Mersinli Wind Power Plant Project

Environmental and Social Impact Assessment (ESIA) Report

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Prepared by	Checked by	Approved by
AECOM Turkey	Burcu Yazgan Kayabalı, ESIA and ESDD Section Manager	Dr. Hande Yukseler Environment End Market (EM) Director Turkey

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Prepared for:

Mersinli Wind Power Plant Project

Prepared by:

Ahmet Korkmaz, Environmental Modeling and GIS Expert
Başak Şentürk, Biologist
Burcu Yazgan Kayabalı, ESIA and ESDD Section Manager
Cansu Karakaş, Environmental Specialist
Cem Ünüştü, GIS and Modeling Specialist
Mertcan Özbakır, Project Manager
Mustafa İşlek, Senior Sociologist
Nilay Aygüney Berke, Senior Project Manager
Taylan Aşkın, Environmental Specialist

Aecom Turkey Danışmanlık ve Mühendislik Ltd. Şti
Mustafa Kemal Mahallesi Dumlupınar Bulvarı Tepe Prime
No:266 B Blok
No:50-51 06800
Çankaya
Ankara
Turkey

T: +90 312 4429863
aecom.com

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ABBREVIATONS

Abbreviation	Definition
AE	Alcazar Energy
AFAD	Disaster and Emergency Management Presidency of Turkey
AQAMR	Air Quality Assessment and Management Regulation
BAP	Biodiversity Action Plan
BoP	Balance of Plant
CCTV	Closed-Circuit Television
CIA	Cumulative Impact Assessment
CLO	Community Liaison Officer
CM	Combined Margin
CMFP	Contractor Management Framework Plan
CORINE	Coordination of Information on the Environment
CWIF	Caithness Wind Farm Information Forum
DSİ	State Hydraulic Works
DTI	Department of Trade and Industry
DTM	Digital Terrain Model
EBRD	European Bank for Reconstruction and Development
EC	European Commission
EHS	Environmental, Health, and Safety
EIA	Environmental Impact Assessment
EMI	Electromagnetic Interference
EMF	Electric and Magnetic Fields
EMRA	Energy Market Regulatory Authority
ESAP	Environmental and Social Action Plan
ESIA	Environmental and Social Impact Assessment
ESMMP	Environmental and Social Management and Monitoring Plan
ETL	Energy Transmission Line
EU	European Union
EU OSHA	European Agency for Safety and Health at Work
E&S	Environmental and Social
FI	Financial Intermediaries
GDRS	Turkish Former General Directorate for Rural Services
GDWM	General Directorate for Water Management
GIP	Good International Practice
GIIP	Good International Industry Practices
GIS	Geographic Information Systems
GMOs	Genetically Modified Organisms
GN	Guidance Note
HAWT	Horizontal Axis Wind Turbine
IAIA	International Association for Impact Assessment
IAPCR	Industrial Air Pollution Control Regulation
ICAO	International Civil Aviation Organization

Abbreviation	Definition
ICNIRP	International Commission on Non-ionizing Radiation Protection
IFC	International Finance Corporation
IFI	International Finance Institutions
IPCC	Intergovernmental Panel on Climate Change
IPEC	International Programme on the Elimination of Child Labour
IRSST	Institut de Recherche Robert-Sauve en Sante et Ensecurite du Travail
KBA	Key Biodiversity Area
KMG	Küçük Menderes Graben
IATA	International Air Transport Association
ICH	Intangible Cultural Heritage
IEA	International Energy Agency
IFR	Instrument Flight Rules
ILO	International Labour Organization
KGM	General Directorate of Highways
LRCF	Livelihood Restoration and Compensation Framework
META	Middle East, Turkey and Africa
MFWA	Ministry of Forestry and Water Affairs
MoCT	Ministry of Culture and Tourism
MoEU	Ministry of Environment and Urbanization
MP	Management Plan
MTA	General Directorate of Mineral Research and Exploration
MV	Medium Voltage
OHS	Occupational Health and Safety
NASA	National Aeronautics and Space Administration
NHMRC	Australian Government National Health and Medical Research Centre
NSR	Noise Sensitive Receptors
NTS	Non-Technical Summary
PAP	Project Affected People
PCBs	Polychlorinated Biphenyls
PCTs	Polychlorinated Terphenyls
PM	Particulate Matter
PS	Performance Standards
PR	Performance Requirements
QHSE	Quality, Health, Safety and Environment
RAMEN	Regulation on the Assessment of Environmental Noise
RPGDPD	Regulation on the Protection of Groundwater Due to Pollution and Degradation
RPM	Revolutions Per Minute
SCADA	Supervisory Control And Data Acquisition
SEP	Stakeholder Engagement Plan
SGK	Turkish Social Security Institute

Abbreviation	Definition
SME	Small and Medium-Sized Enterprise
SNH	Scottish Natural Heritage
SWQR	Surface Water Quality Regulation
TBPP	The National Time-Bound Policy and Programme
TEİAŞ	Turkish Electricity Transmission Company
TUİK	Turkish Statistical Institute
TOX	Total Organic Halogens
TPH	Total Petroleum Hydrocarbons
Turkstat	Turkish Statistical Institute
TÜBİTAK	Scientific and Technological Research Council of Turkey
UN	United Nations
UDHR	Universal Declaration of Human Rights
UNESCO	United Nations Educational, Scientific and Cultural Organization
VAWT	Vertical Axis Wind Turbine
VIA	Visual Impact Assessment
VEM	Visual Envelope Map
VESC	Valued Environmental and Social Component
VFR	Visual Flight Rules
VP	View Point
WGNWT	Working Group on Noise from Wind Turbines
WHO	World Health Organization
WPP	Wind Power Plant
WTG	Turbine
ZTV	Zone of Theoretical Visibility
ZVI	Zone of Visual Influence

1. Introduction

Alcazar Energy ("AE") was established in 2014, with a focus on renewable energy generation in Middle East, Turkey and Africa, since the region is fast shifting towards renewable energy alternatives, as they become a competitive source of power generation below grid parity. AE's focus is on development, structuring, acquisition and operation of on-shore wind energy and photovoltaic solar energy plants in emerging economy countries with strong regulatory frameworks.

Alcazar Energy through the Project Company, as defined below, is planning to construct and operate the Mersinli Wind Power Plant Project ("Mersinli WPP Project", the "Project"), in İzmir province, within the administrative borders of Kemalpaşa, Torbalı and Bayındır districts, Çardaklı Tepe, Kartal Tepe, Mersinli, Karlık Tepe and Akçam Tepe localities. At the national tender stage conducted for the wind power projects in 2007, the previous Project owner established a project company, namely Yander Elektrik Muh. Mus. Ins. Tur. ve Tic. A.S. ("Yander Elektrik" or the "Project Company"), for the development of the Project. In May 2017, AE, through a wholly owned subsidiary, acquired 100% of the shares of Yander Elektrik and is now the sole owner of the Project.

The Project will consist of a total of 17 wind turbines each with 3.45 MWm capacity, making up a total installed capacity of 58.65 MWm/55 MWe. The Project's construction phase, including the earthworks, construction of access roads, preparation of crane pads and turbine foundations, civil works and erection of turbines; is planned to be completed in approximately 16 months including the commissioning of the power plant.

The Energy Generation License ("License") for the Project was obtained from the Energy Market Regulatory Authority (EMRA) on behalf of The Project Company on July 5, 2012 (licensing date). In accordance with the License, the Project is licensed to generate electricity for 49 years starting from the licensing date.

The Mersinli WPP Project was initially planned to include 22 turbines, each having a capacity of 2.5 MWm, making up a total installed capacity of 55 MWm/55We. However, the Project Company conducted further energy assessments and concluded that the current 17-turbine layout is more feasible, which also would lead to more limited environmental and social impacts. An Environmental Impact Assessment (EIA) process, in line with the national EIA Regulation, was conducted for the former 22 turbine layout and the Project obtained the related "EIA Positive Certificate" with decision number 4234 on July 18, 2016. For the current layout and installed capacity (58.65 MWm/55MWe), The Project Company applied to the Ministry of Environment and Urbanization on October 6, 2017 to obtain confirmation for validity of the existing "EIA Positive Certificate". In response to this application, the Ministry has issued an official letter on November 1, 2017 stating that "*Since the changes made in the Mersinli WPP Project, which reduced the turbine numbers from 22 (each having a capacity of 2.5 MWm) to 17 (each having a capacity of 3.45 MWm) causing an increase of 3.65 MWm in the total installed capacity that is below the thresholds specified in the EIA Regulation, no procedure is required to be conducted under the Turkish EIA Regulation. Similarly, changes made in the coordinates of the turbine locations have been considered appropriate as the planned turbines are all located within the same impact area (License Area)"*. Thus, the Ministry has confirmed the validity of the existing "EIA Positive Certificate" for the current layout with 17 turbines and total installed capacity of 58.65 MWm/55MWe so that no additional process is required to be conducted under the Turkish EIA Regulation. The Ministry's relevant official letter is presented in Appendix A.

AE is considering International Finance Institutions (IFIs) financing, through European Bank for Reconstruction and Development (EBRD) and Société de Promotion et de Participation pour la Coopération Economique S.A. (Proparco), for the development of the Project. In line with international categorization approach and criteria of World Bank, IFC and European Bank for Reconstruction and Development (EBRD), Mersinli WPP has been assessed as a "Category A" Project (detailed justification for Project's environmental and social categorization is provided in Section 2.6). Therefore, the need for preparation of a fit-for purpose Environmental and Social Impact Assessment (ESIA) Disclosure Package in line with international Lender requirements, namely the European Bank for Reconstruction and Development (EBRD) Environmental and Social (E&S) Policy and related Performance Requirements (2014) and the IFC Performance Standards (2012) and general and sector-specific EHS Guidelines has arisen. For this purpose, AE has retained AECOM Turkey Consultancy and Engineering Limited Company ("AECOM") in April 2017 for the development of an ESIA Disclosure Package for the Project in line with International Finance Institutions' (IFIs) requirements to inform their decision making process on financing the Project.

The ESIA Disclosure Package consists of the following components:

- ESIA Report (including the Environmental and Social Management and Monitoring Plan (ESMMP))
- Non-Technical Summary (NTS);
- Stakeholder Engagement Plan (SEP);
- Livelihood Restoration and Compensation Framework (LRCF);
- Contractor Management Plan;
- Erosion Control, Soil and Spoil Management Plan;
- Noise Management Plan;
- Air Quality Management Plan;
- Waste Management Plan;
- Environmental and Social Action Plan (ESAP)

The Project will be implemented in line with the national EIA Report and the ESIA Report prepared as a part of this study to reflect the latest changes in the Project layout that are not fundamental. The national EIA Report that was the basis for the EIA Positive Decision issued for the Project will also be disclosed as part of the disclosure process. Environmental and Social Management Plans to be identified within the ESIA Report will be developed subsequent to the ESIA study.

2. Institutional and Legal Framework

This Chapter describes the institutional framework and national legislation as well as the international environmental and social standards and guidelines, European Union legislation and conventions and protocols applicable to the Mersinli WPP Project.

2.1 Institutional Framework

The institutional framework relevant to the Mersinli WPP Project will consist of central administrations; field organizations of the central administrations (provincial, regional and district directorates); and local (municipalities and neighborhood-headmen) administrations in the surroundings of the Project Area.

Ministries, as the core bodies of the central administrations, are headquartered in Ankara. Ministry of Environment and Urbanization (MoEU) is the key organization responsible from the development and implementation of policies and procedures for the protection, improvement and management of environment and regarding global climate change, and will be the authority related with the management of environmental aspects of the Mersinli WPP Project in line with the national environmental legislation. The following general directorates of the MoEU would particularly be relevant to the Mersinli WPP Project:

- Directorate General of Environmental Management
- Directorate General of EIA, Permit and Inspection
- Directorate General of Spatial Planning
- Directorate General for Protection of Natural Assets

The Energy Market Regulatory Authority (EMRA), which is an associated entity of the Ministry of Energy and Natural Resources, is responsible from the supply of sufficient, good quality and low cost electricity on a continuous basis and in an environmentally-compatible manner. EMRA is a key institution for the Mersinli WPP, which issued the Electricity Generation License for the Project.

Other ministries, with which the MoEU, Ministry of Energy and Natural Resources and the Project Owner would collaborate for the management of environmental aspects (management of impacts, auditing, permitting, etc.) of the Project includes the following:

- Ministry of Culture and Tourism
  - General Directorate of Cultural Heritage and Museums
- Ministry of Food, Agriculture and Husbandry
  - General Directorate of Agricultural Reform
- Ministry of Forestry and Water Affairs
  - General Directorate of Nature Protection and National Parks
  - General Directorate of Water Management
  - General Directorate of State Hydraulic Works
  - General Directorate of Forestry
  - General Directorate of Meteorological Services
- Ministry of Labor and Social Security
  - General Directorate of Occupational Health and Safety
  - General Directorate of Labor
- Ministry of Transport, Maritime Affairs and Communications
  - General Directorate of Highways (KGM)

At the local level, the Project Area falls within the jurisdiction of İzmir Greater Municipality and the district municipalities of Bayındır, Torbalı and Kemalpaşa.

2.2 Applicable Turkish Legislation

National legislation applicable to the management of environmental, social, labor and energy generation aspects of the Project are identified in the following sections.

2.2.1 Environmental and Social Legislation

Turkish Environmental Law (No. 2872), which first came into force after being published in the Official Gazette No. 18132 dated August 11, 1983, defines the main principles for the protection of environment in line with sustainable environment and sustainable development principles and relevant institutional responsibilities. Under its broad scope, it also provides the legislative framework for regulation of industries/facilities and their liabilities regarding the assessment and management of their potential impacts on the environment including permitting and information/declaration requirements. Several amendments have been done in the Environmental Law since 1983, most recent ones being introduced by the Constitutional Court Decisions dated July 3, 2014 (No. E:2013/89, K: 2014/116) and April 22, 2015 (No. E: 2015/35, K: 2015/40) (in the subjects of Environmental Impact Assessment process and administrative penalties).

Environmental regulations developed under the Environmental Law specify the procedures and principles regarding the management of particular aspects of the environment. As a part of the European Union (EU) accession process, fundamental reforms, covering the transposition of environmental legislation, enforcement and reorganization of institutional structure, have been done in the environment chapter in the last decade to ensure harmonization and alignment with the EU acquis.

In addition to the Environmental Law and its associated regulations, there are other laws that complementarily regulate the aspects related to the protection of environment and rights and safety of people. Those laws that would be applicable to the Mersinli WPP Project are listed below:

- Expropriation Law (Law No: 2942)
- Forestry Law (Law No: 6831)
- Groundwater Law (Law No: 167)
- Law on National Parks (Law No: 2873)
- Law on Conservation of Cultural and Natural Assets (Law No: 2863)
- Highways Traffic Law (Law No: 2918)
- Law on Improvement of Olive Cultivation and Budding of Wild Species (Law No:3573)

Under the relevant laws, several regulations, communiques, by-laws, etc. have been promulgated to provide specific provisions for the management of environmental and social aspects. Those that pertain to wind energy developments include, but are not limited to, the following:

General

- Regulation on Environmental Impact Assessment (see Section 2.2.1.1 for detailed description of the regulatory procedure)
- Regulation on Environmental Permits and Licenses
- Regulation Concerning Environmental Officers, Environmental Management Unit and Environmental Consulting Firms
- Communique on Certificate of Competency
- Regulation on Environmental Audit
- Regulation for Starting Up and Opening a Workplace
- Regulation on the Implementation of the Law Concerning Private Security Services

Air

- Regulation on Monitoring of Greenhouse Gas Emissions
- Regulation on Control of Exhaust Gas Emission and Diesel Fuel and Gasoline Quality
- Regulation on Control of Industrial Air Pollution
- Regulation on Reduction of Sulphur Rates in Certain Types of Fuels
- Regulation on Assessment and Management of Air Quality
- Regulation of Control of Air Pollution Originated from Heating

Chemicals

- Regulation on Classification, Labelling and Package of the Materials and Mixtures
- Polychlorinated Biphenyls (PCBs) and Polychlorinated Terphenyls (PCTs) Control Regulation

Nature Protection and Forests

- Implementation Regulation of Article 16 of Forestry Law
- Regulation on the Conservation of Wetlands

Noise

- Regulation on Assessment and Management of Environmental Noise
- Regulation Related to Noise Emissions by Equipment for Outdoor Use

Soil

- Regulation on Soil Pollution Control and Contaminated Sites by Point Source
- Regulation on the Extraction , Operation and Control of Sand, Gravel and Similar Materials

Waste

- Regulation on Control of Medical Waste
- Regulation on Control of Waste Vegetable Oils
- Regulation on Waste Management
- Communique on Transportation of Wastes by Highway
- Regulation on Control of Waste Electrical and Electronic Equipment
- Regulation on Control of Packaging Waste
- Communique on Recovery of Some Non-Hazardous Wastes
- Regulation on Control of End-of-Life Vehicles
- Regulation on Control of Waste Oils
- Regulation on Control of Waste Tires
- Regulation on Control of Waste Batteries and Accumulators
- Regulation on Control of Excavation, Construction and Demolition Waste

Water

- Regulation on Monitoring of Surface Water and Groundwater
- Regulation on Surface Water Quality
- Regulation on Protection of Groundwater against Pollution and Deterioration
- Regulation on Control of Pollution Caused by Hazardous Substances in the Aquatic Environment and Its Surroundings
- Regulation on Water Intended for Human Consumption
- Water Pollution Control Regulation
- Regulation on Pit Opening Where Sewer System Construction is not Applicable

Structural Safety

- Regulation on Structures in Natural Hazard Areas
- Regulation on Building Constructions in Earthquake Zones

Traffic

- Regulation on the Transportation of Hazardous Substances by Road
- Regulation on Highway Traffic

2.2.1.1 Environmental Impact Assessment Regulation

Article 10 of the Environmental Law sets forth the legal basis for the Environmental Impact Assessment (EIA) procedure in Turkey. According to this article, the institutions, organizations and facilities that can lead to environmental issues as a result of their planned activities are obliged to prepare an Environmental Impact Assessment (EIA) Report or a Project Description File. Gaining its legal stand from the Environmental Law, the EIA Regulation was put into force for the first time after being published in the Official Gazette numbered 21489 and dated February 7, 1993. Since this date, several amendments were made on the original EIA Regulation and new EIA regulations were published in 2008 and 2013, repealing their predecessors. The latest and currently in force EIA Regulation was published in the Official Gazette dated November 25, 2014, numbered 29186.

Under its annexes, the EIA Regulation categorizes investments as projects subject to full-scale EIA process (Annex-1) that shall prepare an EIA Report and projects subject to screening-elimination criteria (Annex-2) that shall prepare a Project Description File. This categorization is done based on the type of activity and/or capacity.

If the planned investment is defined as an activity under Annex-1 of the EIA Regulation, a full EIA Report is required. If the planned investment is defined as an activity under Annex-2 of the EIA Regulation, initially a Project Description File is prepared in accordance with a limited format specified in the Annex-4 of the EIA Regulation and the MoEU (“Ministry”) evaluates the need for a full EIA process for the project. The procedural steps of the full EIA process under the national legislation are presented in Figure 2-1.

Categorization of the WPP projects under the current EIA Regulation is specified as follows:

- Full EIA process (Annex-1) is required for WPP projects with a total number of 20 or more turbines and a total installed capacity of and above 50 MWm, which are listed in Annex-1 Item 43 of the EIA Regulation;
- Limited EIA process (Annex-2) is required for WPP projects with a total number of 5 or more turbines (up to the threshold given for Annex-1 projects) and a total installed capacity of and above10 MWm to 50 MWm, which are listed in Annex-2 Item 42 of the EIA Regulation.
- WPP projects that have less than 5 turbines or 10 MWm installed capacity are out of scope of the EIA Regulation.

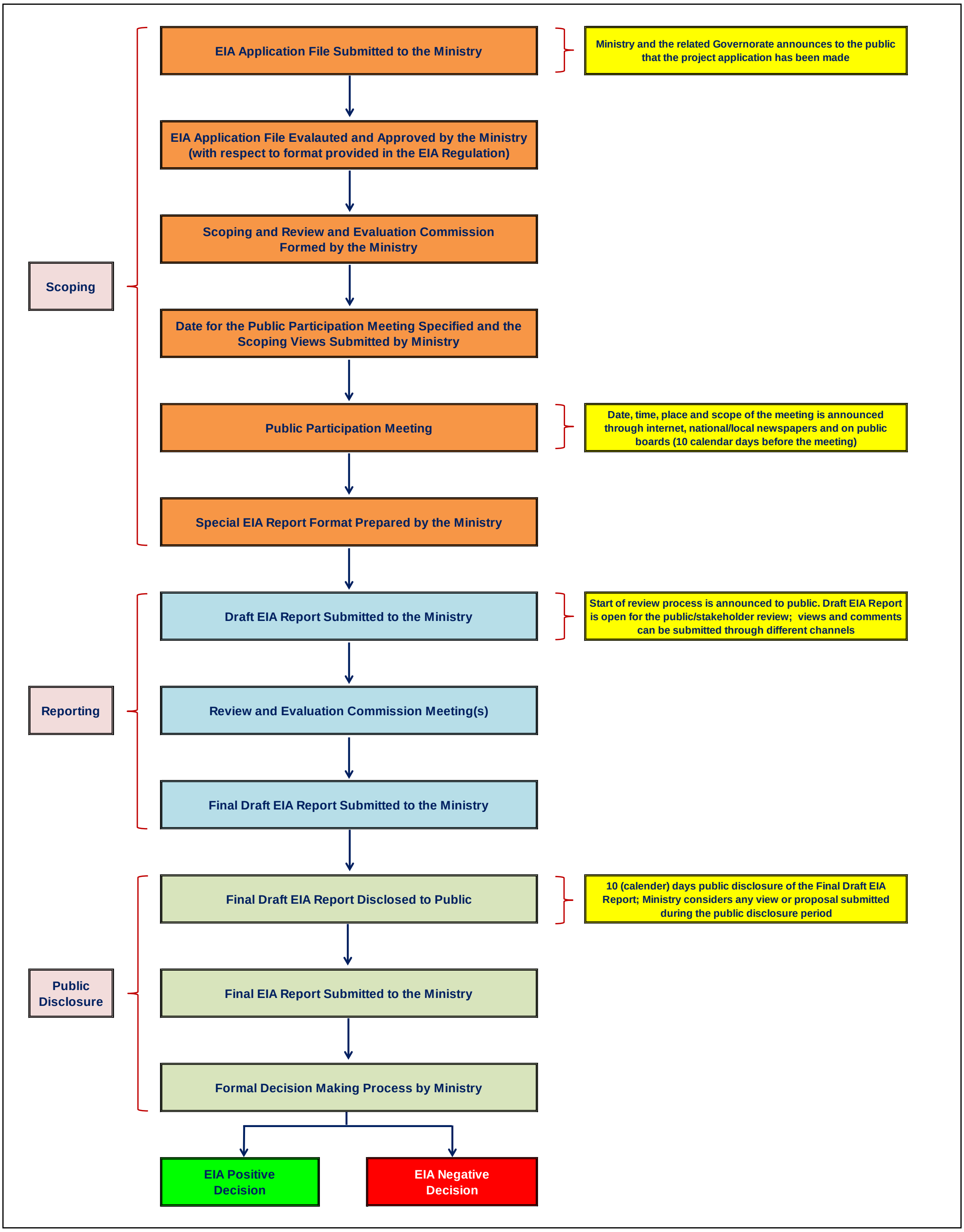


Figure 2-1. Procedural Steps of the EIA Process under National EIA Regulation

Mersinli WPP Project was initially planned to include 22 turbines and a total installed capacity of 55 MWm/MWe. An EIA Report was prepared in 2015-2016 in accordance with the then-current EIA Regulation. In consideration of this EIA Report, which was based on the layout with 22 turbines (55 MWe), MoEU issued an EIA Positive Decision (Decision No: 4234) on July 18, 2016. The Project Company obtained an official letter from the MoEU, which confirms the validity of the EIA Positive Decision numbered 4234 for the current Project design (see Appendix A). Thus, no additional process is required to be conducted under the Turkish EIA Regulation for the WPP Project subject to this ESIA Report.

Categorization of the energy transmission lines projects under the current EIA Regulation is specified as follows:

- Full EIA process (Annex-1) is required for ETLs with voltage above 154 kV and length of and over 15 km;
- Limited EIA process (Annex-2) is required for ETLs with voltage above 154 kV and length of 5-15 km;
- ETLs with voltage level below 154 kV or ETLs with voltage level above 154 kV but length less than 5 km are out of the scope of the EIA Regulation.

Mersinli WPP Project will connect to the existing 154 kV ETL of the Fuat WPP, which is currently in operation in the north-northeast of the Project Area. According to the current optimized design, a maximum of 200 m line is required to ensure this connection thus Mersinli WPP's ETL is out of the scope of the existing EIA Regulation and no full or limited EIA process is required to be conducted.

2.2.2 Labor Law and Regulations

Labor issues are mainly governed by the Labor Law (No. 4857), which was published in Turkish Official Gazette No. 25134 dated June 10, 2003. The law includes legislative framework for the regulation of industries and their potential impact on the human health and safety. Additionally, the Occupational Health and Safety Law (No. 6331), published in Turkish Official Gazette No. 28339 dated June 30, 2012, provides the framework for the health and safety at work. Industrial projects are subject to varying levels of review that begin while projects are in the development and operation phases. Related legislation stemming from these two laws is listed below:

- Regulation on Emergency Situations in Workplaces
- Regulation on Health and Safety at Construction Works
- Regulation on Health and Safety Conditions Regarding Use of Work Equipment
- Regulation on Health and Safety Precautions Regarding Working with Chemicals
- Regulation on Health and Safety Regarding Temporary and Time Limited Works
- Regulation on Health and Safety Signs
- Regulation on Management of Dust
- Regulation on Material Safety Data Sheets on Hazardous Materials and Mixtures
- Regulation on Occupational Health and Safety
- Regulation on Personal Protective Equipment
- Regulation on Protection of Workers from Risks Created by Noise
- Regulation on Risk Assessment for Occupational Health and Safety
- Regulation on Subcontractors
- Regulation on Suspension of Work in Workplaces
- Regulation on Use of Personal Protective Equipment in Workplaces
- Regulation on Vocational Training of the Employees Working in Dangerous and Highly Dangerous Workplaces

2.2.3 Energy Generation

There are multiple laws and regulations on energy generation. These include but are not limited to the following:

- Law on Utilization of Renewable Energy Resources for Electricity Generation (Law No: 5346)
- Electricity Market Connection and System Use Regulation
- Electricity Market Distribution Regulation
- Electricity Market License Regulation
- Regulation on Competitions Regarding Preliminary License Applications Made for Installation of Energy Generation Facilities Based on Wind and Solar Power

2.3 International Environmental and Social Standards and Guidelines

The scope of the international environmental and social standards provided here covers EBRD Environmental and Social Policy (May 2014) and related Performance Requirements (PRs), IFC Policy and Performance Standards (PSs) on Environmental and Social Sustainability (January 2012) and Equator Principles III (June 2013). However, it should be noted that other International Finance Institutions' (IFIs) guidance and Good International Industry Practices (GIIP) is referenced in general in other chapters of this report, where any such guidance provides standardized good practice for the implementation of the Project.

2.3.1 EBRD Environmental and Social Policy and Performance Requirements

Throughout their life phases, EBRD financed projects are required to be realized in compliance with the Bank's Environmental and Social Policy (2014) to ensure environmentally and socially sustainable development. In this regard, the projects are expected to meet the key environmental and social requirements outlined by the PRs set by the Bank. The EBRD PRs are described below.

EBRD PR 1: Assessment and Management of Environmental and Social Impacts and Issues

EBRD PR 1 covers integrated assessment to identify the environmental and social impacts and issues associated with projects and management of the environmental and social performance throughout the life of the project. EBRD PR 1 also outlines the responsibilities of the client in the process of assessing the potential environmental and social impacts and issues associated with the project, and developing and implementing procedures for managing and monitoring these impacts and issues.

EBRD PR 2: Labor and Working Conditions

EBRD PR 2 consists of general requirements on human resources policies, working relationships, child labor, forced labor, non-discrimination and equal opportunity, workers' organizations, wages, benefits and condition of work, Occupational Health and Safety (OHS), worker accommodation, retrenchment and grievance mechanism, non-employee workers, supply chain, security personnel requirements which are applicable to the Project. The PR requires the clients to respect and protect the fundamental principles and rights of workers and protect and promote the safety and health of workers, especially by promoting safe and healthy working conditions.

EBRD PR 3: Resource Efficiency and Pollution Prevention and Control

EBRD PR 3 consists of general requirements on resource efficiency, pollution prevention and control, greenhouse gases, water, waste and safe use and management of hazardous substances and materials which are applicable to the Project. The PR requires the clients to identify project-related opportunities for energy, water and resource efficiency improvements and waste minimization, adopt the mitigation hierarchy approach to addressing adverse impacts on human health and the environment arising from the resource use and pollution released from the project and promote the reduction of project-related greenhouse gas emissions.

EBRD PR 4: Health and Safety

This PR addresses the client's responsibility to identify and to avoid or minimize the risks and adverse impacts to community health, safety and security that may arise from project activities. General requirements for health and safety management (occupational health and safety, community health and safety) and specific requirements for health and safety management (Infrastructure and equipment design and safety, hazardous materials safety, traffic and road safety, natural hazards, exposure to disease and emergency preparedness and response are discussed in this PR.

EBRD PR 5: Land Acquisition, Involuntary Resettlement and Economic Displacement

This PR outlines the requirements related to involuntary resettlement (physical and economic displacement) that can be full, partial, permanent, or temporary as a result of project-related land acquisition and/or restrictions on land use. The objectives of this PR are to avoid or, when unavoidable, minimize, involuntary resettlement by exploring alternative project designs, to mitigate adverse social and economic impacts from land acquisition or restrictions on affected persons' use, restore or, where possible, improve the livelihoods and standards of living of displaced persons8to pre-displacement levels and improve living conditions among physically displaced persons through the provision of adequate housing, including security of tenure at resettlement sites.

EBRD PR 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

This PR outlines the biodiversity conservation requirements, legally protected and internationally recognized areas of biodiversity value, invasive alien species and sustainable management of living natural resources, crop and livestock production, fisheries and aquaculture, natural and plantation forestry, supply chain and genetically modified organisms (GMOs). The objectives of this PR are to protect and conserve biodiversity using a precautionary approach, to adopt the mitigation hierarchy approach, and to promote good international practice (GIP) in the sustainable management and use of living natural resources.

EBRD PR7: Indigenous Peoples

This PR recognizes that projects can create opportunities for Indigenous Peoples to participate in and benefit from project-related activities that may help them fulfil their aspiration for economic and social development. As government often plays a central role in the management of issues related to Indigenous Peoples, clients should cooperate and collaborate, as appropriate, with the responsible authorities and relevant communities in managing the risks and impacts of their activities.

EBRD PR 8: Cultural Heritage

This PR outlines the requirements related to cultural heritage for present and future generations. The aim of this PR is to protect cultural heritage and to guide clients in avoiding or mitigating adverse impacts on cultural heritage in the course of their business operations. The client is expected to be precautionary in their approach to the management and sustainable use of cultural heritage.

EBRD PR 9: Financial Intermediaries

This PR recognizes that Financial Intermediaries (FIs) are a key instrument for promoting sustainable financial markets and provide a vehicle to channel funding to the micro, small and medium-sized enterprise (SME) sector. Such FIs include a variety of financial service providers, including private equity funds, banks, leasing companies, insurance companies and pension funds. FIs are engaged in a wide range of activities, such as microfinance, SME lending, trade finance, large-scale infrastructure finance, medium to long-term corporate or project finance, and housing finance.

EBRD PR 10: Information Disclosure and Stakeholder Engagement

This PR outlines the requirements related to an open and transparent engagement between the client, its workers, local communities directly affected by the project and, where appropriate, other stakeholders. The client is expected to outline a systematic approach to stakeholder engagement, to promote improved environmental and social performance of clients through effective engagement with the project's stakeholders and to ensure that grievances from affected communities and other stakeholders are responded to and managed appropriately.

Direct investment projects must meet PRs 1 to 8 and 10. Each PR defines, in its objectives, the desired outcomes, followed by specific requirements for projects to help clients achieve these outcomes. Compliance with relevant national law is an integral part of all PRs.

Of the PRs, PR 7 is not applicable since there are no indigenous people in Turkey; and PR 9 is not relevant to Mersinli WPP Project. All other EBRD PRs will be applicable to the Project thus have been considered in the scope of the ESIA studies.

2.3.2 International Finance Corporation Performance Standards and Environmental Health and Safety Guidelines

2.3.2.1 Performance Standards

IFC's Sustainability Framework (2012) includes the Performance Standards and all investment and advisory clients whose projects go through IFC's initial credit review process are expected to meet these standards.

IFC Performance Standards on Environmental and Social Sustainability (2012) are;

PS 1: Assessment and Management of Environmental and Social Risks and Impacts

PS 1 establishes the importance of integrated assessment to identify the environmental and social impacts, risks and opportunities of the Project; also for effective community engagement through disclosure. Objectives of PS 1 are:

- To identify and evaluate environmental and social risks and impacts of the Project.
- To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment.
- To promote improved environmental and social performance of clients through the effective use of management systems.
- To ensure that grievances from Affected Communities and external communications from other stakeholders are responded to and managed appropriately.
- To promote and provide means for adequate engagement with Affected Communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.

PS 2: Labor and Working Conditions

PS 2 recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers. Objectives of PS 2 are:

- To promote the fair treatment, non-discrimination, and equal opportunity of workers.
- To establish, maintain, and improve the worker-management relationship.
- To promote compliance with national employment and labor laws.
- To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain.
- To promote safe and healthy working conditions, and the health of workers.
- To avoid the use of forced labor.

PS 3: Resource Efficiency and Pollution Prevention

PS3 recognizes that increased economic activity and urbanization often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels. The objectives of PS 3 are:

- To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities.
- To promote more sustainable use of resources, including energy and water.
- To reduce project-related GHG emissions.

PS 4: Community Health, Safety and Security

PS 4 recognizes that project activities, equipment and infrastructure can increase community exposure to risks and impacts. The objectives of PS 4 are:

- To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances.
- To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.

PS 5: Land Acquisition and Involuntary Resettlement

PS 5 recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Objectives of PS 5 are:

- To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs.
- To avoid forced eviction.
- To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected.
- To improve, or restore, the livelihoods and standards of living of displaced persons.
- To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.

PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

Performance Standard 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. The objectives of PS6 are:

- To protect and conserve biodiversity
- To maintain the benefits from ecosystem services
- To promote the sustainable management of living natural resources through the adoption of practices which integrate conservation needs and development priorities.

PS 7: Indigenous Peoples

PS 7 recognizes that indigenous people as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population and sets objectives to anticipate and avoid adverse impacts of projects on them through ensuring appropriate management and consultation principles.

PS 8: Cultural Heritage

Performance Standard 8 recognizes the importance of cultural heritage for current and future generations. The objectives of PS8 are:

- To protect cultural heritage from the adverse impacts of project activities and support its preservation.
- To promote the equitable sharing of benefits from the use of cultural heritage.

PS's from 2 to 8 establish objectives and requirements to avoid, minimize and where residual impacts remain, to compensate for risks and impacts affective on workers, communities and the environment. PS 7 is not relevant to the Project, since there are no indigenous people in Turkey. All other IFC PSs and related guidance notes will be applicable to the Project thus have been considered in the scope of the ESIA studies.

2.3.2.2 Environmental Health and Safety Guidelines

IFC has in place a comprehensive set of Environmental Health and Safety Guidelines, aimed to provide a technical information source for projects during appraisal activities. The guidelines include examples of Good International Industry Practice (GIIP), as defined by PS 3. In the case project country regulations differ from the provisions of related EHS guidelines, the more stringent of the standards are required to be complied with.

In addition to the General EHS Guidelines (April 2007) that provide multiple guidelines under subjects “environment”, “occupational health and safety”, “community health and safety” and “construction and decommissioning”, IFC also has in place the Industry Sector Guidelines. The Industry Sector Guidelines described below are applicable to the Project.

Environmental Health and Safety Guidelines for Wind Energy (August 2015)

The EHS Guidelines for Wind Energy provides information on major, sector specific EHS issues associated with onshore and offshore wind energy developments and recommends mitigation/management measures for these impacts.

Environmental Health and Safety Guidelines for Electric Power Transmission and Distribution (April 2007)

The EHS Guidelines for Electric Power Transmission and Distribution provides information on major, sector specific EHS issues associated with power transmission between a generation facility and a substation located within an electricity grid and power distribution from a substation to consumers located in residential, commercial, and industrial areas.

2.3.3 Equator Principles III

The Equator Principles is a risk management framework, adopted by financial institutions, for determining, assessing and managing environmental and social risk in projects. It is primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making. EP III (June 2013) comprises 10 principles:

- Principle 1: Review and Categorization
- Principle 2: Environmental and Social Assessment
- Principle 3: Applicable Environmental and Social Standards
- Principle 4: Environmental and Social Management System and Equator Principles Action Plan
- 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

2.4 European Union (EU) Environmental Legislation

The EBRD, as a signatory to the European Principles for the Environment, is committed to promoting the adoption of EU environmental principles, practices and substantive standards (as contained in EU secondary legislation, for example, regulations, directives and decisions) by EBRD-financed projects, where these can be applied at the project level, regardless of their geographical location. When host country regulations differ from EU substantive environmental standards, projects will be expected to meet whichever is more stringent.

- EU EIA Directive 2011/92/EU
- EU Habitats Directive 92/43/EEC
- EU Birds Directive 2009/147/EC
- EU Environmental Noise Directive 2002/49/EC
- EU Waste Framework Directive 2008/98/EC

2.5 International Conventions and Protocols

Turkey has become party to a number of conventions and protocols to contribute to the management of environmental resources, biodiversity and cultural heritage at global and regional scales. Relevant international conventions and protocols on environment, biodiversity and cultural heritage as well as labor subjects are listed below.

Environment, Biodiversity and Cultural Heritage

The international conventions and protocols related to the Project and to which Turkey is a party are listed below.

- International Convention on Wetlands of International Importance especially as Waterfowl Habitat (RAMSAR Convention) enforced on December 21, 1975 and ratified by Turkey in 1994
- Bern Convention on the Conservation of European Wildlife and Natural Habitats enforced June 01, 1982 and ratified by Turkey in 1984
- Convention on the Protection of the World Cultural and Natural Heritage enforced on December 17, 1975 and ratified by Turkey on February 14, 1983
- Convention on Biological Diversity enforced on December 29, 1993 and ratified by Turkey in 1996
- Convention on International Trade in Endangered Species of Wild Fauna and Flora enforced on July 01, 1975 and ratified by Turkey December 22, 1996
- European Landscape Convention enforced in 2000 and ratified by Turkey in 2003
- United Nations Framework Convention on Climate Change enforced on March 21, 1994 and ratified by Turkey May 24, 2004
- Kyoto Protocol enforced on February 16, 2005 and ratified by Turkey on August 26, 2009

Turkey is not yet party to the following international conventions:

- The Convention on Environmental Impact Assessment in a Transboundary Context (Espoo)
- The UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus)
- European Convention on the Protection of the Archaeological Heritage

Labor

In 1932, Turkey became a member of the International Labour Organization (ILO), a specialized United Nations (UN) agency, which states its goals as “to promote rights at work, encourage decent employment opportunities, enhance social protection and strengthen dialogue on work-related issues”. The country ratified 59 of ILO conventions, of which 4 were later denounced (*ILO website, www.ilo.org)*. Of these, conventions that are directly related to the Project in terms of providing a general labor management framework are listed below:

- ILO Safety and Health in Construction Convention enforced on January 11, 1991 and ratified by Turkey on March 23, 2015
- ILO Occupational Safety and Health Convention enforced on August 11, 1983 and ratified by Turkey on April 22, 2005
- ILO Worst Forms of Child Labor Convention enforced on November 19, 2000 and ratified by Turkey on August 02, 2001
- ILO Forced Labor Convention enforced on May 01, 1932 and ratified by Turkey on October 30, 1998
- ILO Minimum Age Convention enforced on June 19, 1976 and ratified by Turkey on October 30, 1998
- ILO Freedom of Association and Protection of the Right to Organize Convention enforced on July 04, 1950 and ratified by Turkey July 12, 1993
- ILO Worker’s Representatives Convention enforced on June 30, 1973 and ratified by Turkey on July 12, 1993
- ILO Human Resources Development Convention enforced on July 19, 1977 and ratified by Turkey on July 12, 1993
- ILO Employment Policy Convention enforced on July 15, 1966 and ratified by Turkey on December 13, 1977
- ILO Social Security Convention enforced on April 17, 1955 and ratified by Turkey on January 29, 1975
- ILO Equal Remuneration Convention enforced on May 23, 1953 and ratified by Turkey on July 19, 1967
- ILO Discrimination (Employment and Occupation) Convention enforced on June 15, 1960 and ratified by Turkey on July 19, 1967
- ILO Abolition of Forced Labour Convention enforced on January 17, 1959 and ratified by Turkey on March 29, 1961
- ILO Right to Organize and Collective Bargaining Convention enforced on July 18, 1951 and ratified by Turkey on January 23, 1952

2.6 Project Categorization

For the projects considered by IFIs for financing, the process for the assessment of environmental and social risks and impacts could range from full-scale ESIA to limited or focused assessments depending on the scale of the project and significance of the risks and impacts.

IFC, as part of the review of environmental and social risks and impacts of a proposed investment, uses a process of environmental and social categorization to reflect the magnitude of risks and impacts. The resulting category also specifies IFC’s institutional requirements for disclosure in accordance with IFC’s Access to Information Policy. These categories, which are also adopted by Equator Principles III, are as follows:

- Category A: Business activities with potential significant adverse environmental or social risks and/or impacts that are diverse, irreversible, or unprecedented.
- Category B: Business activities with potential limited adverse environmental or social risks and/or impacts that are few in number, generally site-specific, largely reversible, and readily addressed through mitigation measures.
- Category C: Business activities with minimal or no adverse environmental or social risks and/or impacts.
- Category FI: Business activities involving investments in financial institutions (FIs) or through delivery mechanisms involving financial intermediation (This category is further divided in 3 as FI-1, FI-2, and FI-3).

In IFC's Guidance Note 1 on the Assessment and Management of Environmental and Social Risks and Impacts, it is further stated that "For certain projects, and particularly for greenfield investments and projects (including, but not limited to, major expansion or transformation-conversion activities) involving specifically identified physical elements, aspects and facilities that are likely to generate potentially significant adverse environmental and social risks and impacts, the client should conduct a comprehensive full-scale ESIA".

The EBRD also categorizes each project to determine the nature and level of environmental and social investigations, information disclosure and stakeholder required. EBRD's description of each category is as follows:

- Category A: Projects that could result in potentially significant adverse future environmental and/or social impacts which, at the time of categorization, cannot readily be identified or assessed, and which, therefore, require a formalized and participatory environmental and social impact assessment process.
- Category B: Projects with potential adverse future environmental and/or social impacts that are typically site-specific, and/or readily identified and addressed through mitigation measures.
- Category C: Projects that are likely to have minimal or no potential adverse future environmental and/or social impacts, and can readily be addressed through limited environmental and social appraisal.

The EBRD also provides an indicative list for Category A projects in the scope of its Environmental and Social Policy (2014), which includes "Large scale wind power installations for energy production (wind farms)" under Item 22 of the list. Item 27 of the list separately includes the projects (including renewables) which are planned to be carried out or are likely to have a perceptible impact on sensitive locations of international, national or regional importance, even if the project category does not appear in this list. Such sensitive locations include, inter alia, nature protected areas designated by national or international law, critical habitat or other ecosystems which support priority biodiversity features, areas of archaeological or cultural significance, and areas of importance for Indigenous Peoples or other vulnerable groups. EBRD, in accordance with its Public Information Policy (May, 2014), specifically requires ESIAs on Category A (private sector) projects to be disclosed for a minimum of 60 calendar days.

In consideration of the given international environmental and social categorization approach and criteria of Equator Principles, IFC and EBRD, Project's nature and scale and the fact that the Project is located within a Key Biodiversity Area (KBA)[1], namely Boz Mountains KBA, Mersinli WPP has been assessed as "Category A" Project, which is likely to include activities and components that are to be effectively managed to avoid or minimize significant environmental and social impacts.

[1] Key Biodiversity Areas (KBAs) are places of international importance for the conservation of biodiversity at the global level. See Chapter 11 for the details of the KBA designation process and the involved parties.

3. Project Description

This Chapter provides a detailed description of the Project; including main units, supporting infrastructure and associated facilities to be constructed and operated within the Project Area. Additionally, background information on the Project including status of relevant permits and licenses, Project schedule, machinery and equipment to be used, workforce requirements, and the costs and applicable tariffs is also presented within this Chapter.

3.1 Project Overview

Located in Kemalpaşa, Bayındır and Torbalı districts of İzmir province, the Mersinli Wind Power Plant (WPP) Project ("Mersinli WPP Project" or "the Project") will have a total installed capacity of 58.65 ≈ 58.7 MWm (55 MWe), which will be provided by a total of 17 wind turbines, each having a capacity of 3.45 MW. The Project consists of land Preparation, Construction, Commissioning, Operation and Maintenance and Closure phases. The main and associated facilities of the Project and their functions are provided below:

- 17 horizontal axis wind turbines (HAWT), which will generate around 180 GWh net electricity annually;
- Underground cable network, which will transmit the generated electricity from the wind turbines to the substation;
- Substation, which will adjust the voltage of the generated electricity for transmission to the grid;
- Access Roads, which will provide access to the site and between the Project units;
- Administrative Building, which will house the control room, in addition to administrative and social facilities;
- Temporary facilities and sites that will be used during the construction phase (including mobilization sites, contractor offices and compound areas, open stock area, top soil storage area, hazardous and non-hazardous waste storage areas, etc.)

Grid connection of the Mersinli WPP will be provided through a 40-200 m connection line that will connect directly to the existing 154 kV Energy Transmission Line (ETL) passing through the Project Area (1 new ETL pylon will be required to be newly constructed). Thus, the Mersinli WPP Project does not include construction and operation of a new ETL line. Key Project characteristics are summarized in Table 3-1.

Table 3-1. Summary of Key Project Characteristics

Information	Explanation/Description
Number of turbines	17
Turbine type	Vestas V126
Turbine capacity	3.45 MW
Total installed capacity of the WPP	58.7 MWm/55 MWe
Annual net electricity generation	Approx.180 GWh
ETL connection	40-200 m line (A new ETL is not required, only one new lattice tower will be erected under the existing ETL)

3.2 Project Location

Mersinli WPP Project is located within the administrative borders of Kemalpaşa, Torbalı and Bayındır districts of İzmir province, at the localities of Çardaklı Tepe, Kartal Tepe, Mersinli (Marmariç), Karlık Tepe and Akçam Tepe. The License Area, designated by the Energy Market Regulatory Authority (EMRA) in the scope of Project's Electricity Generation License provided on 5 July 2012, covers 1,650 ha.

License Area is located approximately 35 km (air distance) southeast of the İzmir city centre. Main access to the site is provided through the district centre of Kemalpaşa, which is located in the north-west of the License Area. From Kemalpaşa district centre, Kemalpaşa-Dağkızılca state road will be followed for about 10 km, which diverges to east near Dereköy neighbourhood to provide access to an existing WPP, namely Fuat WPP that operates in the north/north-east of the Mersinli WPP License Area. Fuat WPP's existing access road will be used for about 10 km until the border of the License Area, where the main entrance of the Project will be located. Alternatively, access can also be provided from the direction of Torbalı district centre, which is located in the southwest of the License Area. The Project Location Map and the Project Layout Map are presented in Figure 3-1 and Figure 3-2 respectively.

The site is generally mountainous, with a complex terrain and elevations ranging between 462 m and 953 m in the Project License Area. The main ridge, where turbines are distributed on, lies in a general north-west/south-east direction for approximately 6 km. The License Area consists mainly of lands registered as forest, while private parcels used for agriculture are also located within the License Area. Within the License Area, footprints of all Project units, including turbines, access roads and others, correspond to the lands registered as forest and no private land is used. The total area to be affected by the Project (including turbine foundations, substation, access roads and construction camp site), covers approximately 31 ha, which corresponds to 2% of the License Area (1620.5 ha).

A number of settlements are situated in the surroundings of the License Area. The closest settlement to the turbine locations is the Mersinli locality[2] of the Dernekli neighbourhood, which is located approximately 1 km south-east of Turbine-17 (WTG 17). List of settlements and the distances to the closest turbine is presented in Table 3-2.

Table 3-2. Settlements Closest to the Project Turbines

Settlement	District	Closest Turbine (WTG) to the Settlement	Approximate (Air) Distance of the Settlement to the Closest Turbine (km)	Direction of Settlement with respect to Turbine	Population (*TurkStat, 2016*)
Mersinli Locality of Dernekli neighbourhood*	Bayındır	WTG 17	1.0	South-east	14**
Dağtekke neighbourhood	Torbalı	WTG 16	1.6	South	169
Yeşilköy neighbourhood	Kemalpaşa	WTG 01	1.9	North	167
Çınardibi neighbourhood	Bayındır	WTG 11	1.9	North-east	822
Cumalı neighbourhood	Kemalpaşa	WTG 01	2.1	North	212
Karaot neighbourhood	Torbalı	WTG 01	2.1	West	282
Karakızlar neighbourhood	Torbalı	WTG 03	2.5	South-west	395
Dernekli neighbourhood	Bayındır	WTG 17	2.8	North-east	166
Gökyaka neighbourhood	Kemalpaşa	WTG 02	3.4	North	95
Dereköy neighbourhood	Kemalpaşa	WTG 02	4.7	North	458

**Referred to as Marmariç Permaculture Village by the residents of the settlement.*

***According to the information provided by the residents of Marmariç Permaculture Village.*

[2] Mersinli was a hamlet of Dernekli neighborhood, which was abandoned more than 20 years ago. The area has been resided by Marmariç Permaculture Community, whose first members have moved to the area in 2003 and established a Permaculture Village, which is referred to as "Marmariç Permaculture Village" within this ESIA Report. Currently, there are 8 houses located in the village.

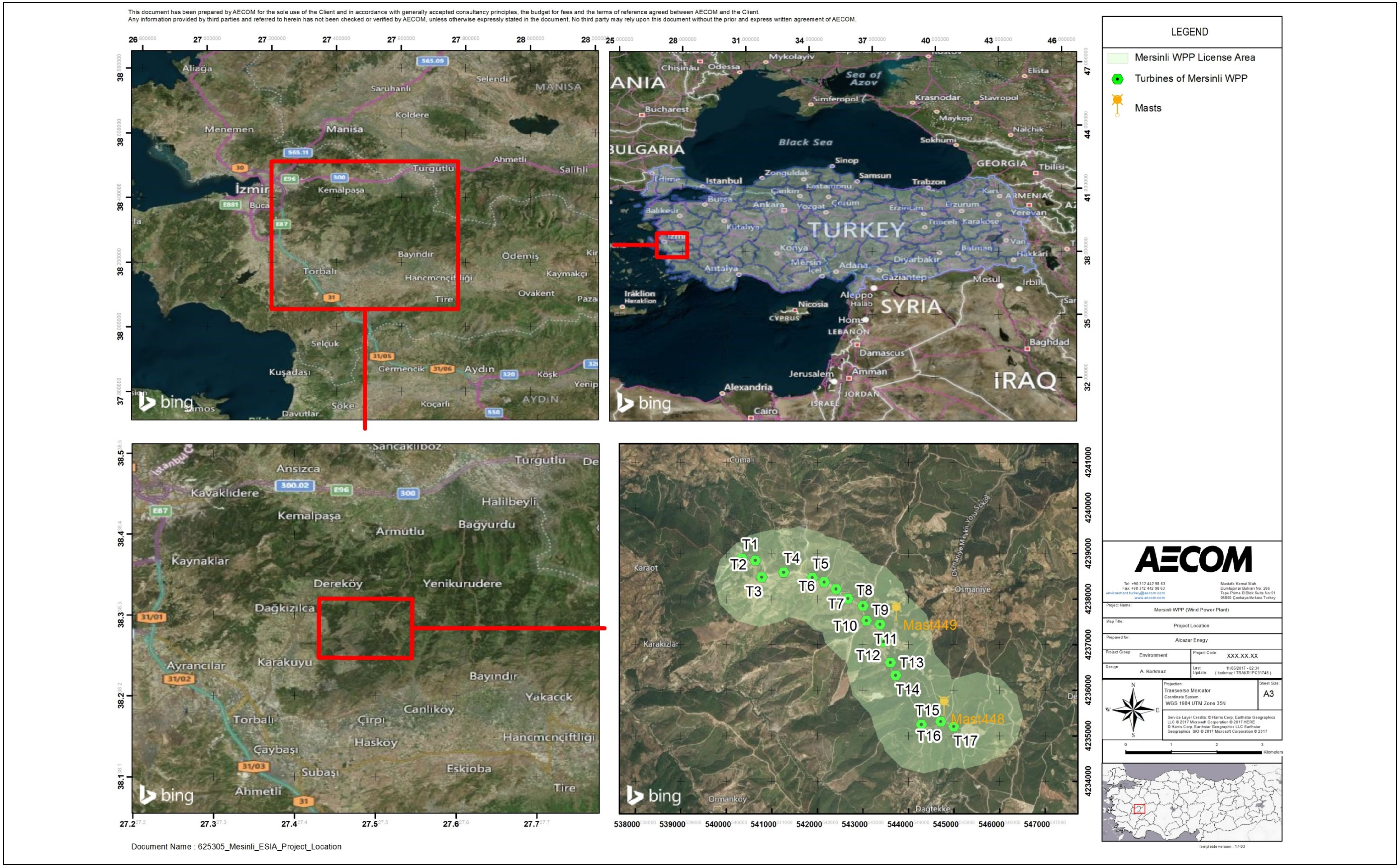


Figure 3-1. Project Location Map

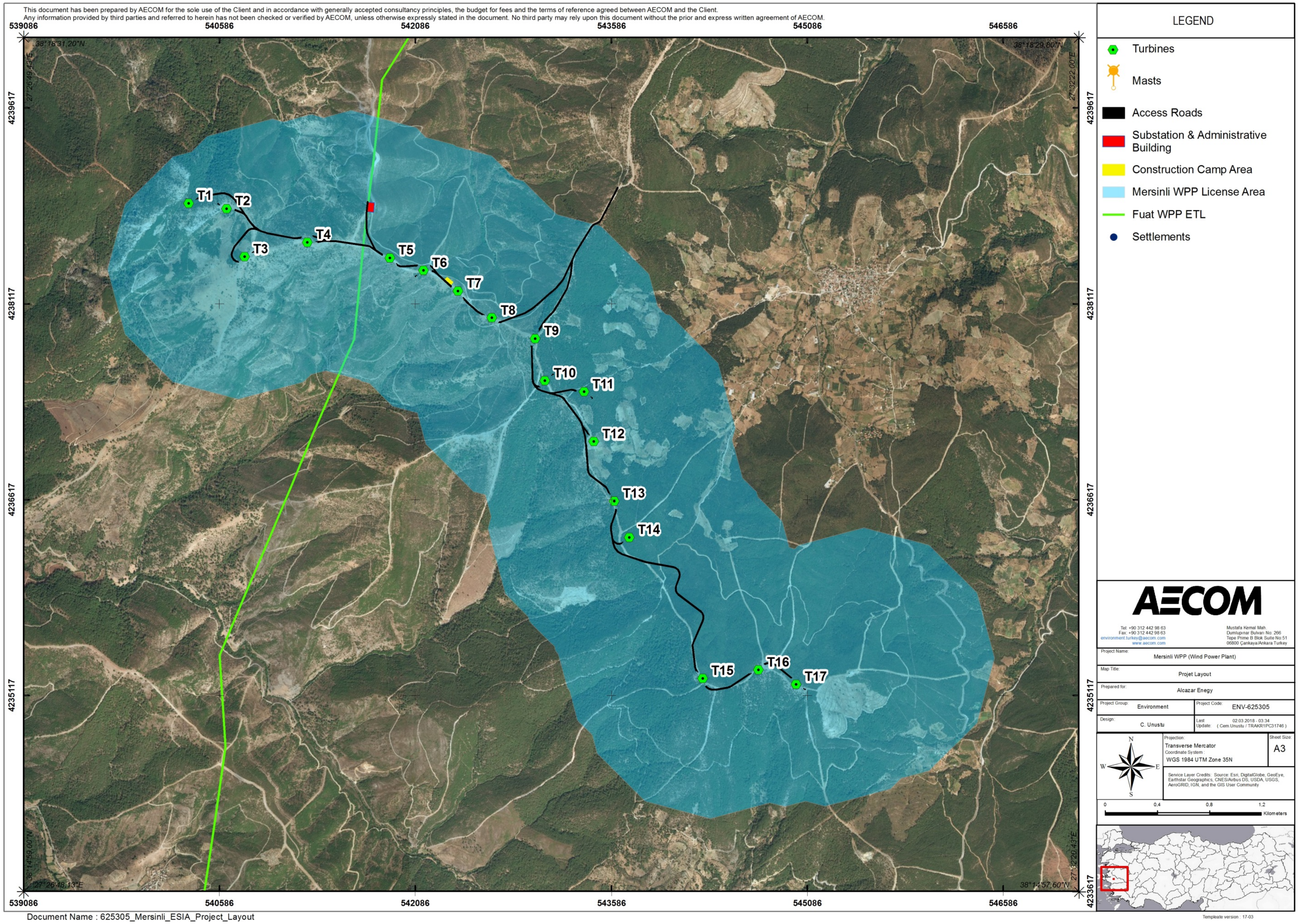


Figure 3-2. Project Layout

In the surroundings of the Mersinli WPP License Area, there are other existing WPP projects. As mentioned above, Fuat WPP (33 MW; 10 turbines), which is operating in the north/north-east of the License Area since 2015, is the closest project to Mersinli WPP. Closest distance between the turbines of the Mersinli WPP and Fuat WPP is around 3.5 km (air distance). The 154 kV ETL of the Fuat WPP is crossing the Mersinli WPP License Area (between Turbine-4 and Turbine-5). Karabel WPP (3 MW; 1 turbine), which is in operation since 2016, is located around 7.5 km northwest (air distance) and Ege WPP (9.2 MW; 4 turbines), which is in operation since 2015, is located around 20 km north-east (air distance) of the Mersinli WPP Project. WPP projects concentrated in the Karaburun and Çeşme peninsulas (which are important touristic area in İzmir province) are located around 80-100 km (air distance) in the west/north-west of the Mersinli WPP License Area. No other industrial facilities are located in the close vicinity of the License Area.

Photographs showing the existing conditions of the Project Area are provided in Figure 3-3.

Looking towards the location of Turbines 1-4 from North-east
(from the Main Access Road)
(Overhead Lines of Existing 154 kV Fuat WPP ETL are seen)

Looking towards the location of
Substation from North-east

Connection Location to the
Existing 154 kV Fuat WPP ETL (west of the Substation)

Substation Location

Figure 3-3. Project Area Photographs

3.3 Project Company

Alcazar Energy ("AE") through the Project Company, as defined below, is planning to construct and operate the Mersinli Wind Power Plant Project ("Mersinli WPP Project", the "Project"), in İzmir province, within the administrative borders of Kemalpaşa, Torbalı and Bayındır districts, Çardaklı Tepe, Kartal Tepe, Mersinli, Karlık Tepe and Akçam Tepe localities. At the national tender stage conducted for the wind power projects in 2007, the previous Project owner established a project company, namely Yander Elektrik Muh. Mus. Ins. Tur. ve Tic. A.S. ("Yander Elektrik" or the "Project Company"), for the development of the Project. In May 2017, AE, through a wholly owned subsidiary, acquired 100% of the shares of Yander Elektrik and is now the sole owner of the Project.

AE is an independent developer and power producer focused on mid-market renewable energy generation across the Middle East, Turkey and Africa (META) region. AE was formed in early 2014 and is positioned to capitalise on the region's shift towards renewable energy as it has become a competitive source of power generation below grid parity.

AE's role is the origination, development, structuring, acquisition and operation of renewable energy projects with a focus on the on-shore wind technologies and photovoltaic solar power plants. In this respect, AE targets emerging economies which have attractive underlying market fundamentals and developed regulatory frameworks.

In 2015, International Finance Corporation (IFC), a member of the World Bank Group and the largest global development institution focused exclusively on the private sector in developing countries, has made an equity investment in Alcazar Energy and become a sponsor of AE to support development of a series of wind and solar energy projects in the META region.

As of 2017, AE leadership team, which incorporates fully resourced Business Development, Investment, Project Finance, Delivery and Operations teams, has financed and developed over 100 power transactions, across 27 countries with a combined power capacity in excess of 41 GW, of which 11 GW is in renewable energy. This includes development of the first utility-scale wind and solar plants in the Middle East and the development of the largest solar plant in the META region.

3.4 Project Background

The Project Company (Yander Elektrik), as the Project SPV, was founded by the former project owner in 2007. In the scope of the national tender process conducted for the wind energy developments in Turkey, the Project Company was awarded with a 55 MW capacity for connecting to the national grid in 2011. Afterwards, starting from 2012, meteorological measurements were conducted for 2 years at the two meteorological masts installed within the License Area. Afterwards, legal requirements under the scope of applicable Turkish legislation were fulfilled (i.e. Electricity Generation License obtained from EMRA, EIA Decisions obtained from the MoEU in line with the then-current EIA Regulation). The ESIA studies have started in 2017, after the acquisition of the Project Company by Alcazar Energy. Figure 3-4 summarises the key Project milestones achieved to date.

2007
- The Project Company was established.

2011
- Early Project development works started.
- Project Company was awarded with a grid connection capacity of 55 MWe through the national wind energy tender process.

2012
- 2 meteorology masts were commissioned at the southern part of the Project Area.
- Electricity Generation License was obtained from EMRA.
- "EIA is not Required" Decision was obtained from the MoEU (in accordance with the then-current EIA Regulation).

2014
- "EIA is not Required" Decision was revised due to change in Project layout obtained from the MoEU (in accordance with the then-current EIA Regulation).

2016
- EIA Positive Decision was obtained (for 22 turbines; 55 MWm/55 MWe installed capacity) in accordance with the EIA Regulation in force.

2017
- Alcazar Energy acquired (100%) of the Project Company.
- Validity of EIA Positive Decision was confirmed for current Project Layout
- Amendment process for the EMRA License based on current Project layout has started.
- AECOM has been commissioned to undertake ESIA studies for the current Project.
- A new meteorology mast has been commissioned at the northern part of the Project Area.

Figure 3-4. Key Project Milestones

3.5 Project Components

Information on the permanent components of the Mersinli WPP, including the wind turbines, substation, administrative building and the site access roads, and the temporary facilities to be used during the land preparation and construction phase only is provided in the following sections. Layout of the Project components is shown on the map previously provided in Figure 3-2.

3.5.1 Wind Turbines

The working principle of a wind turbine is capturing a percentage of the kinetic energy of wind by spinning rotors and thus converting it to mechanical energy and finally converting the mechanical energy to electrical energy via a generator. Therefore, cost effective conversion of kinetic wind energy to electrical energy is the aim of any wind turbine design.

For modern wind turbines, approximate wind speeds of 3 to 4 m/s (10.8 to 14.4 km/hr), called the cut-in speed, is required to rotate the blades for initiation of energy generation. The wind energy a turbine can extract increases proportional to the cube of wind speed. However, a wind turbine cannot make use of %100 of the available wind energy. The maximum power generation is reached at wind speeds of approximately 12 m/sec (43 km/hr), called the rated speed of a turbine. When the available winds exceed the rated speed, the energy generation output remains the same until an approximate wind speed of 25 m/s (90 km/hr), which is called the cut-out speed of a turbine, is reached. At this point, the system shuts down to avoid any damage that may be caused by stress (*IPCC, 2011; IFC, 2015*).

Main components of a modern (HAWT) are presented in the illustration in Figure 3-5. The three blade-upwind rotor seen in the figure prevents the turbine from blocking the wind and is designed to decrease aerodynamic noise. These blades are attached to a hub, a main shaft and optionally a gearbox to adjust the revolutions per minute (RPM) to the turbine's generator operating levels. The containment component of the turbine, namely the nacelle, houses the shaft, the gearbox, the generator, transformer, switchgear and the control system. The Nacelle is mounted on a steel, cylindrical tower with a height predetermined based on wind assessments conducted for a specific site (*IPCC, 2011; IFC, 2015*).

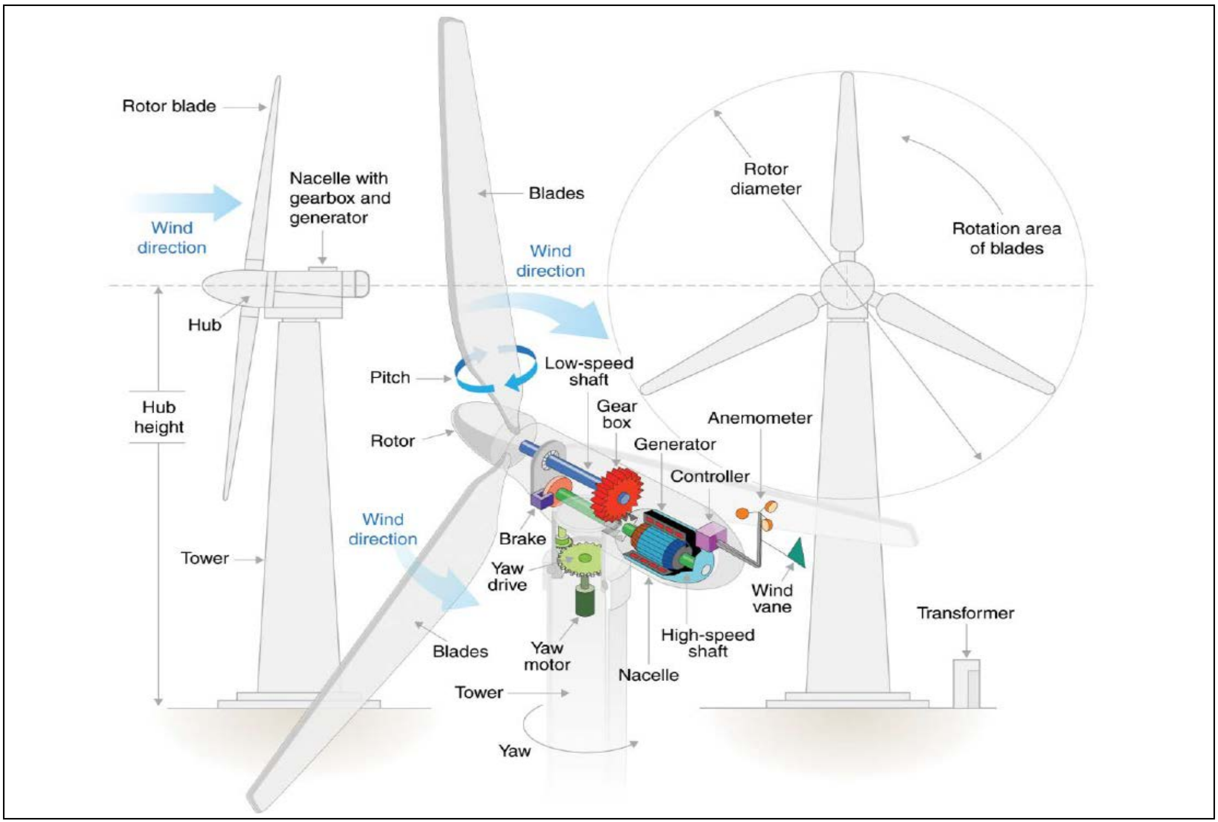


Figure 3-5. Horizontal Wind Axis Turbine Components (*US Department of Energy, Argonne National Laboratory, 2010*)

For the Project, the Project Company selected V126-3.45 MW turbines, a model specifically designed to operate on medium wind sites by Vestas Wind Systems A/S. In Turkey, the V126 turbine model has been used in 5 different projects (as of Q1 2017) having a total installed capacity of more than 280 MW. According to the Energy Assessment conducted by DNV-GL for Mersinli WPP (2017), the hub height for all of the turbines will be 87 m. Technical specifications for the turbine model, which has noise isolation and ability to decrease load, control rotation, optimize voltage and regulate power, are presented in Table 3-3. Transformers will be inside the turbines.

Table 3-3. Technical Specifications of the Turbine Model to be Used

Item	Specification
Operational Data	
Rated power	3,450 kW
Cut-in wind speed	3 m/s
Cut-out wind speed	22.5 m/s
Re cut-in wind speed	20.5 m/s
Wind class	IEC IIIA
Standard operating temperature range	from -20 °C to +45 °C with de-rating above 30 °C
Rotor	
Rotor diameter	126.0 m
Aerodynamic brakes	Full feathering
Electrical	
Frequency	50-60 Hz
Converter	Full scale
Gearbox	

Item	Specification
Type	Two planetary stages and one helical stage
Tower	
Hub height	87.0 m
Nacelle Dimensions	
Height for transport	3.4 m
Height installed (incl. Cooler Top)	6.9 m
Length	12.8 m
Width	4.2 m
Hub Dimensions	
Max. transport height	3.8 m
Max. transport width	3.8 m
Max. transport length	5.5 m
Blade Dimensions	
Length	61.66 m
Max. chord	4 m

Standard turbine foundation designs provided by the turbine suppliers are presented in Figure 3-6 and Figure 3-7. Accordingly, foundation diameters would range between 19 m and 23 m, and depth of the foundations would be around 3 m. Final design will be based on the results of geotechnical surveys to be conducted prior to construction phase. Crane pads will be established on turbine locations to enable erection and assembly of turbine components during the construction phase and maintenance activities during the operation phase. Around the turbines, a clearance area (where the vegetation and trees/brushes will be cleared and regrowth will not be allowed) of around 100 m will be provided.

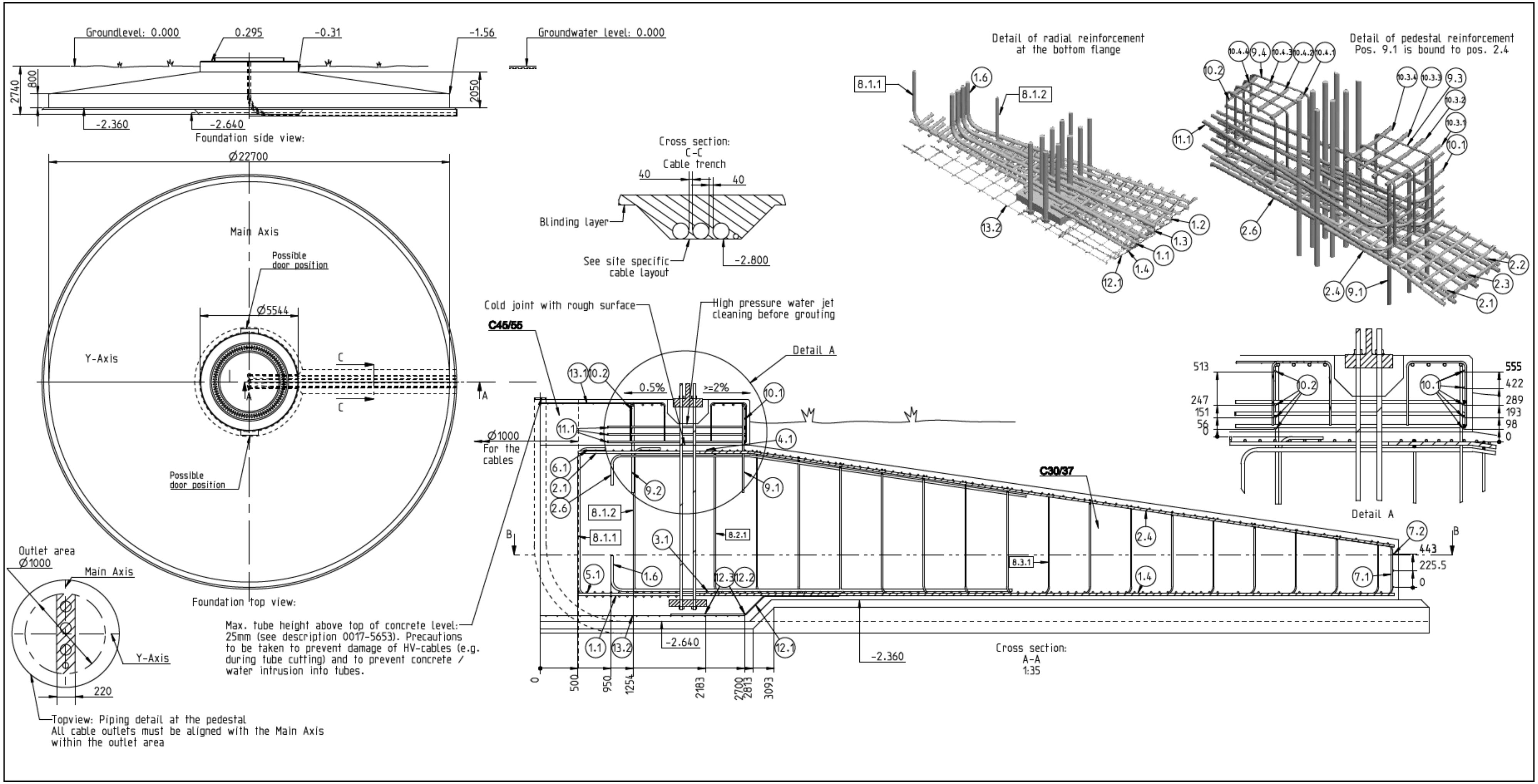


Figure 3-6. Typical Foundation Design for Groundwater Level at Terrain Level

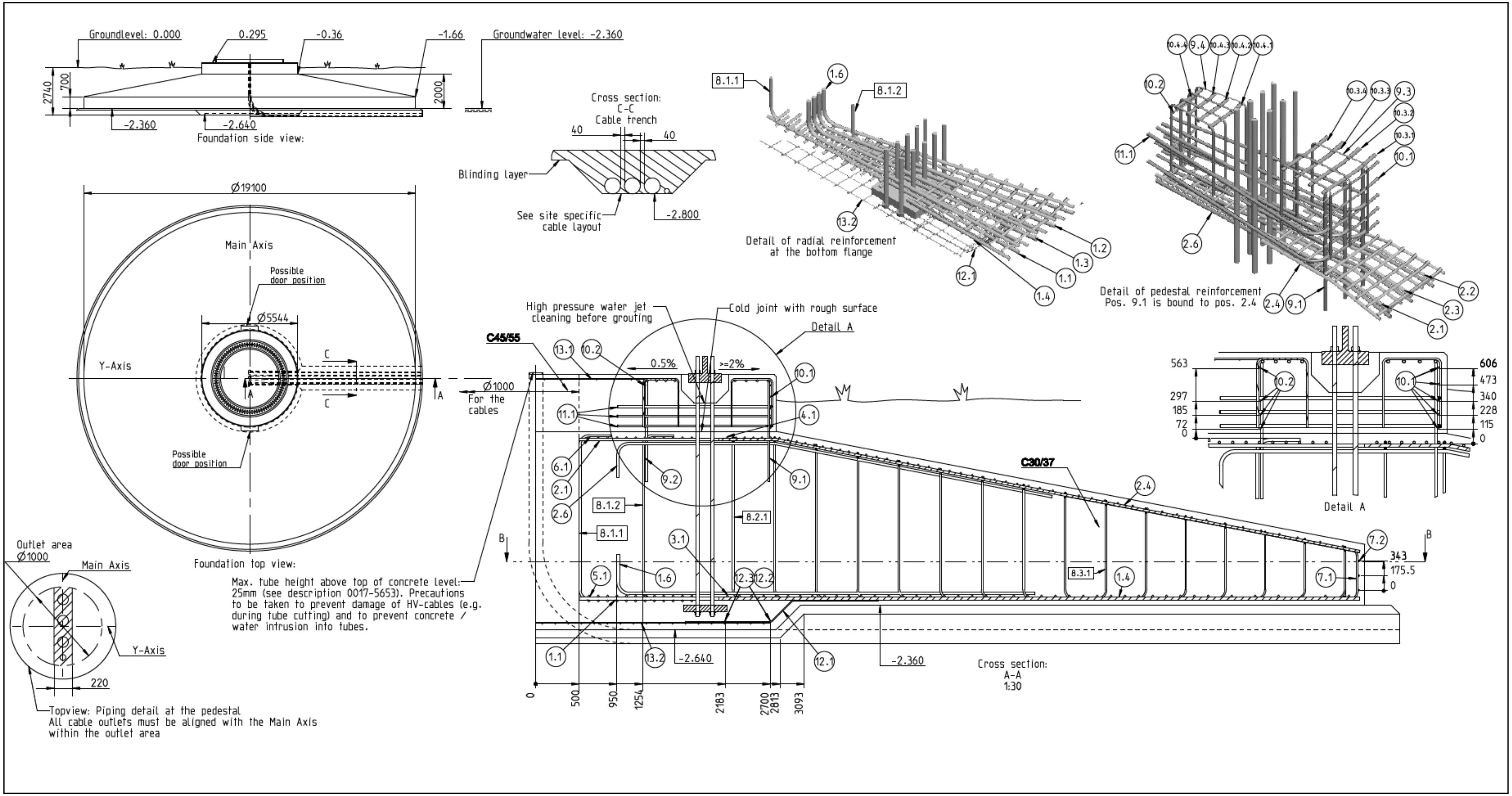


Figure 3-7. Typical Foundation Design for Groundwater Level at Foundation Level

Locations of turbines including their elevations and coordinates are listed in Table 3-4.

Table 3-4. Turbine Coordinates

Turbine	Elevation (m)	Coordinates	
		X	Y
T1	877.8	27.461471	38.297159
T2	893.4	27.464797	38.296777
T3	923.8	27.466353	38.293454
T4	822.7	27.47186	38.294432
T5	793.4	27.47908	38.293321
T6	732.7	27.482013	38.292444
T7	760.8	27.485023	38.291017
T8	783.0	27.487972	38.289139
T9	860.1	27.491759	38.287681
T10	843.1	27.492585	38.284776
T11	792.5	27.495987	38.283995
T12	776.6	27.496833	38.280558
T13	759.9	27.498588	38.276441
T14	775.1	27.499897	38.27393
T15	849.5	27.506254	38.264169
T16	848.6	27.511128	38.264734
T17	826.0	27.514424	38.263728

3.5.2 Access Roads

Main access to the Mersinli WPP site will be provided by using Fuat WPP's existing access road. This stabilised road is around 12 km and was built for the construction and maintenance of the Fuat WPP. The road will be well-maintained and/or improved based on results of the further surveys to be conducted prior to the start of construction phase. Main entrance of the Mersinli WPP site will be on the main access road around 1.2 km north of Turbine-9.

Internal site access roads to be built in the scope of Mersinli WPP Project will include the internal roads that will provide access between turbine locations and substation site. According to the current design, internal site access roads will have a total length of around 11.7 km, which will mainly follow the existing forest roads and fire breakers where possible. Of the total length, 5.2 km is anticipated to be new roads. The remaining 7.2 km will consist of existing forest roads, which will be improved to the road standards required by the Project. Final design of the roads will be done based on the results of further surveys to be conducted prior to the start of construction phase.

Typical cross-section and pavement structure for the site access roads are provided in Figure 3-8 and Figure 3-9, respectively. The effective width of the site access roads will be 6 m. Fill material to be required for the constitution of the pavement structure will be provided from local suppliers to be identified prior to start of relevant activities. Trenches will be excavated in parallel to the access roads or using the existing fire-breakers, to lay the underground cables to be used for transmission of energy from the turbine locations to the substation site.

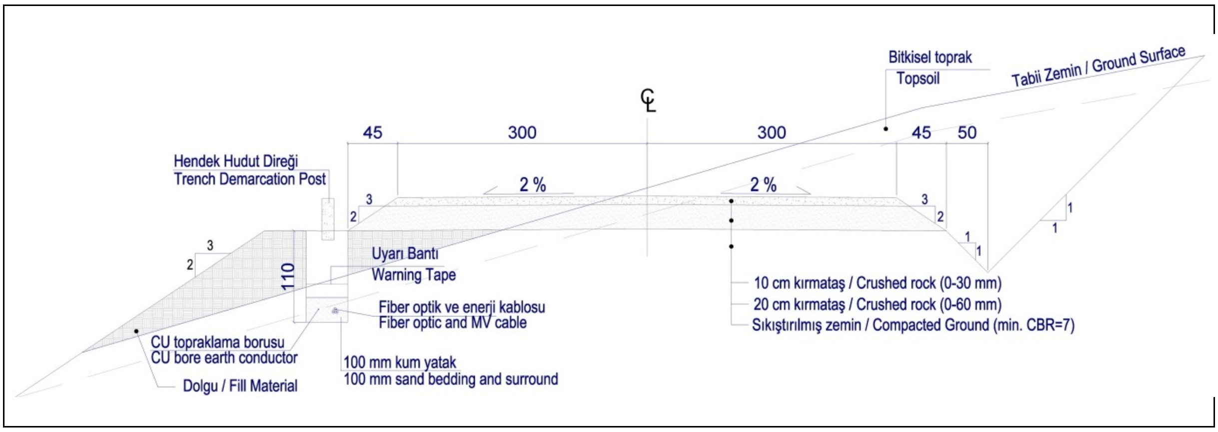


Figure 3-8. Typical Cross-section for Site Access Roads

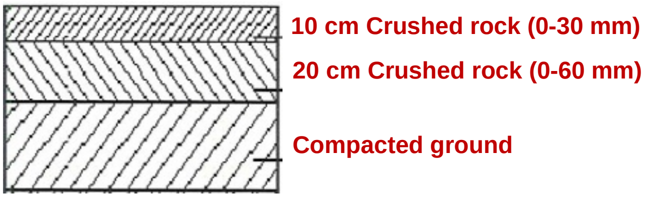


Figure 3-9. Pavement Structure for Site Access Roads

3.5.3 Underground Cable Network

The energy to be generated by the wind turbines will be relayed to the substation via the underground cable network (medium voltage-MV- collector system). The 33 kV MV collector system will include four circuits as listed below:

- Circuit 1: WTG 1 to 4
- Circuit 2: WTG 5 to 8
- Circuit 3: WTG 9 to 13
- Circuit 4: WTG 14 to 17

Underground cables will be placed in trenches to be excavated in parallel to the site access roads to avoid additional land disturbance, environmental impacts and costs. As an exception, trenches to be excavated for Turbin-8 and Turbine-9 will use the fire breaker route due to topographical conditions. The length of the trenches to be excavated is estimated to be around 10 km.

A total of 50.7 km, 33 kV aluminium cables will be laid inside the trenches to be excavated in parallel to the access road routes. In addition to MV cables, these trenches will also accommodate fibre optic cables to be used in the scope of Project communication purposes. A photograph showing the cable trenches excavated in a similar project is given in Figure 3-10.

Figure 3-10. Example Photograph Showing Cable Trenches Opened in a Similar Project

Drawings showing typical cross-section alternatives for the trenches are provided in Figure 3-11. As can be seen the cables will be directly buried in 80 cm depth trenches (shown as Type 1 to 4 in Figure 3-11), except in the road crossings where they will be laid inside 150 mm diameter pipes installed at 1 meter of depth and protected by concrete (shown as Road 1 to 4 in Figure 3-11). Number of cables (3 per circuit) to be put in trenches will change at different turbine locations, resulting in changing trench widths. The width of the trenches will change between 350 mm to 1,100 mm (550 mm to 1,300 mm at road crossings) (see Table 3-5).

Table 3-5. Dimensions for Alternative Trench Types

Trench Type	Trench Dimensions		Total Length of Trench Corresponding to the Specific Trench Type (m)
	Depth (mm)	Width (mm)	
Type-1/Road-1	800-1,000	350-550	5,000
Type-2/Road-2	800-1,000	600-800	3,000
Type-3/Road-3	800-1,000	850-1,050	1,500
Type-4/Road-4	800-1,000	1,100-1,300	500

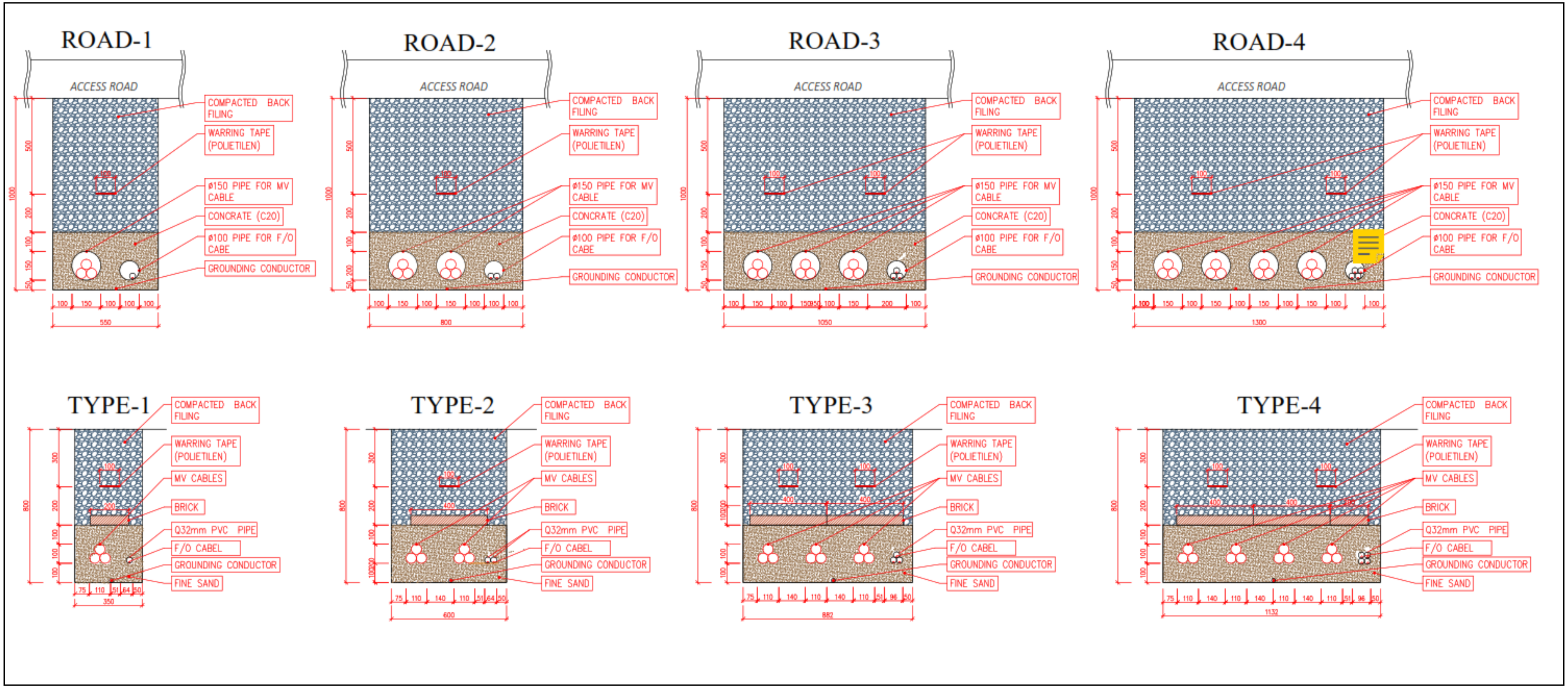


Figure 3-11. Typical Cross-section Drawings for Cable Trench Alternatives

3.5.4 Substation

The Project's substation will be located at the eastern side (adjacent) of the existing ETL of the Fuat WPP. At the substation, a high voltage switchyard (33/154 kV) will serve the adjustment of voltage level of the generated energy before connection to the national grid. At this site, there will be an administrative building where the control centre will be located. Control centre will include necessary supervisory control and data acquisition (SCADA) systems, telecommunication cabinets and closed-circuit television (CCTV), which will allow real time monitoring, optimisation and management of the power plant. The administrative building will also house the offices and social facilities to be used by the operation personnel. Material and waste storage areas and a parking area will also be located at the substation site. General layout of the substation area is presented in Figure 3-12. The operation and maintenance of the substation will be under the responsibility of the Project Company during the operation phase.

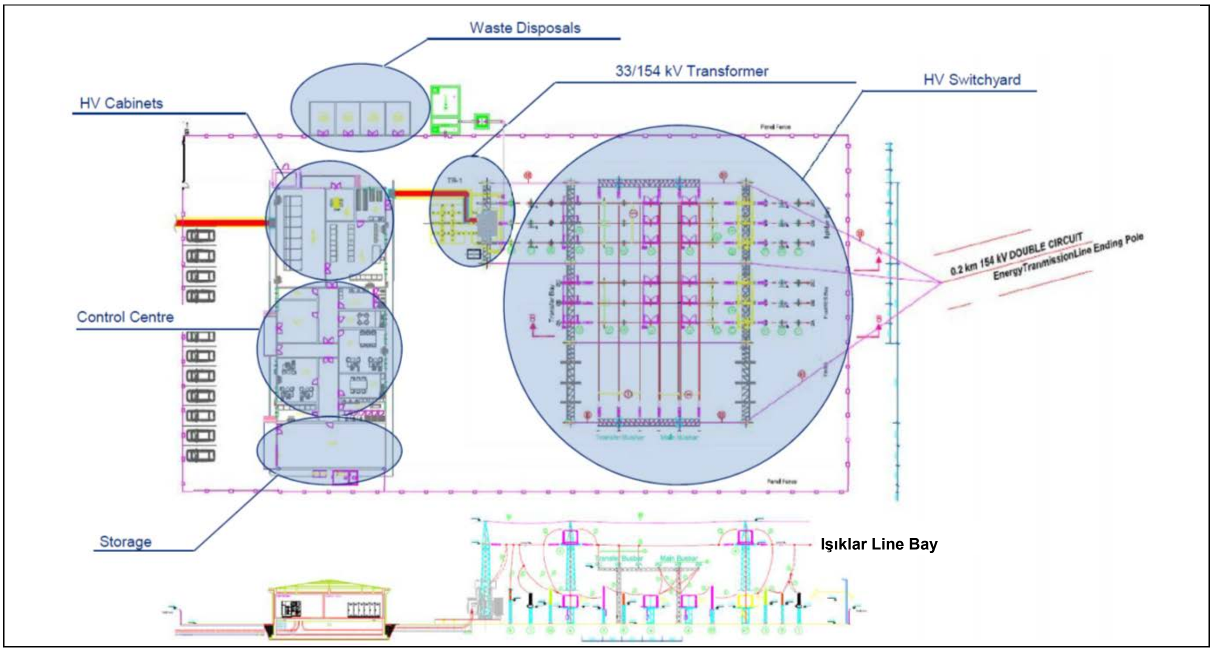


Figure 3-12. General Layout for a Similar Substation Site

3.5.5 Energy Transmission Line (ETL) Connection

The high voltage ETL (154 kV) of the existing Fuat WPP, which is operating in the north/north-east of the License Area, is crossing the License Area between Turbine-4 and Turbine-5. As a result of the optimised design, the Mersinli WPP Project will not include construction and operation of a new ETL and the grid connection of the power plant will be provided by a 40-200 m line that will connect to the existing ETL of the Fuat WPP, which ends up at the Işıklar and Tire Transformer Stations.

In order to connect to the existing ETL of the Fuat WPP, a new ETL pylon will be constructed by the Project Company at the western side of the substation, as illustrated in Figure 3-13. The pylon located right in the south of the newly planned pylon would be decommissioned, as it will not provide any supporting function once the new pylon is constructed. The final design of the connection will be subject to approval of TEİAŞ as owner of the ETL. In exchange for royalty fee to be paid periodically, Connection and System Usage Agreements will be signed between the Project Company and the Turkish Electricity Transmission Company (TEİAŞ), which is the authority responsible from the operation and maintenance of the high voltage ETLs in Turkey (including Fuat WPP ETL). These agreements will be valid for the operational lifetime of the Project.

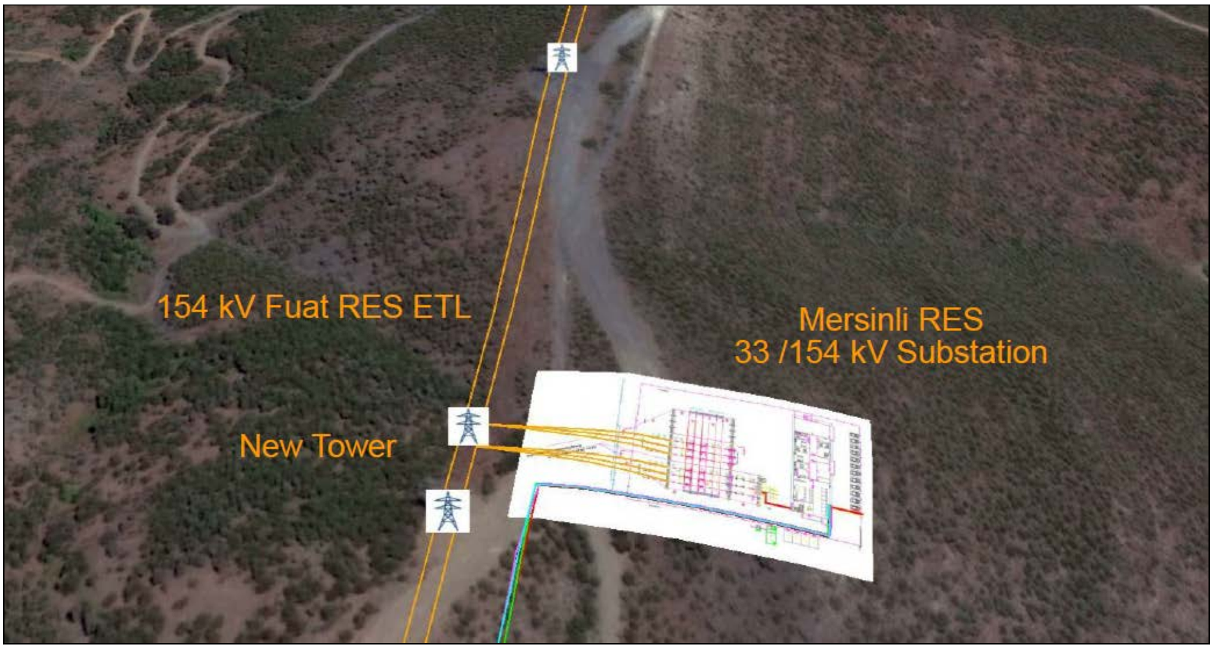


Figure 3-13. Illustration of Project's ETL Connection

3.5.6 Temporary (Construction) Facilities

Temporary facilities to be used during the construction phase are described in the following sections.

3.5.6.1 Construction Camp Site

A Construction Camp Site is planned to be located adjacent to north of the access road between WTG-6 and WTG-7. The site will accommodate the turbine supplier's site (Vestas Site) and the construction (Balance of Plant-BoP) contractor's site (BoP site). At the Vestas Site, there will be offices, toilets, outdoor storage area and hazard waste storage area. At the BoP site, there will be: contractor's office, Project Company's office, a meeting room, canteen, toilets, security a guardhouse, an outdoor storage area and hazardous waste storage area. The construction Camp Site will function as a general mobilisation site for construction and it will be a temporary facility that is to be removed upon the completion of construction. General layout of the Construction Camp Site is provided in Figure 3-14.

It should be noted that there will be no on-site accommodation during the construction or operation phases. Employment from the local will be maximized to the extent possible and workers employed from other regions will accommodate at close settlements and transported to the site by Company cars.

3.5.6.2 Top Soil Storage Areas

Top soil to be stripped from the footprint of permanent Project units will be stored at designated top soil storage areas before being reused for rehabilitation works to be conducted following the completion of construction. Due to topographical conditions and challenges of the Project Area, separate top soil storage areas will be designated to serve a few areas.

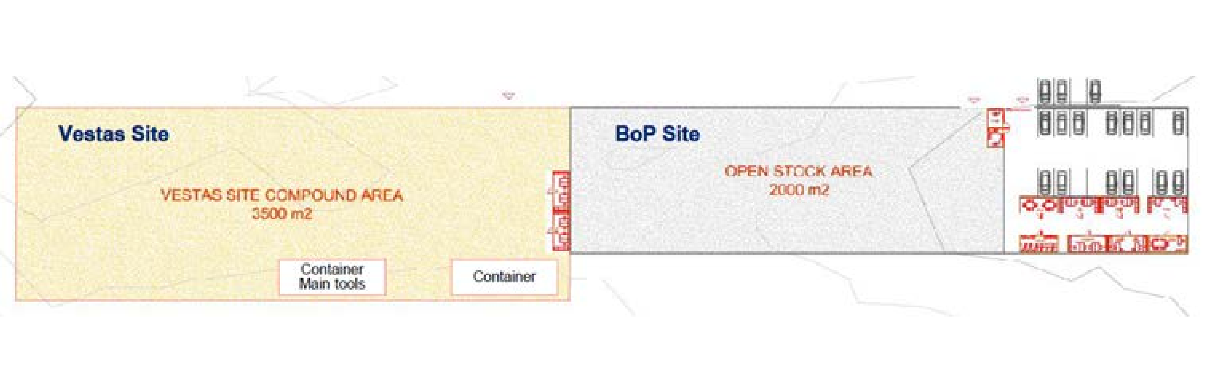


Figure 3-14. General Layout for the Construction Camp Site

3.6 Project Activities

Information on the Project development and planning studies conducted for the Mersinli WPP Project so far has been previously provided in Section 3.4. Land preparation, construction and operation activities to be conducted in the future phases of the Project are described in the following sections.

All financially feasible and cost-effective measures will be taken to minimise consumption and improving efficiency in use of energy, water and other resources and material inputs as well as for recovering and re-utilising water materials in all phases of the Project. In a similar manner, all related pollution prevention and control techniques will be implemented to avoid or minimise adverse impacts on human health and the environment. In line with EBRD PR 3, techniques applied to Mersinli WPP Project will favor the prevention or avoidance of risks and impacts over minimization and reduction in line with the mitigation hierarchy approach, as well as Project GIIP.

3.6.1 Land Preparation and Construction Phase Activities

The activities to be conducted in the land preparation and construction phase will include the following:

- Site preparation,
- Construction of site access roads and internal roads,
- Excavation activities for turbine tower foundations,
- Preparation of crane pads at each wind turbine location,
- Transportation of the anchor cages,
- Construction of turbine/tower foundations,
- Transportation of turbine components including nacelles, hubs, blades and towers,
- On site assembly of the turbines,
- Construction of the substation (including the administrative building) and the ETL connection,
- Electrical works and installation of the control system,
- Connection to the system,
- Testing and commissioning, and
- Site re-instatement and restoration.

Land preparation and construction activities are planned to be completed within 16 months including commissioning. Turbine components, including turbine towers, blades, hubs and nacelles, will be transported by Vestas and temporarily stored at the Project Area. A total of three routes will be used for turbine component transport as summarized below:

- Hubs and nacelles will be manufactured in Denmark, shipped to Aliağa Batı Seaport located in Aliağa district of İzmir province, and will be transported to the Project Area from there via the Menemen-İzmir route.
- Blades will be manufactured at a plant in Menemen and will be transported to the Project Area via the same road network that will be used for transportation of hubs and nacelles, except the Aliağa-Menemen road section that connects the Aliağa Batı Port to Menemen.
- Towers will be manufactured at a plant located on the İzmir-Çanakkale Road, Zeytindağ locality and will be transported to the Project Area via a different road network that passes through Manisa province.

Earthworks phase will include land levelling and excavations, construction of access roads and excavation of turbine foundations and underground cable line trenches. Foundations will be constructed in these excavations for each turbine to be mounted on. The construction of the foundations will comprise of excavation of the hole using a digger, outer form setting, rebar and anchor cage assembly, casting and finishing concrete, removing the forms, backfilling, compacting and foundation site restoration.

A crane pad will be constructed at the base of each turbine location. Once the turbine foundations and crane pads are completed, on-site assembly of the wind turbines will commence, with erection of turbine towers and assembly of hub components and blades. Turbine erection will be performed in multiple stages, including; erecting the tower in three sections, erecting the nacelle, assembling and erecting the rotor, connecting and terminating the internal cables and inspecting and testing the electrical system prior to operation.

In parallel to these construction activities, the administrative building, the substation and the ETL will also be constructed. As each turbine and Project unit's construction is completed, electrical works will be commenced and the Mersinli WPP Project will be ready for commissioning and energy generation.

Estimated amount of the materials to be required during the construction activities is provided in Table 3-6. Materials required for the construction are planned to be supplied from local providers. In this respect, concrete will be supplied from the local licensed concrete plants. Aggregate will be supplied from the licensed borrow sites operating in the region. Exact suppliers will be identified by the Project Company and the construction contractor prior to the start of construction phase.

Table 3-6. Estimated Material Requirement for the Construction Activities

Material	Amount
Fill/cover material*	100,000 m^3
Concrete	10,000 m^3
Steel	1,100,000 kg

**Based on the current data, it is estimated that around 20% of the fill/cover material would be provided from excavated soils (amount of excavated materials is estimated to be around 815,000 m^3). Exact amount of soil to be reused in fill/cover operations will be determined based on the result of the final soil surveys to be conducted prior to start of construction activities.*

The construction machinery and equipment will use diesel as fuel. Fuel consumption is estimated to be about 5 lt per vehicle per hour (see Section 3.7 for the list of construction machinery and equipment planned to be used).

During the construction phase of the Project, various hazardous types of waste will be generated, which if not managed properly may result in soil, surface water and groundwater contamination, as well as related personnel and community health and safety issues. All generated waste oil will be collected in safe leak-proof containers and it will be stored in the designated area located inside the Temporary Site. The storage space will have a concrete surface and a proper secondary container to prevent potential spillages and leakages from reaching the soil and groundwater. "Hazardous waste" labels will be placed on the containers, which also indicate the amount of stored waste as well as the storage time of the waste. With all other waste, hazardous wastes will be managed through the Waste Management Plan.

3.6.2 Operation and Maintenance Activities

In line with the Energy Generation License provided by the Energy Market Regulatory Authority (EMRA) the Project is licensed to generate electricity by using wind energy for 49 years starting from the date the License was issued (5 July 2012).

The design lifetime of the wind turbines is at least 20 years, but in practice turbines may last longer with proper maintenance. With a well-defined maintenance program, the following is aimed (*US Department of Energy, 2015*):

- Increase in efficiency and energy delivery
- Decrease in downtime (hours/year)
- Ensuring EHS and reducing risks
- Extending system lifetime
- Securing additional financing
- Compliance with manufacturer warranty

Therefore, the Project operation phase will also involve carefully planned, routine maintenance operations. The maintenance activities will be conducted either periodically or as required and will consist of preventive maintenance, corrective maintenance and monitoring, as described below (*Andrawus, 2008; US Department of Energy, 2015*):

- Preventive Maintenance: Consists of routine checks, testing and maintenance to determine whether any major maintenance work is required, in order to ensure corrective maintenance is kept to a minimum. Preventive maintenance is planned, scheduled and its expenditure is budgeted.
- Corrective Maintenance: Corrective maintenance tasks can either be identified through routine preventive maintenance, as a result of system shutdown triggered by the protective system or as a result of a failure of a system component. Corrective maintenance tasks include response to issues that may stem from degradation of component integrity/increase in wear and tear, human errors, design faults and operational factors (i.e. over speeding, excessive vibration, loss of grid connection, etc.). Corrective maintenance is unplanned, unscheduled and its expenditure is condition based.
- Monitoring: Consists of metering for revenue, alarms, diagnostics and condition monitoring.

In general, the Project's maintenance will include works such as multiple tasks of turbine components' maintenance, brake adjustment and brake pad maintenance, lubrication, checking the security of fixings, checking the security of cable terminations, generator overhaul, electrical components' maintenance, control equipment maintenance, access roads' maintenance, maintenance of the area around turbines, etc. Oils, solvents, paints for special tasks, etc. are likely to be used as necessary in the scope of operation and maintenance operations.

Hazardous materials used potentially for daily operation and maintenance of plant components (e.g. turbines and transformers) pose risk to personnel involved in handling of related hazardous materials such as oils and lubricants, paint, hazardous liquid wastes, pesticides, etc., which will be managed through implementation of the Waste Management Plan and Occupational Health and Safety Plan, in addition to measures presented in Chapter 10 and Chapter 14 of the ESIA Report.

