefined due to calculation with octave data

Noise sensitive area: B Noise sensitive point: User defined (2)

WTG — Wind speed: 4,0 m/s

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]	Cscreen [dB]
1	5.857	5.858	5,17	101,3	0,00	86,36	-	-	0,00	0,00	-	2,0
2	5.261	5.263	6,55	101,3	0,00	85,42	-	-	0,00	0,00	-	2,0
3	5.350	5.352	6,33	101,3	0,00	85,57	-	-	0,00	0,00	-	2,0
4	4.726	4.729	7,90	101,3	0,00	84,49	-	-	0,00	0,00	-	2,0
5	5.400	5.402	6,21	101,3	0,00	85,65	-	-	0,00	0,00	-	2,0
6	4.968	4.970	7,28	101,3	0,00	84,93	-	-	0,00	0,00	-	2,0
7	5.032	5.034	7,11	101,3	0,00	85,04	-	-	0,00	0,00	-	2,0
8	4.476	4.477	8,58	101,3	0,00	84,02	-	-	0,00	0,00	-	2,0
9	2.336	2.341	18,68	101,3	0,00	78,39	-	-	0,00	0,00	-	0,0
10	2.053	2.058	20,26	101,3	0,00	77,27	-	-	0,00	0,00	-	0,0
11	3.163	3.166	14,83	101,3	0,00	81,01	-	-	0,00	0,00	-	0,0
12	2.630	2.634	17,20	101,3	0,00	79,41	-	-	0,00	0,00	-	0,0
13	1.531	1.538	23,72	101,3	0,00	74,74	-	-	0,00	0,00	-	0,0
14	1.139	1.148	27,03	101,3	0,00	72,20	-	-	0,00	0,00	-	0,0
15	1.074	1.084	27,67	101,3	0,00	71,70	-	-	0,00	0,00	-	0,0

Sum 32,12

- Data undefined due to calculation with octave data

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TR-06550 Ankara
+90 312 441 0031
Caner Sahin / csahin@golder.com
Calculated:
03.09.2019 10:42/3.2.744

DECIBEL - Detailed results

Noise calculation model: ISO 9613-2 United Kingdom

Noise sensitive area: C Noise sensitive point: User defined (3)

WTG Wind speed: 4,0 m/s

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]	Cscreen [dB]
1	7.305	7.307	2,27	101,3	0,00	88,27	-	-	0,00	0,00	-	2,0
2	6.704	6.706	3,40	101,3	0,00	87,53	-	-	0,00	0,00	-	2,0
3	6.311	6.313	4,19	101,3	0,00	87,01	-	-	0,00	0,00	-	2,0
4	6.112	6.114	4,61	101,3	0,00	86,73	-	-	0,00	0,00	-	2,0
5	6.960	6.962	2,91	101,3	0,00	87,85	-	-	0,00	0,00	-	2,0
6	6.594	6.595	3,62	101,3	0,00	87,38	-	-	0,00	0,00	-	2,0
7	6.209	6.211	4,41	101,3	0,00	86,86	-	-	0,00	0,00	-	2,0
8	6.067	6.069	4,71	101,3	0,00	86,66	-	-	0,00	0,00	-	2,0
9	3.239	3.242	12,52	101,3	0,00	81,22	-	-	0,00	0,00	-	2,0
10	2.740	2.744	14,68	101,3	0,00	79,77	-	-	0,00	0,00	-	2,0
11	3.762	3.765	10,68	101,3	0,00	82,52	-	-	0,00	0,00	-	2,0
12	3.065	3.069	13,23	101,3	0,00	80,74	-	-	0,00	0,00	-	2,0
13	2.836	2.840	14,24	101,3	0,00	80,07	-	-	0,00	0,00	-	2,0
14	2.461	2.466	18,03	101,3	0,00	78,84	-	-	0,00	0,00	-	0,0
15	2.012	2.018	20,50	101,3	0,00	77,10	-	-	0,00	0,00	-	0,0