3.7 Machinery and Equipment to be Used

Construction machinery and equipment planned to be used during the land preparation and construction phase is listed in Table 3-7. Generators will be used for electricity supply during the construction phase.

Table 3-7. Construction Machinery and Equipment Planned to be Used during Land Preparation and Construction Phase

Machinery/Equipment	Maximum Number Planned to be Used
BoP Contractor	
Buldozers	2
Excavators	6
Road Graders	2
Road roller	1
JCB	2
Trucks	8
Trailer	1
Sprinkler	1
Pickup trucks	5
Vans for staffs	2
Vestas	
Main Crane (750 ton)	1
Nacelle Offload/Pre Installation Crane (300 ton)	1
Tower Offload/Aux. Crane (120 ton)	2
To install Crane (75 tonne cranes)	3
Trucks to carry Main Crane	3
To carry Material onsite (Forklift)	3
4 vehicles	4
Main Crane : 750 ton	1
Nacelle Offload/Pre Installation Crane (300 ton)	1
Tower Offload/Aux. Crane (120 ton)	2

3.8 Workforce Requirements

A total of 150 personnel will be employed during the construction phase, of which, 120 are projected to be unskilled and 30 are projected to be skilled. On the other hand, the operation phase personnel requirement is estimated as 14, which will consist of 4 unskilled and 10 skilled employees. The Project, to the extent possible, will supply its workforce from local communities since multiple tasks such as cable laying, security, cleaning, etc. would allow employment of local workforce. Contractors will be contractually required to maximise use of local workforce in the Project. Project works are planned to be conducted in one shift that will consist of nine hours. In case of necessity, additional shifts could be planned due to technical requirements (e.g. achieving suitable wind speeds needed for turbine erection) during the construction stage.

3.9 Project Traffic

The Project will cause traffic during the construction phase due to transportation of turbine components and other system equipment. In this respect, hubs and nacelles will be manufactured abroad and shipped to Aliağa Batı Seaport. From the port, the trailer trucks will use the Aliağa-Menemen road, Menemen-İzmir road, Anadolu Avenue and Ankara Avenue in İzmir and İzmir-Kemalpaşa road (i.e. extension of Ankara Avenue) until a junction where they will turn south to smaller roads.

The smaller state roads and village roads to be used from this point on are Taşlıyol Road, Torbalı Avenue and Kemalpaşa-Dağkızılca Road. On this road, a junction will be used to enter the existing Fuat WPP Access Road, which connects to the Mersinli WPP Project area passing from the north of Derekoy and Gokyaka neighbourhoods. Blades will be manufactured at a plant in Menemen and will be transported to the site via the same road network that will be used for transport of hubs and nacelles, starting from Menemen. Finally, towers will be manufactured at a plant located on the İzmir-Çanakkale Road, Zeytindağ locality. The İzmir-Çanakkale Road will be used towards south to reach Yenişakran.

From this point, a network of smaller roads will be used to reach a junction located west of Manisa, on the Manisa Menemen Road. The Manisa Menemen Road will be followed towards east and at north of Manisa, the vehicles will enter the Manisa Ring Road and follow this road towards east to reach the Manisa Turgutlu Road. This road eventually connects to İzmir-Kemalpaşa road (i.e. extension of Ankara Avenue). From here, the vehicles will go towards west, until the junction where the vehicles will transit through the smaller state roads, the village roads and Fuat WPP's existing access roads to reach the Project Area. Estimated number of daily traffic movements for each route is provided in Table 3-8.

Table 3-8. Estimated Daily Traffic Movements due to Project

Road Section	**Project Component**	**Daily Number of Heavy Vehicles due to the Project (including round trip)**
Aliağa to Kemalpaşa	To be used only for transport of Hubs and Nacelles	4
Menemen to Kemalpaşa	To be used for transport of Blades	6
Zeytindağ to Kemalpaşa	To be used for transport of towers	6

The Project will not involve any significant traffic movement during the operation phase. Only passenger cars or pick-up vehicles will be used to ensure daily transportation of operation workforce (14 personnel) to the site offices. No regular heavy vehicle movement will be required during the operation phase.

3.10 Water Use

The Project will not involve intense water use during the construction or operation phase. Water use during the land preparation and construction phase of the Project will include drinking and utility water consumption by Project personnel and workers and water to be required for dust suppression during earthworks. Water use during the operation phase will be limited to the requirements of operation personnel. Daily water requirement per person would be approximately 150 liters per person during the construction and operation phases. Water use for dust suppression is anticipated to be maximum 10 m^3 per day during the construction phase. Further quantification of total water use and wastewater generation is provided in Chapter 9. Utility water will be supplied by means of tankers (from the nearby settlements). Drinking water requirements of the personnel will be supplied as bottled water to be purchased from the local market.

3.11 Permits, Licenses and Approvals

Permits, licenses and approval applicable to the Mersinli WPP Project are listed in Table 3-9.

Table 3-9. Relevant Permits, Licenses and Approvals

Permit	Related Authority/Entity	Status/Remarks
Energy Generation License	Energy Market Regulation Authority	Obtained on 5 July 2012; The license covers 49 years of energy generation. The Project Company has applied to the EMRA for the amendment of existing license based on the current layout, which will be obtained prior to start of construction.
EIA Positive Certificate for the Plant	Ministry of Environment and Urbanization	Obtained on 18 July 2016; Confirmation of validity of the existing EIA Positive Certificate for the current layout has been obtained on 1 November 2017
ETL Connection and System Use Approval	Turkish Electricity Transmission Company	To be signed during the course of further development (connection agreement) and before preliminary acceptance of the power plant (system usage agreement)
Forestry Final Permit	Ministry of Forestry and Water Affairs, General Directorate of Forestry	To be obtained prior to start of construction
Zoning Plan Approval	Ministry of Environment and Urbanization	To be obtained prior to start of construction
Preliminary and Final Design Approval	Ministry of Energy and Natural Resources	To be obtained prior to start of construction
Building Permit	Metropolitan Municipality of Izmir Municipality of Bayındır District Municipality of Kemalpaşa District Municipality of Torbalı District	To be obtained prior to start of construction
Waste Disposal Agreements	Municipality/Licensed Disposal Firms	To be signed early construction phase
Wastewater Disposal Agreement	Municipality	To be signed early construction phase
Temporary Acceptance	Ministry of Energy and Natural Resources	To be obtained prior to operation phase
Workplace Opening and Operating Permit	Municipality/Governorate	To be obtained prior to operation phase
Waste Management Plan Approval	Provincial Directorate of Environment and Urbanization	To be obtained early operation phase

3.12 Project Schedule

The Project schedule for construction phase is provided in Figure 3-15.

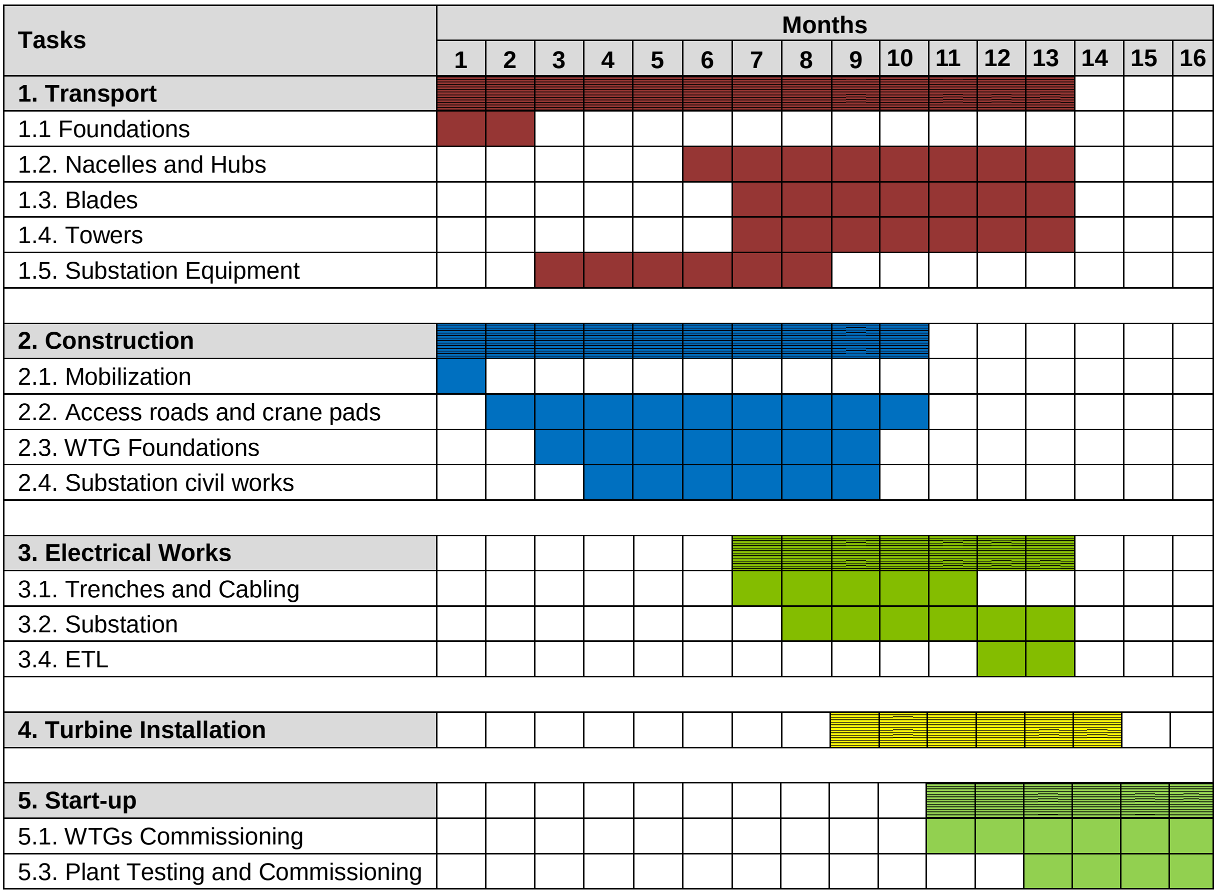


Figure 3-15. Project Construction Schedule

Before the start of construction works, topographical and soil surveys will be conducted on site and the civil and electrical design of the Project will be finalized based on the findings of these surveys. Once the procurement is done and the relevant permits and licenses required under national legislation are completed, transportation of plant components and land preparation and construction works will start and progress in parallel. According to the current schedule, land mobilization activities are planned to be initiated in Q2 2018, while the final schedule will be determined following the completion of permits and licenses.

4. Project Alternatives

The Turkish Energy Policy draws attention to concentrating on domestic resources for meeting the increasing energy demands through use of resource diversity. The Strategic Plan (2015-2019) of the Ministry of Energy and Natural Resources aims to encourage use of renewable energy potential in Turkish economy. With this regard, following main goals are set by the National Renewable Energy Action Plan (*Ministry of Energy and Natural Resources, 2014*):

- Increasing the share of renewable energy in general energy consumption to 20% by 2023;
- Reaching total installed capacities of; 34,000 MW hydropower, 20,000 MW wind power, 1,000 MW geothermal power, 5,000 MW solar power (photovoltaic and concentrated) and 1,000 MW biomass power.

The Ministry of Energy and Natural Resources states on its website that according to the Wind Energy Potential Atlas of Turkey, the country's wind energy potential is 48,000 MW and that only 5,751 MW of this is being utilized as of the end of 2016. Therefore, wind energy emerges as a highly viable option for the country to achieve its strategic energy goals.

The Law on the Utilization of Renewable Energy Sources for the purpose of generating energy, (Law No. 5346 of 10/05/2005) is the first Renewable Energy Law of Turkey, which was approved by the Turkish Parliament. Following the promulgation of this Law, the Turkish Energy Market Regulatory Authority (EMRA) received more than 750 WPP license applications with total capacity of 78,000 MW. To discern between the overlapping applications that applied for the same substation capacity or location and develop a connection request management mechanism, a regulatory framework has been developed allowing the Turkish Electricity Distribution Company (TEİAŞ) to organize tenders (competitions) to identify which of the projects that applied for a license will be awarded the said license and the capacities for these projects. First round of the tenders was conducted for the applications made in November 2017 and a total capacity of 5,500 MW was distributed between 149 different WPP projects. As a part of this process, Mersinli WPP Project was evaluated within the 7th Competition Package held in June 2011, together with 9 other high voltage projects with connection to Aslanlar transformer centre. As a result, The Project Company was awarded with a 55 MW connection capacity (*Turkish Wind Energy Association, 2011*). Further rounds of the WPP tenders were conducted in the subsequent years on regional basis. Currently, tender processes (competitions) are governed by the "Regulation on Competitions Regarding Preliminary License Applications Made for Installation of Energy Generation Facilities Based on Wind and Solar Power. The last competition was held in June 2017 for wind energy. The provinces covered by this last competition did not include İzmir province (*Turkish Wind Energy Association website, 2017*).

Consequently, Mersinli WPP is a licensed Project developed in line with the national energy policy of Turkey that promotes energy generation based on renewable resources. In this Chapter, technology alternatives, site and layout alternatives, energy generation alternatives, and energy transmission alternatives have been considered for the Mersinli WPP Project. Additionally, no-project alternative has also been discussed in this section.

4.1 Energy Generation Alternatives

Each energy generation technology has its own advantages and challenges in terms of construction and operation aspects (including costs, availability and flexibility) and the management of potential environmental and social impacts. As suggested by the illustrative comparison of the alternative energy generation technologies provided in Figure 4-1, electricity generation based on wind energy is considered a green technology as far as the water use, air emissions (including carbon dioxide) and waste generation are concerned as such impacts are mainly limited to the construction phases of the WPP projects. On the other hand, land requirements of the WPPs are considered relatively high, particularly due to the need of access roads and if necessary ETL construction. The area covered by each turbine foundation is generally limited, while the total area requirements increase as the capacity and the number of turbines in a project increases. In addition to the environment attributes covered in the assessment provided in Figure 4-1, potential impacts of the WPP projects on local communities due to visual changes, shadow-flicker and turbine noise, as well as on birds, bats and other fauna components, flora species and habitats are particular social and environmental aspects that require proper assessment and management in WPP projects.

Wind is a sustainable and domestic source of energy that contributes energy import dependency. Projects that are developed with proper siting and effective management of the potential environmental and social impacts identified through an appropriate impact assessment process would provide a beneficial alternative to harness wind energy for meeting the growing energy demand of the Country.

Figure 4-1. Assessment of Relative Benefits and Impacts of Electricity Generation Technologies (*Electric Power Research Institute, 2016*)

4.2 Technology (Turbine) Alternatives

The two main types of turbines currently in use are the horizontal axis wind turbine (HAWT) and the vertical axis wind turbine (VAWT). Of these, HAWTs are the most extensively used turbine type for large scale wind farm developments, due to their various advantages such as high energy generation capacity, better efficiency, adjustable tower length to capture large amounts of wind energy, variable pitch blade capacity, etc.

According to the national EIA of the Project, the first HAWT alternative considered was Goldwind's GW 2.5 MW model. A total of 22 of these 2.5 MW turbines with 100 m hub height and 109 m rotor diameter were planned to be installed. However following further feasibility studies and due to the restrictions considered in siting (detailed below in Section 4.3), The Project Company decided on installation of 17 Vestas V126-3.45 MW model turbines; each with a 3.45 MW capacity, 87 m hub height and 126 m rotor diameter. Considering the specifications for both models, the former Goldwind model's tip height is approximately 154.5 m, whereas the tip height of the current Vestas turbine is 150 m. As expected due to the fact that the increase in rotor diameter is compensated by the decrease in hub height, the change in tip height is approximately 4.5 m less for the current design. Detailed information on the Project turbine model opted for installation is presented in Chapter 3 of this ESIA Report.

4.3 Site and Layout Alternatives

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. Consequently, detailed wind speed and wind density analyses are required for site selection of a wind farm, meaning that a planned wind power plant is site specific. For the Mersinli WPP Project, wind measurements were conducted by two meteorological masts (MER1 and MER2) installed at the southern part of the site. In this respect, meteorology data was recorded during the period from January 2012 to February 2014 and the potential of the site for wind energy development has been confirmed. As part of the acquisition of the Project, a new meteorology mast was installed and commissioned in April 2017 to decrease uncertainty in horizontal extrapolation for wind turbines located in northern area and verify the turbulence data measured at the former two masts (MER1 and MER2).

In an area having the proper wind potential for energy generation, another determining factor for the location of a WPP is the grid connection capacities provided by transformer stations, as each transformer centre used for grid connection of multiple power plants has a certain capacity.

Micrositing of turbine locations is highly important for the maximization/optimization of energy production and minimization of environmental and social impacts (*IPCC, 2011*). In the scope of micrositing studies conducted for the Mersinli WPP Project, mainly the following criteria have been taken into consideration to inform the selection of final turbine locations:

- Legal restrictions such as buffer zones to be maintained within the license area, location of cultural heritage sites, etc.;
- Technical criteria (geotechnical conditions, minimum distances between turbines provided by the turbine supplier; existing routes of the forest roads and fire breakers to minimize access road construction, etc.);
- Social considerations including current land ownership status, locations of nearby settlements;

In consideration of these criteria/considerations, the Project was first planned with 22 turbines, each with an installed capacity of 2.5 MW. However, following further feasibility studies, the number of turbines was decreased to 17, whereas their installed capacity was increased to 3.45 MW. Therefore, the Project layout was also changed to accommodate the 17 turbines in a way that optimizes the energy output and minimizes the impacts. It should be noted that a buffer zone of 300 m has been considered from the outer border of the license area in line with the requirements of the national legislation and no turbine has been placed within this buffer zone when siting the turbines. A comparison of the former turbine layout considered in the national EIA Report (*PROÇED, 2015*) and the current turbine layout is presented in Figure 4-2, together with other sites taken into consideration during the design process.

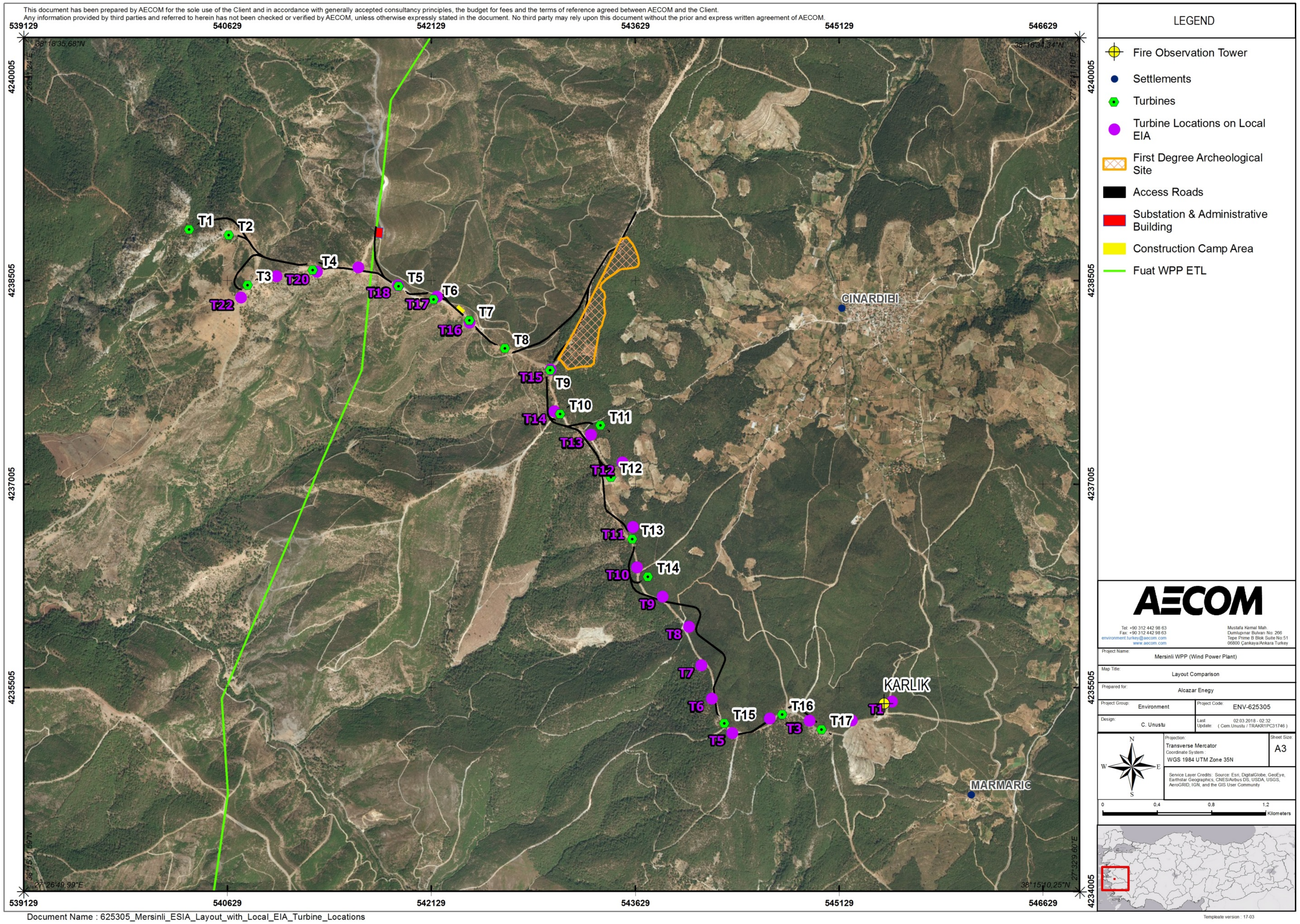


Figure 4-2. Comparison of Layout Considered in the National EIA Report and the Current Layout

The changes made in the layout to reduce the number of turbines have resulted in:

- Minimised land use requirements and biodiversity impacts owing to reduced number of turbines and elimination of associated turbine access roads;
- Minimised visual impact as a result of elimination of 5 turbines, especially on Marmariç Permaculture Village due to cancellation of 3 former turbines (T1, T2 and T3) located north of the settlement with the closest turbine in 800 m distance (i.e. the closest turbine is now located 1 km north of the closest point of this settlement) (see Figure 4-2).
- Reduced amount of earthworks and materials requirements;
- Reduced number of construction machinery/equipment to be operated, which minimize the amount of greenhouse gas and air emissions and fuel consumption;
- Reduced number of traffic movements required for the transportation of turbines and other WPP components.

In the scope of national EIA studies, a Forest Fire Observation Tower (Karlık) has been identified approximately 400 m east/north-east of the centre point (i.e. turbine tower) of Turbine-17 (see Figure 4-2). İzmir Forest Regional Directorate, in its official opinion on the national EIA Report, stated that the turbines are required to be located at a distance of minimum 400 m to the Karlık Forest Fire Observation Tower. Accordingly, Turbine-1 of the former EIA layout, has been eliminated from the design. A meeting was also held with the General Directorate of Forestry, Department of Forest Fire Fighting, Electronics and Communications Branch and it was confirmed that a minimum distance of 300 m is required between the tip of a turbine blade and the fire observation tower. Considering the blade length of the turbine model to be used by the Project, namely the Vestas V126-3.45 MWm, it was identified that at least 363 m is required between the centre point of Turbine-17 and the Fire Observation Tower. Current design ensures that the distance is 400 m.

Similarly, a potential cultural heritage site has been identified northeast of Turbine-9, which is registered as a 1st degree cultural heritage site (see Figure 4-2). Therefore, the Project Company designated this area as restricted and designed the layout accordingly to ensure that none of the temporary or permanent Project units coincide with this area.

The Project layout has been finalised to avoid impact on private lands used for agricultural purposes by the local people. Locations of Turbine-11 and Turbine-12, which were initially coinciding with private lands, have been revised. As a result, Turbine-11 was moved from its optimum position to the northeast and Turbine-12 was moved from its optimum position to the north-northwest to avoid expropriation of private lands used for agricultural purposes. Similarly, the design of the roads that will provide access to the revised turbine locations has also avoided use of private lands. However, at the footprint of Turbine-12, which corresponds entirely to registered forest lands, cherry plantation activities are conducted by illegal users (see Chapter 6 for detailed assessment). These land users, together with their family members (who own another parcel at the south of the affected parcels) also constructed a shed on the affected parcels, which is used during working at the plantation sites. As part of the micrositing studies, the Project Company located the turbine foundation approximately 50 m northwest of the turbine foundation. This siting avoided the asset from being physically affected by the construction works. Socio-economic impacts on the land users associated with the construction and operation of Turbine-12 and management measures proposed to mitigate identified impacts are further discussed in Chapter 13 and the Livelihood Restoration and Compensation Framework (LCRFP) prepared for the Project.

A drawing showing the former and current locations of these turbines is presented in Figure 4-3.

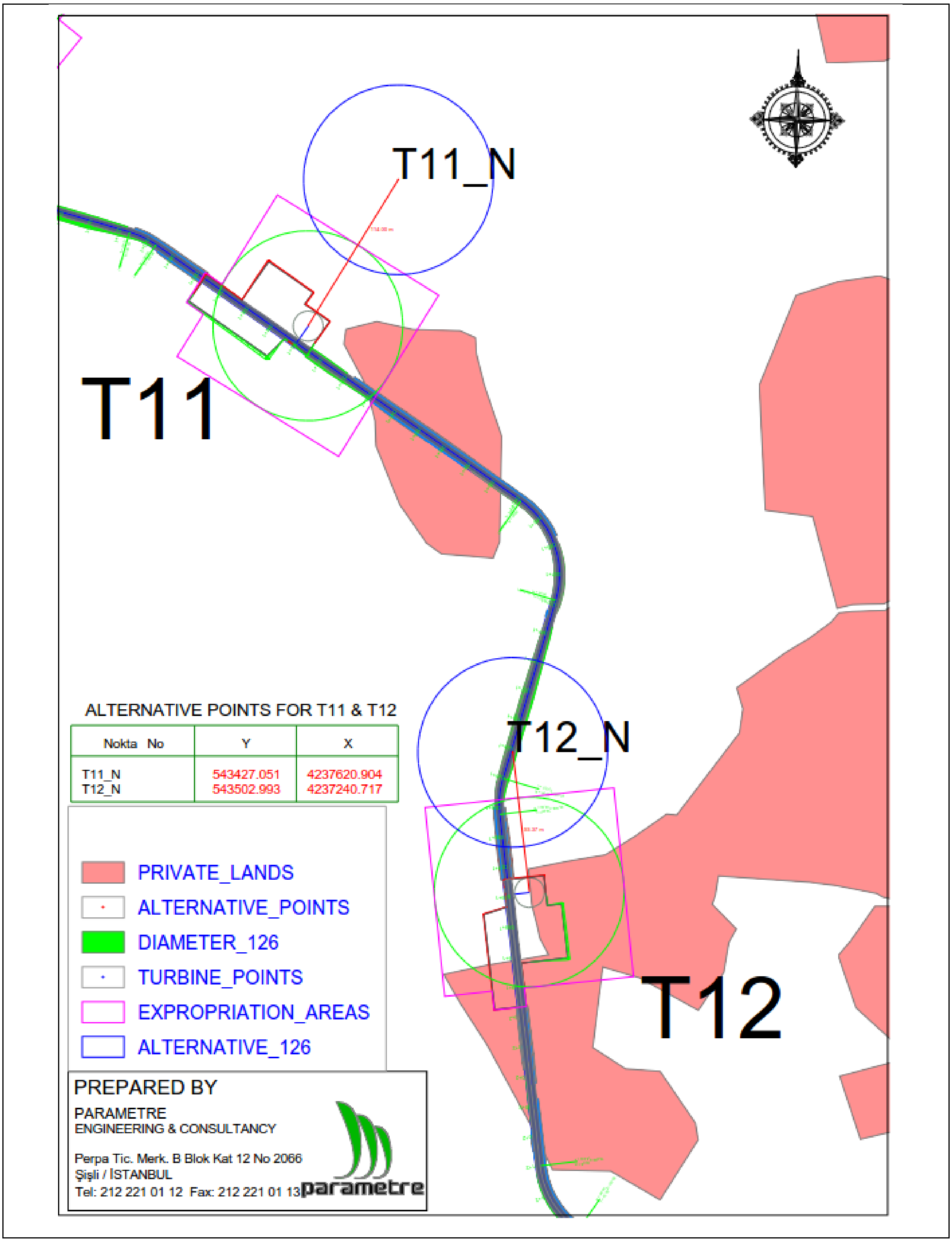


Figure 4-3. Micrositing for Turbine-11 and Turbine-12

4.4 Energy Assessments

Following the confirmation of the Vestas V126-3.45 MW model turbines and the 17 turbine layout, DNV GL was retained to conduct an analysis of the wind regime and energy production (*DNV GL, 2017*). In the analysis, different operational configurations for the same layout and the same Vestas V126-3.45 MW model turbine were considered and the alternative with around 180 GWh annual energy output and a net capacity factor of 34.8%, was selected as the most viable option.

4.5 Energy Transmission Line Alternatives

According to a former "Connection Agreement" signed between the Project Company and TEİAŞ, the Project ETL was first planned as a 3 km, 154 kV ETL, connecting to the existing ETL of Fuat WPP, which itself connects to another ETL that provides the connection between Işıklar Transformer Station and Tire Transformer Station. This ETL design was later revised to decrease the total length to 40-200 m, resulting in the following:

- Minimisation of impacts associated with the Project ETL, including land use requirements, loss of forest land and other potential land use types along the ETL route, loss of habitats, bird/bat collision risk, fire risk, electrocution risk, electromagnetic fields, traffic management impacts during construction phase, etc.;
- Minimisation of ETL related costs such as costs associated with land acquisition, construction costs, and maintenance costs.

4.6 No Project Alternative

Mersinli WPP, as an energy generation Project based on renewable resources, will provide public benefits by safeguarding the increasing energy demand of the country while reducing energy dependency. As with all energy development projects, the Project will bring benefits that are to be maximized and challenges that are to be managed properly, which would not occur if the Project is not realised. Potential economic, environmental and social consequences of opting for the No Project Alternative, where it is assumed that the Project will not be developed, would include the following:

- To meet the energy demand of the country, alternative type(s) of energy development projects would be developed to supply around 180 GWh electricity annually. In case of a conventional thermal power plant of the same energy yield, which is fired with fossil fuel, additional mitigation measures would be required to be taken to manage environmental impacts in a sound and sustainable manner (land use, impacts on biodiversity, air and greenhouse emissions, water supply and use, impacts due fuel extraction/supply, waste/residue management, health and safety risks, etc.). If import fuel is used, no contribution would be made to the limitation of foreign energy dependency.
- National benefits due to payment of royalties to state would not be gained (3.18 kr/ kWh per year).
- The Project will contribute to decreasing the annual carbon intensity of the country in each year it will remain in operation. If the Project is not realized, an estimated amount of 100,000 tonnes of CO_2 could not be saved.
- In comparison with conventional energy generation projects (i.e. thermal power), employment opportunities to be provided by the Project will be relatively limited, but still beneficial at the local-scale if local employment is prioritized wherever possible. In this respect, Mersinli WPP Project is projected to provide direct employment opportunities for a total of 150 workers (120 unskilled; 30 skilled) during the construction phase and a total of 14 workers (4 unskilled; 10 skilled) during the operation phase and will ensure that the maximum number of workers possible will be employed from the local communities. On the other hand, in the case of No Project Alternative, socioeconomic benefits to be provided by the foreseen employment levels would not be provided.
- The socioeconomic benefits such as indirect national and local scale economic benefits and subsequent employment opportunities expected to be sourced from services/ materials procurement would also not be achieved in the case of No Project Alternative. It should be noted that the Project will ensure that local businesses will be selected to the extent possible for procurement of services/ materials.

- Infrastructure development, emerging as another local scale indirect benefit that will be sourced through Project infrastructure development activities would not be achieved. Potential community development projects would also not be implemented.
- The Project's environmental and social impacts identified by this ESIA Report would not occur. However, as described previously, wind is a renewable, clean and sustainable energy resource and the Project's limited impacts will either be eliminated or scaled to a manageable level with the proposed mitigation measures and management practices.
- The Project will be developed in compliance with EBRD Environmental and Social Policy (2014) and PRs and IFC Sustainability Framework (2012) and PSs. In this sense, it will be a Project that can form an example and benchmark for current and future businesses as well as environmental, social and health and safety authorities. Therefore, the Project does not only have benefits in terms of economy, employment and environment, but also in terms of EHS awareness at the local and national scales. In the case of No Project Alternative, this opportunity would not be realized.

In the absence of the Project, the identified potential environmental and social impacts that are to be managed properly throughout Project's life would not take place. However, above-mentioned benefits associated with the Project would not be achieved either. Considering that the Project's environmental and social impacts will be managed by the mitigation measures and management practices proposed by this ESIA study, the Environmental and Social Management System and related environmental and social management plans, the Project's limited environmental and social impacts are assessed to be manageable in a sustainable manner. Therefore, the No Project Alternative is not evaluated as a viable alternative when the Project's potential benefits are considered.

5. Impact Assessment Methodology

The methodology used for the characterization of potential environmental and social impacts of the Mersinli WPP Project has been developed based on the methodologies described in the UK's applicable government publications on Environmental Impact Assessment (*Institute of Environmental management and Assessment-IEMA, 2011: The State of Environmental Impact Assessment Practice in the UK; Highways Agency 205/08: Volume 11, Section 2 Environmental Impact Assessment and Handbook for Scoping Projects: Environmental Impact Assessment*), Scottish Natural Heritage's (SNH) Handbook on Environmental Impact Assessment (2013) and other available guidance documents on impact assessment (*Canter, 1993, Standards Association of Australia, 1999, etc.*). In line with good ESIA practice, this methodology employs the prediction of impacts by using quantitative or, where this is not applicable, qualitative methods and assigning significance of impacts based mainly on professional judgement, especially when quantitative thresholds are not present for the specific assessment subject.

Significance of environmental and social impacts is formulated as a function of the sensitivity/value/importance of the receptor/resource and the overall magnitude of the Project's impact on that receptor/resource. Sensitivity/value/importance of the receptor/resources is determined based on the baseline information available for the Project in consideration of public interest, designations, legal requirements, acceptability, sustainability, etc. The overall magnitude of impact, on the other hand, represents the degree of change and is influenced by a number of different factors as listed below:

- Geographical extent (wide, local or restricted);
- Magnitude (high, medium or low; e.g. area size, how many trees, level of emission or noise, etc.);
- Reversibility (long term reversible, short term reversible or irreversible);
- Duration (long term, middle term or short term);
- Frequency (continuous, intermittent or one-off).

The sensitivity/value/importance of the receptor/resource and the overall magnitude of the Project's impact on that receptor/resource are specific to the each assessment topic. The typical/generic criteria to be taken into consideration when determining sensitivity/value/importance of the receptor/resource and the overall magnitude are provided in Table 5-1and Table 5-2 while specific assessments will be done for each environmental and/or social component in the relevant sections of this report.

Table 5-1. Typical Descriptors for Sensitivity/Value/Importance of Receptors/Resources

Level of Sensitivity/Value/ Importance	Typical Descriptors
High	High importance and rarity, national or international scale of importance, very limited potential for substitution
Medium	Medium importance and rarity, regional scale of importance, limited potential for substitution
Low	Low or medium importance and rarity, local scale of importance
Negligible	No or very low importance and rarity

Source: UK HA 205/08 Volume 11, Section 2.

Table 5-2. Typical Descriptors for Magnitude of Impacts

Level of Magnitude	Typical Descriptors
High	Loss of resource and/or quality and integrity of resources; severe damage to key characteristics, features or elements
Medium	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features and elements
Low	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements
Negligible	No or very minor loss or detrimental alteration to one or more characteristics, features or elements

Source: UK HA 205/08 Volume 11, Section 2.

Specific criteria to be considered for the prediction of impact magnitude in Mersinli WPP Project is provided in Table 5-3.

Table 5-3. Criteria for Predicting Magnitude of Impacts

Geographic Extent	Duration	Reversibility	Frequency	Magnitude*	Overall Magnitude Level
Restricted (at the footprint)	Short (less than 1 year)	Short term reversible (within 3 years)	One-off/ Occasional	Low	Major
Local (within License Area)	Medium (1-2 years)	Medium term reversible (3-20 years)	Intermittent	Medium	Moderate
Wide (beyond License Area)	Long (more than 2 years)	Long term reversible or Irreversible (more than 20 years)	Recurrent/ Continuous	High	Minor

**To be determined separately for each impact subject based on applicable thresholds where available or professional judgement.*

Once the sensitivity/value/importance of the receptor/resource and the overall magnitude of impact are determined, the significance of impact is determined by using a standard matrix style approach. The matrix (4x4) to be used in the assessment of the Project impacts is provided in Table 5-4 and a general description of each significance level from major to negligible (not significant) provided in Table 5-5.

Table 5-4. Significance Assessment Matrix

		Sensitivity/Value/Importance of Receptor/Resource			
		High	Medium	Low	Negligible
Overall Magnitude	High				
	Medium				
	Low				
	Negligible				

Source: Adapted from IEMA, 2011; UK HA 205/08 Volume 11, Section 2 and other impact assessment methodology guidances/handbooks.

Table 5-5. Significance Levels

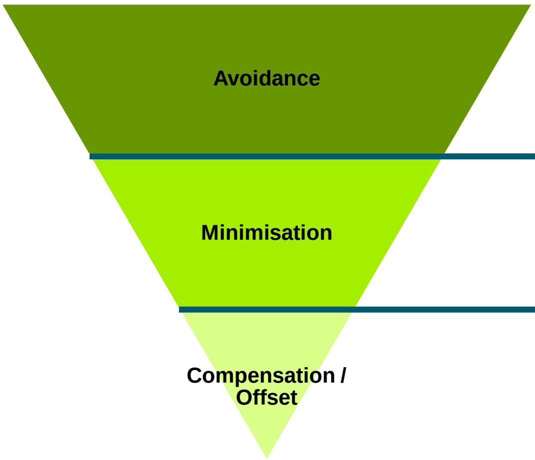
Significance Levels	Major	Impacts are considered to be very important and are likely to be material in decision-making, which would be associated with sites or features of international, national or regional importance as well as local importance if the site or feature is subject to a major change. Mitigation measures are imperative to reduce the significance to lower levels before proceeding with the Project.
	Moderate	Impacts are not likely to be key decision-making factors. The cumulative impacts of such factors may influence decision-making, if they lead to an increase in the overall adverse effect on a particular resource/receptor. If possible, impact significance are to be reduced to lower levels by taking mitigation measures; otherwise acceptance of associated risks is required for proceeding with the Project.
	Minor	Impacts may be raised as local factors, which are unlikely to be critical in the decision making process, but important in enhancing the subsequent design of the Project. Assurance of compliance with standards and safety criteria is sufficient to proceed.
	Negligible (Not Significant)	No impact or impacts are beneath the level of perception so that they are acceptable with normal operating procedures.

Source: Adapted mainly from UK HA 205/08 Volume 11, Section 2 and Canter, L., 1993.

Following completion of the initial impact assessment and based on the predicted results; preventive, mitigative and corrective actions, measures and general management programs will be developed and proposed to ensure Project's environmental and social performance is maintained at a level that achieves compliance with national and international standards. Measures are proposed regardless of the identified level of significance, except for some of the impacts identified as "negligible". Within this regard, the framework mitigation approach described by IFC GN1 (*2012*), and presented in Figure 5-1, was adopted.

Once the mitigation measures are identified for each impact, significance of residual impacts will be assessed, based also on the methodology described above. Residual impacts are impacts that remain in the case where proposed mitigation measures are implemented; meaning that the identified residual impact significance levels reflect the actual impacts that will be caused by Project activities, as well as indicating the potential performance of proposed measures and management practices. Effectiveness of mitigation measures would change for different impact subjects and receptors. In this respect, some measures (e.g. top soil management) can be effective to reduce a high significance impact directly to low levels, while other measures (e.g. dust measurement or measures proposed to mitigate visual impacts) can reduce the level of significance to a lower level only (from high to moderate). Thus, evaluation of the significance of residual impacts will be done based on expert judgment and separately for each type of impact.

The methodology to be followed for the Cumulative Impact Assessment is separately described in "Chapter 17"



Identify and, where available and technically and financially feasible, make changes to the project's design (or potential location) to avoid adverse risks and impacts on social and/or environmental features.

Where avoidance is not possible, minimise adverse impacts and risks through environmental and social measures/ treatments/ design. Acceptable options to minimize vary and include; abate, rectify, repair, and/or restore impacts, as appropriate.

Where avoidance or minimization measures are not available, design and implement measures that compensate/ offset for residual risks and impacts (these measures do not eliminate the identified adverse risks and impacts, but they seek to offset it with an -at least- comparable positive one)

Figure 5-1. Mitigation Hierarchy

Source: Guidance Note 1 - Assessment and Management of Environmental and Social Risks and Impacts (IFC, 2012)

6. Land Use, Soils and Geology

This Chapter identifies the existing characteristics and potential impacts of the Mersinli WPP Project associated with the land use, soil and geology. The information herein is mainly based on literature review, expert knowledge of the sector and review of identified issues related to similar scale projects. The majority of the Project's License Area consists of land registered as forest, while private parcels used for agriculture are also located within the License Area. The Project's potential impacts on the land use, soils and geology, will occur during land preparation and construction phases within the footprint of the Project units (i.e. turbine foundations, access roads, substation site, etc.). No additional impact will take place during the operation phase. Mitigation measures that have already been taken and that have been developed as part of the ESIA are also presented in this Chapter.

6.1 Project Standards and GIIP

All the land corresponding to the Project units (i.e. turbine foundations, access roads, substation site, single ETL pylon location, etc.) of the Mersinli WPP is registered as forest land. Thus, the activities to be conducted in the scope of the Mersinli WPP Project and land use permitting processes, will be primarily subjected to the Turkish Forestry Law (Law No: 6831). Regarding the conservation of soils and structural stability of the Project units, the following national regulations will also be applied to the Project:

- Regulation on Soil Pollution Control and Contaminated Sites by Point Source;
- Regulation on Structures in Natural Hazard Areas;
- Regulation on Building Constructions in Earthquake Zones.

For the identification of the baseline soil conditions prior to the construction activities, the minimum list of parameters and corresponding limits, specified in international and national guidelines/regulations will be taken into consideration as provided in Table 6-1 and Table 6-2.

Table 6-1 presents limit values specified in Dutch Target and Intervention Values (4 February 2000), while Table 6-2 shows sector specific (Electric Power Generation) Generic Contaminant Limit Values specified in the Turkish Regulation on Soil Pollution Control and Contaminated Sites by Point Source.

Table 6-1. Dutch Target and Intervention Values for Soil Remediation (4 February 2000)

Parameter	**Dutch Limits (mg/kg)**	
	Target Value[1]	Intervention Value
Total Petroleum Hydrocarbons (TPH)	5	5,000
Arsenic	29	55
Barium	200	625
Cadmium	0.8	12
Chromium	100	380
Copper	36	190
Mercury	0.3	10
Molybdenum	10	200
Lead	85	530
Antimony	3	15
Selenium	0.7	100
Zinc	140	720

[1]: Target value indicates the level at which there is a sustainable soil quality.
[2]: Intervention Value indicates the action limit for particular parameter.

Table 6-2. Sector Specific Parameters and Limit Values Specified in Turkish Regulation on Soil Pollution Control and Contaminated Sites by Point Source

Parameter	Turkish Regulation on Soil Pollution Control and Contaminated Sites by Point Source[1]				
	Engulfment of the soil and absorption by means of dermal contact (mg/kg)	Inhalation of volatile matter in external environment (mg/kg)	Inhalation of fugitive dust in the external environment (mg/kg)	Moving of the contaminants to the surface water and drinking of the surface water (mg/kg)	
				Dilution Factor[3] = 10	Dilution Factor = 1
Total Organic Halogens (TOX)[2]	-	-	-	-	-
Total Petroleum Hydrocarbons (TPH)	188,496	-	-	175	17.4
Arsenic	0.4	-	471	3	0.3
Boron[2]	-	-	-	-	-
Barium	15,643	-	433,702	288	29
Cadmium	70	-	1,124	27	3
Chromium	235	-	24	900,000	1
Copper	3,129	-	-	514	51
Mercury	23	3	-	3	0.6
Molybdenum	391	-	-	14	1
Lead	400	-	-	135	14
Antimony	31	-	-	2	0.2
Selenium	391	-	-	0.5	0.05
Zinc	23,464	-	-	6,811	681

[1]: Generic Contaminant Limit Values (for Generation of Electric Power, NACE Code:3511) specified in Regulation on Soil Pollution Control and Contaminated Sites by Point Source, Official Gazette No. 27605 dated June 8, 2010.

[2]: No limit value is provided for TOX and B, however these two parameters are presented in sector specific indicator parameters list provided in the Annex-2 of the regulation.

[3]: In occurrence of one the events such as the distance to the aquifer is less than 3 m; existence of fractured or karstic aquifer; and the area of the contaminant source is equal to or greater than 10 ha; the Dilution Factor shall be taken as "1", in other cases, the Dilution Factor shall be taken as 10.

6.2 Baseline Conditions

This section presents the baseline for land use, soil and geological conditions for the Project Area. The baseline information aims to provide a basis for the identification and assessment of impacts on land use and soil (see Section 6.3). The following data sources have been used to identify the baseline conditions for the Project Area:

- Land use and soil databases of the Turkish Former General Directorate for Rural Services (*GDRS, 1993*);
- The land cover database of the Coordination of Information on the Environment (*CORINE, 2012*);
- The information system of the General Directorate of Land Registry and Cadastre;
- Preliminary geological and geotechnical surveys provided in the Project's national EIA Report (*PROCED, 2016*);
- Public governmental databases and literature review on natural hazards;
  - General Directorate of Mineral Research and Exploration's (MTA, Geosciences Portal),
  - Disaster and Emergency Management Presidency of Turkey (Earthquake Research Department's database),
  - Disaster and Emergency Management Presidency of Turkey (Natural Disaster Databank of Turkey).

6.2.1 Land Use

In the scope of the Mersinli WPP Project, land use characteristics were analysed for the License Area to identify the general baseline conditions in the vicinity of the Project. In this respect, land use analyses were conducted based on two different sources, to identify the former and current land use conditions within the License Area. The database of the former Turkish General Directorate for Rural Services (GDRS) was used to identify the land use characteristics prevailing in the around 25 years ago. Additionally, CORINE (2012) database were used to represent the current conditions as detailed below.

In Turkey, the national land use and soil characteristics databases, at province level, were developed by the former GDRS. This institution was established in 1984 and served until 2005, under the former Ministry of Agriculture and Rural Affairs (currently acting as the Ministry of Food, Agriculture and Livestock).

The country-wide study was based on the surveys performed by the General Directorate for Soil and Water (TOPRAKSU, a founding institution of the Turkish General Directorate for Rural Services), and conducted in 1966-1971 and updated in 1982-1984 (*Ministry of Environment and Forestry, 2004*).

The studies for the development of land use and soil database for the province of Izmir were completed by the GDRS in 1993. This data was used in the scope of the Mersinli WPP Project to identify the land use conditions of the area approximately 25 years ago. For the analysis, a land use map of the License Area was developed using the "existing land use" data acquired from the 1/100,000 scaled maps, which were prepared by GDRS in 1993. According to this map, forests constituted the predominant land use type (83%) for the License Area around 25 years ago, with the remaining part was mostly covered by shrubs (12%). Lands covered by orchards were also present near Çınardibi neighbourhood (3.4%). Land use distribution within the License Area according to the Turkish GDRS is presented in Table 6-3.

Table 6-3. Land Use Types within the License Area according to the Turkish GDRS Database

Existing Land Use	Area (ha)	Percentage within the License Area (%)
Forests (O)	1,343.7	82.9
Non-Soil Areas	21.2	1.3
Orchard (B)	55.4	3.4
Shrubs (F)	193.7	12.0
Total	**1,620.5**	**100.0**

The CORINE (2012) database was used to identify the current land use conditions at the License Area. According to CORINE (2012), the License Area is mostly covered by forests (59.1%) and transitional woodland/shrubs (34.3%). Agricultural areas cover a limited part (4.6%) of the License Area. Land cover distribution within the License Area according to the Turkish GDRS is presented in Table 6-4.

Table 6-4. Land Cover Types within the License Area according to CORINE (2012) Database

CORINE Land Cover Type				**Area (ha)**		**Percentage within the License Area (%)**	
Level 1	**Level 2**	**Level 3**	**Definition**	**Level 2**	**Level 3**	**Level 2**	**Level 3**
2. Agricultural areas	2.4. Heterogeneous agricultural areas	2.4.2. Complex cultivation	Juxtaposition of small parcels of diverse annual crops, pasture and/or permanent crops.	73.6	30.1	4.6	1.9
		2.4.3. Land principally occupied by agriculture, with significant areas of natural vegetation	Areas principally occupied by agriculture, interspersed with significant natural areas.		43.5		2.7
3. Forests and semi-natural areas	3.1 Forests	3.1.2 Coniferous forest	Vegetation formation composed principally of trees, including shrub and bush understories, where coniferous species predominate.	957.9	541.3	59.1	33.4
		3.1.3 Mixed forest	Vegetation formation composed principally of trees, including shrub and bush understories, where broad-leaved and coniferous species co-dominate.		416.6		25.7
	3.2. Shrub and/ or herbaceous vegetation associations	3.2.4. Transitional woodland/ shrub	Bushy or herbaceous vegetation with scattered trees. Can represent woodland degradation or forest regeneration/ colonization.	556.2	556.2	34.3	34.3
	3.3. Open spaces with little or no vegetation	3.3.3. Sparsely vegetated areas	Includes steppes, tundra and badlands. Scattered high-attitude vegetation.	32.8	32.8	2.0	2.0
Total				**1620.5**	**1620.5**	**100.0**	**100.0**

Maps showing the land use characteristics of the License Area and its surroundings, based on GDRS (1993) and CORINE (2012), are provided in Figure 6-1 and Figure 6-2, respectively.

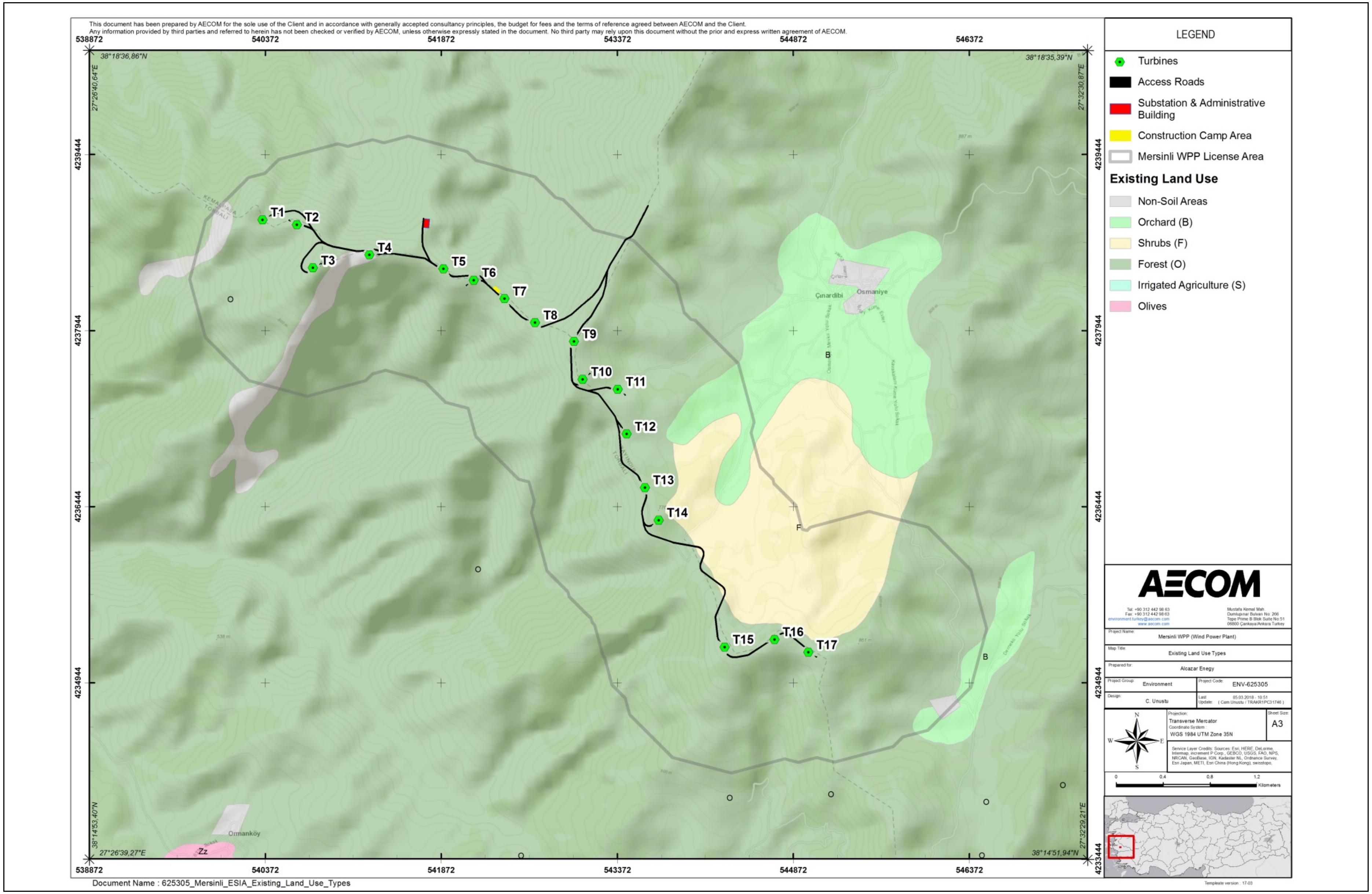


Figure 6-1. Land Use Types within the License Area according to the GDRS Database (1993)

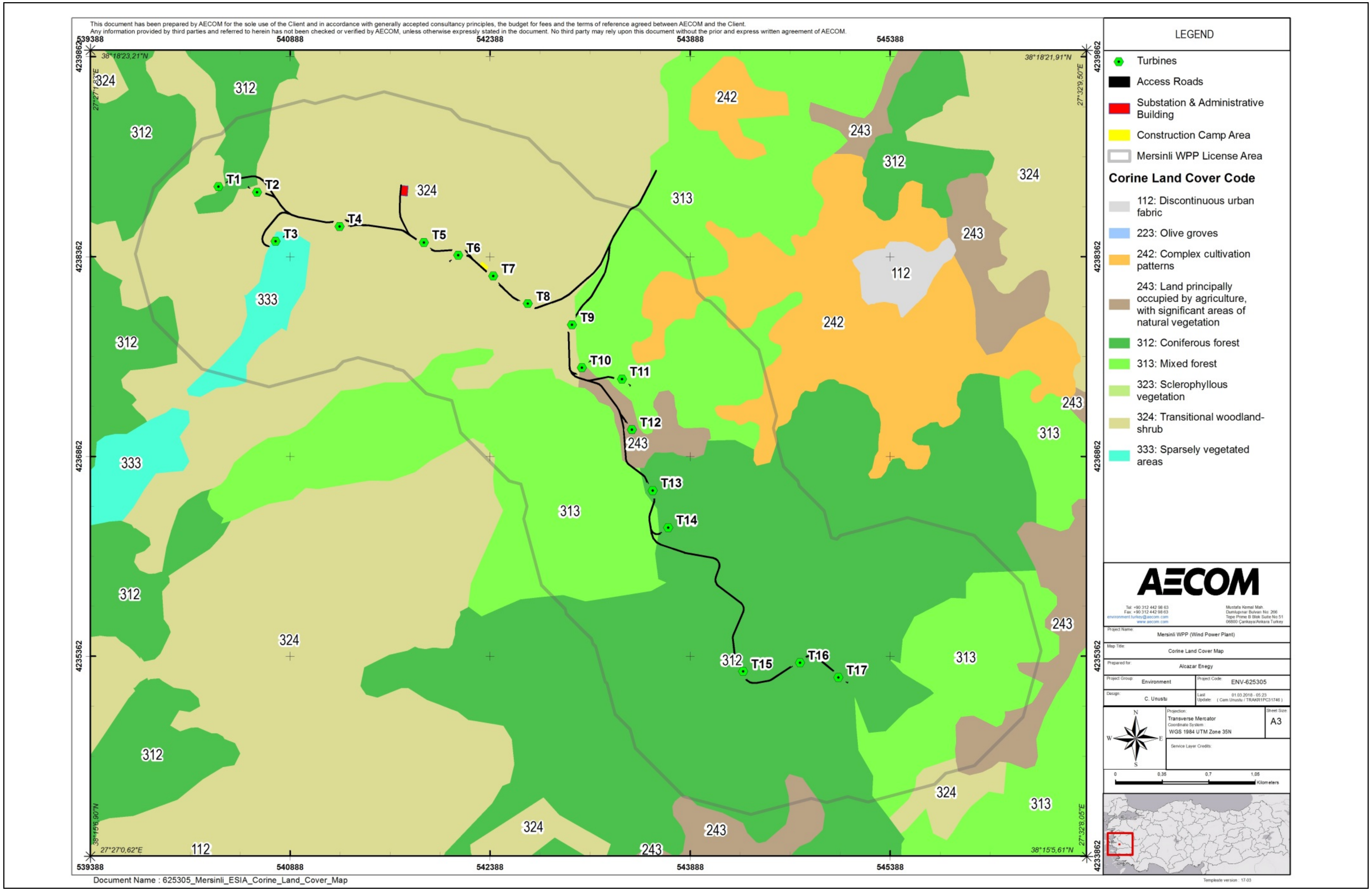


Figure 6-2. Land Cover Map of the License Area according to the CORINE (2012) Database

6.2.2 Major Soil Groups

According to the GDRS Database (1993), the majority of the soil within the Mersinli WPP's License Area is classified as Non-Calcareous Brown Forest Soil, which covers 82.5% of the license area. The northwest section of the License Area is covered by Brown Forest Soils, which comprise the second largest soil group in the License Area with 15% coverage.

A minor portion of the area is represented by Non-Calcareous Brown Soil (0.8%), which is observed along the southeast boundary of the License Area. The remaining is classified as non-soil areas (1.7%). Distribution of the soils within the Project Area according to their major soil groups is provided in Table 6-5 and shown in Figure 6-3. Description for the major soil groups seen in the Project Area is provided below.

Table 6-5. Distribution of Soils within the License Area According to Major Soil Groups

Major Soil Groups	Area (ha)	Percentage within the License Area (%)
Non-Calcareous Brown Forest Soils (N)	1,336.2	82.5
Brown Forest Soils (M)	243.0	15.0
Non-Soil Areas	27.6	1.7
Non-Calcareous Brown Soils (U)	13.5	0.8
Total	**1,620.5**	**100.0**

Non-Calcareous Brown Forest Soils (N)

This soil type is representative of dark-coloured top layer, underneath the colour changes slightly. This type of forest soil does not consist of limes and they might produce acidic, neutral or alkaline reactions. Vegetative productivity of non-calcareous brown forest soils are known to be relatively low.

Brown Forest Soils (M)

These soils have high calcareous content, their reactions can be either alkaline or neutral and they are either granular or blocked with round corners. They have an A, B, C soil profile; with a well-developed, porous A horizon and a poorly developed, brown or dark brown, granular or with a rounded angular block structured B horizon. Clay deposition does not exist or may occur in small amounts in B horizon. The borders of these horizons are transitional and gradual.

Non-Calcareous Brown Soils (U)

These soils are also profiled as A, B, C soils. They are brown or light brown in colour, with dispersible topsoil and pale reddish-brown B horizon. A wash-out is present and its topsoil character is more acid than its subsoil, where free carbonates can be detected in trace amounts. The parent material is gravelly, sandy and clayey deposits, as well as calcareous sandy clay and sandy clay stones. The general existing natural vegetation surface is weeds with a mixture of weeds and bushed throughout some areas.

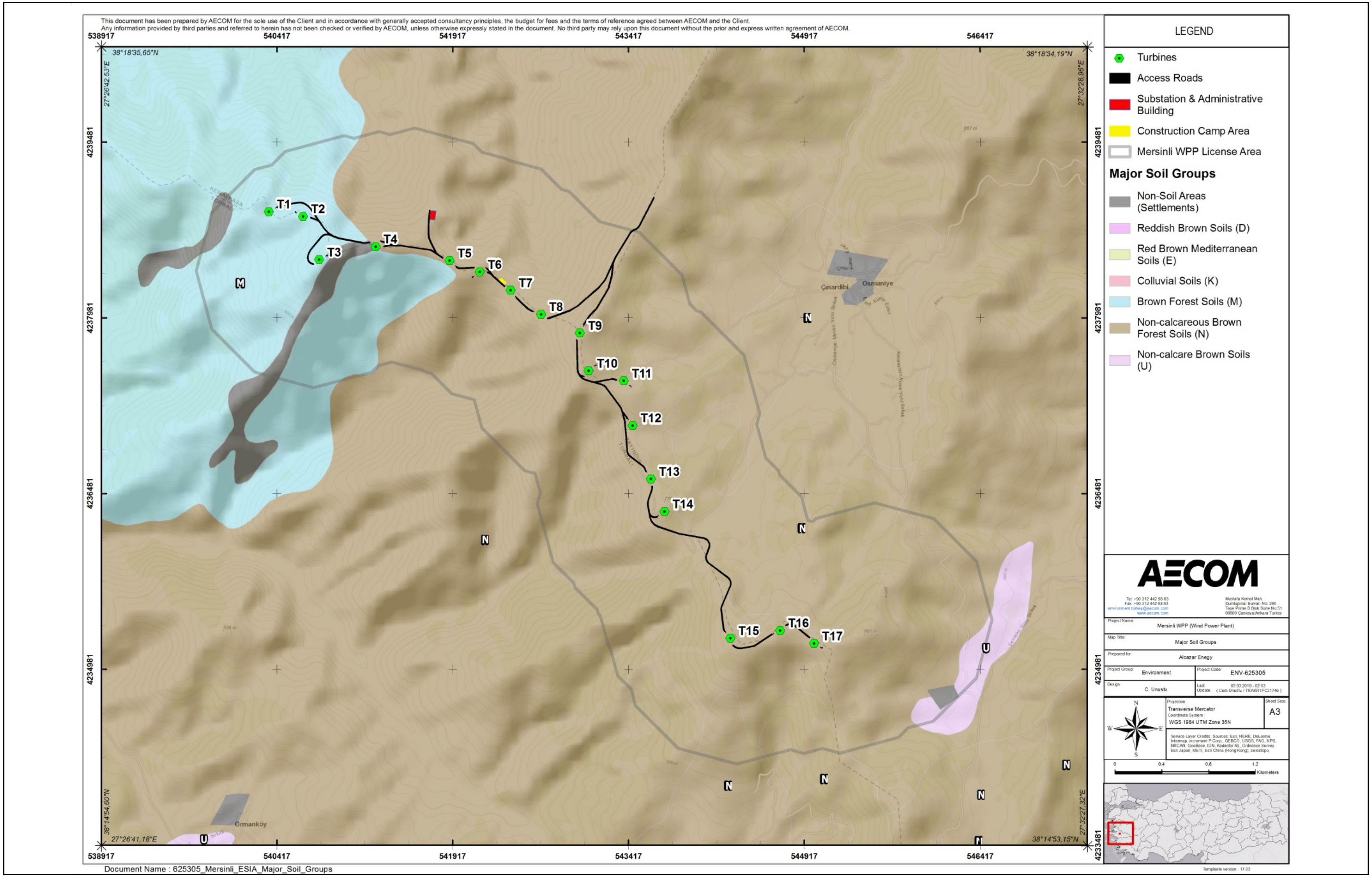


Figure 6-3. Major Soil Groups in the License Area

6.2.3 Land Use Capability Class

Soil capability classes defined by the Turkish Ministry of Food, Agriculture and Livestock were used. These are provided in Table 6-6 below.

Table 6-6. Land Use Capability Classes and Arability

Arability	Capability Class	Description	Factors Limiting Agriculture
Agricultural lands suitable for soil cultivation	I	It is arable for many crop types.	There is no or little limitation.
	II	It is suitable for long term cultivation of several types of crops.	Special mitigation measures are required for soil and water loss.
	III	It is suitable for the cultivation of specific crops that provide special mitigation measures. Generally, it needs special care during agricultural use.	It is prone to erosion and artificial drainage is required during cultivation.
	IV	With suitable ploughing, some special agricultural crops can be cultivated. Generally, it needs special care during agricultural use.	There are serious limitations related with soil depth, stone content, humidity and inclination.
Agricultural lands not suitable for soil cultivation	V	This class includes soils that are even or slightly inclined, stony or very moist. These are not suitable for ploughing and cultivation. Generally they are used for meadow or forestry area.	They have weak drainage and a structure not suitable for ploughing.
	VI	This is not suitable for ploughing and cultivation. They are mostly used as pasture and forestry area.	Very serious limitations are present owing to inclination and shallow soil.
	VII	It is not economic for agricultural activities; however it is suitable for weak pasture or afforestation areas.	There are limitations owing to shallow soil, stone content, inclination and erosion.
Non-arable lands	VIII	It is not suitable for vegetation. It can be used for recreational purposes or as wild life protection area.	It is lacking soil.

According to the analyses performed based on the GDRS database, the majority of the License Area is covered by Class VII (94.4%) soils. The remainder of the License Area is composed of Class VI (3.9%) and Class VIII (1.5%) soils. This indicates that the soils within the License Area are not suitable for soil cultivation. The distribution of the soils within the License Area, according to their land use capability classes, is provided in Table 6-7 and shown on the map provided in Figure 6-4.

Table 6-7. Distribution of Land Use Capability Classes within the License Area

Land Use Capabilities	Area (ha)	Percentage within the License Area (%)
VI	62.5	3.9
VII	1,530.3	94.4
VIII	24.5	1.5
Non-Soil Areas	3.2	0.2
Total	**1,620.5**	**100.0**

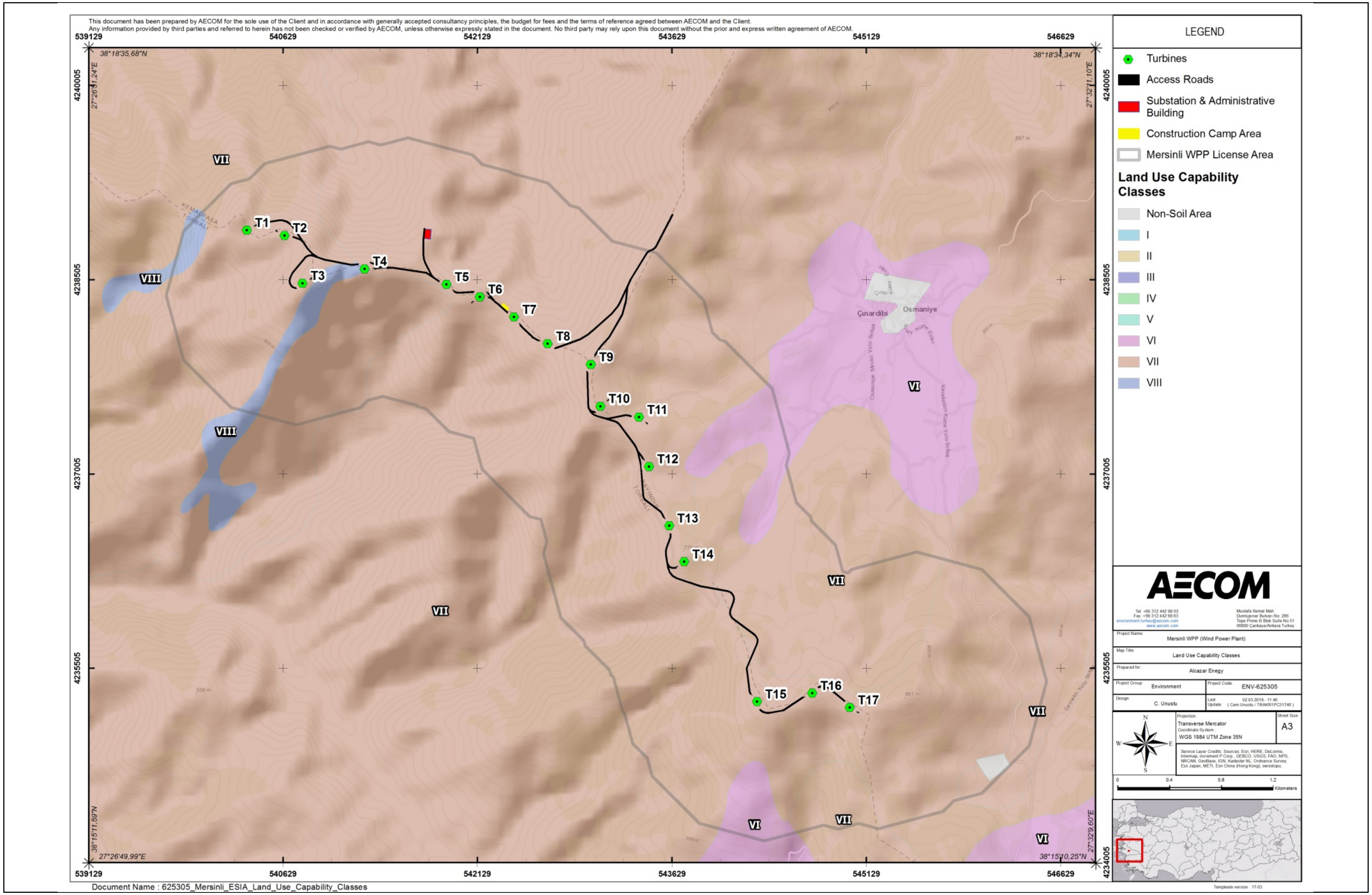


Figure 6-4. Land Use Capability Classes within the License Area

The suitability of different land classes for cultivation, grazing and forestry activities is identified by the former Ministry of Agriculture and Rural Services in the Technical Procedure on Soil and Land Classification Standards dated 2008, as specified in Table 6-8. Soils present within the License Area of Classes VI, VII and VIII) are not suitable for agricultural use.

Table 6-8. Suitable Land Uses According to the Land Use Capability Classes

Land Use Capability	Wild Life	Forestry	Pasture/Grazing			Agriculture			
			Limited	Moderate	Intensive	Limited	Moderate	Intensive	Very Intensive
Class I									
Class II									
Class III									
Class IV									
Class V									
Class VI									
Class VII									
Class VIII									

Source: Former Ministry of Agricultural and Rural Services, July 2008.

6.2.4 Erosion Degree

The classification of the degrees of erosion of the soils has been based on the GDRS database as levels:

- Degree 1: None or very little
- Degree 2: Moderate erosion
- Degree 3: Severe erosion
- Degree 4: Very severe erosion

The distribution of the soils within the License Area, with respect to the erosion degrees presented above is presented in Table 6-9. The erosion degree map of the Project Area is provided in Figure 6-5. Due to its steep topography, the majority (76.9%) of the License Area was identified as very severe erosion (4th degree) potential. Northwest of the License Area, largely display severe erosion zone (classified as 3rd degree; 21.3%). On the other hand, a minor portion of the License Area (1.7%), to the northwest, represents non-soil areas.

Table 6-9. Distribution of Soils within the License Area According to their Erosion Degrees

Erosion Degree	Area (ha)	Percentage within the License Area (%)
Very Severe Erosion (4th Degree)	1,246.9	76.9
Severe Erosion (3rd Degree)	345.9	21.3
Non-Soil Areas	27.7	1.7
Total	**1,620.5**	**100.0**

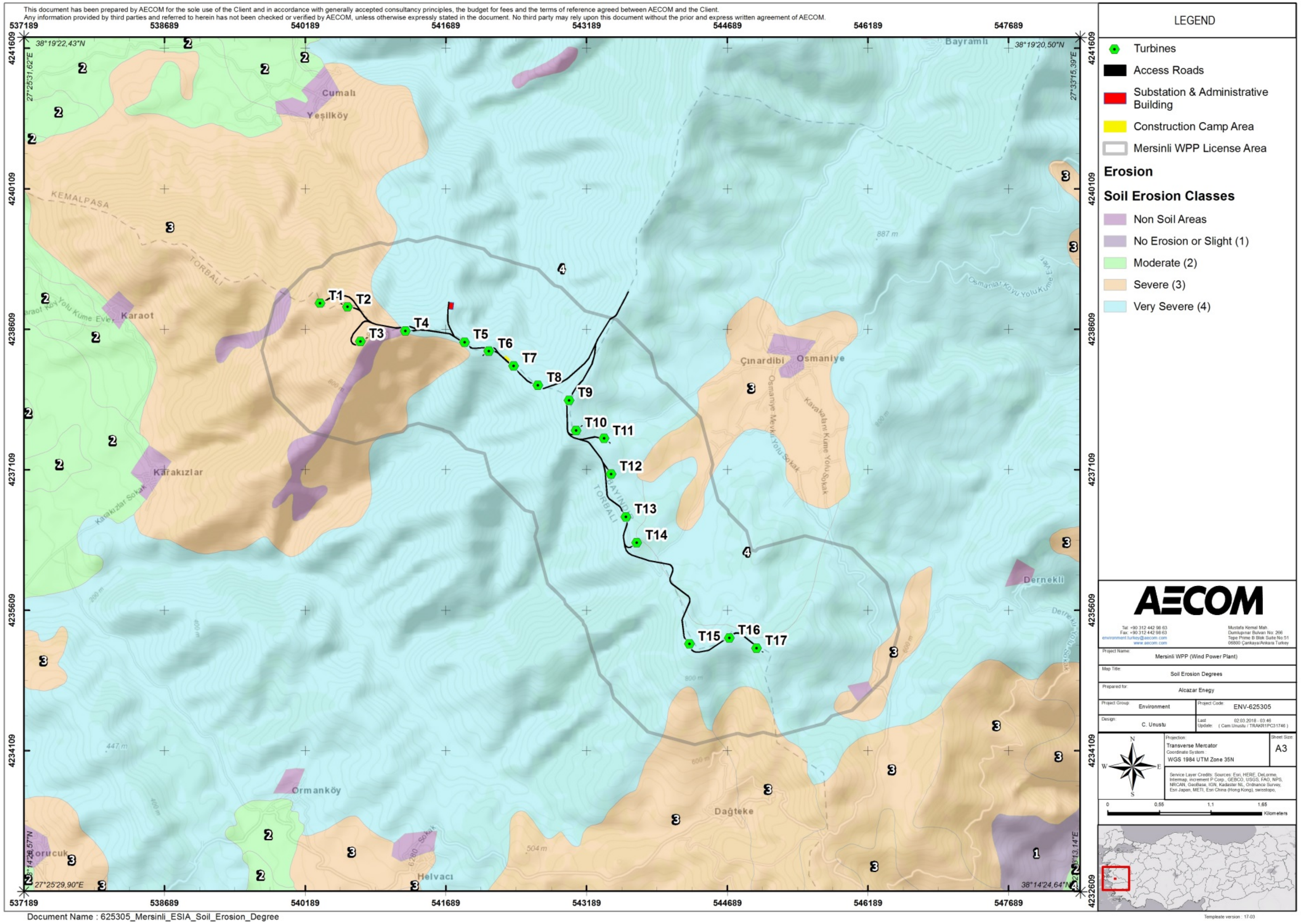


Figure 6-5. Erosion Degree Map for the License Area

6.2.5 Geological Characteristics

This section presents the geological characteristics of the License Area and its surroundings. The information obtained is based on the data obtained from the Project's national EIA Report and geological investigations carried out by General Directorate of Mineral Research and Exploration (MTA) of Turkey.

6.2.5.1 Regional Geology

According to the 1/500,000 scale geological map of MTA, Middle Triassic – Cretaceous (Permian-Mesozoic) – Paleozoic metamorphic series comprises most of the formation within and around the License Area. The map shows the general geology of the License Area and its vicinity is given in Figure 6-6.

The License Area is located in Küçük Menderes Graben. Küçük Menderes Graben (KMG) is part of the horst-graben system of southwestern Anatolia (Turkey). It is bounded by the Bozdağ horst in the north and the Aydın horst in the south.

The Plio-Quaternary evolution of the KMG has been evaluated using the nature of the Miocene-Quaternary fill sediments and palaeostress analysis of slip data, measured in different parts of the graben. The graben is composed of five subbasins: the Kiraz, Ödemiş, Bayındır, Dağkızılca-Torbalı and Selçuk; that are connected to each other through narrow Quaternary troughs.

The Dağkızılca, Kiraz and Selçuk basins bear Miocene and younger sequences, whereas the other sub-basins are largely filled by Quaternary sediments. The maximum thickness of the Quaternary fill reaches about 270 m in the Ödemiş and Bayındır subbasins.

The calculated slip indicates multidirectional extension, three successive deformational periods, and possible counter-clockwise rotation in the KMG during the post-Miocene period. The first phase was a strike-slip regime under north-south compression, followed by a second phase of deformation which resulted in east northeast-west southwest extension with strike-slip components. The final phase of deformation was northeast-southwest extension which constituted the final evolution of the KMG.

The graben gained its present morphological configuration via the onset of east-west-trending, high-angle normal faulting imposed on the region wide synformal structure, during the Plio-Quaternary. The KMG evolved as a result of rifting during the Plio-Quaternary which followed Late Miocene unroofing of the Menderes Massif and the evolution of the Büyük Menderes and Gediz grabens (*Rojay et al., 2005*).

The basement of the study area consists of Paleozoic metamorphic rocks. The units are composed of quartzite and quartzite-schists. One of the best exposures of the old Menderes massive series is observed in the Bozdağ mountain system along the road from Turgutlu to Bayındır. Along the Turgutlu – Bayındır road, the complete arch of unit is displayed, but only the alternations of quartzites, graphitic phyllites and marbles are to be seen.

Northern foot of the arch comprises residual patches of limestone overlying the quartzite series. These residual patches are also observed to have intermittent basal breccia inclusions. The limestone is crystalline and resembles the marble of the upper quartzite series, but its bluish fresh parts distinguish it markedly.

The western Bozdağ arch, ends to the west along north northeast – south southwest flexure, along which the upper quartzitic formation bends down sharply underneath the limestones of the Mahmutdağı. The contact with the limestones, as visible in a gully, is apparently conformable.

The quartzitic series in Menderes Massive with quartzites at the base, which grade upwards into alternations of graphitic phyllites and beds of marble, reach a maximum thickness of 30m. These beds are observed as white in colour representing the fresh zones with a total thickness over 500 m. They build the western Bozdağ where the License Area is located.

Cretaceous limestones have wide distributions in İzmir and are easily recognizable as they are not crystalline like the older limestones. Rudists or fragments of rudist's large foraminifera allow these limestones to be identified in the field; thin sections reveal abundant micro fauna. In the İzmir area, the cretaceous include Permian – Mesozoic limestones (MTA explanatory text of the geological map of Turkey).

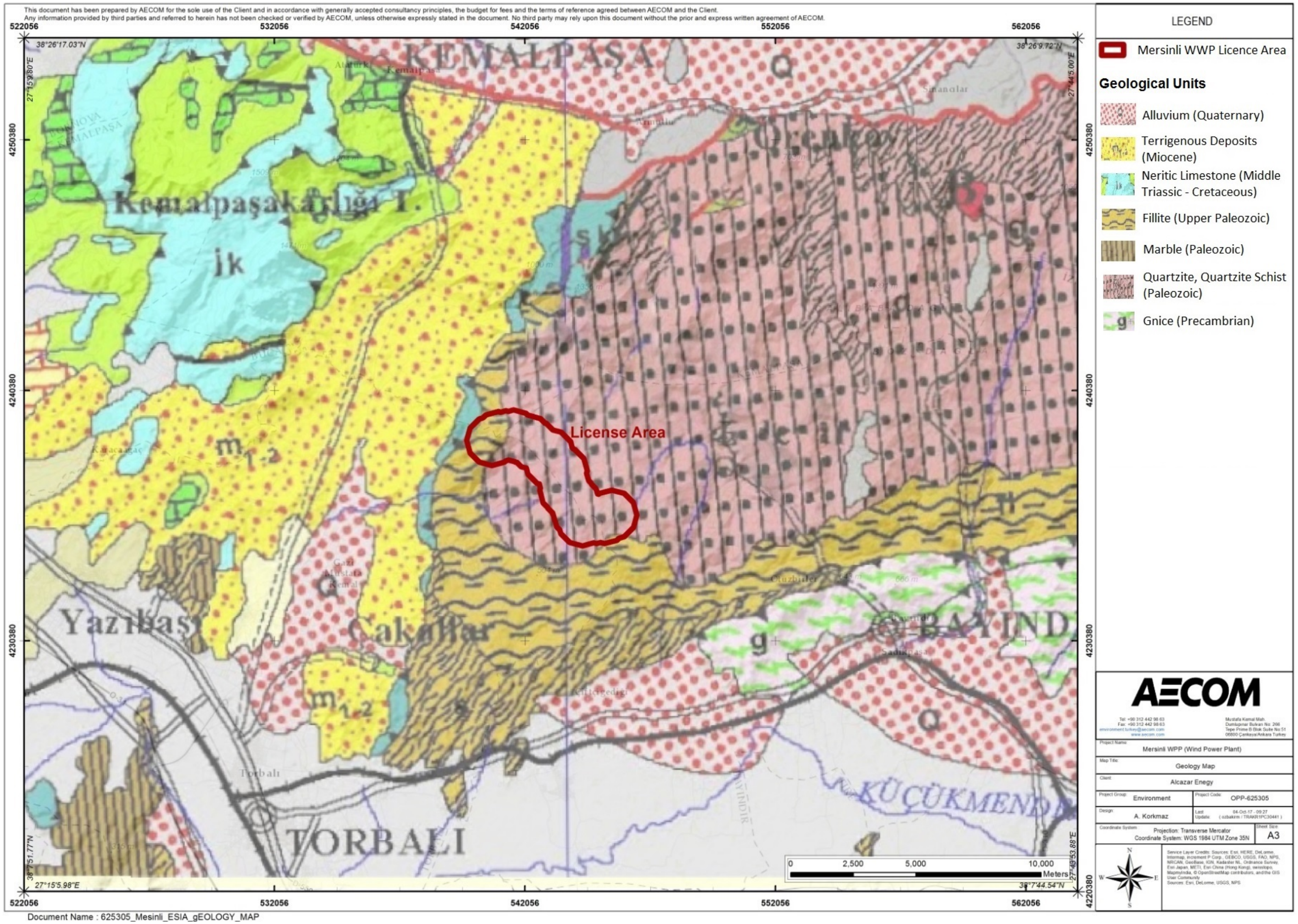


Figure 6-6. Geology Map of the License Area and its Surroundings

6.2.5.2 Tectonics and Structural Geology

West Anatolia graben systems are the origin of active tectonics in Turkey. Most of the earthquakes that happen in the west of Turkey occur at West Mediterranean and Aegean Graben systems. Seismic risks and natural hazards related to tectonic activity and earthquakes for the License Area are provided in Section 6.2.6.

Information on structural geology and tectonics is summarized below.

The License Area is located in the active part of the region, in which the extensional tectonic regime is dominant. The region is characterized by a group of approximately east-west trending, sub-parallel, normal fault zones bordering a set of grabens and intervening horst blocks. Seismic activity is intense, and dominant motion on the faults is in the north-south direction. There are some main graben systems in Western Anatolia, which are orientated approximately in the east-direction (*MTA, 2005*). The best known grabens, which are close to the Project site, are: Gediz Graben, Küçük Menderes Graben (KMG) and Büyük Menderes Graben (BMG). These are shown in Figure 6-7.

The Gediz Graben

The Gediz Graben is located in the central part of Western Anatolia, where one of the major east-west trending grabens is present. The Gediz Graben is 140 km long and 10 to15 km wide, forming an arc shaped structural pattern. The graben is asymmetrical, presenting a steeper and seismically more active southern margin.

Southern margin is characterized by the steep northern flank of the Bozdağ Mountain. This zone is bounded by a major fault zone consisting of a number of relatively steep (>70°) north dipping normal faults, one of which moved during a major earthquake occurred near Alaşehir in 1969. This major fault zone is observed throughout the whole extension of the graben.

The Küçük Menderes Graben

The Küçük Menderes Graben (KMG) is part of the horst-graben system of southwestern Anatolia (Turkey), bounded by the Bozdağ horst in the north and the Aydın horst in the south. As indicated in Section 6.2.5.1 in detail, The KMG is divided into five subbasins, known as the Kiraz, Ödemiş, Bayındır, Dağkızılca-Torbalı and Selçuk. These subbasins are interconnected with narrow Quaternary troughs (*Rojay et al., 2005*). The License Area is located in Küçük Menderes Graben.

The Büyük Menderes Graben

The Büyük Menderes Graben is a seismically active depositional basin in the north-south extensional tectonic region of western Anatolia, Turkey. It extends in east-west direction and is bounded by the Aegean Sea to the west. The infill of this tectonic basin comprises 850 m and 245 m thick clastic sequences of Neogene and Quaternary, respectively. Kazancı et al., (2009) presents the Quaternary part of the basin-fill by the help of seismic sections and boreholes. Results show that the studied succession was made of unconsolidated, mostly fine-grained clastic sediments of marine and continental sequences inter-fingered with each other. Quaternary deposits are represented by lateral alluvial fans and present graben clastics deposited by the Büyük Menderes River and mainly observed along the northern margin of the Büyük Menderes Graben. This succession mainly contains gravel, sand, silt and clay with mud inclusions, having increased thicknesses towards the west. To the west of the graben, sediment wedges were identified that indicate Holocene sea transgressions along the coastline. Therefore, quaternary deposits observed in the west of the graben is mainly characterized by marine-based events whereas the quaternary deposits in the east of the graben is represented by alluvial and fluvial processes mainly driven by the Büyük Menderes River (*Kazancı et al., 2009*).

The Anatolide belt of western Turkey contains three major tectonometamorphic units. The highest structural unit includes the Lycian nappes and the Izmir–Ankara suture zone. This zone comprises ophiolitic melange and Late Palaeozoic to Mesozoic rift successions, deposited during opening of the northern branch of the Neo-Tethys Ocean. Underneath, the Cycladic blueschist unit, Mesozoic platform carbonates and metaolistostromes can be found. Both units were affected by a single HP–LT metamorphic event, resulting from the Late Cretaceous–Eocene closure of the northern branch of the Neo-Tethys. These were subsequently thrusted southward along the Cyclades–Menderes thrust onto the structurally deepest tectonometamorphic unit, the Menderes core series.

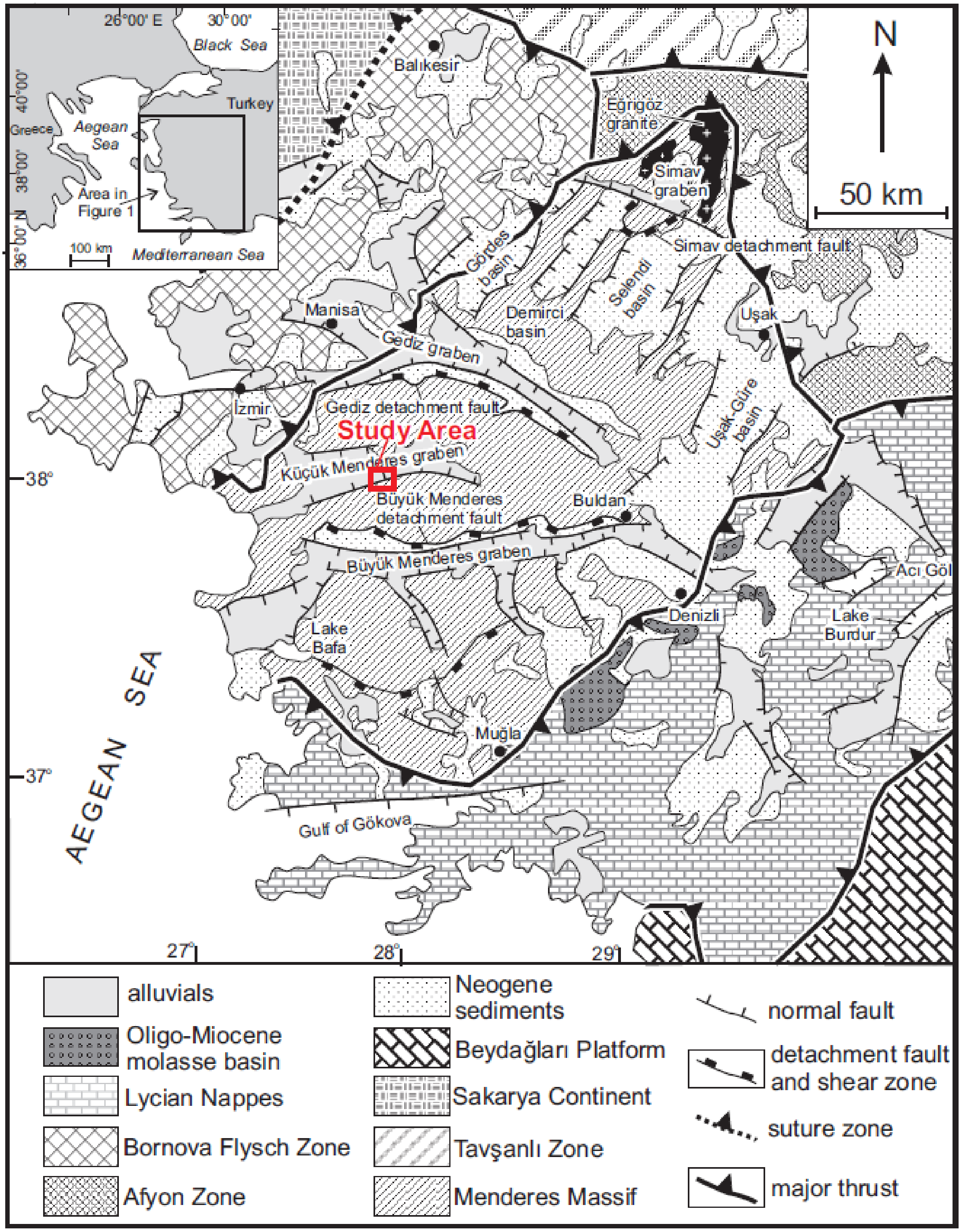


Figure 6-7. Distribution of Grabens and Faults in the Region (*modified from Emre et al., 2010*)

The Menderes core series, also termed Menderes Massive, is divided by Neogene grabens into northern and central submassifs and the southern Cine Massif. It is interpreted as an Eocene out-of-sequence stacking of the Selimiye, the Çine, the Bozdağ and the Bayındır nappes. The highest Selimiye nappe comprises Devonian–Carboniferous metapelite, calc-schist, metamarl, marble and quartzite and was subjected to Eocene greenschist to lower amphibolites grade metamorphism. The following lower Çine nappe contains deformed orthogneiss and undeformed to weakly deformed metagranites of the Çine Massive. The Çine nappe is also characterized by interlayers of mica schists showing amphibolite facies and partially migmatized sillimanite-bearing paragneisses. These paragneisses are observed with eclogite enclaves recording amphibolite facies overprinting.

A late Proterozoic intrusion age (560–540 Ma) is inferred for the orthogneiss protolith. Structurally, below the Çine nappe is the Bozdağ nappe that consists of metapelites with intercalated metapsammite, marble, amphibolite and eclogite of Proterozoic age. Rocks of the Bozdağ and Çine nappes are locally preserved as klippen formed during the late Cretaceou. These rocks are characterized by low-grade phyllite, quartzite, and marble of the structurally lowest nappe (the Bayındır nappe), where consistent top-to the- south sense of shear zone is observed. Rocks of the Bozdağ and Çine nappes display amphibolite facies metamorphism associated with the top of the north shear zone. On the other hand, rocks of the Selimiye nappe are characterized by greenschists. These greenschists were formed as a result of lower amphibolite facies metamorphism coeval with top-to the-south shear zone. All rocks are affected by greenschist facies top-to-the-south shear bands. Amphibolite facies metamorphism is associated with the Proterozoic (*Regnier et al., 2006*).

6.2.5.3 Local (License Area) Geology

Schist rocks were observed dominantly in the whole survey area. In the surface, geological observations were made on the outcrops identified on road cuts, valley floors and natural slopes. The lack of vegetation on the land surface also allows lithological observation and sample collection throughout the survey area. Accordingly, project area rock types, discontinuities, hydrogeological and geotechnical properties were identified.

Schists rocks are generally brown, greyish green and black with smooth, thin-moderate schistosity and corrugated foliation structure. Discontinuities are generally observed as mechanical discontinuity surfaces and fracture zones including joints and bedding planes within the rock mass. Discontinuity cleavage of schists is determined to be medium within 200 – 600 mm.

Rock Specimens were extracted from exposed surfaces for laboratory testing. The Schists in the surveyed area were found to be slightly to moderately weathered (W2-W3). These samples were also subjected to Point Load Tests to obtain their Strength Indexes. The results allowed to classify the Licensed Area's lithological Specimens into Low to Very Low Strength categories based on their Rock-Quality Designation values.

6.2.6 Natural Hazards

According to the study carried out by the Disaster and Emergency Management Presidency of Turkey (*Gökçe et. al., 2008*), the number of the natural hazardous events such as: earthquakes, landslides, rock falls, flooding, avalanches and others, is below average in the İzmir province, when compared with statistics of the country. The distribution of the number of natural hazards recorded since 1950 is shown in Figure 6-8.

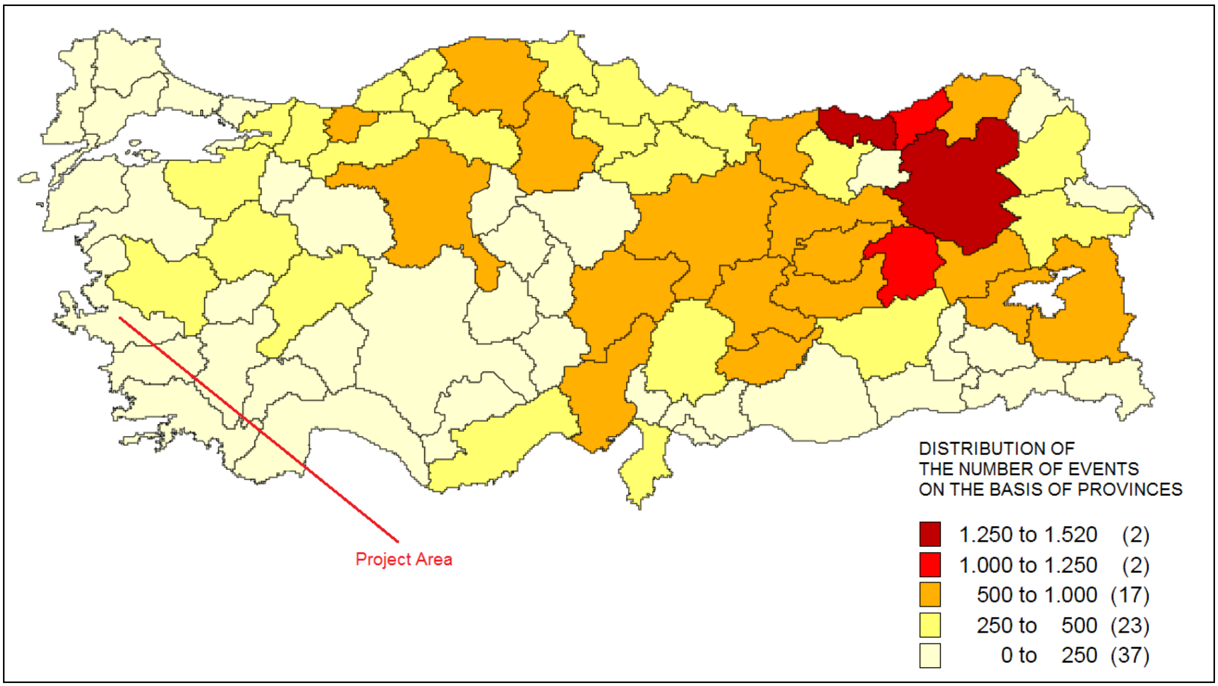


Figure 6-8. Distribution of the Number of Natural Hazards on the Basis of Provinces (*Gökçe et. al., 2008*)

Natural hazards including: earthquakes, landslides, rockfalls and avalanches are discussed in this section. These were also identified to be of importance for the License Area, thus they are discussed in the relevant sections of this ESIA Report, as listed below:

- Flooding (see Chapter 9)
- Meteorological hazards (i.e. heavy rain/snow and storm events) (see Chapter 8)
- Forest fires (see Chapter 15)

6.2.6.1 Earthquakes and Seismic Risks

Baseline information on earthquakes and seismic risks was compiled from the Geological Survey Study (which has been provided within the Project's national EIA Report) and data obtained from the General Directorate of Mineral Research and Exploration in Turkey. The License Area is located in a 1st Degree seismic zone, according to "Earthquake Zoning Map of Turkey". This document was published by the Earthquake Research Department of Disaster and Emergency Management Presidency of Turkey (see Figure 6-9).

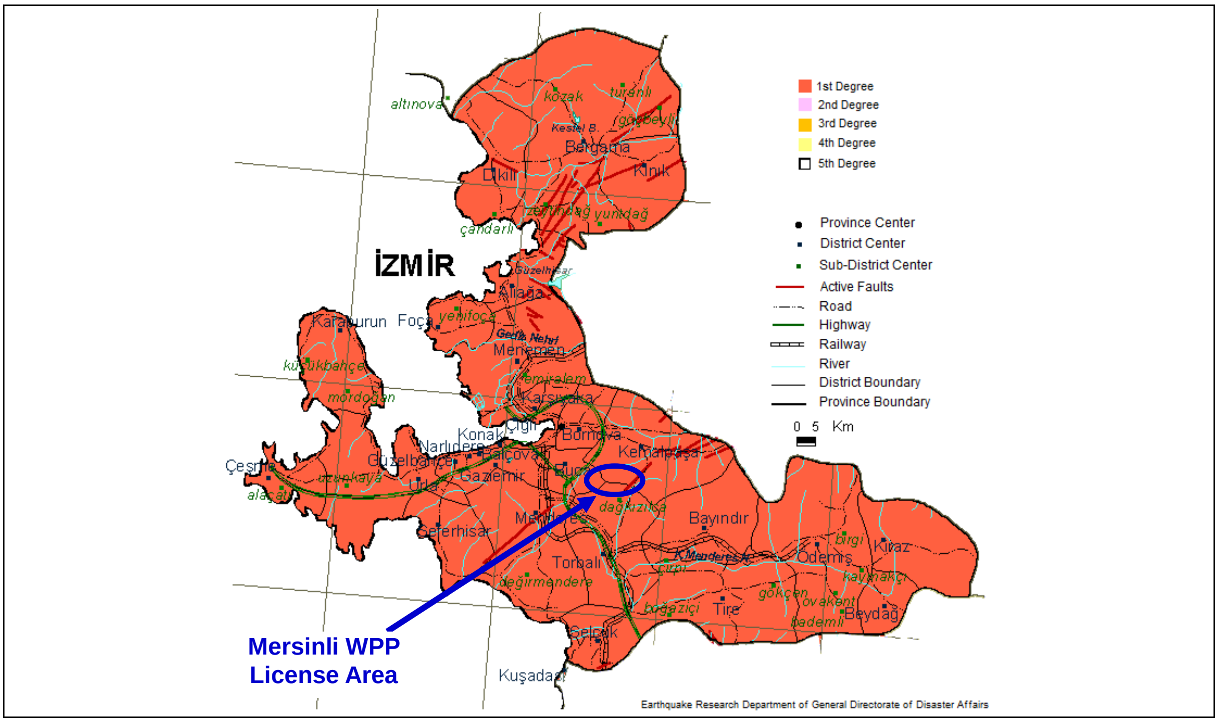


Figure 6-9. Earthquake Zoning Map of Izmir, Turkey

The İzmir region lies on the western edge of Gediz rift valley system. These normal fault structures of the rift valley are located in the western edge of Gediz rift valley and in the Bay of İzmir. Furthermore, northeast-southwest and northwest-southeast faulting zones play an important role, especially around İzmir.

Majority of the earthquake epicentres of the region, fall in Aegean Sea between Karaburun and Chios, İzmir Bay and Lesbos Island and Doğanbey Cape and Sesame Island. According to the epicentre distribution, some earthquakes are known to take place in the Akhisar-Soma-Manisa region, that falls between Gediz Rift Valley and Aegean Sea. No known active faults were observed within the License Area. The nearest active faults were identified at 6 km northwest (Dağkızılca Fault) and 13 km north (Kemalpaşa Fault) of the License Area. Figure 6-10 shows the active faults identified in the İzmir region, while the distribution of earthquakes is presented in Figure 6-11.

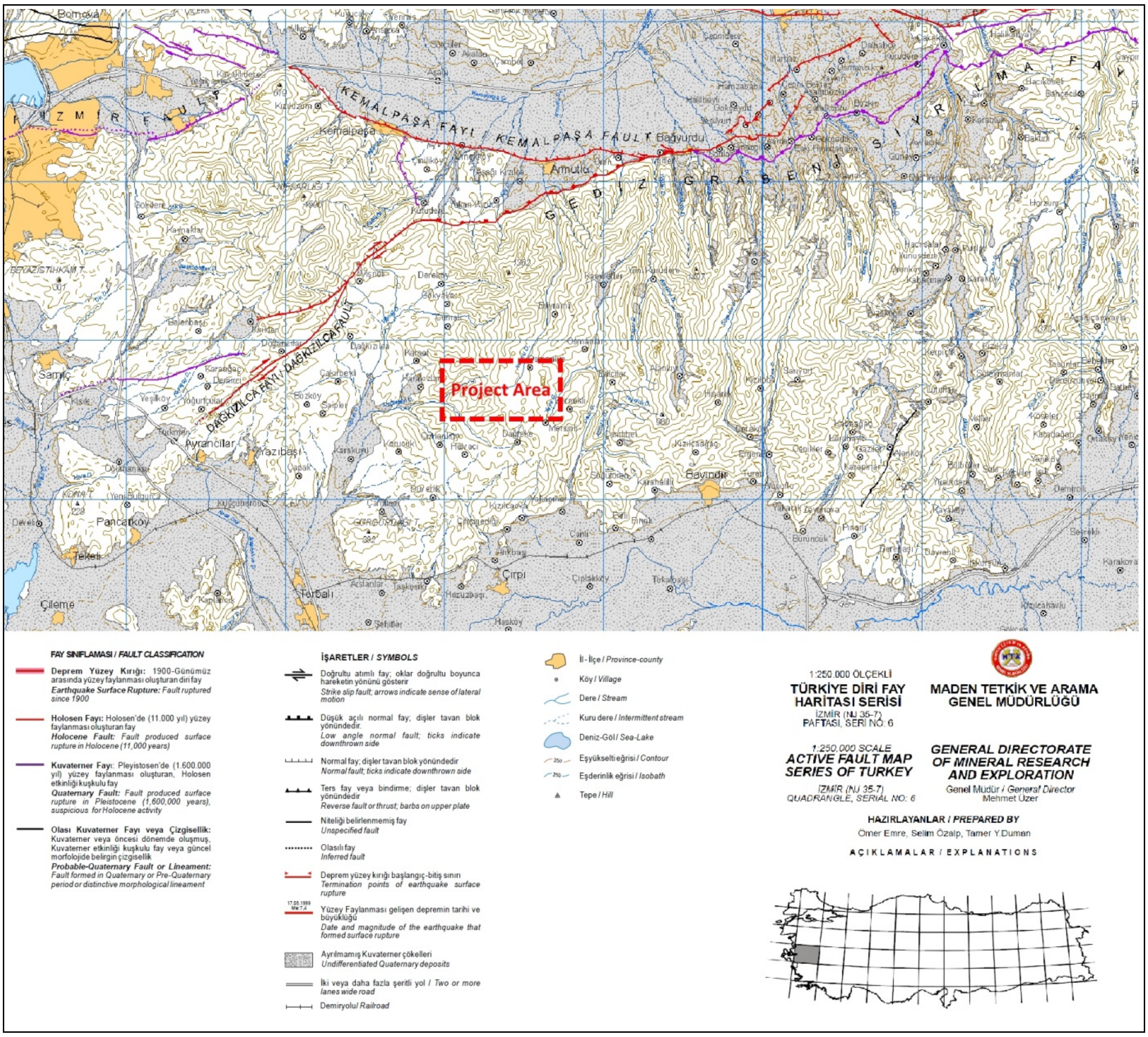


Figure 6-10. Fault Map of the License Area and its Vicinity *(MTA)*

Normal faults and rift valet structures are located East of İzmir Bay. Correspondingly, neo-tectonic era structures outside Gediz rift valley system consist of strike slip faults. This relation reveals that the current deformation outside the Gediz rift valley is met with strike slip faults. NE-SW direction faults yield both right and left lateral earthquake solutions.

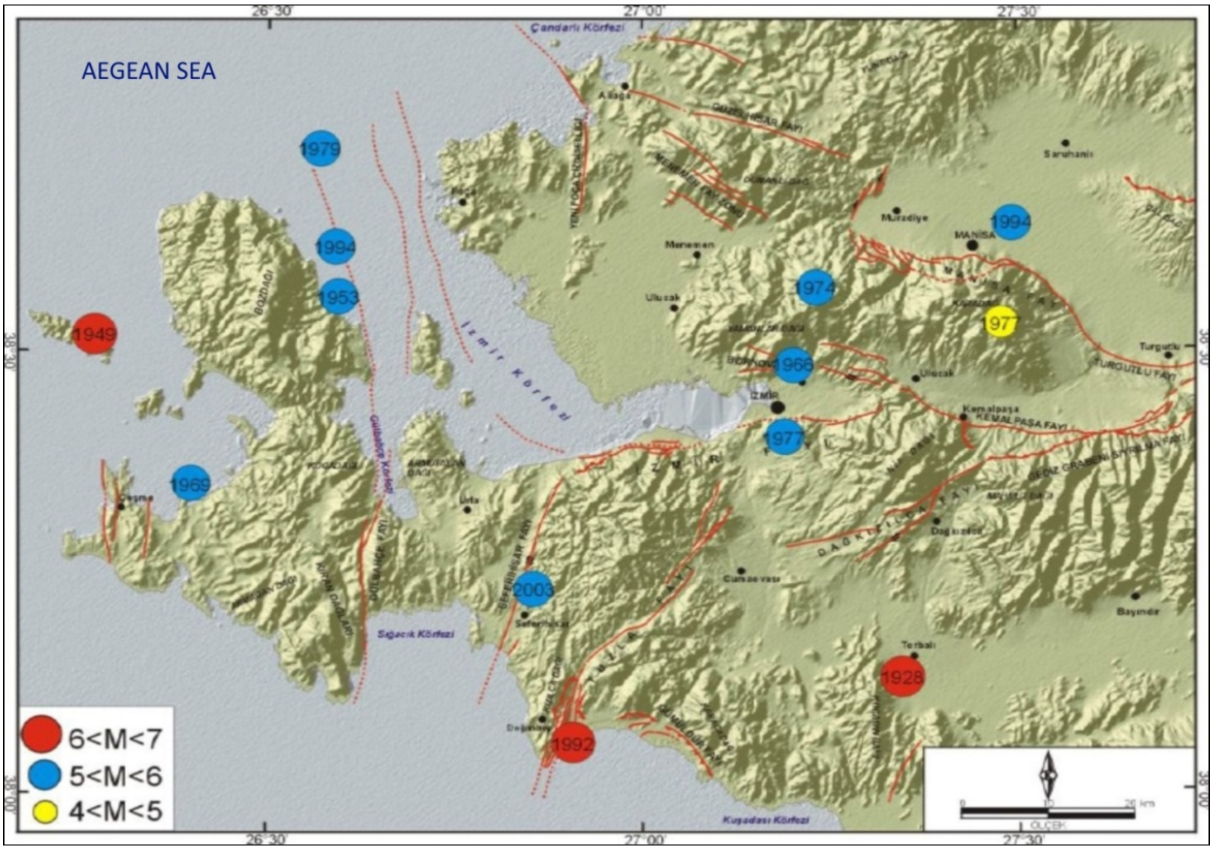


Figure 6-11. Distribution of Earthquakes in İzmir Region during the Instrumental Period (*PROÇED, 2017*)

The Project's national EIA includes a geotechnical study, which was carried out on April 9th, 2014 for the Mersinli Wind Power Plant Project in İzmir Province, Bayındır County, Çınardibi Village. This study examines the dynamic parameters of the ground. Based on this, the ground behaviour has been analysed using a seismic refraction method.

This method creates artificial earthquake waves, in which dynamic studies and dynamic elastic values are determined on site. In order to determine the underground mechanical properties of said area, seismic measurement profiles have been determined to centre the ground geometry and to cover all study area. The values obtained, support the assumption that the Project site is located on firm ground, resistant to seismic movements. Following findings were obtained from the geotechnical study:

- Point load strength values for the schist and marble units of the License Area, were estimated to have values between 5.91 kg/cm^2 – 46.43 kg/cm^2.
- Bearing capacities, estimated for the License Area lithologies, were observed to change between 7.92 kg/cm^2 and 55.84 kg/cm^2.
- Schist lithology in the License Area was classified as: moderately weathered (W2 – W3).
- According to the measurements carried out within a total of 10 seismic refractions, the License Area was represented by two different elastic mediums, as the primary and secondary layers.
- The Shear Modulus (Dynamic Rigidity) for the primary lithological layers of the License Area, was estimated to range between 4893 and 6773, which indicates a moderate resistance to earthquakes. As for the secondary lithological layers, the shear modulus was found to vary between 22180 and 66045, which indicate a strong resistance to earthquakes.
- The Elasticity modulus for the License Area, was estimated to range between 11468 and 15901 for the surficial layers, showing that ground is able to display strong resistance to earthquakes. The Elasticity modulus for the second layer was found to have values between 58121 and 142184, indicating the ground's strong resistance to earthquakes.
- Based on the seismic studies carried out for the License Area, no potential liquefaction is expected.

6.2.6.2 Landslides

The baseline information for landslides was received from the Geosciences Portal of the General Directorate of Mineral Research and Exploration of Turkey (yerbilimleri.mta.gov.tr). The results of the geotechnical studies were carried out within the scope of the Project's national EIA study.

Landslide classifications in Geosciences Portal are based on 5 categories, which are named as:

1. Old landslides,
2. Active landslides,
3. Creeps, flooding, slides and shallow landslide areas,
4. Regional mappable active slides and
5. Regional mappable old slides.

Based on this information, no historical and active landslide has been recorded in the License Area and its near vicinity. The nearest landslide to the License Area was recorded in Kemalpaşa district, which is 13 km north of the License Area.

Geological studies carried out, within the scope of the Project's national EIA report, indicate that the License Area is covered with schist units. Assessments were made from samples collected on site. The assumptions were based on the observations along the road cuts, valley bottoms and natural slopes. The values obtained by the measurements and laboratory analyses, indicate that the License Area is located on firm ground which is resistant to seismic movements (see Section 6.2.6.1).

Based on the Project's national EIA Report, Landslide events are observed in Kiraz (80 km east of the License Area), Ödemiş (45 km east of the License Area) and Tire (30 km southeast of the License Area) districts, which are connected to Büyük Menderes graben fault and Konak district in Izmir province. No rock-fall event has been reported in the near vicinity of the License Area so far.

6.2.6.3 Rock Falls, Avalanches and Other Natural Hazards

Based on the information obtained from the "Spatial and Statistical Distribution of the Natural Hazards in Turkey, Hazard Information Inventory" (*Gökçe et. al., 2008*), the frequency and the number of impacts associated with natural hazards are relatively low. Rock falls are primarily related to physical weathering of rocks due to significant difference in day and night temperatures. Temperature difference between day and night usually associated with regions that show continental climate characteristics. Given that the region is not characterized by continental climate, potential impacts that might originate due to weathering will be relatively low.

Avalanches on the other hand, are observed in Eastern Anatolia and Northeast Black sea regions of Turkey, as it is directly related to the topographic elevation. Topographically elevated regions are also represented by scarce distribution in vegetation with relatively high amount of snow cover. Although rock fall and avalanche occurrence in the License Area is unlikely, measures to prevent/minimize such risks will be implemented (see Section 6.3.1.3).

Other natural hazards such as tsunamis or volcanic activities, which are not relevant to the License Area in terms of location and hazard type, are not assessed within the scope.

6.3 Impact Assessment

Potential impacts of the Project on existing land use and soil will occur mainly during the land preparation and construction phase, due to the earthworks and construction activities that will be conducted. Since the footprint of all the Project's units including turbine foundations, access roads, substation, etc. are located on lands registered as forest, the Project will cause changes in the land use of forests (including shrubs), which will remain throughout the operation phase of the Project. The operation activities will not involve any additional physical impact on the land use and soils. In the closure phase, activities will aim to restore the affected forest vegetation.

The Mersinli WPP will connect to the national grid via the existing 154 kV Energy Transmission Line (ETL) of the Fuat WPP, which is currently operating approximately 3.5 km north/northeast of Project's License Area. The existing ETL of the Fuat WPP crosses the Mersinli WPP between Turbine-4 and Turbine-5. The line that will connect Project's substation to the Fuat WPP's existing ETL will be 40-200 m long. This line will entail construction of only one ETL pylon on forest lands. This design avoided further impacts on land use and soils, that would be caused by construction and operation of a new ETL line.

Assessment of impacts on land use and soils, was done based on the methodology presented in Chapter 5. Accordingly, the magnitude of each impact was estimated as a factor of the foreseen: geographic extent, duration, reversibility, and frequency of the impact, based on expert's judgement. Sensitivity/value of the associated resource/receptor, was determined in consideration of the baseline conditions described in the previous sections and typical descriptor of defined in Chapter 5. Specific sensitivity/value criteria considered in assessing the impacts on land use and soils is provided in Table 6-10.

Table 6-10. Sensitivity/Value Criteria for Resource/Receptors

Impact Subject	High	Medium	Low	Negligible
Top soil	Agricultural areas (top soil thickness of more than 30 cm)	Forests and open areas (top soil thickness of around 20 cm)	Pastures/Steppe (top soil thickness of 5-10 cm)	Areas with top soil thickness of less than 5 cm
Forest lands	Forests having ecological functions according to Forestry Management Plans or forests with closed to fully closed canopy levels (Level 3: 71-100%)	Forests having social and cultural funcitons according to Forestry Management Plans or forests with moderately closed canopy levels (Level 2: 41-70%)	Forests having economic function according to Forestry Management Plans or forests with sparse canopy levels (Level 1: 11-40%)	Open areas or degraded forests with absent to sparse canopy levels (0-10%)
Agricultural areas	Lands having land use capability of Class I-II according to GDRS Database (agricultural lands suitable for agricultural soil cultivation)	Lands having land use capability of Class III-IV according to GDRS Database (agricultural lands suitable for agricultural soil cultivation)	Lands having land use capability of Class V-VII according to GDRS Database (agricultural lands not suitable for soil cultivation)	Lands having land use capability of Class V-VII according to GDRS Database (Non-arable lands)
Erosion	Very severe (4th degree) erosion zones according to GDRS database	Severe (3rd degree) erosion zones according to GDRS database	Moderate (2nd degree) erosion zones according to GDRS database	None or very little erosion (1st degree) zones according to GDRS database
Soil contamination	Agricultural areas Forests and semi-natural areas according to CORINE database	-	Artificial surfaces according to CORINE database	-
Seismic risk	Areas located in 1st Degree Earthquake	Areas located in 2nd Degree Earthquake	Areas located in 3rd Degree Earthquake	-

Impact Subject	High	Medium	Low	Negligible
	Zones according to relevant Earthquake Zoning Maps	Zones according to relevant Earthquake Zoning Maps	Zones according to relevant Earthquake Zoning Maps	

6.3.1 Land Preparation and Construction Phase

6.3.1.1 Impacts on Land Use

All the Project units including turbine foundations, access roads, substation, etc., will be located on lands registered as forest in the Turkish Land Registry and Cadastre (Title Deed) System. For the use of these forestlands, forestry permit will be obtained from the General Directorate of Forestry. Ownership of the forestlands will remain with the General Directorate of Forestry throughout the Project. Forest vegetation and trees, corresponding to the permitted areas where the Project units are to be constructed and operated, will be removed during the land preparation phase.

The area to be affected at the footprint of each Project unit and the corresponding land use type, was identified by means of GIS analysis; this was done based on CORINE database. Even though all the lands corresponding to the Project units are officially registered forest lands, which are under the authority of General Directorate, some of the registered forest parcels are being used for agricultural purposes by illegal users. The CORINE database also recognizes these registered forest lands as agricultural areas. Land use characteristics of the areas corresponding to each Project unit are listed in Table 6-11.

Table 6-11. Land Use Characteristics at the Footprint of Project Units (according to CORINE 2012)

Project Unit		CORINE Classification (Level 2)	Area (ha)
Turbines	T1	Forests	0.39
		Shrubs	0.86
	T2	Forests	0.07
		Shrubs	1.18
	T3	Shrubs	0.28
		Open spaces (forests)	0.97
	T4	Shrubs	1.25
	T5	Shrubs	1.25
	T6	Shrubs	1.25
	T7	Shrubs	1.25
	T8	Shrubs	1.25
	T9	Forests	0.31
		Shrubs	0.94
	T10	Agricultural areas (heterogeneous)	0.50
		Forests	0.37
		Shrubs	0.38
	T11	Forests	1.25
	T12	Agricultural areas (heterogeneous)	1.23
		Forests	0.02
	T13	Forests	1.25
	T14	Forests	1.25
	T15	Forests	1.25
	T16	Forests	1.25
	T17	Forests	1.25
Substation		Shrubs	0.38

Project Unit	CORINE Classification (Level 2)	Area (ha)
Access Roads	Agricultural areas (heterogeneous)	0.97
	Forests	4.27
	Shrubs	3.94
	Open spaces (forests)	0.01
Construction Camp Site (Temporary)	Forests	0.55
Total Area of Project Units		**31.37**
License Area		**1,620.5**

As can be seen from Table 6-11, the total area to be affected by the Project, covers approximately 31 ha, which corresponds to 2% of the License Area (1620.5 ha). More than 88% (27.7 ha) of the area to be affected, is located on lands classified as forests and shrubs in the CORINE database, while 8.6% (2.7 ha) is located on lands classified as agricultural areas (heterogeneous). Lands classified as agricultural areas, according to CORINE database, are located near: Turbine-10, Turbine-11 and Turbine-12; this includes their access roads (see Figure 6-2). The remaining 3.1% (less than 1 ha) corresponds to lands classified as open spaces, with little or no vegetation.

The use of the registered forest lands by illegal users for agricultural purposes (cherry plantation) was further identified and evaluated using the Information System of the General Directorate of Land Registry and Cadastre and site visits were conducted to ground truth it. It was identified that two forest parcels, corresponding to the location of Turbine-12 and part of its access road, are being used by locals as cherry orchards. The title deed area of the corresponding forest parcels and their portion to be affected by the Project units are summarized in Table 6-12.

Figure 6-12 shows the location of Turbine-12 (including part of associated access road) on the two forest parcels affected by the Project. There are other parcels adjacent to (in the south) and in the surroundings of the affected parcels, which are identified to be privately owned and used for agricultural purposes as well. Further evaluation of the potential socio-economics impacts regarding this issue is provided in Chapter 13.

Table 6-12. Cherry Orchards on Registered Forest Lands at the Location of Turbine-12

<table>
<tr><th>Project Unit</th><th>Affected Plot/Parcel</th><th>Title Deed Area of the Parcel(m^2)</th><th>Affected Area of the Parcel(m^2)</th><th>Percentage of Affected Area within the Parcel (%)</th><th>Remaining Area (not affected) (m^2)</th></tr>
<tr><td>Turbine-12</td><td>277/1</td><td>7,724.72</td><td>6,108.00</td><td>79</td><td>1,616.72</td></tr>
<tr><td>Turbine-12</td><td rowspan="2">277/2</td><td rowspan="2">12,895.84</td><td>4,146.00</td><td rowspan="2">39</td><td rowspan="2">7,849.84</td></tr>
<tr><td>Access roads for Turbine-12</td><td>900.00</td></tr>
<tr><td>Total</td><td></td><td></td><td>11,154</td><td></td><td>9,511.56</td></tr>
</table>

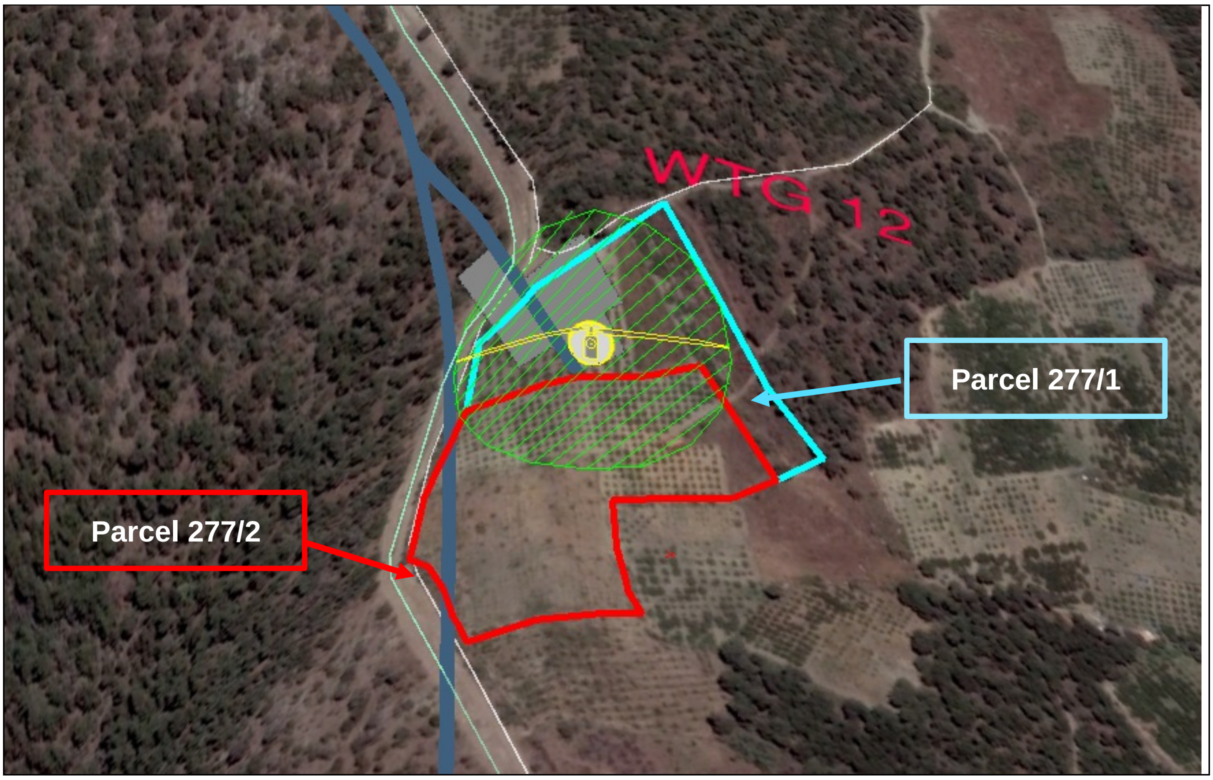


Figure 6-12. Cherry Orchards on Registered Forest Lands at the Location of Turbine-12

It should be noted that in the calculations, the area to be cleared around each turbine, was assumed as dia.126 m (length of blades); this represents the worst case scenario conditions. In practice, the diameter of the area to be cleared (for vegetation removal against the risk of fire) is anticipated to be less (around 100 m for each turbine). Additionally, as previously explained in Chapter 3, internal roads will have a total length of around 11.7 km and only 5.2 km of the total length will be newly constructed. The remaining 7.2 km will consist of existing forest roads, which will be improved to the road standards required by the Project. Even though the impact on the route of existing forest roads will be limited to the improvement areas, the entire length of the internal site access roads was considered in the land use analysis (meaning that; existing forest roads sections were not excluded even though they are located on already affected forest land).

It should be noted that the underground cables will be placed in trenches to be excavated in parallel to the internal roads. For this purposes trenches of 1 m in depth and 0.3 to 1.3 m in width will be excavated. Once the cables are placed, excavated soils will be used to refill the trenches. Since this operation will be conducted along the access road routes, no additional impact on the land use will occur due to cable laying.

Loss of Trees

The removal of top soil, vegetation and trees, corresponding to the footprints of the Project units, will be removed by the Turkish Forestry authorities in accordance with the relevant provisions of the national Forestry Law.

Upon the application of the Project Company, the number of trees to be removed was calculated by the Regional Forestry Directorate authorities based on the related Forestry Management Plans (as summarized in Table 6-13). The Project Company also conducted analysis on Google Earth by using GIS analysis to confirm the figures estimated by the Forestry authorities.

Table 6-13. Number of Trees to be Logged due to Project

Forest Stand Type		Number of Trees to be Logged
English Name	**Turkish Name**	
Turkish pine *(Pinus brutia)*	Kızılçam	8,339
Black pine *(Pinus nigra)*	Karaçam	697
Total		**9,036**

It should be noted that the Regional Directorate of the Forestry, also conducts regular logging of the trees in line with the applicable Forestry Management Plans. An application was made to the authorities to obtain the related Forestry Management Plans and Forest Stand Maps. This will help identifying the forests within the License Area that have been designated with economic functions, which represent the forests operated/managed with the aim of production of forest products, having economic value. Forest maintenance and regeneration works are conducted in these forests to ensure healthy growth of the forests, as well as to ensure social needs of the communities. Since the authorities have not provided the requested plans and maps, the forestlands that will already be degraded as a result of forestry activities could not be identified and assessed in the scope of this ESIA. Additional loss of trees within the License Area may become an issue in the case of unexpected forest fires. Measures to be taken to avoid/minimize the risk of forest fires are discussed in Chapter 15.

In addition to the pines, number of cherry plantations corresponding to the location of Turbine-12 (including the clearance area around the turbine) is estimated to be 300, as presented in Table 6-14. Alternative measures to be evaluated by the Project Company regarding the management of cherry plantations are described in the Livelihood Restoration and Compensation Framework (LRCF).

Table 6-14. Approximate Number of Cherry Plantations Corresponding to the Location of Turbine-12

Project Unit	Affected Plot/Parcel	Number of Cherry Plantations
Turbine-12	277/1	100
Turbine-12	277/2	200
Total		**300**

6.3.1.2 Impacts on Soil

The major Project impacts and/or risks on soils during land preparation and construction phase and that are to be managed in the scope of the Project are listed below:

- Loss of top soil (in terms of quantity and/or vegetative quality);
- Soil disturbance and erosion, due to earthworks: excavation and filling operations;
- Risk of soil contamination due to unplanned accidents and improper management of hazardous materials and waste.

Loss of Top Soil

As explained previously, the Project units correspond entirely to forest lands, where the land use capability classes of the soils are: Class VI, VII and VIII. Class VI and Class VII represent soils that are not suitable for agricultural soil cultivation, while Class VIII represents non-arable lands. Therefore, the Project will not affect any soil with high agricultural potential.

The existing top soil corresponding to the project's construction areas, such as the positioning of turbine foundations or location of new roads, will be removed prior to the commencement of the construction phase. Stripped top soil will be stored at designated sites (top soil storage areas) within the License Area, to ensure that vegetative properties of the stripped soils are not lost. Based on the site surveys conducted at the License Area, it was determined that thickness of the topsoil would be generally around 20 cm. Only within forest lands used for agriculture around Turbine-12, the thickness of the topsoil may increase up to 30 cm. The total volume of the top soil to be stripped from the footprint of Project units has been calculated as 64,500 m^3 (see Table 6-15).

Table 6-15. Volume of Top Soil to be Stripped from the Project Units' Footprint

Land Use Type According to CORINE (2012)	Corresponding Project Units	Estimated Top Soil Thickness	Area (ha)	Top Soil Volume (m^3)
Open spaces	T3, Access Roads	0.10 m	1.0	1,000
Forests and Shrubs	All turbines, Substation	0.20 m	27.7	55,400
Agricultural areas	T10, T12, Access Roads	0.30 cm	2.7	8,100
Total Volume			**31.4**	**64,500**

The areas to be used for the storage of top soil should be located on relatively less sloped locations (less than 5%). Additionally, the top soil storage area should lack trees and must not be positioned on rocky surfaces Accordingly, degraded forestlands having sparse or no vegetation will be selected for Mersinli WPP Project. The height of the top soil stockpiles must not exceed 2 m, to ensure that the vegetative properties of the stored soil are not lost. The area corresponding to the former meteorological mast erected in the north of Turbine-16, has been identified as one of the suitable locations for top soil storage. This area shown in Figure 6-13, would provide a storage capacity of around 10,000 m^3 and serve for: Turbine-15, Turbine-16, Turbine-17 and associated internal and access roads. Additional sites for the storage of top soil are to be stripped from the footprints of: substation, north-eastern turbines and their access roads. These locations will be determined based on the results of final soil surveys. Due to the steep topography and existing forest vegetation, there will be several top soil storage sites close to each turbine location or parallel to internal roads. These sites will be located on open forest areas. Area of each site is likely to range between 1,000 m^2 to 5,000 m^2.

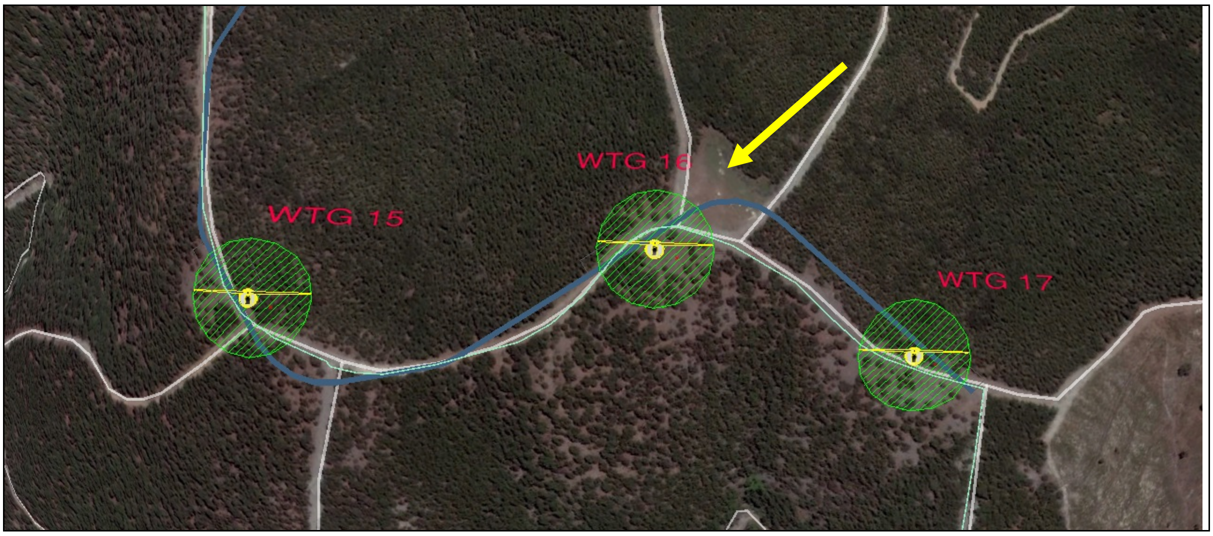


Figure 6-13. Top Soil Storage Area Alternative

Stored top soil will be reused in rehabilitation works (i.e. rehabilitation and landscaping works to be conducted at the temporary construction camp sites and side slopes of the main access road passing parallel to the 1st degree archaeological site, as explained in Chapter 16).

Soil Disturbance and Erosion

Following the top soil stripping, soil excavations will be conducted at the footprints of the Project units. The Project's estimated excavation-fill balance is provided in Table 6-16. Based on the current data, it is estimated that 20% of the excavated materials will be suitable for being reused in fill operations. Excess excavated materials will be disposed of at storage areas in line with the permit to be obtained from the related authorities. Exact volumes for the excavation-fill operations and reuse ratios will be determined based on the final soil surveys to be conducted prior to the construction phase.

Table 6-16. Excavation-Fill Volumes

Task	Volume (m^3)
Total Excavation Requirement	81,500
Amount of Excavated Materials Estimated to be Suitable for being Reused as Fill Material	165,000
Excess Excavated Materials to be Disposed of	**65,000**
Total Fill Requirement	100,000

As a result of the disturbance of top soil during: site clearing, earthworks and excavation activities; soil surface will potentially become susceptible to erosion due primarily to rain and wind. Soil erosion might further trigger transport of soil material with surface drainage networks which may in turn affect the quality of natural water receptors. Soils having severe and very severe baseline erosion conditions will be more sensitive to erosion impacts.

Based on the erosion degree map provided in Section 6.2.4, almost all of the Project Area is located in very severe and severe soil erosion areas. The degree of soil erosion was identified to be severe (Degree III) in the northwest of the Project Area, representing the turbine locations T1, T2 and T3. A minor portion of the license area is classified as having no/slight erosion risk (Class I) which is only representative for turbine location T4. The locations where the remaining Project Units (incl. substation and access roads) will be situated, are classified as having very severe erosion risks (see Table 6-17).

Table 6-17. Erosion Degrees at the Footprint of Project Units

Soil Erosion Degree	Project Units
Very severe	T1, T2, T3
Severe	T5-T15, substation, majority of the access roads
Moderate	None
Slight or none	T4

In order to prevent/minimize soil erosion, exposed work areas (e.g. side slopes of the access roads, turbine foundations, etc.) will be immediately rehabilitated following the completion of construction works. To prevent contamination of surface water and manage surface runoff water, drainage systems and sediment control measures will be designed.

Soil Contamination

Land and soil contamination may be an issue in the land preparation and construction phases of the Project, as accidental releases from hazardous materials, such as oil, are likely. The amount of materials that would be released as a result of accidental spill or leakage incidents cannot be estimated but these types of incidents would happen only during the construction period. Although the strategy of the necessary actions will vary depending on the level and extent of the contamination, basic measures will aim to understand the source-pathway-receptor relation and manage the contaminated media. With the implementation of avoidance and response measures, the amount of release could be taken under control before reaching substantial amounts. Accordingly, significance of the consequence of any leakage/spill incident would be kept at low levels, if not negligible.

6.3.1.3 Natural Hazards

The Project Area is located on a 1st degree earthquake zone according to the Earthquake Map of Turkey. Thus, the seismic design and stability of the wind turbines, is essential to avoid risks on the community and personnel's health and safety, as well as Project's integrity. The seismic design of the Project will be done by applying the results of the final soil surveys. These are to be conducted prior to construction and based on standards. In this respect, the Project units will be designed in full compliance with related natural hazards legislation and legislative technical specification documents, in addition to the specific natural hazard resistance design studies conducted for each Project unit.

6.3.2 Operation Phase

The use of hazardous material during the operation phase of the Project will be limited to: oils, paints, etc., which will be used in limited amounts, as part of the maintenance works.

Similar to the land preparation and construction phases, the amount of substances that would be released as a result of accidental spill or leakage incidents, cannot be estimated. However, these types of incidents would happen only occasionally. The risk of soil contamination due to unexpected/unplanned release or leakage incidents can be prevented by taking precautionary measures. Furthermore, the amount of released substances can also be taken under control before reaching substantial amount, this is done by implementing response measures. Accordingly, the significance of the consequence of any leakage/spill incident would be kept at low levels, if not negligible.

In parallel to operation activities, a Reforestation Programme will be applied to compensate the trees lost as part of construction activities. As the reforestation processes in Turkey is under the authority and control of the Ministry of Forestry and Water Affairs (General Directorate for Afforestation), the Project Company will collaborate with them to plan and implement the Reforestation Programme. At the local level, Regional Forestry Directorates and their sub-directorates will be cooperated.

The national Forest Law (numbered 6831) and the regulations promulgated under the Law, define the procedures to be followed for reforestation activities. In this scope, private companies, who are willing to conduct reforestation activities (on a voluntarily basis) on forest lands that are under the responsibility of forestry authorities, are provided by legislation with two main alternatives; establishment of memorial forests and private reforestation. The Project Company will select one of the two alternatives or a combination of both for their planned reforestation activities. However, regardless of the selected alternative, a Reforestation Protocol will be created with the related Regional Forestry Directorate. Species to be used for reforestation, their ages and abundances, will be identified by the authorities within this Protocol in consultation with the Project Company and their flora and fauna consultants. In this process, the Forestry authorities would consider their own Forestry Management Plans as well.

6.3.3 Closure Phase

Following the completion of operational life, the WPP components will be decommissioned according to applicable legislation and techniques. Thus, the potential impacts of the closure phase, will be similar to those expected for the land preparation and construction phase.

The closure phase of the Project will mainly focus on reinstatement of the ground to its original state. Thus, the overall impact of the closure activities on land use and soils is anticipated to be beneficial.

6.4 Mitigation Measures

The mitigation measures to be taken against the identified impacts in different phases of the Project are listed in Table 6-18. Significance of impacts before and after mitigation (residual impacts) is also identified in the table.

Table 6-18. Impacts, Mitigation and Residual Impacts for Land Use and Soils

Impact Description	Project Phase	Receptor	Impact Magnitude						Sensitivity/ Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Magnitude	Reversibility	Duration	Frequency	Overall Magnitude				
Top soil stripping and management (64,500 m^3)	• Land preparation and construction	• Ecosystem components	Restricted	Low	Short-term reversible	Short-term	Continuous	Low	Low (non-arable soils)	Minor	Implement top soil management measures: • Strip top soil from the footprint of Project units at suitable depths (20 cm at forest lands; 30 cm at lands used for agriculture; 10 cm at open spaces) before the start of construction activities and store it separately separate from the sub soil at designated top soil storage areas. • Minimize soil loss by employing suitable equipment, procedure, and work schedule (windy and rainy periods should be eliminated for activities that is incorporated with soil disturbance such as soil stripping, etc.). • Identify top soil storage areas (of sufficient capacity) at relatively low slope areas with sparse or no forest vegetation based on the results of final soil surveys. • Ensure that height of the top soil stockpiles will not exceed 2 m. • Ensure that no excavation waste (except soil) such as waste rock, domestic waste, medical waste, construction waste and debris will be dumped at top soil storage areas. • Ensure that a maximum slope of 1/3 and a minimum bench width of 10 m will be ensured in order to maintain slope stability and safe working environment for heavy construction vehicles. • In order to avoid soil compaction, ensure that surface grading will be performed with lightweight tracked vehicles or wheeled vehicles. • Enclose the top soil storage areas by wire back silt fence and place adequate number of explanatory signboards at visible points; fix the signboards strongly to ground; • Provide the drainage of the temporary top soil sites throughout the storage period. • At sites where construction activities are completed, reuse stored top soil for rehabilitation of sites (i.e. rehabilitation and landscaping works to be conducted at the temporary construction camp sites and side slopes of the main access road passing parallel to the 1st degree archaeological site, which is located adjacent to the construction camp site). • Ensure that top soil stripping and excavation activities will be performed in compliance with the Regulation on Control of Excavated Soil, Construction and Demolition Wastes. • Ensure that unnecessary soil stripping will not be carried out during construction activities to minimize disturbance to vegetation and soils. • Ensure that vegetative soil will not be used as fill material under any circumstances. • ImplementErosion Control, Soil and Spoil Management Plan.	Negligible
Loss of forests (27.7 ha according to CORINE classification and 9,036 trees)	• Land preparation and construction • Operation	• Ecosystem components • Local communities	Restricted	Low	Long-term reversible	Short-term	One-off	Low	Medium (Regional importance)	Minor	• Implement Biodiversity Action Plan • Sign Reforestation Protocol with the Forestry Authorities • Implement Reforestation Programme	Minor
Loss of forest lands used for agricultural purpose (2.7 ha according to CORINE classification and around 300 cherry plantations on registered forest lands (parcels 277/1 and 277/2)	• Land preparation and construction	• Local communities	Restricted	Low	Irreversible or long-term reversible	Short-term	One-off	Medium	Medium (land use capability classes VI, VII, VII)	Moderate	• Implement top soil management measures • Implement the Livelihood Restoration and Compensation Framework • Ensure that vehicle movements are restricted to designated roads to avoid disturbance of lands adjacent to the roads.	Minor
Soil Disturbance and Erosion	• Land preparation and construction • Operation • Closure	• Ecosystem components	Local	Low	Long-term reversible	Long-term	Intermittent	Medium	High (Very severe and severe erosion levels)	High	• Implement top soil management measures • Implement Erosion Control, Soil and Spoil Management Plan • Conduct final soil surveys prior to construction; based on the survey results plan using excavated soils in fill operations to the extent possible • Implement Biodiversity Action Plan • Implement Reforestation Programme to be developed in	Low

Impact Description	Project Phase	Receptor	Impact Magnitude						Sensitivity/ Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Magnitude	Reversibility	Duration	Frequency	Overall Magnitude				
											consultation with the related forestry authorities • Ensure that natural vegetation will be preserved in non-exposed ground areas for effective sediment and erosion control. • Consider limiting activities during adverse weather conditions to reduce potential wind and water erosion.	
Soil Contamination	• Land preparation and construction • Operation • Closure	• Ecosystem components • Project personnel • Local communities	Restricted	Low	Short-term reversible	Short-term	One-off	Low	Low (non-arable soils)	Minor	• Identify the baseline soil conditions prior to the construction activities by sampling and laboratory analysis • Develop and implement Project-specific Emergency Preparedness and Response Plan • Implement Waste Management Plan • Develop and implement Training Programme covering aspects related with management of hazardous substances • Ensure that hazardous waste will be temporarily stored on-site in an area designated just for this purpose, appropriately enclosed and with concrete paved surface. • Prohibit waste storage out of the designated storage areas. • Ensure that oil changes, refuelling, or lubrication of vehicles will be conducted in a dedicated area. Storage tanks and refuelling stations will be equipped with drip trays and spill control equipment. • Ensure that when spills or leakages of any type of hazardous materials occur, the contamination will be controlled by using absorbents. The contaminated soil (if any) will be stripped to the adequate depth and disposed in compliance with the applicable legislation and international best practice.	Negligible
Seismic risk	• Land preparation and construction • Operation • Closure	• Project personnel • Local communities	Local	Medium	Irreversible (worst case)	Short-term	One-off	Medium	High (1st degree earthquake zone)	High	• Conduct seismic design of the Project taking the results of the final soil surveys to be conducted prior to construction • Ensure that the Project units are designed in full compliance with related natural hazards legislation and legislative technical specification documents, in addition to the specific natural hazard resistant design studies conducted for each Project unit.	Negligible

7. Noise

7.1 Project Standards and GIIP

The noise limits given in the Turkish Regulation on the Assessment and Management of Environmental Noise (RAMEN) and international GIIP documents (i.e. IFC General EHS Guidelines) have been assessed to establish the Project noise limits for the construction and operation phases. It should be noted that amongst the available legislation, standards and GIIP documents, only RAMEN includes specific noise limits for the construction phase; whereas, others have limits applicable for the operation phase of the Project.

In the U.K. a methodology, namely ETSU-R-97, was developed for the Department of Trade and Industry (DTI) by the Working Group on Noise from Wind Turbines (WGNWT). ETSU-R-97 provides a robust basis for determining the noise criteria for wind farms and has become a well-respected and accepted standard for such developments within the UK. This methodology has therefore been adopted for this Project. The ETSU-R-97 noise criterion is based on a level 5 dBA above the best fit curve over the 6-10 m/s wind speed range (actually the ETSU-R-97 criterion is similar to the IFC/WB criterion given above). If the ETSU-R-97 criterion curve is found to be below the IFC/WB night time absolute value of 45 dBA (since this value is the lowest of all absolute limits given by RAMEN and IFC/WB), it is basically fixed at 45 dBA for Laeq or 43 dBA for La90 10min. LA_{90} is the A-weighted sound levels that are exceeded 90% of the time. The use of the $LA_{90-10min}$ data avoids corruption of data from relatively loud, transitory noise events from other sources. Thus, in this assessment, $L_{A90-10min}$ is used for the calculation of the background noise levels and also for the wind farm. It should be noted that $L_{A90-10min}$ is likely to be about 2 dBA less than the LAeq measured over the same time (ETSU-R-97, 1997) and this is the reason of limit use as 43 dBA.

The noise limits set by the above-mentioned standards are given in Table 7-1 together with the Project Limits.

Table 7-1. Noise Standards for Residential Receptors

Time of the Day*	**Noise Limits for Residential**			**Project Standards at Residential Areas**	
	IFC EHS Guidelines*	**Turkish RAMEN**		**Construction Period**	**Operation Period**
		Construction	**Operation**		
Daytime	55 dBA	70 dBA	65 dBA	70 dBA	45 dBA (for LA_{eq}) 43 dBA (for LA_{90})
Evening	-	-	60 dBA	-	
Night-time	45 dBA	-	55 dBA	45 dBA	

**IFC EHS Guidelines define the daytime as 07:00-22:00 and night time as 22:00-07:00. Turkish RAMEN defines the daytime as 07:00-19:00, evening as 19:00-23:00 and night time as 23:00-07:00. It should be also noted that the night time absolute lower limit of 45 dBA is also based on World Health Organisation guidelines for the protection of sleep indoors with windows open.*

***Noise impacts should not exceed the levels presented in or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site.*

7.2 Baseline Conditions

Background environmental noise levels at the settlement located in the vicinity of the Project components, were determined based on the site measurements conducted by an accredited laboratory in October 2017. For this purpose, noise sensitive receptors located within 2,000 meters of the turbines were determined through the analysis of Google Earth images and site surveys. Two of the closest receptors, selected as noise sensitive receptors based on this study, are listed in Table 7-2. Noise measurement locations are shown on the map provided in Figure 7-1.

Table 7-2. Noise Sensitive Receptors (NSR) Selected for Baseline Noise Measurements

Receptor Code	Settlement	Closest Turbine	Distance to the Closest Turbine	Coordinates (UTM Projection ED-50 Datum Zone 55)	
NSR-1	Çınardibi Neighbourhood	WTG12	755 m	544185	4237249
NSR-2	Marmariç Permaculture Village (closest residential building)	WTG 17	1,000 m	546125	4234682

There is a shed near Turbine-12 which is not used for residential purposes. The shed is known to be used temporarily to support agricultural activities. Thus, the shed is not considered as a noise sensitive receptor for assessment of noise impacts.

7.2.1 Background Noise Measurements

Background environmental noise measurements were undertaken for four consecutive days (92 hour) between 27 October 2017 and 31 October 2017 at the selected noise sensitive receptors. Measurement results were logged for ten minutes sampling interval.

Noise measurements were undertaken with SVAN 971, which is a device in compliance with the standards of ANSI S1.4, IEC 651, IEC 61672-1:2002 and IEC 804 (see Figure 7-2). Calibration of the equipment was done before and after each measurement with an acoustic calibrator. The calibrator complies with the standards of ANSI S1.4 and IEC 942. All measurement systems were set to log the L_{min}, L_{max}, LA_{eq} and LA_{90} noise levels over the required ten minute intervals during measurement period. The equipment used for the measurements was set to a-weighted, fast response, continuously monitoring mode over ten minute sampling period. All noise measurements were performed with the following precautions;

- Windshield placed over the microphone,
- Microphone was positioned approximately 4 m above local ground level,
- Microphone placed away from any significant vertical reflective surfaces, and
- Monitoring equipment was secured so as to avoid extraneous wind noise generated in close proximity to the microphone.

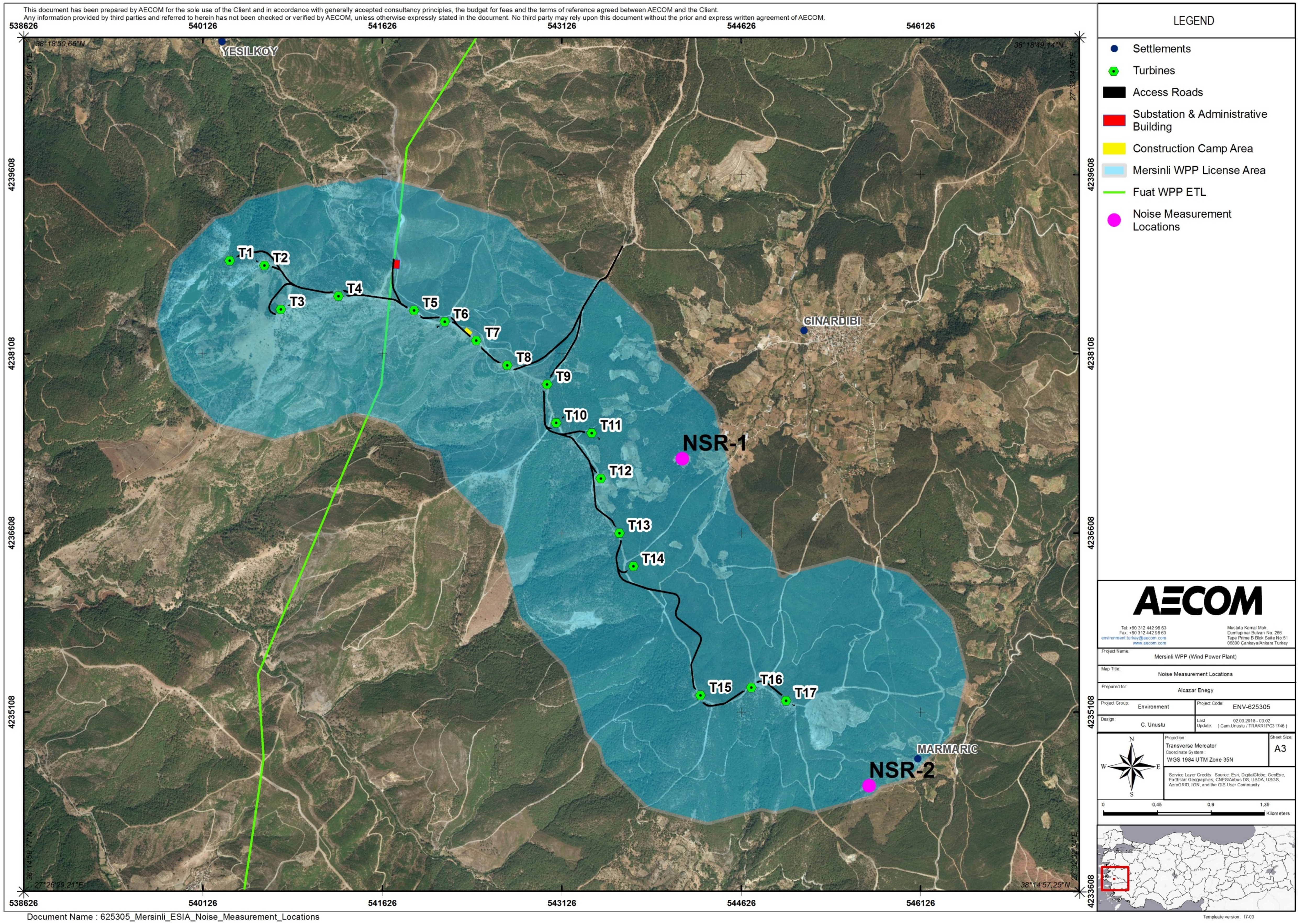


Figure 7-1. Noise Measurement Locations

Figure 7-2. Noise Measurement Device

Background Noise Measurement Results

The noise measurement results for the selected noise sensitive receptors are provided in Table 7-3, separately for the periods defined in the Turkish RAMEN and IFC General EHS Guidelines. The data for the entire measurement duration is also presented in graphs given in Figure 7-3 and Figure 7-4. It should be noted that the wind shear effect was taken into consideration in the production of baseline noise data. The results are presented based on $L_{90,10\ min}$ descriptor[3].

Table 7-3. Noise Measurement Results

Wind Speed (m/s)	Measurement Results (dBA) (La90, 10 minute)									
	NSR-1 (Cinardibi)*					NSR-2 (Marmaric Permaculture Village)**				
	IFC		Turkish RAMEN			IFC		Turkish RAMEN		
	Daytime (07:00-22:00)	Nighttime (22:00-07:00)	Daytime (07:00-19:00)	Evening time (19:00-23:00)	Nighttime (23:00-07:00)	Daytime (07:00-22:00)	Nighttime (22:00-07:00)	Daytime (07:00-19:00)	Evening (19:00-23:00)	Nighttime (23:00-07:00)
3	22.0	17.4	23.3	18.0	17.4	24.5	16.1	25.3	21.7	15.8
4	22.6	17.3	23.7	19.6	17.5	24.8	15.8	25.7	22.9	15.4
5	23.3	17.6	24.0	19.4	18.1	26.1	18.4	26.9	21.1	18.6
6	24.3		24.6	-	-	28.9	-	29.5	-	-
7	25.7		25.8	-	-	33.7	-	34.0	-	-
8	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-

** WTG12 is the closest turbine to NSR-1. Distance of WTG12 to the NSR-1 is 755 m.*

*** WTG17 is the closest turbine to NSR-2. Distance of WTG17 to the NSR-2 is 1,000 m.*

[3] ETSU R-97 Final Report on The Assessment and Rating of Noise from Wind Farms (1996) states that "the Noise Working Group agreed that the $LA_{90\text{-}10\ minute}$ descriptor should be used for both the background noise and the wind farm noise, and that when setting limits, it should be borne in mind that the $LA_{90,\ 10\ min}$ of the wind farm is likely to be about 1.5-2.5 dB(A) less than the La_{eq} measured over the same period. The use of the $LA_{90,10\ min}$ descriptor for wind farm noise allows reliable measurements to be made without corruption from relatively loud, transitory noise events from other sources."

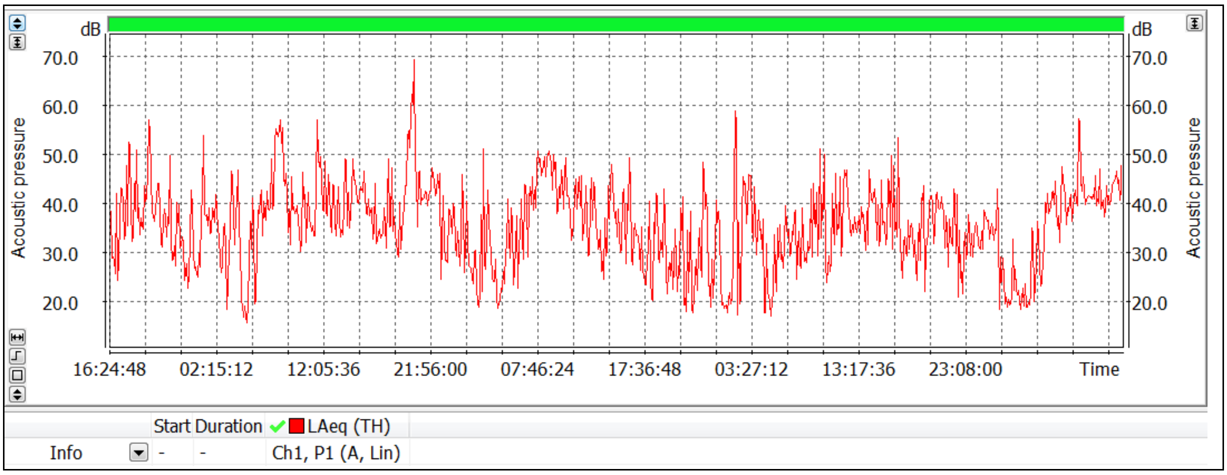


Figure 7-3. Background Noise Measurement Results at NSR-1 (Çınardibi)

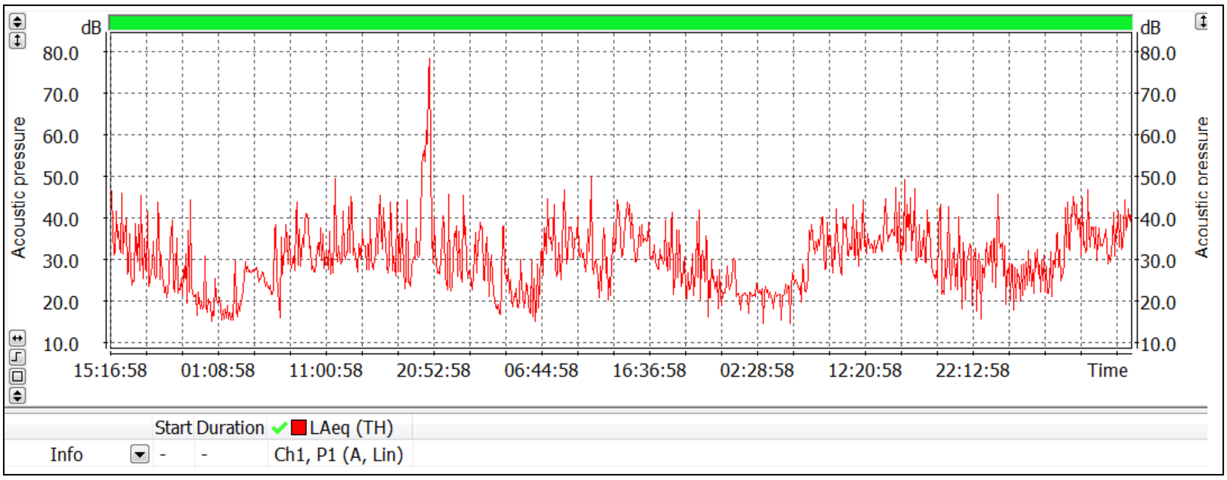


Figure 7-4. Background Noise Measurement Results at NSR-2 (Marmariç)

Plots of day and night time noise measurement results against wind speeds measured at both noise sensitive receptors are presented in Figure 7-5 and Figure 7-6, respectively.

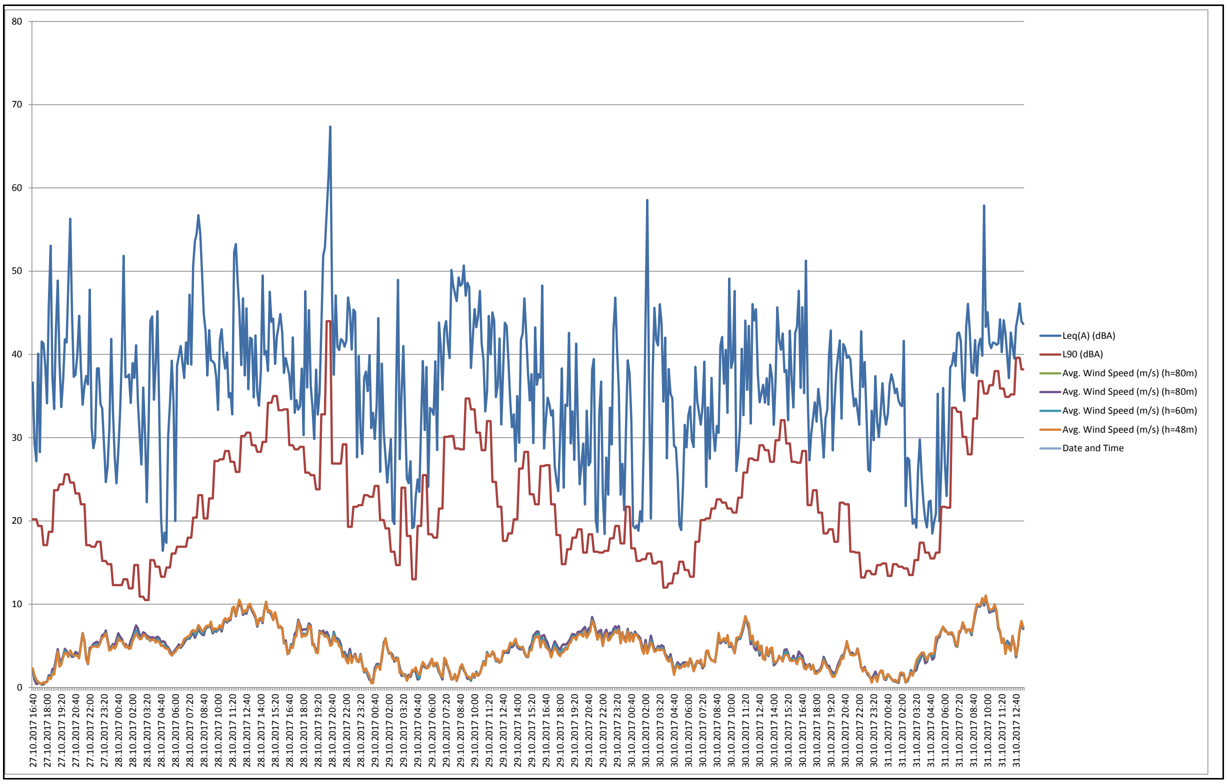


Figure 7-5. Background Noise Measurement Results against Wind Speed at NSR-1 (Çınardibi)

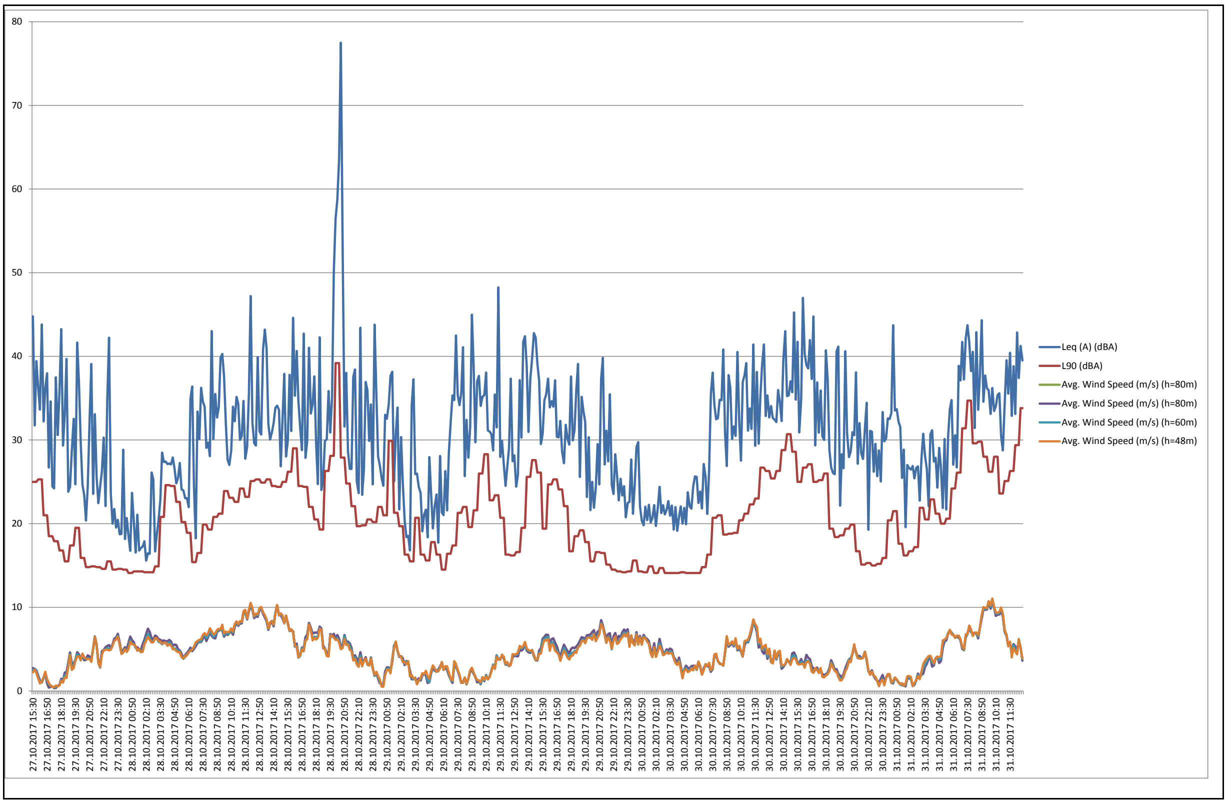


Figure 7-6. Background Noise Measurement Results against Wind Speed at NSR-2 (Marmariç)

Calibration certificates of the noise measurement devices are provided in Appendix B.

7.3 Impact Assessment

Noise to be generated by the land preparation and construction activities, as well as the operation of turbines in the scope of Mersinli WPP Project are assessed in the following sections. Assessment of impacts due to noise generation was done based on the methodology presented in Chapter 5. Accordingly, the magnitude of each impact was estimated as a factor of the foreseen geographic extent, duration, reversibility and frequency of the impact. The geographical extent of the impact will be local (within the License Area). The impact will be short term reversible for the construction phase, and long-term reversible for the operation phase.

Frequency will be intermittent for the construction phase but continuous for the operation phase. The Sensitivity/value of the associated resource/receptor was determined in consideration of the baseline conditions described in the previous sections and typical descriptor of defined in Chapter 5.

The receptors of the noise impact will be human. Specific sensitivity criteria considered in the assessment of noise impact on human receptors was determined in accordance with the approach given in Turkish RAMEN and local conditions as provided in Table 7-4. Criteria to be considered in determining magnitude of change are provided in Table 7-5. Potential impact of noise on workers is covered under Chapter 14: Occupational Health and Safety.

Table 7-4. Criteria for the Sensitivity of Noise Receptors

Impact Subject	High	Medium	Low	Negligible
Noise	Noise sensitive areas where educational, cultural and health facilities are predominantly located together with summer houses and camp sites	Mixed use areas where commercial buildings and noise sensitive areas are collocated with a predominance of residential buildings	Mixed use areas where commercial buildings and noise sensitive areas are collocated with a predominance of workplaces; users of agricultural lands	Industrial areas

Table 7-5. Criteria for Magnitude of Change

Impact Subject	High	Medium	Low	Negligible
Noise	More than 3 dBA increase in background noise level in case of exceedence of regulatory limits	1-3 dBA increase in background noise level in case of exceedence of regulatory limits	0-1 dBA increase in background noise level in case of exceedence of regulatory limits	Compliance with regulatory limits

7.3.1 Land Preparation and Construction Phase

Construction machinery and equipment to be used for the construction of access roads and crane pads, preparation of turbine foundations and other civil works, will result in noise generation during the land preparation and construction phase of the Project, which may impact the noise sensitive receptors.

The magnitude of the noise to be generated at source (work site), will depend on the number and type of equipment and machinery used, which will be reduced by the distance as it propagates towards noise sensitive receptors. Ground absorption, air absorption and barrier effects would be factors reducing noise during propagation.

The type and number of equipment and machines that will be used as part of Mersinli WPP's land preparation and construction activities, and their sound power levels are listed in Table 7-6.

Table 7-6. List of Construction Machinery/Equipment

Machine	Number	Lw (dB)*
Bulldozers	2	85
Excavators	6	101
Road Graders	2	101
Road roller	1	85
JCB	2	103
Trucks	8	104
Trailer	1	101
Pickup trucks	5	75
Vans for staffs	2	55

**Obtained from SoundPlan Software Library*

Cumulative Noise Level at the Source

The noise level at the source, is calculated assuming that all machines/equipment will operate at the same time at one location with maximum sound levels; this is established in order to demonstrate the worst case situation. Total noise level generated by all noise sources, is calculated with the formula (RAMEN, Annex-I) given below:

$$L_{WT} = 10Log\left(\sum_{i=1}^{n} 10^{Lwi/10}\right)$$

where;

n: Number of noise source

L_{Wi}: Sound power level of each source (dBA)

L_{WT}: Cumulative noise level at the source

By using the above formula, the cumulative noise level at source was calculated as 115.5 dBA.

Cumulative Noise Level at the Receptor

Noise generated at source reduces as it propagates. Noise levels at the selected noise sensitive receptors were calculated by using the following formula:

$$L_{PT} = L_{WT} + 10 \times \log\left(\frac{Q}{4.\pi.r^2}\right)$$

where;

L_{PT}: Noise power level at the receptor (dB);

Q: Ground absorption coefficient (assumed as 1 due to rough terrain);

r: Distance between the source and the receptor.

The noise levels at different distances are calculated using the above formula and the results are given in Table 7-7 below. Propagation of noise by distance is represented in graphical format provided in Figure 7-7.

Table 7-7. Noise Levels with Respect to Distance During Construction

Distance (m)	Lpt (dBA)
15	81.0
30	75.0
50	70.5
100	64.5
130	62.2
150	61.0
200	58.5
300	55.0
400	52.5
500	50.5
600	49.0
700	47.6
755 (NSR-1)	47.0
800	46.5
900	45.4
1,000 (NSR-2)	44.5
1,100	43.7
1,200	42.9
1,300	42.2

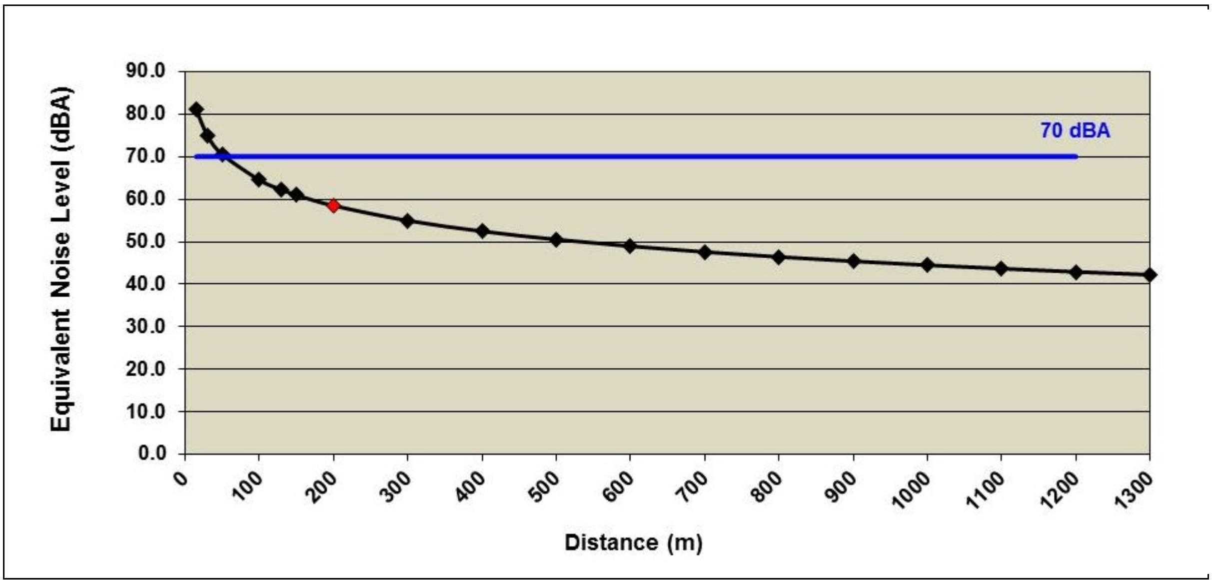


Figure 7-7. Propagation of Noise by Distance

Taking the background noise levels into consideration, environmental noise at the selected sensitive receptors are calculated in Table 7-8. As it can be seen from the table, cumulative noise levels at both of the selected receptor points, which are the closest residential buildings to the related turbines, are anticipated to be well below the regulatory limits for the worst case conditions (Project Standard).

Table 7-8. Cumulative Noise Level at Selected Receptors

Receptor Code	Settlement	Closest Turbine	Distance to the Closest Turbine	Noise Level Calculated at Receptor (dBA)	Background Noise Level for Daytime (dBA)	Cumulative Noise Level at Receptor (dBA) including Background Noise Level	Project Standard for Construction Phase (dBA)
NSR-1	Çınardibi Neighbourhood	WTG12	755 m	47.0	23.4	47.0	70
NSR-2	Marmariç Permaculture Village	WTG 17	1,000 m	44.5	26.9	44.6	70

It should be noted that no atmospheric, ground absorption or barrier effect (topographical conditions, vegetation) was taken into consideration in order to simulate the worst case conditions. Additionally, the case in which all construction machinery and equipment operating at the same time, at one location, with maximum sound levels, is not likely to occur in practice. Additionally, construction activities will be conducted progressively for each turbine. Thus, the construction duration at each turbine location, will be very limited when compared to the duration of the entire construction period, which is considered as 16 months including commissioning. Since the Vestas's turbine installation activities will start following the construction works and involve less number of construction machinery, no additional calculation was performed for them.

Even though the calculations for the worst case conditions indicate that the regulatory limits will be complied with at the closest receptors, mitigation measures will be taken to further reduce the noise. For this purpose, construction machinery will not be operated at the same time, monitoring will be conducted and the public grievance mechanism developed as part of the SEP will be implemented. Any grievance received from the public related with the construction noise, will be taken into consideration and corrective measures will be taken where necessary (i.e. in case regulatory noise limits are exceeded).

7.3.2 Operation Phase

Operating wind turbines generate noise depending on the wind speed. The sources of sounds emitted from wind turbines consist of mechanical and aerodynamic sources. The primary sources of mechanical noise are associated with the drive train and the generator, which produce mechanical sound due to the rotation of mechanical and electrical equipment; whilst aerodynamic noise is produced by the flow of air over the blades. Continuous improvements in mechanical design of large wind turbines have resulted in significant reductions in mechanical sounds. Currently, noise emissions from modern wind turbines mostly come from broadband aerodynamic sounds.

To limit aerodynamic noise generation, modern, large wind turbines restrict the rotor speeds to ensure that the tip speed remains below 65 m/sec or thereabouts. Large, variable speed wind turbines often rotate at slower speeds in low winds, increasing in higher winds until the limiting rotor speed is reached. This results in much quieter operating turbines in low winds than a comparable constant speed wind turbine (*Wind Power Generation and Wind Turbine Design, WIT Press 2010*)

The turbine type to be used in the Mersinli WPP Project is the V126-3.45 MW. Table 7-9 provides the turbine noise characteristics.

Table 7-9. Turbine Noise Characteristics

Manufacturer	Type-generator	Power, rated	Rotor diameter	Hub height	First wind speed	LwaRef	Last wind speed	LwaRef	Pure tones
VESTAS	V126-3.45MW	3,450	126	87	6	98.4	10	108.5	No

7.3.2.1 Noise Modelling

The potential noise impact of the wind turbines on sensitive receptors was assessed by a noise modelling study. Commercially available most recent version of WindPro noise propagation model, which is based on ISO 9613-2, was used in this Project. The model is capable of utilizing different propagation modules, for a variety of wind speeds and it incorporates terrain data into calculations. The model also includes absorbance due to atmosphere and nearby surfaces. Ambient noise levels at the noise sensitive receptors, are modelled under worst case conditions.

The model contained within ISO 9613-2 Acoustics – Attenuation of Sound during Propagation Outdoors – Part 2: General method of Calculation (1996) was used to calculate the noise emission levels at the nearest sensitive receptors. The ISO 9613-2 algorithm, which is one of the available models presented in WindPro software, was chosen as being the most robust prediction method.

7.3.2.1.1 Model Inputs

ISO 9613-2 model uses the following equation in calculating the noise levels at the receptor locations.

$$L(DW) = LWA,ref + K + Dc - (Adiv + Aatm + Agr + Abar + Amisc) - Cmet$$

where,

$L(DW)$: Calculated noise level at the receptor, dBA

LWA,ref : Noise emission of Wind Turbine, dBA

K : Pure tone, dBA

Dc : Directivity correction, dB

$Adiv$: Attenuation due to the geometrical divergence, dB

$Aatm$: Attenuation due to atmospheric absorption, dB

Agr : Attenuation due to ground effect, dB

$Abar$: Attenuation due to a barrier, dB

$Amisc$: Attenuation due to miscellaneous other effects, dB

$Cmet$: Meteorological correction, dB

All the input values, except noise emission of wind turbines (LWA,ref), were calculated according to coordinates of the wind turbines and nearest sensitive receptors. Turbine noise emission levels given in Table 7-9 were used as LWA,ref values. Other inputs and assumptions used for the noise propagation model are as follows:

- Wind turbine and nearest sensitive receptors' coordinates,
- 10 m elevation contour data of the Project Area used to determine ground effect,
- Meteorological coefficient value assumed as 0 to represent worst case conditions,
- Pure tone value assumed as 0 dB,
- Air absorption value assumed as 1.9 dB/km, default value of ISO 9613-2.
- Corine Land Use Classes and Landsat satellite[4] information used to determine details of roughness length and other ground affects.

7.3.2.1.2 Model Output

Predicted turbine noise levels at the noise sensitive receptors, in terms of Laeq, over the wind speed range from 6 m/s to 10 m/s were estimated by modelling. Predicted noise levels at the selected receptors are presented in Table 7-10. Noise levels at receptors located at more distant locations (with respect to the selected receptors) will be below the values predicted for selected receptors. Detailed results of the noise model are provided in Appendix C. Noise contour map presented in Figure 7-8 illustrates the model output. The results are presented based on $L_{90,10\ min}$ descriptor (*ETSU-R-97, 1997; Rogers, et al, 2006; EPA 2008*). As can be seen from the table, the predicted turbine noise levels at all NSRs are below the daytime, evening-time and night time noise limits of Turkish RAMEN and IFC/WB.

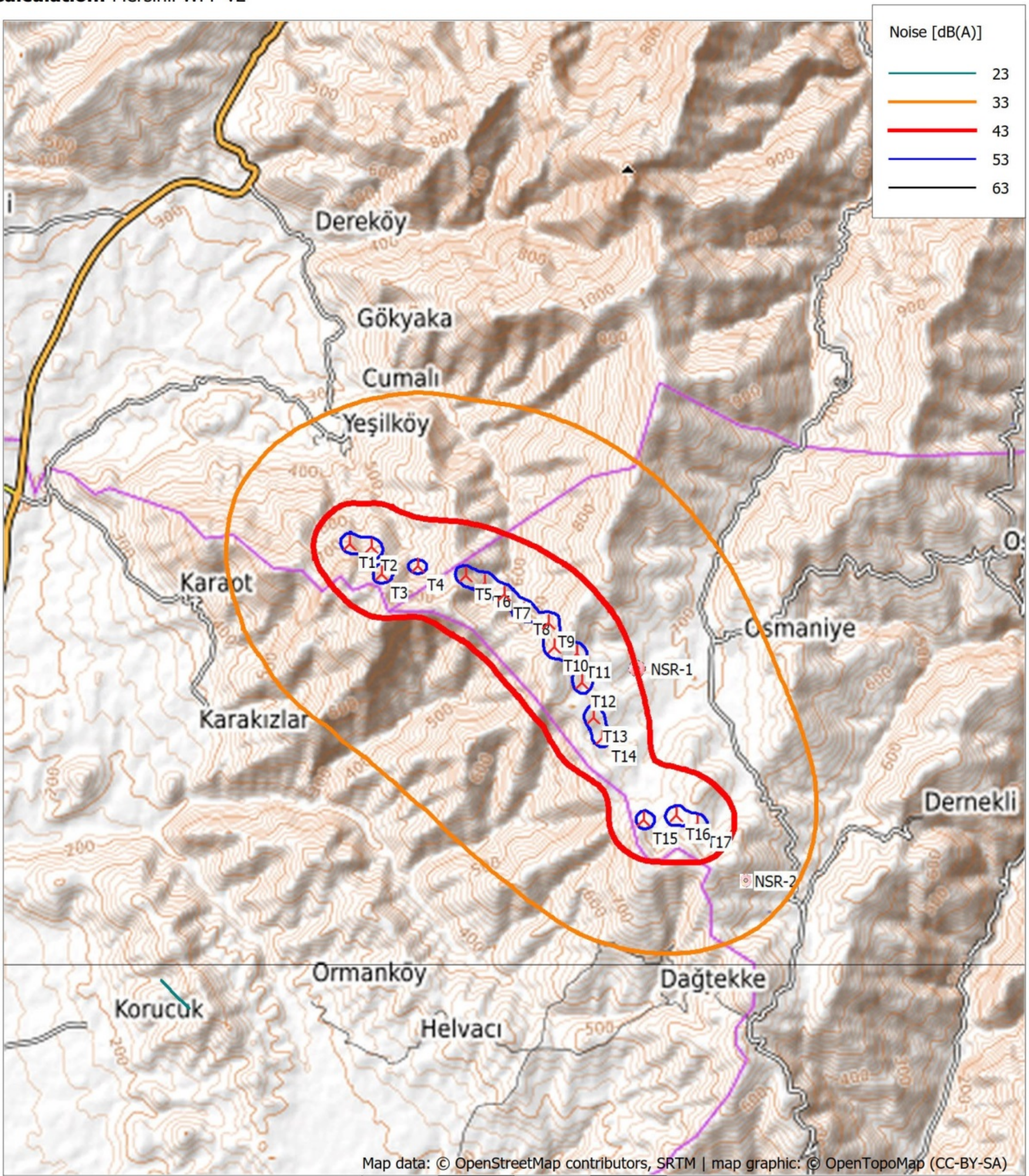
[4] The Landsat Program is a series of Earth-observing satellites co-managed by USGS & NASA, and offers the longest continuous space-based record of Earth's land in existence.

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
29.11.2017 17:42/3.1.617

DECIBEL - Map 10,0 m/s

Calculation: Mersinli WPP v2



0 1 2 3 4 km

Map: OpenTopoMap.org , Print scale 1:75.000, Map center UTM (north)-WGS84 Zone: 35 East: 542.415 North: 4.238.216

New WTG   Noise sensitive area

Noise calculation model: ISO 9613-2 General. Wind speed: 10,0 m/s

Height above sea level from active line object

windPRO 3.1.617 by EMD International A/S, Tel. +45 96 35 44 44, www.emd.dk, windpro@emd.dk   29.11.2017 18:07 / 1   windPRO

Figure 7-8. Noise Contour Map (WindPro Model Output)

Table 7-10. Predicted Noise Levels at the Noise Sensitive Receptors (NSR) as a result of WPP Operation

Noise Sensitive Receptor	L_{90} Values (dBA) Reference Wind Speed (V10) (m/sec)					Cumulative Noise Level at Receptor (dBA) including Background Noise Level (for LA90)		Project Standard (dBA) (for LA90) Night Time	Project Standard (dBA) (for LA90) Day Time
	6	7	8	9	10	at 6 m/sec Wind Speed	at 7 m/sec Wind Speed		
NSR-1 (Çınardibi)	31.5	35.5	38.2	40.9	41.6	32.3	35.9	43	53
NSR-2 (Marmariç)	25.5	28.5	32.2	35.0	35.6	31.0	35.1	43	53

In scope of the noise modelling carried out during the ESIA studies, baseline noise levels were determined at 2 sensitive receptors. For this purpose 5 anemometers were established at different sensor heights within the project area. These sensor heights vary between 30 and 80 meters. According to the measurements carried out, the average wind speeds measured with the anemometers vary between 4.65 and 4.79 m/s while the maximum wind speeds vary between 12.22 and 12.73 m/s. On the other hand, according to the Mersinli Wind Farm Garrad Hassan Energy Assessment Report (2017), the long term mean wind speeds measured at 87 m height at two points are 7.4 and 6.4 m/s, When the results at higher anemometer heights are extrapolated to 10 meters above ground; it was observed that the wind speeds do not exceed 7 m/s. Therefore, wind speed at 10 meter receptor height are not expected to exceed 7 m/s and accordingly cumulative noise levels were calculated for 6 and 7 m/s wind speeds.

The impact area for Turbine-17 is shown in Figure 7-9. As can be seen, the closest settlement, the Marmariç Permaculture Village, is located outside the impact area border, where the Project Standard (43 dBA for LA90) will be complied with.

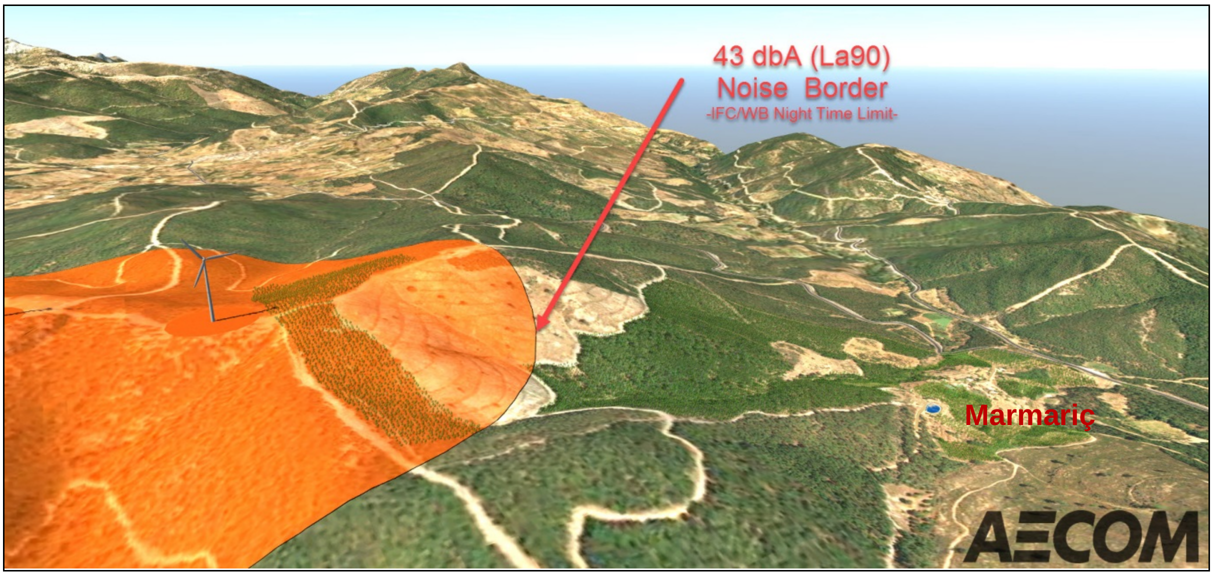


Figure 7-9. Noise Impact Area for Turbine-17

Results of noise modelling studies were evaluated for the shed near Turbine-12, which is not used for residential purposes. The shed is known to be used temporarily to support agricultural activities. As can be observed from Figure 7-8, predicted noise levels around Turbine-12 is between 43-53 dBA, which is below the IFC noise limit (for industrial and commercial receptors) 70 dBA. Public grievance mechanism to be developed as part of the SEP will be implemented and any grievance received from the public related with the operational noise of turbines, will be taken into consideration and corrective measures will be taken where necessary (i.e. in case regulatory noise limits are exceeded).

In addition, monitoring will be carried out at both the noise sensitive receptors and the shed near Turbine-12 to determine the operational phase noise levels and verify that project standards are met.

When the model results were compared with ETSU (*ETSU-R-97, 1997)* recommended noise limit values which are 35-40 dBA for day time and 43 dBA for nightime, it can be observed that at 10 m/s wind speed the noise level in NSR-1 (Çınardibi) exceeds 40 dBA. However, exceedance of the day time ETSU recommended limit value is below 1 dBA and can be accepted to be within the error tolerance. In general, a noticeable increase in noise levels is above 3 dB. Thus, model results do not indicate an audible/noticeable change/increase in background noise levels in the sensitive receptors.

7.3.3 Closure Phase

Noise levels during decommissioning, are expected to not exceed the noise levels predicted for construction. Noise due to decommissioning activities will be local, short term and reversible. Measures will be taken to minimise the impact on receptors and the grievance mechanism will continue to be implemented until the end of closure activities.

7.4 Mitigation Measures

The Mersinli WPP Project was initially planned with 22 turbines (as mentioned in the national EIA Report) and the number of turbines was reduced to 17 based on feasibility studies conducted following the national EIA process. Particularly, three turbines that were located north of the Marmariç Permaculture Village, the closest settlement to the Project components, were eliminated ensuring minimisation of, besides others, the noise impacts on this receptor (see Chapter 4 for additional information). Additionally, the turbine type selected for the Mersinli WPP Project (V126-3.45 MW) has a modern technology providing sound optimised modes for operation that would allow management of WPP in a way to mitigate noise where necessary in specific circumstances.

The temporary construction camp site and permanent substation, were also sited distant to the residential house and agricultural lands of the nearby communities. Main access to the site will be provided through the existing access road of Fuat WPP. Thus, no additional main access road construction that would cause noise generation and disturbance of local communities will take place.

Potential noise impacts on human receptors and specific mitigation is provided in Table 7-11.

Table 7-11. Noise Impacts, Proposed Mitigation Measures and Residual Impacts

Impact Description	Project Phase	Receptor	Impact Magnitude						Sensitivity/ Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Magnitude	Reversibility	Duration	Frequency	Overall Magnitude				
Noise generation due to operation of construction machinery and equipment and nuisance of local communities	• Land preparation and construction • Closure	NSR-1 (Çınardibi)	Local	Negligible	Short-term reversible	Short-term	Intermittent	Negligible	High	Minor	• Conduct construction activities at the work sites located closest to the noise sensitive receptors only during day time, • Limit potentially noisier activities to day time, • Inform noise sensitive receptors about the schedule of activities ahead of start of construction in their proximity, • Keep the main access road in well-maintained condition throughout the construction phase; based on results of the further surveys to be conducted prior to the start of construction phase improve the road conditions if deemed necessary, • Ensure that the mobile vehicles use only designated access roads to reduce traffic routing through community areas, • Select equipment with lower sound power levels, • Optimise the internal-traffic routing, particularly to minimise vehicle reversing needs (reducing noise from reversing alarm) and to maximise distances to the closest sensitive receptors, • Ensure that equipment is regularly maintained, • Implement the Stakeholder Engagement Plan to collect complaints and suggestions through the grievance mechanism to be established, • Conduct noise monitoring programme to verify compliance with regulatory limits and Project standards.	Minor
		NSR-2 (Marmariç)	Local	Negligible	Short-term reversible	Short-term	Intermittent	Negligible	High	Minor		Minor
		Users of the agricultural lands located in the vicinity of Turbine-11 and Turbine-12	Restricted to Local	Low	Short-term reversible	Short-term	Occasional or Intermittent	Low	Low	Minor		Minor
Noise generation due to operation of wind turbines and nuisance of local communities	• Operation	NSR-1 (Çınardibi)	Local	Negligible	Long-term reversible	Long-term	Continuous	Negligible	High	Minor	• Optimise turbine operation in consideration of wind speed to avoid noise becoming unacceptable, • Keep turbines in good running order throughout the operational life of the Project through routine maintenance, • Limit the cutting/clearing of vegetation. • Implement the Stakeholder Engagement Plan to collect, investigate and resolve the complaints and suggestions through the grievance mechanism to be established, • Conduct noise monitoring in the first year of operation and later in case of complaints to verify the compliance with regulatory limits and Project standards; take corrective actions in case of any impact.	Minor
		NSR-2 (Marmariç)	Local	Negligible	Long-term reversible	Long-term	Continuous	Negligible	High	Minor		Minor
		Users of the agricultural lands located in the vicinity of Turbine-11 and Turbine-12	Restricted to Local	Low	Long-term reversible	Long-term	Occasional or Intermittent	Low to Medium	Low	Minor		Minor

8. Air Quality and GHG Emissions

In this Chapter, potential impacts of Mersinli WPP on air quality and potential GHG emissions of the project are assessed. The construction and operation phases of the Project are considered separately and impacts are evaluated accordingly.

8.1 Project Standards and GIIP

The Project will comply with the following regulations:

- Turkish Air Quality Assessment and Management Regulation (AQAMR).
- Turkish Industrial Air Pollution Control Regulation (IAPCR).
- IFC General EHS Guidelines: Environmental Air Emissions and Ambient Air Quality, April 30, 2007.
- Directive 2008/50/EC on ambient air quality and cleaner air for Europe.
- WHO Ambient Air Quality Guidelines (Table 1.1.1).

8.1.1 Turkish Legal Requirements

Ambient air quality is regulated in Turkey by the Regulation on Assessment and Management of Air Quality. Appendices I and I-A of this regulation provide limit values for the 2009-2014 period and for the period after 1 January 2014. Both are based on a tiered system to reduce limit values to target values over time.

Air quality standards are defined in the Regulation on Assessment and Management of Air Quality published on 06.06.2008 in Official Gazette No 26898 and Industrial Air Pollution Control Regulation published on 03.07.2009 in Official Gazette No 27277. Ambient air quality limit values for various pollutants defined in Turkish regulations are presented in Table 8-1. The standards in Table 8-1 are for 2024 and further years.

Table 8-1. Turkish Ambient Air Quality Values

Parameter	Duration	Limit Value* (μg/m^3)
SO_2	Hourly (cannot be exceeded more than 24 times a year)	350
	24 hour	125
	Long term limit	60
	Annual and winter season (October 1 - March 31)	20
NO_2	Hourly (cannot be exceeded more than 18 times a year)	200
	Annual	40
Particulate Matter (PM 10)	24 hour (cannot be exceeded more than 35 times a year)	50
	Annual	40
CO	8 hour daily maximum	10.000
O_3	8 hour daily maximum	120
VOC**	Hourly	280
	24-hour	70

* *Regulation on Assessment and Management of Air Quality*
*** Industrial Air Pollution Control Regulation*

8.1.2 International Standards

IFC EHS Guideline for Air Emissions and Air Quality refers to the limit values recommended by the World Health Organization (WHO) Ambient Air Quality Guidelines which are presented in Table 8-2.

Table 8-2. WHO Ambient Air Quality Guidelines

Parameter	Duration	($\mu g/m^3$)*
SO_2	10 minute	500
	24 hour	20
NO_2	Hourly	200
	Annual	40
Particulate Matter (PM_{10})	24 hour	50
	Annual	20
Particulate Matter ($PM_{2,5}$)	24 hour	25
	Annual	10
O_3	8 hour daily maximum	100

**IFC, Environmental, Health and Safety Guidelines, General EHS Guidelines: Environmental, Air Emissions and Ambient Air Quality*

8.2 Baseline Conditions

Air quality measurements are carried out regularly, in air quality measurement stations that are located in various points in İzmir. National Air Quality Monitoring Stations record air pollution statistics for each province in Turkey. These stations have an automatic data recording system, so that the data is presented through the national air quality monitoring network of the Turkish Ministry of Environment and Urbanisation. Since there is no air quality data for the Mersinli District, the statistical data recorded for Gaziemir (İzmir) Province was evaluated. Measurement results of SO_2 and PM_{10} parameters recorded in Gaziemir, İzmir are presented in Table 8-3 *(http://www.havaizleme.gov.tr)*. As it is observed from the table, SO_2 and PM_{10} concentrations, have shown an increasing trend in the previous years, nevertheless, the results of the measurements are below the limits defined in the Regulation on Assessment and Management of Air Quality. Annual PM_{10} measurement results are above the IFC standard.

Table 8-3.SO_2 and PM_{10} Concentrations Measured in Gaziemir (izmir)

Year	Annual Average Concentration ($\mu g/m^3$)	
	SO_2	PM10
2016	11	51
2015	14	34
2014	7	18
2013	7	23
2012	5	34

Source: Official Website of National Air Quality Monitoring Station (http://www.havaizleme.gov.tr)

8.3 Impact Assessment

The Potential impacts due to the land preparation and construction activities, as well as the operation of turbines of the Mersinli WPP Project, are assessed in the following sections.

The assessment of impacts due to air emissions was done based on the methodology presented in Chapter 5. Accordingly, the magnitude of each impact was estimated as a factor of the foreseen geographic extent, duration, reversibility and frequency of the impact. The geographical extent of the impact will be local (within the License Area).

The impact on air quality will be short term and reversible for the construction phase but long-term and reversible for the operation phase. The frequency of impacts will be intermittent for the construction phase, continuous for the operation phase. The sensitivity/value of the associated resource/receptor, was determined in consideration of the baseline conditions described in the previous sections and typical descriptors for sensitivity/value/importance of receptors/resources as defined in Chapter 5. Receptors of the air quality impact, will be human and ecological components. Specific sensitivity criteria considered in the assessment of impacts on human and ecological receptors are presented Table 8-4.

Table 8-4. Criteria for the Sensitivity of Receptors

Component	High	Medium	Low	Negligible
Human /Ecological Receptors	Densely populated areas where residences are predominant.	Beekeeping and agricultural activities	Users of agricultural areas (located in the vicinity of Turbine-9 - Turbine-14)	Industrial areas

8.3.1 Land Preparation and Construction Phase

The Main emission sources during the construction period of Mersinli WPP Project, will consist of:

- Dust emissions during land preparation phase,
- Earthworks for the construction of site access roads and internal roads,
- Turbine foundations,
- Underground cable network,
- ETL and
- Other ancillary facilities such as the substation.

In addition, emissions from construction machinery and equipment including exhaust emissions such as PM_{10}, NO_x, CO, SO_2 and TOC will be of concern. According to the project schedule, construction of the power plant is planned to last approximately 16 months, including commissioning. During this period, emission of dust and exhaust emissions may have an impact on settlements in the vicinity of the license area and the settlements near the site access road. This will also affect beekeeping and agricultural activities near the turbines. The amount of emissions and their potential impacts are evaluated in this section.

The earthworks phase will include land levelling and excavations, construction of access roads and excavation of turbine foundations and underground cable line trenches. The construction of turbine foundations will comprise of excavation of the hole using a digger, outer form setting, rebar and anchor cage assembly, casting and finishing concrete, removing the forms, backfilling, compacting and foundation site restoration. After the foundations have been backfilled, on-site assembly of the wind turbines will commence, with erection of turbine towers and assembly of hub components and blades.

In parallel to these construction activities, the administrative building, the substation and the ETL will also be constructed. As each turbine and corresponding Project unit's construction is completed, electrical works will be commenced and the Mersinli WPP Project will be ready for commissioning and energy generation.

The estimated amount of excavation during construction of project components is 81,500 m^3. Based on the current data, it is estimated that approximately 20% of the filling material will be provided from on-site excavated soil. (Exact amount of soil to be reused in fill/cover operations will be determined based on the result of the final soil surveys to be conducted prior to start of construction activities). Estimated excavation and fill amounts are presented in Table 8-5.

The Remaining excess of excavated soil will be stored in the license area in designated storage areas. This is in line with the permits to be obtained from relevant authorities. Top soil stripped from the footprint of permanent Project units, will be stored separately at designated top soil storage areas, before being reused for rehabilitation works; which will be conducted following the completion of construction. Due to topographical conditions and challenges of the Project Area, separate top soil storage areas will be designated to serve a few areas.

Table 8-5. Estimated Amount of Excavation and Fill Volumes

Material	Amount (m^3)
Excavation	81,500 m^3
Fill	100,000 m^3

Emission factors defined in the Industrial Air Pollution Control Regulation, were used to calculate the dust emissions from excavation and fill operations. These emission factors are presented in Table 8-6. Uncontrolled emission factors, represent the case in which the activities are performed without any measures taken, while controlled emission factors represent the case when measures such as: watering, usage of closed transportation systems, keeping the material moisturised and performing loading and unloading of materials without scattering are taken.

Table 8-6. Emission Factors for the Calculation of Dust Emissions

Emission Sources	Uncontrolled Emission Factors	Controlled Emission Factors	Unit
Excavation	0.025	0.0125	kg/ton
Loading	0.010	0.005	
Unloading	0.010	0.005	
Storage	5,8	2,9	kg/ha.day
Transportation (total distance)	0.7	0.35	kg/km-vehicle

Source: Industrial Air Pollution Control Regulation, Appendix 12.

Emissions resulting from excavation and fill operations, are calculated with the emission factors presented above. PM10 emissions are presented in Table 8-7. For the purpose of these calculations, it was estimated that excess excavated materials (approximately 80% of the excavation, which is 65,200 m^3) and material supply for fill (approximately 83,700 m3) are carried by trucks and stored at designated storage areas within the license area. Transportation of excess excavation materials within the license area will not exceed 2 km distance.

Table 8-7. PM_{10} Emissions from Project Construction Activities

Emission Sources	PM_{10} Emissions (kg/hr) (Controlled)
Excavation	0.141
Loading of Excavated Material	0.057
Unloading for Fill Operations	0.069
Unloading for Storage of Excess Excavated Material	0.045
Transportation of Fill Material and Excess Excavated Material	0.535
Total	0.847

In addition to dust emissions, exhaust gases will be emitted from operation of construction machinery and equipment. The Construction machinery and equipment planned to be used during construction activities, which use mainly diesel as fuel, are presented in Table 3.6. It should be noted that construction vehicles and equipment will not be operating in the same position and that they will be scattered at different locations within the license area. It is assumed that five construction vehicles will be in operation simultaneously and fuel consumption will be about 5 litres per vehicle per hour. Therefore, the total hourly diesel consumption at the construction site is estimated as 25 litres. USEPA AP-42 Emission Factors are used in order to calculate emissions generated by the diesel fuelled vehicles and estimated amounts of exhaust emissions are presented in Table 8-8.

Table 8-8. Emissions from Construction Machinery and Equipment

Pollutant	Emissions (kg/hr)*
Carbon monoxide	0.32
Sulphur oxides	0.10
Total Organic Carbon	0.12
Nitrogen oxides	1,50
Dust (PM_{10})	0.11

**It is assumed that; Calorific value of diesel = 137,000 BTU/gal x gal/4.54609 l = 30,135.8 BTU/l*

Dust emissions from construction activities and exhaust emissions from construction machinery and equipment, are compared with the limit values defined in the Industrial Air Pollution Control Regulation (see Table 8-9).

When these limit values are exceeded, the regulation requires that an air quality modelling study should be carried out the related pollutants that are of concern. It was observed that both the PM10 emissions and the exhaust gas emissions are below the limit values, above which air quality modelling should be performed.

Table 8-9. Mass Flow Rate Limits of Pollutants *(Industrial Air Pollution Control Regulation Annex 2)*

Emissions	Stack Sources	Non-stack Sources
Dust	10	1
Carbon monoxide	500	50
Sulphur dioxide	60	6
Nitrogen oxides	40	4
TOC	30	3

In order to observe the dispersion of PM_{10} emissions during construction phase of the project air quality modelling was carried out with AERMOD Gaussian Plume Air Dispersion Model (Version 9.5.0). Air dispersion modelling was carried out within an area of 225 km^2 (15 km x 15 km) covering the project license area and the surrounding environment. Within this area around 600 uniform polar receptors were placed and PM_{10} concentrations and total deposition amounts were generated by AERMOD. In addition, receptors were placed on sensitive receptors in the vicinity of the Project Area. In this regard, 9 receptors were placed to surrounding settlements including Marmaric, Çınardibi, Dağtekke, Yeşilköy, Cumalı, Karakızlar and Karaot.

One of the main inputs of AERMOD is the meteorological data which are hourly surface data and upper air meteorological observations. For this purpose, hourly surface data is obtained from Gaziemir Meteorological Station (Station No: 17219) and upper air data is obtained from Izmir Meteorological Station (Station No: 17220). For the selection of the representative meteorological year number of wind blows recorded in Gaziemir Meteorological Station in the last 5 years was evaluated and the representative meteorological year was selected as 2015.

In order to evaluated potential impacts of project construction activities modelling was carried out for PM_{10} and total deposition parameters. Within this scope, 24 hour and annual PM_{10} concentrations and monthly and annual settled dust amounts are determined. The highest 24 hour and annual PM_{10} concentrations along with the highest monthly and annual total deposition values are presented in Table 8-10.

Table 8-10. Highest PM_{10} Concentration and Total Deposition Amounts

24 h PM10 Concentration ($\mu g/m^3$)	Annual PM_{10} Concentration ($\mu g/m^3$)	Monthly Dry Deposition (mg/m^2.day)	Annual Dry Deposition (mg/m^2.day)
18.4	5.2	15.4	9.4

24 hour and annual PM_{10} concentrations along with the monthly and annual total deposition values observed in settlements in the vicinity of the project license area are presented in Table 8-11.

Table 8-11. PM_{10} Concentrations and Total Deposition Amounts Observed in Settlements

Location of the Receptor	24 h PM10 Concentration ($\mu g/m^3$)	Annual PM_{10} Concentration ($\mu g/m^3$)	Monthly Dry Deposition (mg/m^2.day)	Annual Dry Deposition (mg/m^2.day)
Nearest House in Marmariç	0,81	0,01	0,01	0,00
Marmariç Centre	0,51	0,03	0,03	0,01
Nearest House of Çınardibi	0,36	0,01	0,01	0,00
Dağtekke Neighbourhood	0,60	0,02	0,02	0,00
Yeşilköy Neighbourhood	0,83	0,08	0,04	0,01
Cumalı Neighbourhood	0,13	0,03	0,02	0,00
Karakızlar Neighbourhood	0,07	0,00	0,01	0,00
Karaot Neighbourhood	0,29	0,00	0,00	0,00

Contour plots of 24 hour and annual PM_{10} concentrations and monthly and annual deposition are presented in Figure 8-1-Figure 8-4.