Sum 24,79

- Data undefined due to calculation with octave data

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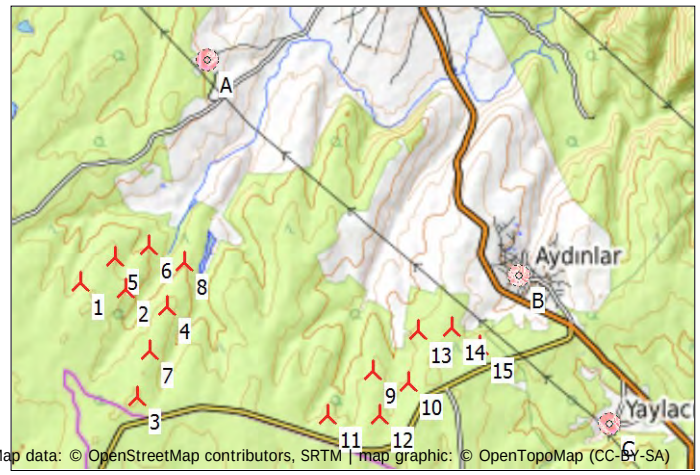
03.09.2019 10:42/3.2.744

DECIBEL - Main Result

Noise propagation model:
ISO 9613-2 United Kingdom
Wind speed:
4,0 m/s - 12,0 m/s, step 1,0 m/s
Ground attenuation:
General, Ground factor: 0,5
Valley effect, Penalty: 3,0 dB
Topographic screening, Reduction: 2,0 dB
Type of demand in calculation:
WTG noise is compared to ambient noise plus 5dB margin with the option of a floor setting (e.g. 35dB)
Noise values in calculation:
All noise values are 90% exeedence values (L90) designed to show compliance with ETSU-R-97 limits
Pure tones:
Fixed penalty added to source noise of WTGs with pure tones
WTG catalogue
Calculation height above ground level:
4,0 m
Octave band data required

All coordinates are in
UTM (north)-WGS84 Zone: 35



Map data: © OpenStreetMap contributors, SRTM | map graphic: © OpenTopoMap (CC-BY-SA)

Scale 1:100.000

New WTG Noise sensitive area

WTGs

	Easting	Northing	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Noise data Creator	Name	First wind speed	LwaRef	Last wind speed	LwaRef	Pure tones	
			[m]					[kW]	[m]	[m]			[m/s]	[dB(A)]	[m/s]	[dB(A)]		
1	594.860	4.580.880	227,2	GE WIND ENERGY 3.4-1...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	USER	Runtime input	4,0	103,3	12,0	111,3	No	a
2	595.459	4.580.796	219,6	GE WIND ENERGY 3.4-1...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	USER	Runtime input	4,0	103,3	12,0	111,3	No	a
3	595.637	4.579.359	240,8	GE WIND ENERGY 3.4-1...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	USER	Runtime input	4,0	103,3	12,0	111,3	No	a
4	596.012	4.580.568	225,7	GE WIND ENERGY 3.4-1...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	USER	Runtime input	4,0	103,3	12,0	111,3	No	a
5	595.317	4.581.222	221,9	GE WIND ENERGY 3.4-1...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	USER	Runtime input	4,0	103,3	12,0	111,3	No	a
6	595.757	4.581.375	198,2	GE WIND ENERGY 3.4-1...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	USER	Runtime input	4,0	103,3	12,0	111,3	No	a
7	595.797	4.579.976	231,4	GE WIND ENERGY 3.4-1...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	USER	Runtime input	4,0	103,3	12,0	111,3	No	a
8	596.240	4.581.162	199,0	GE WIND ENERGY 3.4-1...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	USER	Runtime input	4,0	103,3	12,0	111,3	No	a
9	598.771	4.579.747	224,2	GE WIND ENERGY 3.4-1...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	USER	Runtime input	4,0	103,3	12,0	111,3	No	a
10	599.251	4.579.604	222,9	GE WIND ENERGY 3.4-1...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	USER	Runtime input	4,0	103,3	12,0	111,3	No	a
11	598.181	4.579.150	229,0	GE WIND ENERGY 3.4-1...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	USER	Runtime input	4,0	103,3	12,0	111,3	No	a
12	598.878	4.579.162	230,7	GE WIND ENERGY 3.4-1...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	USER	Runtime input	4,0	103,3	12,0	111,3	No	a
13	599.377	4.580.298	223,7	GE WIND ENERGY 3.4-1...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	USER	Runtime input	4,0	103,3	12,0	111,3	No	a
14	599.821	4.580.338	230,3	GE WIND ENERGY 3.4-1...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	USER	Runtime input	4,0	103,3	12,0	111,3	No	a
15	600.202	4.580.100	228,9	GE WIND ENERGY 3.4-1...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	USER	Runtime input	4,0	103,3	12,0	111,3	No	a

a) Generic data based on turbine power (very uncertain)

Calculation Results

Sound level

Noise sensitive area					Predicted sound level	
No.	Name	Easting	Northing	Z [m]	Imission height [m]	WTG noise [dB(A)]	Max exceedence [dB(A)]
A	Noise sensitive point: User defined (1)	596.514	4.583.851	193,5	4,0	24,9	---
B	Noise sensitive point: User defined (2)	600.714	4.581.044	189,9	4,0	32,1	---
C	Noise sensitive point: User defined (3)	601.942	4.579.090	176,9	4,0	24,8	---

Distances (m)

WTG	A	B	C
1	3401	5857	7305
2	3232	5261	6704
3	4577	5350	6311
4	3321	4726	6112
5	2889	5400	6960
6	2589	4968	6594
7	3941	5032	6209
8	2703	4476	6067
9	4684	2336	3239
10	5052	2053	2740
11	4988	3163	3762

To be continued on next page...

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DECIBEL - Main Result

...continued from previous page

WTG	A	B	C
12	5251	2630	3065
13	4563	1531	2836
14	4824	1139	2461
15	5260	1074	2012

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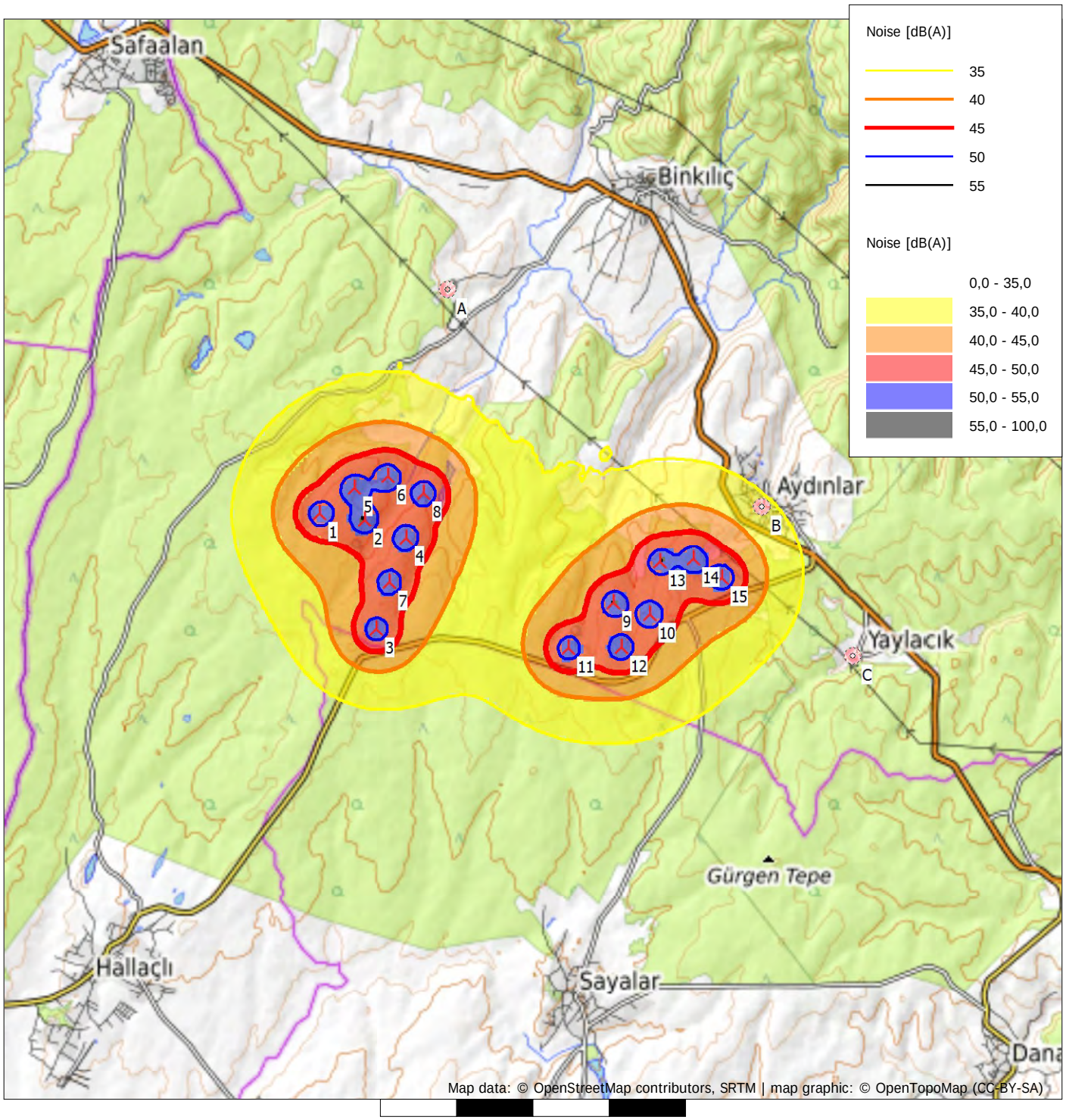
DECIBEL - Map 8,0 m/s