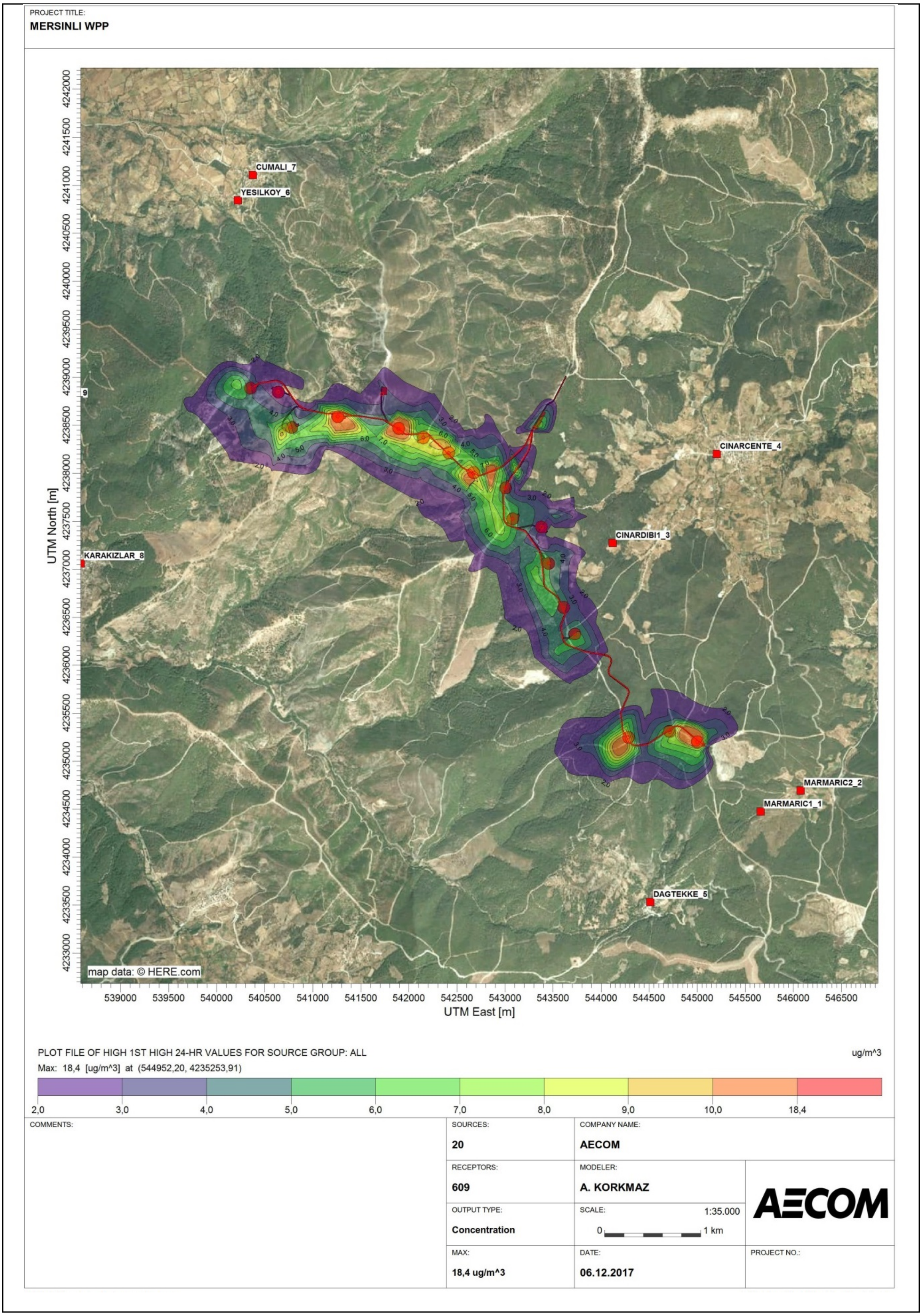


Figure 8-1. 24-hour PM10 Concentrations for Land Preparation and Construction Phase

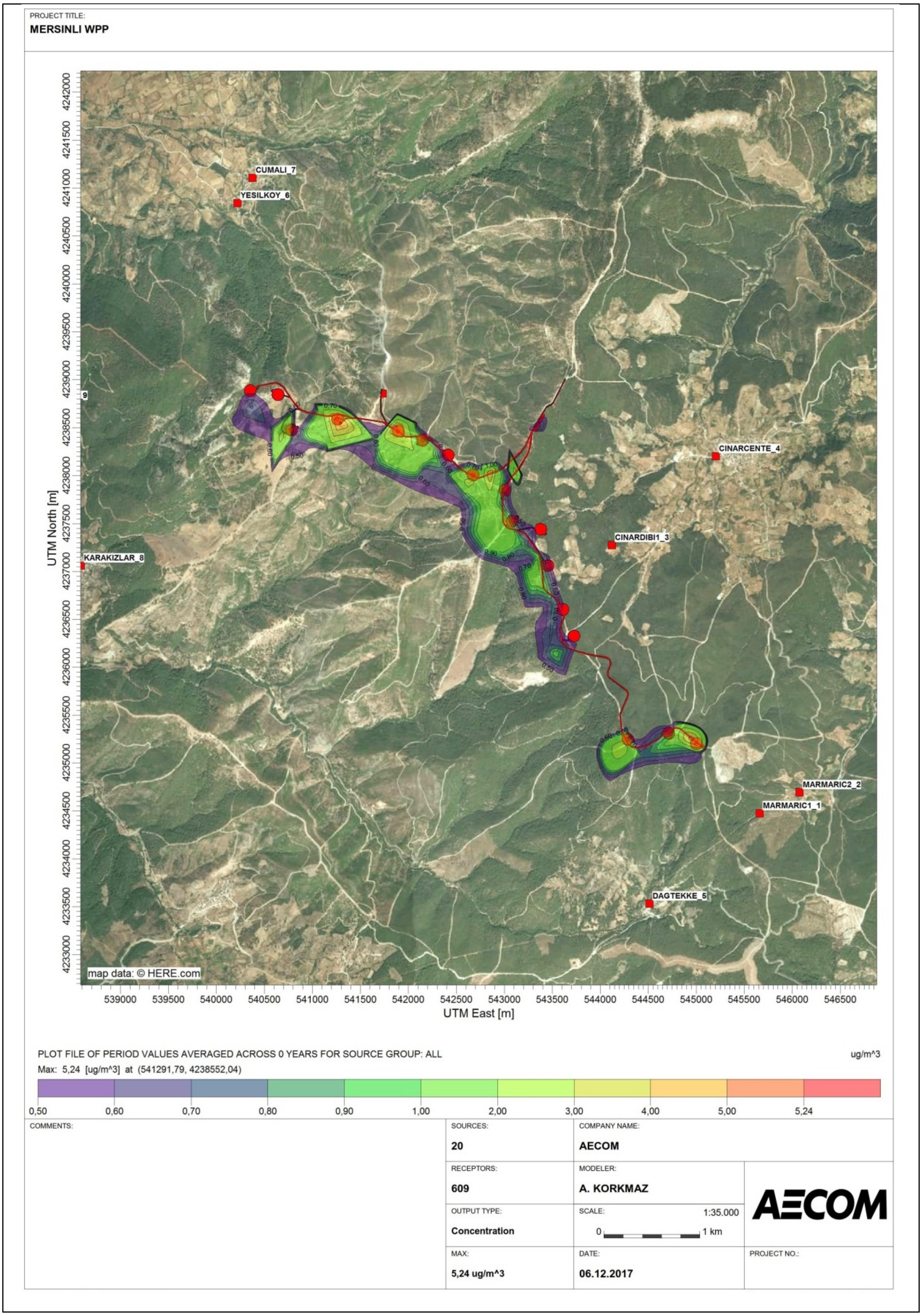
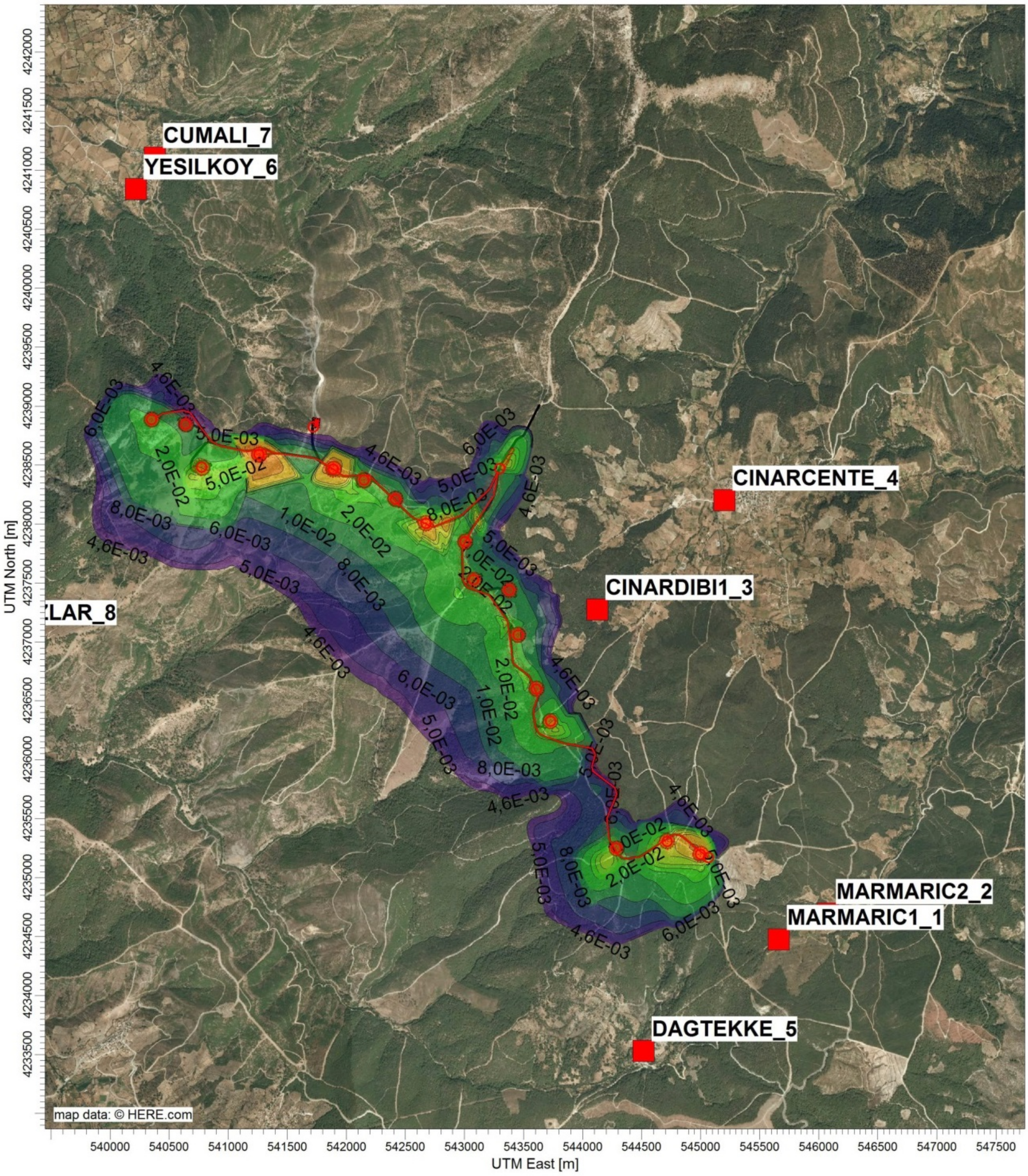


Figure 8-2. Annual PM10 Concentrations for Land Preparation and Construction Phase

PROJECT TITLE:
MERSINLI WPP



PLOT FILE OF HIGH 1ST HIGH MONTH VALUES FOR SOURCE GROUP: ALL

Max: 4,6E-01 [g/m^2] at (541291,79, 4238552,04)

g/m^2

4,6E-03 | 5,0E-03 | 6,0E-03 | 8,0E-03 | 1,0E-02 | 2,0E-02 | 4,0E-02 | 5,0E-02 | 6,0E-02 | 8,0E-02 | 1,0E-01 | 2,0E-01 | 4,0E-01 | 4,6E-01

COMMENTS:	SOURCES: 20	COMPANY NAME: AECOM	
	RECEPTORS: 609	MODELER: A. KORKMAZ	AECOM
	OUTPUT TYPE: Total Depos.	SCALE: 1:35.000 (0 – 1 km)	
	MAX: 4,6E-01 g/m^2	DATE: 11.12.2017	PROJECT NO.:

Figure 8-3. Monthly Settled Dust for Land Preparation and Construction Phase

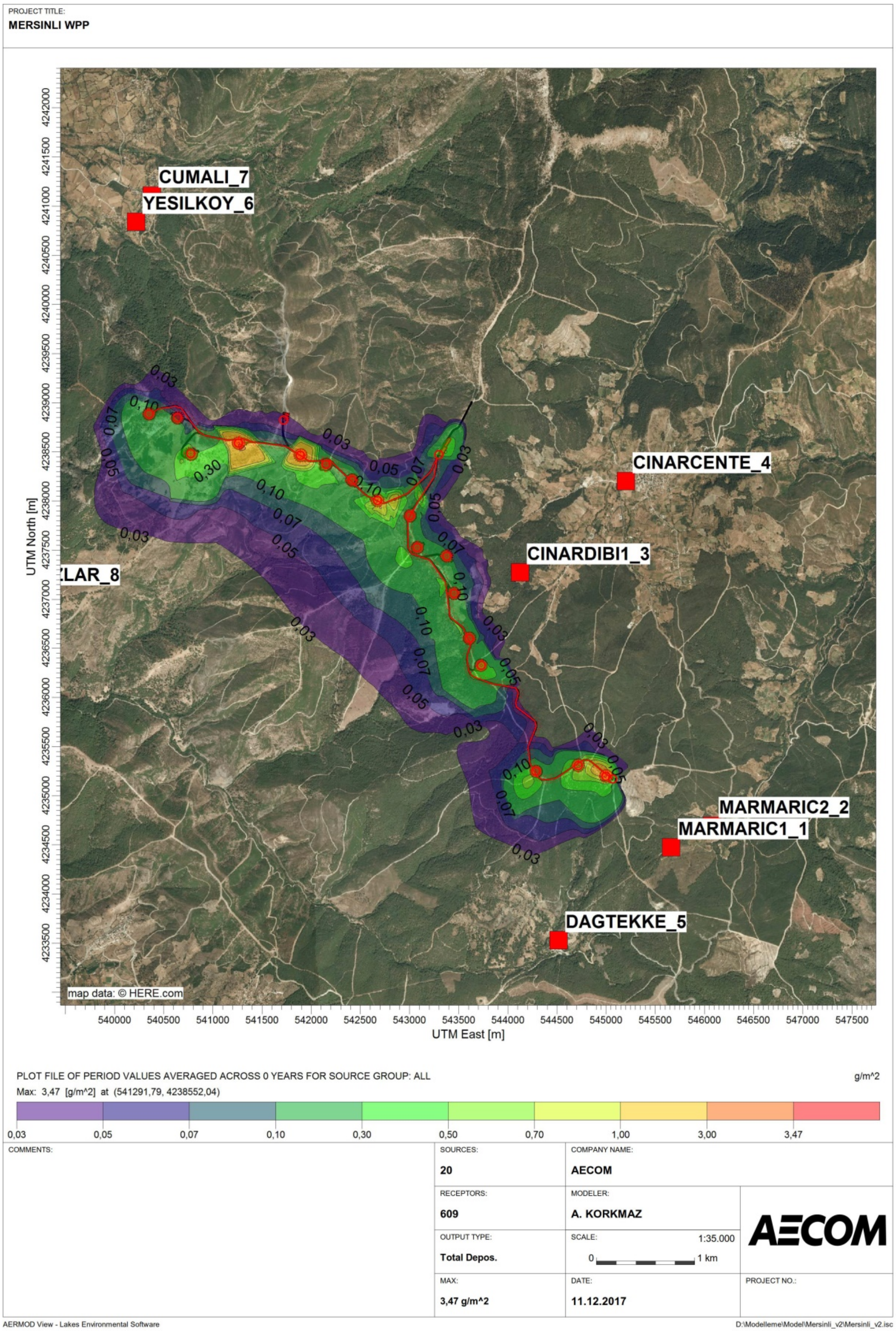


Figure 8-4. Annual Settled Dust for Land Preparation and Construction Phase

As can be seen from model results, 24 hour and annual PM_{10} concentrations and monthly and annual total deposition amounts are below the regulatory limit values. In addition, it should be noted that all the construction activities will not be carried out simultaneously. For example, excavation works for turbine foundations and access road construction will be following each other, so that one does not start until the other one is finished. The assessment and calculations carried out in this Chapter represent worst cases, as all above mentioned activities are assumed to be conducted at the same time.

8.3.2 Operation Phase

Wind power plants utilise renewable energy and rely on the direct conversion of mechanical energy into electrical energy. Thus, during the operation phase of wind power plants, fossil fuels are not used. There will not be any combustion processes and there will be no emissions resulting from heating. Electrical power will be used for heating purposes. The only source of emissions can be considered as the diesel generator. However, the generator will only be used in blackout situations and therefore, its emissions can be considered to be negligible. As a result, the operation of Mersinli WPP is not anticipated to cause air emissions and have any adverse impact on local air quality. In addition, a grievance mechanism will be in place during the operation of the WPP and relevant actions will be taken in case of grievances regarding air quality.

8.3.3 Closure Phase

During the closure phase, potential sources of emissions are likely to be similar to those associated with construction. There may be some dust, generated during the decommissioning of the proposed project, however, this will not be to the same extent as during the construction phase, as there will be less soil moving required. Demolition of the Project will be conducted, so as to minimise the generation and spread of dust. Measures will be taken to minimise the impact on receptors and the grievance mechanism will continue to be implemented, until the end of closure activities. Thus, a significant amount of emissions is not expected to be generated during the closure phase of the Project. The closure phase is not anticipated to have an adverse impact on local air quality.

8.4 Greenhouse Gas Emissions

The EBRD protocol for assessment of greenhouse gas emissions (*EBRD, 2017*), states that the project boundary for renewable energy power generation projects, is always regarded as encompassing the electricity grid in which they serve. Additionally, due to their nature, renewable energy developments are assumed to displace emissions associated with other electricity generation on the grid. Similarly, the “IFI Approach to GHG Accounting for Renewable Energy Projects (*World Bank, 2015*)” states that, energy generated from renewable sources, will avoid emissions that would otherwise be generated wholly or partly from more carbon-intensive sources.

In the calculation, the energy production of the project is multiplied by the Combined Margin (CM) emission factor in tCO2e/MWh (*World Bank, 2015*). According to EBRD’s “Development of the electricity carbon emission factors for Turkey (2015)”, Turkey’s annual carbon emission factor for 2018 is 0.486 tCO2e/MWh. Considering the 180,000 MWh annual energy to be generated by the Project, the Project’s contribution to displacement of emissions associated with other electricity generation on the Turkish grid is calculated as 87,480 tCO_2e/annum.

The minimum design lifetime of wind turbines is 20 years. However, with proper maintenance activities, turbines may last much longer (*US Department of Energy, 2015*). Even considering a 20 year operation phase, the Project’s total contribution to CO_2 emissions reduction is calculated as 1,749,600 tCO_2e.

According to EBRD protocol for assessment of greenhouse gas emissions (*EBRD, 2017*), the construction phase GHG emissions are typically not considered to be significant compared with operational emissions and are normally not included in the assessment. In addition, the protocol states that construction phase GHG emissions will be included in the assessment, in case they are anticipated to be greater than 5 per cent of the operation phase GHG emissions. Since the Project is a renewable energy generation project, its operation phase emissions are considered to be negative (displacement of emissions that would otherwise be sourced from other electricity generation technologies). The Project’s construction phase is expected to last a total of 16 months, of which, 2 months will consist of commissioning activities. Since transport and construction related emissions to be sourced from the remaining 14 months, are expected to constitute a small fraction of the 1,749,600 tCO2e to be displaced by the operation phase, construction phase emissions are not included in the calculations.

It should be noted that one potential source of GHG emissions during the operation phase is the switchgear equipment, circuit breakers and similar high voltage equipment that use sulphur hexafluoride (SF6) gas. According to Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (*IPCC, 2001*) approximately 1% of the existing SF_6 contained in the high voltage equipment is lost each year. Considering the Project's significantly high contribution to displacement of GHGs (i.e. 87,480 tCO_2e/annum), the impact of potential SF6 leakages on the Project operation phase GHGs account is also considered to be negligible.

8.5 Mitigation Measures

This section describes the actions and strategies suggested to avoid or minimise the potential impacts on air quality. During the land preparation and construction phase of Mersinli WPP, potential impacts associated with PM_{10} emissions and exhaust gas emissions from diesel fuelled construction machinery and equipment is of concern.

The following measures for the reduction and control of air emissions will be implemented during the land preparation and construction phase in accordance with relevant Turkish regulations and international standards and best practices.

- Loading and unloading of material will be carried out without scattering.
- During their transportation, excavated materials will be covered with nylon canvas.
- Dust suppression methods such as watering with water trucks will be applied at access roads and internal roads.
- Access roads and internal roads will be stabilized roads (see Chapter 3.5.2. for pavement structure).
- Speed limitations will be applied for vehicles.
- Upper layers of the excavated material stored will be kept at a humidity level of about 10%.
- Construction vehicles will not be permitted to keep engines running while waiting to enter to the site or waiting on-site.
- Construction vehicles leaving the site will be washed to prevent the transmission of soil from the site to the public roads.
- Drop height of materials that have potential to generate dust will be kept as minimum as possible.
- Well and adequate maintained vehicles will be used and regular maintenance of these vehicles will be ensured.
- In order to minimise air emissions sourced from construction machinery and trucks; relevant provisions of the Industrial Air Pollution Control Regulation and the Regulation on Assessment and Management of Air Quality will be complied with.
- Monitoring of project related emissions will be carried out in accordance with the Environmental and Social Management and Monitoring Plan prepared for Mersinli WPP (Chapter 19).
- A Stakeholder Engagement Plan will be implemented to collect complaints and suggestions through the grievance mechanism to be established.

Table 8-12 provides a summary of air quality assessments. Significance of potential impacts is identified before and after the application of the proposed mitigation measures. As it can be observed from the Table, potential impacts on residents of Marmariç are evaluated as moderate, while residual impacts are expected to be minor with the proper application of the mitigation measures. Significance of impacts resulting from exhaust emissions from vehicles on the settlements along the site access road (Dereköy, Gökyaka and Cumalı) are evaluated as moderate. The associated residual impacts are anticipated as minor.

Beekeeping activities and agricultural activities are other receptors where air quality impacts are considered. Significance of residual impacts on beekeeping activities and agricultural activities is estimated to be negligible.

Table 8-12. Air Quality and GHG Related Impacts, Proposed Mitigation Measures and Residual Impacts

<table>
<tr><th rowspan="2">Impact Description</th><th rowspan="2">Project Phase</th><th rowspan="2">Receptor</th><th colspan="6">Impact Magnitude</th><th rowspan="2">Sensitivity/ Value of Resource/ Receptor</th><th rowspan="2">Impact Significance (prior to mitigation or with existing mitigation)</th><th rowspan="2">Proposed Mitigation Measures</th><th rowspan="2">Residual Impact Significance</th></tr>
<tr><th>Extent</th><th>Magnitude</th><th>Reversibility</th><th>Duration</th><th>Frequency</th><th>Overall Magnitude</th></tr>
<tr><td rowspan="2">PM_{10} emissions due to construction of WPP and nuisance of local communities</td><td rowspan="5">• Land preparation and construction
• Closure</td><td>• Marmaric</td><td>Local</td><td>Low</td><td>Short term reversible</td><td>Short-term</td><td>Intermittent</td><td>Low</td><td>High</td><td>Moderate</td><td rowspan="6">• Air Quality Management Plan will be implemented.
• Loading and unloading of material will be carried out without scattering.
• During their transportation, excavated materials will be covered with nylon canvas.
• Dust suppression methods such as watering with water trucks will be applied at access roads and internal roads.
• Access roads and internal roads will be covered with plant mix.
• Speed limitations will be applied for vehicles.
• Upper layers of the excavated material stored will be kept at a humidity level of about 10%.
• Construction vehicles will not be permitted to keep engines running while waiting to enter to the site or waiting on-site.
• Construction vehicles leaving the site will be washed to prevent the transmission of soil from the site to the public roads.
• Drop height of materials that have potential to generate dust will be kept as minimum as possible.
• Well and adequate maintained vehicles will be used and regular maintenance of these vehicles will be ensured.
• In order to minimise air emissions sourced from construction machinery and trucks; relevant provisions of the Industrial Air Pollution Control Regulation and the Regulation on Assessment and Management of Air Quality will be complied with.
• Monitoring of project related emissions will be carried out in accordance with the Environmental and Social Management and Monitoring Plan prepared for Mersinli WPP.
• Stakeholder Engagement Plan will be implemented to collect complaints and suggestions through the grievance mechanism to be established.</td><td>Minor</td></tr>
<tr><td>• Çınardibi
• Cumalı
• Dereköy
• Gökyaka
• Yeşilköy
• Karaot
• Karakızlar
• Dernekli
• Dağtekke</td><td>Wide</td><td>Negligible</td><td>Short term reversible</td><td>Short-term</td><td>Intermittent</td><td>Negligible</td><td>High</td><td>Minor</td><td>Negligible</td></tr>
<tr><td rowspan="2">PM_{10} emissions due to construction of WPP and impacts on productivity of beekeeping and agricultural activities as a result of dust</td><td>Beekeeping activities</td><td>Restricted to Local</td><td>Negligible</td><td>Short term reversible</td><td>Short term</td><td>Intermittent</td><td>Negligible</td><td>Medium</td><td>Negligible</td><td>Negligible</td></tr>
<tr><td>Agricultural activities located in the vicinity of Turbine-9 - Turbine-14</td><td>Restricted to Local</td><td>Low</td><td>Short term reversible</td><td>Short term</td><td>Intermittent</td><td>Low</td><td>Medium</td><td>Minor</td><td>Negligible</td></tr>
<tr><td>Exhaust and dust emissions as a result of transportation of project material to the Project Area via main access road.</td><td>• Dereköy
• Gökyaka
• Cumalı</td><td>Local</td><td>Low</td><td>Short term reversible</td><td>Short term</td><td>Intermittent</td><td>Low</td><td>High</td><td>Moderate</td><td>Minor</td></tr>
<tr><td>Exhaust emissions due to operation of construction machinery and equipment</td><td>• Land preparation and construction
• Closure</td><td>Users of the agricultural lands located in the vicinity of Turbine-9 - Turbine-14</td><td>Restricted to Local</td><td>Low</td><td>Short term reversible</td><td>Short term</td><td>Intermittent</td><td>Low</td><td>Low</td><td>Minor</td><td>Negligible</td></tr>
</table>

9. Water and Wastewater

This Chapter provides information on exiting water resources and assesses the potential impacts on water resources during land preparation and construction, operation and closure phases of Mersinli WPP Project. Measures proposed for mitigation of the potential impacts and residual impacts are also described in this chapter.

9.1 Project Standards and GIIP

Legislation and standards applicable in assessment of the water resources during the land preparation and construction, operation and closure phases of the Project are listed as below:

- European Union Quality Criteria for Waters Intended for Human Consumption – Council Directive 98/83/EC of 3 November 1998;
- Guidelines for Drinking Water Quality – World Health Organisation (WHO), 2011.
- Regulation on the Protection of Groundwater Due to Pollution and Degradation (RPGDPD) – Turkish Ministry of Forestry and Water Works, 2015;
- Regulation on Waters Intended for Human Consumption (RWIHC), Chemical Parameters and Indicator Parameters – Turkish Ministry of Health, 2005;
- Surface Water Quality Regulation (SWQR), Inland Surface Waters Quality Criteria – Turkish Ministry of Forestry and Water Works, 2012;
- 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;
- Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on Environmental Quality Standards (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);

9.2 Baseline Conditions

This Section presents the baseline conditions for water resources of the License Area and the general region. In order to identify baseline characteristics of water resources, findings documented in the Project's national EIA report were used as the main data source. In this context, the following data sources have been used to identify the baseline conditions:

- Geological and geotechnical survey results provided in the Project's national EIA Report.
- Project Report on the Climate Change Impact on Water Resources for the Küçük Menderes River Basin, General Directorate for Water Management (GDWM, 2016), Turkish Ministry of Forestry and Water Affairs.
- İzmir Provincial Environmental Status Report for the year 2016, Turkish Ministry of Forestry and Water Affairs (MFWA, 2017).
- Governmental databases on water resources:
  - Izmir Province Flood Database retrieved from Disaster and Emergency Management Presidency of Turkey.
  - Surface Waters Database retrieved from State Hydraulic Works (DSİ) 2nd Regional Directorate (DSİ, 2017).

9.2.1 Surface Waters

The License Area is located on the boundary of Küçük Menderes (to the south) and Gediz (to the north) River Catchments. Although there are various intermittent streams that drain the License Area, the nearest major surface water resource is Küçük Menderes River, which is located approximately 15 km downstream (south) of the License Area. The Küçük Menderes River Catchment area mainly comprises of a large section of İzmir province and Kuşadası district of Aydın province. Main tributaries of the Küçük Menderes River are Uluçay, Kocahavran, Çamlı, Keleş and Aktaş streams with a total recharge area of 6,907 km^2.

Based on the information provided by Turkish General Directorate for Water Management *(GDWM, 2016*), water supply for drinking and utility purposes has been estimated as 181 x 10^6 m^3/year for the Küçük Menderes River catchment, which corresponds to 80% of the total amount of water that is being used in the catchment area.

A portion of the License Area lies within the Gediz River Catchment, which is accountable for relatively smaller drainage areas. The main surface water in the basin is Gediz River to the north. The location of the License Area with respect to the abovementioned river catchments is shown in Figure 9-1.

Figure 9-2 shows the dams and ponds located in the general region of the License Area. As it can be observed from the map, the closest surface water bodies to the License Area are Uladı Dam and Karakızlar Pond, which are located 2.6 km southeast and 2.8 km southwest of the License Area, respectively. Other than those marked on the map, the nearest wetland area is the Küçük Menderes River Delta, which is located approximately 31 km southwest to the License Area. Other major water bodies are known to be the Gediz Delta (40 km northwest of the License Area) and Gölcük Lake (43 km east of the License Area). Two dams (Balçova and Tahtalı dams) are currently being operated within the İzmir province. The dams were identified to be used for purpose of drinking and domestic water supply. Balçova Dam is located at a distance of 41 km while Tahtalı Dam is located at a distance of 44 km east of the License Area.

Dams and ponds located in the vicinity of the Project Area, according to the database of the State Hydraulic Works, are presented in Table 9-1 *(http://bolge02.dsi.gov.tr/isletmedekitesisler/baraj-golet)*. According to information presented, one dam (Burgaz Dam) and four water ponds (Aslanlar, Savanda, Bağyurdu and Karakızlar ponds) were identified to be in operation. Two dams (Ergenli and Uladı dams) and one water pond (Yukarıkızılca pond) on the other hand, were identified to be in construction phase. The nearest dam/pond was found to be Karakızlar pond, located 2.8 km southwest of the Project area. All identified water bodies were observed to provide water for irrigation purposes.

Table 9-1. General Information on Dams and Ponds Located in the Vicinity of the Project Area (*DSİ, 2017*)

Name of the Water Resource	Surface Area (ha)	Distance to Project Area (km)	Status	Purpose
Aslanlar Pond	3.8	10.8	In Operation	Irrigation
Burgaz (Zeytinova) Dam	160	18.5	In Operation	Irrigation
Savanda Pond	31.2	10.2	In Operation	Irrigation
Bağyurdu Pond	3.9	17.5	In Operation	Irrigation
Karakızlar Pond	8.29	2.8	In Operation	Irrigation
Ergenli Dam	108.6	13.8	Under Construction	Irrigation
Yukarıkızılca Pond	33	10	Under Construction	Irrigation
Uladı Dam	103.2	2.6	Under Construction	Irrigation

Intermittent streams within the License Area regarding Mersinli WPP Project are presented in Figure 9-3. As can be observed from the map, these intermittent streams are from west to east; Gavuramoğlu, Kulvarkavağı, Kılıboz, Kızıl, Keseroğlu, Karakaya, Çiftepınar, Zeybekmezarı, Sarısu, İzmiryolu, Cimbaz and Musluk streams.

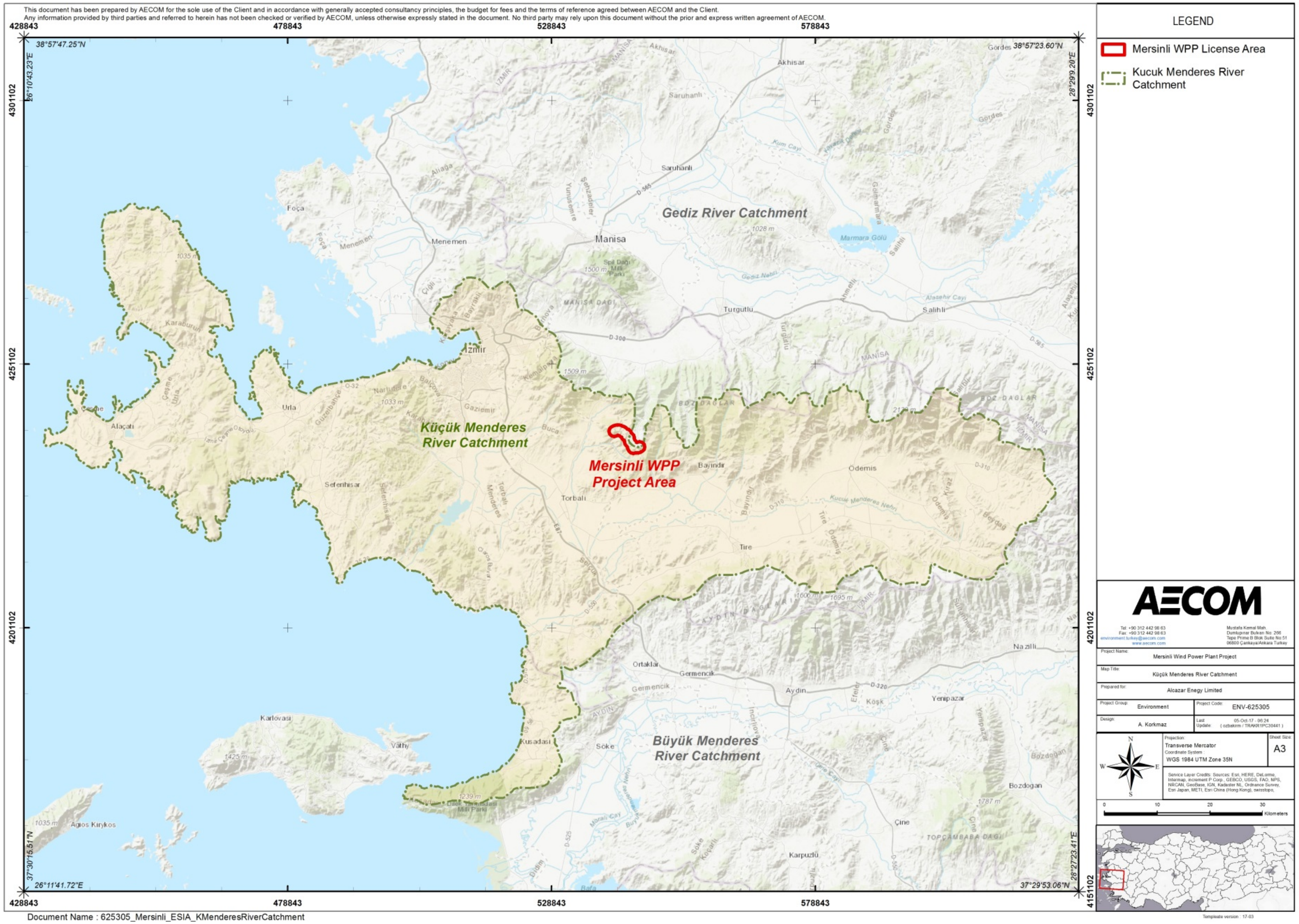


Figure 9-1. Location of the License Area with Respect to River Catchment Areas

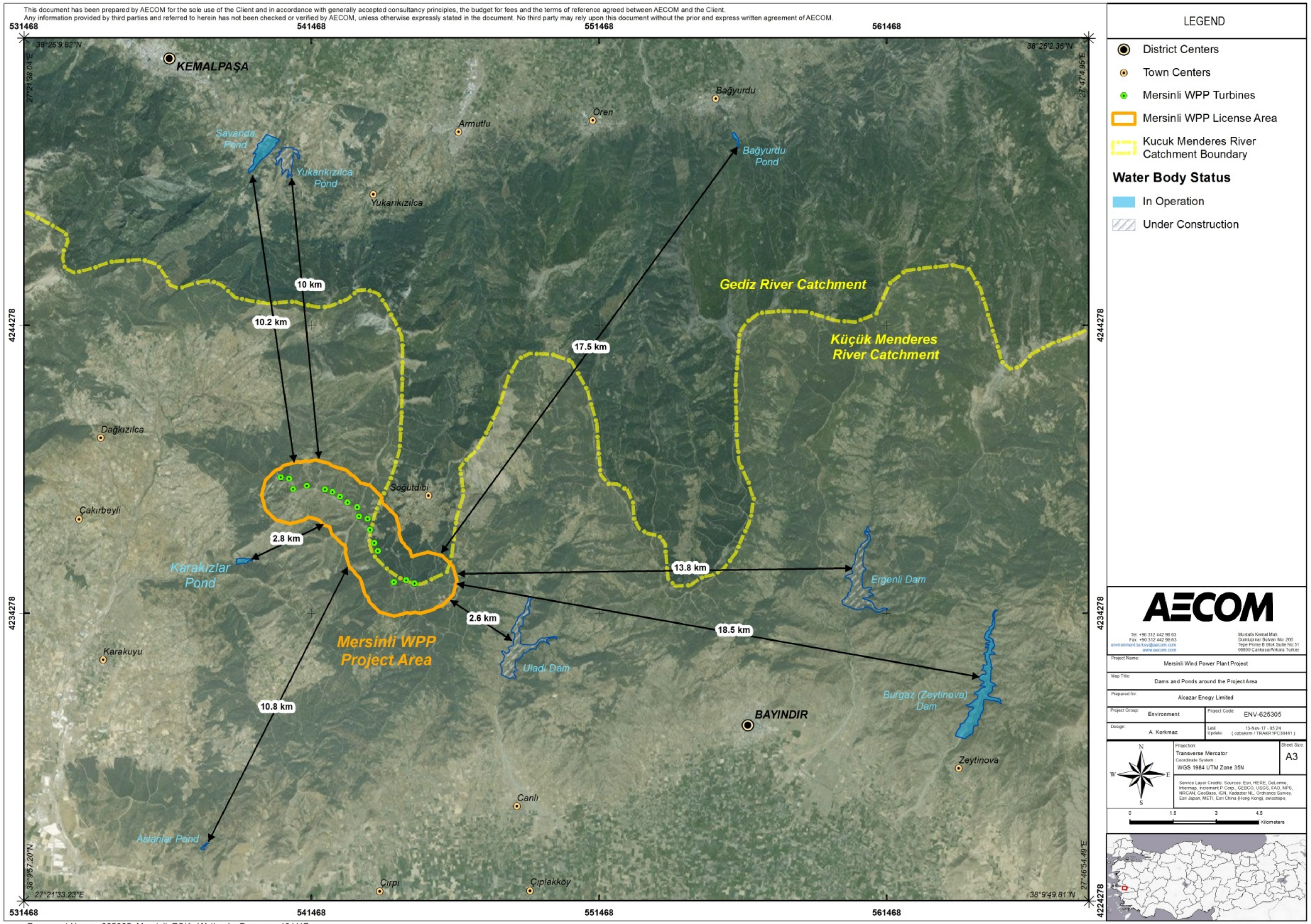


Figure 9-2. Locations of Dams and Ponds in the Vicinity of the License Area

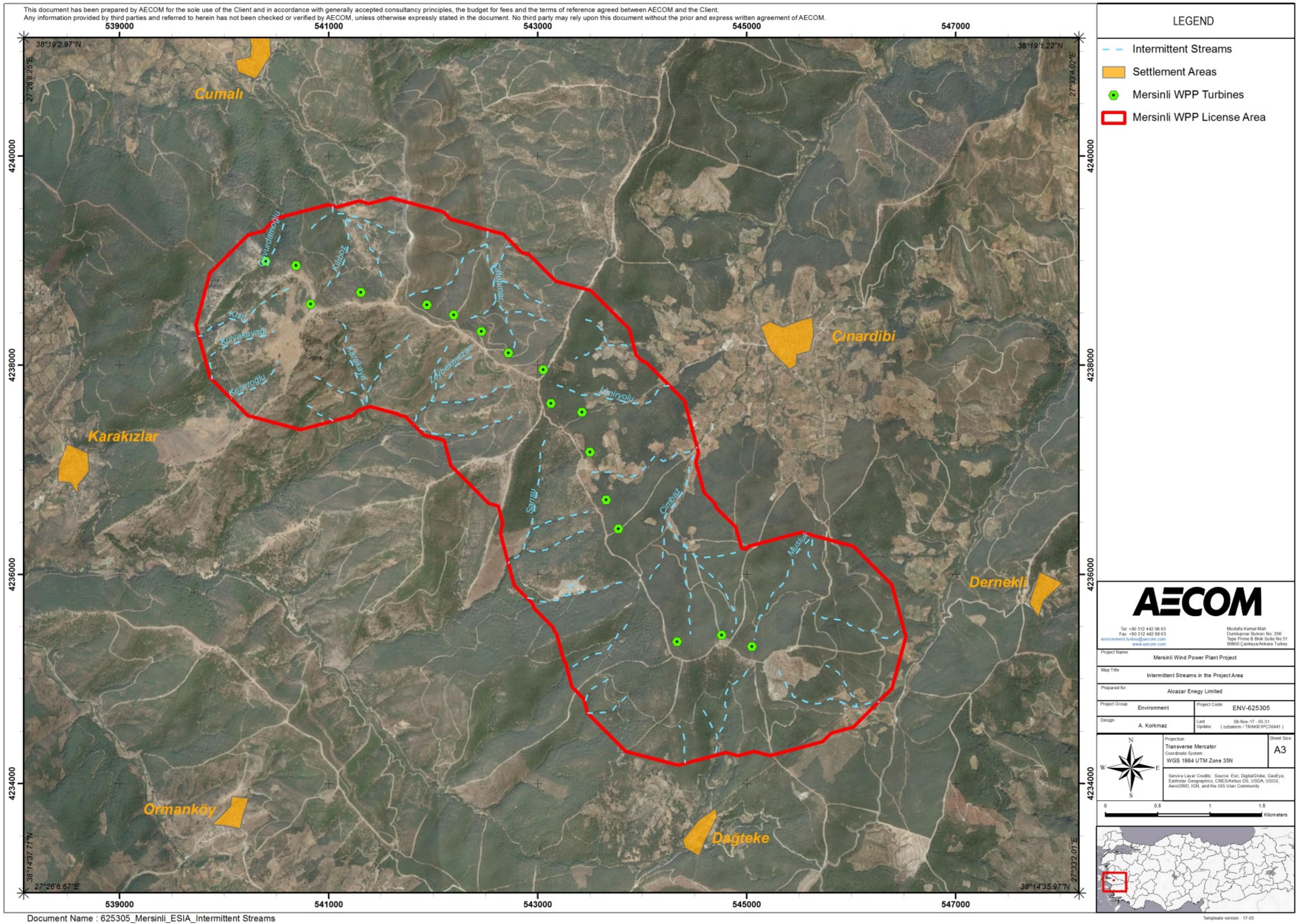


Figure 9-3. Intermittent Streams within the License Area

Flooding

The Küçük Menderes River Catchment is known to be one of the major river basins. The basin has the least number of recorded flood events amongst all basins in Turkey *(Gökçe et. al., 2008)*. Based on the data received from the Turkish Disaster and Emergency Management Presidency, a total of 39 flood events have been reported in İzmir province in the last 50 years *(https://tabb-analiz.afad.gov.tr/Genel/Raporlar.aspx).* It was reported that 10 of these events occurred between 2008 and 2018 (see Figure 9-4). The data also shows that the latest flood event in the vicinity of the License Area was recorded on 16 September 2002 in Bayındır district, with no record of loss of life or property.

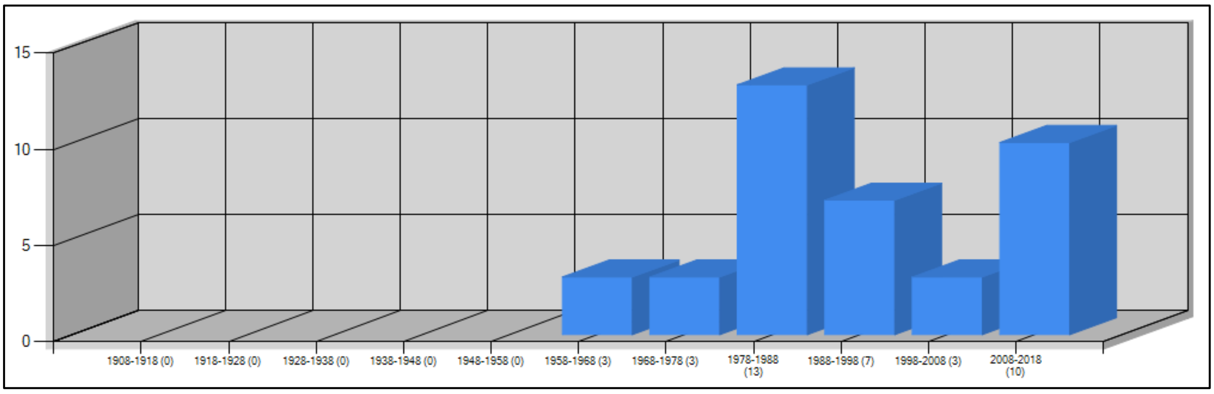


Figure 9-4. Distribution of the Number of Flood Events in Izmir Province of Turkey *(https://tabb-analiz.afad.gov.tr/Genel/Raporlar.aspx)*

The License Area is located in a rural region, along a ridge that separates the Küçük Menderes and Gediz river catchment areas. Relatively, steep and undulating topography is observed with altitudes between 650 m and 850 m. The Project units will be situated on highlands at 800 m altitude approximately. With reference to the Project's national EIA Report and national Law (No. 7269) on "Aid to be Provided and Measures to be Implemented for Natural Hazards Affective on Public Life", no flood plains and flooding risk were identified in the License Area. Taking into account that afforestation is a contributing factor in increased evaporation and reduced flows (*Wheater and Evans, 2009*), and given that the majority of the License Area is forest land, risks associated with floods are not expected in the License Area.

9.2.2 Groundwater

Groundwater in the Küçük Menderes River catchment area, is stored in porous and semi-porous media mostly in the alluvial sediments that have developed along the Küçük Menderes River and its main tributaries. Groundwater does not only exist in unconfined aquifers, as within the alluvial sediments, but it is also found in confined layers of the hydrogeological system, although their distribution is relatively limited compared to the former. The areal distribution of the unconfined aquifers was estimated to extend over 51.6% of the catchment area; whereas the confined aquifers were found to be distributed over 34.7% of the catchment.

The hydrogeological system is developed in three main water bearing units: the permeable porous medium, semi-permeable porous medium and semi-permeable rock medium. The available reserve for the unconfined layers of these water bearing media was estimated to be; 9.7 km^3 for the permeable porous and semi-permeable porous aquifers and 4.2 km^3 for the semi-permeable rock medium. The available reserve for the confined layers on the other hand, was estimated to be 18 km^3.

Several groundwater resources in Torbali and Bayindir districts, which are the nearest major water users to the License Area, have been identified as drinking water resources by GDWM (2016)., Annual amounts of water that is extracted from these sources are provided in Table 9-2. The total annual amount of water that is provided for individual use (drinking and utility purposes), industrial use and irrigation purposes has been estimated as 180.1 x 10^6 m^3.

Table 9-2. Drinking Water Resources for the Nearest Major Settlements to the License Area *(GDWM, 2016*)

Province	District	Name of the Water Resource	Type of the Water Resource*	Water Extraction (m^3/year)
İzmir	Bayındır	Emine Stream	1	220,460
İzmir	Bayındır	Deve İrimi Stream	5	1,708,200
İzmir	Bayındır	Bekleme	5	525,600
İzmir	Bayındır	Canlı	5	262,800
İzmir	Bayındır	Kavaklı Kuyu	5	346,750
İzmir	Bayındır	Unnamed Spring	1	315,360
İzmir	Torbalı	İller Bankası-1	5	3,758,040
İzmir	Torbalı	Cumhuriyet	6	109,500
İzmir	Torbalı	Ege Koop	5	153,300
İzmir	Torbalı	Depot Spring	1	521,950
İzmir	Torbalı	Spring Well	5	584,000
İzmir	Torbalı	Well Water	5	426,400
İzmir	Torbalı	Pancar Water	5	525,600
İzmir	Torbalı	Unnamed Well	5	262,800
İzmir	Torbalı	Ayrancılar	1	157,680
İzmir	Torbalı	İller Bankası-2	5	273,750

Notes:

*: 1: Spring, 2: Lake, 3: Stream, 4: Dam, 5: Water Well, 6: Pond

Although there are no geothermal resources within the License Area and its vicinity, significant geothermal potential is observed in the İzmir province as a result of the fault systems that have been developed mainly along the Küçük Menderes and Büyük Menderes basins.

9.3 Impact Assessment

This Section presents the Project's potential impacts on water resources. In order to identify the potential impacts; land preparation and construction phase, operation phase and closure phase of the project were considered separately, as the project activities and potential releases from these activities are different at each phase. Assessment of impacts associated with water use and wastewater was done based on the methodology presented in Chapter 5.

9.3.1 Land Preparation and Construction Phase

Potential impacts on water resources during the land preparation and construction phase of the Project are expected to be more significant compared to operation phase impacts, since relatively large number of personnel will be involved in relatively more complex activities during this phase.

9.3.1.1 Impacts on Surface Water Resources

Water Use and Wastewater Generation

Water use during the land preparation and construction phase of the Project will include drinking and utility water consumption by project personnel. In addition, water will be required for construction activities such as dust suppression during earthworks, cut and fill works and construction of access roads, underground cable network and other Project units.

A total of 150 people will be employed during this Phase. Accordingly, the amount of personnel utility water requirement was estimated as 22.5 m^3/day, based on the assumption that daily water need for a single personnel will be 150 liters *(Eroğlu & Topacık, 1998*). Projects personnel utility water requirement will be procured and supplied by means of tankers. No surface water or groundwater resources will be used to supply for personnel utility water needs.

Similarly, drinking water will also be procured, as bottled water, and therefore, no surface water or groundwater resources will be utilized for this purpose either. Thus, no impact on water resources, associated with drinking water supply, is expected to occur.

In addition, water will be required for dust suppression, which is not anticipated to exceed 10 m^3 per day. Water will be purchased and transported to the Project Area by tanker trucks. To minize water requirement for dust suppression, water sprinkling will not be conducted during rainy days and seasons. Since water for dust suppression will be outsourced, no impact on water resources, associated with dust suppression is anticipated to occur.

Concrete will be supplied from local providers as ready-mixed concrete and no concrete batching activities are planned to be carried out in the scope of Project construction activities. Therefore, no impact on water resources, associated with concrete mixing is anticipated to occur.

Domestic wastewater will be generated as a result of daily personnel acitvities. Assuming that the wastewater to be generated is equal to the water demand, wastewater generation during land preparation and construction phase of the Project is estimated as 22.5 m^3/day.

According to the Turkish Water Pollution Control Regulation (Official Gazette Date: 31.12.2004, No: 25687), industrial plants having a worker population under 84 are allowed to manage their domestic wastewaters through non-leaking septic tanks. The regulation requires industrial plants having a worker population between 84-2,000 to manage their domestic wastewaters through treatment and/other disposal methods to be approved by the Provincial Directorate of Environment and Urbanization. Since the number of personnel to be employed during the construction phase of the Project is 150, the wastewater generated during the construction phase will be treated by a package wastewater treatment plant and discharged in accordance with the relevant regulatory limits to a nearby surface water. The Environmental Permit will be obtained from the Provincial Directorate for the treated wastewater discharges.

Hazardous Materials

Potential impacts that may cause changes in water quality during land preparation and construction phase are associated with spills and/or leakages of hazardous substances (e.g. fuel, oils, lubricants, hazardous liquid wastes) in to surface and/or groundwater sources. Spills and leaks that might potentially originate from the storage tanks and/or storage areas can contaminate receiving waters, either by direct contact or by contaminant transport through soil and vadose zone. In addition, increased precipitation, particularly during rainy seasons of the year, can lead to a potential increase in transport of contaminants via surface runoff. Streams within the License Area are known to be intermittent, which do not have continuous flow throughout the year. Thus, with the application of relevant mitigation measures, sediment transport through surface water resources will be prevented.

Impacts on Drainage and Flooding

As provided in detail in Chapter 6, loss of land as a result of the construction of Project units (i.e. Project footprint areas) is relatively low and comprises approximately 2% of the License Area. In addition, the Project Area is located on a mountainous region, which does not include any flood plains. Accordingly, no Project-induced flood event is expected in the vicinity. In order to prevent surface waters to reach the construction area around the turbine foundations, interception channels will be constructed to divert the runoff. Diverted runoff waters will be discharged to the receiving environment to maintain the natural flow regime in the License Area.

On the other hand, project land preparation and construction activities may result in impacts on water quality as a result of sediment transport to downstream water bodies. Relevant mitigation to avoid sediment transport is provided in Section 9.4 and an Erosion Control, Soil and Spoil Management Plan is in place for the Project.

9.3.1.2 Impacts on Groundwater

A total of 10 boreholes (SK-1 to SK-10), each with a depth of 10 m, were drilled within the scope of the geological survey conducted as part of the Project's national EIA study. Groundwater was not encountered in any of the boreholes. Turbine foundations are expected to have a maximum design depth of 3 meters from the ground level. The groundwater table on the other hand is at least 10 meter below ground level. Therefore, no groundwater interference is expected during the construction of wind turbines and excavations are not expected to affect groundwater resources.

Potential impacts on groundwater occurrence, which might be of concern during the land preparation and construction phase, will therefore be negligible as there will be no contact with groundwater.

9.3.2 Operation Phase

Water Use and Wastewater Generation

Potential impacts on water resources during operation phase will be generally more limited compared to construction phase. This can be attributed to the limited number of personnel employed, as well as limited water requirement of the activities carried out during this phase. Considering the issue, the Intergovernmental Panel on Climate Change states that; "the water use requirement during operation phase of a wind power plant is significantly lower than majority of conventional power systems or other renewable power systems and their waste generation is also limited" (*IPCC, 2014*).

The water consumption during operation phase of the Project will comprise of utility and drinking water supply of project personnel. The number of personnel during the operation phase will be 14 people and based on the assumption that daily water need for a single personnel will be 150 liters (*Eroğlu & Topacık, 1998*), the total amount of daily utility water requirement during the operation phase is estimated at 2.1 m^3. As is the Case with the Land Preparation and Construction Phase, Project personnel utility water requirement will be procured and supplied by means of tankers. No surface water or groundwater resources will be used to supply for personnel utility water needs

Assuming that the wastewater to be generated is equal to the water demand, the daily wastewater generated during operation phase is also estimated at 2.1 m^3. During this phase, the wastewater will be collected in non-leaking septic tank(s)/mobile toilets to be built/ provided in the Project Area and will be collected by vacuum trucks of the local Municipality for discharge to the sewage system of the Municipality.

Impacts related to drinking water requirement during this phase are considered to be negligible, as the total number of personnel will only be 14.

Hazardous Materials

In scope of maintenance activities, spills and/or leakages of hazardous substances (e.g. fuel, oils, chemicals lubricants and hazardous liquid wastes) to surface and/or groundwater resources is of concern. The measures proposed for land preparation and construction phase will also ensure this type of impact is avoided during operation phase.

9.3.3 Closure Phase

The closure phase of the Project will involve uninstallation of Project components and activities to rehabilitate the site back to its original state. Since these activities involve a large workforce conducting activities similar to construction phase (e.g. demolotion of administrative building, landscape reinstatement, etc.), impacts and measures identified for land preparation and construction phase are also applicable for closure phase.

9.4 Mitigation Measures

The potential impacts, identified impact significance parameters and proposed mitigation measures are presented in Table 9-3, together with the significance of residual impacts. In addition to the detailed mitigation provided in Table 9-3, the following management programs will also be in place for management of water resources related impacts:

- Erosion Control, Soil and Spoil Management Plan
- Waste Management Plan
- Emergency Preparedness and Response Plan
- Reforestation Program

Table 9-3. Water and Wastewater Impacts, Proposed Mitigation Measures and Residual Impacts

Impact Description	Project Phase	Receptor	Impact Magnitude: Extent	Impact Magnitude: Magnitude	Impact Magnitude: Reversibility	Impact Magnitude: Duration	Impact Magnitude: Frequency	Impact Magnitude: Overall Magnitude	Sensitivity/ Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
Impacts on water quality due to transport of uncontrolled sediments to downstream surface waters	• Land Preparation and Construction	Surface water	Local	Low	Short term reversible	Short term	Intermittent	Low	Low	Minor	• Erosion Control Soil and Spoil Management Plan will be implemented. • All required and effective drainage and construction procedures will be applied in order to minimise the impacts on soil hydrology and to benefit soil infiltration. Interception channels around the crane pads will be built to divert runoff waters and to prevent/minimise erosion caused by water. • It will be ensured that exposed ground that will be disturbed during the construction phase activities will be minimised (unnecessary soil stripping will not be carried out). • Vehicle movements will be restricted to designated roads to avoid disturbance of soils adjacent to the roads. • Construction activities will be limited during adverse weather conditions to reduce potential wind and water erosion. • Water sprinkling will be implemented on access roads (initially, based on the air quality model results, water sprinkling will be conducted for at least 3 times a day during dry season and the frequency will be increased if the monitoring results require so).	Negligible
Impacts on the quality of nearby water resources due to improper management of wastewater, hazardous materials/wastes, construction machinery and vehicles	• Land Preparation and Construction • Operation • Closure	Surface water (Gavuramoğlu, Kulvarkavağı, Kılıboz, Kızıl, Keseroğlu, Karakaya, Çiftepınar, Zeybekmezarı, Sarısu, İzmiryolu, Cimbaz and Musluk streams and Uladı Dam and Karakızlar Pond)	Local	Low	Short term reversible	Short term	Intermittent	Low	Low	Minor	• Waste Management Plan will beimplemented • Hazardous materials management will be included as a subject in EHS and OHS trainings to be provided to personnel. • Routine control of hazardous waste containers will be carried out and it will be ensured that they are not damaged and no spill exists. • All maintenance activities will be performed on suitable impermeable ground that prevents potential transport of contaminants to surface waters and groundwater. • A designated area for refueling of the mobile vehicles and machinery will be constructed (if required). • Construction machinery and vehicles will be checked regularly in order to prevent spills and leakages of fuel and other hazardous materials. • Spill kits, absorbent pads and absorbent sands will be available on site at all times. • Vehicle parking will be restricted to designated areas to minimise the potential for any oil or fuel leaks. • In order to prevent surface water contact with the construction area around the turbine foundations, interception channels will be constructed to divert the runoff. Diverted runoff waters will be discharged to the receiving environment to maintain the natural flow regime in the License Area. • In order to prevent / minimise potential impacts on surface waters, no earthworks material will be dumped into the intermittent streams and their banks located within the License Area (Gavuramoğlu, Kulvarkavağı, Kılıboz, Kızıl, Keseroğlu, Karakaya, Çiftepınar, Zeybekmezarı, Sarısu, İzmiryolu, Cimbaz and Musluk streams) and in the near vicinity of the license area (Yayala, Kestane, Kiraz, Akalan, Soğukdere, Karadere, Çeşmebaşı and Akkaya streams). • In the case of need for construction of water structures (such as bridge, culvert, concrete tubes, etc.) on the stream beds, required approvals from the relevant governmental authorities with regard to the type, characteristic and potential impacts on stream flows, will be obtained before construction. • Impermeable septic tank(s)/mobile toilets will be built/ provided within the Project Area for collection of wastewaters during operation phase. • During operation phase, routine control and maintenance of domestic waste storage area(s) (septic tank(s)) will be carried out. • Septic tanks will be emptied regularly by vacuum trucks of related Municipalities for discharge to municipal sewage systems during the operation phase..	Negligible

10. Waste

This Chapter discusses hazardous and solid waste to be generated by the Project construction, operation and closure phase activities, identifies the impacts related to waste management and provides mitigation for these impacts.

10.1 Project Standards and GIIP

The main national regulation regarding management of waste in Turkey is the Regulation on Waste Management.

In addition to this, there are other regulations in place for specific waste types and waste management procedures. These include waste created by: excavations, construction, demolitions, oils, packaging, batteries, accumulators, medical supplies, electrical and electronic materials, as well as waste produced by transportation.

The full list of national waste legislation the Project will comply with is provided in Chapter 2 of this ESIA Report.

In addition, the Project will fully comply with EBRD standards, related EU legislation, namely the Waste Framework Directive or Directive 2008/98/EC. This directive provides general provisions for waste management and sets the basic waste management definitions. The Directive amended former EU directive on waste, hazardous waste and waste oils and is currently covering all wastes identified by Decision 2000/532/EC (i.e. the European Waste Codes). It should be noted that waste codes provided in Annex 4 of the Turkish Regulation on Waste Management are entirely the same with the European Waste Codes.

10.2 Baseline Conditions

Sanitary landfills are designed as Class II Landfills, in accordance with Regulation on the Landfill of Wastes. Within this regard, the landfills have in place systems that prevent surface water from entering the facility, proper impermeable liners, leachate collection systems and systems for treatment of collected leachate in line with related legislation.

İzmir Metropolitan Municipality currently operates 2 sanitary landfills for disposal of domestic waste, namely the Harmandalı Sanitary Landfill and the Bergama Sanitary Landfill, in addition to a few local wild landfills serving some districts of the Province (*İzmir Provincial Directorate of Environment and Urbanisation, 2016*).

Prior to disposal in the sanitary landfills, domestic waste is collected by district municipalities and transported to 7 transfer stations (established in Urla, Menderes (Kısık, Gümüldür), Buca (Gediz), Konak (Halkapınar), Menemen (Türkeli), Ödemiş districts) or 7 transfer pads (established in Torbalı, Foça, Selçuk, Dikili, Çeşme, Karşıyaka and Kemalpaşa districts). From these centres, the Metropolitan Municipality is responsible of transferring the wastes to the 2 sanitary landfills (*İzmir Provincial Directorate of Environment and Urbanisation, 2016*).

As stated in Chapter 3, the Project area is located in Bayındır, Torbalı and Kemalpaşa districts. In general, the waste generated in the area that surrounds the Project is sourced from commercial, agricultural and domestic activities. Domestic waste collected from all three districts is transferred through the above-mentioned transfer stations and pads and disposed of in Harmandalı Sanitary Landfill. Therefore, the domestic waste to be generated by the Project will also be disposed of in Harmandalı Sanitary Landfill. As of 2016, this landfill receives approximately 4,500-5,000 tons/day of domestic waste, as well as domestic type treatment sludge sourced from industry (*İzmir Metropolitan Municipality website, http://www.izmir.bel.tr*).

Facilities and management practices in the Province for other types of waste are summarised below (*İzmir Provincial Directorate of Environment and Urbanisation, 2016; İzmir Metropolitan Municipality website, http://www.izmir.bel.tr*):

- 342 facilities are permitted to collect and segregate non-hazardous waste, whereas 86 facilities are licensed for recovery/recycling. Non-hazardous industrial waste is collected by licensed firms for recovery in these facilities.
- 11 excavation, construction and demolition waste disposal sites serve the province of İzmir. In 2016, approximately 1,800,000 m^3 of excavation and construction waste was disposed in these facilities. However, since the total capacity provided by these disposal sites is not sufficient, permitting process has been initiated for a multitude of other sites.

- In İzmir province, district municipalities are responsible of separated collection of recyclable packaging waste at the waste source (i.e. instead of separation at waste disposal or waste transfer sites). Within this scope, district municipalities of Bayındır, Torbalı and Kemalpaşa (i.e. districts the Project area corresponds to) all have resources and capacities allocated for this purpose.
- Several facilities are in place that aim to recover and dispose hazardous waste. These include; 30 recovery facilities with environmental licenses or temporary activity permits, 4 facilities that use hazardous waste as fuel, 1 hazardous waste disposal facility and 3 interim storage facilities.
- Waste mechanical oils generated in the Province, are either collected by the municipalities within the scope of a protocol (signed with Petroleum Industry Association) or by licensed recovery/ disposal firms. In 2016, approximately 3,145 tons of mechanical oil waste was collected for recovery and disposal. Vegetable oil waste on the other hand, is collected and sent to 3 licensed vegetable oil recovery firms, as well as 1 vegetable oil interim storage area.
- In the province, there are a total of 2 waste accumulator recovery/recycling facilities. The transportation of this waste is conducted by 3 licensed transport companies. There is no waste battery recycling facility in the province. However, a waste battery collection system is implemented by a cooperation of Portable Battery Producers and Exporters Association, Metropolitan Municipality and district municipalities. The collected waste-batteries are sent to İstanbul province for disposal at İstaç facilities, a private association established in 1994 by İstanbul Metropolitan Municipality. Similarly, no electronic waste (e-waste) recovery, recycling and disposal facility is established in İzmir province. However, some municipalities collect e-waste for scrap material trade and multiple others are planning collection and recovery/recycling facilities. In addition, e-waste is also collected by various small scale scrap material trade firms.
- For reuse and recycling of scrap vehicles, 7 temporary storage areas, 2 processing facilities and 3 delivery points, either with a temporary activity permit or an environmental permit, are in place. Scrap tires on the other hand, are handled in 2 licensed scrap tire recovery facilities and 2 licensed facilities that use tires as fuel.
- As İzmir province currently does not have a sterilisation/incineration facility for medical wastes, this type of waste is collected by the Metropolitan Municipality and transferred to a licensed municipal waste facility in Manisa province (*İzmir Metropolitan Municipality website, http://www.izmir.bel.tr*).

10.3 Impact Assessment

Several types of hazardous and non-hazardous waste (especially domestic), will be generated by the construction, operation and closure activities of the Project. During the construction phase, relatively higher number of workers will be involved, more diverse and tightly scheduled activities will be conducted and materials use will be higher. Therefore, compared to operation phase, waste generation during construction phase is expected to be more substantial in terms of impacts.

In general, improper management of waste may result in the following general impacts:

- Landfill capacity (additional to current levels);
- Soil, surface water and groundwater contamination;
- Disturbance of biodiversity components;
- Visual nuisance;
- Potential degrading impacts on personnel and public health and safety (including odour) and
- Loss of materials that may otherwise be reused/ recovered/ recycled.

10.3.1 Land Preparation and Construction Phase

Waste to be generated during the construction phase include; excess excavation material (i.e. the portion of excavation material that will not be reused on site for cut and fill works), wood and timber scraps, municipal (domestic) solid waste, recyclable waste and hazardous waste.

Municipal Solid Wastes

According to Turkstat (*2014*), which publishes data on municipal solid waste generation in Turkey, the average municipal solid waste generated by one person is 1.08 kg/day for Turkey and 1.12 kg/day for İzmir province. The value for İzmir province is used within the scope of this ESIA, as it is higher than the daily municipal solid waste generation figure for Turkey. This is due to the fact that İzmir is a highly developed province in terms of socio-economics and therefore, it's average general consumption is also higher, which is reflected in its waste generation.

Considering that the peak number of personnel to be employed during the construction phase is 150, the total domestic waste generation per day is calculated as 168 kg. According to the Environmental Indicators published each year by the Ministry of Environment and Urbanisation, 30% of generated municipal waste (by weight) consists of packaging waste (*Ministry of Environment and Urbanisation, 2015*). Therefore, the packaging waste to be generated by the Project personnel is calculated as 50.4 kg. Considering the 4,500 tons of waste disposed daily in the Harmandalı Sanitary Landfill, the Project construction phase's additional load in the landfill will be less than 0.004%. Therefore, the load to be added by the Project on the capacity of existing waste disposal infrastructure will be negligible. It should also be noted that waste management trainings will be provided and separate collection of packaging waste will be encouraged so as to decrease the total generated amount of domestic waste that will be landfilled.

It should be noted that, any amount of landfilled domestic waste has a potential to contribute to GHG emissions from landfills. However, as the Project related landfill impact is assessed to be negligible, this impact is also considered as negligible.

Excavation and Construction Waste

A total of 81,500 m^3 of soil will be excavated within the Project land preparation activities. An estimated 16,300 m^3 of the excavated material will be used on site as fill or landscaping material. Therefore, the 65,200 m^3 of material in excess, that cannot be reused within the scope of Project activities will be transported to one of the 11 excavation, construction and demolition waste disposal sites within the province of İzmir.

The main construction activity is erection of turbines, which require dismountable cranes that are used for installation of multiple turbines and are transported out of the site for use in other projects. However, in case temporary structures such as fences, barriers, walls, etc. are used during the construction phase, these will also constitute potential construction waste sources.

Recyclable waste like cement bags, metal scraps, packaging and wooden crates, etc. will be segregated from other wastes and stored temporarily on site for eventual recycling process. A licensed company will be hired to transport/dispose recyclable waste. Any other solid waste that is non-recyclable and non-hazardous will be collected within closed containers and disposed by the related Municipality.

A special type of non-hazardous waste that will be generated during the construction phase is small pieces of timber, shavings, etc., which will be sourced from vegetation clearing. As the related Forestry Directorate is responsible of cutting and transporting trees, the amount of this type of waste to be generated will be very small. Leaving these small pieces on site, in a way that will not interrupt construction activities and the mobility of animals in the area is the common approach, since they will fertilise the soil in time. Another similar timber based waste is pallets and formwork that will be used during construction phase. These will be collected by related contractors for reuse.

Hazardous and Special Wastes

During the construction phase of the Project, various hazardous types of waste will be generated, which if not managed properly may result in soil, surface water and groundwater contamination, as well as related personnel and community health and safety issues. Within this category the following are considered:

- Waste oil,
- Waste vegetable oil,
- Used batteries and accumulators,
- Contaminated wastes (cables, PPEs, packages),
- Electronic waste, fluorescents and
- Medical waste.

The Maintenance of construction vehicles will be performed outside the Project Area, at authorised services. These services will be responsible for related special waste such as: waste batteries, mechanical oil, scrap tires, etc. In case it is inevitable to perform the maintenance of the construction vehicles on site, as is the case with the cranes, minor amount of waste oil can be generated.

A canteen will be placed at the Construction Camp Site, to cater for the needs of construction phase personnel, which will generate vegetable waste oil. This oil will be collected in leak-proof containers, transported by licensed entities and sent to a licensed facility.

All generated waste oil will be collected in safe leak-proof containers and it will be stored in the designated area located inside the Construction Camp Site. The storage space will have a concrete surface and a proper secondary container to prevent potential spillages and leakages from reaching the soil and groundwater. "Hazardous waste" labels will be placed on the containers, which also indicate the amount of stored waste as well as the storage time of the waste.

Small amounts of waste batteries, accumulators, electronic waste and contaminated waste will also be generated during construction. These will be collected separately, transported by licensed companies and sent to licensed facilities.

A medical room will be in place at the construction site, where medical waste may be generated. Medical waste will be temporarily stored on site, in line with the provisions of Regulation on Control of Medical Wastes and will be collected and disposed of by authorised health services.

In order to ensure pest related impacts are avoided, the underground cable network to be constructed is designed to utilise shielded cables. In addition all turbines and switchyard rooms, the cable network components lead to will be checked for openings and appropriate materials will be used to block these openings to ensure the highest achievable level of isolation. In case these preventive measures do not ensure pest and rodent entry to cable networks, additional measures may include pesticide use, which results in generation of hazardous waste. Therefore, pesticide wastes (e.g. containers) will be handled as hazardous wastes and all hazardous waste related impacts' mitigation will also be applicable for them (i.e. storage area specifications, record keeping, disposal firm agreements, etc.).

Hazardous waste can only be stored in temporary waste storage areas for up to 180 days. Before the 180 day period expires, waste must be sent to licensed waste disposal facilities.

10.3.2 Operation Phase

The Project operation phase activities will require a significantly reduced number of personnel. In addition, the generation of for hazardous materials will only be limited to materials required for maintenance of turbines, the substation and the electrical infrastructure. Therefore, waste volumes expected to be generated during the operation phase will be considerably lower compared to the construction phase. Consequently, waste related impacts such as soil, surface water, groundwater contamination and requirement for landfill space will also be significantly lower.

Municipal Solid Wastes

A total of 14 people will be employed during the operation phase. As a result, a maximum amount of only 14.4 kg of municipal solid waste will be generated each day. Of this figure, 4.32 kg that correspond to 30% of the total percentage, is expected to be packaging waste. The Project's operational phase impact on available landfill capacity of the province is therefore, considered to be negligible.

Hazardous and Special Wastes

Hazardous wastes expected to be generated during the operation phase of the Project include minor quantities of hydrocarbons (i.e. fuel, oil, lubricants required for maintenance operations) and materials that came into contact with these hydrocarbons and other hazardous materials used such as paint, equipment with SF_6 and pesticides (contaminated materials). It should be noted that, maintenance of vehicles during the operation will be performed outside the Project Area; at authorised services. Therefore, these services will be responsible for related special waste such as waste batteries, mechanical oil, scrap tires, etc.

10.3.3 Closure Phase

Since the construction phase activities and the closure phase activities are basically the same and both involve a relatively large workforce, the impacts identified for the construction phase are also applicable for the closure phase.

One exception to this is management of plant components that will be dismantled, since they have a potential to become waste in case they are not sent to related parties that can reuse or recycle them. Within the scope of the Project, all plant components will be dismantled and the site will be rehabilitated completely, unless related authorities (e.g. TEİAŞ in the current case) requests otherwise. During this phase, each decommissioned component will be sent to competent, licensed facilities for reuse/ recycling/ disposal, based on the technology and applicable legislation of the time:

- Any reusable component of the turbine nacelles, will be reused and the remaining components will be scrapped.
- Turbine blades and nacelle covers will most likely be recycled.
- Turbine towers will most likely be recycled.
- Substation components and electrical equipment, will be reused to the extent possible. In case this is not possible due to damage or heavy degradation of physical integrity, they will be transported to licensed facilities for disassembly. The remaining parts will be recycled or landfilled.
- Concrete used for foundations will also be removed and sent either to a concrete recycling facility or to a demolition waste disposal facility.

10.4 Mitigation Measures

The Waste Framework Directive (Directive 2008/98/EC) provides a waste hierarchy, as given in Figure 10-1. The waste hierarchy lays down priorities for best overall environmental option in applicable waste legislation and policy. Within this scope, the EU waste hierarchy will also be the hierarchal approach of the Project.

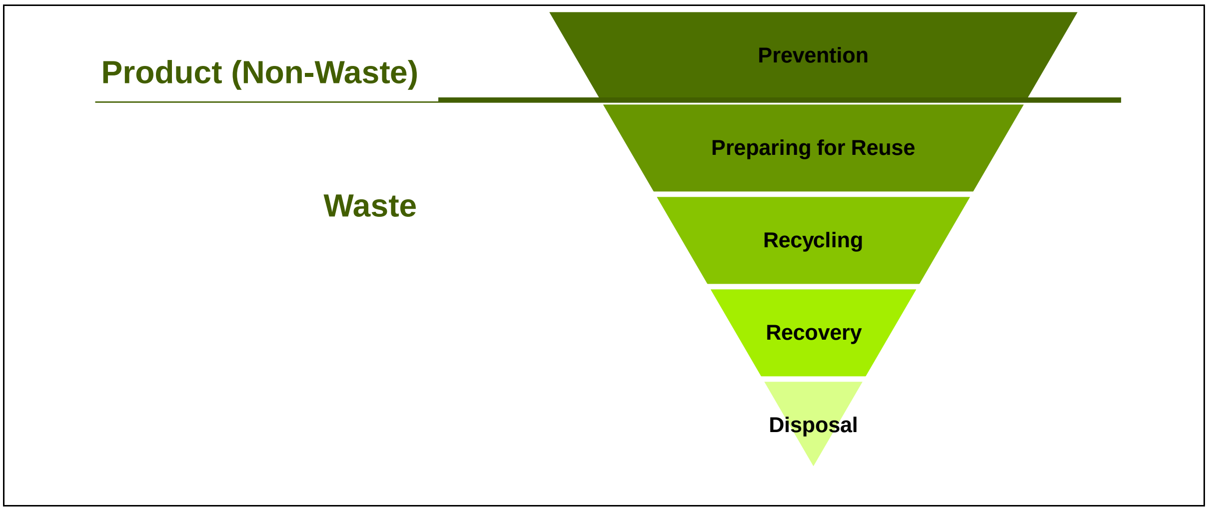


Figure 10-1. The Waste Management Hierarchy set by EU Waste Framework Directive

Source: Modified from European Commission website, https://ec.europa.eu)

The priority of the Project, will be to maximise conservation of resources and minimise waste generation at the source. Training for the construction phase personnel will be especially important for raising awareness in terms of waste generation. Where waste generation cannot be avoided, any generated waste will be evaluated for reuse, recycling, recovery and segregated accordingly, depending on the waste type. Where an onsite reuse option is not applicable, waste will be transported by licensed firms for further reuse, recycling and recovery options, also based on the waste type. Only in case no alternative is left, the ultimate option will be sending the waste to final disposal by landfilling.

The waste storage areas to be used within the scope of the Project will have following properties:

- Roof and sides of the storage areas will be properly covered and drainage will be provided to prevent surface water and rainfall from contacting the wastes.
- Reinforced concrete or similar impermeable materials such as epoxy will be used on the floors of storage areas.
- Proper drainage will be provided to collect any leakage.
- Adequate ventilation will be provided, in case storage of volatile wastes is required.
- Storage areas' access will be controlled by gates.
- Cautionary signage and boards with name and contact number of authorised personnel will be in place.
- Separate storage areas/compartments will be designated for diverse types of wastes.
- Secondary containment in line with related legislation and standards will be in place.
- Absorbents, firefighting equipment, etc. will be kept ready at a close location for immediate response in case of an emergency such as spills, fires.
- Non-hazardous waste producers are not obliged to obtain a permit for temporary storage of waste. They may temporarily store non-hazardous wastes up to 1 year in the storage area. Before the 1 year period expires, wastes must be sent to a licensed disposal facility.

The Waste Management Plan will be in place throughout all phases of the Project and the Plan will be periodically reviewed to ensure the existing best practice in waste management is implemented. Potential impacts and detailed mitigation measures to be implemented for each impact during construction, operation and closure phases are presented in Table 10-1.

Table 10-1. Waste Related Impacts, Proposed Mitigation Measures and Residual Impacts

Impact Description	Project Phase	Receptor	Impact Magnitude						Sensitivity/ Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Magnitude	Reversibility	Duration	Frequency	Overall Magnitude				
Additional load on region's waste management facilities (e.g. landfills, excavation storage areas, etc.)	• Land Preparation and Construction • Operation • Closure	• Regional waste management infrastructure	Wide	Negligible	Irreversible	Long term	Continuous	Negligible	Low	Negligible	• Ensure related waste disposal agreements with the Municipality and licensed recovery/disposal firms are in place. • Implement the Waste Management Plan.	Negligible
Improper waste management causing environmental pollution or nuisance	• Land Preparation and Construction • Operation • Closure	• Soil, surface water and groundwater environments	Local	Low	Short term reversible	Short to long term	Intermittent	Medium	Low	Minor	• Provide adequate and appropriate storage areas. • Ensure container types, labelling, classifying, etc., in the storage areas are in in line with Project standards. • Segregate hazardous and non-hazardous wastes at source. • Separate recyclable and non-recyclable solid waste and store separately until the related Municipality/ licensed firm collects it. • Ensure the firms that will conduct transport/ recovery/ disposal of non-hazardous waste are licensed. • Ensure that all excavation activities are implemented in line with the cut and fill program to minimise excavation waste. • Provide trainings to personnel on waste reduction, general waste management and housekeeping. • Under no circumstances, dispose of or bury waste on site • Implement the Waste Management Plan.	Negligible
Personnel and community health and safety (incl. odour)	• Land Preparation and Construction • Operation • Closure	• Personnel • Communities	Restricted	Low	Short term reversible	Short term	Intermittent	Low	High	Moderate	• Provide adequate and appropriate storage areas for all types of wastes. • Provide trainings to personnel on general waste management and housekeeping. • Under no circumstances, dispose of or bury waste on site. • Conduct visual checks on site to ensure proper housekeeping. • Implement the Grievance Mechanism. • Implement the Waste Management Plan.	Negligible
Loss of valuable material through improper waste management practices (losing recycling and reusing opportunities)	• Land Preparation and Construction • Operation	• Ecosystems • Economy	Wide	Low	Irreversible	Long term	One-off	Medium	Low	Minor	• Ensure container types, labelling, classifying, etc. in the storage areas are in in line with Project standards. • Ensure the firms that will conduct transport/ recovery/ disposal of waste are licensed. • Separate recyclable and non-recyclable solid waste and store separately until the related Municipality collects it. • Provide trainings to personnel on waste reduction and general waste management. • Implement the Waste Management Plan.	Negligible
	• Closure		Wide	High	Irreversible	Long term	One-off	High	Low	Moderate	• Ensure the decommissioning contractor has in place a detailed plan for handling of reusable, recyclable, recoverable turbine, substation and other plant components. • Ensure other mitigation proposed above for land preparation and construction phase and operation phase are in place for closure phase too.	Negligible

11. Biodiversity

11.1 Project Standards and GIIP

Mersinli WPP Project ESIA studies have been conducted in accordance to the Turkish legislation, as well as international environmental and social standards and guidelines, European Union (EU) legislation and all conventions and protocols applicable to the Project.

Chapter 2 of this ESIA Report explains the related Institutional Framework, Applicable Turkish Legislation including not only the Environmental and Social Legislation, but also the Labour Law and Regulations. International Environmental and Social Standards and Guidelines are also provided, which incorporate EBRD Environmental and Social Policy and Performance Requirements, and IFC Performance Standards and Environmental Health and Safety Guidelines.

In line with institutional and legal framework set for the Project, standards, guidelines and GIIP documents pertaining to biodiversity studies are presented in this chapter. Accordingly, within a similar framework, first an institutional background is provided on how conservation of biodiversity is managed at the Government level is explained, followed by applicable Turkish laws and regulations, as well as national plans and programs that are currently being implemented are elucidated. Although not official, there are also guideline documents that have been prepared by experts in their related fields on different elements of biodiversity, which are referred to as local references.

In terms of international standards and guidelines, the Project biodiversity studies have been conducted in line with EBRD PR6, as well as IFC PS6 requirements, in each of the phases completed so far including scoping, field surveys, data analyses, impact assessment and developing mitigation strategies. For different groups of biodiversity elements, and depending on the type of assessment they different species and habitats require a number of international guidelines and best practices were also utilized throughout this Report, all of which are mentioned in the related sections.

11.1.1 Institutional Framework

It is the responsibility of the Ministry of Forestry and Water Affairs (MoFWA) and its affiliated organisations to formulate policies concerning the conservation of biodiversity in Turkey, designate and manage protected areas under various statuses, to develop and implement plans and programs, to carry out activities in this scope and to ensure coordination among different institutions (National CHM to CBD, n.d.).

The affiliated organisations of the Ministry are the Special Environmental Protection Agency, the General Directorate of Forestry, the General Directorate of the State Meteorological Service, and the General Directorate of State Hydraulic Works. The provincial organisation of the MoFWA consists of the Provincial Directorates of Forestry and Water Affairs, as well as the regional directorates of the affiliated organisations.

The Ministry’s unit with primary authority and responsibility for the conservation and sustainable use of biological diversity is the General Directorate of Nature Conservation and National Parks, which is also the Convention on Biological Diversity (CBD) focal point. The General Directorate of Nature Conservation and National Parks is the principal unit responsible for the management of protected areas designated under the National Parks Law, for the conservation of wildlife and for the regulation and supervision of terrestrial hunting.

The Ministry of Food, Agriculture and Livestock is another important institution with authority and responsibility in the conservation and sustainable use of biological diversity. Duties and responsibilities of the Ministry of Food, Agriculture and Livestock, which concern biological diversity, are performed by its central and provincial organisations through the General Directorate of Agricultural Research, the General Directorate of Protection and Control and the General Directorate of Agricultural Production and Development, which are amongst its main service units.

11.1.2 Applicable Turkish Legislation

11.1.2.1 National Laws and Regulations

The Environment Law, dated August 9, 1983 and numbered 2872, aiming at the protection of the environment, the common asset of all living things, in accordance with the principles of sustainable environment and sustainable development, determines and provides for the basic principles related to protecting and improving the environment and preventing its pollution.

Law 5491 of April 26, 2006 amending the Environment Law states the importance of protecting biological diversity in Article 6 and introduces penal sanctions against damage to the environment, including the destruction of biological diversity, when detected through inspection and audits. The regulations issued on the basis of the Environment Law specify rules on the prevention of pollution and on environmental impact assessment. The laws and regulations for conservation of habitats and species in Turkey as the following:

- Law on National Parks
- Law for the Protection of Cultural and Natural Assets
- Decree-Law Establishing the Special Environmental Protection Agency
- Terrestrial Hunting Law
- Law on Fisheries
- Law for the Protection of Animals
- Regulation for the Protection of Wetlands
- Regulation for Implementing the Convention on International Trade in Endangered Species of Wild Fauna and Flora
- Regulation on Fisheries
- Regulation on Protection of Wildlife and Wildlife Development Areas

There are also laws and regulations effective in terms of protecting other environmental components, as well as to minimise pollution and ensure sustainable development and management of natural resources. Legislation on air quality control and management, environmental management and permitting, health and safety, management of chemicals and other dangerous substances, noise control and management, soil quality control, water quality control and management, and waste management, also ensure management of issues that might have secondary impacts on biodiversity components (see Chapter 2 on other related laws and regulations).

11.1.2.2 National Plans and Programs

In addition to the international conventions Turkey is a party to, which will be detailed in the upcoming sections, national environmental strategies have been set out over the past thirty years through preparation of various plans and programs, which can be listed as the following:

- National Environmental Action Plan (1998)
- National Plan for In-Situ Conservation of Plant Genetic Diversity (1998)
- National Agenda 21 Programme (2001)
- National Wetland Strategy (2003)
- Turkish National Forestry Programme (2004)
- National Science and Technology Policies 2003-2023 Strategy Document (2004)
- Turkish National Action Programme Against Desertification (2005)
- National Environmental Strategy (2006)
- National Rural Development Strategy (2006)

- National Biological Diversity Strategy and Action Plan (2007)

The National Biological Diversity Strategy and Action Plan, whose most recent update was completed in 2007, is a response to the obligation to prepare a national strategy for the purpose of guiding the implementation of the Convention on Biological Diversity (CBD). The aim of this Strategy is to identify and assess Turkey's biological diversity in brief, to determine a generally agreed strategy for conservation and to propose the actions required for achieving the goals of Biodiversity Conservation in Turkey. The Strategy defines the current legal responsibilities concerning biological diversity, underlines the importance of international cooperation intended for policy-making and the importance of the necessary research conditions to develop ecosystem management, and includes a definition and assessment of Turkey's biological diversity and the strategies and priority action plans towards the goals (MoEF, 2007).

11.1.2.3 Guidelines on National Threat Statuses of Flora and Fauna

Protected Areas

There are three important sources in the Turkish biodiversity literature that provide guidance on determining a site's status as a whole, especially when it is not a conservation area officially designated and protected by law, but is significant to be considered as a protected area. In "122 Important Plant Areas of Turkey", Ozhatay et al. (2008) define important plant areas (IPAs) from different regions of Turkey, based on internationally recognised criteria and locally collected data. Each IPA is explained in terms of its general characteristics, detailed flora species' composition, threats it faces and related conservation efforts if there are any.

Important Bird Areas (IBA) of Turkey have also been studied since 1990, through successive projects, which today are conducted by WWF-Turkey. An inventory that defines 97 IBAs, also in accordance with international selection criteria that had previously been developed by BirdLife International (Magnin & Yarar, 1997), was published in 1997 and is updated on regular basis as conservation studies continue across the country.

Doğa Derneği, partner of BirdLife International in Turkey, which has been working towards sustaining biodiversity since 2002 all across the country, through a number of projects covering a wide array of ecosystems, habitats, species, protected areas, as well as local communities and educational programs, initiated a comprehensive study on Key Biodiversity Areas (KBAs) in Turkey analysing a total of 472 sites from different regions. An inventory was published in 2006, which defines each site in terms of its outstanding characteristics and provides a detailed list of species and their global and regional threat statuses (Eken et al., 2006).

Flora

Plant specimens collected during field surveys were identified using the "Flora of Turkey and East Aegean Islands" (Davis, 1965-1988), while Turkish names of the identified species were compiled using the "Turkish Plant Names" by Prof. Dr. Turhan Baytop (Baytop, 1994). Threat statuses for flora species identified within the biodiversity study area were evaluated according to the categories and criteria presented in the reference book of Red Data Book of Turkish Plants (Ekim et al., 2000), which was prepared in accordance with the IUCN Red List criteria of 1994. The threat categories provided in this reference book were re-evaluated considering the population of endemic species within the site and also IUCN 2001 criteria.

Project flora and vegetation studies are conducted by Prof. Dr. Hayri Duman from Gazi University, whose knowledge and expertise leads to invaluable judgment on habitats and species that guide the studies.

Fauna

Unlike the Red Data Book of Turkish Plants (Ekim, et al. 2000) that provides a list for national threat statuses of flora species, on which a consensus have been reached among the scientific community in Turkey, there are no widely accepted threat lists established for fauna species. The references provided in this section are utilised to provide some form of evaluation, but they do not provide adequate information to make thorough assessments when it comes to make detailed assessments on critical and higher priority habitats and species.

It is therefore utterly important to rely on expert judgment in terms of statuses of fauna species in Turkey, as well as their populations, distributions and general ecology. Three experts have been engaged in Project fauna studies. Avifauna studies have been coordinated by Kerem Ali Boyla, an expert ornithologist, who also has vast experience with WPP impacts on birds. Bat studies have been carried out by Dr. Emrah Coraman, who is not only an expert on bats, but also a prominent evolutionary biologist. Last but not least, the all other groups of fauna have been researched by Prof. Mustafa Sözen from Bülent Ecevit University, who is an expert zoologist and taxonomist.

General and Turkish Zoogeography

This reference prepared by Prof. Dr. Ali Demirsoy and published by the former Ministry of Environment and Forestry lists the threat/conservation statuses for vertebrates in Turkey as presented in Table 11-1 (Demirsoy, 2002).

Table 11-1. National Threat Statuses for Vertebrates

Category	Definition
Ex	Extinct
E	Endangered
R	Rare species
V	Vulnerable species
I	Status of taxon is unknown
K	The category of taxon is unknown due to data deficiency
O	Species that are not threatened
nt	Widespread, abundant species that are not threatened

The Pocket Book for Birds of Türkiye

The Pocket Book of Birds of Turkey defines the criteria in Table 11-2 for birds in Turkey. The book provides an overview of species' statuses; yet, it does include range or distribution data for individual species, and therefore reliable information to support detailed assessments.

Table 11-2. National Threat Statuses for Bird Species

Category		Definition
Category A		
A.1.2	(CR)	Critically endangered and breeding species in Turkey
A.2	(EN)	Endangered and breeding species in Turkey
A.3	(VU)	Vulnerable and breeding species in Turkey
A.3.1	(D)	Declining, vulnerable and breeding species in Turkey
A.4	(NT)	Near threatened, breeding species do not face any risk now but are likely to qualify for the threatened category in near future in Turkey
A.5	(LC)	Least concern, breeding species that are widespread in Turkey
A.6	(DD)	Data deficient, breeding species on which there is deficient information in Turkey
A.7	(NE)	Not evaluated, breeding species which have not been evaluated in Turkey
Category B		
B.1.2	(CR)	Critically endangered and non-breeding species in Turkey
B.2	(EN)	Endangered and non-breeding species in Turkey
B.3	(VU)	Vulnerable and non-breeding species in Turkey
B.3.1	(D)	Declining, vulnerable and non-breeding species in Turkey
B.4	(NT)	Near threatened, non-breeding species do not face any risk now but are likely to qualify for the threatened category in the near future in Turkey

B.5	(LC)	Least concern, non-breeding species that are widespread in Turkey
B.6	(DD)	Data deficient, non-breeding species on which there is deficient information in Turkey
B.7	(NE)	Not evaluated, non-breeding species which have not been evaluated in Turkey

11.1.3 International Standards and Guidelines

11.1.3.1 EBRD Performance Requirement 6

EBRD Performance Requirement (PR) 6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources covers areas of biodiversity conservation, ecological functions of ecosystems, sustainable management of living resources, as well as the livelihood of indigenous people and affected communities whose access to or use of biodiversity or living natural resources may be affected by project activities. Accordingly, the objectives of PR6 are outlined as the following (EBRD, 2014: 44):

- To protect and conserve biodiversity using a precautionary approach;
- To adopt the mitigation hierarchy approach, with the aim of achieving no net loss of biodiversity, and where appropriate, a net gain of biodiversity; and
- To promote good international practice (GIP) in the sustainable management and use of living natural resources.

Mersinli WPP Project is a “Category A” project according to EBRD’s Environmental and Social Policy. Therefore, EBRD requires that a full Environmental and Social Impact Assessment (ESIA) is conducted for the Project in line with its performance requirements. In order to comply with the requirements of PR6, clients are required to identify how necessary actions will be taken throughout the life-cycle of the Project. These actions are to be managed within the scope of the environmental and social management systems (ESMS) and project-specific environmental and social management plans (ESMP), including a Biodiversity Management Plans and a Biodiversity Action Plan, if the Project is identified to have adverse impacts on a critical habitat.

EBRD PR6 requires that for conservation of biodiversity, if the assessments conducted within the scope of ESIA studies, potential impacts that the Project might have on biodiversity features are managed through mitigation strategies following a mitigation hierarchy and good international practice (GIP). It should also be identified whether the Project would have adverse effects on what might be evaluated as “priority biodiversity features” including threatened habitats, vulnerable species, other significant biodiversity features identified by various stakeholders, as well as ecological structure and functions needed to maintain the integrity of priority biodiversity features. The most sensitive of these biodiversity features are assessed according to the concept of “critical habitat”, which requires that habitat and species-specific action plans are prepared, as appropriate (EBRD, 2014).

11.1.3.2 IFC Performance Standard 6

A member of the World Bank, International Finance Corporation (IFC) provides financial support to private sector ventures and projects. In the projects, which they are funding, they implement the Performance Standards (PS) in order to manage social and environmental risks and impacts. PS 6 covers areas of biodiversity conservation, ecosystem services and sustainable management of living resources, which are all fundamental to achieve sustainable development. Accordingly, the objectives of PS 6 are outlined as the following (IFC, 2012a):

- To protect and conserve biodiversity.
- To maintain the benefits from ecosystem services.
- To promote the sustainable management of living natural resources through the adoption of practices that integrates conservation needs and development priorities.

Actions necessary to implemented to meet the requirements of PS 6 are managed within the scope of the Environmental and Social Management System (ESMS) of a project. Henceforth, the requirements can be listed as the following; considering direct and indirect impacts of the project on biodiversity and ecosystem services, avoiding such impacts, taking necessary measures to minimise them when avoidance is not possible, adopting an adaptive management system, protecting and conserving the biodiversity, managing ecosystem services and living natural resources, and evaluating the supply chain in terms of its potential impacts. IFC PS 6 also requires that a mitigation hierarchy is applied to protect and conserve biodiversity, which would include biodiversity offsets after appropriate avoidance, minimisation, and restoration measures are applied.

Within the scope of IFC PS 6, it is important to evaluate ecosystem services that a particular site offers, which include “benefits that people, including businesses, derive from ecosystems”. Accordingly, IFC defines four types of ecosystem services (IFC, 2012):

(i) Provisioning services, which are the products people obtain from ecosystems

(ii) Regulating services, which are the benefits people obtain from the regulation of ecosystem processes

(iii) Cultural services, which are the non-material benefits people obtain from ecosystems

(iv) Supporting services, which are the natural processes that maintain the other services

IFC requires that a project owner carries out a systematic review to identify priority ecosystem services, which are referred to as an Ecosystem Services Review (ESR). For the purposes of PS 6 implementation and the ESR, ecosystem services are categorised as two types (IFC, 2012: 42):

- **Type I:** Provisioning, regulating, cultural and supporting ecosystem services, over which the client has direct management control or significant influence, and where impacts on such services may adversely affect communities.
- **Type II:** Provisioning, regulating, cultural and supporting ecosystem services, over which the client has direct management control or significant influence, and on which the project directly depends for its operations

If a project has potential impacts on ecosystem services Type I and Type II ecosystem services should be reviewed through an Ecosystem Services Review and should be prioritised if (i) project operations are likely to result in a significant impact on the ecosystem service; and (ii) the project has direct management control or significant influence over the service.

Accordingly, Type I ecosystem services will be considered priority, if:

- Project operations are likely to result in a significant impact on the ecosystem service;
- The impact will result in a direct adverse impact on Affected Communities“ livelihood, health, safety and/or cultural heritage; and
- The project has direct management control or significant influence over the service.

On the other hand, Type II ecosystem services will be considered priority, if:

- The project directly depends on the service for its primary operations; and,
- The project has direct management control or significant influence over the service

11.1.4 European Union (EU) Environmental Legislation

The EBRD, as a signatory to the European Principles for the Environment, is committed to promoting the adoption of EU environmental principles, practices and substantive standards (as contained in EU secondary legislation, for example, regulations, directives and decisions) by EBRD-financed projects, where these can be applied at the project level, regardless of their geographical location. The European Union (EU) environmental legislation, in the most general sense, is set forth to ensure protection of air and water quality, conservation of resources and protection of biodiversity, waste management and control of activities which can have an adverse environmental impact, at both Member State level and internationally. Since the mid-1970s, EU environmental policy has been guided by action programmes defining priority objectives to be achieved over a period of years. The latest of these programmes was adapted by the European Parliament and the Council of the European Union in November 2013 and extends until the year 2020 (EC, 2014b).

Protection of biodiversity is one of EU’s key objectives, besides all other areas of environmental legislation. The Biodiversity Strategy for 2020 was adapted to protect and improve the state of biodiversity in Europe for the next decade. It identified six targets, which covers different aspects of biodiversity loss:

- Target 1: conserving and restoring nature
- Target 2: maintaining and enhancing ecosystems and their services
- Target 3: ensuring the sustainability of agriculture and forestry
- Target 4: ensuring sustainable use of fisheries resources
- Target 5: combating invasive alien species
- Target 6: addressing the global biodiversity crisis

Although not an EU Member State, Turkey has a set program for alignment with the EU Acquis, which comprises more than 200 major legal acts covering horizontal legislation, water and air quality, waste management, nature protection, industrial pollution control and risk management, chemicals and genetically modified organisms (GMOs), noise and forestry. A number of regulations have been adapted, yet there is a rather long way for Turkey to achieve in the field of biodiversity and nature protection.

Action 7 under Target 2 of the EU Biodiversity Strategy to 2020 seeks to ’ensure no net loss of biodiversity and ecosystem services’. It is composed of two complementary sub-actions. Action 7a foresees that, ’in collaboration with the Member States, the Commission will develop a methodology for assessing the impacts of EU funded projects, plans and programmes on biodiversity by 2014’ (EC, 2014b).

The Birds Directive (2009/147/EC)

Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (this is the codified version of Directive 79/409/EEC as amended). This Directive ensures far-reaching protection for all of Europe's wild birds, identifying 194 species and sub-species among them as particularly threatened and in need of special conservation measures. There are a number of components to this scheme (EC, 2014a, see Table 11-3):

- Member States are required to designate Special Protection Areas (SPAs) for 194 particularly threatened species and all migratory bird species listed in Annex I of the Birds Directive. SPAs are scientifically identified areas critical for the survival of the targeted species, such as wetlands. They are part of the Natura 2000 ecological network set up under the Habitats Directive 92/43/EEC.
- A second component bans activities that directly threaten birds, such as the deliberate killing or capture of birds, the destruction of their nests and taking of their eggs, and associated activities such as trading in live or dead birds (with a few exceptions).
- A third component establishes rules that limit the number of bird species listed in Annex III, which can be hunted (82 species and sub-species) and the periods during which they can be hunted. It also defines hunting methods which are permitted (e.g. non-selective hunting is banned).

Table 11-3. Annexes to the EU Birds Directive

Annex	Explanation
I	Species subject to special conservation measures concerning their habitat in order to ensure their survival and reproduction in their area of distribution
II	Species may be hunted under national legislation. Member States shall ensure that the hunting of these species does not jeopardise conservation efforts within their distribution area
III	Species whose sale, transport for sale, keeping for sale and the offering for sale of live or dead birds and of any readily recognisable part or derivatives of such birds is not prohibited provided that the birds have been legally killed or captured or otherwise legally acquired.

The Habitats Directive (92/43/EEC)

The Habitats Directive 92/43/EEC was adapted in 1992. The main aim of this Directive is to promote the maintenance of biodiversity, taking account of economic, social, cultural and regional requirements. While the Directive makes a contribution to the general objective of sustainable development; it ensures the conservation of a wide range of rare, threatened or endemic species, including around 450 animals and 500 plants. Some 200 rare and characteristic habitat types are also targeted for conservation in their own right (EC, 2014a).

The Habitats Directive (together with the Birds Directive) forms the cornerstone of Europe's nature conservation policy. It is built around two pillars: the Natura 2000 network of protected sites and the strict system of species protection. All in all the directive protects over 1,000 animals and plant species and over 200 so called "habitat types" (e.g. special types of forests, meadows, wetlands, etc.), which are of European importance.

Annexes I and II to the Directive contain the types of habitats and species whose conservation requires the designation of special areas of conservation. Some of them are defined as "priority" habitats or species (in danger of disappearing). Annex IV lists animal and plant species in need of particularly strict protection at national level (see Table 11-4).

Table 11-4. Annexes to the EU Habitats Directive

Annex	Explanation
I	Natural habitat types of community interest whose conservation requires the designation of special areas of conservation
II	Animal and plant species of community interest whose conservation requires the designation of special areas of conservation
III	Animal and plant species of community interest in need of strict protection
IV	Animal and plant species of community interest whose taking in the wild and exploitation may subject to management measures
V	Natural habitat types of community interest whose conservation requires the designation of special areas of conservation

11.1.5 International Conventions and Protocols

Turkey is party to a number of conventions on different aspects of biological diversity, which are listed below are also part of its national legislation. Although, not all of the listed conventions are directly within the scope of this Project, yet each of these conventions were considered in terms of their relevance. Therefore, it is worth putting forth the binding framework for any project undertaken in Turkey:

- Convention on Biological Diversity (CBD) (1997) and the Cartagena Protocol on Biosafety
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- Convention on the Conservation of Migratory Species of Wild Animals (CMS) / Agreement on the Conservation of Populations of European Bats (EUROBATS)
- Convention to Combat Desertification (CCD)
- Convention on Wetlands of International Importance, Especially as Waterfowl Habitat (RAMSAR)
- Convention for the Protection of World Cultural and Natural Heritage
- Convention for the Prevention of Marine Pollution from Ships (MARPOL)
- Convention on Plant Genetic Resources for Food and Agriculture
- Convention for the Conservation of European Wildlife and Natural Habitats (BERN)
- European Landscape Convention
- Convention for the Protection of Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention) (1981) and its protocols including the Protocol on Special Protected Areas and Biological diversity in the Mediterranean
- Convention for the Protection of the Black Sea Against Pollution (Bucharest) (1994) and its protocols including the Protocol for the Protection of Biological and Landscape Diversity in the Black Sea

11.1.5.1 Convention on Biological Diversity (CBD)

Amongst the conventions listed in Chapter 2, the United Nations Convention on Biological Diversity is the one that sets the stage for the Project biodiversity studies, in terms of not only providing a globally recognisable definition of biological diversity but also defining clear strategies on conservation of biodiversity that are to be addressed within the scope of this Report.

The United Nations Environment Programme (UNEP) convened the Ad Hoc Working Group of Experts on Biological Diversity in November 1988 to explore the need for an international convention on biological diversity. Soon after, in May 1989, it established the Ad Hoc Working Group of Technical and Legal Experts to prepare an international legal instrument for the conservation and sustainable use of biological diversity. The experts were to take into account "the need to share costs and benefits between developed and developing countries" as well as "ways and means to support innovation by local people". By February 1991, the Ad Hoc Working Group had become known as the Intergovernmental Negotiating Committee. Its work culminated on 22 May 1992 with the Nairobi Conference for the Adoption of the Agreed Text of the Convention on Biological Diversity. The Convention was opened for signature on 5 June 1992 at the United Nations Conference on Environment and Development (the Rio "Earth Summit"). It remained open for signature until 4 June 1993, by which time it had received 168 signatures. The Convention entered into force on 29 December 1993, which was 90 days after the 30th ratification. The first session of the Conference of the Parties was scheduled for 28 November – 9 December 1994 in the Bahamas (CBD, 2014). Turkey ratified the Convention in 1996, and since then prepared four National Reports on Biological Diversity, the latest of which is dated 2007.

In year 2010, the Conference of Parties (COP) of the Convention adapted a revised and updated Strategic Plan for Biodiversity, which also included the Aichi Biodiversity Targets for the period of 2011-2020. The targets provide a framework for action by all stakeholders to save biodiversity and enhance its benefits for people (CBD, 2014):

- Strategic Goal A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society
- Strategic Goal B: Reduce the direct pressures on biodiversity and promote sustainable use
- Strategic Goal C: Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity
- Strategic Goal D: Enhance the benefits to all from biodiversity and ecosystem services
- Strategic Goal E: Enhance implementation through participatory planning, knowledge management and capacity building

11.1.5.2 Convention for the Conservation of European Wildlife and Natural Habitats

Convention for the Conservation of European Wildlife and Natural Habitats (Bern Convention) was put forward in 1982 in order to protect the European wildlife and natural habitats. Species to be protected according to the Bern Convention are listed in four appendices, which are presented in with their explanations:

Table 11-5. Annexes to the Bern Convention

Annex	Explanation
I	Natural habitat types of community interest whose conservation requires the designation of special areas of conservation
II	Animal and plant species of community interest whose conservation requires the designation of special areas of conservation
III	Animal and plant species of community interest in need of strict protection
IV	Animal and plant species of community interest whose taking in the wild and exploitation may subject to management measures
V	Natural habitat types of community interest whose conservation requires the designation of special areas of conservation

The Convention aims at conserving and promoting biodiversity, developing national policies for the conservation of wild flora and fauna and their natural habitats, protection of the wild flora and fauna from the planned development and pollution, developing trainings for protection practices, promoting and coordinating the researches made regarding this subject. It has been signed by 26 member states of the European Council (as well as Turkey) with the aim of conserving the wild life in Europe. Species that are not included within the appendices of the Convention are those that do not require any special protection. Species are not listed individually but instead are protected due to the habitat protection approach of the Bern Convention. All of the nations, which are party to the Bern Convention, have signed the Convention on Biological Diversity as well. Parties of this convention are responsible from ensuring sustainable use of resources in line with their national development trends and conserving the threatened species.

11.1.5.3 Convention on International Trade in Endangered Species of Wild Flora and Fauna

Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) is an international agreement that has been ratified by governments of 164 states (including Turkey), whose aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. The principles of CITES are based on sustainability of the trade in order to safeguard ecological resources (live animals and plants, vast array of wildlife products derived from them, including food products, exotic leather goods, etc.). CITES was signed in 1973 and entered in force on July 1, 1975. Turkey ratified the Convention in 1996. Categories and species included in CITES are listed in three different appendices based on their protection statuses. These appendices and their explanations are given in Table 11-6.

Table 11-6. Annexes to the Bern Convention

Annex	Explanation
I	covers the species, which are under the threat of extinction. Trade in the specimens of these species is not allowed except extraordinary circumstances
II	includes species, which are not threatened with extinction, but trade in specimens is restricted in order to prevent utilisation incompatible with their survival
III	for which other parties of CITES is applied for assistance in controlling trade and which are conserved at least in one country.