Map: OpenTopoMap.org , Print scale 1:75.000, Map center UTM (north)-WGS84 Zone: 35 East: 597.531 North: 4.580.262

New WTG

Noise sensitive area

Noise calculation model: ISO 9613-2 United Kingdom. Wind speed: 8,0 m/s
Height above sea level from active line object

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SHADOW - Main Result

Assumptions for shadow calculations

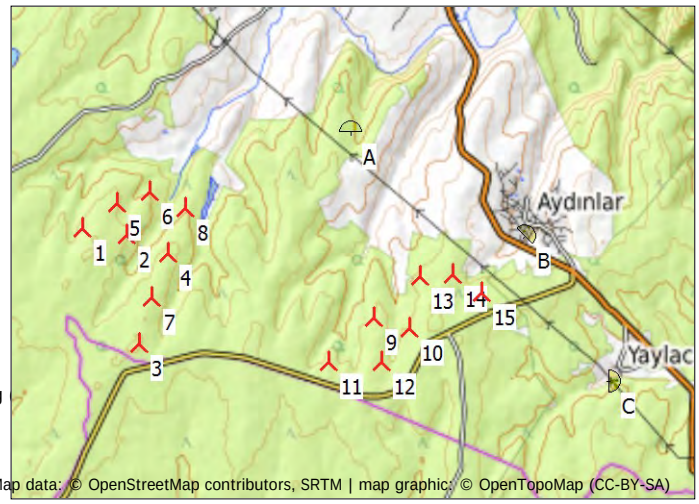
Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Elevation Grid Data Object: TayakadinShadow_EMDGrid_1.wpg
Obstacles used in calculation
Eye height for map: 1,5 m
Grid resolution: 1,0 m

All coordinates are in
UTM (north)-WGS84 Zone: 35



Scale 1:100.000
New WTG
Shadow receptor

WTGs

	Easting	Northing	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
1	594.860	4.580.880	227,2	GE WIND ENERGY 3.4-130 3430 130.0 !-! hu...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	2.500	0,0
2	595.459	4.580.796	219,6	GE WIND ENERGY 3.4-130 3430 130.0 !-! hu...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	2.500	0,0
3	595.637	4.579.359	240,8	GE WIND ENERGY 3.4-130 3430 130.0 !-! hu...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	2.500	0,0
4	596.012	4.580.568	225,7	GE WIND ENERGY 3.4-130 3430 130.0 !-! hu...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	2.500	0,0
5	595.317	4.581.222	221,9	GE WIND ENERGY 3.4-130 3430 130.0 !-! hu...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	2.500	0,0
6	595.757	4.581.375	198,2	GE WIND ENERGY 3.4-130 3430 130.0 !-! hu...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	2.500	0,0
7	595.797	4.579.976	231,4	GE WIND ENERGY 3.4-130 3430 130.0 !-! hu...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	2.500	0,0
8	596.240	4.581.162	199,0	GE WIND ENERGY 3.4-130 3430 130.0 !-! hu...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	2.500	0,0
9	598.771	4.579.747	224,2	GE WIND ENERGY 3.4-130 3430 130.0 !-! hu...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	2.500	0,0
10	599.251	4.579.604	222,9	GE WIND ENERGY 3.4-130 3430 130.0 !-! hu...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	2.500	0,0
11	598.181	4.579.150	229,0	GE WIND ENERGY 3.4-130 3430 130.0 !-! hu...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	2.500	0,0
12	598.878	4.579.162	230,7	GE WIND ENERGY 3.4-130 3430 130.0 !-! hu...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	2.500	0,0
13	599.377	4.580.298	223,7	GE WIND ENERGY 3.4-130 3430 130.0 !-! hu...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	2.500	0,0
14	599.821	4.580.338	230,3	GE WIND ENERGY 3.4-130 3430 130.0 !-! hu...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	2.500	0,0
15	600.202	4.580.100	228,9	GE WIND ENERGY 3.4-130 3430 130.0 !-! hu...	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	2.500	0,0

Shadow receptor-Input

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Degrees from south cw	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]	[°]		[m]
A	598.428	4.582.202	203,8	1,0	1,0	1,0	0,0	90,0	Fixed direction	2,0
B	600.765	4.580.863	196,6	1,0	1,0	1,0	45,0	90,0	Fixed direction	2,0
C	601.922	4.578.938	188,9	1,0	1,0	1,0	90,0	90,0	Fixed direction	2,0

Calculation Results

Shadow receptor

Shadow, worst case

No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
A	0:00	0	0:00
B	27:18	79	0:40
C	0:00	0	0:00

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03.09.2019 10:03/3.2.744

SHADOW - Main Result

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]
1	GE WIND ENERGY 3.4-130 3430 130.0 !-! hub: 110,0 m (TOT: 175,0 m) (1)	0:00
2	GE WIND ENERGY 3.4-130 3430 130.0 !-! hub: 110,0 m (TOT: 175,0 m) (2)	0:00
3	GE WIND ENERGY 3.4-130 3430 130.0 !-! hub: 110,0 m (TOT: 175,0 m) (3)	0:00
4	GE WIND ENERGY 3.4-130 3430 130.0 !-! hub: 110,0 m (TOT: 175,0 m) (4)	0:00
5	GE WIND ENERGY 3.4-130 3430 130.0 !-! hub: 110,0 m (TOT: 175,0 m) (5)	0:00
6	GE WIND ENERGY 3.4-130 3430 130.0 !-! hub: 110,0 m (TOT: 175,0 m) (6)	0:00
7	GE WIND ENERGY 3.4-130 3430 130.0 !-! hub: 110,0 m (TOT: 175,0 m) (7)	0:00
8	GE WIND ENERGY 3.4-130 3430 130.0 !-! hub: 110,0 m (TOT: 175,0 m) (8)	0:00
9	GE WIND ENERGY 3.4-130 3430 130.0 !-! hub: 110,0 m (TOT: 175,0 m) (9)	2:44
10	GE WIND ENERGY 3.4-130 3430 130.0 !-! hub: 110,0 m (TOT: 175,0 m) (10)	1:08
11	GE WIND ENERGY 3.4-130 3430 130.0 !-! hub: 110,0 m (TOT: 175,0 m) (11)	0:00
12	GE WIND ENERGY 3.4-130 3430 130.0 !-! hub: 110,0 m (TOT: 175,0 m) (12)	0:00
13	GE WIND ENERGY 3.4-130 3430 130.0 !-! hub: 110,0 m (TOT: 175,0 m) (13)	7:28
14	GE WIND ENERGY 3.4-130 3430 130.0 !-! hub: 110,0 m (TOT: 175,0 m) (14)	16:53
15	GE WIND ENERGY 3.4-130 3430 130.0 !-! hub: 110,0 m (TOT: 175,0 m) (15)	0:00