11.1.6 IUCN Red List of Threatened Species

The International Union for Conservation of Nature (IUCN) Species Programme, together with the IUCN Species Survival Commission (SSC) has been providing assessments on conservation statuses of a whole range of taxa, including species, subspecies, varieties and even subpopulations of certain species around the globe, in order to draw attention to especially those that are threatened with extinction. Using the IUCN Red List Categories and Criteria, the IUCN Red List of Threatened Species provides information on species' taxonomy, conservation status and distribution, which have been evaluated globally. The main purpose of the system that the IUCN puts forth is to "catalogue and highlight those plants and animals that are facing a higher risk of global extinction (ie. those listed as Critically Endangered, Endangered and Vulnerable)" (IUCN, 2017).

IUCN Red List Categories, as presented in Figure 11–1 (IUCN SPSC, 2017, p.10), appointed to species based on their global conservation statuses, is the world's most comprehensive and commonly used inventory, which provides a strong basis for assessments made within the scope of Project biodiversity studies.

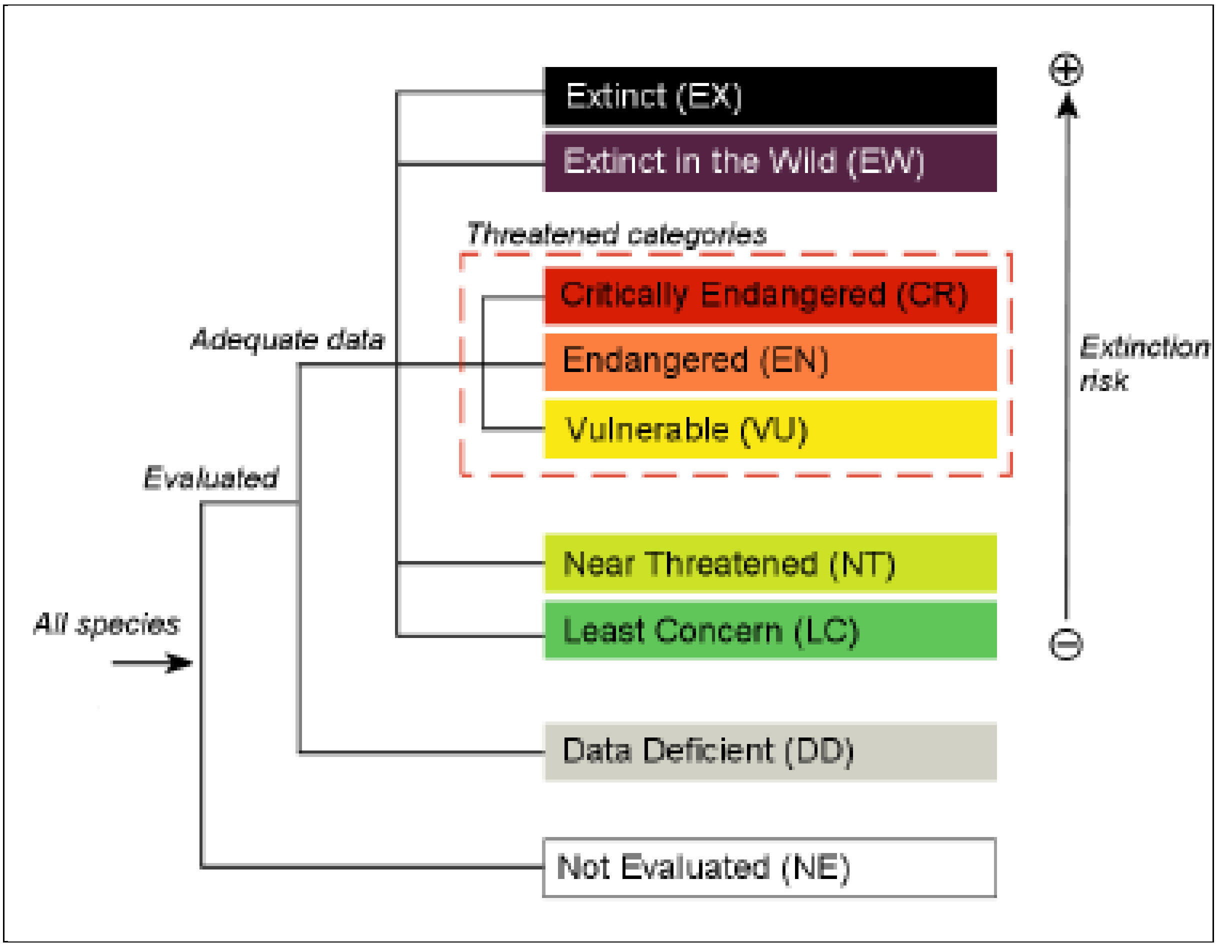


Figure 11–1. Structure of the IUCN Red List Categories

11.2 Mersinli Biodiversity Study Area

Mersinli WPP Project is located within the administrative borders of Kemalpaşa, Torbalı and Bayındır districts of İzmir province, at the localities of Çardaklı Tepe, Kartal Tepe, Mersinli (Marmariç), Karlık Tepe and Akçam Tepe. The License Area, designated by the Energy Market Regulatory Authority (EMRA) in the scope of Project's Electricity Generation License provided on 5 July 2012, covers 1,650 ha.

License Area is located approximately 35 km (air distance) southeast of the İzmir city centre. Main access to the site is provided through the district centre of Kemalpaşa, which is located in the north-west of the License Area. From Kemalpaşa district centre, Kemalpaşa-Dağkızılca state road will be followed for about 10 km, which diverges to east near Dereköy neighbourhood to provide access to an existing WPP, namely Fuat WPP that operates in the north/north-east of the Mersinli WPP License Area. Fuat WPP's existing access road will be used for about 10 km until the border of the License Area, where the main entrance of the Project will be located. Alternatively, access can also be provided from the direction of Torbalı district centre, which is located in the southwest of the License Area.

The site is generally mountainous, with a complex terrain and elevations ranging between 462 m and 953 m at the Project License Area. The main ridge, where turbines are distributed on, lies in a general north-west/south-east direction for approximately 6 km. The License Area consists mainly of lands registered as forest, while private parcels used for agriculture are also located within the License Area. Within the License Area, footprints of all Project units, including turbines, access roads and others, correspond to the lands registered as forest and no private land is used.

Forests of the Project License Area are mostly composed of Turkish pine (*Pinus brutia*) forests. While parts of these forests maintain their natural value, some parts have been rejuvenated. There are also black pine (*Pinus nigra*) forests distributed at the north-facing slopes of 800 m of elevation between Turbine-14 and Turbine-15. However, these forests are not widespread due to the fact that altitudes between 750 and 800 meters are the lowest elevation that black pines are found in this region.

Biodiversity baseline surveys and BAP studies have been conducted in a wider area, defined as the Biodiversity Study Area, which includes the Project License Area, as well as surrounding habitats including reference sites outside the Project footprint, which include habitats with similar ecological characteristics and sufficient carrying capacity to be inhabited especially for terrestrial fauna features.

For analysis of impacts on biodiversity, and critical habitat assessment, an ecologically sensible unit of analysis has been defined as the Mersinli Discrete Management Unit (DMU), in line with EBRD PR 6. With an approximate area of 6680 ha, the DMU includes Project components and a wider area of analysis as presented in Figure 11–2. The DMU boundaries were established based on habitat continuance and topographic thresholds, under the guidance of the Project expert botanist, based on his initial work at the License Area, and also expert judgment from having studied in the wider Aegean Region over the last few decades. The DMU is main unit of analysis for biodiversity studies, unless otherwise stated as an exceptional requirement for a specific habitat or species.

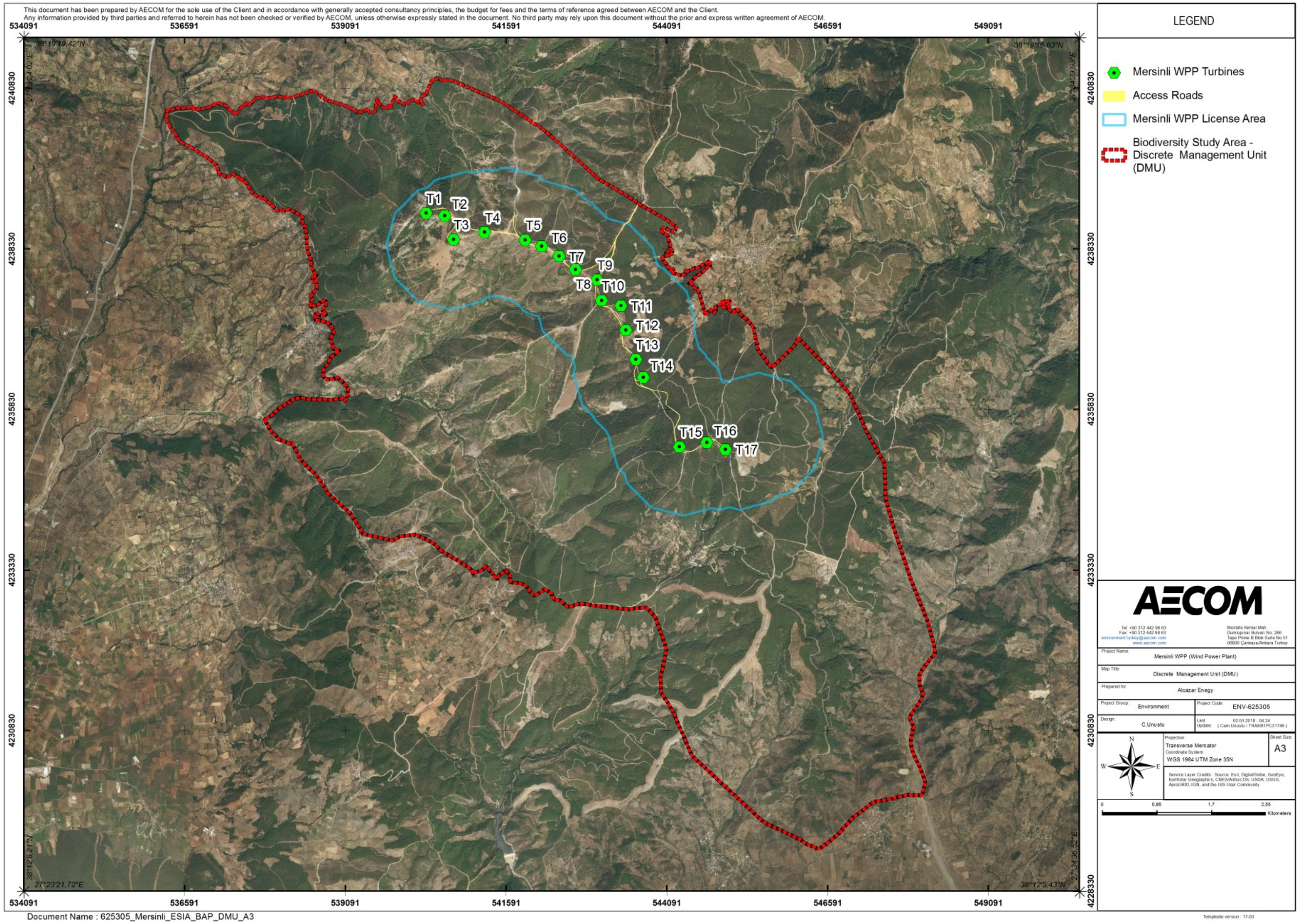


Figure 11–2. Mersinli Biodiversity Study Area - Discrete Management Unit (DMU)

11.3 Protected Areas and Designated Sites

The International Union for Conservation of Nature (IUCN, 2017; IUCN, 2008) proposes the following definition for a protected area, which today is widely used around the globe, and accepted as the most appropriate and valid definition by EBRD to be recognised to comply with provisions of PR 6:

> *"A protected area is a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values."*

Protected areas constitute an integral part of biodiversity conservation efforts, as well as ecosystem services provided by ecological functions they convey. In Turkey, Ministry of Forestry and Water Affairs (MoFWA) is the main official body responsible for development and implementation of national biodiversity conservation policies, action plans, designation of conservation areas, and many other related tasks conducted by its central and local within the Ministry's organisational structure. The General Directorate of Nature Conservation and National Parks of the Ministry, defines seven different categories of national nature conservation areas in Turkey within its "Protected Area System". The process of designating a site in one of these categories considers not only the site's ecological value, but also its geological, geomorphological, landscape, historical, archaeological and cultural characteristics (MoFWA, 2013).

There are also regionally recognised areas under the European Commission Wild Birds Directive, and areas that are of global conservation value, which are given different statuses and are under protection by different laws and regulations in Turkey, all of which sum up to be 7.24% of the terrestrial land in the country. Categories of national, regional and global nature conservation areas are listed in Table 11-7 below, as appointed by the Ministry (MoFWA 2013).

Table 11-7. Categories of Legally Protected Areas in Turkey*

Category	Level of Conservation
National Park	National
Nature Protection Area	National
Nature Park	National
Natural Monument	National
Wildlife Reserve	National
Conservation Forest	National
Natural Protection Area (SIT)	National
Special Protection Area (SPA)	Regional
Ramsar Site	Global
Biosphere Reserve	Global
UNESCO World Heritage Site	Global

**Adapted from MoFWA (2013)*

The Project License Area does not overlap with any national, regional and/or global designated sites protected under the above-listed categories of Protected Area System in Turkey. In line with the national Environmental Impact Assessment procedure, official views of both Governship of İzmir, Directorate of Environment and Urbanisation, and Ministry of Environment and Urbanisation, General Directorate for Protection of Natural Assets that the Project License Area is not included within a Natural Protection Area (see PROÇED, 2016 for the official statements obtained for the Project).

The nearest designated area is İzmir Bayındır Ovacık Wildlife Reserve, located at a distance of about 11 km to the east of the Project License Area (see Figure 11–3). The other protected areas at the national and global levels, which are located within a 50-km radius of the Project License Area are further given in Table 11-8.

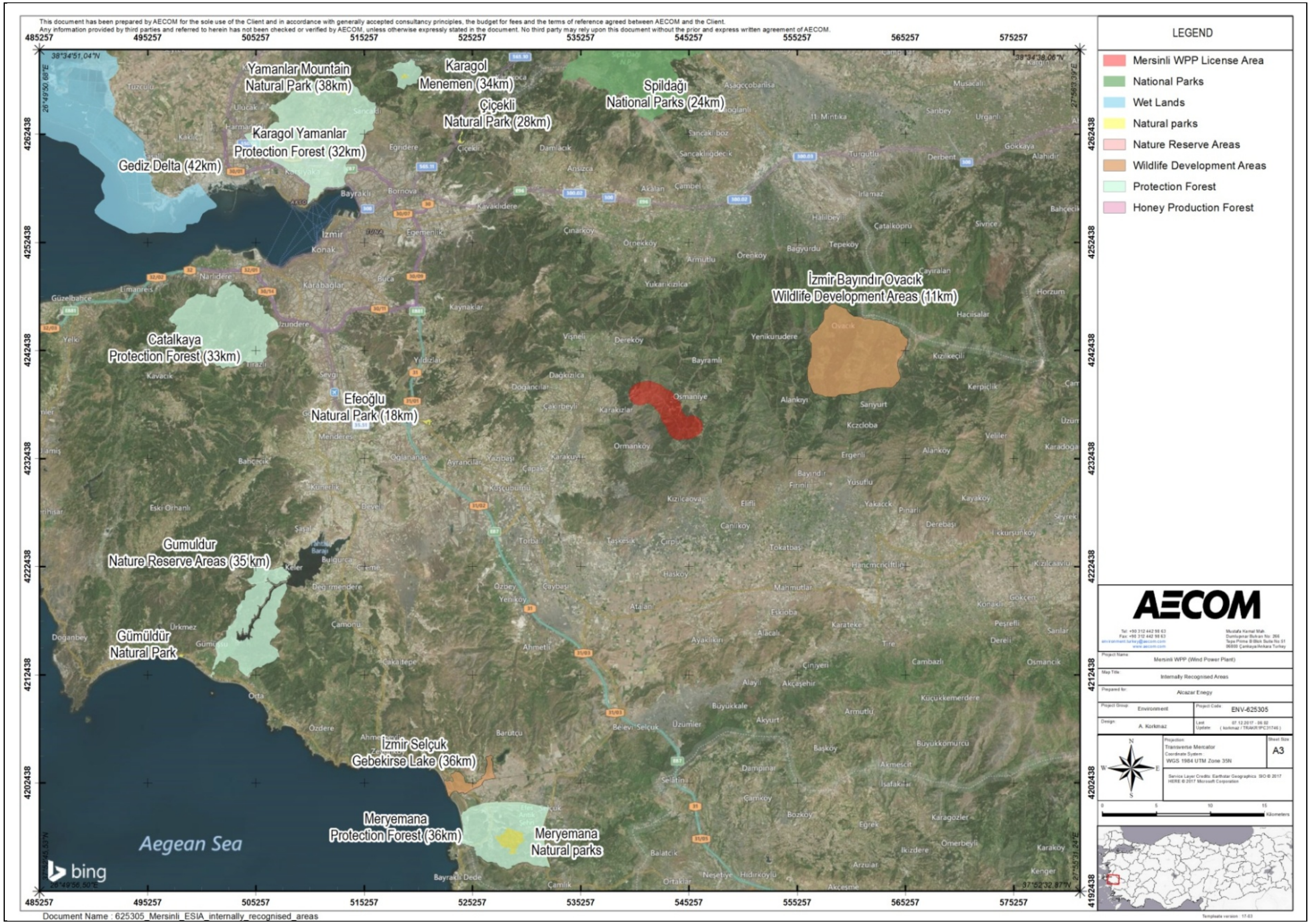


Figure 11–3. Regional Protected Area Map

Table 11-8. Legally Protected Areas Around the Project License Area

Name	Category	Distance from the Project License Area
Bayındır Ovacık	Wildlife Development Area	11 km
Efeoğlu	Nature Park	18 km
Spil Dağı	National Park	24 km
Çiçekli	Nature Park	28 km
Karagöl Yamanlar	Protection Forest	32 km
Çatalkaya	Protection Forest	33 km
Gümüldür	Nature Park	35 km
Gebekirse Gölü	Wildlife Development Area	35 km
Meryemana	Nature Park	36 km
Gediz Deltası	Ramsar Site	42 km

Besides the Ministry's official work, there are also various non-governmental organisations (NGOs), academic entities, as well as individual researchers and professionals who work in collaboration or independently to better understand Turkey's natural resources and put forward effective conservation strategies to ensure survival of habitats and species, some of which constitute unique ecosystems of global conservation value.

Doğa Derneği, also the partner of BirdLife International in Turkey, is one of the NGOs, which have been working towards sustaining biodiversity since 2002 all across the country, through a number of projects covering a wide array of ecosystems, habitats, species, protected areas, as well as local communities and educational programs. Following their initial work combined with other literature and expert input, in 2006 Doğa Derneği published an inventory of Key Biodiversity Areas (KBA) in Turkey analyzing a total of 472 sites from different regions of the country (Eken et al., 2006). The study was conducted in collaboration with then the Ministry of Environment and Forestry, as well as other non-government organisations, civil society, academicians and researchers, both from Turkey, and other countries. Despite the involvement of the Ministry, it is clearly stated in the inventory that results of the inventory are not binding for Turkey, nationally or internationally.

The preparation of the inventory was the first time the KBA approach was applied at a national scale, which was based on principles developed by BirdLife International for bird species in their "Important Bird Areas" studies. One of the fundamental functions of the inventory is defined as "providing resource for areas and species that should be worked upon to reach zero extinction" (Eken et al., 2006, p.23). The inventory still stands as an important guidance in Turkey, due to its wide coverage of terrestrial and aquatic natural systems and detailed lists of species.

Eken et al. (2006) describe how until the inventory was published, most of the conservation effort had focused on species, and continue suggesting that in order to conserve biodiversity as a whole, a methodology that utilises quantitative criteria should also be applied in selecting protection areas. The inventory recognises that this landscape-scale conservation alone would not be sufficient in maintaining biodiversity in the long-run. Therefore, it is also suggested that KBAs are used together with an ecosystem approach (Eken et al., 2006, p. 60).

Another important note is that KBAs are not defined as preservation areas, where there would be no human settlements. Eken et al. (2006) also mention how each KBA should be appointed an appropriate conservation status based on its location and conditions. Identification of KBAs is considered as the first step of an ongoing conservation process, which should be followed by a gap analysis, priority listings and planning (Eken et al., 2006, p. 60).

Based on this very first step of a conservation effort in the Aegean Region of Turkey, the inventory identified “Boz Dağlar” as one the KBAs in Turkey with a surface area of 236,126 hectares. Elevation at Boz Dağlar mountain range changes between 40 and 2,159 meters above sea level. Eken et al. (2006) list a total of 38 plant taxa meeting the KBA criteria, four of which are locally endemic species of *Anthemis xylopoda, Scilla luciliae (Chionodoxa luciliae), Hieracium sericophyllum*, and *Ornithogalum improbum.* In addition there are bird, mammal, amphibian and butterfly species. Boz Dağlar KBA flora and fauna species are listed in Table 11-9, with two additional species; *Prangos hulusii* and *Pyrus anatolica*, which were not listed by the KBA inventory but are known to be distributed in the upper zones of the area based on research of the Project botanist. The inventory does not provide a detailed assessment, other than brief explanations on habitats and species of conservation concern.

Table 11-9. Boz Dağlar KBA-Listed Flora and Fauna Species

Species	Red Data Book Category
Plants	
Anthemis xylopoda	CR
Chionodoxa sardensis	CR
Erysimum caricum	CR
Ferula anatolica	CR
Prangos hulusii	CR
Anthemis dipsacea	EN
Bromus macrocladus	EN
Chionodoxa luciliae	EN
Colchicum micaceum	EN
Corydalis lydica	EN
Cyclamen mirabile	EN
Hesperis buschiana	EN
Hieracium tmoleum	EN
Ornithogalum improbum	EN
Pyrus anatolica	EN
Sedum samium subsp. *samium*	EN
Astragalus nervulosus	VU
Campanula teucrioides	VU
Centaurea aphrodisea	VU
Chronanthus orientalis	VU
Doronicum reticulatum	VU
Jasione supina subsp. *tmolea*	VU
Jurinea cadmea	VU
Linum aretioides	VU
Minuartia recurva subsp. *carica*	VU
Minuartia saxifraga subsp. *tmolea*	VU
Paronychia anatolica subsp. *balansae*	VU
Papaver argemone subsp. *davisii*	VU
Pseudophleum gibbum	VU
Rumex tmoleus	VU
Tordylium macropetalum	VU
Sideritis tmolea	VU

Species	Red Data Book Category
Plants	
Cirsium sipyleum	NT
Echinophora trichophylla	NT
Lamium pisidicum	NT
Nepeta nuda ssp.lydiae	NT
Ornithogalum improbum	EN
Ornithogalum nivale	LC
Sedum samium ssp. *samium*	EN
Sternbergia schubertii	-
Velezia hispida	LC
Verbascum phyrgium	NT
Birds	
Buteo rufinus	LC
Circaetus gallicus	LC
Coracias garrulous	NT
Dendrocopos medius	LC
Dendrocopos syriacus	LC
Emberiza hortulana	LC
Lanius nubicus	LC
Lullula arborea	LC
Phyrrhocorax pyrrhocorax	LC
Sitta krueperi	NT
Mammals	
Capreolus capreolus	LC
Microtus subterraneus	LC
Amphibians	
Triturus karelinii	LC
Butterflies	
Archon apollinus	EN
Glaucopsyche alexis	VU
Parnassius apollo	VU
Pseudophilotes vicrama	VU

AECOM approached Doğa Derneği in October of 2017, to acquire information on the current status of Boz Dağlar KBA. The request for information sought answers to questions like whether Doğa Derneği has any up-to-date information on other projects in the area that could be considered in assessment of cumulative impacts, there have been any cumulative impact assessment studies regarding impacts on birds and bats, and there are any bird/bat baseline and monitoring studies available. Although no contact had been reached with a representative until the date this Report was submitted, both the Project Company and AECOM are open for collaboration with Doğa Derneği with any input they would like to make in terms of the assessment of the area.

It is worth mentioning that being close to İzmir, flora of the region has been studied many times over the years, and is quite well-known. The inventory of “122 Important Plant Areas in Turkey” also identifies Boz Dağ as an IPA, covering a smaller area in comparison to Boz Dağlar KBA (Özhatay et al.,2008). A map showing Boz Dağlar KBA, Boz Dağ IPA and the Project License Area is provided in Figure 11–4.

All available data and expert opinion from the Project botanist, Prof. Hayri Duman, who had previously visited and studied the area several times over the past 30 years, the last being within the scope of Project biodiversity studies in November of 2017, suggest that what constitutes the major KBA-trigger, which might be at higher risk, is the endemic flora composition of the area. Based on these references, and research of Prof. Duman, Table 11-9 provides a list of endemic species that are of higher conservation concern, which have been recorded in the area. The table also provides IUCN Red List categories of the species according to the Red Data Book of Turkish Plants (Ekim et al., 2000), as some of these regional and local endemic species do not have global evaluations to be included in the IUCN Red List.

Among these species, those that are categorised as CR, namely; *Anthemis xylopoda, Hieracium tmoleum, Ornithogalum improbum*, *Minuartia saxifraga* subsp. *tmolea, Paronychia anatolica* subsp. *balansae, Campanula teucrioides, Jasione supina* subsp. *tmolea* and *Prangos hulusii,* are only known from this area, which make Boz Dağlar an important plant area due to their restricted ranges. All of these species are concentrated at the eastern half of the mountain range, at steppes and rocks of 1400-2160 meters with schist and calcareous main rock foundation. Özhatay et al. (2008) also clearly state that “many of the rare plant species recorded at Boz Dağ, are only found at the alpine zone (over 1900 meters above sea level)” (p.152).

Mersinli WWP Project is located at the southwest end of the Boz Dağlar mountain range, at an altitude of 700-900 meters, covered with *Pinus brutia* forests. There are schistic rocks only sparsely distributed in the area. Project flora and vegetation studies, details of which is provided in the next section, also revealed presence of none of the endemic species listed in Table 11-9. As a matter of fact, habitats within the Project License Area (see Figure 11–12 for the detailed habitat map of the Project License Area) are not suitable enough for any of these regional and local endemic species even as a tampon zone.

Based on all available data, although included within the boundaries of Boz Dağlar KBA according to Eken et al. (2006), if designated a conservation status, the Project License Area would fall completely outside of not only the core zone, but also the potential tampon zones of Boz Dağlar protected area. The Project-related activities are expected to have no impact on this particular zone, given distribution and range of these regional and local endemic species.

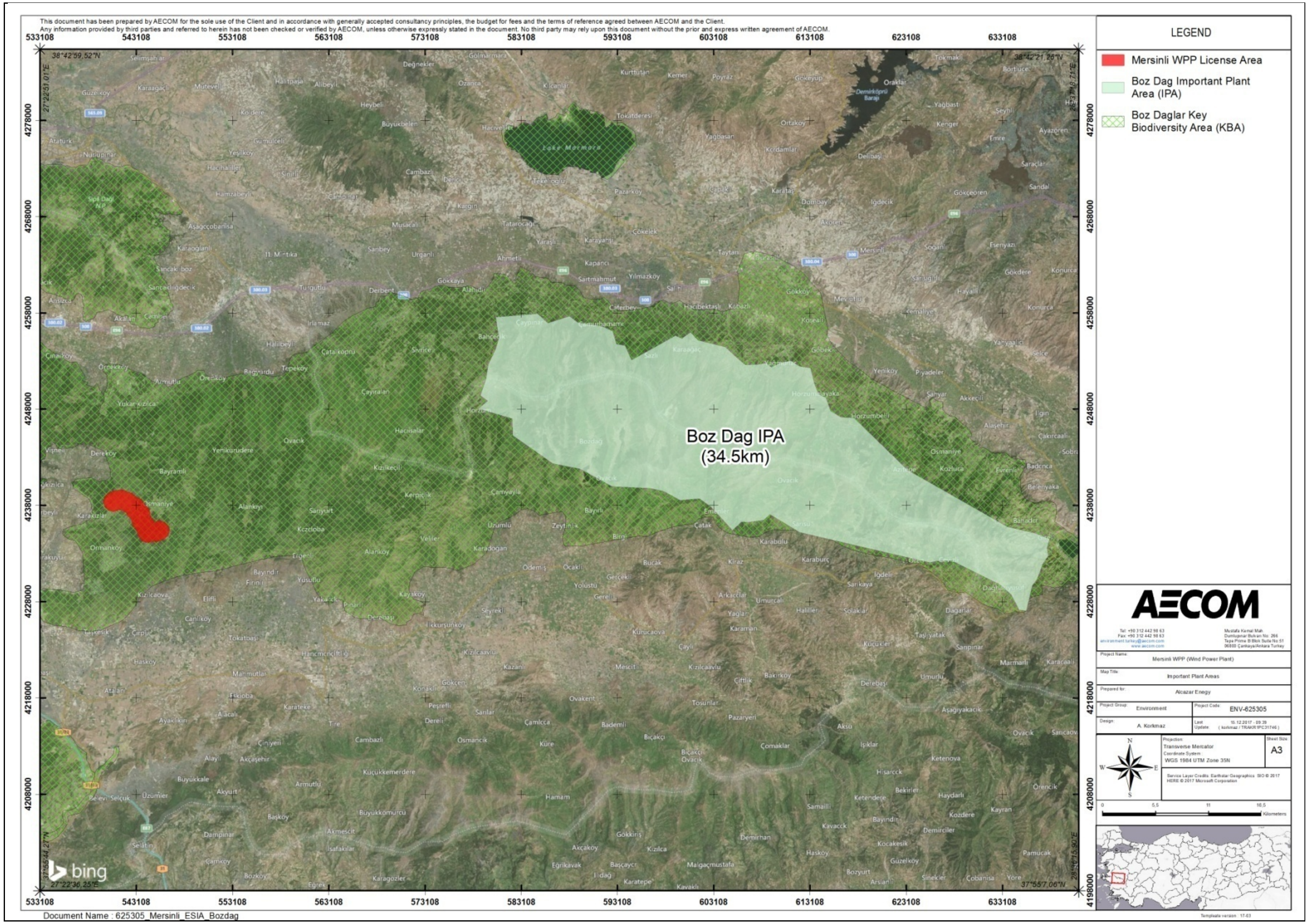


Figure 11–4. Project License Area with respect to Boz Dağ IPA and Boz Dağlar KBA

11.4 Terrestrial Flora and Fauna Studies

11.4.1 Flora and Vegetation

Terrestrial flora and vegetation surveys, within the scope of Project biodiversity studies, were conducted to identify habitat types, vegetation characteristics and flora elements of both the Project footprint that would be directly impacted by the proposed WPP activities, and the wider License Area to include reference sites for future potential restoration and/or transplantation locations. The main objective of terrestrial flora and vegetation studies is to understand the floristic composition in the area, determine the degree of potential impact due to the Project, and put forward effective mitigation measures. Habitats are also studied in detail, which provide a basis for terrestrial fauna studies as well.

Mersinli WPP Project ESIA Report includes the first set of data and the following assessments based on the field surveys conducted in November of 2017. Habitat and flora composition of the area will be studied in further detail following another survey in spring of 2018, which will be incorporated into the Biodiversity Action Plan (BAP). Mersinli BAP will be prepared to include a more thorough assessment, as well as species and habitat-specific actions to be implemented to ensure no-net-loss of habitats and flora species.

The Project License Area, where terrestrial flora and vegetation studies were conducted, is mostly composed of Turkish pine (*Pinus brutia*) forests. A general overview of the site is presented in Figure 11–5. While parts of these forests maintain their natural value (see Figure 11–6), some parts have been rejuvenated (see Figure 11–7). There are also black pine (*Pinus nigra*) forests distributed at the north-facing slopes of 800 m of elevation between Turbine-14 and Turbine-15 (see Figure 11–8). However, these forests are not widespread due to the fact that altitudes between 750 and 800 meters are the lowest elevation that black pines are found in this region. The highest point of the Project License Area is about 900 meters. At the southwestern parts of the Project License Area there is degraded maquis vegetation. Most of the agricultural land within the Project License Area is used for rainfed agriculture, where *Cerasus avium* (Cherry) is the main produce.

Figure 11–5. Overview of the Project License Area Vegetation

Figure 11–6. Natural *Pinus brutia* Forests

Figure 11–7. Rejuvenated *Pinus brutia* Forests

Figure 11–8. *Pinus nigra* Forests

11.4.1.1 Flora and Vegetation Surveys

In order to identify flora species at the Project License Area, as well as to define habitats and vegetation characteristics, the first survey within the scope of Project biodiversity studies was conducted in November of 2017. The surveys covered the entire License Area as the study area. Flora species were either identified on-site, or collected samples were taken to the laboratory for further taxonomical analysis. Based on field surveys, a list of flora species has been prepared to be updated with upcoming surveys in spring of 2018 (see Table 11-10).

Plants collected at the Project License Area were identified using "Flora of Turkey and East Aegean Islands" (Davis, 1965-1988). The Turkish names of the identified species were compiled using the "Turkish Plant Names" by Prof. Turhan Baytop (Baytop, 1994). In identifying endemic and non-endemic but rare species, the main reference was "Red Data Book for Turkish Plants" by Prof. Tuna Ekim et al (2000). The threat categories provided in this reference book were re-evaluated considering the population of endemic species within the site and also IUCN 2001 criteria.

The flora list is given in the phylogenetic order; ferns (Pteridophyta), open-seeded plants (Gymnospermae) and closed-seeded plants (Angiospermae). Each genera and species that fall under these groups are listed alphabetically to make it easier to follow. While listing the species, their phytogeographic region, endemism levels, threat statuses of endemic and rare plant species, their inclusion in Bern or CITES lists, habitats and abundance in the area are also included in the list.

Habitats identified in the area were assessed according to the European Nature Information System (EUNIS) and a detailed classification was made. These habitats and also identified flora species were also compared to species lists and habitat information provided in the KBA (Eken et al., 2006) and IPA (Ozhatay et al. 2008) inventories.

Flora of the Aegean Region of Turkey, especially that of İzmir and its surroundings, has been studied quite extensively, and is therefore very well-known. Phytogeographically, the entire region belongs to the Mediterranean region, and is under the influence of the Mediterranean climate.

Based on the flora and vegetation surveys conducted at the Project License Area, a total of 219 taxa, which belong to 50 plant families were identified. Only three of these species are endemic to Turkey; *Campanula lyrata subsp. lyrata, Verbascum parviflorum* ve *Stachys cretica* subsp*. smyrnaea*, all of which are widespread endemic species. Although not endemic, another significant species at the site is *Cyclamen hederifolium*, which is listed under the CITES, as its tubers are used commercially in the ornamental plant sector (see Figure 11–9). Examples of flora species identified at the site are shown in Figure 11–10. The detailed list of flora species identified at the Project License Area is given in Table 11-10.

Figure 11–9. *Cyclamen hederifolium*

Colchium boissieri

Pyrus amygdaliformis var. *amygdaliformis*

Stacys cretica subsp. *smyrnaea* (Endemic)

Verbascum parviflorum (Endemic)

Campanula lyrata subsp.*lyrata*(Endemic)

Crocus pallasii subsp. *pallasii*

Figure 11–10. Examples of Flora Species

Table 11-10. Flora Species of the Project License Area

Family	Taxon	Phytogeographic Region	Endemism		Red Data Book	BERN	CITES	Habitat*					Relative Abundance				
			Regional	Local				1	2	3	4	5	1	2	3	4	5
PTERIDOPHYTA																	
SELAGINELLACEAE	*Selaginella denticulata* (L.) Link	Widespread						X	X					X			
HYPOLEPIDIACEAE	*Pteridium aquilinum* (L.) Kuhn	Widespread						X	X					X			
POLYPODIACEAE	*Polypodium vulgare* L. Subsp. *vulgare*	Widespread							X					X			
ASPLENIACEAE	*Ceterach officinarum* DC.	Widespread									X			X			
SPERMATOPHYTA																	
GYMNOSPERMAE																	
PINACEAE	*Pinus brutia* Ten.	Mediterranean						X									X
	Pinus nigra L. subsp. *pallasiana* (Lamb.) Holmboe var. *pallasiana*	Widespread							X						X		
CUPRESSACEAE	*Cupressus sempervirens* L.	Widespread						X						X			
EPHEDRACEAE	*Ephedra campylopoda* C. A. Meyer	Widespread						X				X		X			
ANGIOSPERMAEX																	
RANUNCULACEAE	*Delphinium peregrina* L.	Mediterranean										X		X			
	Anemone coronaria L.	Mediterranean						X	X			X		X			
	Ranunculus sprunerianus Boiss.	Mediterranean						X		X				X			
	Ranunculus arvensis L.	Widespread										X		X			
	Ranunculus ficaria L. subsp. *ficariiformis* Rouy & Fouc.	Widespread						X	X					X			
	Clematis vitalba L.	Widespread							X					X			
PAPAVERACEAE	*Papaver rhoeas* L.	Widespread								X		X		X			
	Papaver dubium L.	Widespread								X		X		X			
BRASSICACEAE	*Hirschfeldia incana* (L.) Lag.-Foss.	Widespread										X		X			
	Sinapis arvensis L.	Widespread										X		X			
	Raphanus raphanistrum L.	Widespread										X		X			
	Rapistrum rugosum (L.) All.	Widespread										X		X			
	Biscutella didyma L.	Widespread										X		X			
	Thlaspi perfoliatum L.	Widespread										X		X			
	Capsella bursa-pastoris (L.) Medik	Widespread							X			X		X			
	Alyssum strigosum Banks et Sol. Subsp. *strigosum*	Widespread							X			X		X			

Family	Taxon	Phytogeographic Region	Endemism		Red Data Book	BERN	CITES	Habitat*					Relative Abundance				
			Regional	Local				1	2	3	4	5	1	2	3	4	5
	Aubrieta deltoidea (L.) DC.	Widespread									X			X			
	Clypeola jonthlaspi L.	Widespread								X			X				
	Erophila verna (L.) Chevall subsp *praecox* (Stern.) Walters	Widespread						X	X			X		X			
	Erophila verna (L.) Chevall.subsp. *macrocarpa* (Boiss. & Heldr.) Walters	Widespread						X	X					X			
	Cardamine hirsuta L.	Widespread						X	X					X			
	Cardamine graeca L.	Widespread						X						X			
	Alliaria petiolata (Bieb.) Cavara & Grande	Widespread						X	X					X			
	Arabis verna (L.) DC.	Mediterranean						X	X					X			
	Malcolmia chia (L.) DC	Mediterranean							X			X		X			
	Erysimum smyrnaeum Boiss. & Bal.	Widespread						X		X				X			
	Sisymbrium officinale (L.) Scop.	Widespread							X			X		X			
CAPPARACEAE	*Cleome ornithopodioides* L.	Widespread										X		X			
CISTACEAE	*Cistus creticus* L.	Mediterranean						X				X			X		
	Cistus laurifolius L.	Mediterranean							X						X		
	Tuberaria guttata (L.) Fourr. var. plantaginea (Willd.) Gross.	Mediterranean						X	X	X				X			
CARYOPHYLLACEAE	*Minuartia hybrida* (Vill.) Schischk. subsp.*hybrida*	Widespread							X	X		X		X			
	Arenaria serpyllifolia L.	Widespread								X				X			
	Cerastium brachypetalum Pers. subsp. *roeseri* (Boiss. &Heldr) Nyman	Widespread						X	X	X				X			
	Cerastium gracile Duf.	Widespread						X	X	X				X			
	Moenchia mantica (L.) Bartl subsp. *caerulea* (Boiss.) Clapham	Widespread						X	X	X				X			
	*Petrorhagia velutina (*Guss.) Ball & Heywood	Mediterranean						X	X				X				
	Holosteum umbellatum L. var. umbellatum	Widespread						X	X				X				
	Velezia rigida L.	Widespread						X	X			X		X			
	Silene italica (L.) Pers.	Widespread						X	X					X			
	Silene subconica Friv.	Widespread						X	X					X			
	Silene dichotoma Ehrh. Subsp. dichotoma	Widespread						X	X					X			
ILLECEBRACEAE	*Herniaria incana* Lam.	Widespread							X					X			

Family	Taxon	Phytogeographic Region	Endemism		Red Data Book	BERN	CITES	Habitat*					Relative Abundance				
			Regional	Local				1	2	3	4	5	1	2	3	4	5
HYPERICACEAE	*Hypericum perforatum* L.	Widespread							X			X		X			
	Hypericum triquetrifolium Turra	Widespread										X		X			
MALVACEAE	*Malva sylvestris* L.	Widespread										X		X			
	Malva neglecta Wallr.	Widespread							X	X				X			
	Alcea pallida Waldst. & Kit.	Widespread								X				X			
GERANIACEAE	*Geranium lucidum* L.	Widespread							X			X		X			
	Geranium molle L. subsp. *brutium* (Gasp.) Davis	Widespread						X	X					X			
	Geranium purpureum Vill.	Widespread							X			X		X			
POLYGONACEAE	*Rumex tuberosus* L. subsp. *tuberosus*	Widespread						X	X					X			
	Rumex bucephalophorus L.	Widespread						X	X				X				
	Rumex acetosella L.	Widespread							X					X			
	Rumex scutatus L.	Widespread						X						X			
RHAMNACEAE	*Paliurus spina-christi* Miller	Widespread						X				X		X			
	Rhamnus oleoides L subsp. *graecus* (Boiss. Et Rent Holmboe	Mediterranean						X		X		X		X			
ANACARDIACEAE	*Rhus coriaria* L.	Widespread						X				X		X			
	Pistacia terebinthus L. subsp. *palaestina* (Boiss.) Engler	Mediterranean						X				X		X			
FABACEAE	*Vicia cracca* L. subsp. *stenophylla* Vel.	Widespread						X	X			X		X			
	Vicia sericocarpa Fenzl var. *sericocarpa*	Widespread						X	X			X		X			
	Vicia articulata Hornem	Mediterranean						X	X					X			
	Lathyrus digitatus (Bieb.) Fiori	Mediterranean							X			X		X			
	Lathyrus laxiflorus (Desf.) O. Kuntze subsp. *laxiflorus*	Widespread						X	X					X			
	Lathyrus aphaca L. var. *pseudoaphaca* (Boiss.) Davis	Mediterranean						X	X					X			
	Lathyrus aphaca L var. *affinis* (Guss.) Arc.	Widespread						X	X			X		X			
	Pisum sativum L. subsp. *elatius* (Bieb.) Aschers & Graebn.	Mediterranean							X			X		X			
	Ononis spinosa L. subsp. *leiosperma* (Boiss.) Sirj	Mediterranean										X		X			
	Trifolium pilulare Boiss.	Widespread						X	X					X			
	Trifolium pauciflorum d'Urv.	Mediterranean						X	X					X			

Family	Taxon	Phytogeographic Region	Endemism		Red Data Book	BERN	CITES	Habitat*					Relative Abundance				
			Regional	Local				1	2	3	4	5	1	2	3	4	5
	Trifolium campestre Schreb.	Mediterranean						X	X			X		X			
	Trifolium arvense L. Var. *arvense*	Widespread						X		X				X			
	Trifolium stellatum L. var. *stellatum*	Widespread						X	X			X		X			
	Trifolium angustifolium L. var. *angustifolium*	Widespread						X	X					X			
	Medicago minima (L.) Bart. var. *minima*	Widespread						X	X					X			
	Medicago orbicularis (l.) Bart.	Widespread						X				X		X			
	Hymenocarpus circinnatus (L.) Savi.	Mediterranean						X	X					X			
	Securigera securidaca (L.) Degen & Dörf.	Widespread							X			X		X			
	Coronilla varia L. subsp. *varia*	Widespread							X			X		X			
ROSACEAE	*Prunus divaricata* Ledeb. subsp. *divaricata*	Widespread						X				X		X			
	Rubus sanctus Schreber	Widespread						X	X					X			
	Cerasus avium (L.) Moench	Culture										X		X			
	Amygdalus webbii Spach	Mediterranean									X	X		X			
	Potentilla recta L.	Widespread						X	X			X		X			
	Agrimonia eupatoria L.	Widespread						X	X					X			
	Orthurus heterocarpus (Boiss.) Juz.	Widespread						X	X					X			
	Sangiosorba minor Scop subsp. *muricata* (Spach) Brig	Widespread						X	X			X		X			
	Rosa canina L.	Widespread						X	X			X		X			
	Crataegus monogyna Jacq. subsp *monagyna*	Widespread						X				X		X			
	Pyrus amygdaliformis Vill. var. *amygdaliformis*	Mediterranean						X	X			X		X			
CRASSULACEAE	*Sedum hispanicum* L. Var. *hispanicum*	Widespread						X						X			
	Sedum sartorianum Boiss. subsp. *sartorianum*	Widespread						X			X			X			
CAPRIFOLIACEAE	*Lonicera etrusca* Santi. var. etrusca	Mediterranean						X	X			X		X			
APIACEAE	*Eryngium campestre* L. var. *campestre*	Widespread						X	X			X		X			
	Scaligeria napiformis (Sprengel) Grande	Mediterranean						X	X					X			
	Pimpinella cretica Poiret var. *cretica*	Mediterranean								X				X			
	Myrrhoides nodosa (L.) Cannon	Widespread						X						X			
	Lagoecia cuminoides L.	Mediterranean						X	X			X		X			
	Opopanax hispidus (Friv.) Gris.	Widespread								X				X			
	Conium maculatum L.	Widespread						X						X			

Family	Taxon	Phytogeographic Region	Endemism		Red Data Book	BERN	CITES	Habitat*					Relative Abundance				
			Regional	Local				1	2	3	4	5	1	2	3	4	5
	Orlaya daucoides (L.) Greuter	Widespread							X					X			
	Tordylium apulum L.	Mediterranean							X					X			
	Scandix australis L. subsp. grandiflora *(L.) Thell.*	Widespread						X	X				X				
	Daucus carota L.	Widespread							X			X		X			
ARALIACEAE	*Hedera helix* L.	Widespread						X						X			
RUBIACEAE	*Sherardia arvensis* L.	Mediterranean						X		X		X		X			
DIPSACACEAE	*Pterocephalus plumosus* (L.) Coulter	Widespread						X	X			X		X			
	Scabiosa argentea L.	Widespread						X	X			X		X			
VALERIANACEAE	*Valeriana dioscoridis* Sm.	Mediterranean						X	X				X				
ASTERACEAE	*Inula heterolepis* Boiss.	Widespread						X	X			X		X			
	Inula viscosa (L.) Aiton	Mediterranean							X					X			
	Calendula arvensis L.	Widespread								X				X			
	Anthemis chia L.	Mediterranean						X	X			X		X			
	Anthemis cretica L. subsp. *leucanthemoides* (Boiss.) Grierson	Widespread									X		X				
	Bellis perennis L.	Euro-Siberian						X	X			X		X			
	Doronicum orientale Hoffm.	Mediterranean						X						X			
	Senecio vernalis Waldst. et Kit	Widespread						X	X			X		X			
	Silybum marianum (L.) Gaertner	Mediterranean							X					X			
	Picnomon acarna (L.) Cass.	Mediterranean										X		X			
	Notobasis syriaca (L.) Cass.	Mediterranean						X				X		X			
	Onopordum illyricum L.	Mediterranean										X		X			
	Carduus nutans L.	Widespread						X	X			X		X			
	Centaurea solstitialis L. subsp. *solstitialis*	Mediterranean							X			X		X			
	Centaurea cyanus L.	Widespread						X	X			X		X			
	Crupina crupinastrum (Moriss) Vis.	Widespread						X	X			X		X			
	Carthamus dentatus Vaht.	Widespread						X	X			X		X			
	Carlina corymbosa L.	Mediterranean							X			X		X			
	Echinops ritro L.	Widespread						X	X			X		X			
	Scariola viminea (L.) F:W:Schmidt	Widespread						X	X			X		X			
	Leontodon tuberosus L.	Mediterranean						X	X			X		X			

Family	Taxon	Phytogeographic Region	Endemism		Red Data Book	BERN	CITES	Habitat*					Relative Abundance				
			Regional	Local				1	2	3	4	5	1	2	3	4	5
	Crepis sancta (L.) Babcock	Widespread						X	X			X		X			
	Crepis reuterana Boiss. subsp. *reuterana*	Mediterranean						X	X					X			
	Crepis foetida L. subsp. *rhoeadifolia* (Breb.) Celak.	Widespread						X	X			X		X			
	Sonchus asper (L.) Hill subsp. *glaucescens* (Jordon) Ball	Widespread						X	X					X			
	Hypochoeris radicata L.	Euro-Siberian							X			X	X				
	Rhagadiolus stellatus (L.) Gaertner var. *edulis* (Gaertner) DC.	Mediterranean						X	X					X			
	Scorzonera laciniata L. Subsp. *laciniata*	Widespread						X						X			
	Aetheorhiza bulbosa (L.) Cass. Subsp. *microcephala* Rech. Fil.	Mediterranean						X						X			
	Lapsana communis L. subsp. *adenophora* (Boiss.) Rech. Fil	Widespread						X	X			X		X			
	Chondrilla juncea L. var. *juncea*	Mediterranean						X	X			X		X			
CAMPANULACEAE	***Campanula lyrata* Lam.subsp. *lyrata***	**Mediterranean**		**x**	**LC**			**X**				**X**		**X**			
	Legousia speculum-veneris (L.) Chaix	Widespread						X				X		X			
PRIMULACEAE	*Lysimachia atropurpurea L.*	Mediterranean							X			X	X				
	Anagallis arvensis L.var. *arvensis*	Widespread						X	X			X		X			
	***Cyclamen hederifolium* Aiton**	**Mediterranean**			**VU**			**X**		**X**				**X**			
STYRACACEAE	*Styrax officinalis* L.	Widespread						X		X				X			
OLEACEAE	*Jasminum fruticans* L.	Mediterranean						X	X			X		X			
	Olea europaea L. Var. *europaea*	Mediterranean								X				X			
	Phillyrea latifolia L.	Mediterranean						X						X			
BORAGINACEAE	*Rochelia disperma* (L. fil.) C. Koch var. *disperma*	Widespread						X				X		X			
	Buglossoides incrassata (Guss.) Johnston	Mediterranean						X						X			
	Echium italicum L.	Mediterranean						X	X			X		X			
	Myosotis stricta Link ex Roemer & Schultes	Euro-Siberian						X						X			
	Anchusa undulata L. subsp. *hybrida* (Ten.) Coutinho	Mediterranean						X	X					X			
SCROPHULARIACEAE	*Verbascum glomeratum* Boiss.	İran-Turan										X		X			
	Verbascum speciosum Schrader	Widespread								X				X			
	***Verbascum parviflorum* Lam.**	**Mediterranean**		**X**	**LC**					**X**				**X**			

Family	Taxon	Phytogeographic Region	Endemism		Red Data Book	BERN	CITES	Habitat*					Relative Abundance				
			Regional	Local				1	2	3	4	5	1	2	3	4	5
	Scrophularia lucida L.	Mediterranean						X	X				X				
	Parentucellia latifolia (L.) Caruel subsp. *latifolia*	Mediterranean								X				X			
	Linaria pelisserina (L.) Miller	Mediterranean						X						X			
	Veronica cymbalaria Bodard	Mediterranean						X				X		X			
	Veronica arvensis L.	Widespread						X					X				
LAMIACEAE	*Teucrium lamiifolium* d'Urv. subsp. *lamiifolium*	Widespread						X	X					X			
	Phlomis pungens Willd. Var. *hirta* Velen	Widespread								X				X			
	***Stachys cretica* L. subsp. *smyrnaea* Rech.fil.**	**Mediterranean**		**x**	**LC**			**X**	**X**								
	Lavandula stoechas L. subsp. *stoechas*	Mediterranean							X					X			
	Calamintha nepeta (L.) Savi subsp. *glandulosa* (Req.) P.W.Ball	Widespread						X					X				
	Marribium vulgare L.	Widespread							X					X			
	Nepeta nuda L. subsp. *albiflora* (Boiss.) Gams	Widespread						X						X			
	Prunella vulgaris L.	Euro-Siberian							X					X			
	Origanum vulgare L subsp. *hirtum* (Link) Iestwart	Mediterranean						X	X			X		X			
	Origanum onites L.	Mediterranean						X		X	X			X			
	Acinos rotundifolius Pers.	Widespread								X				X			
	Micromeria juliana (L.) Bentham ex Reichb.	Mediterranean									X			X			
	Melissa officinalis L. subsp. *altissima* (Sm) Arcengeli	Mediterranean						X	X					X			
	Salvia virgata Jacq.	Iran-Turan						X	X					X			
PLANTAGINACEAE	*Plantago lanceolata* L.	Widespread							X	X				X			
FAGACEAE	*Quercus infectoria* Oliver subsp. *boissieri* (Reute) O. Schwartz	Widespread						X				X			X		
	Quercus cerris L. var. *cerris*	Widespread						X				X			X		
	Quercus ithaburensis Decne subsp. *macrolepis* (Kotschy) Hedge et Yalt.	Widespread						X				X	X				
URTICACEAE	*Urtica dioica* L.	Euro-Siberian							X					X			
MORACEAE	*Morus alba* L.	Culture								X				X			
	Ficus carica L. Subsp. *carica*	Culture								X				X			
ULMACEAE	*Celtis tournefortii* Lam.	Widespread						X						X			
JUGLANDACEAE	*Juglans regia* L.	Culture							X					X			

Family	Taxon	Phytogeographic Region	Endemism		Red Data Book	BERN	CITES	Habitat*					Relative Abundance				
			Regional	Local				1	2	3	4	5	1	2	3	4	5
PLATANACEAE	*Platanus orientalis* L.	Widespread							X					X			
SALICACEAE	*Salix alba* L.	Euro-Siberian							X					X			
	Populus nigra L.	Culture								X				X			
ARACEAE	*Dracunculus vulgaris* Schott	Mediterranean							X				X				
LILIACEAE	*Asparagus aphyllus* L subsp. *orientalis* (Baker) P.H.Davis L.	Mediterranean						X	X			X		X			
	Asphodelus aestivus Brot.	Mediterranean							X					X			
	Allium paniculatum L. Subsp. *paniculatum*	Mediterranean							X	X			X				
	Allium pallens L. Subsp. *pallens*	Mediterranean							X	X			X				
	Colchicum boissieri Orph.	Mediterranean						X	X					X			
	Muscari weissii Freyn	Mediterranean						X				X		X			
	Scilla autumnalis L.	Mediterranean						X	X	X				X			
IRIDACEAE	*Crocus pallasii* Goldb. Subsp. *pallasii*	Widespread						X				X		X			
ORCHIDACEAE	*Limodorum abortivum* (L.) Swartz	Widespread						X	X					X			
POACEAE	*Trachynia distacchya* (L.) Link	Mediterranean							X					X			
	Hordeum bulbosum L.	Widespread						X	X			X		X			
	Taeniathrum caput-medusae Nevsk subsp. *crinitum* (Schreber) Melderis	Widespread						X	X			X		X			
	Bromus tectorum L.	Widespread						X	X			X		X			
	Anthoxanthum odoratum L. subsp. *odoratum*	Widespread						X	X			X		X			
	Poa bulbosa L.	Widespread						X	X			X		X			
	Dactylis glomerata L. subsp. *hispanica* (Roth) Nyman	Widespread						X	X			X		X			
	Cynosurus echinatus L.	Mediterranean						X	X			X		X			
	Brachypodium sylvaticum (Hudson) P. Beauv.	Euro-Siberian							X					X			
	Briza maxima L.	Widespread						X	X			X		X			
	Melica minuta L.	Widespread							X					X			
	Stipa bromoides (L.) Dörfler	Widespread						X	X			X		X			
	Polypogon viridis (Gouan) Breistr.	Euro-Siberian						X	X			X		X			

**1: Pinus brutia forest (G3.7), 2: Pinus nigra forest (G3.5), 3: Maquis (F5.2), 4: Acid siliceous inland cliffs (H3.1), 5: Small-scale agricultural land (I1.3)*

*** 1: Very rare, 2: Rare, 3: Moderately rare, 4: Abundant, 5: Very abundant*

11.4.1.2 Threat Categories and Endemism Levels

Most of the 219 species identified at the Project License Area are widespread cosmopolitan species. As mentioned earlier, only three of these species are endemic to Turkey. Considering 34% of the Turkish flora is composed of endemic species, it can be concluded that the endemism at the WPP License Area is quite poor. One of the main reasons for this appears as the homogenous structure of the main rock foundation and dominant soil properties, which do not allow much vegetative diversity. It should however also be considered that these are findings of a Fall/Winter survey and do not necessarily reflect the entire flora and vegetation composition of the area. It is expected to observe a wider range of species during the Spring survey.

All of the three endemic flora species; *Campanula lyrata subsp. lyrata, Verbascum parviflorum* ve *Stachys cretica* subsp*. smyrnaea* are listed as LC according to the IUCN Red List. The Red List category of *Cyclamen hederifolium* is VU according to the Red Data Book of Turkish Plants (Ekim et al., 2000).

11.4.1.3 Vegetation Characteristics

There are four main vegetation types at the Project License Area. Located within the Aegean Region, and showing typical characteristics of the Mediterranean climate, the first type of vegetation that the Project License Area hosts is the quite healthy *Pinus brutia* (Turkish pine) forests with a dense coverage. Secondly, at the humid northern slopes of the Project License Area, which constitute the lowest limits of its extent of occurrence in the region, there are *Pinus nigra* (Black pine) forests, either of purely black pine species, or mixed with Turkish pines. Thirdly, there is maquis vegetation, where the Turkish pine forests have been relatively degraded. Lastly, on schistic and calcareous rocks of the western parts of the License Area is rock vegetation. These four vegetation types are explained in detail in this section.

***Pinus brutia* Forest Vegetation**

Located on the Turkish pine forest zone, a great majority of the Project License Area is covered with *Pinus brutia* forests (see Figure 11–6; Figure 11–7). Some parts of these forests form old climax communities, while other parts are younger forests of trees that have grown after clear-cutting.

General height of *Pinus brutia* forests, which are old enough to form vegetation is 6-8 meters, and overall coverage is around 60-90%. At the second level of the forests, shrubs are composed of species like *Prunus divaricata* ssp. *divaricata*, *Rosa canina, Cistus creticus*, *Crataegus monogyna* ssp. *Azarella* and *Pyrus amygdaliformis* var*. amygdaliformis. T*he understory of the forests, which are formed by herbaceous species, is quite rich in its floristic composition, yet its coverage is rather weak. Besides endemic species like *Campanula lyrata* and *Stachys cretica* subsp. *smyrnaea, the understory is composed of herbaceous Cynosurus echinatus, Cerastium gracile, Geranium lucidum, Geranium purpureum, Vicia sericocarpa, Lathyrus digitatus, Trifolium uniflorum, Trifolium campestre, Trifolium pauciflorum, Trifolium stellatum, Scaligeria napiformis, Doronicum orientale,* which have relatively high abundance coverage. Coverage rate of these herbaceous species reach 70%. Endemic species found at the understory of *Pinus brutia* forests are best developed at the forest openings.

Phytosociologically, *Pinus brutia* forests in the area are classified under the class of *Quercetea ilicis* Br.-Bl. 1974, *Quercetalia ilicis* Br.-Bl. 1974 ordo, and *Quercion alnifolia* Barbero & Quezel, 1979 alliance.

***Pinus nigra* Forest Vegetation**

The highest altitudes at the Project License Area, about 740-800 meters, constitute the lowest extent of occurrence of the *Pinus nigra* (Black pine) forests in the region, where at the north-facing slopes there are only black pines or they are mixed with Turkish pine trees (see Figure 11-7). Between Turbine-14 and Turbine-15 is a mixed forest , whose higher layer is formed by *Pinus nigra* trees, heights of which average 3-8 meters, while general coverage is about 60-90%. The second layer of shrubs are composed of mostly *Prunus divaricata* ssp. *divaricata*, *Rosa canina, Quercus cerris, Quercus infectoria*, *Cistus laurifolus* ve *Pyrus amygdaliformis* var*. amygdaliformis* species*.* The understory of herbaceous plants are again rich in their composition but they have a weak coverage. *Cynosurus echinatus, Stipa bromoides, Chondrilla juncea, Cerastium gracile, Geranium lucidum, Geranium purpureum, Vicia sericocarpa, Lathyrus digitatus, Trifolium uniflorum, Trifolium campestre, Trifolium pauciflorum, Trifolium stellatum,* and *Doronicum orientale.* At some parts of the area the coverage rate goes as high as 70%.

Phytosociologically, *Pinus nigra* forests in the area are classified under the class of *Quercetea pubescentis* Doing-Kraft ex Scamoni & H. Passarge 1959, *Querco pseudocerridis-Cedretalia libani* Barbero, Loisel & Quezel, 1974 ordo, and *Adenocarpa complicati- Pinion pallasianae* Quzel, Barbero & Akman 1978 alliance.

Maquis Vegetation

Maquis vegetation at the Project License Area is distributed at patches where Pinus brutia forests have been degraded. Dominant species of the maquis vegetation, which is mostly found at the south-facing slopes are *Quercus infectoria, Quercus cerris, Cistus creticus, Pistacia terebinthus.* Coverage of species at the shrub layer is about 60-70%, where their height changes between 1 and 3 meters. The understory is composed of perennial *species like Origanum onites, Ballota acetabulosa, Nepeta nuda, Asphodelus aestivus,* and *Onopordum Illyricum.*

Phytosociologically, maquis vegetation in the area are classified under the class of *Quercetea pubescentis* Doing-Kraft ex Scamoni & H. Passarge 1959, *Querco pseudocerridis-Cedretalia libani* Barbero, Loisel & Quezel, 1974 ordo, and *Adenocarpa complicati- Pinion pallasianae* Quzel, Barbero & Akman 1978 alliance.

Rock vegetation

Rock vegetation at the Project License Area has a very limited distribution (see Figure 11–11). Common species of this vegetation that is found between Turbine-1 and Turbine-4 are *Inula heterolepis, Micromeria juliana, Ballota acetabulosa, Aubrieta deltoidea, Scrophularia lucida ve Cetarach officinarum.* Rock vegetation in the area has not been classified phytosociologically.

Figure 11–11. Rock Vegetation

11.4.1.4 Habitat Classification

The European Nature Information System (EUNIS) puts forward a system for identification and classification of European habitat types. Classification area is quite large including the entire European mainland and seas including islands that are close to the mainland (except for Cyprus, Iceland and Greenland), EU states' archipelagos (Canary Islands, Madeira Islands and Azore Islands) and the European mainland to the west of Ural Mountains that cover Turkey and the Caucasus. The aim of the EUNIS habitat classification is to create a European reference set of habitat types including a description of all types and hierarchical classification (EEA, 2012).

Habitats of the Project License Area were also evaluated in accordance with the EUNIS classification, which is useful in terms of not only relating the national classifications to international level, but in terms of corresponding EUNIS habitats to habitats listed in Annex I of Habitats Directive in critical habitat assessment and "designation of special areas of conservation".

Major types of vegetation and characteristic plant species of these vegetation types, as well as their corresponding EUNIS and Habitats Directive Annex I habitat descriptions and codes are as presented in Table 11-11. A habitat map is provided in Figure 11-11. Based on this initial assessment, being listed as Habitats Directive Annex I habitats, "*Pinus brutia* forests" and "Acid Siliceous Rocks" are priority habitats, which will be subject to further impact and critical habitat assessment in the upcoming sections.

Table 11-11. Habitat Types

Habitat	Habitat Description	EUNIS Code	EUNIS Description	Habitats Directive Annex I Code	Habitats Directive Annex I Title
Pinus brutia Forests	• The most widespread habitat of the Project License Area • Some parts are natural forests, while others have been rejuvenated. • Tree coverage rate is around 80-90% • Tree layer is only composed of *Pinus brutia*	G3.7	Lowland to montane Mediterranean *Pinus* woodland (excluding *Pinus nigra*)	9540	Mediterranean pine forests with endemic Mesogean pines
Pinus nigra Forests	• Since elevation of the Project License Area is not suitable for Pinus nigra, these are only found at the highest altitudes of north-facing humid slopes • Black pines are also found mixed with Turkish pine trees	G3.5	*Pinus nigra* woodland	-	-
Conifer Plantation	• Located at the eastern end of the Project License Area • Conifer plantations are composed of Pinus brutia trees	G3.F	Highly artificial coniferous plantations	-	-
Acid Siliceous Rocks	• Located at the western parts of the Project License Area • Rocks constituting the habitat are predominantly schistic and siliceous • Dominant plant species are *Inula heterolepis, Scrophularia lucida* and *Micromeria juliana*	H3.1	Acid siliceous inland cliffs	8220	Siliceous rocky slopes with chasmophytic vegetation
Maquis	• Maquis habitat in the area has been formed due to disruption of Pinus brutia forests • Represents south-facing slopes of the southwestern parts of the Project License Area • Dominant species are *Quercus cerris, Quercus infectoria* and *Cistus creticus*	F5.2	Maquis	-	-
Orchards	• There are small and medium-scale orchards at the Project License Area • Most common produce is *Cerasus avium* (Cherry)	G1.D	Fruit and nut tree orchards	-	-
Small-Scale Agricultural Land	• Mostly utilised to grow wheat	I1.3	Arable land with unmixed crops grown by low-intensity agricultural methods		
Road Network	• Composed of stabilised soil roads for transportation, as well as fire lines to prevent forest fires in the area	J4.2	Road networks		

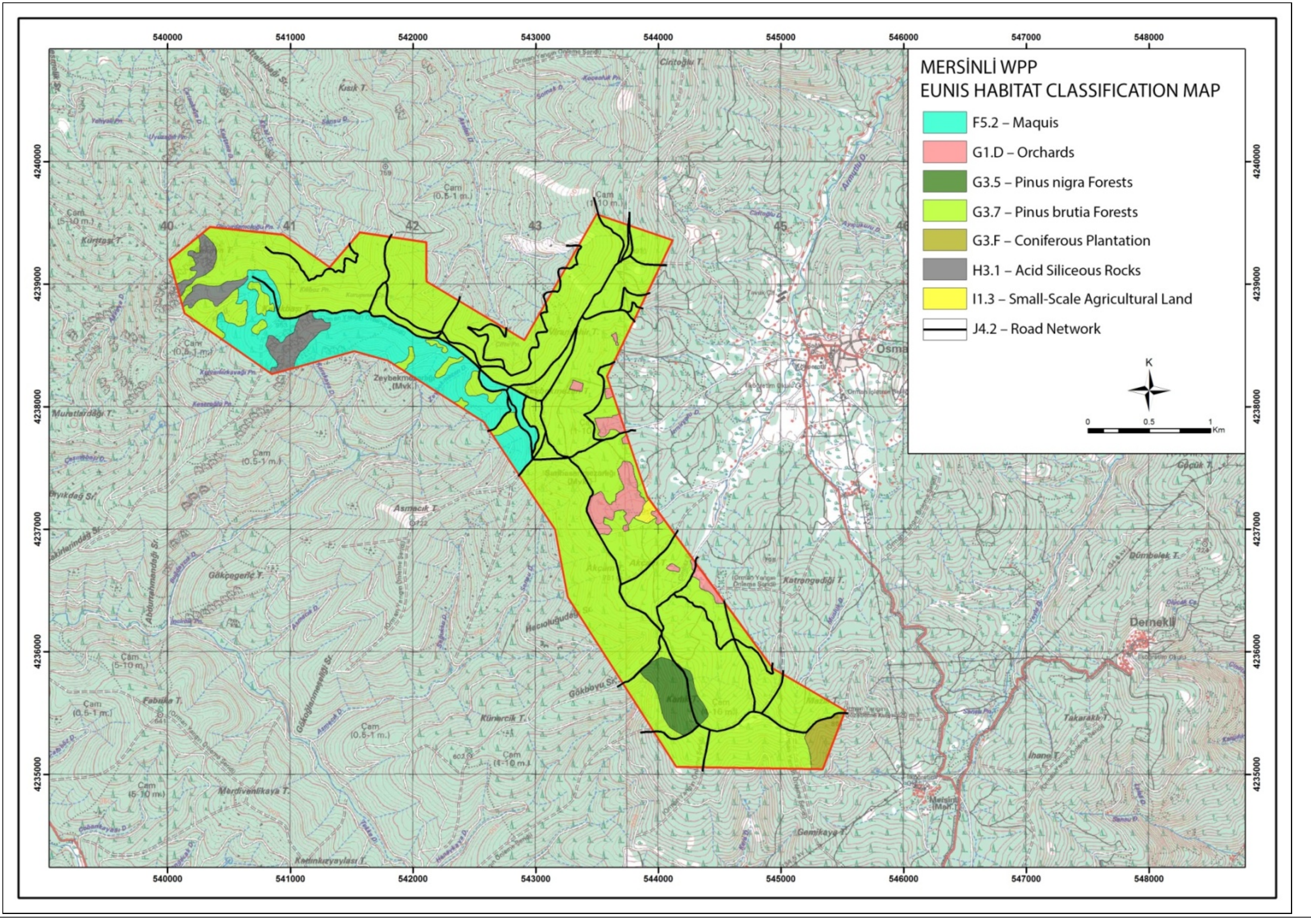


Figure 11–12. EUNIS Habitat Map of the Project License Area

11.4.2 Fauna

The main objective of terrestrial fauna studies is to identify key areas for animal species that would potentially be impacted by the Project-related activities, as well as to identify terrestrial fauna elements inhabiting the Project License Area. Avifauna and bat studies have been conducted separately, and are presented in Section 11.5 and, Section 11.6 of this Report, respectively. Therefore, this section is to provide an assessment on the other groups of terrestrial vertebrates including; amphibians, reptiles, and mammals other than bats.

On-site terrestrial fauna surveys were conducted in November of 2017. Since the timing of studies limited direct observation of animals, for instance reptiles and amphibian species getting closer to their hibernation period, the results mostly reflect literature data. However, it should be noted that, although not observed directly on-site, previously conducted studies, including the National EIA Report, which focuses on the Project License Area, also verify presence of most of these species.

In order to determine inhabitance of the Project License Area by fauna elements that have been presumed to be present, more detailed surveys during appropriate seasons in 2018 will be conducted. Results of those surveys will be included in the Mersinli Biodiversity Action Plan (BAP), together with updates on the statuses of species and their associated habitats in impact management and critical habitat assessment.

11.4.2.1 Fauna Surveys

Surveys conducted to identify amphibian, reptile and mammal species, except for bats, were designed to cover potential habitats that might be utilised by these different animal groups at the Project License Area. This included not only habitat suitability data for species, but also research on tracks, signs, and any remains of the animals that might be encountered during the surveys.

In line with the Project flora and vegetation studies, fauna species that are likely to be present at the habitats of the Project License Area, as well as those that have previously been recorded in the wider area are presented in the mammal and reptile lists below. Since there are no water bodies within the Project License Area, surveys did not yield any finding on amphibians.

Fauna species have been assessed according to the IUCN Red List, Habitats Directive, and international conventions; Bern and CITES, in order to better understand species' statuses. In the analysis of each species though, due to lack of sufficient population data on many of the fauna species, expert judgment was referred.

Reptiles and mammals of the Project License Area are listed in Table 11-12and Table 11-13, respectively. An endemic reptile species; *Anatololacerta anatolica* (Anatolian rock lizard) was observed on the rocks along a road around Turbine-14 (see Figure 11-12). Presence of *Testudo graeca* (Common tortoise), on the other hand, was confirmed by a villager.

Among the mammals listed in Table 11-13, *Sus scrofa* (Wild boar) is known to inhabit the Project License Area, both from previously conducted studies, and also some feeding points were observed during the surveys in November of 2017. Rock habitats at the Project License Area (see Figure 11–12 for the Habitat Map) have been assessed to be suitable for *Apodemus mystacinus* (Broad-toothed field mouse), while *Pinus brutia* forests for *Apodemus flavicollis*. Such areas of habitat suitability photographed during the surveys are presented in Figure 11–14and Figure 11–15, respectively. Surveys with local people also confirmed presence of Ca*nis aureus* (Golden jackal), *Vulpes vulpes* (Red fox), *Martes foi*na (Beech marten) and *Sus scrofa* (Wild boar) in the area.

Table 11-12. Reptile Species of the Project License Area

Scientific Name	Common Name	IUCN	BERN	CITES	Habitats Directive
Testudinata					-
Testudinidae					-
Testudo graeca	Common Tortoise	VU	Annex II	Annex II	Annex II/IV
Squamata			-		-
Suborder: Lacertilia			-		-
Gekkonidae			-		-
Hemidactylus turcicus	Mediterranean house gecko	LC	Annex III	-	-
Cyrtopodion kotschyi	Kotschy's gecko	LC	Annex III	-	Annex IV
Agamidae			-		
Laudakia stellio	Stellion	NE	Annex II	-	-
Scincidae			-		
Trachylepis aurata	Levant skink	LC	Annex II	-	-
Ablepharus kitaibelii	-	LC	Annex II	-	Annex IV
Chalcides ocellatus	Ocellae skink	NE	Annex III	-	
Amphisbaenidae					
Blanus strauchi	Anatolian worm lizard	LC	Annex III	-	-
Anguidae					
Pseudopus apodus	Sheltopusik	NE	Annex III	-	Annex IV
Lacertidae					
Anatololacerta anatolica	Anatolian rock lizard	LC	Annex III	-	-
Lacerta trilineatta	Balkan green lizard	LC	Annex II	-	Annex IV
Ophisops elegans	Snake-eyed lizard	NE	Annex II	-	Annex IV
Suborder: Ophidae					
Boidae					
Eryx jaculus	Sand boa	NE	Annex III	-	Annex IV
Colubridae					
Dolichophis caspius	Caspian whipsnake	NE	Annex III	-	Annex IV
Dolichophis jugularis	Large whipe snake	LC	Annex III	-	-
Eirenis modestus	Ring-headed dwarf snake	LC	Annex III	-	-
Elaphe sauromates	Blotched snake	NE	Annex III	-	-
Malpolon insignitus	Eastern Montpellier snake	NE	Annex III	-	-
Platyceps najadum	Dahl's whip snake	LC	Annex II	-	-
Platyceps collaris	Red whipe snake	LC	Annex III	-	-
Telescopus fallax	Soosan snake	LC	Annex III	-	-
Zamenis situla	European ratsnake	LC	Annex III	-	-
Natrix natrix	Grass snake	LC	Annex III	-	-
Hemorrhois nummifer	Coin Snake	NE	Annex III	-	-
Typhlopidae					-
Typhlops vermicularis	Eurasian worm snake	NE	Annex II	-	-
Viperidae					-
Mantivipera xanthina	Ottoman viper	LC	Annex II	-	-

Table 11-13. Mammal Species of the Project License Area

Scientific Name	Common Name	IUCN	BERN	CITES	Habitats Directive
Erinaceomorpha					-
Erinaceidae					-
Erinaceus concolor	Southern White-breasted Hedgehog		-	-	
Lagomorpha					
Leporidae					
Lepus europaeus	European hare	LC	Annex III	-	-
Rodentia					
Sciuridae					
Sciurus anomalus	Caucasian squirrel	LC	Annex II	-	Annex IV
Muridae					
Apodemus mystacinus	Broad-toothed Field Mouse	LC	-	-	-
Apodemus flavicollis	Yellow-necked Mouse	LC	-	-	-
Apodemus witherbyi	Steppe field mouse	LC	-	-	-
Mus macedonicus	Macedonian mouse	LC	-	-	-
Rattus rattus	Black rat	LC	-	-	-
Rattus norvegicus	Brown rat	LC	-	-	-
Gliridae					
Dryomys nitedula	Forest dormouse	LC	Annex III	-	-
Carnivora					
Canidae					
Canis aureus	Golden jackal	LC	-	-	Annex V
Vulpes vulpes	Red fox	LC	-	-	-
Mustelidae					
Mustela navilis	Least weasel		Annex III	-	-
Martes foina	Beech marten	NE	Annex III	-	-
Meles meles	European badger		Annex III	-	-
Felidae					
Felis silvestris	Wildcat	LC	Annex II	Annex II	Annex IV
Lynx lynx	Eurasian lynx	LC	Annex III	Annex II	Annex II/IV
Artiodactyla					
Suidae					
Sus scrofa	Wild boar	LC	-	-	-

Figure 11–13. *Anatololacerta anatolica*

Figure 11–14. Rock Habitat Suitable for *Apodemus mystacinus*

Figure 11–15. *Pinus brutia* Habitat Suitable for *Apodemus flavicollis*

11.5 Avifauna Studies

Avifauna of the Project footprint has been studied through extensive surveys designed to cover the four seasons of Spring, Summer, Fall and Winter in 2017, the first three of which have been completed, while Winter surveys are still ongoing at the time this Report is being prepared for submission.

A detailed methodology is provided in the upcoming sections. It is worth highlighting the fact that the birds of the entire License Area, as well as the wider region has been well documented as part of Project avifauna studies, not only through primary data collected on-site, but also through analysing previously conducted studies. The two most notable of these are the inventory on the Key Biodiversity Areas (KBA) of Turkey (Eken et al., 2006), which covers the Project License Area under “Boz Dağlar Key Biodiversity Area” in the Aegean Chapter, and Mersinli National EIA Report (PROÇED, 2016), which were both reviewed in detail.

Scoping for ornithological studies was made considering the potential impacts of wind farms on various bird species, by an expert-lead team of ornithologists, whose competence in the field played a crucial role in portraying the characteristics of avifauna at the Project footprint, identifying target species, carrying out vantage point and breeding bird surveys, estimating the collision risk and collecting all other essential data to conduct an impact assessment.

There are some limitations to the study, which are further mentioned in related sections below. One major obstacle in a comprehensive study of this sort appears to be lack of systematic research on bird mortality, and impacts on bird species in general, from wind turbines in Turkey. Despite the ongoing efforts of increasing wind energy potential of the country as a whole, a national consensus on the methodology of studies of this sort, guidelines to provide appropriate impact assessment and mitigation strategies, as well as status of bird populations in Turkey is yet to be reached. Consequently, the framework for the Project avifaunal studies has been constructed around internationally recognised best-practice guidelines and more so on the expertise of the head ornithologist and his team, given their broad knowledge on avifauna of Turkey and the region, and experience in researching impacts of wind farms on bird species.

In order to reach the main objective of avifauna studies at the Project footprint; to fully understand bird activity in the area and mitigate potential impacts of the foreseen Project-related activities on birds in the region, more specifically target species to be directly impacted, a tiered approach has been adapted. In line with best practices being currently implemented not only in continental Europe and the UK, but also in North America, Latin America and Caribbean Region, as well as South Africa (Atienza et al., 2011; Kuvlesky et al., 2007; Ledec et al., 2011; Scottish Natural Heritage, 2014; Tosh et al., 2014; U.S. Fish and Wildlife Service, 2012, and other literature listed herein), the framework for avifauna studies was constructed to cover the following phases of this tiered assessment process in the given order:

(i) Scoping Assessment

(ii) Pre-Construction Vantage Point and Breeding Bird Surveys

(iii) Impact Assessment

(iv) Mitigation

(v) Construction Phase Monitoring

(vi) Operation Phase Monitoring

This chapter of the ESIA Report on Avifauna Studies was structured with the same tiered approach following the phases listed above, where monitoring studies will be carried out as the Project proceeds. Under each heading, objectives of each phase, as well as all research, survey, and evaluation procedures, obtained data and results as well as related assessments are provided all of which are structured on the basis of international guidelines and best practices available. Each step of avifauna studies was conducted by highly qualified ornithologists, ensuring that all aspects related to avifauna and impacts of the Project are covered in the study.

11.5.1 Avifauna Scoping

11.5.1.1 Avifauna Scoping Framework

In order to identify potential impacts that would be relevant to target species defined at the site, a scoping assessment for avifauna studies was conducted based on previously conducted studies, as well as international standards and GIIP, with an attempt to focus on species that would be under high risk of threat due to the mostly recognizable impacts of on-shore wind farms on birds.

Besides literature on avifaunal composition of the area and the wider region, expert knowledge on potential target species as well as the European Breeding Bird Atlas (EBCC, 2017a), two site-specific documents that had previously been prepared were reviewed to acquire all existing data; the first being the Key Biodiversity Areas (KBA) inventory of Turkey (Eken et al., 2006), and the second is the national EIA Report, which includes results of previously conducted surveys at the Project License Area at for a total of 44 days in 2014 and 2015 (PROÇED, 2016).

Scoping assessment involved the following steps, which were taken prior to exhaustive site surveys and in-depth impact assessment based on the data collected:

- A thorough description of the site was made by the ornithology team.
- A list of bird species that are at higher risk of collision and other impacts; a preliminary list of target species was prepared.
- Significance of the site for potential target species (utilised for breeding, nesting, roosting, foraging, etc.) and their seasonal presence/absence data were assessed.
- Major impacts that the Project might have on bird species were described and analysed based on literature and expertise on Turkish avifauna.

The fundamental approach in scoping was to understand avifauna composition in the area, bird activity in the wider region and how this information could be used to design site-specific surveys to define target species, enable a comprehensive impact assessment and effectively mitigate identified impacts.

Essentially, pre-construction surveys were designed based on findings of scoping, yet open for updating as new data become available as studies progress. In determining types of survey methods to be applied, locations where surveys should be conducted, potential breeding and other activity ranges for bird species, information obtained through scoping assessment was widely utilised.

11.5.1.2 Avifauna Scoping Findings

In line with international guidelines and best practices, in order to first narrow down available information on avifauna of the region and then utilise expert judgment on how to widen the scale of baseline studies, scoping phase findings were classified into three groups, namely; species, habitats and designated sites. Firstly, species-specific information was gathered with the primary goal of defining target species to be surveyed. Then, habitat structure in the area was assessed in collaboration with the Project botanist, so as to identify potential ranges for species at the Project footprint prior to field surveys. Lastly, designated sites in the region were assessed to further analyse specific bird interest of these sites and in what capacity they would be incorporated into the impact analysis.

Species

Studies in the US and Europe have shown that the impacts of wind turbines on birds vary depending on site selection, species, and the season when surveys are conducted. The most documented impacts listed by the Guidelines for Assessing the Impact of Wind Farms on Birds and Bats (Atienza et al., 2011) are as the following:

- Collision fatalities particularly with raptors (birds of prey)
- Disturbance and displacement
- Barrier effect
- Habitat loss and degradation

Although there is substantial lack of research on bird mortality from wind turbines in Turkey, studies in southern Europe, particularly in Spain and Greece, which have similar species compositions to Turkey, have shown that most of the bird fatalities are among species that frequently hover, such as the common buzzard, common kestrel and short-toed snake eagle, as well as those species that soar slowly to look for dead animals, such as the red kite, Egyptian vulture and Griffon vulture. However, it is also reported that relatively high number of smaller terrestrial species do suffer from collisions as well (Atienza et al., 2014; Jenkins et al., 2015; Ledec et al., 2011; U.S. Fish and Wildlife Service, 2012). Although, raptors are especially vulnerable to collisions due to their flight behaviours, and their populations are under higher risk of decline, other species, especially those that are potential breeders at the Project footprint were also given special consideration during scoping.

The avifauna of Turkey is represented by 400 regular species, including 39 species of birds of prey, 4 species of vultures, and 2 species of storks (Kirwan et al., 2008). Moreover, Turkey lies on two main migration routes of the soaring birds (Newton, 2010).

The average range of an energy transmission line (ETL) varies usually between 5-20 km and the cables pose a threat for large bodied flying birds, particularly storks and waterfowls. Certainly, in some cases, the impact of the ETL may be even higher than the impact of the wind turbines. Review of other Project documents during scoping yielded the information that Mersinli WPP Project will not involve construction and operation of a new ETL. Instead, the high voltage ETL (154 kV) of the existing Fuat WPP, which crosses the Project License Area between Turbine-4 and Turbine-5 will be used through a grid connection of a 40-200 meter-line.

The route of the ETL passes through lower valleys and through a low value habitat for most species, thus it seems to avoid any high risk to birds. Most of the pylons are based in the valleys, below the elevation of the crest between Turbine-1 and Turbine-8. However, it crosses the crest of the hill between Turbine-4 and Turbine-5, where there might be relatively higher degree of impacts on bird species.

The birds with the highest collision risk at wind farms are listed as (Atienza et al., 2011):

(i) High mountain species,

(ii) Bird species that move between their feeding, resting and breeding grounds,

(iii) Wetland and water bird species and

(iv) Migratory bird species

A wide variety of survey techniques are used to survey birds in general (Gregory et al. 1996). For example, for surveying breeding waders, territory mapping is a good technique, whereas for estimation of smaller land bird densities, distance sampling with point counts or transect walks are more useful. For breeding divers, geese commuting between the feeding and resting habitats, and the birds of prey, the vantage point study is the most appropriate method. Considering this wide variety of survey techniques, in order to design an efficient and targeted bird survey at the Project footprint, one of the first steps in scoping assessment is to generate a list of bird species that are expected to occur at the Project License Area and its surroundings.

Accordingly, digital distribution maps of birds of Turkey, published by Kirwan et al. (2008), as well as digital maps with geographical coordinates of the Project License Area were converged together, using a buffer zone of 50 km, which is large enough for a potential vulture colony in the area (Atienza et al., 2011). Both of these maps provided such general information that cannot replace findings of a field study but were useful in understanding avifauna composition of the Project License Area and the wider region at the scoping phase and while planning for appropriate surveys.

Based on extensive scoping assessments that rely on a number of national and international resources, and using Geographical Information System (GIS) data, an initial list of 173 species that are known to inhabit the wider region including the Project License Area for various purposes like breeding, feeding, layover, etc., was produced (see Table 11-14).

Table 11-14. List of Bird Species Identified During Scoping within 50-Km Radius of the Project License Area

No.	Scientific Name	Common Name	Potential Status	Red List Category*	EU Birds Directive
1	*Tadorna ferruginea*	Ruddy Shelduck	Passage Migrant	-	Annex I
2	*Anas platyrhynchos*	Mallard	Breeding Resident	-	Annex II
3	*Alectoris chukar*	Chukar Partridge	Breeding Resident	-	Annex II
4	*Coturnix coturnix*	Common Quail	Breeding/Passage Migrant	-	Annex II
5	*Ciconia nigra*	Black Stork	Breeding/Passage Migrant	-	Annex I
6	*Ciconia ciconia*	White Stork	Breeding/Passage Migrant	-	Annex I
7	*Pandion haliaetus*	Western Osprey	Passage Migrant	-	Annex I
8	*Neophron percnopterus*	Egyptian Vulture	Passage Migrant	EN	Annex I
9	*Pernis apivorus*	European Honey Buzzard	Passage Migrant	-	Annex I
10	*Gyps fulvus*	Griffon Vulture	Passage Migrant	-	Annex I
11	*Circaetus gallicus*	Short-Toed Snake Eagle	Breeding/Passage Migrant	-	Annex I
12	*Clanga pomarina*	Lesser Spotted Eagle	Passage Migrant	-	Annex I
13	*Clanga clanga*	Greater Spotted Eagle	Passage Migrant	VU	Annex I
14	*Hieraaetus pennatus*	Booted Eagle	Passage Migrant	-	Annex I
15	*Aquila heliaca*	Eastern Imperial Eagle	Passage Migrant	VU	Annex I
16	*Accipiter brevipes*	Levant Sparrowhawk	Passage Migrant	-	Annex I
17	*Accipiter nisus*	Eurasian Sparrowhawk	Breeding Resident	-	Annex I
18	*Accipiter gentilis*	Northern Goshawk	Non-Breeding Resident	-	Annex I
19	*Circus aeruginosus*	Western Marsh Harrier	Passage Migrant	-	Annex I
20	*Circus cyaneus*	Hen Harrier	Non-Breeding Resident	-	Annex I
21	*Circus macrourus*	Pallid Harrier	Passage Migrant	NT	Annex I
22	*Circus pygargus*	Montagu's Harrier	Passage Migrant	-	Annex I
23	*Milvus migrans*	Black Kite	Passage Migrant	-	Annex I
24	*Haliaeetus albicilla*	White-Tailed Eagle	Passage Migrant	-	Annex I
25	*Buteo rufinus*	Long-Legged Buzzard	Breeding Resident	-	Annex I
26	*Buteo buteo*	Common Buzzard	Non-Breeding Resident	-	Annex I
27	*Scolopax rusticola*	Eurasian Woodcock	Non-Breeding Resident	-	Annex III
28	*Larus michahellis*	Yellow-Legged Gull	Non-Breeding Resident	-	-
29	*Columba livia*	Rock Dove	Breeding Resident	-	Annex II
30	*Columba oenas*	Stock Dove	Passage Migrant	-	Annex II
31	*Columba palumbus*	Common Wood Pigeon	Breeding Resident	-	Annex III
32	*Streptopelia turtur*	European Turtle Dove	Breeding/Passage Migrant	VU	Annex II
33	*Streptopelia decaocto*	Eurasian Collared Dove	Breeding Resident	-	Annex II
34	*Clamator glandarius*	Great Spotted Cuckoo	Breeding/Passage Migrant	-	-
35	*Cuculus canorus*	Common Cuckoo	Breeding/Passage Migrant	-	-
36	*Tyto alba*	Common Barn Owl	Breeding Resident	-	-
37	*Otus scops*	Grey Sea Eagle	Breeding/Passage Migrant	-	-
38	*Bubo bubo*	Eurasian Eagle-Owl	Breeding Resident	-	-
39	*Strix aluco*	Tawny Owl	Breeding Resident	-	-
40	*Athene noctua*	Little Owl	Breeding Resident	-	-
41	*Asio otus*	Long-Eared Owl	Breeding Resident	-	-
42	*Caprimulgus europaeus*	European Nightjar	Breeding/Passage Migrant	-	Annex I
43	*Tachymarptis melba*	Alpine Swift	Passage Migrant	-	-

No.	Scientific Name	Common Name	Potential Status	Red List Category*	EU Birds Directive
44	*Apus apus*	Common Swift	Breeding/Passage Migrant	-	-
45	*Apus pallidus*	Pallid Swift	Passage Migrant	-	-
46	*Coracias garrulus*	European Roller	Breeding/Passage Migrant	NT	Annex I
47	*Alcedo atthis*	Common Kingfisher	Non-Breeding Resident	-	Annex I
48	*Merops apiaster*	European Bee-Eater	Breeding/Passage Migrant	-	-
49	*Upupa epops*	Eurasian Hoopoe	Breeding/Passage Migrant	-	-
50	*Jynx torquilla*	Eurasian Wryneck	Passage Migrant	-	-
51	*Dendrocopos medius*	Middle Spotted Woodpecker	Breeding Resident	-	Annex I
52	*Dendrocopos syriacus*	Syrian Woodpecker	Breeding Resident	-	Annex I
53	*Dendrocopos major*	Great Spotted Woodpecker	Breeding Resident	-	-
54	*Picus viridis*	European Green Woodpecker	Breeding Resident	-	-
55	*Falco naumanni*	Lesser Kestrel	Passage Migrant	-	Annex I
56	*Falco tinnunculus*	Common Kestrel	Breeding Resident	-	-
57	*Falco vespertinus*	Red-Footed Falcon	Passage Migrant	NT	Annex I
58	*Falco eleonorae*	Eleonora's Falcon	Passage Migrant	-	Annex I
59	*Falco columbarius*	Merlin	Non-Breeding Resident	-	Annex I
60	*Falco subbuteo*	Eurasian Hobby	Passage Migrant	-	-
61	*Falco cherrug*	Saker Falcon	Passage Migrant	EN	Annex I
62	*Falco peregrinus*	Peregrine Falcon	Breeding Resident	-	Annex I
63	*Lanius collurio*	Red-Backed Shrike	Breeding /Passage Migrant	-	Annex I
64	*Lanius minor*	Lesser Grey Shrike	Breeding/Passage Migrant	-	Annex I
65	*Lanius senator*	Woodchat Shrike	Breeding/Passage Migrant	-	-
66	*Lanius nubicus*	Masked Shrike	Breeding/Passage Migrant	-	Annex I
67	*Oriolus oriolus*	Eurasian Golden Oriole	Breeding/Passage Migrant	-	-
68	*Garrulus glandarius*	Eurasian Jay	Breeding Resident	-	Annex II
69	*Pica pica*	Eurasian Magpie	Breeding Resident	-	
70	*Coloeus monedula*	Western Jackdaw	Breeding Resident	-	-
71	*Corvus frugilegus*	Rook	Non-Breeding Resident	-	Annex II
72	*Corvus cornix*	Hooded Crow	Breeding Resident	-	-
73	*Corvus corax*	Northern Raven	Breeding Resident	-	-
74	*Periparus ater*	Coal Tit	Breeding Resident	-	-
75	*Poecile lugubris*	Sombre Tit	Breeding Resident	-	-
76	*Cyanistes caeruleus*	Eurasian Blue Tit	Breeding Resident	-	-
77	*Parus major*	Great Tit	Breeding Resident	-	-
78	*Remiz pendulinus*	Eurasian Penduline Tit	Breeding Resident	-	-
79	*Panurus biarmicus*	Bearded Reedling	Non-Breeding Resident	-	-
80	*Lullula arborea*	Woodlark	Breeding Resident	-	Annex I
81	*Alauda arvensis*	Eurasian Skylark	Breeding Resident	-	Annex II
82	*Galerida cristata*	Crested Lark	Breeding Resident	-	-
83	*Calandrella brachydactyla*	Greater Short-Toed Lark	Passage Migrant	-	Annex I
84	*Melanocorypha calandra*	Calandra Lark	Passage Migrant	-	Annex I
85	*Riparia riparia*	Sand Martin	Passage Migrant	-	-
86	*Hirundo rustica*	Barn Swallow	Breeding/Passage Migrant	-	-
87	*Delichon urbicum*	Common House Martin	Breeding/Passage Migrant	-	-
88	*Cecropis daurica*	Red-Rumped Swallow	Breeding/Passage Migrant	-	-

No.	Scientific Name	Common Name	Potential Status	Red List Category*	EU Birds Directive
89	*Cettia cetti*	Cetti's Warbler	Breeding Resident	-	-
90	*Aegithalos caudatus*	Long-Tailed Tit	Breeding Resident	-	-
91	*Phylloscopus trochilus*	Willow Warbler	Passage Migrant	-	-
92	*Phylloscopus collybita*	Common Chiffchaff	Breeding/Non-Breeding Migrant	-	-
93	*Phylloscopus orientalis*	Eastern Bonelli's Warbler	Breeding/Passage Migrant	-	-
94	*Phylloscopus sibilatrix*	Wood Warbler	Passage Migrant	-	-
95	*Acrocephalus palustris*	Marsh Warbler	Passage Migrant	-	-
96	*Iduna pallida*	Eastern Olivaceous Warbler	Breeding/Passage Migrant	-	-
97	*Hippolais olivetorum*	Olive-Tree Warbler	Passage Migrant	-	Annex I
98	*Hippolais icterina*	Icterine Warbler	Passage Migrant	-	-
99	*Locustella naevia*	Common Grasshopper Warbler	Passage Migrant	-	-
100	*Locustella fluviatilis*	River Warbler	Passage Migrant	-	-
101	*Locustella luscinioides*	Savi's Warbler	Passage Migrant	-	-
102	*Sylvia atricapilla*	Eurasian Blackcap	Breeding/Passage Migrant	-	-
103	*Sylvia borin*	Garden Warbler	Passage Migrant	-	-
104	*Sylvia nisoria*	Barred Warbler	Passage Migrant	-	Annex I
105	*Sylvia curruca*	Lesser Whitethroat	Breeding/Passage Migrant	-	-
106	*Sylvia crassirostris*	Eastern Orphean Warbler	Breeding/Passage Migrant	-	-
107	*Sylvia communis*	Common Whitethroat	Breeding/Passage Migrant	-	-
108	*Sylvia cantillans*	Subalpine Warbler	Breeding/Passage Migrant	-	-
109	*Sylvia melanocephala*	Sardinian Warbler	Breeding Resident	-	-
110	*Sylvia ruppeli*	Rüppell's Warbler	Breeding/Passage Migrant	-	Annex I
111	*Regulus regulus*	Goldcrest	Breeding Resident	-	-
112	*Troglodytes troglodytes*	Eurasian Wren	Breeding Resident	-	-
113	*Sitta krueperi*	Krüper's Nuthatch	Breeding Resident	-	Annex I
114	*Sitta neumayer*	Western Rock Nuthatch	Breeding Resident	-	-
115	*Pastor roseus*	Rosy Starling	Passage Migrant	-	-
116	*Sturnus vulgaris*	Common Starling	Breeding Resident	-	Annex II
117	*Turdus torquatus*	Ring Ouzel	Passage Migrant	-	-
118	*Turdus merula*	Common Blackbird	Breeding Resident	-	Annex II
119	*Turdus pilaris*	Fieldfare	Non-Breeding Resident	-	Annex II
120	*Turdus iliacus*	Redwing	Non-Breeding Resident	NT	Annex II
121	*Turdus philomelos*	Song Thrush	Non-Breeding Resident	-	Annex II
122	*Turdus viscivorus*	Mistle Thrush	Breeding Resident	-	Annex II
123	*Cercotrichas galactotes*	Rufous-Tailed Scrub Robin	Breeding/Passage Migrant	-	-
124	*Muscicapa striata*	Spotted Flycatcher	Breeding/Passage Migrant	-	-
125	*Erithacus rubecula*	European Robin	Non-Breeding Resident	-	-
126	*Luscinia svecica*	Bluethroat	Passage Migrant	-	Annex I
127	*Luscinia luscinia*	Thrush Nightingale	Passage Migrant	-	-
128	*Luscinia megarhynchos*	Common Nightingale	Breeding/Passage Migrant	-	-
129	*Irania gutturalis*	White-Throated Robin	Passage Migrant	-	-
130	*Ficedula hypoleuca*	European Pied Flycatcher	Passage Migrant	-	-
131	*Ficedula albicollis*	Collared Flycatcher	Passage Migrant		Annex I
132	*Ficedula semitorquata*	Semicollared Flycatcher	Passage Migrant	-	Annex I

No.	Scientific Name	Common Name	Potential Status	Red List Category*	EU Birds Directive
133	*Ficedula parva*	Red-Breasted Flycatcher	Passage Migrant	-	Annex I
134	*Phoenicurus ochruros*	Black Redstart	Non-Breeding Resident	-	-
135	*Phoenicurus phoenicurus*	Common Redstart	Breeding/Passage Migrant	-	-
136	*Monticola saxatilis*	Common Rock Thrush	Passage Migrant	-	-
137	*Monticola solitarius*	Blue Rock Thrush	Breeding Resident	-	-
138	*Saxicola rubetra*	Whinchat	Passage Migrant	-	-
139	*Saxicola rubicola*	European Stonechat	Breeding Resident	-	-
140	*Oenanthe oenanthe*	Northern Wheatear	Breeding/Passage Migrant	-	-
141	*Oenanthe isabellina*	Isabelline Wheatear	Breeding/Passage Migrant	-	-
142	*Oenanthe hispanica*	Black-Eared Wheatear	Breeding/Passage Migrant	-	-
143	*Oenanthe pleschanka*	Pied Wheatear	Passage Migrant	-	Annex I
144	*Passer domesticus*	House Sparrow	Breeding Resident	-	-
145	*Passer hispaniolensis*	Spanish Sparrow	Breeding Resident	-	-
146	*Passer montanus*	Eurasian Tree Sparrow	Breeding Resident	-	-
147	*Petronia petronia*	Rock Sparrow	Non-Breeding Resident	-	-
148	*Prunella modularis*	Dunnock	Non-Breeding Resident	-	-
149	*Motacilla flava*	Western Yellow Wagtail	Passage Migrant	-	-
150	*Motacilla citreola*	Citrine Wagtail	Passage Migrant	-	-
151	*Motacilla cinerea*	Grey Wagtail	Non-Breeding Resident	-	-
152	*Motacilla alba*	White Wagtail	Breeding Resident	-	-
153	*Anthus campestris*	Tawny Pipit	Breeding/Passage Migrant	-	Annex I
154	*Anthus pratensis*	Meadow Pipit	Non-Breeding Resident	-	-
155	*Anthus trivialis*	Tree Pipit	Passage Migrant	-	-
156	*Anthus cervinus*	Red-Throated Pipit	Passage Migrant	-	-
157	*Anthus spinoletta*	Water Pipit	Non-Breeding Resident	-	-
158	*Fringilla coelebs*	Common Chaffinch	Breeding Resident	-	Annex I
159	*Fringilla montifringilla*	Brambling	Non-Breeding Resident	-	-
160	*Coccothraustes coccothraustes*	Hawfinch	Non-Breeding Resident	-	-
161	*Chloris chloris*	European Greenfinch	Breeding Resident	-	-
162	*Linaria cannabina*	Common Linnet	Breeding Resident	-	-
163	*Carduelis carduelis*	European Goldfinch	Breeding Resident	-	-
164	*Serinus serinus*	European Serin	Breeding Resident	-	-
165	*Spinus spinus*	Eurasian Siskin	Non-Breeding Resident	-	-
166	*Emberiza calandra*	Corn Bunting	Breeding Resident	-	-
167	*Emberiza citrinella*	Yellowhammer	Non-Breeding Resident	-	-
168	*Emberiza cia*	Rock Bunting	Breeding Resident	-	-
169	*Emberiza hortulana*	Ortolan Bunting	Breeding/Passage Migrant	-	Annex I
170	*Emberiza caesia*	Cretzschmar's Bunting	Breeding/Passage Migrant	-	Annex I
171	*Emberiza cirlus*	Cirl Bunting	Breeding Resident	-	-
172	*Emberiza melanocephala*	Black-Headed Bunting	Breeding/Passage Migrant	-	-
173	*Emberiza schoeniclus*	Common Reed Bunting	Non-Breeding Resident	-	-

**IUCN Red List categories are presented only for species that are “assessed for the IUCN Red List” and are “species of elevated conservation concern” as defined by the IUCN SPSC (2017, p.11), which includes species qualifying for categories of EX, CR, EN, VU and NT.*

When scoping-phase birds were assessed in terms of the degree of collision risk they encounter, the following conclusions were reached. In terms of;

(i) high mountain species, no vultures or large eagles are known to breed within the buffer zone of 50 km surrounding the Project footprint.

(ii) bird species that move between their feeding, resting and breeding grounds, it was concluded that there are no sites with significant goose or crane gatherings in the surrounding region, particularly coming from Gediz and Küçük Menderes plains.

(iii) wetland and water bird species, the Project footprint is not associated with a wetland habitat and so no wetland and water bird species were included in the list.

(iv) migratory bird species, although Turkey lies on migratory routes of soaring birds that fly between Europe and Africa (Bijlsma, 1987; Newton, 2010), the Project License Area is far from the major migration routes of storks and raptors. Yet, there are many unknown minor routes in Western Turkey. Considering collision risk of migratory and resident soaring birds with the wind turbines has been one of the main concerns regarding impacts of wind farms on birds in Turkey, baseline surveys were designed to allow for recording and monitoring of migratory birds as well.

Therefore, species known to inhabit the wider area, except for soaring breeding residents and passage migrants, were not considered as target species. Pre-survey target bird species, which are the ones that are under high risk of threat due to the projected WPP activities, are listed in Table 11-15. Secondary species, which are of regional importance and are listed in Annex I of the Birds Directive, were further identified following the site surveys, after confirming their presence at the Project License Area. Supported by literature data, findings of the scoping assessment are in line with the expert judgement of the Project head ornithologist and his team of field surveyors.

Table 11-15. Avifauna Studies Target Species

No.	Scientific Name	Common Name	Potential Status	Red List Category*	EU Birds Directive
1	*Ciconia nigra*	Black Stork	Breeding/Passage Migrant	-	Annex I
2	*Ciconia ciconia*	White Stork	Breeding/Passage Migrant	-	Annex I
3	*Pandion haliaetus*	Western Osprey	Passage Migrant	-	Annex I
4	*Pernis apivorus*	European Honey Buzzard	Passage Migrant	-	Annex I
5	*Hieraaetus pennatus*	Booted Eagle	Passage Migrant	-	Annex I
6	*Accipiter nisus*	Eurasian Sparrowhawk	Breeding Resident	-	Annex I
7	*Accipiter gentilis*	Northern Goshawk	Non-Breeding Resident	-	Annex I
8	*Circaetus gallicus*	Short-Toed Snake Eagle	Breeding/Passage Migrant	-	Annex I
9	*Buteo rufinus*	Long-Legged Buzzard	Breeding Resident	-	Annex I
10	*Buteo buteo*	Common Buzzard	Non-Breeding Resident	-	Annex I
11	*Falco tinnunculus*	Common Kestrel	Breeding Resident	-	-
12	*Falco peregrinus*	Peregrine Falcon	Breeding Resident	-	Annex I
13	*Falco eleonorae*	Eleonora's Falcon	Passage Migrant	-	Annex I

**IUCN Red List categories are presented only for species that are “assessed for the IUCN Red List” and are “species of elevated conservation concern” as defined by the IUCN SPSC (2017, p.11), which includes species qualifying for categories of EX, CR, EN, VU and NT.*

Habitats

The Project License Area is located on the Bozdağ Massive, which extends in the east-west axis and bordered by Gediz Plain in the north and Küçük Menderes Alluvial Plain in the south. The wind turbines are projected to spread over an area along a west-east extension of 4650 m and the maximum extension in the north-south direction is 3700 m. The elevation of turbine sitings varies between 770 and 940 meters above sea level.