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

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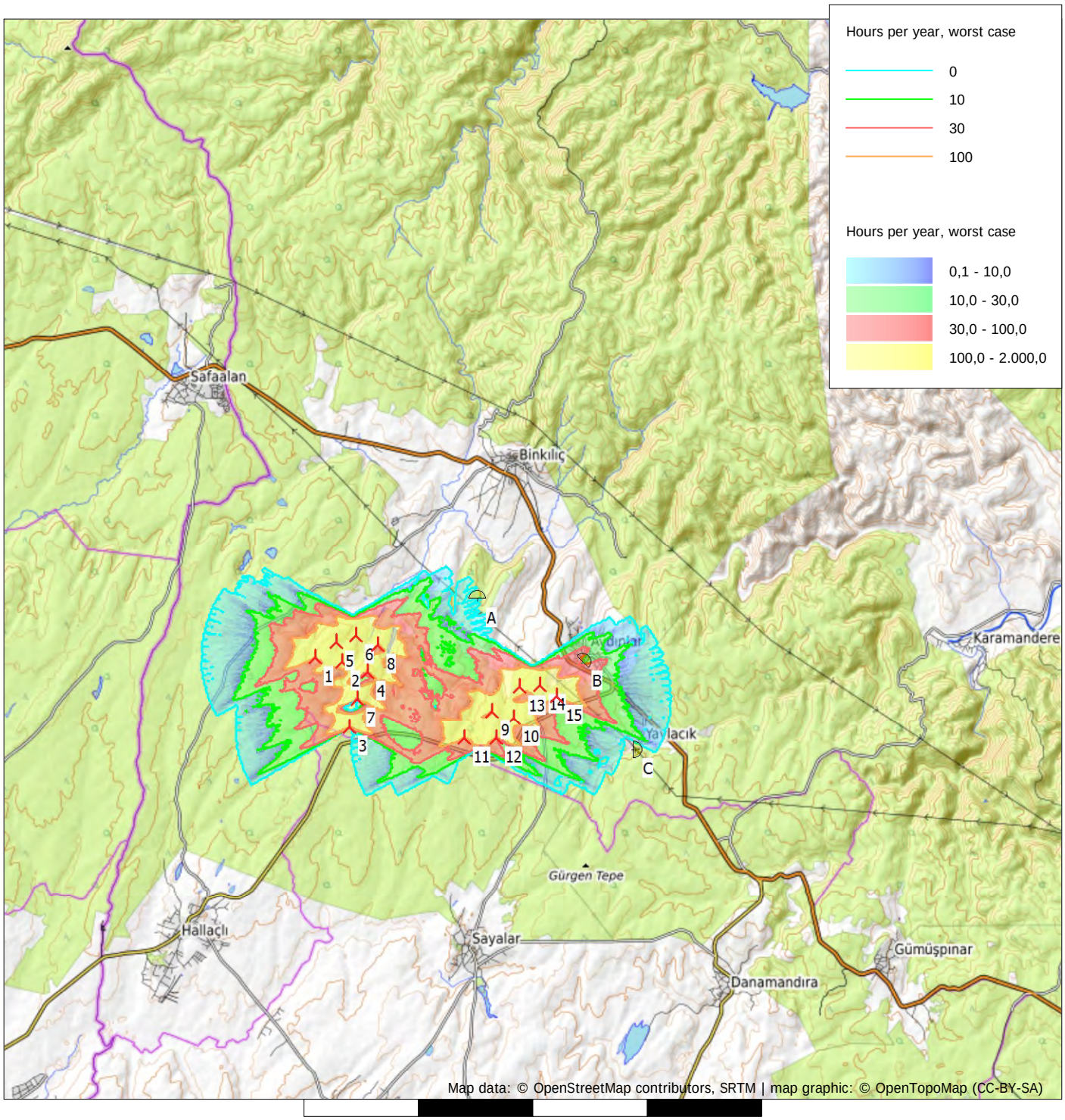
SHADOW - Map



Map: OpenTopoMap.org , Print scale 1:125.000, Map center UTM (north)-WGS84 Zone: 35 East: 599.370 North: 4.583.010

New WTG

Shadow receptor

Flicker map level: Elevation Grid Data Object: TayakadinShadow_EMDGrid_1.wpg (2)