Major habitat types at the Project License Area can be listed as the *Pinus brutia* natural forests, *Pinus brutia* plantations, *Pinus nigra* forests, as well as rock vegetation and maquis where Pinus brutia forests have been degraded. A detailed habitat map of the Project License Area is provided in Figure 11–12. During the scoping phase of the avifauna studies, potential resident birds at the Project License Area based on their habitat preferences. Habitat data were further utilised during the "Breeding Bird Surveys" especially in determining potential breeding sites for secondary species that are resident breeders at the Project footprint.

Designated Sites

There are seven different types of national nature conservation sites in Turkey, besides regionally recognised "Special Protection Areas (SPA)" under the European Commission Wild Birds Directive, and internationally recognised Ramsar sites, biosphere reserves, and UNESCO World Heritage sites. Covering a wide variety of ecosystems, considering not only their ecological, but also geological, geomorphological, landscape, historical, archaeological and cultural characteristics in designating a site, the national conservation areas system appoints these sites as National Parks, Nature Conservation Areas, Nature Parks, Natural Monuments, Wildlife Reserves, Conservation Forests and Natural Protection Areas (MoFWA, 2013).

The Project License Area does not overlap with any national, regional and/or international designated site. The nearest designated site is İzmir Bayındır Ovacık Wildlife Development Area, located at a distance of about 11 km to the east of the Project License Area (see Figure 11–3). As explained in detail in Section 11.3, official views of related directorates were obtained ensuring that the area does not fall under an officially designated site.

The KBA status of the Project License Area is also explained in detail in Section 11.3. Accordingly, Doğa Derneği, in its inventory dated 2006 (Eken et al. 2006), considers a wider Boz Dağlar KBA to include the Project License Area. However, flora composition triggering the area's KBA status is confined to elevations much higher than that of the Project altitude, which suggests that the area to be protected would not be impacted by any Project-related activities. In reaching such a conclusion, the IPA inventory (Ozhatay et. al. 2008), as well as research of the Project botanist were referred to in terms of the flora composition of Boz Dağlar massive.

Information provided by the KBA inventory was considered during scoping. Yet, since Boz Dağlar KBA covers a much larger area, assessments made within the scope of Project avifauna studies depend mostly on four-season surveys conducted by Project ornithologists covering a wide array of issues related to the bird composition and WPP impacts in the area.

11.5.2 Avifauna Baseline Surveys

11.5.2.1 Objectives

The main objective of avifauna baseline surveys is to gather sufficient data, which, combined with understanding of interactions between identified bird species and proposed wind turbines, would allow for an effective impact analyses and mitigation strategies.

Scottish Natural Heritage (2005), in their pioneer work guiding principles to assess impacts of onshore wind farms on bird communities that has been updated several times since, emphasises the necessity of "matching field survey to the information needs" (Scottish Natural Heritage, 2005, p. 3). Based on the thorough avifauna scoping conducted for the Project License Area, it was possible to construct a survey methodology meeting the utmost requirements of the impact assessment and design the necessary tools for mitigation with the following goals:

1. Confirm presence and breeding activity of identified target species
2. Produce a comprehensive list of bird species recorded at the relevant sites
3. Acquire counts, abundance estimates and breeding information for target species through exhaustive vantage point and breeding bird surveys
4. Determine habitat preferences and record counts for secondary species
5. Outline flight paths for target species
6. Conduct a Collision Risk Assessment for target species
7. Record any other data that might be useful in identifying impacts of the Project on avifauna

11.5.2.2 Study Area

Avifauna studies were conducted at the Biodiversity Study Area, which is mostly dominated by Mediterranean vegetation characterised by maquis shrubland and Turkish pine (*Pinus brutia*) forests. The maquis extends along the sectors between Turbine-1 and Turbine-8 the most, and is mixed with oak shrub (see Figure 11–16). In this zone, the vegetation is relatively poor, the soil is very dry. The area seems to have been relatively degraded through intensive land use practices, such as coppicing, heavy grazing, and past forest fires. The climate with hot and dry summers and occasional heavy rain seem to have washed away the top soil. There are previously reforested areas and the trees in these areas are short and weak. However, the Mediterranean vegetation seems to recover and form some good natural habitat patches, thus the habitat can be regarded safely as a natural habitat.

The pine forests extend the most between Turbine-9 and Turbine-17, where the oldest trees with full canopy are found (see Figure 11–17). The entire forest is intensely managed by the state for wood production. Nests of pine processionary moth (*Thaumetopoea pityocampa*) have been regularly encountered. The moth is known to have local negative impacts on the health of the forest. As a result, the forestry department has locally replaced harvested Turkish pine (*Pinus brutia*) with Black pine (*Pinus nigra*), to minimise the impacts of the pine processionary moth (Presence of this species at the Project License Area needs confirmation. If encountered during Spring 2018 biodiversity studies, additional measures will be provided within the scope of Mersinli BAP). Black pine is also the part of natural vegetation of the Bozdağ Massive, although occurring rather at higher altitudes. The agricultural activity near the Project footprint is limited to cherry orchards near Turbine-11 and Turbine-12. Turbine-17 is at a distance of about 1000 m away from the orchards and fields of Marmariç settlement.

Throughout the site surveys there were no construction activities at the Project footprint which is the ideal condition for a baseline avifauna study, covering the pre-construction period.

Figure 11–16. View of the Section between Turbine-5 &Turbine-8; Looking in the East Direction from Turbine-4

Figure 11–17. View of the Section between Turbine-8 &Turbine-14; Looking in the North Direction from Turbine-15

11.5.2.3 Vantage Point and Breeding Bird Surveys

The methodology for baseline surveys was designed to meet the above-listed objectives, considering behavioural patterns of target species, topography and habitat composition of the Project License Area, as well as Project characteristics, to make a comprehensive analysis.

The Project License Area was visited three times during spring of 2017, another three times in early summer and five more times during late summer and fall. At the time this Report is prepared for submission, on-site winter surveys are still being conducted. A detailed baseline survey schedule is provided in Table 11-16 (details on survey dates, times, durations and weather conditions are provided in Appendix D.1).

Table 11-16. 2017 Avifauna Baseline Survey Schedule

Season	Survey	Date
Spring / Early Summer	1st baseline survey	4-6 April 2017
	2nd baseline survey	19-21 April 2017
	3rd baseline survey	10-12 May 2017
	4th baseline survey	26-28 May 2017
	5th baseline survey	5-9 June 2017
	6th baseline survey	26-28 July 2017
Late Summer / Autumn	1st baseline survey	11-13 August 2017
	2nd baseline survey	26-28 August 2017
	3rd baseline survey	13-15 September 2017
	4th baseline survey	26-28 September 2017
	5th baseline survey	11-13 October 2017

Baseline surveys conducted in spring and early summer aimed at covering the breeding season of target species and late summer/fall surveys targeted the non-breeding season. Spring and fall surveys were considered as essential studies for especially soaring migratory birds due to these two being the migration seasons. During summer, the main objective was to observe the breeding activity of target species, as well as secondary species that are breeding residents. During the late summer/fall survey, young raptors were also monitored, which are highly sensitive to impacts of wind farms.

Vantage Point Surveys

<u>Framework and Survey Methods</u>

Vantage Point (VP) surveys are a series of bird watches from a pre-determined location in order to acquire quantitative data on flight activity of birds at a certain site. Within the scope of Project Avifauna Studies, VP surveys were, and in most cases they are, designed to record flight activity and distribution of bird species across the study area to provide data for the Collision Risk Analysis. VP survey results are utilised to portray flight behaviour of target species, as well as necessary input for the impact assessment as it enables an overview of the entire Project footprint. (SNH, 2014).

VP survey (on high ground) for migratory and breeding resident species was conducted following the methodology provided by Scottish Natural Heritage (SNH) in its "*Guidance: Recommended Bird Survey Methods to Inform Impact Assessment of Onshore Wind Farms*" (SNH, 2014). The VP methodology includes observations from a fixed location from where the whole Project footprint can be seen and all the birds that would be flying through the rotors can be detected. For each season a minimum of 36 hours of observations are required, summing up to a total of 144 survey hours. (SNH, 2005). It is worth mentioning that SNH guidelines are widely used for ecological impact assessment studies on wind farms and are referred by the World Bank Group (2015), in "*Environmental, Health, and Safety Guidelines for Wind Energy"* as one of the guidelines developed to "detail the scope and extent of biodiversity surveys for onshore wind energy facilities", especially "where robust in-country guidelines are not yet developed" (World Bank Group, 2015, p.7).

The term of detectability is described as the rate of the birds detected by the observer. The detectability increases with the number of observers, where individual observers have lower detectability than a team of two observers (Gregory et al., 1996). In areas with low bird densities, such as the Project footprint, an individual observer's efficiency drops and a significant percentage of birds fly undetected. Where there are busy skies, on the other hand, an individual observer is kept busy scanning the horizon, and as a result, the percentage of undetected birds is much lower.

Another WPP concept currently used in bird and bat collision analyses is the "Rotor Swept Area". As the Project specifications put forward in detail, a rotor is the part of a wind turbine that interacts with wind to produce energy. It consists of the turbine's blades and hubs to which the blades are attached. Rotor swept area is defined as the area of the circle or volume of the sphere swept by the turbines blades, which is a specifically significant metric in risk calculations for birds and bats, as its upper and lower limits represent a certain zone that carries the highest level of collision risk (U.S. Fish and Wildlife Service, 2012).

A total of three VP survey locations with maximum visibility were determined for the Project footprint, based on scoping findings and expert judgment on avifauna composition, flight activity and habitat characteristics and also considering the following issues as outlined by SNH (2014):

- VP survey locations were chosen to be as appropriate as possible for target species identified during scoping.
- VP surveys were designed to be conducted so that no other field work activities would interfere in a manner to invalidate survey results.
- VP survey locations were chosen so that they are not at a distance too close to disturb any potential breeding range.
- The exact VP survey locations were re-used for successive baseline surveys, as small changes in the locations may result in substantial viewshed differences. For this, coordinates of VP locations were taken at the highest level of accuracy and recorded to be used during each survey (see Table 11-17)
- VP survey watches considered ecology of target species; breeding, feeding, and migration patterns, day and night-time activities, etc.

The exact VP survey locations are given in Table 11-17, and photographs taken during the surveys showing each one of the VP survey locations is presented in Figure 11–18. A map showing the VP survey locations is also provided in Figure 11–19.

Table 11-17. Vantage Point (VP) Survey Locations

Vantage Survey Point	Coordinates (UTM 35 N WGS84)		Relative Location
	Northing	Easting	
VP1	4238567	541592	Near Turbine-3
VP2	4237109	543433	Between Turbine-11 and Turbine-12
VP3	4235365	544786	Near Turbine-16

Relatively Poor Vegetation Composed of Plantation Openings and Oak Shrub Near VP1 and Turbine-4

VP2 Survey Location; Next To the Cherry Orchard

View from VP3 Facing the Firewatch Tower

View of VP3 from Turbine-7; Turbines Will Be Located Along This Open Strip

Figure 11–18. Photographs of the VP Survey Locations

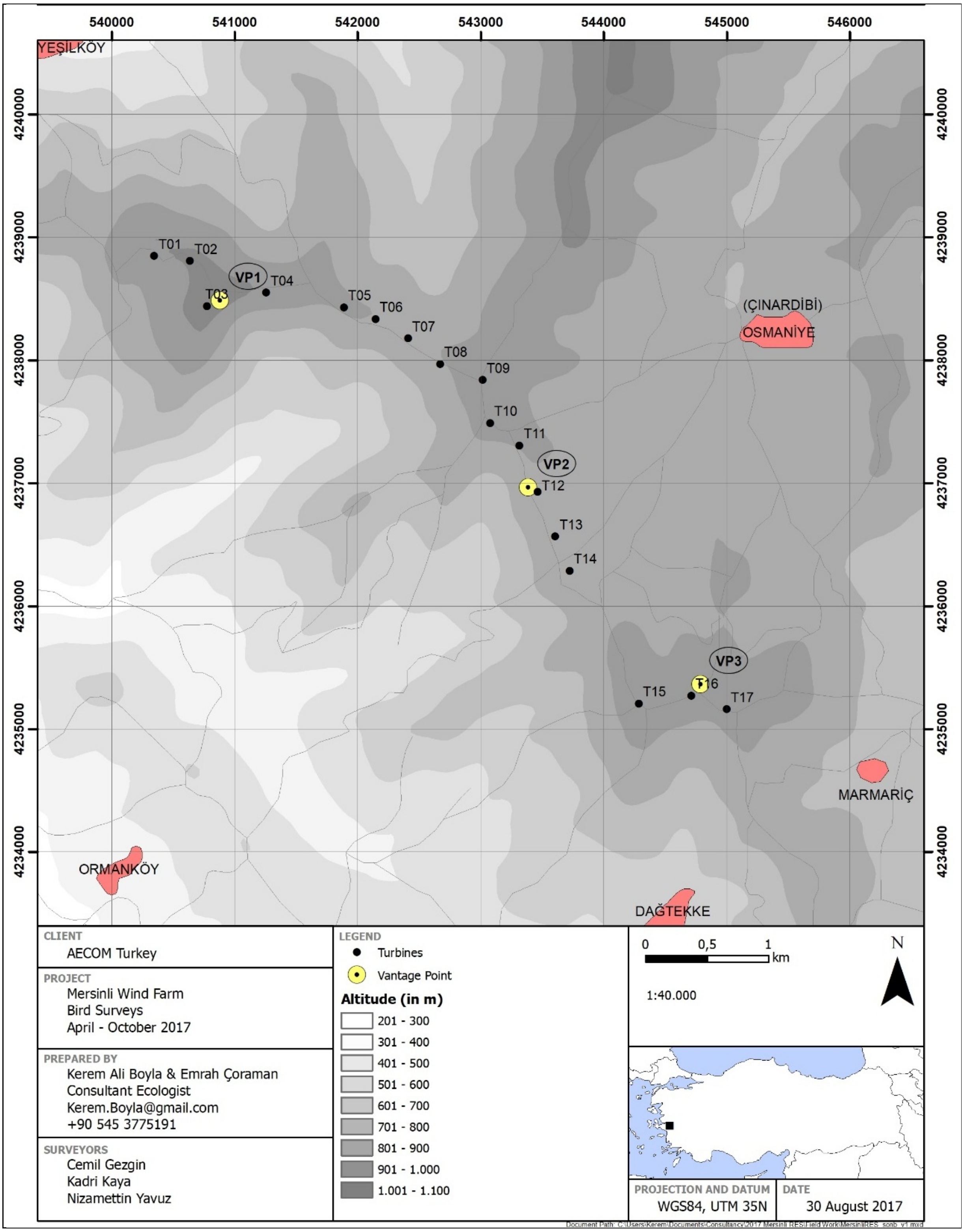


Figure 11–19. VP Survey Location Map

With the main objective of covering all of the flight activity for target species, two teams consisting of three observers were present on-site at all times. To ensure a high detectability rate, third team member shifted from one observer to the other, to avoid lower observer coverage. On most days, a lunch break at noon allowed the observers to refresh. Moreover, instant text messaging ensured a flawless communication among the team members.

Watches during the VP surveys were conducted under good ground visibility, which is considered to be no greater than 2 km. The observations started at 09:00 in the morning and finished at 18:30 on most days. Between 13:00 – 14:00 a lunch break was organised. It is recommended to take a break after the maximum duration of observation of 4 hours. The observers scanned the area each 15 minutes at an angle of 360 degrees. Since it would be impossible for the surveyor to make a constant record of changes in a bird's height and keep track of its position, the method followed allows for bird's height to be recorded at time intervals of 15 seconds. Accordingly; the time of detection is T=0 sec, followed by records at T=15 sec, T=30 sec, etc.). When a bird is detected, the species is identified, the number of individuals is recorded, minimum and maximum heights are estimated, and finally the first and last time of each sighting is noted. A separate standard field data recording sheet was used for each VP survey as presented in Figure 11–20.

The flight height for each observed bird was recorded during its entire flight period. In order to outline a target species' flight activity, flight heights are classified into height bands, which are described in reference to rotor swept area; (i) below the rotor swept area, (ii) the rotor swept area, and (iii) above the rotor swept area (SNH 2014).

Although VP1 had a very clear view on the targeted turbine locations (T1-T8), it had a narrow look to an air corridor in the north direction. Therefore, therefore birds here were recorded for a shorter period of time. VP3 also had problems with the view, due to the existing forest cover. Due to these limitations, it can be clearly stated that the VPs chosen for Project avifauna studies were the best available options, and there were no other feasible alternatives since the forest cover is quite dense in these areas.

Considering the hub height of 87 m and rotor diameter of 126 m (see Chapter 3 of the ESIA Report for turbine specification details), the flight height bands for the Project footprints were marked as the following, where the band, which constitutes the rotor swept area is the one with the higher risk of collision:

(i) Below the rotor swept area: Less than 15 meters above ground level

(ii) The rotor swept area: Between 15 and 145 meters above ground level

(iii) Above the rotor swept area: Higher than 145 meters above ground level

Data recorded for target species were also mapped to outline flight lines, which indicate direction of flight, using different colours for different flight heights. On maps special for each Vantage Point, flight path for each target species was also shown in detail at the "Results" section below. Data recording maps for VP1, VP2 and VP3 survey locations are also provided in Figure 11–21.

VP NUMBER:
SURVEYOR:
PROJECT:

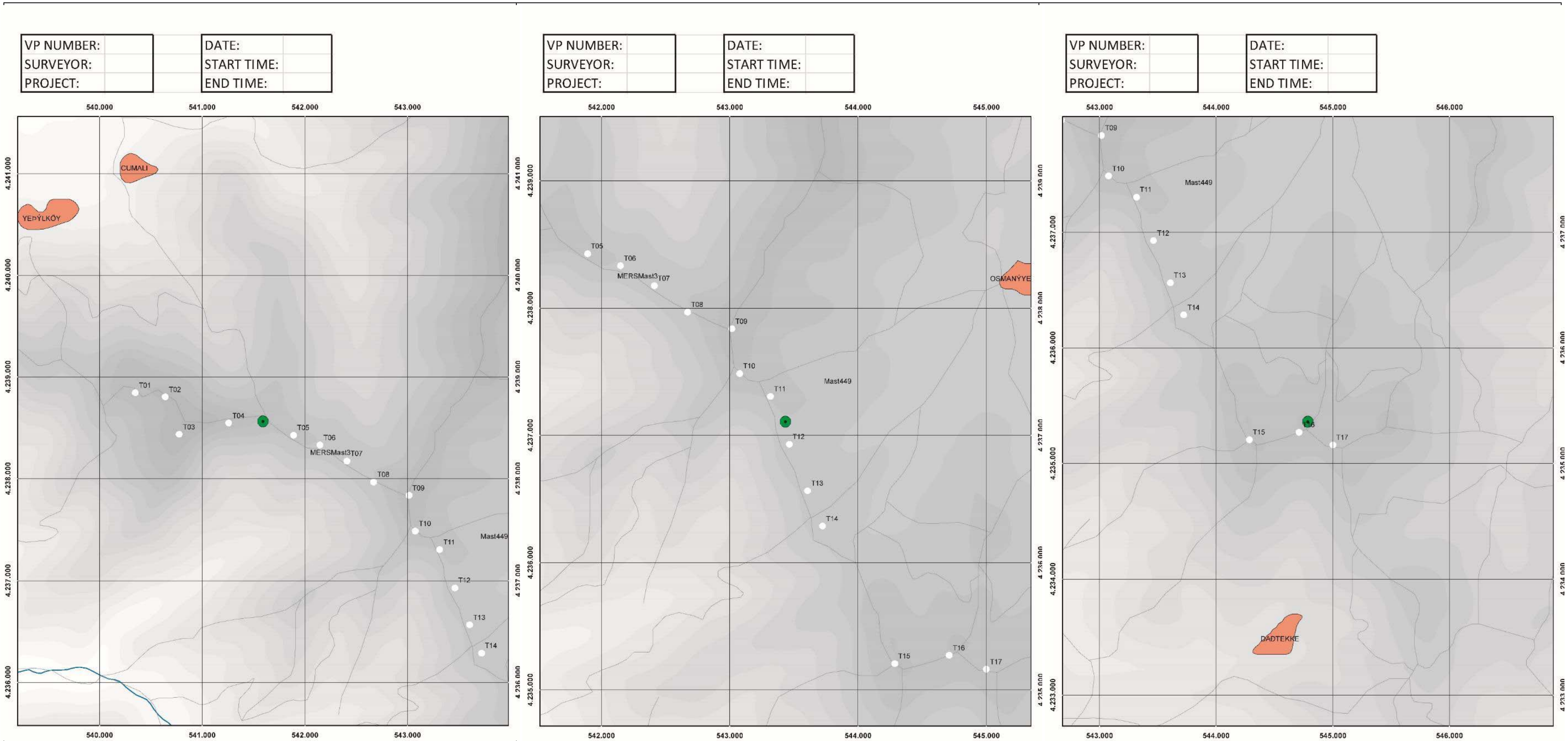
DATE:
START TIME:
END TIME:

%CLOUD COVER:
WIND DIRECTION:
WIND SPEED (Beaufort Scale):

PRECIPITATION (none/low/heavy):
TEMPERATURE:
VISIBILITY (km):

REF	TIME	NO of BIRDS	SPECIES	BEHAVIOUR	TOTAL (sec)	HEIGHT (15 sec. intervals)	1	2	3	4	5	6
1						C (>135m)						
						B (35-135 m)						
						A (0-35 m)						
2						C (>135m)						
						B (35-135 m)						
						A (0-35 m)						
3						C (>135m)						
						B (35-135 m)						
						A (0-35 m)						
4						C (>135m)						
						B (35-135 m)						
						A (0-35 m)						
5						C (>135m)						
						B (35-135 m)						
						A (0-35 m)						
6						C (>135m)						
						B (35-135 m)						
						A (0-35 m)						
7						C (>135m)						
						B (35-135 m)						
						A (0-35 m)						
8						C (>135m)						
						B (35-135 m)						
						A (0-35 m)						
9						C (>135m)						
						B (35-135 m)						
						A (0-35 m)						
10						C (>135m)						
						B (35-135 m)						
						A (0-35 m)						
11						C (>135m)						
						B (35-135 m)						
						A (0-35 m)						
12						C (>135m)						
						B (35-135 m)						
						A (0-35 m)						
13						C (>135m)						
						B (35-135 m)						
						A (0-35 m)						
14						C (>135m)						
						B (35-135 m)						
						A (0-35 m)						
15						C (>135m)						
						B (35-135 m)						
						A (0-35 m)						

Figure 11–20. Vantage Point (VP) Survey Data Recording Sheet



VP1 Flight Path Recording Map	VP2 Flight Path Recording Map	VP3 Flight Path Recording Map

Figure 11–21. Flight Path Recording Maps for VP Survey Locations

Results of Vantage Point (VP) Surveys

VP surveys were conducted during the three seasons of spring, summer, and fall, for a total of 460 hours at the three VP survey locations. Survey hours at each VP location well exceeded 36 hours. Table 11-18 presents number of hours spent at each VP location during each season avifauna studies were conducted. The approximate dates for the seasons are between April and 15 May for spring, 15 May-15 July for summer and between August and October for fall.

Table 11-18. VP Survey Durations

Bird Activity	Season	Survey	Date	VP Survey Location			Total
				VP1	VP2	VP3	
Breeding	Spring	1	4-6 April	13:20	10:30	14:15	38:05
		2	19-21 April	8:40	10:45	6:50	26:15
		3	10-12 May	17:20	13:50	10:30	41:40
	Summer	4	26-28 May	9:45	14:25	13:45	37:55
		5	5-9 June	28:25	30:55	30:00	89:20
		6	26-28 July	11:55	13:00	15:50	40:45
Non-Breeding	Fall	7	11-13 Aug	7:40	12:35	12:08	32:23
		8	26-28 Aug	12:15	12:15	14:10	38:40
		9	13-15 Sep	11:30	13:40	13:35	38:45
		10	26-28 Sep	9:55	12:58	11:40	34:33
		11	11-13 Oct	12:55	14:30	14:45	42:10
Total				143:40	159:23	157:28	460:31

A “contact” is defined as the period, which starts with the detection of a bird in the air, and ends by disappearance of the same bird. A total of 670 bird contacts have been recorded during the Project avifauna studies. The contacts are mostly of resident birds, dominated by individuals of *Buteo buteo* (Common buzzard), *Circaetus gallicus* (Short-toed eagle), *Corvus corax* (Common raven), and *Pernis apivarus* (European honey buzzard). Out of these 670 contacts, only 40 of them were encounters with migrant species. Table 11-19 summarises these contacts, including target and non-target species recorded during the VP surveys (Details on bird observations during VP counts are provided in Appendix D.2).

Table 11-19. VP Survey Bird Contacts

Scientific Name	Common Name	Spring	Autumn	Total	At Rotor Height
Buteo buteo	Common Buzzard	120	32	152	61
Corvus corax	Common Raven*	72	39	111	22
Circaetus gallicus	Short-Toed Snake Eagle	77	9	86	30
Falco eleonorea	Eleonora's Falcon	30	37	67	23
Pernis apivorus	European Honey Buzzard	42	13	55	27
Falco peregrinus	Peregrine Falcon	34	11	45	17
Falco tinnunculus	Common Kestrel	17	19	36	20
Accipiter nisus	Eurasian Sparrowhawk	9	19	28	10
Accipiter gentilis	Northern Goshawk	3	11	14	9
Accipitridae spec.	Unidentified	4	8	12	4
Buteo rufinus	Long-Legged Buzzard	3	4	7	5
Ciconia nigra	Black Stork	7		7	4
Falco sp.	Unid. Falcon	4	3	7	2
Hieraaetus pennatus	Booted Eagle	1		1	-
Pandion haliaeetus	Osprey		1	1	-
Phalacrocorax carbo	Great Cormorant*	1		1	1
Total		424	206	630	235

The total duration of each contact at risk height was also calculated, while for contacts of more than one individual, the duration was multiplied with the number of individuals. Table 11-20 shows the total duration of contact for target species at risk height.

Table 11-20. Total Duration of Flight per Species

Scientific Name	**Common Name**	**Spring**		**Autumn**		**Total**	
		Rotor Height **(sec)**	Total **(sec)**	Rotor Height **(sec)**	Total **(sec)**	Rotor Height **(sec)**	Total **(sec)**
Buteo buteo	Common Buzzard	2385	12840	1005	3180	3390	16020
Circaetus gallicus	Short-Toed Snake Eagle	1740	8100	360	1395	2100	9495
Pernis apivorus	European Honey Buzzard	1515	6375	540	2055	2055	8430
Falco eleonorea	Eleonora's Falcon	450	3405	720	7725	1170	11130
Falco peregrinus	Peregrine Falcon	960	5250	180	1215	1140	6465
Falco tinnunculus	Common Kestrel	435	2265	540	3045	975	5310
Accipiter nisus	Eurasian Sparrowhawk	135	465	360	2085	495	2550
Accipiter gentilis	Northern Goshawk	0	600	435	1305	435	1905
Buteo rufinus	Long-Legged Buzzard	30	165	390	510	420	675
Accipitridae spec.	unidentified.	75	165	135	300	210	465
Ciconia nigra	Black Stork	135	720			135	720
Falco sp.	unid. Falcon	0	120	60	90	60	210
Total		7860	40470	4725	22905	12585	63375

The number of target birds that are likely to fly through the sweeping areas of the rotors was also calculated. A total of 102 birds' flight path has crossed the 68 meter-radius of axes of the tower and the rotor height, at the same time (see Table 11-21).

Table 11-21. Number of Birds Flying through Proposed Rotors

Scientific Name	**Common Name**	**Spring**	**Autumn**	**Total**
Buteo buteo	Common Buzzard	10	10	20
Pernis apivorus	European Honey Buzzard	10	3	13
Falco peregrinus	Peregrine Falcon	10	2	12
Falco eleonorea	Eleonora's Falcon	4	8	12
Circaetus gallicus	Short-Toed Snake Eagle	9		9
Falco tinnunculus	Common Kestrel	4	5	9
Accipiter nisus	Eurasian Sparrowhawk	3	3	6
Buteo rufinus	Long-Legged Buzzard	1	2	3
Ciconia nigra	Black Stork	3		3
Accipiter gentilis	Northern Goshawk		1	1
Accipitridae spec.	unidentified.	1		1
Falco sp.	unid. Falcon		1	1
Total		55	35	90

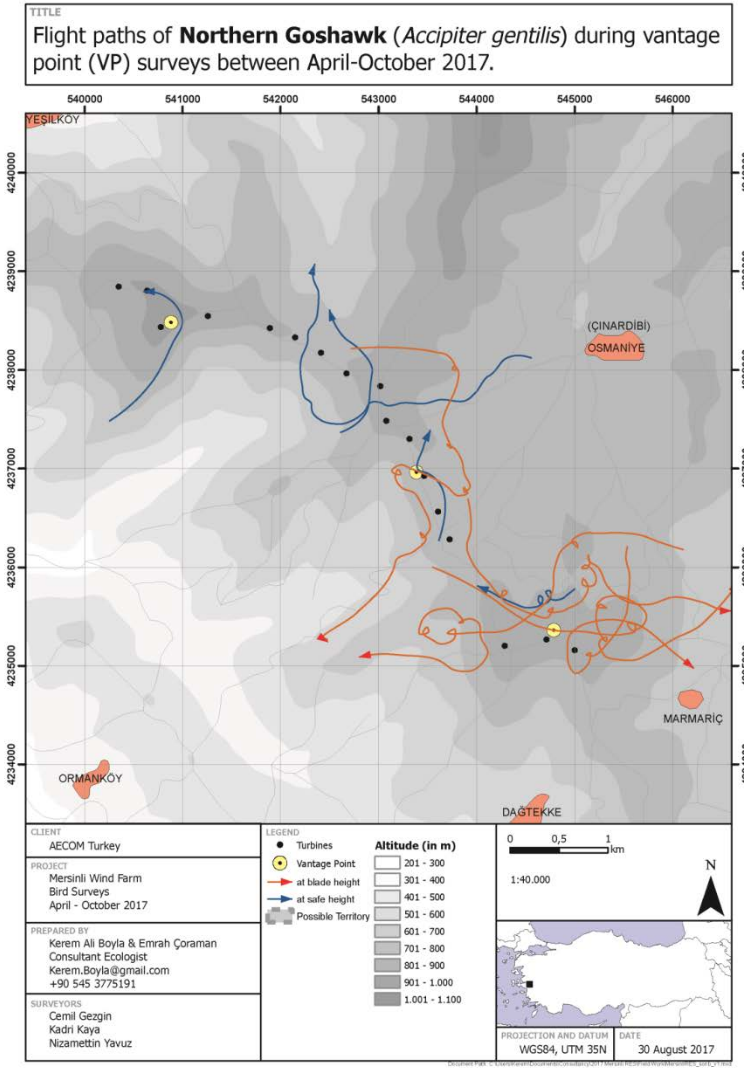
A total of 40 migratory soaring birds were recorded to fly over the Project License Area during the VP surveys. Of these 40 birds, only 9 flew at rotor height. During the two months of spring migration period between 1 April and 31 May 2017, migratory species were observed for 12 days. During the three months of fall migration between 1 August and 31 October 2017, observations were made for another 15 days. Based on these observations, a total of 48 birds flew over the Project License Area, 36 during the spring migration, and the other 12 during the fall migration (seeTable 11-22).

Table 11-22. Number of Migratory Birds Flying through Proposed Rotors

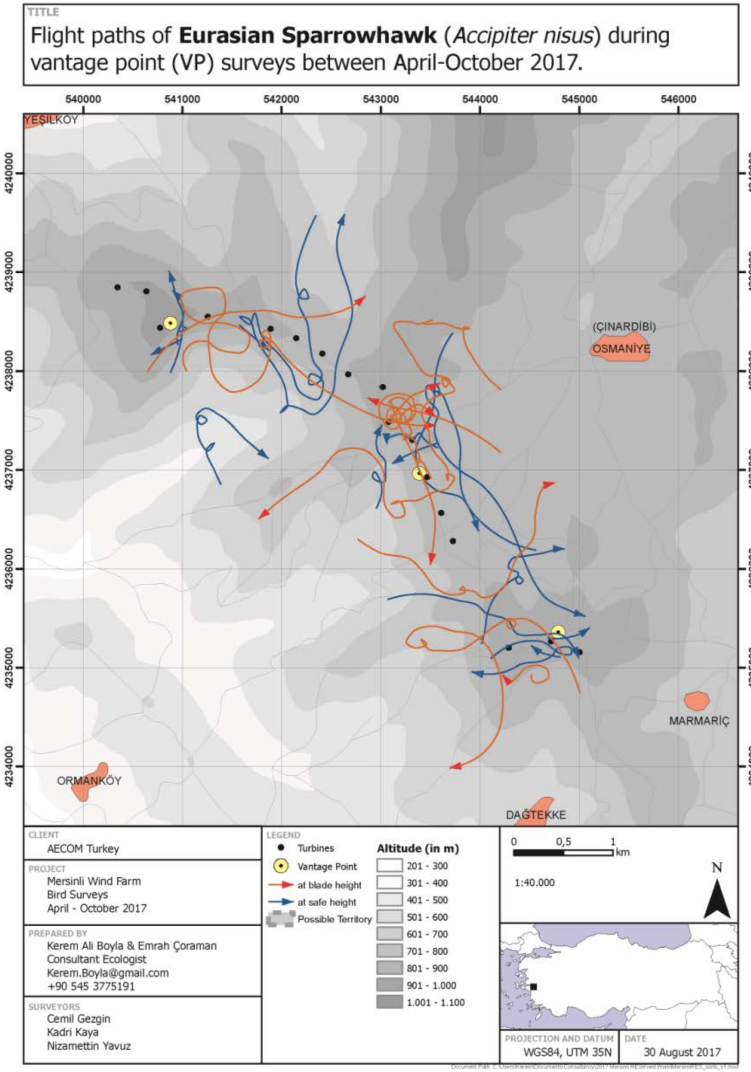
Season	Date	Scientific Name	Common Name	Over Rotor Height	At Rotor Height
Spring	5 Apr	*Buteo buteo*	Common Buzzard	1	
		Accipitridae spec.	unidentified.		1
	6 Apr	*Buteo buteo*	Common Buzzard	1	5
		Accipiter nisus	Eurasian Sparrowhawk	4	
		Circus aeruginosus	Western Marsh-Harrier	2	
	11 May	*Pernis apivorus*	European Honey Buzzard	2	
	24 May	*Pernis apivorus*	European Honey Buzzard	1	1
Fall	12 Aug	*Hieraaetus pennatus*	Booted Eagle	1	
	13 Sep	*Pernis apivorus*	European Honey Buzzard	2	
		Accipitridae spec.	unidentified.	1	
	14 Sep	*Pernis apivorus*	European Honey Buzzard	4	
		Accipitridae spec.	unidentified.	1	
	15 Sep	*Milvus migrans*	Black Kite	1	
		Clanga pomarina	Lesser Spotted Eagle	1	
		Pandion haliaeetus	Osprey	1	
		Circus aeruginosus	Western Marsh-Harrier	2	
	26 Sep	*Ciconia nigra*	Black Stork	1	
	27 Sep	*Accipitridae spec.*	unidentified.	1	
		Circus aeruginosus	Western Marsh-Harrier	2	
	28 Sep	*Circus aeruginosus*	Western Marsh-Harrier		1
	11 Oct	*Buteo buteo*	Common Buzzard		1
		Accipiter nisus	Eurasian Sparrowhawk	1	
	13 Oct	*Accipiter nisus*	Eurasian Sparrowhawk	1	
Total				31	9

Moreover a total of 21 sightings of *Falco eleonorea* (Eleonora's Falcon) were recorded, when the birds were hunting during May. Those were regarded as non-breeding summer visitors and excluded from migrant birds.

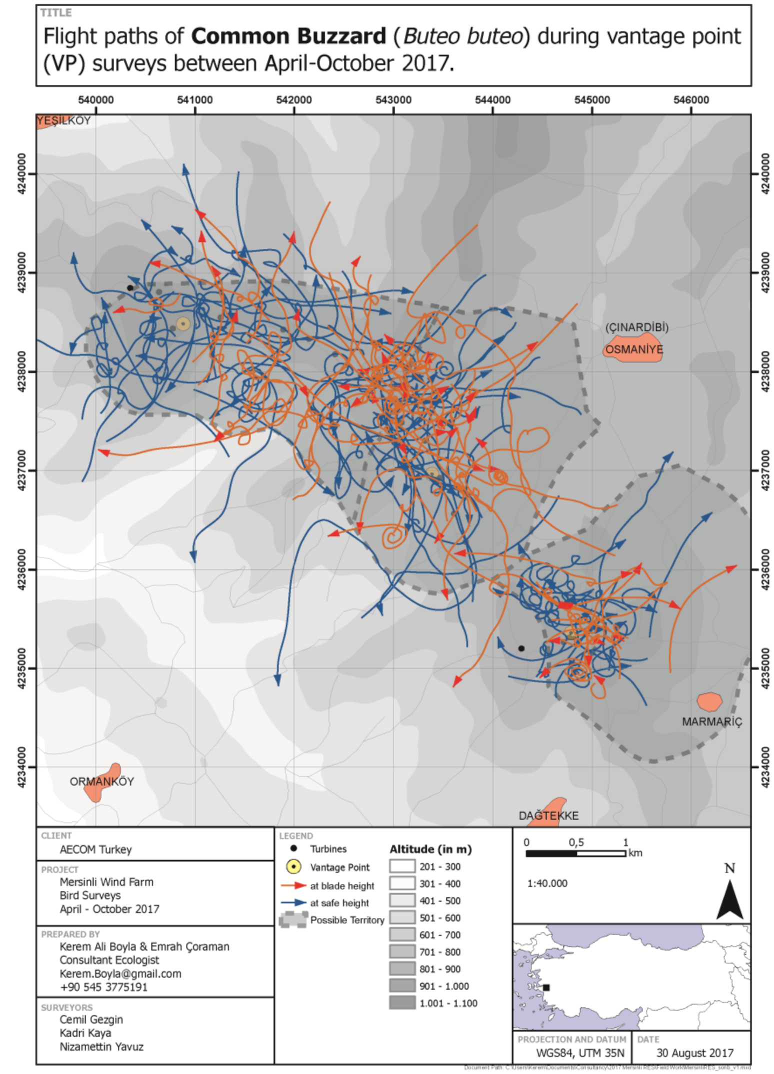
Maps of flight paths for target species that have been prepared based on VP survey results are presented in Figure 11–22.



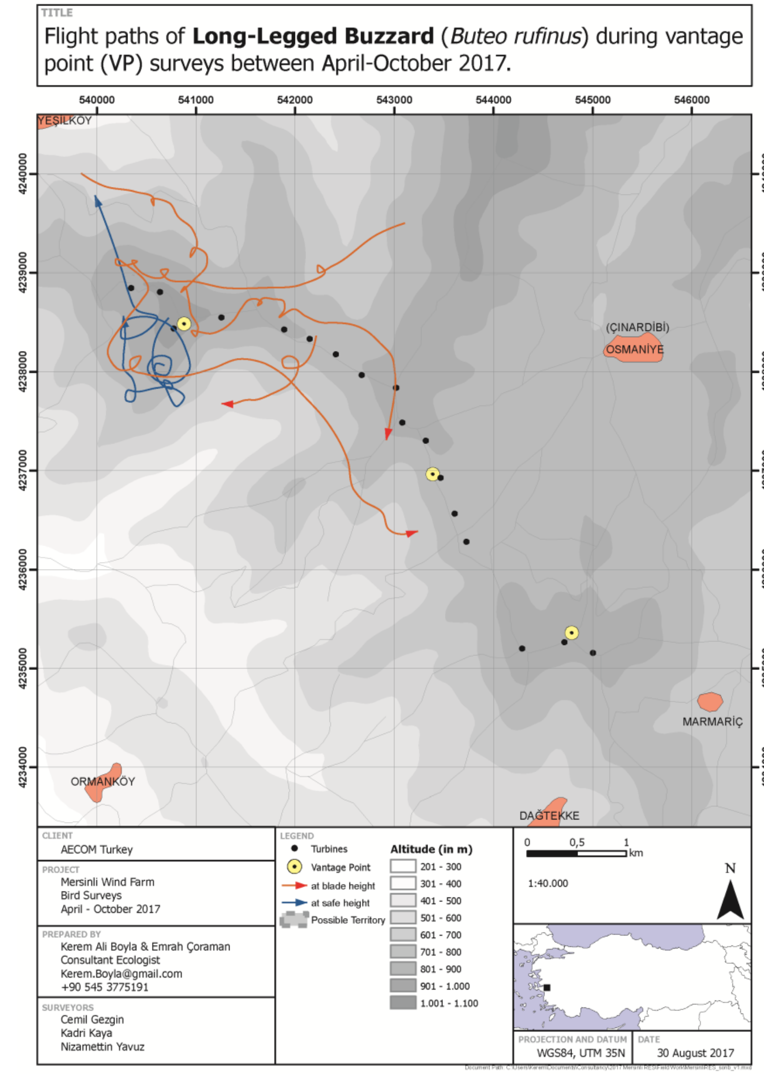
Flight Path – *Accipiter gentilis*



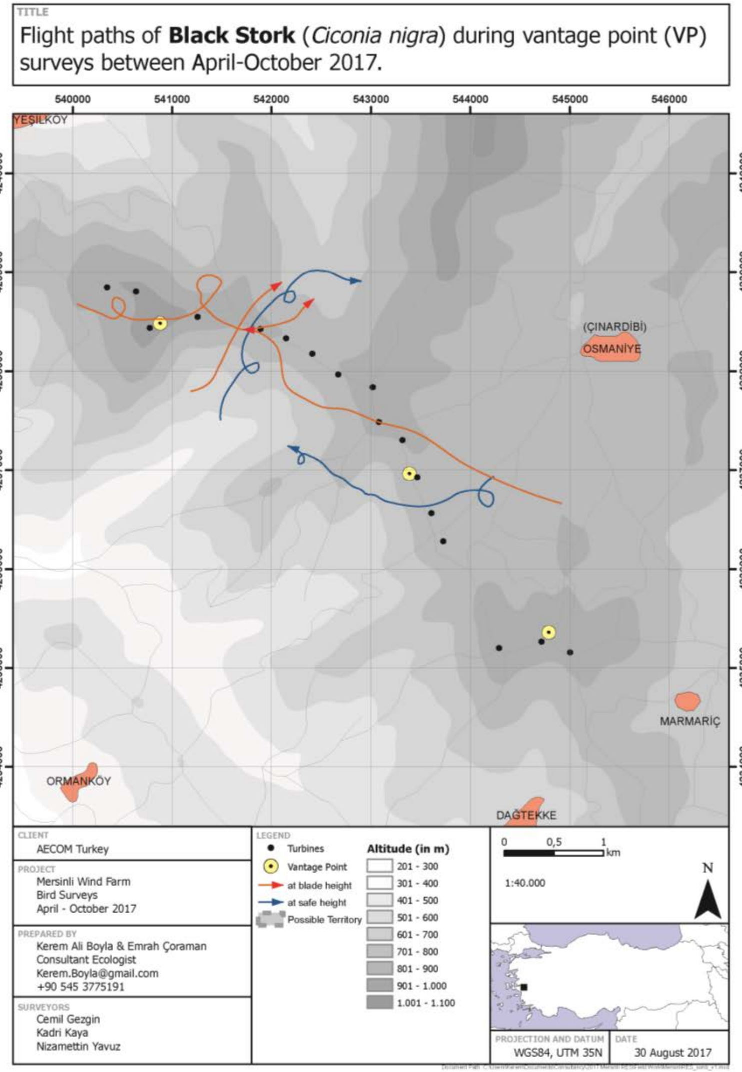
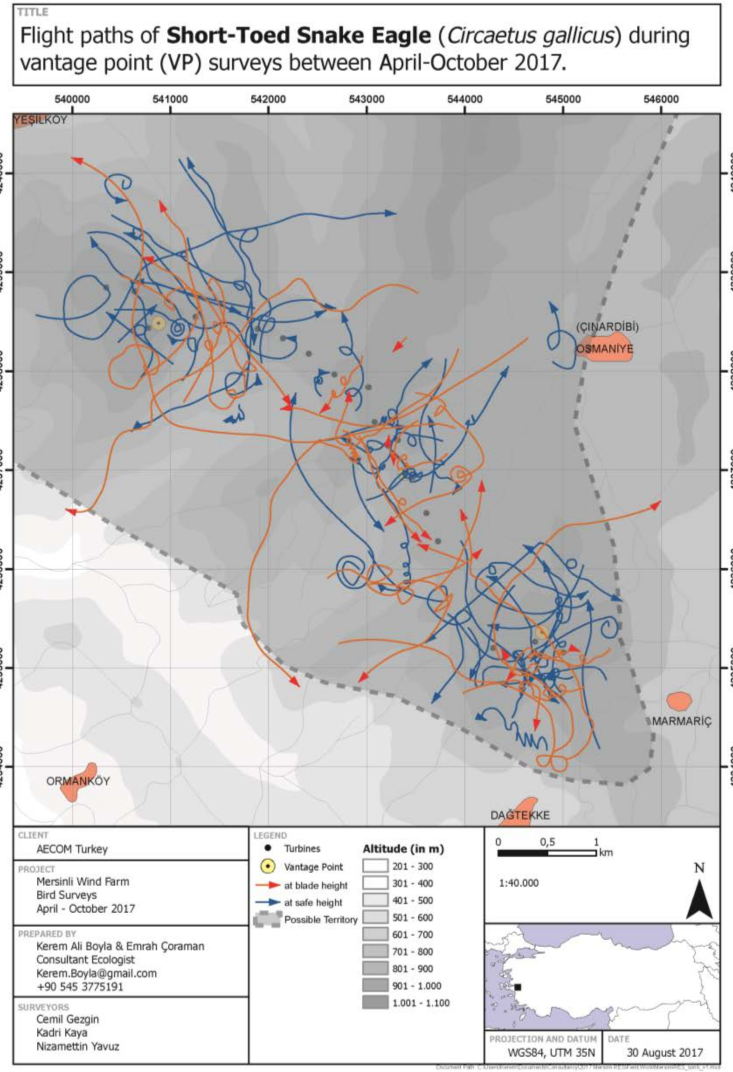
Flight Path – *Accipiter nisus*

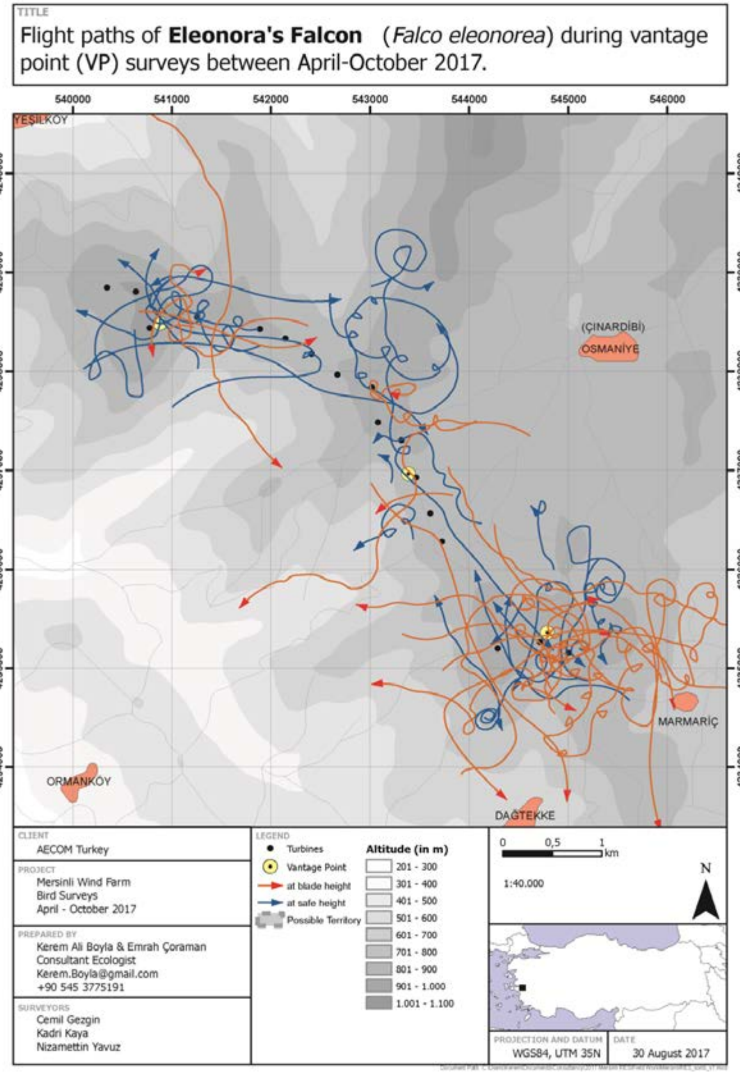


Flight Path – *Buteo buteo*

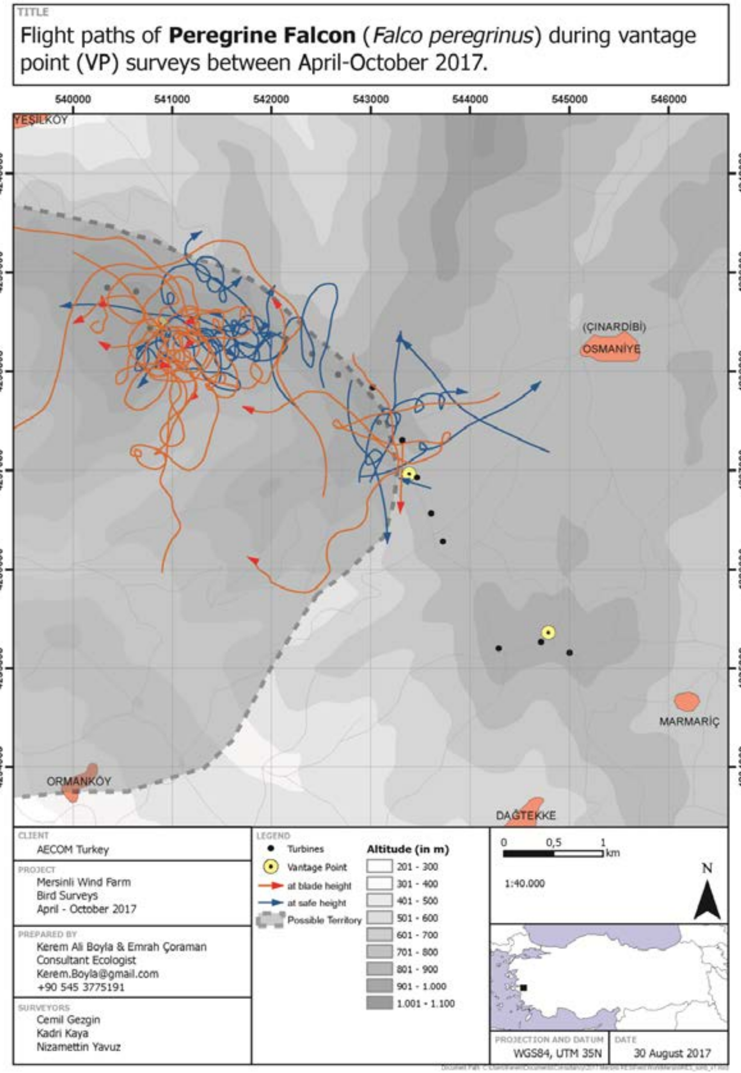


Flight Path – *Buteo rufinus*

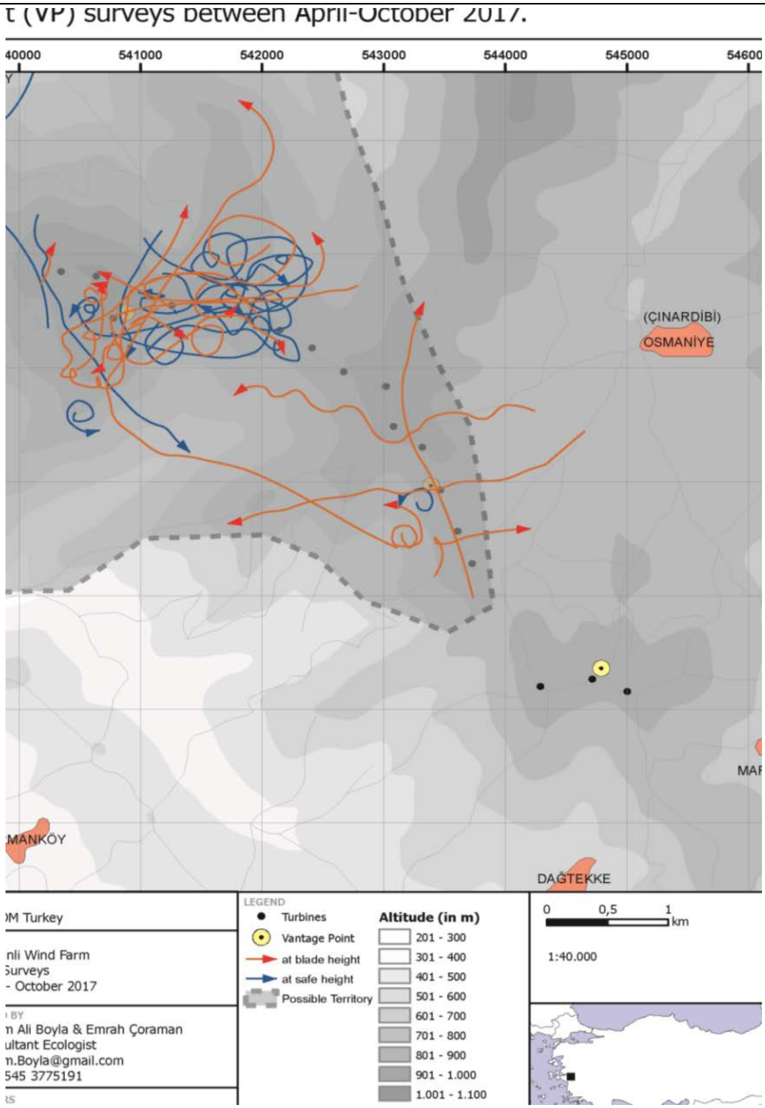
	
Flight Path – *Ciconia nigra*	**Flight Path – *Circaetus gallicus***



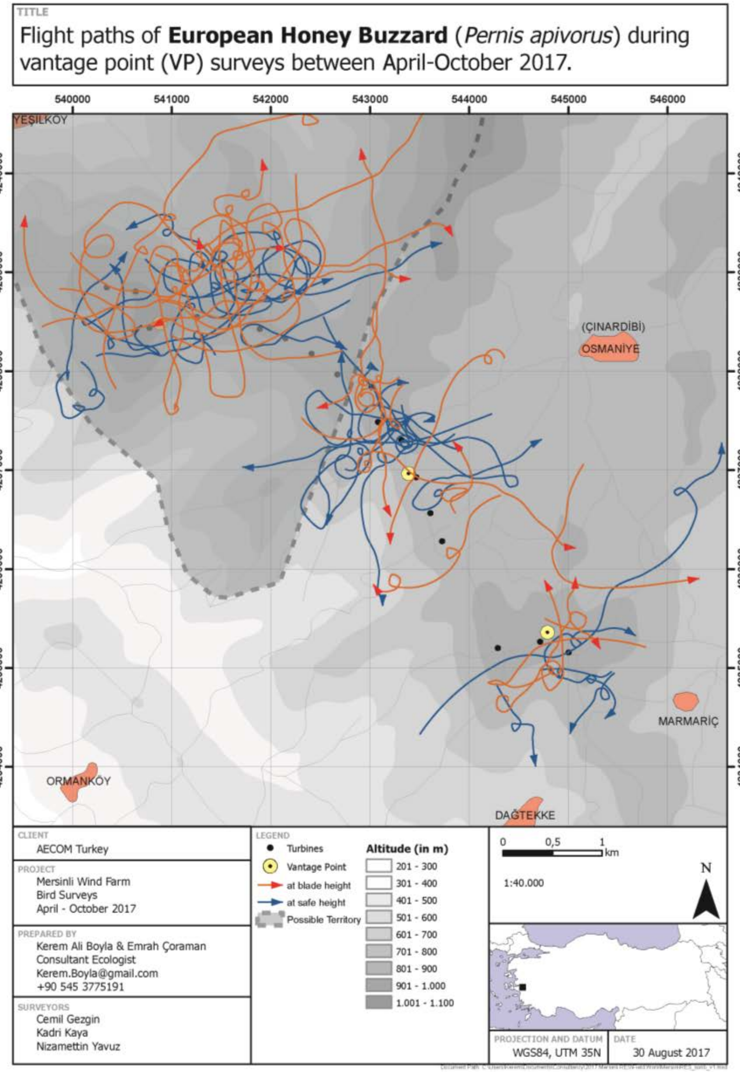
Flight Path – *Falco eleonorea*



Flight Path – *Falco peregrinus*



Flight Path – *Falco tinnunculus*



Flight Path – *Pernis apivorus*

Figure 11–22. Flight Path Maps of Target Species

Breeding Bird Surveys

Framework and Survey Methods

Breeding bird surveys are to record distribution of breeding, wintering and migrant birds using Mersinli WPP License Area in order to make an evaluation on the area's significance to identify impacts due to Project activities. Although the general emphasis of the Project avifauna studies have been target species, it is important to understand distribution, abundance and potential displacement effects on populations of secondary species that are breeding residents and/or species that are of regional conservation significance. This is mostly to understand general effects of Mersinli WPP on broader avifauna, besides the impact assessment focusing on target species.

Consequently, breeding bird surveys at Mersinli WPP License Area have been conducted with the main objective of confirming presence and assessing activity levels of secondary bird species identified during scoping. In addition to secondary species, however, breeding statuses of target species have also been evaluated. For this, in addition to transect surveys, nest sites of raptors and any habitats likely to support nest sites of target species have been surveyed and checked to confirm active occupancy.

The walk-over and species-specific surveys have been conducted through collecting data along one-hour transect surveys following the existing forest roads that are accessible. Particular attention has been paid to species of regional conservation importance whose populations are in decreasing trend, namely; *Coracias garrulous* (Common roller) and *Streptopelia turtur* (European turtle dove), Table 11-23 shows times and routes of breeding bird transects. Additional observations have also been conducted during the vantage point surveys and included in the overall inventory and assessments made.

Table 11-23. Breeding Bird Transect Surveys

Transect	Route	Date	Duration
Transect 1	T4-T7	5 April 2017	1 hour
Transect 2	T13-T14	5 April 2017	1 hour
Transect 3	Forest Tower-T15	5 April 2017	1 hour

Results of Breeding Bird Transect Surveys

Breeding bird transect surveys yielded the list of breeders at the Mersinli WPP License Area as presented in Table 11-24. The table includes both the results of the field surveys, which are provided using the European Breeding Bird Atlas codes, as the "highest breeding code recorded", and expert judgement on statuses of each species listed. Due to the time constraint of the study, expert judgement on each species is important, as it reflects on vast knowledge on species, their habitat preferences and the study area's and birds' regional significance. The table also provides relative abundances of species, together with a scale defined based on characteristics of different species.

In addition, surveys and related observations conducted during the Project avifauna studies revealed more detailed information on possible territories of raptors in the area, which were recorded through direct observations and are further listed in Table 11-25.

Coracias garrulus (Common roller), was initially considered to be a potential breeder in the area. However, due to lack of suitable habitats for this species, it was not observed throughout the surveys. Breeding bird surveys, however, identified populations of a restricted range species of *Sitta kruperi* (Krüper's nuthatch) and the only IUCN Red List species of elevated conservation concern; *Streptopelia turtur* (Eurasian turtle dove), which is listed as VU. Both of these species are woodland species, populations of which are not expected to be impacted by Mersinli WPP Project activities.

Table 11-24. Results of Breeding Bird Transect Surveys

Scientific Name	Common Name	VP1	VP2	VP3	Highest Breeding Code Recorded*	Expert Judgment	Relative Abundance	Scale of Abundance		
								Low	Medium	High
Alectoris chukar	Chukar	x			Possible	Confirmed	Medium	1-5	6-20	21+
Pernis apivorus	European Honey-buzzard	x	x	x	Possible	Confirmed	Medium	1-5	6-20	21+
Circaetus gallicus	Short-toed Snake-Eagle	x	x	x	Possible	Confirmed	High	1-5	6-20	21+
Accipiter nisus	Eurasian Sparrowhawk	x	x	x	Possible	Confirmed	Medium	1-5	6-20	21+
Accipiter gentilis	Northern Goshawk	x	x	x	Possible	Possible	Medium	1-3	4-10	11+
Buteo buteo	Common Buzzard	x	x	x	Confirmed	Confirmed	High	1-5	6-20	21+
Buteo rufinus	Long-legged Buzzard	x			Possible	Possible	Medium	1-5	6-20	21+
Columba palumbus	Common Wood-Pigeon			x	Possible	Confirmed	Low	1-10	11-50	51+
Cuculus canorus	Common Cuckoo	x			Possible	Confirmed	Low	1-3	4-10	11+
Strix aluco	Tawny Owl		x		Possible	Confirmed	Low	1-3	4-10	11+
Caprimulgus europaeus	Eurasian Nightjar		x		Possible	Confirmed	Low	1-3	4-10	11+
Upupa epops	Eurasian Hoopoe	x	x		Possible	Confirmed	Low	1-5	6-20	21+
Dendrocopos medius	Middle Spotted Woodpecker	x			Possible	Confirmed	Medium	1-5	6-20	21+
Picus viridis	Eurasian Green Woodpecker			x	Possible	Confirmed	Low	1-5	6-20	21+
Falco tinnunculus	Eurasian Kestrel	x	x		Confirmed	Confirmed	Low	1-10	11-50	51+
Falco peregrinus	Peregrine Falcon	x	x		Confirmed	Confirmed	Medium	1-5	6-20	21+
Garrulus glandarius	Eurasian Jay		x	x	Possible	Confirmed	High	1-10	11-50	51+
Corvus corax	Common Raven	x	x	x	Confirmed	Confirmed	High	1-5	6-20	21+
Lullula arborea	Wood Lark	x	x	x	Probable	Confirmed	Medium	1-10	11-50	51+
Periparus ater	Coal Tit	x	x	x	Possible	Confirmed	High	1-10	11-50	51+
Cyanistes caeruleus	Eurasian Blue Tit			x	Possible	Confirmed	Low	1-10	11-50	51+
Parus major	Great Tit	x		x	Possible	Confirmed	Medium	1-10	11-50	51+
Aegithalos caudatus	Long-tailed Tit	x	x	x	Possible	Confirmed	Medium	1-10	11-50	51+

Scientific Name	Common Name	VP1	VP2	VP3	Highest Breeding Code Recorded*	Expert Judgment	Relative Abundance	Scale of Abundance		
								Low	Medium	High
Sitta krueperi	Krüper's Nuthatch		x	x	Possible	Confirmed	Medium-High	1-10	11-50	51+
Sitta neumayer	Rock Nuthatch	x			Possible	Confirmed	Medium	1-10	11-50	51+
Certhia brachydactyla	Short-toed Treecreeper			x	Possible	Confirmed	Medium	1-10	11-50	51+
Troglodytes troglodytes	Eurasian Wren		x	x	Possible	Confirmed	Medium	1-10	11-50	51+
Phylloscopus collybita	Common Chiffchaff			x	Possible	Confirmed	Medium	1-10	11-50	51+
Phylloscopus orientalis	Eastern Bonelli's Warbler	x			Possible	Confirmed	Medium	1-10	11-50	51+
Sylvia cantillans	Subalpine Warbler	x			Possible	Confirmed	Low	1-10	11-50	51+
Oenanthe hispanica	Black-eared Wheatear	x			Possible	Confirmed	Low	1-10	11-50	51+
Erithacus rubecula	European Robin			x	Possible	Confirmed	Medium	1-10	11-50	51+
Turdus merula	Eurasian Blackbird	x	x		Possible	Confirmed	Medium	1-10	11-50	51+
Turdus viscivorus	Mistle Thrush	x		x	Possible	Confirmed	Medium	1-10	11-50	51+
Anthus campestris	Tawny Pipit	x			Possible	Confirmed	Low	1-10	11-50	51+
Emberiza hortulana	Ortolan Bunting			x	Possible	Confirmed	Medium	1-10	11-50	51+
Emberiza caesia	Cretzschmar's Bunting	x			Possible	Confirmed	Low	1-10	11-50	51+
Fringilla coelebs	Common Chaffinch	x	x	x	Possible	Confirmed	High	1-10	11-50	51+
Chloris chloris	European Greenfinch		x	x	Possible	Confirmed	Medium	1-10	11-50	51+
Carduelis carduelis	European Goldfinch		x	x	Possible	Confirmed	Medium	1-10	11-50	51+
Serinus serinus	European Serin		x	x	Possible	Confirmed	High	1-10	11-50	51+

***See EBCC (2017b) for “Atlas codes” defining possible and confirmed breeding bird species.**

Table 11-25. Results of Breeding Bird Transect Surveys

Scientific Name	Common Name	Possible Territory	Nearest Turbine
Buteo buteo	Common Buzzard	A pair of breeding birds, and two young birds	Turbine 4
		Possible pair with two young birds	Turbine 8
		1-2 possible pairs in the southern slopes of the forested hill	Turbine 14-16
Pernis apivorus	European Honey Buzzard	A possible pair in the area, hunting mostly north of Turbine 4-9	Turbine 4-9
Circaetus gallicus	Short-toed Snake Eagle	A pair breeding 1-2 km north of Turbine 9	Turbine 9
Falco tinnunculus	Common Kestrel	A pair at the western slopes of the hill near Turbine 4	Turbine 4
Falco peregrinus	Peregrine Falcon	A pair at the southern slopes of the hill near Turbine 4	Turbine 4

Most of the turbine sitings have a safe distance from breeding raptors. However, the sitings of the Turbine 1, 2 and 3 correspond to the rock habitat, which is frequently used as a nesting site by *Falco peregrinus* (Peregrine falcon), as well as *Falco tinnunculus* (Common kestrel), *Buteo buteo* (Common Buzzard), and possibly by *Buteo rufinus* (Long-legged Buzzard) and *Accipiter nisus* (Eurasian sparrowhawk).

Peregrine Falcon is likely to co-exist with the turbine in operation. The bird has been observed flying down from the nest to the south, possibly visiting the towns and villages to feed on Eurasian Collared Dove (Streptopelia decaocto) and other similar food items. The Common Kestrel is likely to feed on the lowland fields and open areas. Both have been observed to use limited time around the turbine sitings, which has been investigated in the species-specific collision risk analysis.

Impacts of the existing ETL have also been assessed as part of the Project avifauna studies. As mentioned earlier, the ETL passes through lower valleys and through a low value habitat for most species, at a distance of about 800 m from the nesting site of *Falco tinnunculus* and *Falco peregrinus*. The birds seem not to be affected by the ETL and the distance to the nests has been assessed to be safe enough for breeding activity to continue in the area. No other nests along the ETL have been detected.

Three species have been observed spending more time along the ETL route, namely; *Buteo buteo* (8 prolonged observations), *Falco tinnunculus* (5 prolonged observations) and *Pernis apivorus* (2 prolonged observations), *Circaetus gallicus* is a high flyer, and *Buteo rufinus* and *Accipiter nisus*, on the other hand, have very low populations in the area. A few foraging *Pernis apivorus* individuals may spend some time along the ETL route, which in terms of impacts they are exposed to can be assessed as negligible.

11.5.2.4 Collision Risk Analysis

VP surveys for the Project avifauna studies were designed to ensure that they provide adequate data for a collision risk analysis for the Project License Area, where there is a large amount of flight data. Observations made throughout the year supply the collision risk modelling with robust flight activity estimates.

Collision risk analysis methodology for the Project avifauna studies has been adapted from the guidelines of the Scottish Natural Heritage (2000), which involves a two-stage process, details of which are provided in this section.

Approach 1: Regular Flights through a Wind Farm

The first approach is where a bird population makes regular flights through the wind farm, possibly in a reasonably defined direction (SNH, 2000). This is usually applied to species that realise regular flights between their feeding and sleeping areas, such as wintering geese, gulls and cranes. For the Project License Area, this approach was used for migratory species.

The step-by-step methodology for this approach is as the following:

1. Identify a 'risk window', i.e. a window of width equal to the width of the wind farm across the general flight direction of the birds, and of height equal to the maximum height of the highest turbine. The cross-sectional area W = width x height.
2. Estimate the number of birds n flying through this risk window per annum, i.e. flock size x frequency of flight. Make allowance in the flock size for occasions on which birds which may fly higher than this risk window and for the fact that the risk window may only straddle a proportion of the overall flight corridor used by the birds.
3. Calculate the area A presented by the wind farm rotors. Assume the rotors are aligned in the plane of the risk window as, to a first approximation; any reduction in cross-sectional area because the rotors are at an oblique angle is offset by the increased risk to birds which have to make a longer transit through the rotors. Where rotors overlap when viewed in cross-section, allow for the full cross-sectional area of separate rotors as the risk to birds is doubled if passing through two successive rotors:

   A = N x πR_2 where N is the number of rotors and R is the rotor radius
4. Express the total rotor area as a proportion A / W of the risk window.
5. Number of birds passing through rotors = number of birds through risk window x proportion occupied by rotors = n x (A / W).

During the VP surveys a total of 9 migratory birds were observed to by flying at rotor height. When the risk window at rotor height is calculated, the number of birds expected to pass through the blades is 115 birds a year. Variables of this calculation are presented in Table 11-26.

Table 11-26. Estimating Total Number of Migratory Birds

Variables	Spring	Fall	Total
Flight at rotor height	7	2	9
Duration of observation	274 hr	186 hr	460 hr
Period	April-July	August-October	-
Total daylight hours	4392 hr	3240 hr	-
Estimated number of birds	80	35	115

Avoidance rate for the collision risk analysis was also adapted from the Scottish Natural Heritage Guidelines (2000), calculated according to the following formula:

$$AvoidanceRate = 1 - \frac{No.ofObservedCollision}{no.of\ \mathrm{Pr}\,edictedCollisionWithNoAvoidance}$$

Consequently cumulative mortality rate was calculated for migratory species, based on the data collected during the VP surveys, which are provided in Table 11-27.

Table 11-27. Cumulative Mortality Rate for Migratory Birds

Regular Flight through the Wind Farm		Spring	Fall	Total
Number of Wind Turbines	N	17	17	17
	Flight angles with respect to NW-SE (degrees)	30	30	30
	Width (m)	4650	4650	4650
	Height (m)	126	126	126
1. Identify a risk window. W=width x height	W (m^2)	585900	585900	585900
2. Estimate the number of birds (Table 11-23)	n	80	35	115
3. Area represented by wind farm rotors.	A(m^2)	211973	211973	211973

A=N x πR

4. Total rotor areas as a proportion of A /W of the risk window	A/W	31%	31%	31%
5. Number of birds passing through rotors	n x (A / W)	29	13	42
Probability of birds being hit when flying through the rotor		11,5%	11.5%	11.5%
Mortality rate without avoidance	birds	3,33	1.46	4.78
(1 - avoidance rate)	birds	2%	2%	2%
Mortality estimation per year	Birds	0.07	0.03	0.1

As can be seen in Table 11-27, the cumulative mortality rate for all migrant species was calculated to be 0.1, which is 1 bird every 10 years.

During the spring migration number of recorded birds was lower. However, more birds flew at rotor height. During the fall migration total number of birds was higher but fewer birds flew at rotor height. This might be an indication of hot air temperatures helping bird species flying higher with stronger thermal air currents.

Approach 2: Birds Using the Wind Farm Airspace

The Scottish Natural Heritage suggests a second approach that is more appropriate for birds like raptors, which occupy a recognised territory, and where observations have led to some understanding of the likely distribution of flights within this territory (SNH, 2000). This approach was applied with the following the step-by-step methodology:

1. Identify a 'flight risk volume' Vw which is the area of the wind farm multiplied by the height of the turbines.
2. Calculate the combined volume swept out by the wind farm rotors Vr = N x πR^2 x (d + l) where N is the number of wind turbines, d is the depth of the rotor back to front, and l is the length of the bird.
3. Estimate the bird occupancy n within the flight risk volume. This is the number of birds present multiplied by the time spent flying in the flight risk volume, within the period (usually one year) for which the collision estimate is being made. For good results the data available should be based on actual observations within the area of the wind farm alone (provided the observation is done without disturbance), and the best results will be based on observational data about flight heights, such as will enable informed estimate of the proportion of flights at a level which may collide with the wind farm rotors. However, in the absence of such data, an estimate can be made knowing only the number of birds, and proportion of time flying, within the bird's territory, and using some knowledge of flight behaviour to gauge the proportion of flights at a height to be at risk.
4. The bird occupancy of the volume swept by the rotors is then

   n x (Vr / Vw) bird-secs.
5. Calculate the time take for a bird to make a transit through the rotor and completely clear the rotors:

   t = (d + l) / v where v m/sec is the speed of the bird through the rotor
6. To calculate the number of bird transits through the rotors, divide the total occupancy of the volume swept by the rotors in bird-secs by the transit time t:

   Number of birds passing through rotors = n x (Vr / Vw) / t

First, bird occupancy within the flight risk window was calculated. The total amount of time spent at the risk height was obtained from Table 11-28, and for each species total time in seconds per year was calculated. Resident birds were observed from the total time of observation, while migratory birds staying in the area (and in Turkey) for at most 7 months, spring and summer occupancy rates were calculated separately and then summed up to reach the total value. Results of the calculations are presented in Table 11-29 and Table 11-30 following each step. Using the bird occupancy expected number of passes per year was calculated. The speed for soaring birds was accepted as 11m/sec. Table 11-29 presents an example for *Buteo buteo* (Details of collition risk calculations are given in Appendix D.3), while Table 11-30 shows results for other species calculated separately.

Table 11-28. Bird Occupancy at Risk Height

Scientific Name	Common Name	Spring (sec)	Autumn (sec)	Total (sec)	Months of Stay	Breeding (sec)	Non-breed. (seuc)	Total (sec/year)
Buteo buteo	Common Buzzard	1364	1005	3390	12	8184	6,030	24,367
Circaetus gallicus	Short-Toed Snake Eagle	1077	360	2100	7	6462	2,160	8,622
Pernis apivorus	European Honey Buzzard	774	540	2055	5	3483	2,160	5,631
Falco eleonorea	Eleonora's Falcon	209	720	1170	7	1254	4,320	5,574
Falco peregrinus	Peregrine Falcon	589	180	1140	7	3534	1,080	4,614
Falco tinnunculus	Common Kestrel	280	510	945	12	1680	3,060	8,126
Accipiter nisus	Eurasian Sparrowhawk	134	360	495	12	804	2,160	5,081
Accipiter gentilis	Northern Goshawk	0	435	435	12	0	2,610	4,474
Buteo rufinus	Long-Legged Buzzard	18	390	420	12	108	2,340	4,197
Accipitridae spec.	Unidentified	71	135	210	12	426	810	2,119
Ciconia nigra	Black Stork	122		135	7	732	0	732
Falco sp.	Unid. Falcon	0	60	60	7	0	360	360
Total		7860	4637	4695	12555		41,996	27,261

Table 11-29. Collision Risk Analysis for *Buteo buteo*

Birds Using the Wind Farm AirSpace		
Number of Wind Turbines	N	17
(The buffer of 500-m radius around the turbine location)	Area (m^2)	30,000.000
	Height (m)	6.970.000
1. Identify a risk window. W=width x height	Vw (m^2)	126
Seeping area	m^2	878.220.000
	r (m)	12469
Depth of the rotor back to front	d (m)	63
Length of the bird	l (m)	2
2. Calculate the combined volume swept out by the wind farm rotors	Vr= N x Πr^2 x (d +l)	0.52
3. Estimate the bird occupancy (Table 11-28)	n	529.933
4. Bird occupancy of the volume swept by the rotors is then	n x (Vr /Vw)	24.367
	v	14,70
5. Calculate the time a bird takes to make a transit through the rotor	t= (d + l) / v	11
6. The number of bird transits through the rotors	n x (Vr / Vw) / t	0.23
Probability of birds being hit while flying through a rotor		**65**
		10.9%
		7
		2%
		0.14

Table 11-30. Collision Risk Analysis for Target Species

Scientific Name	Common Name	Total (sec/year)	Estimated Number of Passages	Probability of Getting Hit	N_{noA} (Number of Casualties without Avoidance)	r_{Avo} (1 - Avoidance Rate)	Number of Casualties with Avoidance
Buteo buteo	Common Buzzard	24.367	65	10,90%	7,05	2%	0,15
Circaetus gallicus	Short-Toed Snake Eagle	8.622	23	12,40%	2,63	2%	0,05
Pernis apivorus	European Honey Buzzard	5.631	15	11,70%	1,72	2%	0,03
Falco eleonorea	Eleonora's Falcon	5.574	15	10,60%	1,70	2%	0,03
Falco peregrinus	Peregrine Falcon	4.614	12	10,90%	1,41	2%	0,03
Falco tinnunculus	Common Kestrel	8.126	22	10,20%	2,48	2%	0,05
Accipiter nisus	Eurasian Sparrowhawk	5.081	13	10,30%	1,55	2%	0,03
Accipiter gentilis	Northern Goshawk	4.474	12	11,50%	1,37	2%	0,03
Buteo rufinus	Long-Legged Buzzard	4.197	11	11,80%	1,28	2%	0,03
Accipitridae spec.	Unidentified	2.119	6	11,50%	0,65	2%	0,01
Ciconia nigra	Black Stork	732	2	14,60%	0,22	2%	0,00
Falco sp.	Unid. Falcon	360	1	11,50%	0,11	2%	0,00
Total		73.897	196	11.50%	22,56		0.45

Alternative Method

Mersinli avifauna surveys provided extensive information on target species. As an alternative method, using the first approach of SNH (2010), data collected on resident bird species were used to calculate collision risk as presented in Table 11-31.

The first correction in Table 11-31 is required as the birds that have been recorded to fly at risk height, are recorded to spend only 50% of their time at this height. The first estimate was multiplied by 50%, which is the factor of birds spending time at the rotor height. A second correction was also made with respect to the volume. The whole volume is a cylindrical volume, and includes the corner of the rectangular area, which is not swept by the rotor. This means that the total number of birds under collision risk should be 78% (=PI/4) of the estimation derived from the counts. Moreover the angel of the rotors is not always perpendicular to the flight direction of the bird. In some cases, the birds might fly perpendicular to the axis of the rotor, decreasing the collision risk down to 0%. To calculate an average value, the risk should be multiplied by a correction factor of 0.63, which is the average of Sin (alpha), where alpha is between 0 and 90 degrees. The combined factor is 0.78 * 0.63 = 0.50. A total of 467 birds are expected to fly through the rotors. This figure is significantly higher than 60 birds calculated with the standard methodology.

Using the bird occupancy data from Table 11-28, the collision risk for target species was calculated as in Table 11-32. Accordingly, a single bird is expected to be killed by the blades every year. The highest probability is calculated for *Buteo buteo*, which is followed by *Falco tinnunculus, Falco peregrinus*, and *Falco eleonorea* (see Table 11-32).

The expected rate of casualty of 1.03 birds per year is considerably higher than 0.4 birds per year, calculated with the previous method. This may be explained by two factors. First, the topography of the Project License Area is very hilly and most birds may prefer to hang around on the crests of the hills, to gain thermal and to visit open spaces there. The second reason may be related to the observer effort. All vantage points were located at crest tops Therefore, the observers probably detected more birds flying over the crest, which constitute turbine locations, and undercounted the birds in lower parts or high in open air. As a result, it is best to consider the rate of casualties for resident birds as 0.45-1.03 birds per year.

Table 11-31. Number of Target Species Expected to Fly through the Rotors

Scientific Name	Common Name	Spring	Autumn	Total	Months	Hours	1st Estim.	After the 1st Correct.	After the 2nd Correct.
Buteo buteo	Common Buzzard	10	10	20	12	4320	563	281	141
Pernis apivorus	European Honey Buzzard	10	3	13	5	1800	152	76	38
Falco peregrinus	Peregrine Falcon	10	2	12	7	2520	197	99	49
Falco eleonorea	Eleonora's Falcon	4	8	12	7	2520	197	99	49
Circaetus gallicus	Short-Toed Snake Eagle	9		9	7	2520	148	74	37
Falco tinnunculus	Common Kestrel	4	5	9	12	4320	253	127	63
Accipiter nisus	Eurasian Sparrowhawk	3	3	6	12	4320	169	84	42
Buteo rufinus	Long-Legged Buzzard	1	2	3	12	4320	84	42	21
Ciconia nigra	Black Stork	3		3	7	2520	49	25	12
Accipiter gentilis	Northern Goshawk		1	1	12	4320	28	14	7
Accipitridae spec.	unidentified.	1		1	7	2520	16	8	4
Falco sp.	unid. Falcon		1	1	7	2520	16	8	4
Total		55	35	90	7	2520	1872	937	467

Table 11-32. Collision Risk Analysis for Target Species Flying through Rotor Space

Common Name	Scientific Name	Estimated Number of Passages	Probability of Getting Hit	Number of Casualties without Avoidance N_{noA}	(1 - Avoidance Rate) r_{Avo}	Number of Casualties with Avoidance
Common Buzzard	*Buteo buteo*	141	10.90%	15.37	0.02	0.31
European Honey Buzzard	*Pernis apivorus*	38	12.40%	4.71	0.02	0.09
Peregrine Falcon	*Falco peregrinus*	49	10.90%	5.34	0.02	0.11
Eleonora's Falcon	*Falco eleonorea*	49	11.70%	5.73	0.02	0.11
Short-Toed Snake Eagle	*Circaetus gallicus*	37	10.60%	3.92	0.02	0.08
Common Kestrel	*Falco tinnunculus*	63	10.20%	6.43	0.02	0.13
Eurasian Sparrowhawk	*Accipiter nisus*	42	10.30%	4.33	0.02	0.09
Long-Legged Buzzard	*Buteo rufinus*	21	14.60%	3.07	0.02	0.06
Black Stork	*Ciconia nigra*	12	11.80%	1.42	0.02	0.03
Northern Goshawk	*Accipiter gentilis*	7	11.50%	0.81	0.02	0.02
unidentified.	*Accipitridae spec.*	4	11.50%	0.46	0.02	0.01
unid. Falcon	*Falco sp.*	4		0.00	0.02	0.00
Total		467				1.03

11.6 Bat Studies

Bats are another important group of fauna that require special considerations during each and every phase of a WPP development. WPP impacts on bats have been established on the international conservation agenda more recently than bird species. Although some reasons of bat attraction to wind farms are still poorly understood, studies show that bats can even be more vulnerable than birds and mortality occurs mainly due to collision and barotrauma, which entails that they do not even have to touch a turbine to get killed. Bats are long-lived animals with very low reproductive rates, which makes any increase in mortality quite critical for their populations.

Similar to avifauna studies at the Project License Area, bat studies were conducted to cover all four seasons in 2017. Yet, results of winter studies are not included in this Report, as studies were still going on at the time of submission. The following sections of this chapter cover details of how bat studies at the Project License Area were conducted, following the same tiered approach presented for avifauna studies:

(i) Scoping Assessment

(ii) Pre-Construction Static and Transect Acoustic Surveys

(iii) Impact Assessment

(iv) Mitigation

(v) Construction Phase Monitoring

(vi) Operation Phase Monitoring

Accordingly, in line with international guidelines and best practices, before on-site surveys, a scoping assessment was completed for bats to identify which species are known to inhabit the area, which habitats and other features would be utilised by certain bat species, and which impacts might be present affect bat populations. Scoping data were then used to develop the most effective site-specific methodology to identify the bat composition and make a thorough assessment on potential impacts of the Project, and how to mitigate them to ensure no-net-loss of species' populations.

As in the case of avifauna studies, due to lack of related research and data on bats in Turkey, internationally recognized guidelines were utilized. Especially in terms of echolocation call parameters for bat populations, data in Anatolia is quite limited. Therefore, parameters gathered from European bat populations were used for Project bat studies. Expert judgment also played a crucial role, to fill gaps in data and available country-wide research.

11.6.1 Bat Scoping Assessment

Scoping assessment was conducted to understand bat species composition of the Project License Area, bat activity in the wider region, and how information gathered from literature records, previously conducted research, as well as similar studies conducted in other parts of the world, especially in Europe with identical species, could be used to design a site-specific bat survey methodology.

The following questions were sought to be answered through the bat scoping assessment:

- Which bat species are known to be present at the Project License Area?
- Which landscape features in the area could be used by bats?

In order to answer these questions, available data were reviewed to have a preliminary list of target bat species, which would be lengthened according to results of on-site surveys. One of the major guidelines that provide a framework for the Project bat studies is the guideline document published by the Secreteriat of the Agreement on the Conservation of Populations of European Bats (EUROBATS), which came into force in 1994 under the auspices of the Convention on the Conservation of Migratory Species of Wild Animals. "Guidelines for Consideration of Bats in Wind Farm Projects *Revision 2014"* (Rodrigues et al. 2015) is referred to mostly to fill gaps in research in Turkey, as European focus of the guidelines puts forth a valuable resource due to close geographical range, and also in terms of bat survey methodology.

Accordingly, the following scoping information has been compiled, also using other significant research from the UK, North America, Latin America and Caribbean Region (Atienza et al., 2011; Kuvlesky et al., 2007; Ledec et al., 2011; Tosh et al., 2014; U.S. Fish and Wildlife Service, 2012), as well as scientific views of the Project expert on local bat populations and implications of wind farm impacts in Turkey:

- The most documented impacts on bat species from WPP developments are:
  - Direct collision
  - Barotrauma (mortality due to damage to bats' lungs caused by sudden change in air pressure close to a turbine blade)
  - Loss of foraging and commuting habitats (due to construction or avoidance)
  - Barrier to commuting or seasonal movement, and severance of foraging habitats
- Mature broad-leaved forests are the most important bat habitats in Europe, in terms of species diversity and abundance.
- Bat species at higher risk of collision with wind turbines are those species that fly and forage in open space (aerial hunters), and species that migrate long distances. EUROBATS Guidelines also provide categorisation of European and Mediterranean bat species according to their level of collision risk, which is presented in Table 11-33 as adapted from Rodrigues et al. (2015, p.21).

Table 11-33. Level of Collision Risk with Wind Turbines for Bat Species

High Risk	Medium Risk	Low Risk	Unknown
Nyctalus spp.	*Eptesicus* spp.	*Myotis* spp.	*Rousettus aegyptiacus*
Pipistrellus spp.	*Barbastella* spp.	*Plecotus* spp.	*Taphozous nudiventris*
Vespertilia murinus	*Myotis dasycneme*	*Rhinolophus* spp.	*Otonycteris hemprichii*
Hypsugo savii			
Miniopterus schreibersii			
Tadarida teniotis			

- Bat fauna of Turkey is represented by 40 species, 11 of which are open-air foraging bat species including; *Pipistrellus* spp., *Tadarida teniotis*, *Nyctalus* spp., *Miniopterus schreibersii*, and *Eptesicus* spp., which are all at high risk based on the level of collision risk suggested by the EUROBATS Guidelines.

Review of all available data on previously identified bat species and acoustic surveys conducted in the wider area, distribution maps of the IUCN Red List of Threatened Species, as well as information from related literature (Çoraman et al. 2013; Dietz & Kiefer, 2014; Rodrigues et al. 2015) reveals the list of bat species potentially present at the Project License Area as presented in Table 11-34.

Table 11-34. Preliminary List of Bat Species Potentially Present at the Project License Area

Scientific Name	Common Name	Red List Category	Habitats Directive	Collision Risk Level*
Rhinolophus blasii	Blasius's Horseshoe Bat	LC	Annex II	Low
R. euryale	Mediterranean Horseshoe Bat	NT	Annex II	Low
R. ferrumequinum	Greater Horseshoe Bat	LC	Annex II	Low
R. hipposideros	Lesser Horseshoe Bat	LC	Annex II	Low
R. mehelyi	Mehely's Horseshoe Bat	VU	Annex II	Low
Barbastella barbastellus	Western Barbastelle Bat	NT	Annex II	Medium
Eptesicus serotinus	Serotine Bat	LC	-	Medium
Hypsugo savii	Savi's Pipistrelle Bat	LC	-	High
Myotis capaccinii	Long-fingered Bat	VU	Annex II	Low
M. emarginatus	Geoffroy's Bat	LC	Annex II	Low
M. myotis	Greater Mouse-eared Bat	LC	Annex II	Low
M. mystacinus	Whiskered Bat	LC	-	Low
M. nattereri	Natterer's Bat	LC	-	Low
M. oxygnathus	Lesser Mouse-eared Bat	LC	-	Low
Nyctalus lasiopterus	Greater Noctule Bat	NT	-	High
N. leisleri	Leisler's Bat	LC	-	High
N. noctula	Noctule Bat	LC	-	High
Pipistrellus kuhlii	Kuhl's Pipistrelle Bat	LC	-	High
P. pipistrellus	Common Pipistrelle	LC	-	High
P. pygmaeus *	Soprano Pipistrelle	LC	-	High
Plecotus macrobullaris	Alpine Long-eared Bat	LC	-	Low
P. kolombatovici	Balkan Long-eared Bat	LC	-	Low
Miniopterus schreibersii	Schreiber's Bent-winged Bat	NT	Annex II	High
Tadarida teniotis	European Free-tailed Bat	LC	-	High

**Refer to Table 11-24 adapted from Rodrigues et al. (2015).*

11.6.2 Bat Baseline Surveys

The main objective of bat baseline surveys is to identify which of the open-air foraging bat species in Turkey do actually use the Project license area, and what activities they are engaged in. Bat baseline surveys were designed to identify target species, which would be further considered in impact assessment. The following are the questions tackled during the bat baseline surveys:

- Do surveys indicate presence of open-air foraging bat species identified during scoping?
- Do surveys point to potential impacts of the Project on confirmed bat species?
- What are the activity levels of bat species?
- What are possible valued ecological receptors (VER) related to bats at the Project License Area?

In order to answer these questions, bat surveys were designed to cover three seasons in 2017 and to record the entire span of bat activity at the Project License Area. Accordingly, the spring survey was conducted on 2-4 May, summer on 14-16 June, and fall survey on 28-30 October 2017.

Every night during each survey, one transect and three static surveys were conducted, details of which are further presented below. Static surveys, as a general rule, started before sunset and ended 30 minutes after sunrise. As a significant variable, weather condition during each survey was also recorded. All three seasons the wind speed was around 0-2 according to the Beaufort scale (calm to gentle breeze; up to 5.5 m/s), while the average temperature for spring was recorded to be 11-19 °C, for summer 15-26°C, and for fall the temperature varied between 9 and 26°C. The static detector recorded up to 12 hours at every night of each baseline survey conducted.

11.6.2.1 Static and Transect Acoustic Surveys

Four full spectrum bat detectors (Batlogger M, Elekon) with omni-directional microphones (FG Black, Elekon) were used during the surveys. The detectors were triggered by bat calls using the advance crest (CrestAdv) methodology. Recordings were made at 312500 Hz sample rate and each of them logged time and temperature. In static surveys, the microphones were located at approximately 1.5 s above the ground. In transect surveys recordings were also geo-tagged by using the built-in GPS of the detectors.

Static acoustic surveys were conducted at three sampling points (SP), representing three different habitat types at the Project License Area.

- **Sampling Point 1**; next to Turbine-5; located at the *Pinus brutia* plantation area (at 806 meters)
- **Sampling Point 2**; between Turbine-10 and Turbine-11, near the junction of the forest service road and the road to Osmaniye (Çınardibi) Village around six mature oak trees (at 813 meters)
- **Sampling Point 3**; next to Turbine-14, along the forest service road (at 760 meters)

The exact SP locations are given in Table 11-35, and photographs taken during the surveys showing each one of the SP locations is presented in Figure 11–23. A map showing SP locations is further presented in Figure 11–24.

Table 11-35. Static Acoustic Survey Sampling Point (SP) Locations

Static Acoustic Survey Sampling Point	Coordinates (UTM 35 N WGS84)		Relative Location
	Northing	Easting	
SP1	541966	4238456	Near Turbine-5
SP2	543213	4237364	Between Turbine-10 and Turbine-11
SP3	543674	4236212	Near Turbine-14

Bat recordings were analysed using BatSound v3.31 and BatExplorer v1.10. Species were identified and species identifications were done by following the methodology described in Barataud (2015), as well as the parameters presented by Dietz and Kiefer (2014).

It is quite common that the call parameters of some species overlap. In such cases, conducting a definitive species identification can be misleading. Therefore, such species presence at the Project License Area was recorded as “possible”. As suggested by Barataud (2015), identified species have been categorised under major “call types”. This grouping is based on the echolocation call shapes and frequencies. Feeding buzzes and social calls were also noted during the surveys.

In order to compare the levels of bat activity across the Project License Area and to evaluate seasonal variations, Bat Activity Index (BAI) was calculated separately for each SP during every survey night and recorded as bat passes per night.

Potential roosts at the Project License Area were also searched for. No caves were identified near designated turbine sitings. The only potential roosting sites identified in the area were old and dead trees, located around SP2 (Figure 11–24).

Static Acoustic Survey Sampling Point 1

Static Acoustic Survey Sampling Point 2

Static Acoustic Survey Sampling Point 3

Figure 11–23. Photographs of the SP Survey Locations

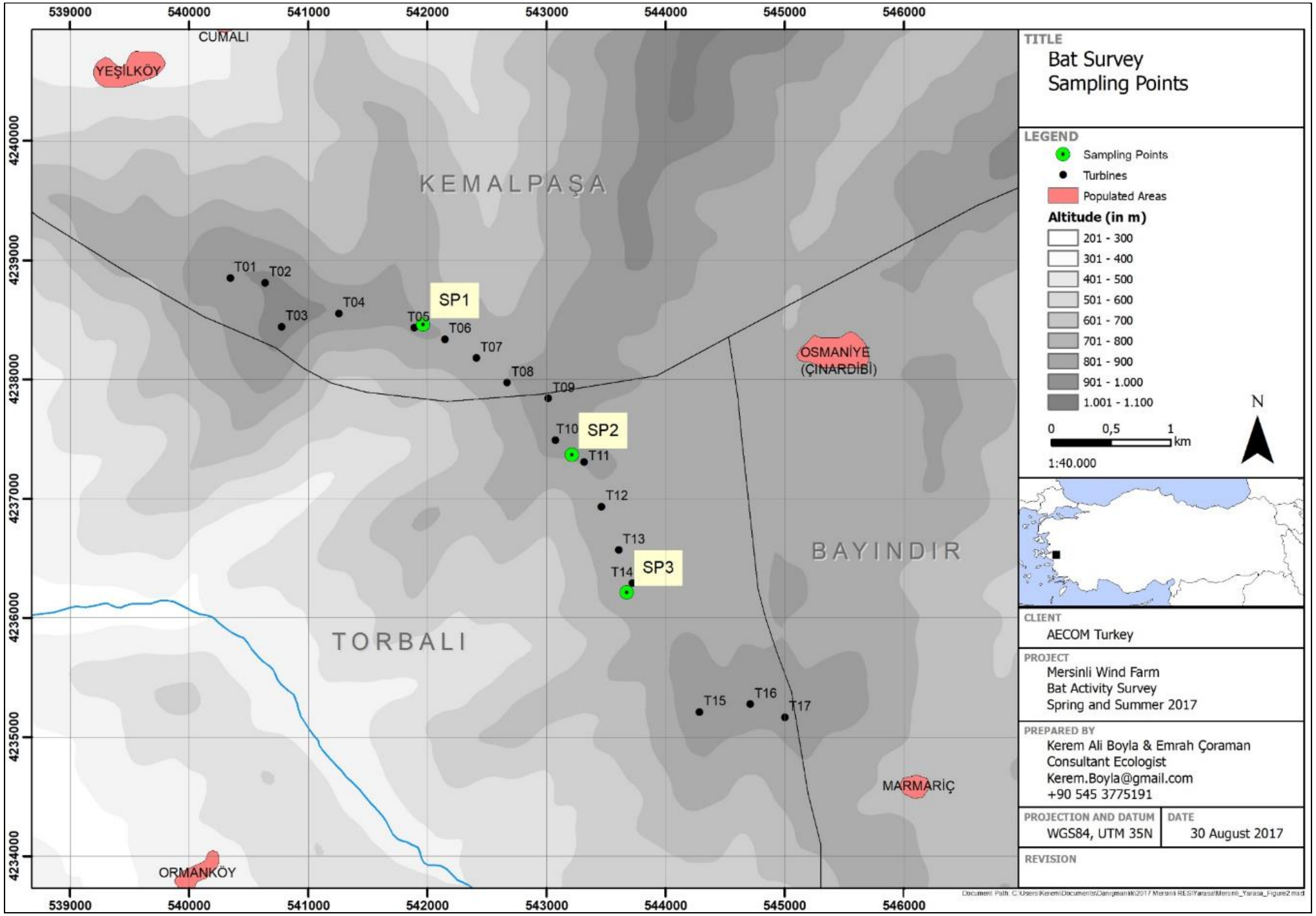


Figure 11–24. Map of Static Acoustic SP Locations

Results of Static Acoustic Surveys

Spring static acoustic surveys resulted in recording of 4419 bat passes, representing a minimum of 13 species. During both survey nights, the most frequently recorded species was *Pipistrellus pipistrellus* (Common pipistrelle), representing more than 90% of the passes. *Barbastella barbastellus* (Western Barbastelle bat) was an interesting recording since the species is very rare in this region.

The species compositions and the BAIs were similar among the SPs and the survey nights. The highest BAI was at SP2 with 1461, and again approximately 95% of the activity was associated with *Pipistrellus pipistrellus.* High flying bats, such as noctules (*Nyctalus noctula*) and free-tailed bats (*Tadarida teniotis*) were also identified in moderate numbers.

During summer static surveys, a total of 5695 bat passes were recorded, representing a minimum of 15 species. The species composition was similar to the results of the spring survey and again, most of the activity was associated with *Pipistrellus pipistrellus*, accounting for approximately 90% of the recordings. In this survey, the highest activity was recorded at SP1. Here, a high level of activitiy of *Rhinolophus hipposideros* (Lesser horseshoe bat) was also identified.

The fall static acoustic surveys yielded the lowest bat activity, with a total of 911 recordings. The identified species were similar to that of the other seasons', *Pipistrellus pipistrellus* being the most common one. In this survey period, approximately 30% of the recordings included social calls, all of which belong to *Pipistrellus pipistrellu*s, and these were recorded mostly around SP3.

All of the static acoustic survey results are presented in Table 11-36, showing species grouped according to different call types and number of recordings at the three sampling points at each survey season.

Results of Transect Acoustic Surveys

The results of transect survey results, as presented in Table 11-37, are similar to that of the static acoustic surveys in terms of bat species composition and overall activity levels, in all seasons, *Pipistrellus pipistrellus* being the most common species.

Based on static and transect acoustic survey results, scoping-phase preliminary list of bat species has been updated to include species whose presence at the Project License Area had been confirmed, and species whose presence had been assessed to be "possible" due to inconclusive recordings. Table 11-38 presents this updated list of "confirmed" and "possible" bat species.

According to the EUROBATS Guidelines, majority of the identified bat species at the Project License Area are at the high collision risk level, whose presence have been confirmed through static and transect acoustic surveys. This indicates that bat populations in the area are susceptible to direct mortality from the wind turbines (see Table 11-33).

Table 11-36. Static Acoustic Survey Recordings

Species	Spring						Spring Total	Summer						Summer Total	Fall						Autumn Total	Grand Total
	1st Survey Night			2nd Survey Night				1st Survey Night			2nd Survey Night				1st Survey Night			2nd Survey Night				
	SP1	SP2	SP3	SP1	SP2	SP3		SP1	SP2	SP3	SP1	SP2	SP3		SP1	SP2	SP3	SP1	SP2	SP3		
Call Type 1 - *Rhinolophus*																						
Rhinolophus blasii	-	2	4	-	-	5	**11**	3	-	-	1	-	-	**4**	4	4	-	3	10	-	**21**	**36**
R. euryale	-	2	-	-	2	1	**5**	-	2	-	1	-	-	**3**	2	-	-	-	-	-	**2**	**10**
R. ferrumequinum	1	4	-	3	2	-	**10**	2	2	2	-	4	2	**12**	-	-	-	-	-	-	-	**22**
R. hipposideros	4	9	1	5	1	-	**20**	105	5	1	201	1	-	**313**	-	-	-	12	2	1	**15**	**348**
R. euryale/hipposideros	-	3	1	-	-	-	**4**	-	-	-	4	-	-	**4**	-	-	-	1	-	-	**1**	**9**
Call Type 2 - *Myotis*																						
Myotis sp.	1	6	7	9	9	1	**33**	1	4	1	2	4	-	**12**	-	-	-	-	1	1	**2**	**47**
M. myotis/M. oxygnathus	7	-	3	1	2	4	**17**	4	-	1	1	-	-	**6**	-	-	-	-	-	1	**1**	**24**
Call Type 3 - Vesper high																						
Pipistrellus kuhlii	7	-	-	1	3	1	**12**	-	1	2	2	2	-	**7**	1	2	1	2	1		**7**	**26**
P. pygmaeus	-	-	-	-	-	-	-	-	-	-	1	-	-	**1**	-	-	-	-	-	-	-	**1**
P. pipistrellus	500	745	443	588	1376	352	**4004**	1714	245	364	1923	476	401	**5123**	23	44	167	63	57	463	**817**	**9944**
Miniopterus schreibersii	-	-	-	-	-	-	-	-	2	-	-	-	5	**7**	-	-	-	-	-	-	-	**7**
P. pipistrellus/M. schreibersii	-	-	-	-	4	-	**4**	-	1	-	1	16	-	**18**	-	-	1	-	-	-	**1**	**23**
Call Type 4 - Vesper low																						
Barbastella barbastellus	-	-	2	-	3	-	**5**	-	1	1	-	1	2	**5**	-	-	-	-	1	-	**1**	**11**
Hypsugo savii	1	-	-	27	1	7	**36**	2	-	-	37	-	-	**39**	-	-	-	4	-	-	**4**	**79**
Eptesicus serotinus	3	-	2	4	6	10	**25**	55	5	3	14	2	3	**82**	-	1	1	-	1	1	**4**	**111**
Nyctalus leisleri	-	-	-	-	-	2	**2**	-	-	-	-	-	-	**-**	-	-	-	-	-	-	-	**2**
N. noctula	2	-	1	-	-	13	**16**	2	-	-	-	-	-	**3**	-	-	-	-	-	-	-	**19**
N. noctula/N. leisleri	11	4	2	22	10	35	**84**	10	2	1	13	6	-	**32**	3		2	12	2	10	**29**	**145**
N. noctula/N. leisleri/E. serotinus	1	-	1	6	-	-	**8**	3	-	2	4	-	-	**9**	2	1	-	-	-	-	**3**	**20**
Tadarida teniotis	5	11	1	43	42	19	**121**	7	-	-	5	1	-	**13**	-	-	-	-	-	-	-	**134**
Unidentified	-	1	-	-	-	1	**2**	2	-	-	-	-	-	**2**	-	-	1	-	-	2	**3**	**7**
Total	**543**	**787**	**468**	**709**	**1461**	**451**	**4419**	**1910**	**270**	**378**	**2211**	**513**	**413**	**5695**	**35**	**52**	**173**	**97**	**75**	**479**	**911**	**11025**

Table 11-37. Transect Acoustic Survey Recordings

Species	Spring			Summer			Fall			Grand Total
	1st night	2nd night	Total	1st night	2nd night	Total	1st night	2nd night	Total	
Call Type 1 – *Rhinolophus*										
Rhinolophus blasii	-	-	**-**	-	-	**-**	3	1	**4**	**4**
R. hipposideros	-	-	**-**	-	-	**-**	-	1	**1**	**1**
Call Type 2 – Myotis										
Myotis sp.	-	4	**4**	9	-	**9**	**-**	**2**	**2**	**15**
M. myotis/M. oxygnathus	-	2	**2**	-	-	**-**	**-**	**-**	**-**	**2**
Call Type 3 - Vesper high										
Pipistrellus kuhlii	-	-	**-**	-	-	**-**	**1**	**-**	**1**	**1**
P. pipistrellus	85	81	**166**	126	29	**155**	**35**	**64**	**99**	**420**
Call Type 4 - Vesper low										
Eptesicus serotinus	3	4	**8**	12	3	**15**	2	-	**2**	**25**
Hypsugo savii	-	3	**3**	-	-	**-**	-	1	**1**	**4**
N. noctula/N. leisleri	1	6	**7**	-	-	**-**	2	4	**6**	**13**
N. noctula/N. leisleri/E. serotinus	-	1	**1**	2	1	**3**	1	-	**1**	**5**
Tadarida teniotis	-	10	**10**	-	-	**-**	-	-	**-**	**10**
Call Type 5 – Plecotus										
Plecotus sp.	1	-	**1**	-	-	**-**	**-**	**-**	**-**	**1**
Unidentified	-	-	**-**	4	-	**4**	**-**	**-**	**-**	**4**
Total	**90**	**112**	**202**	**153**	**34**	**187**	**44**	**73**	**117**	**506**

Table 11-38. Bat Species of the Project License Area

Scientific Name	Common Name	Red List Category	Habitats Directive	Collision Risk Level*	Presence at the Project Footprint
Rhinolophus blasii	Blasius's Horseshoe Bat	LC	Annex II	Low	Confirmed
R. euryale	Mediterranean Horseshoe Bat	NT	Annex II	Low	Confirmed
R. ferrumequinum	Greater Horseshoe Bat	LC	Annex II	Low	Confirmed
R. hipposideros	Lesser Horseshoe Bat	LC	Annex II	Low	Confirmed
Barbastella barbastellus	Western Barbastelle Bat	NT	Annex II	Medium	Confirmed
Eptesicus serotinus	Serotine Bat	LC	-	Medium	Confirmed
Hypsugo savii	Savi's Pipistrelle Bat	LC	-	High	Confirmed
Myotis myotis	Greater Mouse-eared Bat	LC	Annex II	Low	Possible
M. oxygnathus	Lesser Mouse-eared Bat	LC	-	Low	Possible
Nyctalus leisleri	Leisler's Bat	LC	-	High	Confirmed
N. noctula	Noctule Bat	LC	-	High	Confirmed
Pipistrellus kuhlii	Kuhl's Pipistrelle Bat	LC	-	High	Confirmed
P. pipistrellus	Common Pipistrelle	LC	-	High	Confirmed
P. pygmaeus *	Soprano Pipistrelle	LC	-	High	Confirmed
Plecotus macrobullaris	Alpine Long-eared Bat	LC	-	Low	Possible
P. kolombatovici	Balkan Long-eared Bat	LC	-	Low	Possible
Miniopterus schreibersii	Schreiber's Bent-winged Bat	NT	Annex II	High	Confirmed
Tadarida teniotis	European Free-tailed Bat	LC	-	High	Confirmed

**Refer to Table 11-24 adapted from Rodrigues et al. (2015).*

11.6.2.2 Valuing Bats

In order to better understand the valued ecological receptors (VER) related to bats at the Project License Area, and significance of the area for bat species, relative importance of the bat commuting routes and foraging habitats have also been assessed based on the methodology adapted from a study entitled Valuing Bats in Ecological Impact Assessment" by Wray et al. (2010).