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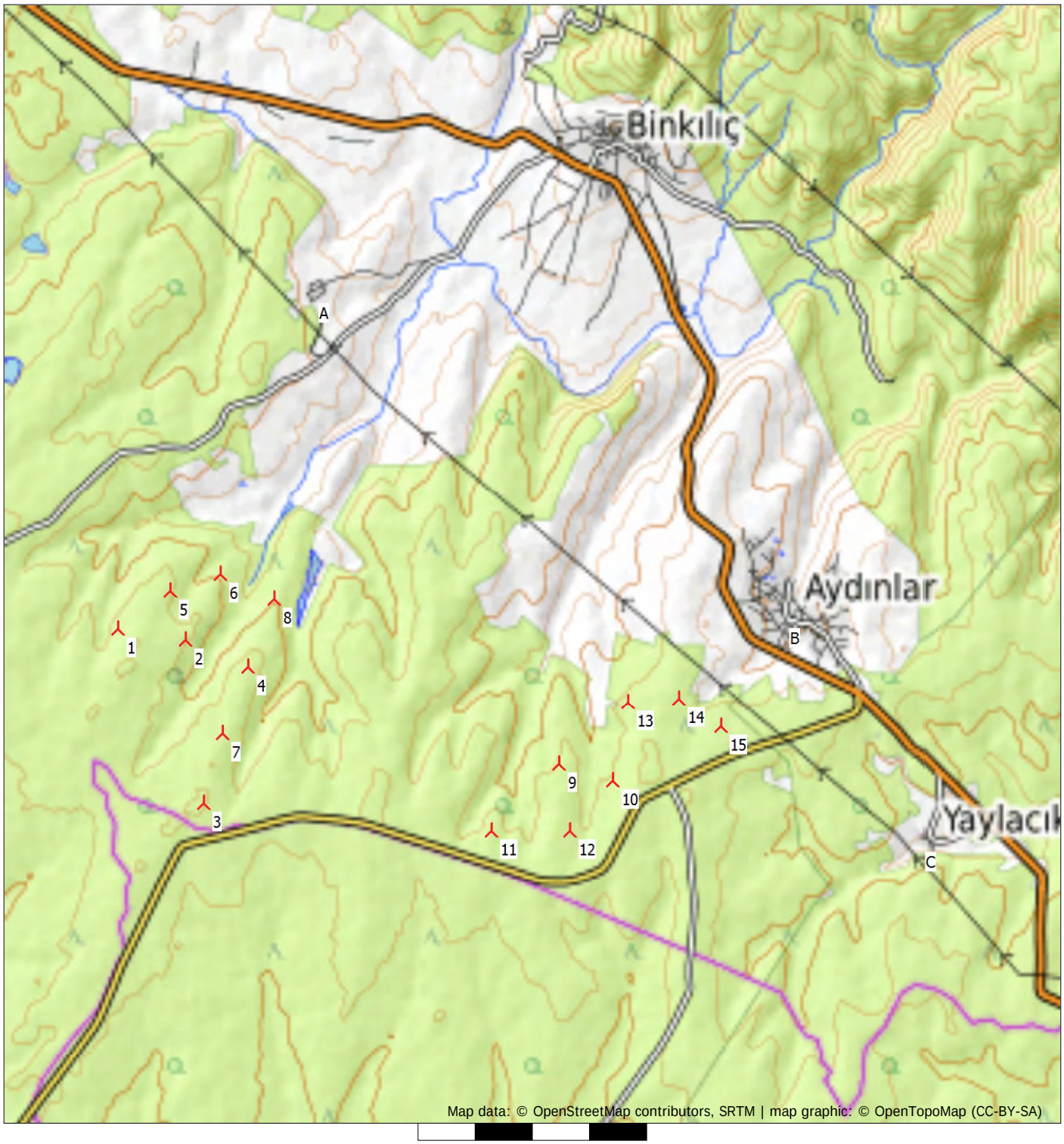
ZVI - Map



Map: OpenTopoMap.org , Print scale 1:50.000, Map center UTM (north)-WGS84 Zone: 35 East: 598.401 North: 4.581.471

New WTG Radar

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Calculated:
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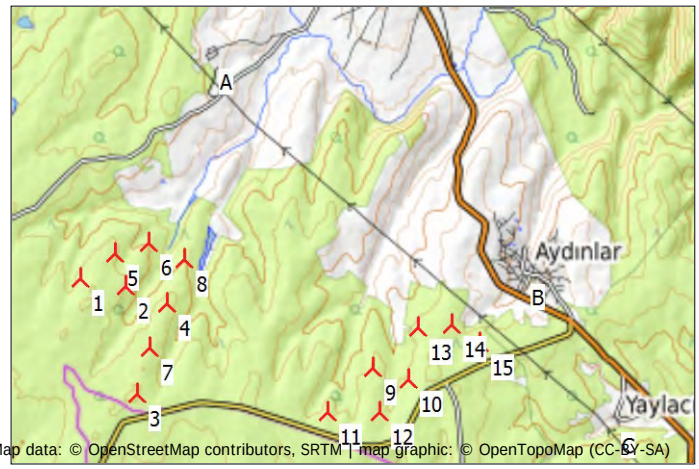
ZVI - Radar ZVI for WTGs summary

Coordinate system information:
Coordinate System: UTM (north)-WGS84 Zone: 35

Radar ZVI settings
ZVI Grid step: 25,0 m
Refraction constant, k: 1,33

DHM object:Elevation Grid Data Object: TayakadinShadow_EMDGrid_1.wpg (2)



Scale 1:100.000
New WTG
Radar

WTG type

	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Total height [m]	Easting	Northing	Z [m]
1	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	175,0	594.860	4.580.880	227,2
2	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	175,0	595.459	4.580.796	219,6
3	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	175,0	595.637	4.579.359	240,8
4	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	175,0	596.012	4.580.568	225,7
5	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	175,0	595.317	4.581.222	221,9
6	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	175,0	595.757	4.581.375	198,2
7	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	175,0	595.797	4.579.976	231,4
8	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	175,0	596.240	4.581.162	199,0
9	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	175,0	598.771	4.579.747	224,2
10	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	175,0	599.251	4.579.604	222,9
11	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	175,0	598.181	4.579.150	229,0
12	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	175,0	598.878	4.579.162	230,7
13	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	175,0	599.377	4.580.298	223,7
14	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	175,0	599.821	4.580.338	230,3
15	No	GE WIND ENERGY	3.4-130-3.430	3.430	130,0	110,0	175,0	600.202	4.580.100	228,9

Radar objects

	Radar name	Easting	Northing	Radar height a.g.l [m]
A	Radar eff. height: 0,0m a.g.l. (6)	596.514	4.583.851	0,0
B	Radar eff. height: 0,0m a.g.l. (7)	600.714	4.581.044	0,0
C	Radar eff. height: 0,0m a.g.l. (8)	601.942	4.579.090	0,0

		Clearance height [m]		
		R1	R2	R3
1	GE WIND ENERGY 3430 kW (1)	-43,2	199,1	483,1
2	GE WIND ENERGY 3430 kW (2)	-61,3	164,8	432,4
3	GE WIND ENERGY 3430 kW (3)	-25,3	147,6	348,7
4	GE WIND ENERGY 3430 kW (4)	-65,1	127,4	369,1
5	GE WIND ENERGY 3430 kW (5)	-63,6	171,0	481,9
6	GE WIND ENERGY 3430 kW (6)	-67,7	165,4	469,8
7	GE WIND ENERGY 3430 kW (7)	-43,8	142,7	328,2
8	GE WIND ENERGY 3430 kW (8)	-78,0	128,8	413,6
9	GE WIND ENERGY 3430 kW (9)	-137,6	-72,1	89,3
10	GE WIND ENERGY 3430 kW (10)	-130,8	-112,8	29,5
11	GE WIND ENERGY 3430 kW (11)	-120,9	-33,4	122,8
12	GE WIND ENERGY 3430 kW (12)	-117,7	-93,6	56,1
13	GE WIND ENERGY 3430 kW (13)	-152,9	-110,9	61,3
14	GE WIND ENERGY 3430 kW (14)	-160,8	-151,0	7,1
15	GE WIND ENERGY 3430 kW (15)	-153,7	-174,5	-34,5

The clearance height specifies the space between the WTG and the line of sight of a radar; negative value indicates that the height of the WTG is above the limit.

Signature Page

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