This methodology is based on the concept of rarity of species, their numbers, and presence of roosts and/or potential roosts nearby. For each SP, a score for commuting and foraging habitats were also assigned. Finally, these scores derived for each species at each SP were summed up for each sampling period and the total scores are used to describe a geographic scale of importance

As there are no national IUCN Red List of bats in Turkey, data from the IUCN Global Red List categories as presented in Table 11-34, were used to determine each species' population status within its range in Table 11-39showing categories of bat rarity.

Table 11-39. **Categories of Bat Rarity in Turkey**

Rarity Within Range	Species
Rarest species	*Barbastella barbastellus* (NT)
Rare species	*Rhinolophus blasii* (NT) *Miniopterus schreibersii* (NT)
Common species	*Eptesicus serotinus* (LC) *Hypsugo savii* (LC) *Myotis myotis* (LC) *Myotis oxygnathus* (LC) *Nyctalus leisleri* (LC) *Nyctalus noctula* (LC) *Pipistrellus kuhlii* (LC) *Pipistrellus pipistrellus* (LC) *Tadarida teniotis* (LC) *Plecotus macrobullaris* (LC) *Rhinolophus blasii* (LC)

There is a variety of roosts that bats use, which constitute different levels of importance in terms of supporting bat populations in a given area. While maternity roosts and hibernation sites in general are used for longer periods of times, there may be feeding sites utilised only for once (Wray et al., 2010). Therefore, it is important to reflect on the significance of the roosts to bat populations at the Project License Area. In Table 11-40, bat roosts for identified species are provided with respect to a geographical scale, ranging from Mersinli WPP Project License Area extending towards an international frame of reference.

To provide a geographical scale to the scoring systems used in valuing commuting routes and foraging habitats, score ranges given in Table 11-41 are used.

In valuing commuting routes in the area for bat species, survey results on number of bats using the routes, as well as rarity of species were assessed together. The scores for each of these factors are provided in Table 11-42. When valuing foraging habitats, similar to commuting routes, again the rarity of species and estimates on bat numbers using them, as well as proximity to the known roosts, and landscape scale foraging opportunities are all factored in as displayed in Table 11-43.

Accordingly, conservation value of the Project License area was assessed through valuing "commuting routes" and "foraging habitats" for bat species. Except for *Barbastella barbastellus* (Western Barbastelle bat) and *Pipistrellus pipistrellus* (Common Pipistrelle), both of which had "Provincial level" of importance in all survey seasons, all of the bat species were assessed to have "Local level" of importance.

Considering that *P. pipistrellus* is a common species in the wider region and in Turkey, it is not foreseen that the Project will have a major threat to the populations of this species. For *B. barbastellus*, there would be impacts associated with construction of turbines and roads; causing loss of roosting sites, and alteration and fragmentation of its habitats.

Table 11-40. Valuing Bat Roosts

Geographic Frame of Reference	Roost Types
District/Local Mersinli	Feeding perches (common species) Individual bats (common species) Small numbers of non-breeding bats (common species) Mating sites (common species)
Province İzmir	Maternity sites (common species) Small numbers of hibernating bats (common and rarer species) Feeding perches (rarer/rarest species) Individual bats (rarer/rarest species) Small numbers of non-breeding bats (rarer/rarest species)
Regional Aegean	Mating sites (rarer/rarest species) including well used swarming sites Maternity sites (rarer species) Hibernation sites (rarest species) Significant hibernation sites for rarer/rarest species or all species assemblages
National Turkey	Maternity sites (rarest species). Maternity sites (rarer species) of over 1000 bats
International	Sites qualifying as a Special Area of Conservation (SAC) e.g. Maternity Roosts of over 5000 bats

Table 11-41. Geographic Scales of Importance

Geographic Frame of Reference	Score
International	>50
National	41 - 50
Regional	31 - 40
Province	21 - 30
District/local	11 - 20
Not important	1 - 10

Table 11-42. Valuing Commuting Routes

Species	Number of bats	Roosts/potential roosts nearby	Type and complexity of linear features
Common (2)	Individual bats (5)	None (1)	Absence of (other) linear features (1)
Rarer (5)	Small number of bats (10)	Small number (3)	Unvegetated fences/walls and large field sizes (2)
Rarest (20)	Large number of bats (20)	Moderate number/Not known (4)	Walls gappy or flailed hedgerows isolated well grown hedgerows and moderate field sizes (3)
		Large number of roosts or close to a nationally important/protected site for the species (5)	Well-grown and well-connected hedgerows/tree lines small field sizes (4)
		Close to or within an Internationally important/ protected site for the species(20)	Complex network of mature well established hedgerows tree line small fields and rivers/streams (5)

Table 11-43. Valuing foraging habitats

Species	Number of bats	Roosts/potential roosts nearby	Foraging habitat characteristics
Common (2)	Individual bats (5)	None (1)	Industrial or other site without established vegetation (1)
Rarer (5)	Small number of bats (10)	Small number (3)	Suburban areas or intensive arable land (2)
Rarest (20)	Large number of bats (20)	Moderate number/Not known (4)	Isolated woodland patches less intensive arable and/or small towns and villages (3)
		Large number of roosts or close to a nationally important/protected site for the species (5)	Larger or connected woodland blocks mixed agriculture and small villages/hamlets (4)
		Close to or within an Internationally important/ protected site for the species(20)	Mosaic of pasture woodlands and wetland areas (5)

11.7 Critical Habitat Assessment

11.7.1 Conceptual Framework

Defined by Article 2 of the Convention on Biological Diversity (CBD) and adapted by EBRD PR 6, biodiversity is the “biological diversity, or biodiversity is defined as the variety living organisms inhabiting all terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part, this includes biodiversity within species, between species and of ecosystems” (EBRD, 2014, p.36)

To meet EBRD PR 6 requirements thorough assessments based on characteristics of the Project and biodiversity features it might be impacting, early in the project life-cycle to effectively identify potential project-related risks and define a mitigation hierarchy to establish an approach ensuring no-net-loss of biodiversity. It is required to consider not only biodiversity features but also integrity of ecosystems in question, independent of their conservation statuses.

If biodiversity screening and related assessments reveal that there will be potential project-related impacts on biodiversity, it is required that all of the associated impacts and risks are managed through the mitigation hierarchy and good international practice. In order to put forward effective mitigation and management strategies, areas and species affected by the project should be well-identified based on their natural characteristics, as well as nationally and internationally recognised conservation statuses. Those which are identified as “priority biodiversity features” by EBRD PR 6 (EBRD, 2014) are:

- threatened habitats
- vulnerable species
- significant biodiversity features identified by a broad set of stakeholders or governments
- ecological structure and functions needed to maintain the viability of priority biodiversity features

Based on biodiversity assessments, if “significant, adverse and irreversible impacts” to priority biodiversity features are identified, then project activities should not be implemented unless (EBRD, 2014):

- There are no technically and economically feasible alternatives
- The overall benefits outweigh the project impacts on biodiversity
- Stakeholders are consulted in accordance with PR 10
- The project is permitted under applicable environmental laws, recognizing priority biodiversity features

- Appropriate mitigation measures are put in place, in accordance with the mitigation hierarchy to ensure no net loss and preferably a net gain of priority biodiversity features over the long term to achieve measurable conversion outcomes

Among the priority biodiversity features, critical habitats (CH) are the most sensitive biodiversity features, which comprise one of the following according to EBRD PR 6 (EBRD, 2014):

(i) : Highly threatened and/or unique ecosystems

(ii) : Critically Endangered (CR) and/or Endangered (EN) species

(As listed in the IUCN Red List, for exceptions see IFC, 2012).

(iii) : Endemic and/or restricted-range species

(iv) : Migratory and/or congregatory species

(v) : Key evolutionary processes

(vi) : Ecological functions

EBRD PR 6 requires the clients not to implement any project activities in areas of critical habitat unless all of the following are met (EBRD, 2014):

- No other viable alternatives within the region exist for development of the project in habitats of lesser biodiversity value;
- Stakeholders are consulted in accordance with PR 10 (Information Disclosure and Stakeholder Engagement);
- The project is permitted under applicable environmental laws, recognizing the priority biodiversity features;
- The project does not lead to measurable adverse impacts on those biodiversity features for, which the critical habitat was designated;
- The project is designed to deliver net gains for critical habitat impacted by the project;
- The project is not anticipated to lead to a net reduction in the population of any endangered or critically endangered species, over a reasonable time period; and
- A robust and appropriately designed, long-term biodiversity monitoring and evaluation program aimed at assessing the status of critical habitat is integrated into the client's adaptive management program.

According to EBRD PR 6, if the client is able to meet the above-given requirements, it is required to define a mitigation strategy for the project in a Biodiversity Management Plan or Biodiversity Action Plan, which should also cover any biodiversity offsets that might be proposed for priority biodiversity features or critical habitats.

"Critical Habitat" is a concept originally developed by the International Finance Corporation (IFC) in its Performance Standard 6 on Biodiversity Conservation and Sustainable Management of Living Resources. The concept has been designed to identify areas of high biodiversity value, which would be subject to special conservation interest. Criteria used to identify critical habitat by the EBRD PR 6 are also built on and closely associated with those put forward by the IFC PS 6.

IFC PS 6 defines a habitat as "a terrestrial, freshwater or marine geographical unit or airway that supports assemblages of living organisms and their interactions with the non-living environment". Under this general definition are natural and modified habitats; the first being composed of plant and/or animal species that are mostly of native origin, where human activity has not been significant enough to modify ecological functions and species compositions within, and the second containing large proportions of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition (IFC, 2012a, p.3). Critical habitat is a subset of modified and natural habitats, which includes at least one or more of the five values specified in IFC PS 6.

Critical habitat criteria as put forward by IFC PS 6 (2012b, p. 19) that forms the basis of critical habitat assessment are as follows:

- Criterion 1: Critically Endangered (CR) and/or Endangered (EN) species
- Criterion 2: Endemic and/or restricted-range species
- Criterion 3: Migratory and/or congregatory species
- Criterion 4: Highly threatened and/or unique ecosystems
- Criterion 5: Key evolutionary processes

11.7.2 Critical Habitat Methodology

In order to carry out a Critical Habitat Assessment (CHA), a study area, more specifically a discrete management unit (DMU) has been identified in accordance with EBRD PR 6 and IFC PS 6. Mersinli DMU, not only includes the Project footprint and License Area, but covers a larger area defined by landscape features, as well as residential and industrial boundaries, in which Project-related direct and indirect impacts can be assessed. As shown in Figure 11–2, the wider Biodiversity Study Area represents Mersinli DMU used as an ecologically sensible unit of analysis.

In order to determine statuses o species identified during the baseline surveys, besides the IUCN Red List of Threatened Species utilised to determine endangered and critically endangered species, other criteria were also used in critical habitat assessment, wherever applicable. In determining “highly threatened and unique ecosystems”, habitats listed under Annex I to Habitats Directive, as well as IUCN Red List assignments for ecosystems were used as the main criteria. Since international, even European biodiversity assessment do not always cover Turkish habitats and species, experts’ judgments were often consulted to draw conclusions on the current statuses of biodiversity components. Referring to local expert judgment has also been utilised due to the fact that there are no officially established or widely accepted national evaluations on threat and conservation statuses of habitats and species.

11.7.3 Highly Threatened or Unique Ecosystems

EBRD PR 6 defines “Highly threatened or unique ecosystems” as those that are at risk of significantly decreasing in area or quality; have a small spatial extent; and/or contain concentrations of biome-restricted species, examples to which can be listed as the following (EBRD, 2014):

- Ecosystems listed as, or meeting criteria for, Endangered or Critically Endangered by the IUCN Red List of Ecosystems
- Areas recognised as priorities in official regional or national plans
- Areas determined to be of high priority/significance based on systematic conservation planning carried out by government bodies, recognised academic institutions and/or other relevant qualified organisations (including internationally-recognised NGOs).

According to IFC PS 6, highly threatened and/or unique ecosystems are those; (i) that are at risk of significantly decreasing in area or quality; (ii) with a small spatial extent; and/or (iii) containing unique assemblages of species including assemblages or concentrations of biome-restricted species. Areas determined to be irreplaceable or of high priority/significance based on systematic conservation planning techniques carried out at the landscape and/or regional scale by governmental bodies, recognized academic institutions and/or other relevant qualified organizations (including internationally recognized NGOs) or that are recognized as such in existing regional or national plans, such as the National Biodiversity Strategies and Action Plan, would qualify as critical habitat per Criterion 4 of IFC PS 6 critical habitat criteria.

As an attempt to assign IUCN Red List categories to ecosystems at local, regional and global levels, Rodriguez et al. (2011) developed a system “Establishing IUCN Red List Criteria for Threatened Ecosystems”, based on the following main criteria:

- Criterion A: Short-term decline (in distribution or ecological function., over any 50-year period in the past or future)
- Criterion B: Historical decline (in distribution or ecological function; in the last 500 years)
- Criterion C: Small current distribution and decline (in distribution or ecological function) or very few locations
- Criterion D: Very small current distribution

In defining ecosystems within the Biodiversity Study Area that trigger CH under the Highly Threatened and/or Unique Ecosystems, Habitats Directive Annex I habitats were considered to be potential critical habitat trigger biodiversity features. In addition, based on the criteria put forward by Rodriguez et al. (2011), habitats that meet the IUCN Red List categories of CR and EN are assessed to be critical habitats, although available data do not allow an assessment to be made against Criterion B, so only Criterion A, C and D have been used.

11.7.4 Critically Endangered (CR) and/or Endangered (EN) Species

Areas supporting species at high risk of extinction (Critically Endangered or Endangered) according to the IUCN Red List of Threatened Species (or equivalent national/regional assessments) trigger CH under Criterion (ii) of EBRD PR 6.

IFC PS 6 also refers to the IUCN Red List of Threatened Species for determination of Critically Endangered (CR) and Endangered (EN) species. Accordingly, the determination of critical habitat based on other listings is as follows (IFC, 2012a, p.4):

(i) If the species is listed nationally / regionally as critically endangered or endangered, in countries that have adhered to IUCN guidance, the critical habitat determination will be made on a project by project basis in consultation with competent professionals; and

(ii) in instances where nationally or regionally listed species' categorizations do not correspond well to those of the IUCN (e.g., some countries more generally list species as "protected" or "restricted"), an assessment will be conducted to determine the rationale and purpose of the listing. In this case, the critical habitat determination will be based on such an assessment

In determining CR and EN species at the Biodiversity Study Area, the IUCN Red List of Threatened Species, and the only IUCN correspondence in Turkey; the Red Data Book of Turkish Plants (Ekim et al., 2000) have been utilized as the main references. Regional statuses of species, supported by expert judgment on species' current population trends in Turkey, have also been assessed.

11.7.5 Endemic and/or Restricted-Range Species

Endemic species are defined as those that have "…≥ 95% of its global range inside a country or region of analysis", while restricted-range species are listed as the following (IFC, 2012b, p. 25):

- For terrestrial vertebrates, a restricted-range species is defined as those species which have an extent of occurrence of 50,000 km^2 or less.
- For plants, restricted-range species may be listed as part of national legislation. Plants are more commonly referred to as "endemic," and the above-given definition would apply. Particular attention should therefore be paid to endemic plants of smaller countries which are likely, by definition, to be globally rarer and therefore of higher overall priority.

EBRD PR 6, on the other hand, defines areas holding a significant proportion of the global range or population of species qualifying as restricted-range under BirdLife or IUCN criteria (EBRD, 2014).

Species identified during terrestrial flora, fauna, as well as avifauna and bat surveys have been assessed to identify whether they meet any of these definitions. The assessment also required a great deal of input from the Project biodiversity experts.

11.7.6 Migratory or Congregatory Species

Guidance Note on EBRD PR 6 defines habitats supporting globally significant (concentrations of) migratory or congregatory species as; areas that support significant proportion of a species' population, where that species cyclically and predictably moves from one geographical areas to another (within the same ecosystem), or areas that support large groups of species' population that gather on a cyclical or otherwise regular and/or predictable basis (EBRD, 2014).

Birds that meet BirdLife International Criterion A4 for congregations, and/or those that meet Ramsar Criteria 5 or 6 on Identifying Wetlands of International Importance are considered as critical habitat trigger species.

Migratory birds and bats identified at Mersinli Biodiversity Study Area have been assessed against these criteria to identify whether they are critical habitat trigger species.

For (ii) endangered or critically endangered species, (iii) endemic or geographically restricted species, and (iv) migratory or congregatory species, IFC PS 6 also requires that the client determines if the project site is located in a Tier 1 or Tier 2 critical habitat with respect to Criteria 1 through 3. Table 11-44 below presents the quantitative thresholds for Tiers 1 and 2 of these Critical Habitat Criteria (IFC, 2012b, p. 27).

Table 11-44. Quantitative Thresholds for Tier 1 and Tier 2*

Criteria	Tier 1	Tier 2
1. Critically Endangered (CR)/ Endangered (EN) Species	(a) Habitat required to sustain ≥ 10 percent of the global population of a CR or EN species/subspecies where there are known, regular occurrences of the species and where that habitat could be considered a discrete management unit for that species. (b) Habitat with known, regular occurrences of CR or EN species where that habitat is one of 10 or fewer discrete management sites globally for that species.	(c) Habitat that supports the regular occurrence of a single individual of a CR species and/or habitat containing regionally- important concentrations of a Red-listed EN species where that habitat could be considered a discrete management unit for that species/ subspecies. (d) Habitat of significant importance to CR or EN species that are wide-ranging and/or whose population distribution is not well understood and where the loss of such a habitat could potentially impact the long-term survivability of the species. (e) As appropriate, habitat containing nationally/regionally important concentrations of an EN, CR or equivalent national/regional listing.
2. Endemic/ Restricted Range Species	(a) Habitat known to sustain ≥ 95 percent of the global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that species (e.g., a single-site endemic).	(b) Habitat known to sustain ≥ 1 percent but < 95 percent of the global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that species, where data are available and/or based on expert judgment.
3. Migratory/ Congregatory Species	(a) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 95 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle where that habitat could be considered a discrete management unit for that species.	(b) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent but < 95 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle and where that habitat could be considered a discrete management unit for that species, where adequate data are available and/or based on expert judgment. (c) For birds, habitat that meets BirdLife International's Criterion A4 for congregations and/or Ramsar Criteria 5 or 6 for Identifying Wetlands of International Importance. (d) For species with large but clumped distributions, a provisional threshold is set at ≥5 percent of the global population for both terrestrial and marine species. (e) Source sites that contribute ≥ 1 percent of the global population of recruits.

**Adapted from IFC (2012b, p.27)*

As with most of other assessments made within the scope of Mersinli biodiversity studies, quantitative data on identified species' population statuses have been based on expert knowledge and judgment, in lack of widely accepted and/or published population information.

11.7.7 Key Evolutionary Processes

Evolutionary processes are defined as "…structural attributes of a region, such as its topography, geology, soil, temperature, and vegetation and combinations of these variables can influence evolutionary processes that give rise to regional configurations of species and ecological properties." (IFC, 2012b, p. 29). EBRD PR 6 takes a note of critical habitat trigger areas associated with key evolutionary processes as those with landscape features that might be associated with particular evolutionary processes or populations of species that are especially distinct and may be of special conservation concern given their distinct evolutionary history. Examples to these can be listed as isolated areas (e.g. islands, mountain tops, lakes) that are associated with a species' populations that are phylogenetically distinct or areas of high endemism that often contain flora and/or fauna with unique evolutionary histories (EBRD, 2014; IFC, 2012).

Location of the Biodiversity Study Area, thus Project License Area, as an area is not associated with key evolutionary processes. Neither it hosts flora and/or fauna species that have distinct evolutionary histories with populations that show proven phylogenetic divergence from other species' other known populations.

11.7.8 Ecological Functions

In addition to IFC PS 6 critical habitat criteria, EBRD PR 6 defines ecological functions that are vital to maintaining the viability of biodiversity features, which are identified as critical habitat features, also as a critical habitat criterion, without which critical biodiversity features cannot persist (EBRD, 2014). Some of the examples can be listed as riparian zones and rivers, dispersal or mitigation corridors, hydrological regimes, seasonal refuges or food sources, keystone or habitat-forming species.

Surveys at the Biodiversity Study Area indicate of no such function associated with the existing habitats and ecosystems, that could be assesses as vital to any potential critical habitat features, or any biodiversity feature identified.

11.8 Determination of Critical Habitat Trigger Biodiversity Features

Based on Project Biodiversity Studies and available data, potential biodiversity features that trigger critical habitat are summarised in Table 11-45, followed by assessment on each these features in terms of their characteristics and significance.

Table 11-45. Potential Critical Habitat Trigger Biodiversity Features

Biodiversity Feature	Status	CH as per EBRD PR 6
Pinus brutia Forest s	Habitats Directive Annex I (9540)	CH (i)
Acid Siliceous Rocks	Habitats Directive Annex I (8220)	CH (i)
Anatololacerta anatolica	Endemic and restricted-range species	CH (iii)
Migratory Birds	Migratory and congregatory species	CH (iv)

It is recognized that there could be flora species at the Project License Area, which may also trigger CH under CH (iii). Surveys to be conducted in Spring of 2018 will identify any such species and their distribution within the License Area. Accordingly, the Critical Habitat Assessment also conducted within the scope of Mersinli BAP will be updated to cover the new set of data and assessments to be conducted.

While CHA covers a limited number of habitats and species within the biodiversity study area, there are also other habitats and species of higher priority and conservation importance, although they do not trigger critical habitat. Additional criteria were used in identification of such biodiversity components to include not only critical habitat triggering species but also those that have special conservation needs. Mersinli BAP provides details on priorities for biodiversity conservation, including the selection criteria.

11.8.1 *Pinus brutia* Forests

Within the scope of Project flora and vegetation studies, a EUNIS code has been assigned to habitats formed by Pinus brutia as G3.7, which has a Habitats Directive Annex I correspondence natural habitat types of community interest whose conservation requires the designation of special areas of conservation) as “Mediterranean pine forests with endemic Mesogean pines”, with an Annex I Code of 9540.

Pinus brutia forests in Turkey are the most widespread pine forests. At the Biodiversity Study Area, parts of the forest have already been degraded, where there is maquis vegetation. *Pinus brutia* forests in this region of Turkey are particularly vulnerable to forest fires. Apart from this, there are no other major threats identified due to proposed Project activities. The overall impact on the forest vegetation in the wider region will be very low.

When assessed against the IUCN Red List criteria for ecosystems, *Pinus brutia* forests of the Biodiversity Study Area do not meet thresholds to be considered as CR or EN. Neither requirements of critical habitat criteria as per EBRD PR 6 Paragraph 14, nor those of IFC PS 6 GN90 are met by the *Pinus brutia* habitat at the Biodiversity Study Area, since the habitat is not under any risk of significant reduction in area or quality and there are no unique assemblages of species including biome-restricted species within the Biodiversity Study Area. Therefore, the DMU does not qualify as critical habitat under EBRD CH (i) or IFC CH 4 for *Pinus brutia* forests.

Mersinli WPP Project ESIA studies identify about 31 ha of forest cover to be cleared due to proposed Project activities. This corresponds to 2% of the Project License Area. The removal of top soil, vegetation and trees, corresponding to the footprints of the Project units, will be removed by the Turkish Forestry authorities in accordance with the relevant provisions of the national Forestry Law. Upon request of the Project Company, the number of trees to be removed was calculated by the Regional Forestry Directorate authorities based on the related Forestry Management Plans.

Since the *Pinus brutia* habitat calls for designation of special areas of conservation under Annex I of the Habitats Directive, its management requires a habitat specific action plan. As an offset measure the same amount of land will be forested, through a Reforestation Programme, which, following an application procedure, will be developed by the Project Company in collaboration with the Regional Directorate of Forestry

Considering the soil characteristics and the natural forest cover of the region, it is possible to plant *Pinus brutia* trees in any given plot at the Project License Area that is suitable for reforestation. Potential reforestation sites (RS-1 through RS-8) are provided in Figure 6-1. Size of each potential site that could be considered for reforestation is provided in Table 11-46 Exact locations will be decided together with the Regional Directorate of Forestry and finalized within the scope of the Reforestation Programme.

Table 11-46. Potential Reforestation Sites

Reforestation Site (RS)	Area (ha)
Reforestation Site 1	14,84
Reforestation Site 2	16,31
Reforestation Site 3	26,70
Reforestation Site 4	29,26
Reforestation Site 5	18,09
Reforestation Site 6	18,94
Reforestation Site 7	20,23
Reforestation Site 8	28,63

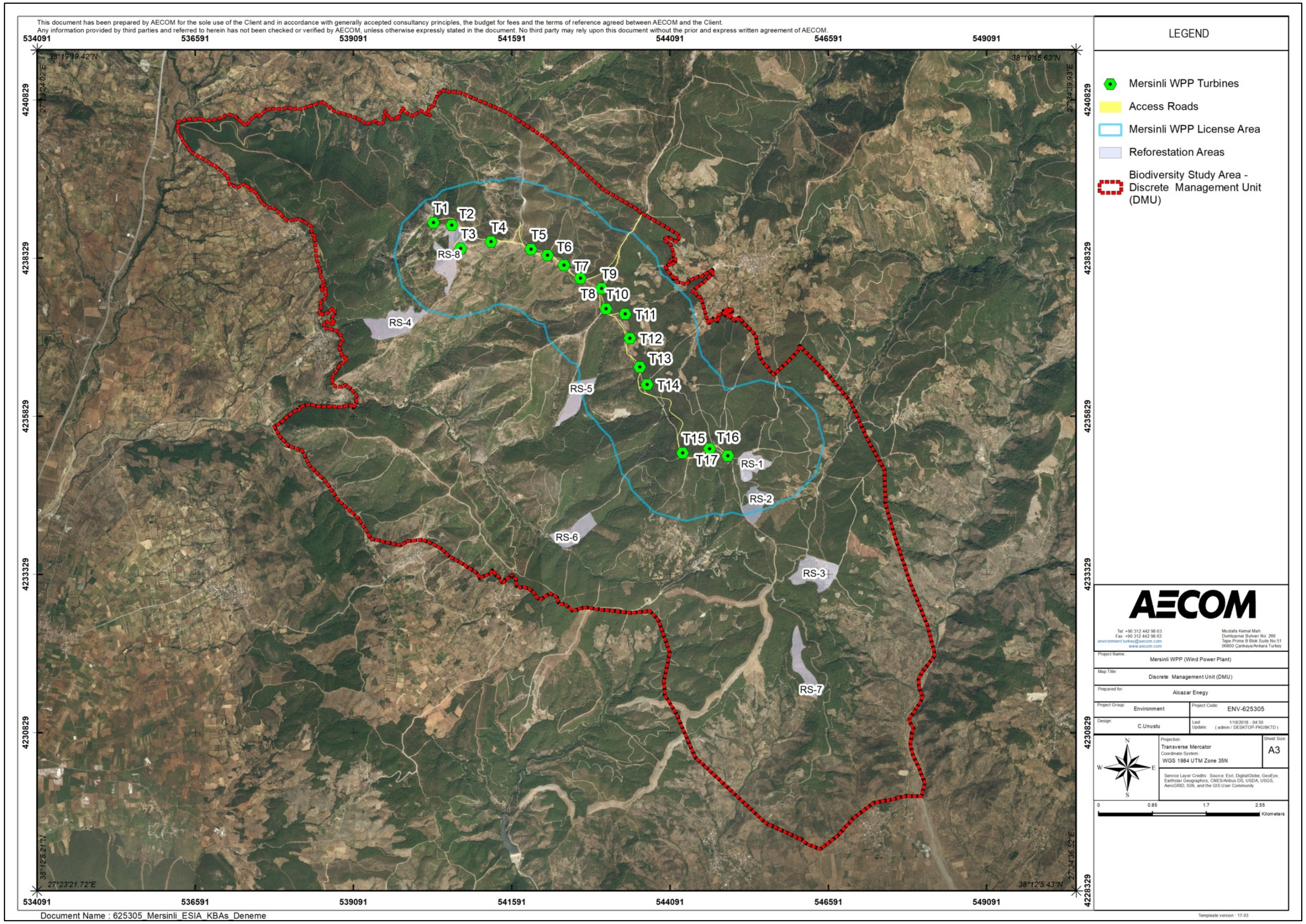


Figure 11–25. Potential Reforestation Areas

11.8.2 Acid Siliceous Rocks

Acid siliceous rock habitat at the Biodiversity Area, which is of high conservation value for flora and fauna species, is also a Habitats Directive Annex I habitat with the assigned Code of 8220 that requires designation of a special area of conservation. Therefore, it has been assessed a potential critical habitat trigger biodiversity feature.

Acid siliceous rock habitat identified at the Biodiversity Study Area, is confined to the Aegean and Mediterranean regions of Turkey, but there is no recorded data on its distribution in the region or they country as a whole. Due to seasonal constraints, species composition of the habitat is also not known to the fullest detail. Accordingly, it is hard to make a CHA on acid siliceous rocks at the Biodiversity Study Area at this point in time, given limited data available on both its flora composition and also extent of occurrence.

Second set of flora surveys will be conducted in Spring of 2018, which will reveal more on the habitat composition. Regardless though, it is established that there will be no Project-related impacts on the rocks throughout the life-cycle of the Project. As a potential critical habitat trigger feature and Annex I habitat, Acid Siliceous Rocks of the DMU require habitat-specific action plans to be developed within the scope of Mersinli BAP studies.

11.8.3 Anatololacerta anatolica

Present in western Anatolia, Anatolia rock lizard is mostly associated with rocky areas in open woodland and Mediterranean forests, from sea level up to 1,600 m. It is listed as Least Concern by the IUCN Red List of Threatened Species, due to its relatively wide distribution, presumed large population and because it is unlikely to be declining fast enough to qualify for listing in a more threatened category (Tok et al., 2009).

At the Biodiversity Study Area, a single individual was observed at the acid siliceous rock habitat, which constitutes a suitable habitat for the species. However, due to its limited habitats in the area, and the fact that it is listed as LC, make it rather unlikely that the Biodiversity Study Area supports more than 1% of this species global population. Therefore, the DMU does not qualify for critical habitat for *Anatololacerta anatolica* under EBRD PR 6 CH (ii). Status of the species will be further studied during fauna surveys of Spring 2018 to reflect more on its population in the area and how it might be impacted due to Project activities will be assessed in more detail. As an endemic species, it is still considered as a species of higher conservation importance and its conservation at the Biodiversity Study Area, together with other reptiles of conservation importance, is subject to preparation of a specific action plan. Following spring surveys, as additional data become available, BAP actions regarding reptiles of conservation importance will be updated.

11.8.4 Migratory Birds

Mersinli WPP Project avifauna studies have identified migratory bird species recorded to be flying over the Biodiversity Study area as the following; *Buteo buteo, Accipiter nisus, Accipiter gentilis, Pernis apivorus, Circus aeruginosus, Hieraaetus pennatus, Milvus migrans, Clanga pomarina, Pandion haliaeetus* and *Ciconia nigra*, of which the first four species are breeders. All of these migratory species are assessed as Least Concern by the IUCN Red List. Therefore, it is very unlikely for the Mersinli DMU to support the quantitative threshold of more than 1% of global populations of these species as set forth by CH 3 Tier 2 of IFC PS 6. Therefore, the DMU does not correspond to a critical habitat under CH (iii) of EBRD PR 6 or CH 3 of IFC PS 6.

Collision Risk Analysis conducted within the scope of Project avifauna studies yielded a cumulative mortality rate of 0.10 for all migratory birds identified in the area. Project activities would also impact breeding migratory species mostly through habitat loss during construction. Although the DMU does not qualify as critical habitat for migratory bird species, all related measures will be taken to minimize Project impacts on migratory bird species. Together with other bird species of conservation importance migratory birds are subject to specific conservation actions to be implemented to ensure no-net-loss of their populations in the area as the Project proceeds. Effective monitoring strategies will also be in place to evaluate success of mitigation and take more stringent measures whenever necessary.

11.8.5 Critical Habitat Assessment Conclusions

Critical Habitat Assessment conducted within the scope of Mersinli WPP Project Biodiversity Studies indicates that there are no habitats or species within the Biodiversity Study Area, which would qualify the area as critical habitat.

It should however be noted that as the Project Biodiversity studies are yet to be completed with winter avifauna studies and spring flora and fauna studies, assessments made within the scope of this chapter will be updated in Mersinli BAP, as new data become available.

11.9 Ecosystem Services

One of the key values of biodiversity is lies in its role in functioning of ecosystems as a whole. Biodiversity is not only the foundation of life on Earth, but with a wide variety of benefits it provides, it constitutes essence to human life. From the most basic needs of air, water and food, into more complex ones like medicine, industrial materials, leisure, aesthetic value, cultural dependence, research, and education, biological resource support people and their livelihoods in so many different ways.

The Millennium Ecosystem Assessment (MA), which was initiated with the support of the UN in 2001, to assess how changes in ecosystems impact human well-being and what actions are needed to be enhanced to ensure sustainable use of ecosystems and their contribution to human life. The MA involved knowledge and expertise of 1360 experts worldwide to publish its synthesis reports linking biodiversity to ecosystem services, as well as to human well-being and development needs. These reports, reflecting consensus view of a large body of social and natural scientists, provide a widely accepted definition and categorisation of ecosystem services.

The MA defines ecosystem services as "…the benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services, such as nutrient cycling, that maintain the conditions for life on Earth". (MA, 2005, p.1).

The four broad categories of ecosystem services that the MA puts forward, as recognised by IFC PS 6 (IFC, 2012), can be listed as the following with definitions widened by the World Resources Institute (WRI), in its report entitled "Weaving Ecosystem Services into Impact Assessment: A Step-by-Step Method" (Landsberg et. al., 2013, p.6):

- **Provisioning services;** are goods or products obtained from ecosystems, such as food, timber, fiber and freshwater.
- **Regulating services;** are the contributions to human well-being arising from an ecosystem's control of natural processes, such as climate regulation, disease control, erosion prevention, water flow regulation, and protection from natural hazards.
- **Cultural services;** are the non-material contribution of ecosystems to human well-being, such as recreation, spiritual values, and aesthetic enjoyment.
- **Supporting services;** are the natural processes, such as nutrient cycling and primary production that maintain other services.

These broad categories of ecosystem services are further detailed and exemplified in Table 11-47.

The EBRD's PR 6 on "Biodiversity Conservation and Sustainable Management of Living Natural Resources" also recognises the importance of maintaining core ecological functions of ecosystems and the biodiversity they support. According to PR 6 (EBRD, 2014, p.36);

(i) the livelihood of indigenous peoples and affected communities whose access to, or use of, biodiversity or living natural resources may be affected by project activities, and

(ii) they may have a positive role in biodiversity conservation and sustainable management of living natural resources.

Consequently, the objective of biodiversity conservation and sustainable management of living resources, in accordance with PR 6, must be balanced with the potential for utilising the multiple economic, social and cultural values of biodiversity and living natural resources in an optimised manner.

In line with the objective of Mersinli ESIA studies to identify, assess and mitigate potential impacts that might incur due to Project activities, interactions of the Project with the natural environment in terms of its impact, and if any, dependence on ecosystems services have also been evaluated.

Guidelines developed by the World Resources Institute on "Ecosystem Services Review for Impact Assessment (ERS for IA)" provide useful tool to incorporate evaluation of ecosystem services into the Project ESIA studies (Landsberg et. al., 2013). ERS for IA for Mersinli WPP Project started off with identification of ecosystem services at the Project License Area, which has been carried out based on the following criteria:

- **Impact:** Direct impact on a particular ecosystem service caused by project activities that also impacts the community
- **Dependence:** Project's dependence on the ecosystem service for its operations
- **Relevance to Affected Community:** Ways in which livelihood, health, safety or culture of a community will be impacted
- **Management Control:** The project's control over the ecosystem service in question

Table 11-47. Definitions and Examples of Ecosystem Services Categories*

Service	Subcategory	Definition	Examples
Provisioning Services			
Food	Crops	Cultivated plants or agricultural products harvested by people for human or animal consumption as food	• Grains • Vegetables • Fruits
	Livestock	Animals raised for domestic or commercial consumption or use	• Chickens • Pigs • Cattle
	Capture Fisheries	Wild fish captured through trawling and other non-farming methods	• Cod • Crabs • Tuna
	Aquaculture	Fish, shellfish, and/or plants that are bred and reared in ponds, enclosures, and other forms of freshwater or saltwater confinement for purposes of harvesting	• Shrimp • Oysters • Salmon
	Wild Foods	Edible plant and animal species gathered or captured in the wild	• Fruits and nuts • Fungi • Bush meat
Biological Raw Material	Timber and Other Wood Products	Products made from trees harvested from natural forest ecosystems, plantations, or non-forested lands	• Industrial round wood • Wood pulp • Paper
	Fibers and Resins	Non-wood and non-fuel fibers and resins	• Cotton, silk, hemp • Twine, rope • Natural rubber
	Animal Skins	Processed skins of cattle, deer, pigs, snakes, sting rays, or other animals	• Leather, rawhide, cord wain
	Sand	Sand formed from coral and shells	• White sand from coral and white shells • Coloured sand from shells
	Ornamental Resources	Products derived from ecosystems that serve aesthetic purposes	• Tagua nut, wild flowers, coral jewellery
Biomass Fuel		Biological material derived from living or recently living organisms—both plant and animal—that serves as a source of energy	• Fuel wood and charcoal • Grain for ethanol production

Service	Subcategory	Definition	Examples
Freshwater		Inland bodies of water, groundwater, rainwater, and surface waters for household, industrial, and agricultural uses	• Freshwater for drinking, cleaning, • cooling, industrial processes, • electricity generation, or mode of • transportation
Genetic Resources		Genes and genetic information used for animal breeding, plant improvement, and biotechnology	• Genes used to increase crop • resistance to disease or pests
Biochemical, Natural Medicines and Pharmaceuticals		Medicines, biocides, food additives, and other biological materials derived from ecosystems for commercial or domestic use	• Echinacea, ginseng, garlic • Paclitaxe as basis for cancer drugs • Tree extracts used for pest control
Regulating Services			
Regulation of Air Quality		Influence ecosystems have on air quality by emitting chemicals to the atmosphere (i.e., serving as a “source”) or extracting chemicals from the atmosphere (i.e., serving as a “sink”)	• Lakes serve as a sink for industrial emissions of sulfur compounds Tree and shrub leaves trap air pollutants near roadways
Regulation of Climate	Global	Influence ecosystems have on the global climate by emitting greenhouse gases or aerosols to the atmosphere or by absorbing greenhouse gases or aerosols from the atmosphere	• Forests capture and store carbon dioxide Cattle and rice paddies emit methane
	Regional or Local	Influence ecosystems have on local or regional temperature, precipitation, and other climatic factors	• Forests can impact regional rainfall levels
Regulating Services			
Regulation of Water Timing and Flows		Influence ecosystems have on the timing and magnitude of water runoff, flooding, and aquifer recharge, particularly in terms of the water storage potential of the ecosystem or landscape	• Permeable soil facilitates aquifer recharge River floodplains and wetlands retain water—which can decrease flooding—reducing the need for engineered flood control infrastructure
Erosion Control		Role ecosystems play in retaining and replenishing soil and sand deposits	• Vegetation such as grass and trees prevents soil loss due to wind and rain and prevents siltation of waterways • Coral reefs, oyster reefs, and sea grass beds reduce loss of land and beaches due to waves and storms
Water Purification and Waste Treatment		Role ecosystems play in the filtration and decomposition of organic wastes and pollutants in water; assimilation and detoxification of compounds through soil and subsoil processes	• Wetlands remove harmful pollutants from water by trapping metals and organic materials • Soil microbes degrade organic waste, rendering it less harmful
Regulation of Diseases		Influence that ecosystems have on the incidence and abundance of human pathogens	• Some intact forests reduce the occurrence of standing water—a breeding area for mosquitoes—which lowers the prevalence of malaria
Regulation of Soil Quality		Role ecosystems play in sustaining soil’s biological activity, diversity, and productivity; regulating and partitioning water and solute flow; storing and recycling nutrients and gases; among other functions	• Some organisms aid in decomposition of organic matter, increasing soil nutrient levels • Some organisms aerate soil, improve soil chemistry, and increase moisture retention
Regulation of Pests		Influence ecosystems have on the prevalence of crop and livestock pests and diseases	• Predators from nearby forests—such as bats, toads,

Service	Subcategory	Definition	Examples
			and snakes—consume crop pests
Pollination		Role ecosystems play in transferring 251olen from male to female flower parts	• Bees from nearby forests pollinate crops
Regulation of Natural Hazards		Capacity for ecosystems to reduce the damage caused by natural disasters such as hurricanes and tsunamis and to maintain natural fire frequency and intensity	• Mangrove forests and coral reefs protect coastlines from storm surges • Biological decomposition processes reduce potential fuel for wildfires
Cultural Services			
Recreation and Ecotourism		Recreational pleasure people derive from natural or cultivated ecosystems	• Hiking, camping, and bird watching • Scuba diving
Ethical and Spiritual Values		Spiritual, religious, aesthetic, intrinsic, “existence,” or similar values people attach to ecosystems, landscapes, or species	• Spiritual fulfilment derived from sacred lands and rivers • People’s desire to protect endangered species and rare habitats
Educational and Inspirational Values		Information derived from ecosystems used for intellectual development, culture, art, design, and innovation	• The structure of tree leaves has inspired technological improvements in solar power cells • School fieldtrips to nature preserves aid in teaching scientific concepts and research skills
Supporting Services			
Habitat		Natural or semi-natural spaces that maintain species populations and protect the capacity of ecological communities to recover from disturbances	• Native plant communities often provide pollinators with food and structure for reproduction • Rivers and estuaries provide nurseries for fish reproduction and juvenile development • Large natural areas and biological corridors allow animals to survive forest fires and other disturbances
Nutrient Cycling		Flow of nutrients (e.g., nitrogen, sulfur, phosphorus, carbon) through ecosystems	• Transfer of nitrogen from plants to soil, from soil to oceans, from oceans to the atmosphere, and from the atmosphere to plants
Primary Production		Formation of biological material by plants through photosynthesis and nutrient assimilation	• Algae transform sunlight and nutrients into biomass, thereby forming the base of the food chain in aquatic ecosystems
Water Cycling		Flow of water through ecosystems in its solid, liquid, or gaseous forms	• Transfer of water from soil to plants, plants to air, and air to rain

**Adapted from Landsberg et. al., 2013*

Based on the socio-economic features of the Project License Area detailed in Chapter 13 of the Mersinli WPP ESIA Report, the five ecosystem services have been identified for the Project are; wild mushrooms, olive farming, apiculture, cherry orchards and animal grazing. Analyses of these ecosystem services based on the above-listed categories and criteria yielded Mersinli WPP Project ecosystem service categorisation as presented in Table 11-48. It should be noted that ecosystem services identified in this chapter are in line with the socio-economic features of the Project impact area, but are not necessarily confined to the Project License Area. Assessment of ecosystem services provided in the remainder of this section differentiates between those services provided in the wider impact area, and ecosystem services directly impacted by project activities, which also impacts the community.

Table 11-48. Ecosystem Services Related to Mersinli WPP Project

Service	Subcategory	Project-Related Ecosystem Service	Status
Provisioning Services			
Food	Crops	Wild Mushrooms	• Wild mushrooms at the Project License Area are picked at appropriate seasons covering the months of October-November and March every year. • Consumed at the household, and sold at the market, with no significant generation of income.
		Cherry Orchards	• Cherry orchard owners in the wider area supply local, regional, as well as international markets with their produce. • The harvest season in June is important in terms of the cherry market and related income generation • Harvest season also draws about 150 individuals to the area as seasonal workers. • Two orchards within the Project License Area will be directly impacted.
		Olive Cultivation	• Traditionally significant activity in the region. • Also provides income for seasonal workers during harvest season in October and November. • There is no olive cultivation within the Project License Area.
	Livestock	Apiculture	• Common among settlements at the Project impact area for domestic consumption • Secondary income source for some of the settlements, although number of households that generate income from apiculture is unknown. • Some beekeepers sell their products at the local market • Harvest season also draws about 150 individuals to the area as seasonal workers.
		Grazing	• Project License Area is used for grazing by some of the cattle owners

As a second step in ERS for IA, these services were prioritised to define which ecosystem services should be considered in the impact assessment, based on direct impacts the Project would cause, and on how livelihoods, health, safety and culture of local communities would be affected. Decision tree provided in Figure 11–26 has been adapted from the World Resources Institute (Landsberg et al., 2013, p. 22) to prioritise identified ecosystem services according to potential impacts of the Project on beneficiaries of existing ecosystem services (see Table 11-49).

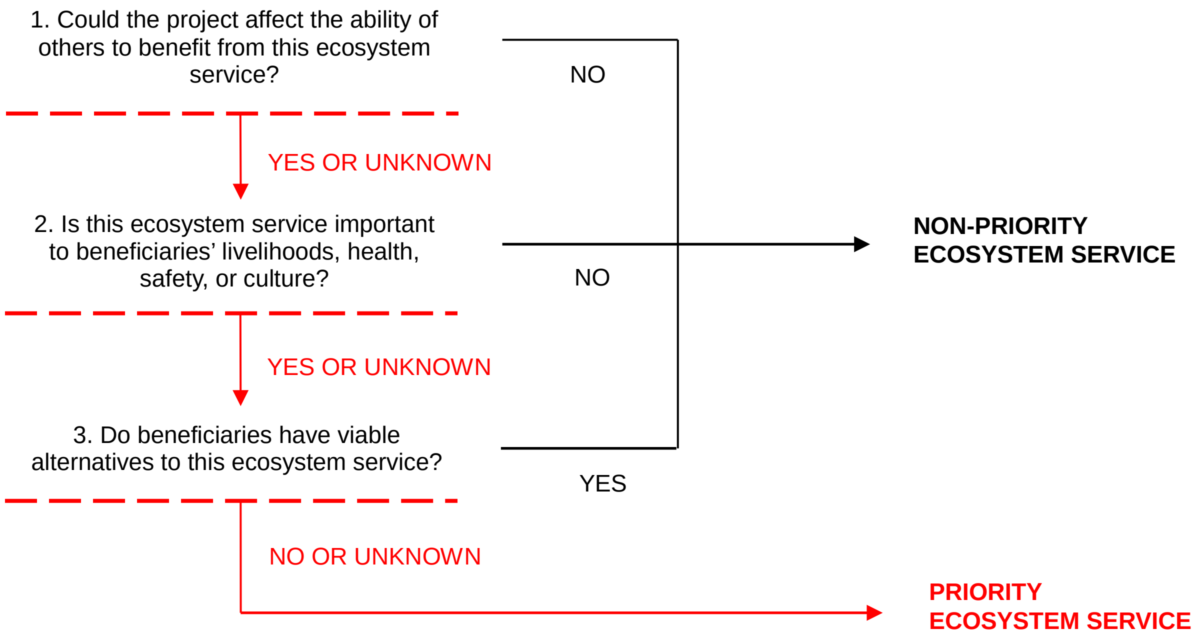


Figure 11–26. Decision Tree to Prioritise Ecosystem Services

Table 11-49. Prioritisation of Project-Related Ecosystem Services

Project-Related Ecosystem Service	**Decision Tree Question** 1	2	3	**Decision**
Wild Mushrooms	Yes • Project License Area will be transformed during construction, ceasing the service temporarily	No • Seasonal impact • Wild mushrooms do not generate sufficient income have impact on livelihoods	-	Non-Priority Ecosystem Service
Cherry Orchards	Yes • Project License Area will be transformed during construction, ceasing the service permanently	Yes • Major source of income for 1 household of 4 people	No	Priority Ecosystem Service
Olive Cultivation	No • There is no cultivation within the Project License Area • Dust generated during construction will be suppressed to mitigate related impacts	-	-	Non-Priority Ecosystem Service
Apiculture	Yes • Project License Area will be transformed during construction, ceasing the service	Yes • There are settlements and households that may depend on apiculture for income	Yes	Non-Priority Ecosystem Service
Grazing	Yes • Project License Area will be transformed during construction, ceasing the service temporarily.	No • No direct impact on livelihoods • Alternative grazing land is available with similar means of access	-	Non-Priority Ecosystem Service

Each of the ecosystem services identified and explained in Table 11-49, has been assessed to determine which one of them are priority ecosystem services. As can be seen in the table, cherry orchards represent the only priority ecosystem service, as they provide major income to 1 household.

Beneficiaries of this ecosystem service have no viable alternative to replace the benefits they obtain. Therefore, within the scope of Project social impact studies, a Livelihood Restoration and Compensation Framework (LRCF) has also been prepared in line with EBRD PR 5, in order to restore and if possible improve beneficiaries' livelihoods. Although it has not been evaluated as a priority ecosystem service, apiculture will also be further assessed within the scope of the LRCF, in order to detail impacts on provision of this service to local livelihoods and how these will be mitigated.

11.10 Impact Assessment

Potential impacts of Mersinli WPP Project on biodiversity during the land preparation and construction, operation, and closure phases of the Project are presented in the following section, divided in the same manner as baseline studies; terrestrial flora and vegetation, terrestrial fauna, avifauna and bats. Assessment of Project impacts on biodiversity has been conducted based on the methodology presented in Chapter 5. Accordingly, magnitude of each impact was estimated as a factor of the foreseen geographic extent, duration, reversibility, and frequency of the impact. Sensitivity/value of the associated receptor was determined with respect to the baseline conditions described in the previous sections and as defined in Chapter 5.

Receptors of Project impacts on flora and vegetation are flora species and habitat types identified in Section 11.8, for impact on fauna other than birds and bats receptors are terrestrial vertebrates, for avifauna receptors are target and secondary species, and finally for bat species of the Project License Area Sensitivity criteria used in the assessment of impacts on these biodiversity groups are presented in Table 11-50.

Table 11-50. **Criteria for Sensitivity of Flora and Vegetation**

Sensitivity	High	Medium	Low	Negligible
Flora species sensitivity	Local endemic species that listed as CR, EN, VU according to the Red Data Book of Turkish Plants or local endemic species that have not been evaluated according to the Red List criteria yet	Regional endemic species that listed as CR, EN, VU according to the Red Data Book of Turkish Plants or regional endemic species that have not been evaluated according to the Red List criteria yet	Widespread endemic species that are listed as LC according to the Red Data Book	Non-endemic widespread flora species
Habitat sensitivity	Protected areas or natural habitats of local or regional endemic species or habitats of species of elevated conservation concern according to the IUCN Red List or endangered habitats or unique habitats or highly threatened and/or unique habitats that are listed under Annex I of the Habitats Directive	Habitats listed under Annex I of the Habitats Directive that are of regional significance inhabited by widespread endemic species	Natural habitats that are less likely to be inhabited by species of elevated conservation concern	Modified and artificial habitats
Terrestrial vertebrate species sensitivity	Endemic species and/or species of elevated conservation concern according to the IUCN Red List and/or EU Habitats Directive Annex II species and/or species whole local populations are evaluated as declining and/or under threat based on expert judgement.	Widespread species that are not threatened but have limited mobility and/or EU Habitats Directive Annex or Annex IV species or regional importance	Widespread species also inhabiting reference sites	Widespread species that do not utilise the are vagrants

Sensitivity	High	Medium	Low	Negligible
Bird species sensitivity	Target species that are of elevated conservation concern according to the IUCN Red List and/or EU Birds Directive Annex I species and/or species whole local populations are evaluated as declining and/or under threat based on expert judgement, which are breeding residents or which have high levels of terrestrial activity or intense flight activity	Secondary species including EU Birds Directive Annex I species that are widespread in Turkey, which are breeding residents or ecologically pivotal species	Secondary species that are widespread in Turkey and are non-breeding and non-resident	Species that do not use the area that are vagrants/accidental birds
Bat species sensitivity	Rarest and rare species and/or species of elevated conservation concern according to the IUCN Red List and/or EU Habitats Directive Annex II and/or species whose local populations are evaluated as declining and/or under threat based on expert judgment, which have high value foraging and commuting habitats	Common species and EU Habitats Directive Annex II species, which have medium value foraging and commuting habitats	Common species that have low value ecological receptors in the area	Accidental spottings with no association with the area

11.10.1 Land Preparation and Construction Phase

Land preparation and construction phase impacts of the Project on biodiversity features are mostly associated with loss of species' habitats. In general, deforestation and land clearing leave the most significant impact on flora and fauna species, for flora resulting in loss of populations, and fauna species are affected through losing areas that are fundamental to their ecological functions in an area.

Project activities at this phase will be limited to the Project footprint, where minimum clearing of natural vegetation will be ensured. Turbines will be sited so populations of biodiversity features identified at the Project License Area will not be compromised during land preparation and construction activities.

Another potential impact is destruction of animal's breeding sites and nests. Two nests of birds of prey are probably located near Turbine 3 on the rocky southern slope of the hill. Those birds are Common Kestrel (*Falco tinnunculus*) and Peregrine Falcon (*Falco peregrinus*). The exact nest site could not be found, however the approximate nest location is nearly 300-400 m away from the turbine location. The construction and the operation of the turbine Turbine 3 is likely cause a disturbance for the nesting activities. Particular care should be given to avoid the construction of the site should not be timed in the period between March and July.

Biodiversity studies indicate that there are alternative habitats for almost all identified fauna groups that breeding activity will continue in the area, despite construction activities. Removing vegetation before nesting season will be effective in avoiding further impacts on next generations. At the habitat level, the impact on overall composition will also be rather low, considering the integrity of habitats will be maintained, apart from disruptions restricted to turbine footprint and access roads. For bat species, old and dead trees can be roosting sites, destruction of which will be avoided.

ETLs may also have considerable impact on birds when not placed properly. As mentioned earlier in this chapter, the high voltage ETL (154 kV) of the existing Fuat WPP, which is operating in the north/north-east of the License Area, is crossing the License Area between Turbine-4 and Turbine-5. As a result of the optimized design, the Mersinli WPP Project will not include construction and operation of a new ETL and the grid connection of the power plant will be provided by a 40-200 m line that will connect to the existing ETL of the Fuat WPP, which ends up at the Işıklar and Tire Transformer Stations.

Although the nesting sites of *Falco tinnunculus* and *Falco peregrinus* were identified at about 800 m from the ETL, the birds do not seem to be affected existing transmission line and, therefore, the distance to the nests has been assessed to be safe enough for breeding activity to continue in the area. No other nests along the ETL have been detected.

The three species that have been observed spending more time along the ETL route are *Buteo buteo*, *Falco tinnunculus* and *Pernis apivorus*. *Circaetus gallicus* is a high flyer, and *Buteo rufinus* and *Accipiter nisus* are not abundant in the area. A few foraging Pernis apivorus individuals may spend some time along the ETL route, which in terms of impacts they are exposed to can be assessed as negligible.

Migratory birds seen not be threatened by the ETL for two reasons. First, the ETL is in the valley, where most migrant birds were recorded to fly above 700 m a.s.l. Second, the direction of ETL is perpendicular to the general migration direction of birds.

Construction phase displacement impacts can only be evaluated during monitoring studies. Presence of alternative sites indicates that for most terrestrial vertebrates, avoiding construction areas and inhabiting nearby suitable sites is a viable option.

There will also be secondary impacts on biodiversity features, like dust and noise, without directly impacting their populations, and when mitigated in line with environmental management plans to be implemented within the scope of the Project, disturbance on biodiversity could also be avoided. Some general practices that would also benefit biodiversity features can be listed as proper waste disposal, following on-site traffic rules, using designated access road, minimizing noise, and complying with international standards and GIIP during each activity conducted.

11.10.2 Operation Phase

Operation phase impact of the Project on biodiversity features focuses mostly birds and bats, and to some extent on other fauna species. Detailed avifauna and bat studies presented in Section 11.5 and Section 11.6, respectively, document all potential impacts, as well as how avifauna and bat species in the area would be affected. Accordingly, to estimate the collision risk of the bird and bat species with the turbines, detailed analyses have been carried out for both to understand the avifauna and bat composition of the Project License Area and define Project-related risks on identified species.

Collision risk analysis conducted for target species suggests that the mortality rate would be very low, for breeder, non-breeders and also migratory species. The collision risk is estimated to be between 0.14 and 1.03 birds per year, indicating a single casualty for every 1-7 years. Therefore, there will be no net loss in these species' populations in the area due the operation of the Project.

Disturbance and displacement of avifauna caused by realisation of Mersinli WPP Project will be assessed through monitoring. Since the Project License Area is not involved in any routine movement of bird species, it is not considered to cause a barrier effect. Use of existing forest roads wherever feasible will minimise additional habitat fragmentation impacts. If bird species are monitored to be impacted more than the estimated levels, measures like increasing cut-in-wind speed, temporary shutdown of some turbines during the breeding season and using UV lights to avoid collisions will be considered to be implemented. A post-construction monitoring programme will be implemented to identify the real impact on the bird species. Carcass studies will also be conducted for the operation phase of the Project to cross-check the results with the calculated collision risk assessment values.

For bat species, on the other hand, such analyses are harder to make. Yet, recorded activity levels are quite low for bats of higher risk in the area, which may indicate that direct mortality rates may also be low. Also, no significant threat has been assessed for commuting routes due to the low activity levels.

The potential impact of the Project on the severance of foraging habitats is likely to affect mostly *Pipistrellus pipistrellus*, as most of the feeding buzzes recorded belong to this species. Yet, considering the distribution range of the species and the other available habitats around the Project License Area, the Project is not likely to have a significant impact on the population of this species.

As direct collision and barotrauma are the main impacts that wind turbines potentially have on bats, mortality during the operation phase will be monitored to evaluate the Project's direct impacts. Carcass survey is an essential tool for monitoring impact of the wind farms during operation phase. It involves searching for dead birds and bats below turbines. However, there are many factors influencing the number of dead animals. Wild animals, such as foxes, dogs, and crows often take dead animals for food. Also observers have different capacities for finding dead animals on the ground. Therefore, the carcass surveys to be conducted during monitoring will also follow international guidelines and best practices to achieve the most effective results.In case of high level of bat fatalities, using methods such as blade feathering, increased turbine cut-in wind speed, and shutting down turbines temporarily during higher risk times of certain days and seasons will be effective in reducing mortality rates.

A potential operation-phase secondary impact has been identified as use of traps and pesticides against rodent activity. This will depend on the rodent activity in the area during operation. If the use of traps and pesticides becomes necessary, a Pest Control and Management Plan will be prepared, which will be implemented to take all necessary measures to avoid any hazard to biodiversity features in the area.

Restoration of natural habitats, maintaining pre-existing land uses and following good international practices in terms of proper waste disposal, hunting bans, movement and operation of machinery, as well as limiting public access, will be effective in terms of avoiding or minimizing operational impacts on all biodiversity features in the area, which may start re-utilizing the site when short-term disturbances of the construction phase is over.

11.11 Mitigation Measures

In line with EBRD PR 6 requirements, as well as international guidelines and best practices, a mitigation hierarchy was followed in order to achieve “no net loss” of biodiversity features. For each group of biodiversity features that has been subject to impact assessment, the mitigation hierarchy presented in Figure 5-1 has been implemented. A summary of potential impacts of the Project on biodiversity features and measures to mitigate these impacts are provided in Table 11-51.

Table 11-51. Impacts on Biodiversity, Proposed Mitigation Measures and Residual Impacts

Impact Description	Project Phase	Receptor	Impact Magnitude						Sensitivity/ Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Magnitude	Reversibility	Duration	Frequency	Overall Magnitude				
Land clearing and deforestation	Land preparation and construction	Priority habitats	Restricted	Low	Irreversible	Long-term	One-off	Medium	High	High	• Keep land clearance of natural vegetation at minimum and restricted to designated sites • Avoid destruction of trees and other vegetation for purposes other than planned Project activities • Avoid dumping excavated soils on natural habitats • Stabilise all destructed habitats and rehabilitate as early as possible • Clear vegetation before nesting seasons of animals identified in the area • Train on-site employees to be aware of nests, avoid any displacement without an expert opinion on the status of the nests • Conserve all natural habitats that are outside the Project footprint • Monitor species' estimated populations and statuses in the area to propose further mitigation measures if needed • Implement Biodiversity Action Plan that will specify the bio restoration measures • Sign Reforestation Protocol with the Forestry Authorities • Implement Reforestation Programme	Moderate
		Widespread endemic flora species	Restricted	Low	Irreversible	Long-term	One-off	Medium	Low	Low		Minor
		Priority terrestrial vertebrates	Restricted	Low	Irreversible	Long-term	One-off	Medium	Medium	Medium		Minor
		Target bird species	Restricted	Low	Irreversible	Long-term	One-off	Medium	High	High		Moderate
		Secondary bird species	Restricted	Low	Irreversible	Long-term	One-off	Medium	Medium	Medium		Minor
		Priority bat species	Restricted	Low	Irreversible	Long-term	One-off	Medium	High	High		Moderate
Destruction of breeding habitats/roost sites	Land preparation and construction	Priority terrestrial vertebrates	Restricted	Low	Medium term reversible	Medium-term	One-off	Medium	High	Medium	• Avoid all identified nests • Remove habitat features before nesting season • Ensure proper waste disposal avoiding natural habitats • Avoid cutting trees and other vegetation independent of Project activities • Avoid any destruction to habitats other than those at designated construction sites • Monitor identified nests to verify whether they are active • Allow for adaptive management and take additional measures if needed	Minor
		Target bird species	Restricted	Low	Medium term reversible	Medium-term	One-off	Medium	Medium	High		Moderate
		Secondary bird species	Restricted	Low	Medium term reversible	Medium-term	One-off	Medium	High	Medium		Minor
		Priority bat species	Restricted	Low	Medium term reversible	Medium-term	One-off	Medium	High	High		Moderate
Movement and operation of machinery	Land preparation and construction	Priority habitats	Restricted	Negligible	Short term reversible	Short-term	Intermittent	Negligible	High	Low	• Limit on-site vehicle speed to avoid potential road kill • Maintain all related equipment to avoid introduction of invasive species • Minimise noise to in accordance with the Project standards • Use designated roads for on-site traffic	Negligible
		Widespread endemic flora species	Restricted	Negligible	Short term reversible	Short-term	Intermittent	Negligible	Low	Negligible		Negligible
		Priority terrestrial vertebrates	Restricted	Negligible	Short term reversible	Short-term	Intermittent	Negligible	Medium	Negligible		Negligible
		Target bird species	Restricted	Negligible	Short term reversible	Short-term	Intermittent	Negligible	High	Low		Negligible

Impact Description	Project Phase	Receptor	Impact Magnitude						Sensitivity/ Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Magnitude	Reversibility	Duration	Frequency	Overall Magnitude				
		Secondary bird species	Restricted	Negligible	Short term reversible	Short-term	Intermittent	Negligible	Medium	Negligible		Minor
		Priority bat species	Restricted	Negligible	Short term reversible	Short-term	Intermittent	Negligible	High	Low		Negligible
Dust	Land preparation and construction	Widespread endemic flora species	Restricted	Negligible	Short term reversible	Short-term	Intermittent	Negligible	Low	Negligible	• To minimise dust impacts, clear vegetation only at designated sites and rehabilitate all sites after construction • Limit on-site vehicle speed, also to avoid direct mortality of animals • Implement all necessary dust suppression measures to avoid further impacts on biodiversity features	Negligible
		Priority terrestrial vertebrates	Restricted	Negligible	Short term reversible	Short-term	Intermittent	Negligible	Medium	Negligible		Negligible
		Target bird species	Restricted	Negligible	Short term reversible	Short-term	Intermittent	Negligible	High	Low		Negligible
		Secondary bird species	Restricted	Negligible	Short term reversible	Short-term	Intermittent	Negligible	Medium	Negligible		Negligible
		Priority bat species	Restricted	Negligible	Short term reversible	Short-term	Intermittent	Negligible	High	Low		Negligible
Collision with turbines	Operation	Target bird species	Restricted	Low	Irreversible	Long-term	Intermittent	Medium	High	High	• Monitor activity and conduct carcass searches to assess the level of impact • Identify which species are more prone to collision • Ensure there is no net loss of populations • Avoid any lights, coloured equipment and acoustic effects that may attract birds and bats into the risk zone • If mortality rates are higher than initially estimated, take measures like increasing cut-in-wind speed, shutting off some of the turbines during critical times like migration, using UV lights, where necessary	Moderate
		Secondary bird species	Restricted	Low	Irreversible	Long-term	Intermittent	Medium	Medium	Medium		Moderate
		Priority bat species	Restricted	Low	Irreversible	Long-term	Intermittent	Medium	High	High		Moderate
Displacement	Operation	Priority terrestrial vertebrates	Local	Low	Irreversible	Long-term	One-off	Medium	Low	Low	• Maintain pre-existing land uses • Conserve and restore natural habitats to allow species re-inhabit the area • Avoid any vegetation clearance • Manage public access to avoid further disturbances • Manage land for priority species • Monitor species' populations to ensure there is no net loss • Ban illegal hunting, poaching, or other activities involving biodiversity features • Raise awareness to conserve species on-site and around	Negligible
		Target bird species	Local	Low	Irreversible	Long-term	One-off	Medium	High	High		Moderate
		Secondary bird species	Local	Low	Irreversible	Long-term	One-off	Medium	Medium	Medium		Minor
		Priority bat species	Local	Low	Irreversible	Long-term	One-off	Medium	High	High		Moderate

12. Visual

12.1 Project Standards and GIIP

Visual impact assessment (VIA) is not directly referenced in EBRD's Environmental and Social Policy and related PRs (2014). However, PR1 states that the assessment process will cover in an integrated way, all relevant direct and indirect environmental and social impacts and issues of the project and IFC Wind Energy Guidelines (2015) recommend consideration of the landscape character during siting and evaluation of visual impacts from relevant viewing angles.

The construction and operation of the Project will result in changes of elements and the physical structure of the landscape. Therefore, a VIA study was conducted based on the Guidelines for Landscape and Visual Impact Assessment (*UK Landscape Institute, Institute for Environmental Management and Assessment-IEMA, 2013. 3rd Edition*).

12.2 Baseline Conditions

Mersinli WPP Project's License Area has a highland topography, which consists of ridges and hills ranging between 462-953 m high altitudes. The existing landscape character of the License Area is dominated by forests consisting mainly of Turkish pine and also black pine and shrubs. There are no remote upland areas that are designated for landscape qualities or notable hilltops that provide recognized viewpoints.

Settlements located on the plains surrounding the hills comprise Dağtekke, Yeşilköy, Çınardibi, Cumalı, Karaot, Karakızlar, Dernekli (including Marmariç Permaculture Village), Gökyaka and Dereköy neighbourhoods. Agricultural lands (mainly cherry gardens) of the Çınardibi and Dernekli neighbourhoods are observed on the plains in the eastern and south- eastern side of the License Area.. In the western side of the License Area, Kemalpaşa-Dağkızılca-Torbalı Road (Philsa Avenue) passes at a distance of approximately 4 km at the closest point. In the eastern side, Armutlu Road passess through the Çınardibi neighbourhood and crosses the License Area in the southern part. İzmir-Aydın State Road is located around 20 km west of the License Area. There are also several forest roads and firebreaks within the License Area, some of which are used by local people. Fuat WPP (10 turbines) is currently operating approximately 3.5 km north/north-east of the License Area. The existing 154 kV ETL of the Fuat WPP crosses the Mersinli WPP License Area between Turbine-4 and Turbine-5. Within the License Area and its surroundings, deforested areas are observed where Regional Directorate of the Forestry has conducted logging activities in line with the applicable Forestry Management Plans.

An initial study area of 15 km x 15 km was determined to characterize the baseline conditions that will be basis for the VIA. Zone of Theoretical Visibility (ZTV) diagrams were produced for the study area by using WindPro software and GIS tools to identify the area over which the WPP Project can theoretically be seen and within which the field studies will be conducted. Based on the model outputs, 16 potential receptor points (viewpoints) were selected as field study locations. These points were selected based on their representatives of a range of views and viewer types, including residents within settlements, visitors to main visitor destinations, users of roads, varying landscape types and a variety of distances, aspects, elevations. The field study was conducted on 10-11 April 2017. During the field study, all the 16 potential receptor points were visited, 8 of the 16 potential receptors were selected as the viewpoint (VP) for the baseline characterisation and detailed assessment of visual impacts. The map of VIA Study Area showing the locations of the selected VPs is presented in Figure 3-1. Photographs taken during the field study are presented in Section 12.3.2.3.

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
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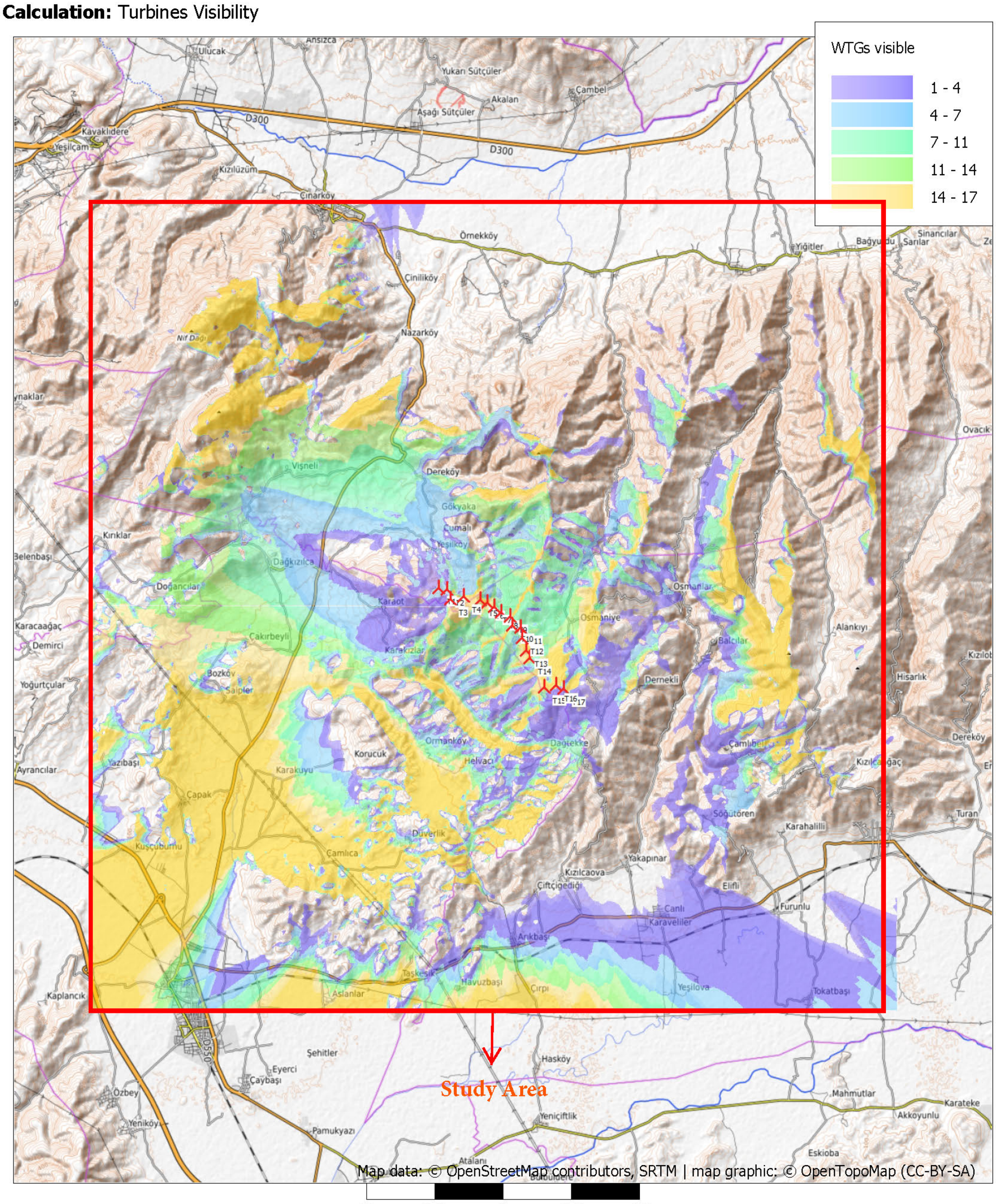
ZVI - Map Standard ZVI summary

Calculation: Turbines Visibility



Map: OpenTopoMap.org , Print scale 1:200,000, Map center UTM (north)-WGS84 Zone: 35 East: 542,415 North: 4,238,216

New WTG

windPRO 3.1.617 by EMD International A/S, Tel. +45 96 35 44 44, www.emd.dk, windpro@emd.dk

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windPRO

Figure 12-1. VIA Study Area

12.3 Impact Assessment

Assessment of visual impacts was done based on the methodology presented in Chapter 5. Impact assessment was mainly focused on the operation phase, as the wind turbines will be the main visible components of the Project. To estimate the impact magnitude, photomontages were generated by using Adobe Photoshop and WindPro software and 3D modelling was conducted by using Autodesk3ds Max and ESRI ArcGIS software. The geographical extent of the visual impacts will be wide (beyond the License Area). The duration of the impacts will be long-term (more than 2 years) and the frequency of impacts will be continuous. The duration of the Energy Generation License is 49 years starting from the date the License was issued (5 July 2012). The operational life of the Project will be a minimum of 20 years, which could potentially be extended to cover the License Duration with proper maintenance and advancements that could be made in line with future technological developments. The turbines and other Project components, except the access roads, would be decommissioned following the completion of operation activities. On the other hand, wind energy developments are often argued to be reversible since they have a limited life and could eventually be removed and/or the land reinstated (*Landscape Institute, IEMA, 2013*). In this assessment, the impact was assumed to be long-term reversible (reversible after 20 years). It should be noted that visual impacts may be adverse or positive depending on the perception of the receptors. Sensitivity criteria to be considered in the assessment has been developed based on the Guidelines for Landscape and Visual Impact Assessment 3rd edition (*Landscape Institute, IEMA, 2013*) and provided in Table 12-1.

Table 12-1. Sensitivity Criteria for Visual Receptors

Impact Subject	High	Medium	Low
Visual	• Residents at home • People, whether residents or visitors, who are engaged in outdoor recreation • Visitors of heritage assets or to other attractions, • Communities where views contribute to the landscape setting enjoyed by residents • Travellers on road, where travel involves recognised scenic routes awareness of views is likely to be particularly high	• Residents at public places • Travellers on road, rail or other transport routes	• People engaged in outdoor sport or recreation, which does not involve or depend upon appreciation of views of the landscape • People at their place of work whose attention may be focused on their work or activity, not on their surroundings

12.3.1 Land Preparation and Construction Phase

The main impact during construction phase will be sourced from installation of turbines. Visual impacts of turbines will start with a relatively low magnitude and reach the highest magnitude by the end of construction phase, especially during commissioning activities. Visual impacts during construction, due to vegetation and tree removal, earthworks, construction camp site and transportation activities will be temporary. Impacts due to presence of wind turbines, substation, and access roads are assessed under the operation phase.

12.3.2 Operation Phase

During the operation phase, 17 wind turbines will be operational within the License Area. The wind turbines have 126 meter diameter blades and 87 meter hub height, both of which can be visible from relatively far distances (approximately 15 km), based on topography and vegetation.

The visual impact assessment of Mersinli WPP Project turbines was carried out according to the operational phase visibility of the Mersinli WPP Project turbines in the view shed from the viewpoints identified as major principle visual receptors. As detailed in the following sections, the following studies were conducted as part of the VIA:

- Zone of Theoretical Visibility (ZTV) diagrams were produced
- Photomontages were prepared
- Effects on representative viewpoints were assessed

12.3.2.1 Zone of Theoretical Visibility Diagrams (ZTV)

The term ‘Zone of Theoretical Visibility’ (ZTV) is used to describe the area over which a development can theoretically be seen and is based on a Digital Terrain Model (DTM) and overlaid on a map base. This is also known as a Zone of Visual Influence (ZVI), Visual Envelope Map (VEM) and Viewshed. However, the term ZTV is preferred for its emphasis of two key factors that are often misunderstood:

- Visibility maps represent where, in theory, a development may be seen, it may not actually be visible in reality, for example due to localized screening which is not represented by the DTM; and
- The maps indicate potential visibility only, that is the areas within which there may be a line of sight. They do not convey the nature or magnitude of visual impacts, for example whether visibility will result in positive or negative effects and whether these will be significant or not.

ZTV diagrams for Mersinli WPP Project have been generated using Geographic Information System (GIS) software, to demonstrate the number of turbines that may theoretically be seen from any point in the study area. In the preparation of the ZTV diagrams, as the DTM, 20 m resolution DTM generated from topographic map (and compared with satellite data, such as ASTER, SRTM etc.) elevation data was used. The height of the observer points was assumed as 1.6 m as the recommended value. The ZTVs indicate the number of hubs that are theoretically visible. In the preparation of hub height ZTV, the hub height values for each turbine model in wind power plant were taken as the height that will be visible from any point in the study area. The map produced as a result of the ZVI model is provided in Figure 12-2.

There are some limitations in the generation and use of the ZTVs. These limitations mean that while the ZTVs are used as a starting point in the assessment, providing an indication of where the wind power plant will theoretically be visible, the information drawn from the ZTVs is always checked on the ground to ensure that the assessment accurately represents the visibility of the wind power plant. This was done as part of the field study conducted for the Project and the number of viewpoints was reduced to 8 (from 16) accordingly.

The assessment of visual impacts is informed by a series of viewpoints, which are selected to cover points of specific importance such as recognized settlements, minor and major routes. The type of locations used for viewpoints in visual impact assessments tends to vary from site to site, depending on the nature of the study area and the land uses that surround the site. The study area is not developed in terms of settlements and transport corridors. Since there are no remote upland areas that are designated for landscape qualities or notable hilltops that provide recognized viewpoints, the majority of the viewpoints used in the assessment are located within or on the edges of settlements and were included to represent the views that will be experienced by residents, who are considered to have increased sensitivity. These viewpoints generally provide a clearer and more open view than is available from public areas within settlements and the viewpoints therefore represent views that may be gained by residents of nearby houses. In the scope of the VIA study conducted for the Mersinli WPP, 8 representative viewpoints were selected as shown in the map provided in Figure 12-2.

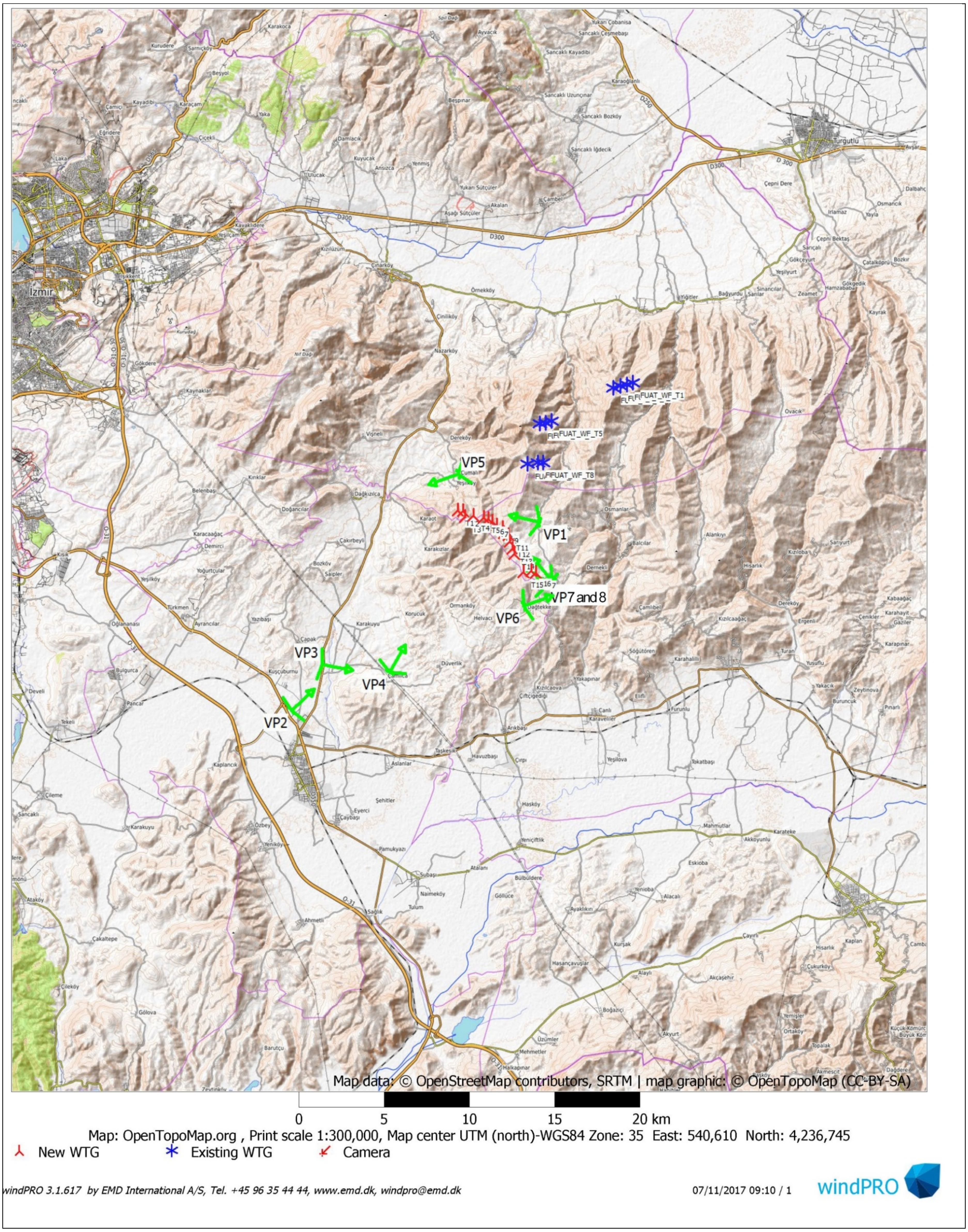


Figure 12-2. Locations of Representative Viewpoints (Photomontage Model Output)

12.3.2.2 Preparation of Photomontages

Photomontages are illustrations that aim to represent an observer's view of a proposed development. For the purposes of this assessment, photomontages have been compiled to analyse the potential visual impact of the wind turbines from a selection of representative viewpoints. Photomontages produced in this scope are presented in A3 format in Appendix E.

The methodology used for the visualisation production is based on the Guidelines for Landscape and Visual Impact Assessment 3rd edition (*Landscape Institute, IEMA, 2013*) and the Visual Representation of Wind Farms, (*Scottish Natural Heritage, December 2014*). Eight of the sixteen photographed viewpoints have been selected for the preparation of photomontages. The selection was based on the viewpoints which represent a range of viewer types (e.g. residents living in the surroundings, travellers along designated routes) and potential cumulative impacts due to other operational WPPs identified in the study area.

The photomontages were generated using digital photographs taken by Nikon D3200 DSLR photograph machine with 55-200mm lens, ESRI ArcGIS software, 3D modelling software (Autodesk 3ds Max) to generate the wireline diagrams or ‘wireframes’, and rendering software WindPro with (Adobe Photoshop). To ensure the photomontages consistently present a view which is representative of the human eye, photographs were taken at average human viewing height (approximately 1.60 m). Although the parameters of human vision when stationary are often quoted as falling between the 45- 60°, humans generally move their eyes, heads and bodies as necessary to experience a view. Therefore, a wider field of view has been used for the photomontages to represent panorama view. .

12.3.2.3 Assessment of Effects on Representative Viewpoints

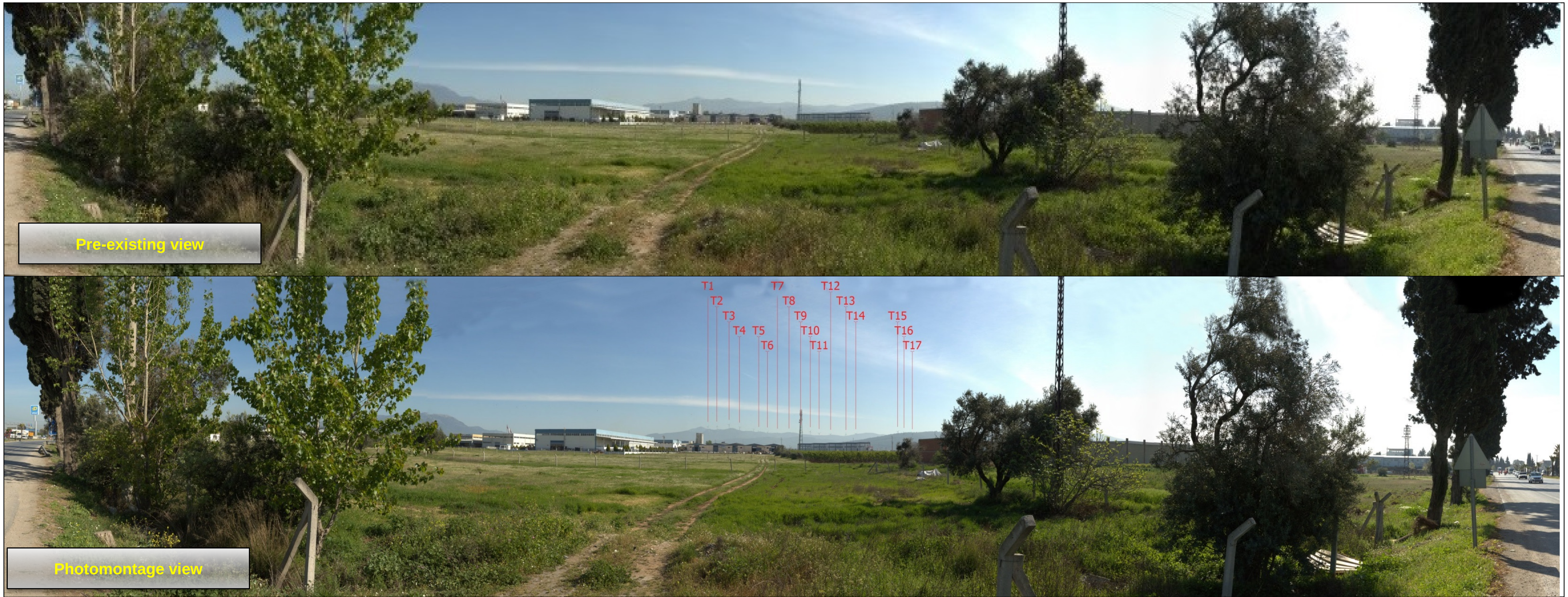
A receptor audience is a group of people that have the potential to view the Project from outside the Project boundaries. A variety of views that can be obtained by individual receptors were intended to be represented by the eight viewpoints that are included in this assessment. Each of these viewpoints was carefully selected to represent areas where either the most sensitive receptors are permanently located or where the highest number of receptors are likely to pass by. The following visual receptors were identified to be likely viewers who would experience views of the Mersinli WPP:

- Residents at home and public places in the surrounding neighbourhoods (Çınardibi, Cumalı, Marmariç Permaculture Village, etc.);
- Visitors of heritage assets or to other attractions (people who may visit the 1st degree archaeological site located within the License Area);
- Communities where views contribute to the landscape setting enjoyed by residents (Marmariç Permaculture Village);
- Travellers on road, rail or other transport routes (Kemalpaşa-Dağkızılca-Torbalı Road, Armutlu Road, İzmir-Aydın State Road);

In order to demonstrate the views from the representative viewpoints, photographs were taken during the site visit. The views from each representative viewpoint are given below between Figure 12-3 and Figure 12-10 and in Appendix E (in high resolution). The assessment of potential effects on each representative viewpoint is given below, with digital renderings of the observable turbines incorporated into the images.

Viewpoint Location Information										
X (Easting)	Y (Northing)	Z (from sea level)	Z (Offset)	Centre of panorama View Direction	Field of View (deg)	WTGs within field of view	Visible WTGs at tip height	Visible WTGs at hub height	Closest WTG (m)	Furthest WTG (m)
545208	4238201	691	+1.5	283	131x35	14	9	6	1,981	4,900
Visual Sensitivity									**Magnitude of change**	
Represents typical and accessible views of visitors. The turbines will be screened partially by foreground vegetation and changes in landform. The most sensitive visual receptors are expected to be local residents, who have a strong familiarity with the local area and who will typically experience this view often. Turbines will be seen from some of the residential houses. Overall, this viewpoint is considered to be of high sensitivity.									In existing view, Fuat WPP Project turbines (2 turbines) are visible at this location in right side of the photograph. 9 Mersinli WPP Project turbines hub and blades will be visible in operation period. The magnitude of change from this viewpoint is considered to be high.	

Figure 12-3. Viewpoint 1: Existing View from Çınardibi Neighbourhood



Viewpoint Location Information

X (Easting)	Y (Northing)	Z (from sea level)	Z (Offset)	Centre of panorama View Direction	Field of View (deg)	WTGs within field of view	Visible WTGs at tip height	Visible WTGs at hub height	Closest WTG (m)	Furthest WTG (m)
530962	4226241	57	+1.5	44	160x37	17	17	17	15,715	28,327

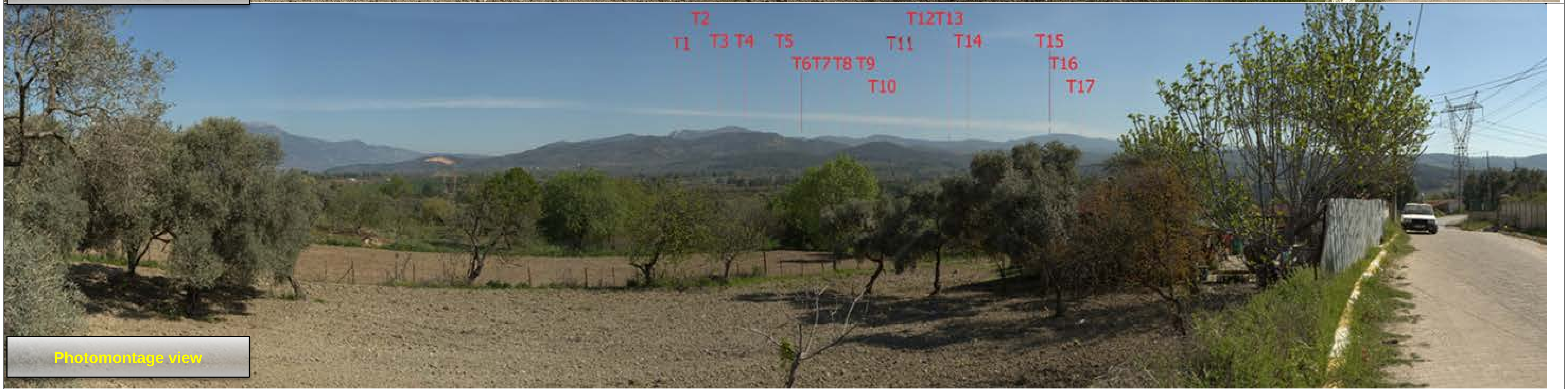
Visual Sensitivity	**Magnitude of change**
Represents typical and accessible views of road users and workers. Turbines are visible in the hills behind the industrial buildings. Overall, this viewpoint is considered to be of low visual sensitivity.	17 Mersinli WPP Project turbines will be visible in operation period. However, the atmospheric conditions (dust, fog, humidity and/or precipitation) easily affect visibility from this distance. The magnitude of change from this viewpoint is considered to be negligible due to the distance reducing visibility.

Figure 12-4. Viewpoint 2: Existing View from İzmir-Aydın State Road

Viewpoint Location Information									
X (Easting)	Y (Northing)	Z (from sea level)	Z (Offset)	Centre of panorama View Direction	Field of View (deg)	WTGs within field of view	Visible WTGs at tip height	Visible WTGs at hub height	Closest WTG (m)	Furthest WTG (m)
532308	4229706	86	+1.5	100	200x44	17	17	17	12,212	24,938

Visual Sensitivity	Magnitude of change
Represents typical and accessible views of road users. The turbines will be screened by foreground vegetation and changes in landform. Overall, this viewpoint is considered to be of low visual sensitivity.	Due to distance, turbines do not have notable effect within view. The magnitude of change from this viewpoint is considered to be negligible.

Figure 12-5. Viewpoint 3: Existing View from Torbalı-Kemalpaşa Road



Viewpoint Location Information

X (Easting)	Y (Northing)	Z (from sea level)	Z (Offset)	Centre of panorama View Direction	Field of View (deg)	WTGs within field of view	Visible WTGs at tip height	Visible WTGs at hub height	Closest WTG (m)	Furthest WTG (m)
536331	4229276	140	+1.5	29	132x39	17	17	17	9,955	22,162

Visual Sensitivity	Magnitude of change
Represents typical and accessible views of neighbourhood visitors and residents of Çamlıca Neighbourhood Overall, this viewpoint is considered to be of medium visual sensitivity due to its distance that would reduce receptors' attention/focus and limited number of people likely to experience this view.	In existing view, Fuat WPP Project turbines are slightly visible at this location. All Mersinli WPP Project turbines will be visible in operation period. The magnitude of change from this viewpoint is considered to be low.

Figure 12-6. Viewpoint 4: Existing View from Çamlıca Neighbourhood

Viewpoint Location Information									
X (Easting)	Y (Northing)	Z (from sea level)	Z (Offset)	Centre of panorama View Direction	Field of View (deg)	WTGs within field of view	Visible WTGs at tip height	Visible WTGs at hub height	Closest WTG (m)	Furthest WTG (m)
540319	4241021	358	+1.5	250	257x72	17	2	2	2,141	7,482

Visual Sensitivity	**Magnitude of change**
Represents typical and accessible views of residents. Overall, this viewpoint is considered to be of medium visual sensitivity.	In existing view, Karabel WPP Project turbine is visible at this location in right side of the photograph. 2 Mersinli WPP turbines will be visible in operation period (shown on left side of the photomontage). The magnitude of change from this viewpoint is considered to be medium.

Figure 12-7. Viewpoint 5: Existing View from Cumalı Neighbourhood


Pre-existing view

Viewpoint Location Information										
X (Easting)	Y (Northing)	Z (from sea level)	Z (Offset)	Centre of panorama View Direction	Field of View (deg)	WTGs within field of view	Visible WTGs at tip height	Visible WTGs at hub height	Closest WTG (m)	Furthest WTG (m)
544117	4233150	491	+1.5	45	65x35	2	2	2	2,241	2,250
Visual Sensitivity								**Magnitude of change**		
That is an alternative route for Dağtekke residents and visitors coming from Korucuk Neighbourhood and/or Torbalı District. Turbines will not be visible on public places of Dağtekke neighbourhood centre. Overall, this viewpoint is considered to be of low visual sensitivity.								In existing view, the skyline is not interrupted by any structures. 2 Mersinli WPP Project turbines will be visible in operation period. The magnitude of change from this viewpoint is considered to be medium.		

Figure 12-8. Viewpoint 6: Existing View from Dağtekke Neighbourhood Road


Pre-existing view

Viewpoint Location Information										
X (Easting)	Y (Northing)	Z (from sea level)	Z (Offset)	Centre of panorama View Direction	Field of View (deg)	WTGs within field of view	Visible WTGs at tip height	Visible WTGs at hub height	Closest WTG (m)	Furthest WTG (m)
545973	4234697	664	+1.5	320	70x55	17	2	1	1,094	7,142

Visual Sensitivity	Magnitude of change
Marmariç is an “Ecological Settlement” which has local and international visitors. Visitors profile consists of volunteers, tourists and permaculture students. There are also some residents who are permanently living there. Overall, this viewpoint is considered to be of high visual sensitivity.	In existing view, just one telecommunication tower visible. 2 Mersinli WPP Project turbines will be visible in operation period. The magnitude of change from this viewpoint is considered to be medium.

Figure 12-9. Viewpoint 7: Existing View from Marmariç

Viewpoint Location Information										
X (Easting)	Y (Northing)	Z (from sea level)	Z (Offset)	Centre of panorama View Direction	Field of View (deg)	WTGs within field of view	Visible WTGs at tip height	Visible WTGs at hub height	Closest WTG (m)	Furthest WTG (m)
545648	4234491	685	+1.5	315	177x36	2	0	0	961	1,245
Visual Sensitivity							**Magnitude of change**			
Represents typical and accessible views of residents. Overall, this viewpoint is considered to be of high visual sensitivity.							Mersinli WPP turbines will not be visible in operation period.			

Figure 12-10. Viewpoint 8: Existing view from Nearest House of Marmariç

Marmariç Permaculture Village is the closest settlement to the wind turbines of the Project. Distance between the closest residential house and the Turbine-17 is 1 km. None of the turbines is seen from this structure. Two turbines (Turbine-16 and Turbine-17) will be seen from the communal areas, including the common building of the settlement and the rain pool. View of Turbine-16 and Turbine-17 from the rain pool of the Marmariç Permaculture Village is presented in Figure 12-11.

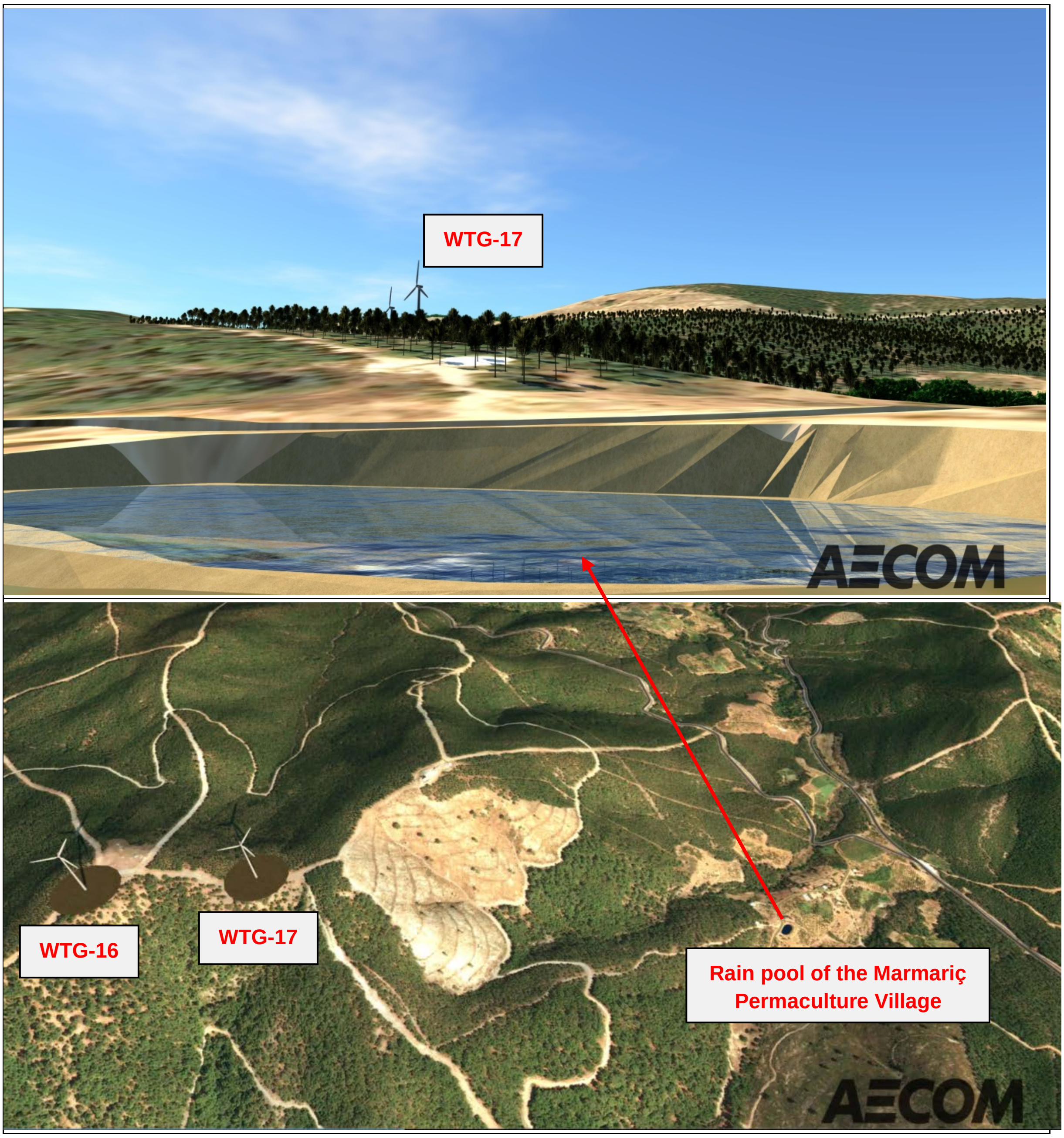


Figure 12-11. View of the Turbines from the Rain Pool of Marmariç Permaculture Village

12.3.3 Closure Phase

During the beginning of closure phase, visual impacts associated with turbines will have the same impact significance as the operation phase. In time, as the turbines are dismantled, the visual effect of the turbines will decrease. Once the decommissioning work is complete, the visual impact will disappear completely. Details of the restoration work in the closing period are given in Chapter 11.

12.3.4 Mitigation Measures

The Mersinli WPP Project was initially planned with 22 turbines (as mentioned in the national EIA Report) but the number of turbines was reduced to 17 based on feasibility studies conducted following the national EIA process. This revision in the Project layout inherently resulted in the avoidance of visual impacts caused by the 5 additional turbines. Particularly, three turbines that were located north of the Marmariç Permaculture Village, the closest settlement to the Project components, were eliminated ensuring minimisation of the visual impacts on this receptor (see Chapter 4 for additional information).

Similarly, the former Project design included construction of a new 154 km ETL line of 3 km, which has also been revised throughout the process. The current design ensures direct connection to the existing 154 kV ETL of the Fuat WPP with a 40-200 m line. This revision eliminated the visual impacts that would be sourced from the construction of a new ETL line with additional pylons.

The Project's potential visual impacts and the proposed mitigation measures for the land preparation, construction, operation and closure phases are provided in Table 12-2.

Table 12-2. Visual Impacts, Proposed Mitigation Measures and Residual Impacts

Impact Description	Project Phase	Receptor	Impact Magnitude						Sensitivity/ Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Magnitude (of change)	Reversibility	Duration	Frequency	Overall Magnitude				
Visual impact due to earthworks, cooperation of construction machinery, temporary construction compounds	• Land preparation and construction • Closure	Local communities	Local	Medium	Short-term reversible	Medium-term	Continuous	Medium	High	Major	• Implement dust suppression measures to avoid dust cloud. • Implement topsoil management measures (see Chapter 6). • Keep lightning to a minimum, insofar as is consistent with maintaining activities and health and safety requirements. • Use of materials that will not result in light reflection will be required, for all project components. • The obstacle lighting fixtures will include shielding such that no light is visible below 10 degrees below horizontal. • Minimize the amount of excess excavated materials to minimize the footprint of storage areas and height of the stockpiles.	Minor
Visual impact due to visibility of turbines	• Operation	Nearest house of Marmariç (VP 8)	-	Negligible/None (No turbines are seen from the receptor)	-	-	-	No impact	High	No impact	• Implement the Project with the 17 turbines-layout, which includes reduced number of turbines (reduced from 22 turbines with almost same tip height). • Connect to the existing 154 kV ETL line of the Fuat WPP to avoid additional ETL pylons in line with the agreement to be done with the related authority (TEİAŞ). • Use underground cable system. • At sites where construction activities are completed, reuse stored top soil for rehabilitation of sites • Implement Biodiversity Action Plan. • Develop and implement Reforestation Program in line with the Reforestation Protocol to be signed with the Forestry authorities. • Implement Grievance Mechanism in line with the Stakeholder Engagement Plan (prepared as a stand-alone document as part of the ESIA Disclosure Package) and take possible corrective actions in consultation with the local communities and authorities. • Use materials that will not result in light reflection. • Paint the turbine blades and tower with non-reflective materials.	No impact
		Marmariç (VP 7)	Local	Medium (2 turbines; closest at 1 km distance)	Long-term reversible	Long-term	Continuous	High	High	Major		Moderate
		Çınardibi Neighbourhood (VP 1)	Wide	High (11 turbines; closest at 2 km distance)	Long-term reversible	Long-term	Continuous	High	High	Major		Moderate
		Cumalı Neighbourhood (VP 5)	Wide	Medium (3 turbines; closest at 2.1 km distance)	Long-term reversible	Long-term	Continuous	High	High	Major		Moderate
		Dağtekke, Karaot, Karakızlar, Dernekli, Gökyaka and Dereköy Neighbourhoods	-	Negligible/None (Turbines are seen from the neighbourhoods)	-	-	-	No impact	Medium	No impact		No impact
		Çamlıca Neighbourhood (VP 4)	Wide	Low (17 turbines at 10 km distance)	Long-term reversible	Long-term	Continuous	Medium	Low	Minor		Minor
		Users of Torbalı Kemalpaşa Road (VP 3)	Wide	Negligible (17 turbines; closest at 12 km distance)	Long-term reversible	Long-term	Intermittent	Negligible	Low	Negligible		Negligible
		Users of Izmir Aydın Road (VP 2)	Wide	Negligible (17 turbines; closest at 15 km distance)	Long-term reversible	Long-term	Intermittent	Negligible	Low	Negligible		Negligible
		Users of Armutlu-Dağtekke Neighbourhood Road (VP 6)	Wide	Medium (2 turbines; closest at 2.2 km)	Long-term reversible	Long-term	Intermittent	High	Low	Moderate		Minor
		Visitors of the 1st degree archaeological site	Restricted	Low	Short-term reversible	Short-term	One-off	Low	High	Moderate		Minor

13. Socio-Economy

Socio-economic baseline conditions of the Project Area vicinity and its general region, as well as the potential social impacts of the Project, are described in this Chapter. During the assessment process, relevant international requirements and standards (such as EBRD PR1 and IFC PS1), related IFC General EHS Guidelines (Community Health and Safety and Construction and Decommissioning), related IFC sector specific guidelines (Wind Energy and Electric Power Transmission and Distribution) and expert knowledge were taken into consideration.

13.1 Project Standards and GIIP

The Project will fully comply with related national legislation and international standards, such as: IFI standards and guidance relevant to social issues (see Chapter 2).

13.2 Baseline Conditions

13.2.1 Study Purpose and Methodology

The purpose of the Social Baseline Study is to collect key primary and secondary information that can be used as reference points for describing the current social and economic situation in the Project Area, as well as provide the base information for the development of the Social Impact Assessment.

The scope of this SIA is to assess the impacts associated with the construction, commissioning, operation and closure of the Project, and develop and propose mitigation to be implemented. In this way, impacts can be prevented, reduced or maintained to an acceptable level, and the positive impacts can be further enhanced. The SIA intends to assist the Project Company to develop a clear understanding of the impacts, risks and mitigation options, including through meaningful participation from relevant and interested stakeholders. The assessment of potential socio-economic impacts, risks and outcomes (both to the Project Company and the community) of the Mersinli WWP development, informs a comprehensive social risk mitigation plan which will comprise Social Management Plans (SMPs) and a Stakeholder Engagement Plan (SEP), incorporating a grievance management process. A Social Management Framework will be prepared as part of the disclosure documents and detailed Social Management Plans will be prepared prior to Construction and will become part of the Project's Environmental and Social Management System (ESMS). Social management plans include: Worker Health and Safety; Emergency Response; Stakeholder Engagement; Grievance Management; Community Development; Cultural Heritage; Local Employment and Training; Community Health, Safety and Security; and Procurement and Supply Chain.

The assessment methodology is comprised of the following steps, and indicates where in this report further details can be found:

Scoping

Identification of sensitivities and activities with the potential to contribute to or cause potentially significant impacts to receptors and resources, based on the Project definition described in Chapter3. Project planning, decision-making and refinement of the Project description evolve through the assessment process as a result of the development of the Project and in response to the identified impacts.

Stakeholder Engagement

Continues throughout the assessment to ensure that legislative requirements are met, stakeholder concerns are addressed in the Project design and assessment and sources of existing information and expertise are identified, as described in Chapter 18.

Collection of Baseline Data

Establishing and reviewing the existing conditions and legislative requirements pertaining to the Project area and its surrounds and highlighting receptors and resources sensitive to potential impacts..

Assessment of Impacts and Mitigation

Predicting and evaluating the likely extent and significance of the potential impacts on identified receptors and resources according to defined assessment criteria; to develop and describe measures that will be taken to avoid, minimise, reduce or compensate for any predicted adverse effects, or to enhance positive impacts; and to report the significance of the residual impacts that remain following mitigation, a stage described in Chapter 5.

Integration

Developing a systematic approach for incorporating mitigation actions into the Project, taken forward as commitments with specified timing and responsibilities, typically achieved through Management Plans.

Reporting

Presentation of findings of the impact assessment, including a Non-Technical Summary.

Baseline conditions of the settlements that are located within the identified potential impact area are addressed under this section. Various instruments and communication methods were used in order to obtain explanatory information on social baseline conditions of the potential affected communities. These methods were as follows:

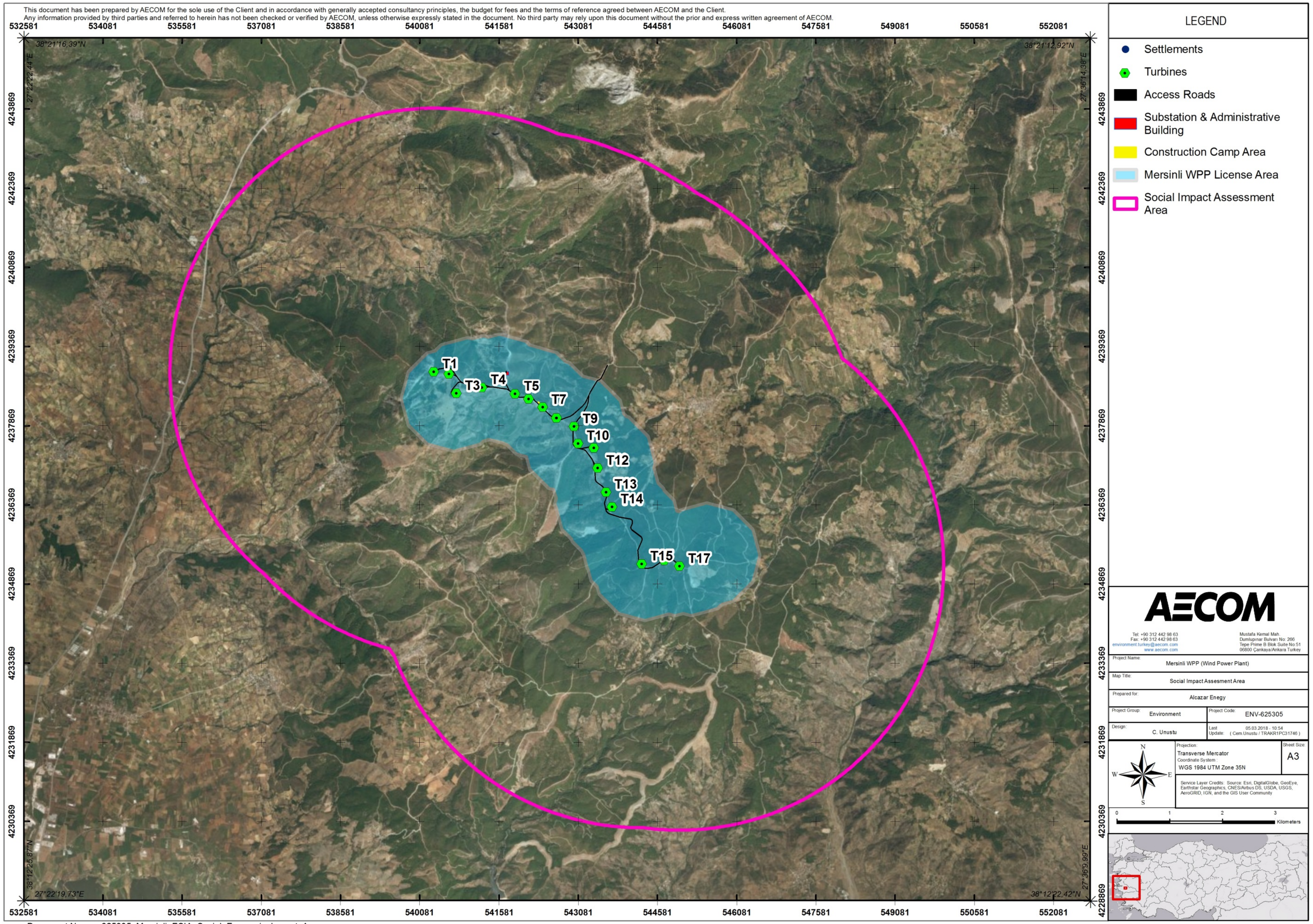
- Desktop studies: Information regarding local and regional socioeconomic conditions, was obtained from online sources and relevant publications. Websites of several institutions and governmental offices such as: the Turkish Statistical Institute (Turkstat) and Ministry of National Education (MEB) were used during desktop studies.
- Interviews with local headmen: Since access to the information on local socio-economic conditions through desktop studies is limited, headmen of the settlements were interviewed through face to face meetings and phone interviews in September 2017. Additional meetings with the headmen of the settlements were held on 20-22th December 2017. During the meetings, a key informant questionnaire was used.
- Interviews with local people: During the site visit conducted on 3-4th of September 2017, several informal meetings were held with local people. The aim of these meetings was mainly to understand the actual socio-economic conditions of the settlements. These meetings were also helpful to understand local communities' perception of the Project.
- Interviews with the governmental authorities: During the site visit conducted on 20-22th December 2017, several governmental offices were visited in order to understand the potential impacts of the Project on livelihoods and also effectiveness of the proposed mitigation measures were discussed with the participants.

It is important to note that the socio-economic data from Turkstat was only available at regional level; no data (such as age groups, gender distribution etc.) was available for the local communities except population information.

13.2.2 Social Impact Assessment Area

The potential socio-economic impact area of the Project was determined based on turbines' distance to the nearest settlements, considering a 5 km radius. While determining the impact area, potential social impacts on local resources and receptors were considered.

A map presenting the identified social study area (i.e. the potential social impact area) is given in Figure 13-1.



Document Name : 625305_Mersinli_ESIA_Social_Economic_Impact_Area

Figure 13-1. Socio-economic Impact Area

13.2.3 Baseline Information

13.2.3.1 Population

Provinces in Turkey are administered by governors appointed by the Ministry of Interior Affairs, after approval of the Council of Ministers and the President. The governor is the principal agent of the central government and reports to the Ministry of Interior Affairs. The district administration consists of: a district sub governor, central government representatives, and a district administrative board. The district sub governor is accountable to the governor, serving essentially as his agent in supervising and inspecting the activities of government officials in the district. In addition to appointed governors, metropolitan and district mayors as well as their municipal council members in cities, and headmen (muhtars) and "elderly councils" in rural areas (and also in neighbourhoods within urban areas) are elected as local authorities.
According to the Address Based Population Registration System (ABPRS) 2016, the population of Izmir is 4,223,545 making it the 3rd largest city in Turkey comprising 5.3% of the Country's population. Population density in the province is 355 per km^2, as opposed to 102 per km^2 in Turkey as a whole.

According to data obtained from Turkstat, the population of Izmir had increased more than 30% since 1960. As shown in Figure 13-2, the population of Izmir increased gradually from 1927 to 1990, when the population growth started decreasing. (see Figure 13-3).

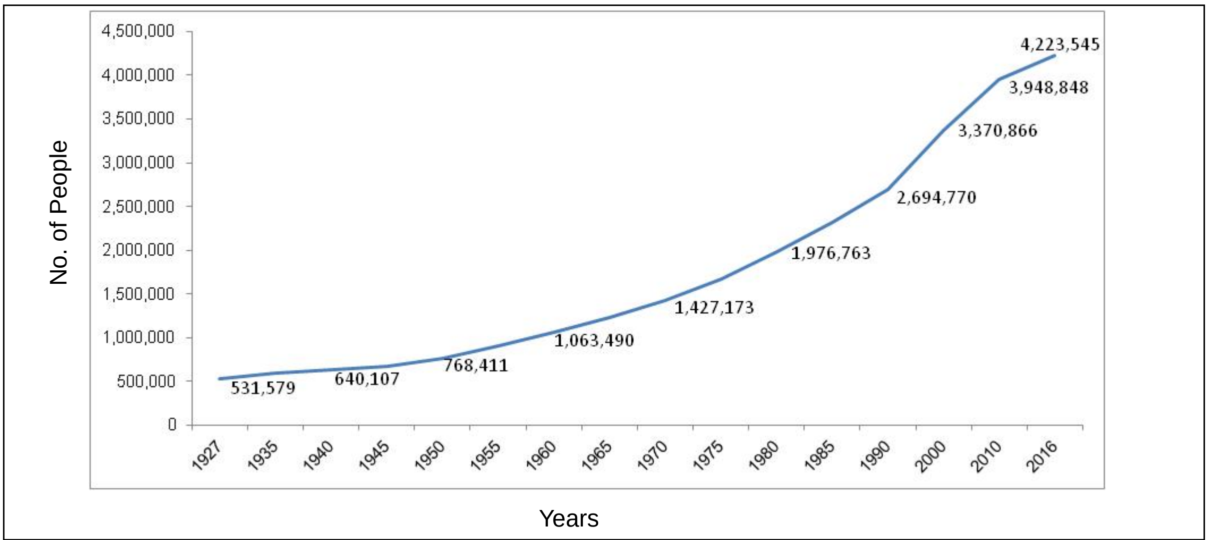


Figure 13-2. Population of Izmir Province between 1927-2016

Source: Turkstat, 2016

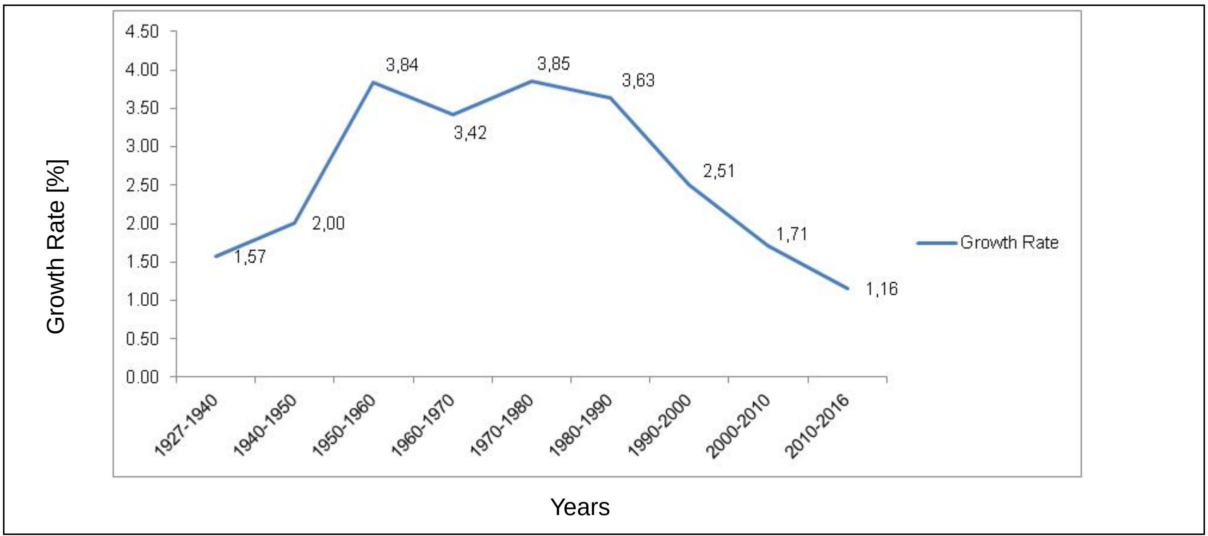


Figure 13-3. Population Growth Rate of Izmir Province

Source: Turkstat, 2016

The population pyramid of the Izmir Province (which includes age-sex distribution) is given in Figure 13-4 below. It can be seen from this figure that 49.8% of the population is male and 50.2% is female. The proportion of people in the working age group of 15-64 (2,990,943) is 70.8%. This age group can also be defined as active population. Older people, who can be considered as a vulnerable group, make up 10.8% of the population in the Province. According to this rate, it is understood that the dependency ratio[5] in Izmir is 41.2% and it is significantly below than country average which is 47.2%.

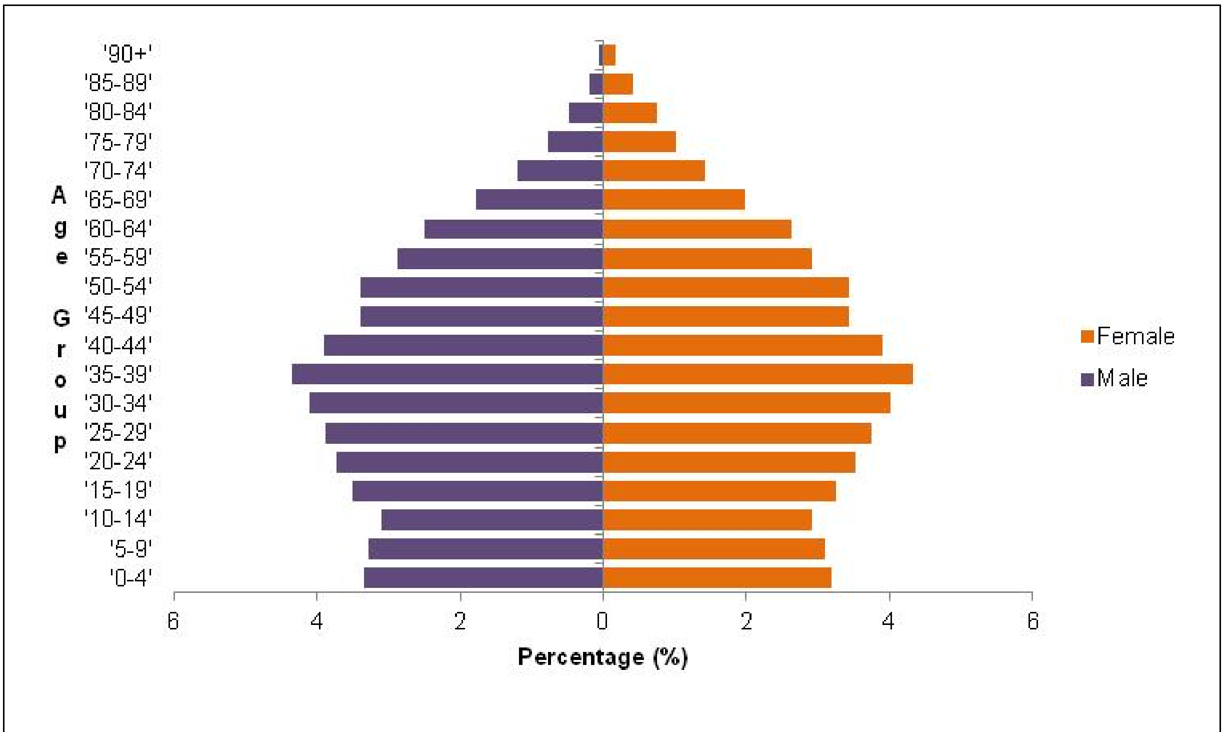


Figure 13-4. Population Pyramid of Izmir Province

Source: Turkstat, 2016

[5] The dependency ratio is equal to the number of individuals aged below 15 or above 64 divided by the number of individuals aged 15 to 64, expressed as a percentage.

The median age in Izmir is 35.7, this rate is noticeably higher than Turkey's average (31.4). The fertility rate in Izmir has been increasing in the last 6 years. In fact, the total fertility rate was 1.53 in 2010 and it reached 1.68 in 2016 (*Turkstat, 2016*).

The district of Buca has the largest population with its 482,337 individuals. Karabaglar and Bornova Districts are following Buca with populations of 480,523 and 438,549 respectively. Considering the three districts where the Project Area is located, Torbali has the largest population with 164,981 individuals and Bayindir has the lowest population with 40,216 individuals (see Table 13-1.

Table 13-1. District Populations of Izmir Province

District	Male	Female	Total	Male (%)	Female (%)
Aliaga	50,092	40,934	91,026	55.0	45.0
Balcova	38,192	39,894	78,086	48.9	51.1
Bayindir	19,916	20,300	40,216	49.5	50.5
Bayrakli	156,425	157,583	314,008	49.8	50.2
Bergama	51,267	50,823	102,090	50.2	49.8
Beydag	6,133	6,167	12,300	49.9	50.1
Bornova	218,410	220,139	438,549	49.8	50.2
Buca	241,384	240,953	482,337	50.0	50.0
Cesme	20,613	19,699	40,312	51.1	48.9
Cigli	93,548	93,169	186,717	50.1	49.9
Dikili	20,613	20,662	41,275	49.9	50.1
Foca	16,188	12,403	28,591	56.6	43.4
Gaziemir	66,505	66,061	132,566	50.2	49.8
Guzelbahce	14,699	15,136	29,835	49.3	50.7
Karabaglar	237,489	242,764	480,253	49.5	50.5
Karaburun	4,947	4,628	9,575	51.7	48.3
Karsiyaka	159,700	178,785	338,485	47.2	52.8
Kemalpasa	52,709	51,097	103,806	50.8	49.2
Kinik	14,279	13,986	28,265	50.5	49.5
Kiraz	22,154	21,691	43,845	50.5	49.5
Konak	181,407	189,255	370,662	48.9	51.1
Menderes	43,816	42,678	86,494	50.7	49.3
Menemen	83,431	80,134	163,565	51.0	49.0
Narlidere	32,187	32,613	64,800	49.7	50.3
Odemis	65,515	66,213	131,728	49.7	50.3
Seferihisar	19,141	18,556	37,697	50.8	49.2
Selcuk	18,035	17,925	35,960	50.2	49.8
Tire	40,952	42,130	83,082	49.3	50.7
Torbali	83,417	81,564	164,981	50.6	49.4
Urla	31,468	30,971	62,439	50.4	49.6
Total	**2,104,632**	**2,118,913**	**4,223,545**	**49.8**	**50.2**

Source: Turkstat, 2016

The Project Area is located at the border of Bayindir, Kemalpasa and Torbali districts within the Izmir Province. There are 11 neighbourhoods within the vicinity of Project area. These neighbourhoods and their populations are shown in Table 13-2. According to the Table, Cinardibi Neighbourhood has the largest population with 822 individuals while Gokyaka has the lowest population with 95 individuals. In terms of average household size within the neighbourhoods, Derekoy has the highest average household size with 2.86 people and Helvaci has the lowest with 1.70 people.

Table 13-2. Population and Average Household Size of Project Affected Settlements

District	Neighbourhood	Population*	Number of HH**	Average HH Size	Approximate Distance of the Settlement to the Closest Turbine (km)
Bayindir	Cinardibi	822	400	2.06	1.9 km (WTG-11)
	Dernekli	166	60	2.77	2.8 km (WTG-17)
Kemalpasa	Cumali	212	80	2.65	2.1 km (WTG-01)
	Derekoy	458	160	2.86	4.7 km (WTG-02)
	Gokyaka	95	50	1.90	3.4 km (WTG-02)
	Yesilkoy	167	70	2.39	1.9 km (WTG-01)
Torbali	Dagtekke	169	60	2.82	1.6 km (WTG-16)
	Helvaci	255	150	1.70	3.5 km (WTG-15)
	Karakizlar	395	180	2.19	2.5 km (WTG-03)
	Karaot	282	120	2.35	2.1 km (WTG-01)
	Ormankoy	217	80	2.71	4.4 km (WTG-14)
Total		**3,238**	**1,410**	**2.30**	

**Source: Turkstat, 2016*

***Information was obtained from Neighbourhood Headmen and other Key Informants such as members of headmen council.*

13.2.3.2 Socio-economic Features

Information regarding the main income sources of the settlements, located within the impact area is presented in this section. The main sources of income within all neighbourhoods are: agriculture, retirement pension and wage labour. Due to the suitable features of the land and climate, olive cultivation and cherry plantations are the most common agricultural activities in the neighbourhoods. In addition, gardening products such as tomatoes and peppers are also suitable for certain areas in terms of horticulture activities but these are not common in the region. Apart from agricultural activities, beekeeping and livestock activities are also carried out by the local communities. Especially, beekeeping is a raising trend for the local people over the last decades while livestock activities are decreasing within the region.

Primary, secondary and tertiary income sources in the settlements are given in Table 13-3. According to the information obtained from neighbourhood headmen, the predominant source of income is olive cultivation within the Project impact area. Retirement pension and cherry cultivation are also important income sources. Apart from these activities, beekeeping and wage labour are significant income source for local communities.

Table 13-3. Primary, Secondary and Tertiary Income Sources of the Neighbourhoods

Settlement	Primary Income Source	Secondary Income Source	Tertiary Income Source
Cinardibi	Cherry Cultivation	Retirement Pension	Forestry
Dernekli	Cherry Cultivation	Olive Cultivation	Retirement Pension
Cumali	Retirement Pension	Olive Cultivation	Wage Labour
Gokyaka	Olive Cultivation	Beekeeping	Retirement Pension
Yesilkoy	Retirement Pension	Olive Cultivation	Cherry Cultivation
Dagtekke	Olive Cultivation	Beekeeping	Retirement Pension
Helvaci	Olive Cultivation	Retirement Pension	Livestock
Karakizlar	Olive Cultivation	Retirement Pension	Beekeeping
Karaot	Olive Cultivation	Wage Labour	Retirement Pension
Ormankoy	Retirement Pension	Olive Cultivation	Wage Labour

Source: Headmen Interviews, September 2017

Cherry Cultivation

In the impact area, cherry cultivation is most common in the Cinardibi and Dernekli neighbourhoods. According to the information obtained from the headmen, vineyards were popular for the local people; however, these vineyards were converted into cherry plantations over the last 20 years. Still, some households are cultivating grapes, producing grape molasses and selling it on the local markets. However, it is not a major income generating activity within the region.

Cherry plantation owners are supplying local and regional markets with their products. However, there are some owners who export their cherries for international markets such as Eastern European markets. During the harvest season (especially in June), local markets have an important role for the cherry owners who can present their products to the buyers. Cinardibi is an important location for the producers where most of the buyers procure cherries from this neighbourhood.

Harvest season has another important role for the seasonal workers coming from different regions to the Project impact area. These workers mostly reside in larger Districts such as Kemalpasa and Torbali. According to the information obtained from the headmen, the duration of the workers stay is generally 2 months. Every year approximately 150 individuals come to the region as seasonal workers. Majority of these people come from surrounded districts such as Turgutlu and Salihli districts in the Manisa Province. According to the interviews held with the headmen of the affected settlements, Syrian refugees are not working as seasonal workers.

Olive Cultivation

Olive cultivation is mostly implemented in Gokyaka, Dagtekke, Helvaci, Karakizlar and Karaot neighbourhoods within the Project impact area. As it has a regional importance from past to date, local people presents their products to the local and regional markets. There are multiple olive processing factories around the region and apart from the sales agreement, local people are providing their annual needs of olive oil and olive related products from these factories in accordance to the agreements they made with the factory owners.

Same as cherry cultivation, seasonal workers are coming to the region for olive harvest, especially in October and November and reside in Kemalpasa and Torbali Districts. According to the information obtained from headmen, at least 200 workers come to the region every year for olive harvest. Majority of these people come from south-eastern part of Turkey. According to the interviews held with the headmen of the affected settlements, Syrian refugees are not working as seasonal workers.

Forestry

Forestry is an important source of income in the Cinardibi neighbourhood. Wood chopping is the main forestry activity and local people in Cinardibi have gained professional expertise in this sector over time. They are not only doing this business within the region, they also travel to other cities as seasonal wood choppers.

Every year, the Regional Directorate of Forestry designates the areas where the trees will be cut. Wood choppers around the region are working in these designated areas.

Beekeeping

Beekeeping activity is carried out in every settlement within the Project impact area; however, most of the families are providing their household needs from beekeeping and do not present their product for local market. Generally, beekeeping has an important role in the Cinardibi, Gokyaka and Dagtekke neighbourhoods. Most of the beekeepers in Gokyaka sell their products on local markets. As shown in Table 13-4, In total 111 households are carrying out beekeeping activities within the Project impact area. Among these neighbourhoods, Gokyaka stands out with 30 households in terms of beekeeping activities and Cinardibi and Dagtekke neighbourhoods are following Gokyaka with 25 and 20 households respectively. Considering that Gokyaka consists of 50 households, 60% of these households are carrying out beekeeping activities, whereas the rate is 33% for the Dagtekke neighbourhood. It should be noted that various type of beekeeping activities are conducted in the region. Some of the beekeepers are known to approach the region from different cities, who are not necessarily the same beekeepers every year. Additionally, according to the District Directorates of Agriculture (Bayindir, Kemalpasa and Torbali districts) the official number of beekeepers within the Project impact area in 2017 was only 64 (interviews held with the directorates in January 2018).

Table 13-4. Beekeeping Activities in the Settlements (Headmen Interviews, September 2017)

District	Neighbourhood	Number of HH
Bayindir	Cinardibi	25
	Dernekli	10
Kemalpasa	Cumali	4
	Gokyaka	30
	Yesilkoy	1
Torbali	Dagtekke	20
	Helvaci	4
	Karakizlar	10
	Karaot	2
	Ormankoy	5
Total		**111**

Source: Headmen Interviews, September 2017

In line with the related Turkish legislation, all beekeepers are supposed to be registered at the District Directorate of Food, Agriculture and Livestock in Bayındır, Kemalpaşa or Torbalı districts. Each season, beekeepers apply to the Directorate for that season's locations of their beehives or if they are new comers for their registration. The Directorate provides the beekeepers with available/appropriate locations for that season. Therefore, these location may vary from one season to another.

Livestock

The livestock activities carried out in the neighbourhoods within the Project impact area are mostly for household subsistence. Stock-farming type of livestock activities are present in Cinardibi, Helvaci, Gokyaka and Yesilkoy and approximately 20 households are involved and only one household from Yesilkoy neighbourhood is grazing their animals close to the Project license area. During the site visits, it was not possible to interview this household however; proper consultation activities will be held in order to avoid any impact on livelihoods. . Additionally, there is no poultry farm around the region.

There is no pasture land that will be affected by the Project. However, some livestock owners are grazing their animals within the Project impact area and therefore, information related to the potential impacts of the Project on grazing are addressed in Section 13.3.

Wage Labour

People who are at working age within the neighbourhoods are mostly working in the factories located around the region. Most of these factories produce agricultural products and employees are supplied from the region as well as raw material needs.

Retirement Pension

People who are living in the neighbourhoods are mostly retired and their retirement pension depends on agricultural business. Retirement pension is the main income source for Cumali, Yesilkoy and Ormankoy residents.

Mushroom Gathering

Mushroom gathering is being carried out in the Project impact area to gain income. However, this activity is limited to the appropriate season and usually mushrooms are collected in October, November and March. Mushrooms are sold on the local market, in addition to consumption in their own households.

13.2.3.3 Labour Force and Unemployment

In Izmir, unemployment rate has shown a steady increase after 2008 from 11.8% up to 15.0% in 2015. Table 13-5 presents labour force and employment data by age group in the Izmir Province for the year 2013. The percentage of labour force and employment rates is high in the 25-34 age group, while unemployment rate is high in the 20-24 age group.

Table 13-5. Labour and Employment Data for Izmir Province

Age Group	Unemployed (%)		Labour Force (%)		Employment Rate (%)	
	Izmir	Turkey	Izmir	Turkey	Izmir	Turkey
15-19	24.8	16.2	34.3	28.2	25.8	23.6
20-24	28.0	21.5	65.0	58.6	46.8	46.0
25-34	14.5	12.3	76.0	69.5	65.0	61.0
35-54	12.6	8.1	68.1	64.7	59.5	59.5
55+	13.5	6.2	23.1	35.6	20.0	33.4

Source: Turkstat, 2016

13.2.3.4 Vulnerable Groups

According to the headmen the important vulnerable groups among the settlements are: elderly people and disabled people. It should be noted that, it is not easy to put every elderly person in the vulnerable categories who are living in the affected settlements. As a matter of fact, most of the elderly people are retired and they have a monthly income from the government. However, there are some elderly people who need special care and according to the information obtained from the headmen, these elderly people are living with their families and are also receiving monthly aid from the government.

There are also some disabled people present in the neighbourhoods. Numbers of disabled people in the settlements are shown in Table 13-6.

Information regarding women headed households in the neighbourhoods could not be obtained from the headmen during the site visit.

Table 13-6. Disabled People Living in the Settlements

District	Neighbourhood	Population	Number of Disabled People
Bayindir	Cinardibi	822	N/A
	Dernekli	166	4
Kemalpasa	Cumali	212	0
	Derekoy	458	N/A
	Gokyaka	95	2
	Yesilkoy	167	1
Torbali	Dagtekke	169	2
	Helvaci	255	5
	Karakizlar	395	5
	Karaot	282	3
	Ormankoy	217	2
Total		**3,238**	**24**

Source: Headmen Interviews, September 2017

According to the headmen interviews, above-mentioned vulnerable people do not own/use any land within the License Area.

13.2.3.5 Education

Education in Turkey is administered by a centralised management. All schools, other than higher education institutions, are subject to management by Ministry of National Education. Higher education institutions provide services under Council of Higher Education (YOK). In addition to public schools, there are private schools operating in every level of education, which are also working under Ministry of National Education. Prior to 2012, 8 years mandatory primary education was enforced in Turkey and as of 2012-2013 education term, a 12 year primary education system with 4+4+4 year levels was adopted. Educational policy has been an important subject in Turkey since the founding of the Republic. Therefore, mandatory primary education was first raised from 5 years to 8 years. After adoption of the 12 year system, schooling rate of Turkey is expected to reach European Union countries' rates. Even with all these policies, it was not possible to establish a school in every settlement in Turkey. Gradual decrease in rural population due to inland migration and migration of the young village populations to other settlements can be identified as the main reason for this. Current educational infrastructure and educational level within the Project impact area are described below.

Izmir is a highly developed city in terms of educational infrastructure. There are 9 universities located in Izmir and approximately 200,000 students are studying in these facilities. Considering the lower level of educational facilities; 2,942 schools, 22,163 classrooms are located in Izmir and 678,130 students and 40,817 teachers are participating in the educational system. According to these numbers, the number of students per classroom is 32 for primary education and 27 for secondary education (*Izmir Province National Education Directorate Website; http://izmir.meb.gov.tr/*). The number of illiterate people in the Province in 2016 was 63,752 (1.5% of the total population).

There are 53 schools, 346 classrooms, 7.004 students and 378 teachers in the Bayindir district. According to these numbers, the number of students per classroom is 21 for primary education and 14 for secondary education (*Bayindir District National Education Directorate Website; http://bayindir.meb.gov.tr/*). The number of illiterate people in the district in 2016 was 1,202 (3.0% of the total population). There are 71 schools, 920 classrooms, 17,975 students and 996 teachers in Kemalpasa District, the district where the Project Area is located. According to these numbers, the number of students per classroom is 28 for primary education and 31 for secondary education (*Kemalpasa District National Education Directorate Website; http://kemalpasa.meb.gov.tr/*). The number of illiterate people in the district in 2016 was 2,038 (2.0% of the total population). There are 125 schools, 887 classrooms, 32,779 students and 1,871 teachers in Torbali District (*Torbali District National Education Directorate Website; http://torbali.meb.gov.tr/*). The number of illiterate people in the district in 2016 was 3,894 (2.4% of the total population).

In terms of educational facilities within the Project impact area, only 2 schools are located in Derekoy and Cinardibi and only primary education is provided in these schools. Students attending higher education are traveling to the larger districts around the region. Apart from Derekoy and Cinardibi, students living in other neighbourhoods are using mobile educational system. Information regarding the number of students and where they travel during the educational season is given in Table 13-7.

Table 13-7. Number of Students who use Mobile Education System in the Neighbourhoods

Neighbourhood	Number of Students	Traveling to
Dernekli	10	Cinardibi
Cumali	13	Derekoy
Gokyaka	10	Derekoy
Yesilkoy	20	Derekoy
Dagtekke	15	Korucuk
Helvaci	23	Korucuk
Karakizlar	30	Karakuyu
Karaot	22	Karakuyu
Ormankoy	8	Korucuk
Total	**151**	

Source: Headmen Interviews, September 2017

13.2.3.6 Health

In the last decade, health service agencies in Turkey have been merged within the framework of the Health Transformation Programme. Healthcare is provided by public, semi-public, private and philanthropic organisations, including the Ministry of Health (MoH), universities, the Ministry of Defence and private health professionals. Provincial Health Directorates are responsible for service planning and healthcare provision at provincial level. Primary health care is provided through health centres, health posts, Maternal and Child Health and Family Planning Centres and tuberculosis dispensaries. Municipalities play a role in environmental health and sanitation. The most recent initiative at the primary health care level has been the introduction of a family physician scheme. Family practitioners are the first level of contact. Individuals are free to choose their family practitioner and can change their doctor under certain conditions.

The healthcare services in Izmir Province are under the control of the Provincial Directorate of Health. According to the data obtained, the following healthcare facilities are present in the Province (*Izmir Provincial Directorate of Health website, www.ism.gov.tr. 2017*):

- 21 state hospitals;
- 6 training and research hospitals;
- 2 state university hospitals;
- 2 private university hospitals;
- 25 private hospitals; and
- 2 military hospitals

The number of health centres in Bayindir, Kemalpasa and Torbali Districts are as follows:

- 1 oral and dental health clinics;
- 3 state hospitals;
- 1 tuberculosis control dispensaries; and
- 10 family health centres.
- 1 private hospital

There are only 2 community health centres in the area. These are located in the neighbourhoods of Derekoy and Cinardibi. Family practitioners visit the neighbourhoods every week. When special care is needed or in case of an emergency, people visit the state hospitals located in the district centres.

According to the headmen of the neighbourhoods, there are no endemic diseases within the Project impact area. This information is also confirmed by Torbali and Bayindir District Directorates of Health.

13.3 Impact Assessment

The identified potential social impacts of construction, operation and closure activities of the proposed Project are described in this section:

- Land Use
- Employment and Procurement Opportunities
- Livelihoods
- Infrastructure

It should be noted that a multitude of Project related potential impacts that may affect the communities such as air quality, noise, visual amenity, water resources, community health and safety (shadow flicker, blade and ice throw) etc. are assessed separately in relevant chapters of this ESIA Report, together with related mitigation measures.

13.3.1 Land Preparation and Construction Phase

13.3.1.1 Land Use

The total footprint area needed for the Project components is approximately 31 ha, registered forest land. Of this area, around 1 ha (of registered forest land) is used for agricultural purposes, but not formally owned agricultural land (see Section 13.3.1.3 for details). Cherry plantations are located on these agricultural lands and the rest of the Project Area that will be affected from the Project belongs to the Forestry, which are classified as public land. Detailed information regarding the land use within the Project Area and potential land use impacts are given in Chapter 6. Impacts on livelihoods of the users of the said 1 ha agricultural area are provided in Section 13.3.1.3.

13.3.1.2 Employment and Procurement Opportunities

Jobs creation by wind power technologies can be grouped into three categories according to their location, temporal nature, and level of expertise. The first category involves jobs generated in technological development, and includes Research and Development (R&D) and equipment manufacturing. The second category refers to jobs in installation and decommissioning of plants, and comprises planning, project management, transportation and power plant construction. Finally, the third category is operation and maintenance (O&M). The characteristics are summarised in Table 13-8.

Table 13-8. Characteristics of WPP Projects in terms of Employment Opportunities

Category	Volume of Job Creation	Location	Temporal Nature	Specialisation level demanded
Technological development	Medium	From non-local to local	Stable	Very high
Installation / decommissioning	High	From local to non-local	Temporary	High
Operation and maintenance	Low	Local	Stable	Medium

Source: Sastresa et. al, 2010.

Consisting of 120 unskilled and 30 skilled personnel, a total of 150 people will be employed at peak during the Project's construction activities. Considering the 16 months duration of construction, this benefit will be limited and it can be assessed as minor.

Recruitment procedures will be in line with the Project Company and the Contractor's employment policies. This will include the aim of providing opportunities for employment of local workforce to the extent possible considering unskilled, semi-skilled and skilled workforce. To avoid spontaneous settlements at the construction sites, no day-labourers will be hired.

The Project Company will seek to maximise the benefits from the Project to local communities in terms of direct and indirect employment, and purchasing of local goods and services during construction. This will include measures such as adopting local employment policies, establishing tenders for procurement of subcontracted goods and services at a scale that local businesses can respond to, ensuring opportunities are advertised locally, and providing training for local people to allow them to obtain jobs relevant for the Project to the extent possible.

13.3.1.3 Livelihoods

Potential impacts of the Project construction activities on livelihoods are assessed under this section. Information on main income sources within the region is provided in Section 13.2.3.

The most significant impact of the construction activities to the livelihoods, is likely to be dust and vehicle emissions. Especially, cherry and olive plantations located within the region and beehives situated along the access route will be subject to dust emission and these impacts are likely to cause economic displacement in case relevant mitigation measures are not implemented.

Another economic displacement will be possible for those people who are using the public land as informal user located under the 12th WTG. There are two parcels which will be affected by the turbine construction and total area of that two parcels is 2.06 hectare, while the total affected land is only 1.12 hectare. It is understood that 79% of the parcel number 277/1 will be affected; while 39% of the parcel 277/2 will be affected. (see Table 13-9). Within these two parcels, there are a few number of cherry plantations located close to the 12th WTG and these plantations are also likely to be affected by the dust during construction activities unless relevant mitigation measures are taken.

Table 13-9. Agricultural Lands that will be affected from the Project

Wind Turbine No	Plot	Parcel	Title Deed Area (m2)	Total Affected Area (m2)	Remaining Area (m2)	Percentage (%)
WTG 12	277	1	7,724.72	6,108.00	1,616.72	79.07
	277	2	12,895.84	4,146.00	7,849.84	39.13
Access Road for WTG 12				900.00		
Total			20,620.56	11,154.00	9,466.56	54.09

Apart from the cherry plantations, economic displacement may also be caused by the Project's construction activities due to impacts on beekeeping activities. Especially during the construction phase of the Project, beehives situated along the transportation route and turbine locations may adversely be affected if necessary measures are not implemented. According to the criteria defined by the Ministry of Food, Agriculture and Livestock, beehives must be located 200 meters from the main roads and 30 meters from the stabilised roads where the traffic is not busy.

The current construction plan includes transporting turbine components (such as blades and towers) via existing and additional access roads. Olive plantations are located 1 km of the transportation route and the impacts of the transportation activities will be minor when relevant mitigation measures are taken into account.

Grazing activities are also carried out within the Project Area. However, according to the information obtained from the headmen, these activities are limited and the impact of the construction activities can be considered as minor if relevant mitigation measures are taken into account (see Chapter 15 for impacts related to Public Access).

Apart from livestock activities, mushroom gathering is also carried out within the region and gathering is limited to two months which are November and March. This activity is also carried out for household needs and a limited number of people sell their products to the local market. No adverse impact on mushroom gathering activities is expected. Additionally, local communities can use various locations within the Project Area based on the mushroom types and actual seasonal conditions.

Any livelihood losses among olive producers, other cherry plantation owners and also seasonal worker are not expected within the scope of the Project activities.

No businesses along the construction route are expected to experience income losses as a result of the Project related activities. There may be short term impacts on quality of life (such as dust and noise emissions) of residents living along the transport route; however, impacts will be below limits of Project standards when necessary measures are taken into account (see Chapter 7 and Chapter 8). Appropriate compensation and reinstatement measures have to be implemented before construction is completed.

13.3.1.4 Infrastructure

Project construction phase will require the use of existing and additional access roads. Access roads are mostly passing through forest areas; however there are some olive plantations also located along the route at a distance of 1 km.

The upgrading and widening of access roads prior to construction is expected to be beneficial for local communities as it will lead to improved access to other neighbourhoods. The impact has been assessed as negligible. On the other hand, damages to road surfaces during transport of heavy machinery and impacts on local infrastructure are also possible and this can cause tension among the local road users. Turbine components will not be transported prior to completion of necessary improvements and therefore, this impact has also been assessed as negligible.

Since infrastructure will be secured locally on the Project Site (i.e. water, electricity, sewage) the Project will not place any additional demands on community infrastructure during construction. Additionally, there will be no campsite for workers accommodation. Accommodation is planned to be provided by renting flats in the Cumali and Cinardibi neighbourhoods.

There is also a building (shed/ storage) (40 m^2 according to the users' statement and approximately 30 m^2 according to the GIS analysis conducted by using satellite imagery) within the cherry plantation (land parcel 277/2) near the WTG-12. The building is used by three brothers. One side of the building is made of stone, the other side is made of concrete and it is used only for storage purposes. However, the building will not be displaced due to Project activities.

The Project will not cause any impacts on fixed structures within the Project area. Additionally, there are no public amenities that will be affected by the Project.

13.3.2 Operation Phase

13.3.2.1 Employment and Procurement Opportunities

During the operation phase a small workforce consisting of 14 personnel will be needed. Of these, the aim is to employ 4 unskilled individuals from the local communities, while the remaining 10 will be skilled workforce from the region, to the largest extent possible. This will give long term stability to the full time employees and will have a significant effect on their lives. However, within the local communities and at the national level, the number of individuals with relevant skill is very low therefore the impact is assessed as minor beneficial.

Indirect employment may occur as a result of increased spending by those employed in the facility; however, since this number is limited, impact is also assessed as minor beneficial. The procurement of local goods and services is also likely to be minimal and have a minor effect on local business.

13.3.2.2 Livelihoods

During the operation phase of the Project, losses of crops and some damages may occur during maintenance and transportation works. Losses of crops and damages will be fully compensated by the Project Company, in accordance with national legislation. As the site and the wind turbines will be accessed via the existing access roads and since off-road travel will not be allowed, this impact is expected to be negligible.

As mentioned above, beekeeping activities are being carried out within the region and potential adverse impacts on beekeeping during the operational phase were mentioned by the local people during the site visit. In order to understand the correlation between beekeeping and the wind turbines, desktop studies were carried out and relevant research was examined. Additionally, an interview was held with a bee expert from Ankara University and it is understood that the correlation between bees and wind turbine operations is still needs to be investigate thoroughly.

Additionally, the Project Company will seek to implement community development activities and a Community Development Plan to be prepared by the Project Company will be active during the lifetime of the Project.

13.3.3 Closure Phase

All construction phase social impacts identified in Section 13.3.1, except for impacts on land use due to land requirements of the Project, are also relevant for the closure phase, since closure activities consist of decommissioning and dismantling/uninstalling of existing Project units and rehabilitation activities.

13.4 Mitigation Measures

Mitigation measures for identified potential socio-economic impacts of the Project are provided in this section. Table 13-10 provides identified residual impact significance levels for social impacts that differ for various settlements in the overall impact area. It should be noted that the community health and safety related impacts such as deterioration of air and water quality, noise, visual impacts, etc. are provided in corresponding impact assessment chapters of this ESIA Report.Social impacts, proposed mitigation measures, and residual impacts are further provided in Table 13-11.

Table 13-10. Anticipated Residual Impacts on Vicinity Settlements

Impact Category	Phase	Marmaric	Cinardibi	Dagtekke	Yesilkoy	Cumali	Karaot	Karakizlar	Dernekli	Gokyaka	Ormankoy
Land Use	• Land Preparation and Construction	No impact	Minor	No impact	No impact	No impact	No impact	No impact	No impact	No impact	No impact
Employment and Procurement Opportunities	• Land Preparation and Construction • Operation • Closure	No impact	Minor	Minor	Negligible	Negligible	Minor	Minor	Minor	Minor	Negligible
Livelihoods	• Land Preparation and Construction • Closure	No impact	Minor	Minor	Minor	Negligible	Negligible	Negligible	No impact	Minor	No mpact
Infrastructures	• Land Preparation and Construction • Closure	No impact	Minor	No impact	Minor	Minor	No impact	No impact	No impact	No impact	No impact

13.4.1 Land Preparation Construction Phase

13.4.1.1 Land Use

During the construction phase of the Project, 1 ha of the agricultural land will be needed and the Project Company will seek to minimise the amount of the land occupied during the construction. Certain measures will be implemented in order to mitigate the potential impacts on land use and these measures will include the following:

- Minimise the amount of land occupied during construction
- After the completion of construction activities, fully reinstate all land not permanently occupied.

In order to avoid public access to the lands as a result of increased traffic within the region, the following mitigation measures will be implemented during the construction period:

- Develop and implement a Traffic and Transport Management Plan
- Provide timely information to land users when access to the lands might be more difficult (e.g. during scheduled transportation activities)
- Establish and implement a public grievance mechanism.

13.4.1.2 Local Employment and Procurement Opportunities

The Project will create direct employment opportunities during the construction phase. 20% of the opportunities will be for skilled labour however, considering the work force characteristics of the settlements this impact may not be significant for local communities. The engagement of all non-employee workers will be in line with international best practice and relevant international standards. In terms of employment opportunities, the following measures will be taken into account during construction phase of the Project:

- Local workforce will be used during construction phase to the extent possible.
- Transparent and fair recruitment procedures will be implemented
- Employment opportunities will be advertised through settlement headmen (muhtar) offices and available public buildings (e.g. municipality billboards, settlement coffeehouses)
- The recruitment selection process will seek to promote gender equality where possible
- A Local Employment and Training Management Plan will be developed.

To promote the economic benefits of the Project, the Project Company will procure goods and services locally whenever possible.

13.4.1.3 Livelihoods

Economic displacement of individuals whose lands will be affected as a result of land acquisition process or people whose livelihoods will be affected by construction activities will be mitigated by undertaking the following measures:

- Minimise the amount of land occupied during construction
- Implement the Livelihood Restoration and Compensation Framework (LRCF) Compensate all users of land (including informal users) whose crops or livelihood will be affected at full replacement cost, in accordance with Turkish Laws and IFI's Requirements
- Fully reinstate the land after disruption
- Develop and implement a Stakeholder Engagement Plan and establish a public grievance mechanism.

To prevent any livelihood losses as a result of increased traffic, the following measures will be taken:

- Develop and implement a Traffic and Transport Management Plan
- Provide timely information on transportation schedule to the land owners whose lands are located along the route
- Establish and implement a public grievance mechanism.
- District Governorate of Agriculture will be informed on the location of upcoming transportation activities. When beekeepers apply to the Directorate either for new registration or to get the current season's available locations for their beehives, they will be informed on construction zones, which the Directorate will avoid when providing that season's locations. This will ensure that the beehives will be located at a safe distance from the construction areas and roads, preventing any potential impacts.

13.4.1.4 Infrastructure

During the construction phase of the Project, transportation of equipment may lead to damage of roads and other infrastructure. The following measures will be in place to mitigate relevant impacts:

- Improvement of existing roads for heavy machinery transportation Restoration of roads to at least pre-construction level.
- All damages on infrastructure will be compensated by the Project Company in accordance with Turkish Laws and IFI requirements.

Apart from abovementioned mitigation measures, the Project Company will seek to the extent possible to not use roads during heavy traffic.

13.4.2 Operation Phase

13.4.2.1 Employment and Procurement Opportunities

The contracting of any individuals for the operation of the WPP will follow principles of international best practice and IFI requirements. To foster the creation of indirect employment opportunities, the Project Company will procure goods and services locally whenever possible.

13.4.2.2 Livelihoods

Economic displacement of individuals whose lands and livelihoods will be affected during maintenance works as part of operations will be mitigated by the following measures:

- Minimise the amount of land occupied during maintenance and repair
- Fully reinstate the land after disruption
- Compensate all land users whose crops or livelihood will be affected at full replacement cost, in accordance with Turkish Laws and IFI requirements
- Develop and implement a public grievance mechanism.

To prevent any livelihood losses as a result of increased traffic, the following measures will be taken into account:

- Develop and implement a Traffic and Transport Management Plan
- Provide timely information on transportation schedule to the land owners whose lands are located along the route
- Establish and implement a public grievance mechanism.

13.4.2.3 Infrastructure

Regular maintenance of access roads will be carried out during the operation phase to contribute to improved access to agricultural lands.

Table 13-11. Social Impacts, Proposed Mitigation Measures and Residual Impacts

Impact Description	Project Phase	Receptor	Impact Magnitude						Sensitivity/ Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Magnitude	Reversibility	Duration	Frequency	Overall Magnitude				
Land Use	• Land Preparation and Construction	• Land owners	Local	Low	Irreversible	Long term	One-off	Medium	Medium	Moderate	• Minimise the amount of land occupied during construction • After the completion of construction activities, fully reinstate all land not permanently occupied • Develop and implement a Traffic and Transport Management Plan • Provide timely information to land users when access to the lands might be more difficult (e.g. during scheduled transportation activities) • Establish and implement public grievance mechanism	Minor
Employment and Procurement Opportunities	• Land Preparation and Construction • Operation • Closure	• Local Communities	Local	Low	Short term reversible	Short term	Intermittent	Low	Low	Minor	• To the extent possible, use local workforce during construction phase • Implement transparent and fair recruitment procedures • Advertise employment opportunities through settlement headmen (muhtar) offices and available public buildings (e.g. Municipality billboards, settlement coffeehouses) • Seek to promote gender equality and employment of women where possible during the recruitment selection process	Minor
Livelihoods	• Land Preparation and Construction • Closure	• Land Owners	Local	Low	Short term reversible	Medium term	Intermittent	Medium	Low	Minor	• Minimise the amount of land occupied during construction • Implement the Livelihood Restoration and Compensation Framework (LRCF) • Compensate all users of land whose crops or livelihood will be affected at full replacement cost, in accordance with Turkish Laws and IFI's Requirements • Fully reinstate the land after disruption • Implement the Stakeholder Engagement Plan (SEP) • Develop and implement a Traffic and Transport Management Plan • Provide timely information on transportation schedule to the land owners whose lands are located along the route • Establish and implement a public grievance mechanism	Minor
	• Land Preparation and Construction • Closure	• Livestock owners • Beekeepers	Local	Low	Short term reversible	Medium term	Intermittent	Medium	Low	Minor	• Implement the Livelihood Restoration and Compensation Framework (LRCF) • Compensate all users of land whose crops or livelihood will be affected at full replacement cost, in accordance with Turkish Laws and IFI requirements • Develop and implement a Traffic and Transport Management Plan • District Governorate of Agriculture will be informed on the location of upcoming transportation activities. Thus, beekeepers will be aware with the construction zones. This will help them to avoid to place their hives nearby to the construction zones. • Provide timely information on transportation schedule to the land owners whose lands are located along the route • Establish and implement a public grievance mechanism	Minor
	• Operation	• Local communities	Local	Negligible	Short term reversible	Short to long term	Intermittent	Negligible	Low	Negligible	• Minimise the amount of land occupied during maintenance and repair • Fully reinstate the land after disruption • Compensate all users of land whose crops or livelihood will be affected at full replacement cost, in accordance with Turkish Laws and IFI's Requirements • Implement the public grievance mechanism	Negligible
Infrastructure	• Land Preparation and Construction • Closure	• Local infrastructure	Local	Low	Short term reversible	Short to medium term	Intermittent	Medium	Low	Minor	• Improve roads for heavy machinery transportation (e.g. asphalt coating on specific locations) • Restoration of roads to at least pre-construction level • Compensation of all damages on infrastructure by the Project Company in accordance with Turkish laws and IFI requirements	Negligible
	• Operation	• Local infrastructure	Local	Negligible	Short term reversible	Short to long term	Intermittent	Negligible	Low	Negligible	• Carry out regular maintenance of access roads during operation phase to contribute to improved access to agricultural lands	Negligible

14. Labour and Working Conditions

This Chapter discusses the aspects regarding labour and working conditions and the Project Company's approach to labour management, applicable regulations and standards, the general Occupational Health and Safety (OHS) setting in Turkey and in the wind energy sector, Project-specific OHS risks and impacts and related mitigation.

Main data sources used to compile baseline information, conduct impact assessment and develop related mitigation measures are listed below:

- European Agency for Safety and Health at Work (EU OSHA), Occupational safety and health in the wind energy sector, European Risk Observatory Report (2013)
- IFC, Environmental, Health, and Safety (EHS) Guidelines, General EHS Guidelines: Occupational Health and Safety, Construction and Decommissioning (April 30, 2007)
- IFC, Environmental Health and Safety Guidelines for Wind Energy (August 7, 2015)
- IFC, Environmental Health and Safety Guidelines for Electric Power Transmission and Distribution (April 30, 2007)
- Institut de recherche Robert-Sauvé en santé et ensécurité du travail (IRSST), Wind Energy Sector: Occupational Health and Safety Risks and Accident Prevention Strategies Report (2015)
- International Labour Organisation (ILO) website: www.ilo.org
- Renewable UK, Onshore Wind Health and Safety Guidelines (2015)
- Turkish Social Security Institute (SGK) website: www.sgk.gov.tr

14.1 Project Standards and GIIP

Following the United Nations' Universal Declaration of Human Rights (UDHR) adopted in 1948 by the General Assembly of the United Nations as its main framework for labour management, the Project will fully comply with related national legislation, EU legislation and international standards such as IFI standards and guidance and ILO conventions for management of its workforce (see Chapter 2).

Provision of appropriate standards during the Project phases, where accommodation will be provided (i.e. construction and closure phases for the Project) is a requirement as per EBRD PR 2. Regarding this issue, a standards document, namely "Workers' accommodation: processes and standards" is in place (IFC and EBRD, 2009). This standard, as well as other standards, GIIP and applicable national legislation such as the Turkish Regulation on Water Intended for Human Consumption and Waste Management Regulation, will constitute the Project standards in terms of accommodation and provision of sufficient sanitary and social facilities.

Over the past decade, Turkey has been engaged in a process of reform of its national OSH system, harmonizing it with international and regional standards regarding national, as well as enterprise level requirements for prevention and risk assessment reflected, inter alia, in the ILO Occupational Safety and Health Convention, 1981 (No. 155) ratified by Turkey in 2005. Turkey also ratified the Occupational Health Services Convention, 1985 (No. 161) in 2005 and has been a party to the Labour Inspection Convention, 1945 (No. 81) since 1951. Most recently, in 2014, Turkey ratified the Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187). This reform process has involved a reshaping of the national OSH legislation and has included the adoption of a new stand-alone OSH Act (No. 6331 of 20 June 2012). This Act, which is generally applicable across all sectors, attributes central importance to prevention and risk assessment and is aimed at continuous improvement of national OSH conditions for all workers (*ILO website, www.ilo.org*).A list of ILO conventions ratified by Turkey that are applicable for general management of Project workforce is provided in Chapter 2.

14.2 Baseline

14.2.1 Labour and Working Conditions

As stated above Section 14.1, Turkey is party to a multitude of ILO conventions, including but not limited to conventions on: equal treatment of employees, gender equality, child labour, forced labour, OHS, right of association and minimum wage. Accordingly, the current Turkish Labour Law is in compliance with international labour standards and EBRD PR2 requirements, including aspects such as: child labour, forced labour, non-discrimination and equal opportunity and right to join workers' organisations. However, as is the case with many countries transitioning to international standards, labour related problems, especially on employment rate, women's presence in the workforce, freedom of association, and child labour exist in Turkey. In addition to these, another issue that became prominent in the working life of Turkey is the informal employment of refugees and other foreign seasonal workers, which became a major issue as the official refugee number in Turkey has surpassed 3 million in 2017 (*Ministry of the Interior, 2017*). Therefore, labour management in Turkey is described below, with a focus on these issues.

According to ILO, through the International Programme on the Elimination of Child Labour (IPEC) programs, which consists primarily of field-based programs that support countries through its projects, and assistance, Turkey became one of the initial six countries to undertake direct action against child labour. Since 1992, a total of 101 action programs were implemented, IPEC projects have reached approximately 50,000 children and 60% of these children have been placed in schools, while working conditions have been improved for the remaining 40%. In addition, 25,000 families have received counselling services and assistance (*ILO website, www.ilo.org*).

The Turkish Statistical Institute (TUİK) provides in its 2017 dated Statistics on Child Report[6] that in 2016, the labour force participation rate was 20.8% for children in 15-17 age group. Employment rate was 18% and unemployment rate was 13.5%. In terms of labour force participation rate by sex, participation rate for the boys was 28.6% in 2015, and it declined to 27.8% in 2016. For the girls, this ratio increased to 13.4% in 2016 from 13% in 2015.

The National Time-Bound Policy and Programme (TBPP) developed by the Ministry of Labour and Social Security for years 2017-2023 identifies seasonal agricultural as the primary sector as far as child labour is concerned, where street work and heavy and hazardous work in small and medium sized enterprises are identified as other priority interventions areas in Turkey (*T.R. Ministry of Labour and Social Security, 2017*). Child labour in seasonal agricultural work is still a problem mainly due to lack of capacity to enforce minimum age requirements for work and ensure universal basic education. During peak work periods, children do not maintain regular school attendance and fall behind in their classes and are unable to make up for this when they return to school. For these reasons and as the children who engage in this type of work are very young, this sector was considered a priority. The very nature of seasonal agricultural work exposes families to all types of risks, to which children are the most vulnerable. For economic and social reasons, children of adult seasonal workers usually accompany their parents from place to place. As a result, children alongside their parents and other adults are found in work that is unsuitable for their age, in order to secure the subsistence of their families. Children engage in hard physical labour under working conditions that cannot be considered decent even for adults. They live in temporary settlement areas that mostly lack basic infrastructure and in conditions that are well below minimum standards (*http://www.ilo.org/ankara/projects/WCMS_373426/lang--en/index.htm*).

The latest national Child Labour Force Survey of Turkstat[7] was conducted in 2012. According to the results of this survey, which is also referenced by UNICEF's November 2017 dated child labour statistics[8], 44.7% of the employed children in the age group 6-17 are employed in the agriculture sector, which emerges as the main sector in terms of child labour in Turkey. On the other hand, the children of the Syrian refugees, who have migrated to Turkey mainly with their mothers since 2011, have faced with the risk of child labour. It is likely that the illegal employment of Syrian refugee children has contributed to the increase in child labour in Turkey. According to the 2016 Findings of the Worst Forms of Child Labour Report published by the US Department of Labour; various academic, media, and other reports, continued to suggest growing numbers of child labourers within the increasing Syrian refugee population, including exploitation in the worst forms of child labour. Regarding this issue, the Turkish government expanded education programs to refugee children; however, Syrian refugee children are still engaged in street begging, manufacturing work in various sectors and agriculture sector (*US Department of Labour, 2016*).

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[6] Turkstat, Statistics on Child, 2016; obtained on 22.02.2018 from, http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=24645
[7] Turkstat, Child Labour Force Survey, 2012, obtained on 22.02.2018 from http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=13659
[8] UNICEF, Child Labour Data, obtained on 22.02.2018 from https://data.unicef.org/topic/child-protection/child-labour/

The report on the Child Labour in Seasonal Agricultural, which was prepared by Hayata Destek Dernegi (a non-governmental association) in 2014 based on the results of a field study conducted in 9 provinces in Turkey, has drawn the migration map for seasonal agriculture in Turkey as presented in Figure 14-1. As can be seen, Izmir is one of the stops for the seasonal agricultural workers where they harvest cherries during June and July. Even though the interviews held with the headmen of the affected settlements did not indicate child labour as an issue in the Project vicinity, considering the high potential of the general Project region in terms of agricultural activities (mainly cherry and olive cultivation) and the prominence of seasonal workers, it is likely that a section of the seasonal workers are children. On the other hand, the headmen of the settlements consulted in the scope of the ESIA studies indicated that Syrian refugees working in seasonal agricultural sector is not common in the region where the Project will be implemented.

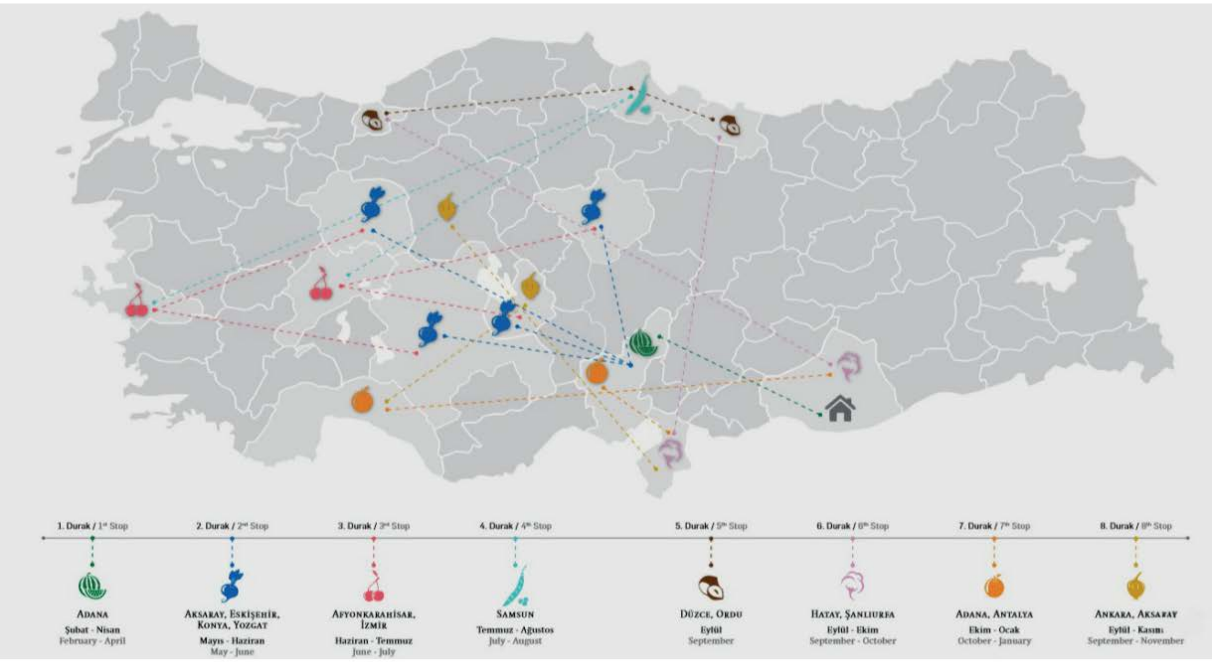


Figure 14-1. Migration Map for Seasonal Agriculture in Turkey

(*Source: Hayata Destek Dernegi, July 2016*)

Regarding child labour, ILO also states that "the trend of migration to major metropolises, together with the disintegration or non-availability of familiar social support network, means the phenomenon of working children is becoming more apparent, particularly, the number of children working in marginal sectors and on the streets in order to help support family income levels" (*ILO website, www.ilo.org*).

Another important issue in working life of Turkey is women's employment rates, which ILO describes as extremely low compared to EU Member States (*ILO website, www.ilo.org)*. According to the modelled estimates of ILO, female participation rate (% of female population ages 15+) in the labour force was 32.37% in 2017 (World Bank Open Data, 2018[9]). As can be seen in Figure 14-2, the participation rate was at its lowest point in 2006 and has been in a steady increase from this year on. However, estimated participation rate decreased slightly in 2017.

[9] World Bank Open Data, Labor Force Participation Statistics, obtained on 22.02.2018 from, https://data.worldbank.org/indicator/SL.TLF.CACT.FE.ZS?locations=TR

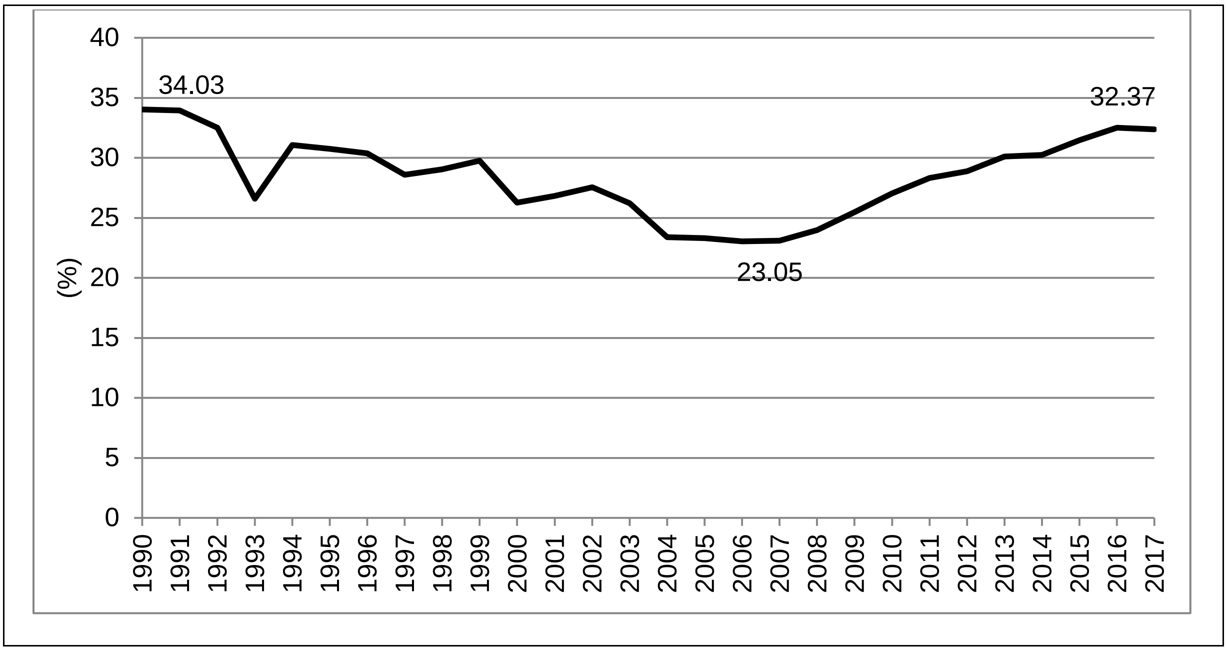


Figure 14-2. Female Participation Rate in Turkish Labour Force

Source: World Bank Open Data, 2018[10]

According to the information obtained from key informant meetings conducted for affected settlements, in terms of gender differences in employment within the affected settlements, majority of female population that are of working age are not participating in the work force and are involved in domestic work; whereas majority of the working age male population are employed in agricultural industries and forestry. The female population participating in the workforce are mainly from Cinardibi and Derekoy neighbourhoods and are mainly working in the agricultural sector, including greenhouse cultivation, olive factories and dairy production. Apart from participation in the agricultural sector, 5 women from Dernekli neighbourhood have also attended the Apiculture Training Program provided by the İzmir Metropolitan Municipality.

Currently, more than 3 million refugees, most of which consist of Syrian refugees, are residing in Turkey. This resulted in illegal employment of refugees with significantly lower wages and no insurance and thus the displacement of Turkish workers, consequently leading to increase in conflict. Turkey has recently implemented a major change in its refugee employment policy and is now issuing work permits for registered Syrian refugees. In addition, ILO Office for Turkey has introduced in 2015 a comprehensive strategy for employment of Syrian refugees and implemented various projects within this scope. The main aims of the strategy are directly quoted below (*ILO website, www.ilo.org*):

- Increase the availability of a skilled, competent and productive labour supply to facilitate access to decent work for Syrian refugees and Turkish host communities;
- Support an enabling environment for business development and economic growth in identified sectors and geographic locations to address job creation and stimulate entrepreneurship opportunities for Syrian refugees and Turkish host communities;
- Provide support to strengthen labour market governance institutions and mechanisms to assist Turkey in implementing inclusive development strategies.

However, a considerable time is required for these measures to become effective and illegal employment of refugees is still an ongoing issue, including exploitation in the worst forms of child labour (Del Carpio and Wagner, 2015; *US Department of Labour, 2016*).

[10] World Bank Open Data, Labor Force Participation Statistics, obtained on 22.02.2018 from, https://data.worldbank.org/indicator/SL.TLF.CACT.FE.ZS?locations=TR

According to the Turkey Migration Report 2016[11] (*Turkish Ministry of the Interior Affairs, General Directorate of Immigration Authority, 2017*), İstanbul, Sanliurfa and Hatay provinces have the highest numbers of registered Syrian refugees with 438,861, 405,511 and 379,141 refugees respectively. Number of registered Syrian refugees in İzmir province is 99,701, which constitutes 2.36% of the total province population.

Although İzmir province has a considerable Syrian refugee population, no Syrian refugees are settled in the Project affected settlements. Similarly, according to the interview held with the headmen of the affected settlements, no Syrian refugees are working on seasonal or permanent jobs in the Project area vicinity. Most of the agricultural land owners prefer to hire people from surrounding settlements such as Turgutlu and Salihli districts in the Manisa Province.

14.2.2 OHS in Wind Energy Sector

OHS statistics in wind energy sector is generally sparse and lacks comprehensive data, the reason for this is generally attributed to the fact that the sector is relatively new with the turbine designs constantly progressing (*IRSST, 2015; EU OSHA, 2013*). However, the number of accidents occurring in the sector showed an increasing trend, especially in the past few years, proportional to the increase in new installations each year (*EU OSHA, 2013*).

Currently, the Caithness Wind Farm Information Forum (CWIF) collects information on turbine related incidents and accidents that occur in the world, mainly through press releases and published official reports (*CWIF website - http://www.caithnesswindfarms.co.uk/index.htm, 2017*). These records are publicly accessible, however the author, as well as EU OSHA and IRRST, point out that the provided OHS statistics constitute a fraction of the real accident numbers. IRSST (*2015*) states that, to their knowledge, no OHS agency in the world keeps OHS statistics specific to wind energy sector and that no scientific publication provided any such data. Therefore, as there is no other detailed OHS statistics database for wind energy sector, including lack of a database or related research in Turkey, and as CWIF is the main organisation cited by EU OSHA (*2013*), CWIF statistics for general OHS in wind energy sector for the world constitute the basis for this section.

For the years 2000-2017 (September 2017 inclusive), the total number of accidents are provided in Figure 14-3, fatal accidents are provided in Figure 14-4 and accidents with injuries are provided in Figure 14-5. According to the data provided, the total number of accidents reported to date (September 2017 inclusive) is 2,159 and the total number of accidents occurred prior to 2000 is only 109. Similarly, the average number of accidents per year is 22, 135 and 164 respectively between the periods 1997-2001, 2002-2006 and 2012-2016, meaning that the ever increasing number of new installations highlighted the OHS problems in the sector, as also suggested by EU OSHA (*2013*). IRSTT (*2015*) states that despite fact that worldwide growth in the number of installed wind turbines is occurring very rapidly, OHS statistics for the sector remain fragmentary and that these statistics are not indicative of the status of OHS in the sector. Therefore, it is unknown if the accident/incident occurrence trend is upwards or downwards, since there is no assessment comparing the annual total installed capacity and the annual accident/incident numbers (or data compiled that can be used to conduct such an assessment).

Other provided statistics are summarised below (*CWIF, 2017*):

- Total number of fatal accidents is 136.
- Total number of accidents that involved injuries is 160.
- Blade failures constituted the main cause of incidents and a total of 370 such incidents were identified. This is followed by 299 fire incidents, 189 structural failure related incidents, 177 transport related incidents and 39 ice throw incidents.

[11] Turkish Ministry of the Interior Affairs, General Directorate of Immıgration Authority, Turkey Migration Report 2016, obtained on 22.02.2018 from http://www.goc.gov.tr/icerik6/2016-turkiye-goc-raporu-yayinlandi_363_377_10625_icerik

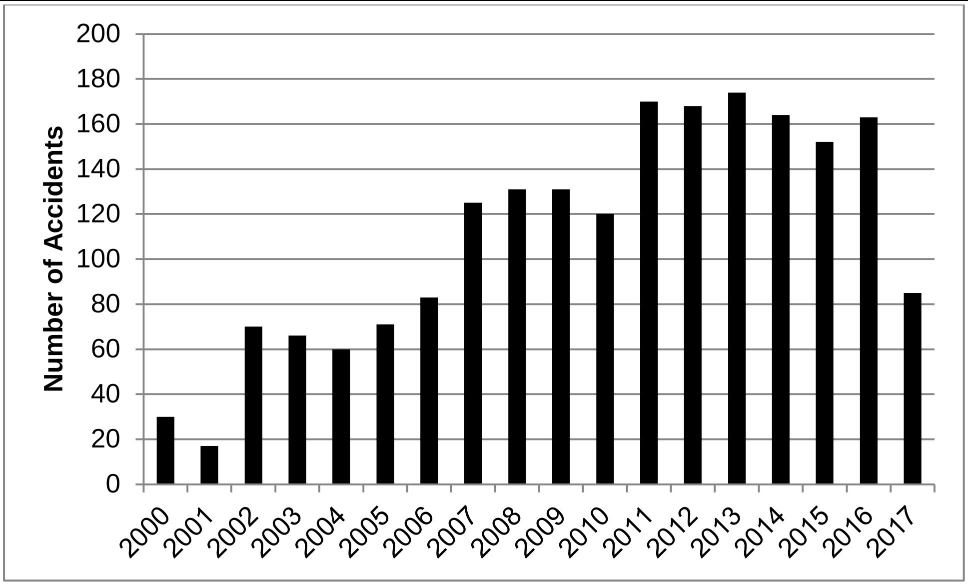


Figure 14-3. Total Number of Accidents in the Global Wind Energy Sector between the Years 2000-2017

Source: CWIF, 2017

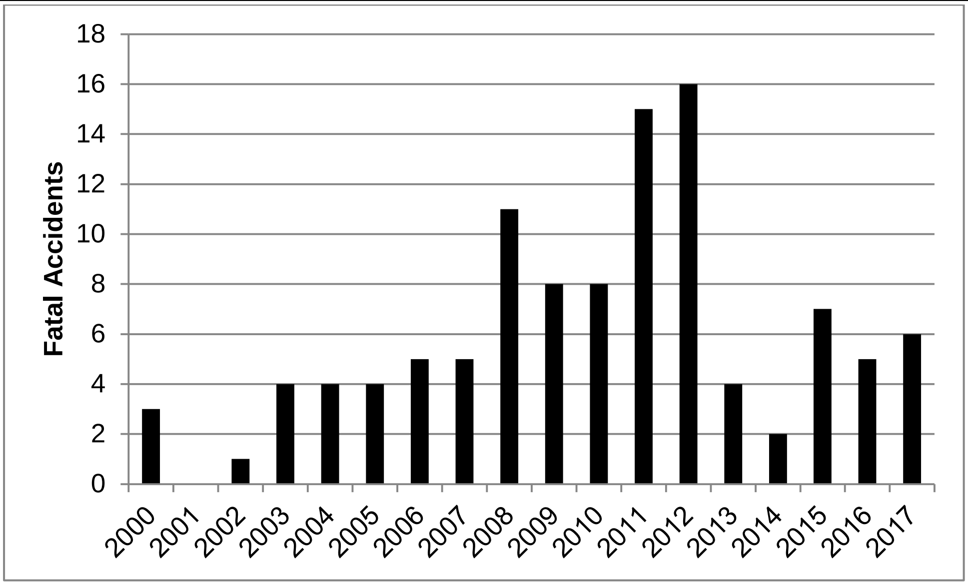


Figure 14-4. Total Number of Fatal Accidents in the Global Wind Energy Sector between the Years 2000-2017

Source: CWIF, 2017

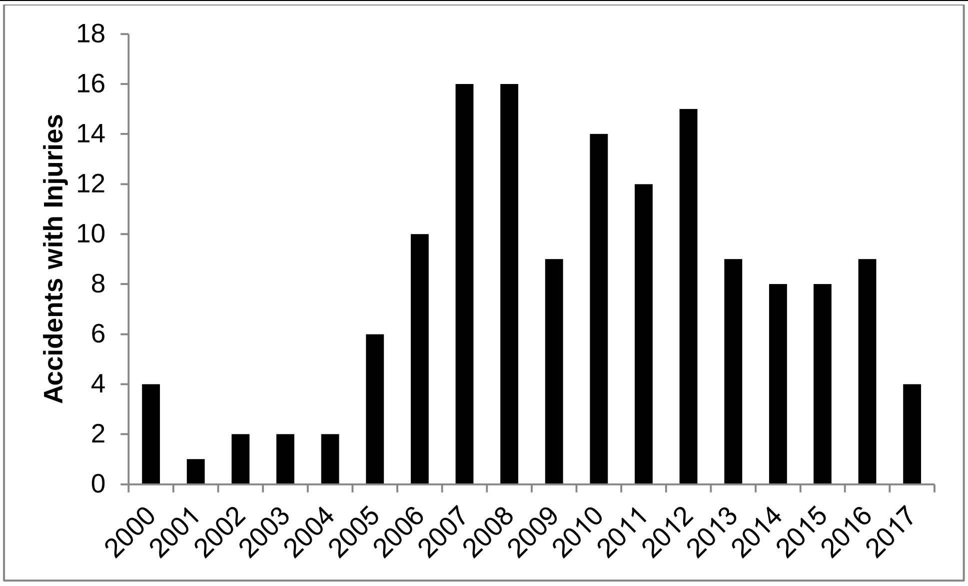


Figure 14-5. Total Number of Accidents that Resulted in Injuries in the Global Wind Energy Sector between the Years 2000-2017

Source: CWIF, 2017

14.2.3 OHS in Turkey

As can be seen in Table 14-1, occupational accident rates in Turley have shown a continuous decline in the last 20 years until 2013 for the total of all sectors. In the year 2013, OHS incidents notification system was revised and the increase in recorded number of accidents may be the result of that change (*ILO Occupational Safety and Health Profile – Turkey, 2016*).

Table 14-1. Occupational Accidents in Turkey (1995-2014)

Year	**Number of workers (x1000)**	**Number of occupational accidents**	**Occupational accident per 100 workers**	**Number of deaths**	**Mortality rate per 100,000***	**Fatality** rate per 1000***
1995	4 411	87 960	1.99	919	20.8	10.4
2000	5 254	74 847	1.42	731	13.9	9.8
2005	6 919	73 923	1.06	1 048	15.1	14.2
2006	7 819	79 027	1.01	1 583	20.2	20.0
2007	8 505	80 602	0.94	1 043	12.3	12.9
2008	8 803	72 963	0.82	865	9.8	11.9
2009	9 030	64 316	0.71	1 171	13.0	18.2
2010	10 031	62 903	0.63	1 444	14.4	23.0
2011	11 031	69 227	0.63	1 700	15.4	24.6
2012	12 527	74 871	0.60	744	5.9	9.9
2013	11 940	191 389	1.60	1 360	11.4	7.1
2014	13 967	221 366	1.58	1 626	11,6	7.3

* Number of deaths divided by number of employees.

Source: Social Security Institution, Statistics Yearbooks; from ILO Occupational Safety and Health Profile -Turkey, 2016

Similar to the case stated in Section 14.2.2, no statistical data specific to the wind energy sector is provided in Turkey by the Turkish Social Security Institute (SGK) or the Turkish Statistical Institute (TÜİK). However, SGK publishes annual OHS statistics, which provides number of incidents occurring in various sectors. The last year these statistics are provided for is 2016. Since the statistics provided between 2013-2016 are based on number of work days lost due to incidents and the former years' statistics are based on number of accidents; the 2008-2012 data and the 2013-2016 data are presented separately here.

It should be noted that, the data provided by SGK is categorised based on NACE codes (rev 2). Since electricity generation, gas generation, steam generation, air conditioning system manufacturing and distribution of these is classified together, the baseline information provided below is also specific to this general category, instead of only to energy generation. Therefore, it is not possible to provide general OHS trends that are based on total generation capacities or total employment in the energy generation sector.

For the "electricity generation, gas generation, steam generation, air conditioning system manufacturing and distribution "sector; a chart showing the total number of incidents occurred between the years 2008-2012 is presented in Figure 14-6, a chart showing the total number of work days with incidents between the years 2013-2015 is presented in Figure 14-7 and a chart showing the number of work days lost (i.e. the total number of days lost due to incidents resulting in "incapacity to work") are presented in Figure 14-8.

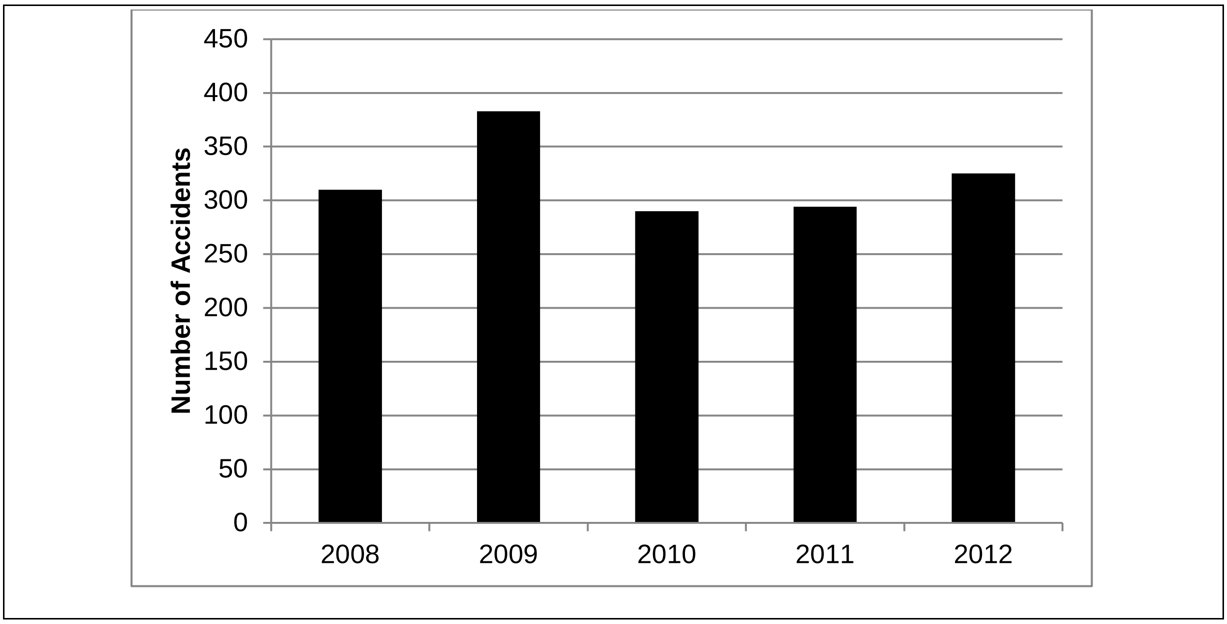


Figure 14-6. Number of Accidents between the years 2008-2012

Source: Social Security Institution, Statistics Yearbooks

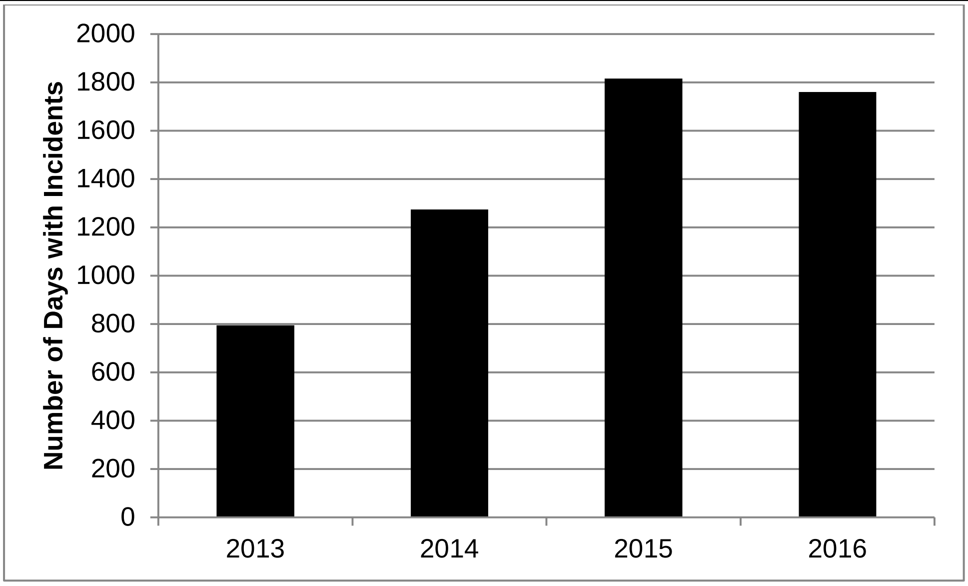


Figure 14-7. Number of Days with Incidents between the Years 2013-2016

Source: Social Security Institution, Statistics Yearbooks

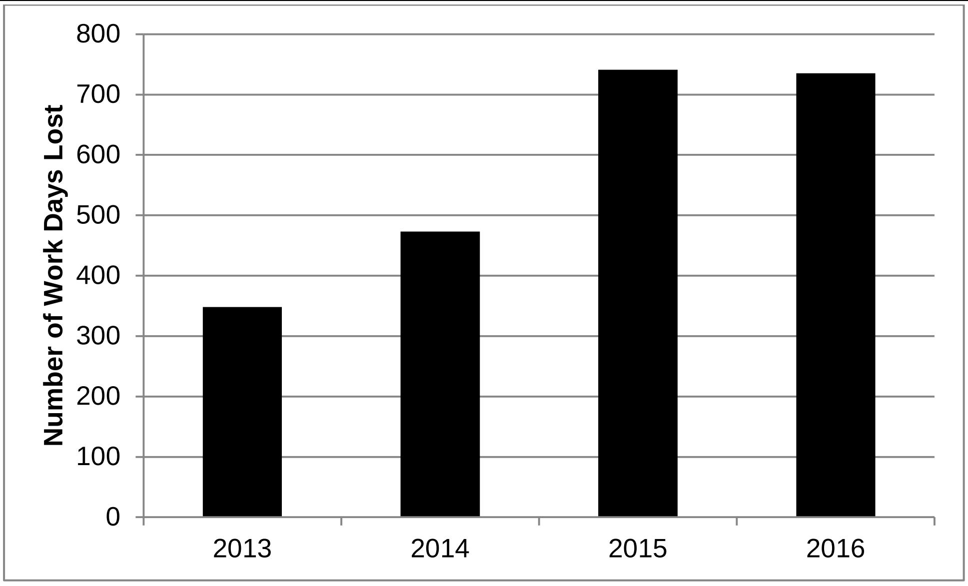


Figure 14-8. Number of Work Days Lost between the Years 2013-2016

Source: Social Security Institution, Statistics Yearbooks

As evident from the figures covering the years 2013-2016 (i.e. beginning with the year when the OHS reporting system in Turkey was changed, which resulted in more comprehensive and better comparable data), the number of incidents and accidents in the sector is in an apparently general and very significant increasing trend. However, it is not possible to attribute this increase just to the increase in number of workers employed in the sector, since rates in terms of total accidents and incidents per 100,000 workers are required to identify the trend in occupational accidents and no such data was published by SGK. Still, with number of work days lost due to injuries or fatal accidents reaching up to more than 700 in 2015 and due to the increasing trend in number of incidents, it is clear that better OHS management in compliance with international labour standards is required generally in the sector.

It should also be noted that these numbers are provided by Social Security Institution and therefore reflect the number of accidents experienced only by insured workers. As per the Labour Law, it is mandatory in Turkey to insure every worker; however, considering the fact that some workers may still be employed without insurance, the actual number of accidents in the sector may be somewhat above the statistics published by SGK.

14.2.4 Existing Labour and OHS Management of AE

AE has in place a corporate level Health and Safety Policy, a corporate level Human Resources policy and a Quality, Environment, Health and Safety (QHSE) Management System with related procedures. Within this scope, AE is planning to obtain OHSAS 18001 Occupational Health and Safety Management System certificate by the end of Q1 2018. In addition to Project specific policies, the Project specific Environmental and Social Management System and related Management Plans and procedures, these corporate level policies and the QHSE System will provide a framework for management of labour issues within the scope of the Project.

In addition, IFC became one of the shareholders of AE in 2015, and therefore, environmental and social management practices implemented for any project AE is involved in are already in compliance with IFC Sustainability Framework (*2015*) and related PSs, including labour management practices.

14.2.5 Project Personnel Requirement and Accommodation

Construction phase personnel requirement is estimated as 150, which is projected to consist of 120 unskilled and 30 skilled personnel. On the other hand, a total of 14 personnel, 10 of which is skilled and the remaining unskilled, is planned to be employed during the operation phase.

According to the information obtained during the site studies and headmen interviews, it was identified that majority of the working age group people in the Project vicinity settlements are employed in the agricultural industries in the region. In addition, forestry is another important sector in the region. These people work as wood cutters and seasonally they travel to different regions for seasonal agricultural work. Within the scope of the Project, skilled and semi-skilled workforce can only be provided from the Cinardibi neighbourhood. Considering the working age group in the settlements, it was identified that most of the people from this group already migrated to the district and province centres such as Torbali, Kemalpasa, Bayindir districts and Izmir and Manisa provinces.

There will be no on-site accommodation within the scope of the Project. However, a Camp Site will be in place during construction phase which will house a canteen, sanitary facilities, social facilities and offices, in addition to serving other requirements such as hazardous material and waste storage areas. On the other hand, the administrative building will also house sanitary facilities and social areas during the operation phase. Therefore, the Project Company will be responsible of providing adequate accommodation in the vicinity districts, as well as services for transport of the workforce to and from the Project area. According to the information provided by the Project Company, accommodation will be provided through following means:

- At nearest hotels or hostels (locations to be determined later at the beginning of land preparation and construction phase), and
- At rental apartments/houses in Cinardibi and Cumali neighbourhoods.

All accommodation to be provided and the above mentioned facilities that are on-site will comply fully with EBRD PR2 and the “Workers’ accommodation: processes and standards” (*IFC and EBRD, 2009*).

14.3 Impact Assessment

This Section details the potential labour and OHS risks and impacts associated with construction, operation and closure phases of a WPP of Mersinli WPP Project's scale. Mitigation measures for the identified impacts on the other hand, are presented in Section 14.4.

Identification of potential impacts and risks is based on related IFC General EHS Guidelines (Occupational Health and Safety, Construction and Decommissioning for general impacts), related IFC sector specific guidelines for wind energy development and energy transmission related impacts and expert knowledge of the sector and WPP developments of this scale.

As the BoP contractor and Vestas (turbine supply) will mainly be responsible of Project implementation activities, the Project Company will ensure their compliance with Project Standards through implementation of a multitude of mechanism, including; the Contactor Management Framework, the Stakeholder Engagement Plan, review of internal grievance records, labour and OHS audits to be conducted by independent experts and review of related periodic reporting to be conducted by the contractors, together with monitoring of follow-up actions identified in cooperation with the contractors or directly by the Project Company. Contractual requirements will be in place to ensure contractors' full compliance with the Project Standards. Within this framework, detailed mitigation for labour and OHS related impacts are provided in Section 14.4.

14.3.1 Land Preparation and Construction Phase

Construction phase OHS risks associated with WPP developments are similar to OHS risks stemming from construction activities of other projects. The identified OHS impacts/risks are provided in Table 14-2 and the potential labour related impacts are provided in Table 14-3.

Table 14-2.Potential OHS Impacts and Risks Identified for Construction Phase

Risk/ Impact	Description
Working at Height (and Falling Objects)	Construction activities that involve working with ladders, scaffolding, partially built structures and cranes constitute risks related to working at height. Considered particularly important for WPP construction activities, related hazards are caused in most cases by lack of protective equipment use, such as full body harnesses, proper barriers and rails. These risks include the following: • Falls from at least 2 meter high work environments into ground, construction equipment, water or other liquids and hazardous substances. • Objects that may fall from height on the individuals working below.
Working in Remote Locations	Although working in remote locations is mainly an issue for offshore WPP developments, need for immediate access to health services can be considered a risk for the Project too, as the Project is located in a generally mountainous area. However, the area is completely accessible by road network and has good connection in terms of communications network.
Lifting Operations	Lifting operations will be conducted during installation of wind turbines, since the components will be transported separately and assembled on-site. The work requires significant planning and involves the use of complex lifting equipment. See "Working at Height (and Falling Objects)" above and "Collisions with Objects and Moving Machinery" below in the table for similar impacts:
Hazards due to Accidents, Incidents (Ergonomic Injuries and Illnesses)	Ergonomic injuries and illnesses include any type of injury and illness that may be caused by manual handling, repetitive motion and over-exertion associated with various work activities, such as musculoskeletal disorders. Ergonomic injuries and illnesses are the most common OHS issue related to construction activities.
Hazards due to Accidents, Incidents (Collisions with Objects and Moving Machinery)	Being struck, trapped and/or entangled by machinery parts or heavy equipment can lead to fatal and nonfatal injuries, especially since heavy equipment operators have limited fields of view of the area close to the equipment they use. For WPP projects, this risk is significant since installation of turbine components require working with heavy equipment, including cranes.
Hazards due to	Generally caused by slips on excavation material debris and/or work equipment left unattended on

Risk/ Impact	Description
Accidents, Incidents (Slips and Falls)	site, as well as due to lack of attention to objects such as cables and ropes on ground, slips and falls are one of the most frequent types of accidents that occur in construction sites.
Hazards due to Accidents, Incidents (Other Physical Hazards)	Other OHS risks the construction personnel are potentially prone to include the following: • Being struck by sprayed materials during use of power tools such as drills • Eye hazards caused by splatter of solid particles and/or liquid substances and fire sparks during welding • Hot work • Working environment temperature (potential heat exhaustion, dehydration, hypothermia and various other health effects) • Excessive exposure to sun (potential dermal problems).
Air Quality	Direct exposure of personnel to dust generated by construction vehicles' movement and improper soil and rock excavation and transportation practices, as well as exposure to other air pollutants generated by working construction equipment and vehicles can result in respiratory problems, which may lead to further illnesses.
Noise and Vibration	Exposure to excessive levels of noise generated by construction equipment and activities may cause OHS problems such as hearing loss; whereas use of vibrating equipment such as ground drillers or hand-held drillers and whole body vibration caused by contact with large vibrating surfaces may potentially cause occupational illnesses such as hand-arm vibration syndrome and other musculoskeletal consequences.
Site Traffic	Since construction vehicle operators and truck drivers have limited fields of view around their equipment, systematic and well laid out traffic management practices are required to ensure safety. This risk is significant for WPP developments, as there will be a constant on site traffic not just due to transport of construction materials and equipment but also due to transport of turbine components, which require very large lorries.
Live Power Lines and Components/ Electrocution	Contact with live power lines components during construction phase is a potential health and safety hazard during testing/commissioning of ETLs and the switchyard, as electrocution from high voltage lines occur.
Diseases	Communicable and vector borne diseases present a heightened risk both for the personnel (since a large number of workers is involved during construction) and for the communities (due to interaction of personnel and the local communities). However, considering the general meteorological conditions of the region, the relatively small number of personnel required for construction of the WPP and especially due to the fact that on-site accommodation will not be provided, this impact is assessed to be negligible.

Table 14-3.Potential Labour Related Impacts and Risks Identified for Construction Phase

Risk/ Impact	Description
Worker's Accommodation	Accommodation conditions are directly related to well-being of personnel in terms of diseases and general morale. These impacts may result from incompliance with related standards (e.g. IFC and EBRD's Workers' accommodation: processes and standards ;2009 and national Regulation on Water Intended for Human Consumption): • Provision of potable and other domestic purpose water that are not in line with related standards or lack of sufficient water to ensure hygiene. • Improper accommodation conditions such as lack of proper heating, separate beds, general hygiene. • Inadequate sanitary facilities. • Inadequate canteen/food facilities. • Inadequate first aid facilities. • Lack of proper insect and rodent control. • Lack of gender based accommodation. • Lack of proper social facilities (including lack of proper communication tools for workers, since a portion of the personnel will be employed will not be locals). Within the scope of the Project, accommodation will not be provided on-site. Both on site facilities such as sanitary facilities and canteen and the accommodation to be provided outside the Project area will ensure compliance with Project standards.
Dismissal of Workers on Fixed Term Contracts at the End of Construction Phase	A relatively high number of personnel will be involved in land preparation and construction activities, including contractors' personnel. These workers will have fixed term contracts (covering the construction phase activities) and in case not managed in compliance with applicable legislation, legal requirements and contractual requirements, their dismissal may constitute problems. It should be noted that the Project will not cause retrenchment of existing personnel, but dismissal of personnel that will directly be employed only for the construction phase for a limited duration. Therefore, the personnel will be aware of their limited employment duration, as per their contracts. The Project Company and the Contractors will ensure that effective and transparent information dissemination mechanisms are in place to inform the personnel on the issue and that dismissal of each personnel is in line with related legislation, EBRD PR2 and their individual contracts (or collective contracts if the case). In addition, a Demobilization Plan will be developed and implemented by the Project Company, which, in conjunction with the SEP and the internal grievance mechanism, will ensure the process is well laid out, transparent mechanisms are in place and workers have sufficient tools to understand the process or to raise their concerns.
Other Labour Issues	The Project will fully comply with requirements of the Turkish Labour law, EBRD PR 2 and IFC PS 2. The Turkish Labour Law is in compliance with principles of international labour standards, most of which is ensured through compliance with ILO Conventions Turkey is party to. Therefore; child labour, forced labour and discrimination (of race and gender) will not be tolerated. Equal opportunity, equal rights to wages and benefits and right to join workers' associations will be ensured as per both national legislation and international standards. All contractors will also be responsible of implementing Project standards for management of their workforce. As per the national Labour Law, which, as stated, is in compliance with international standards through ratified ILO conventions, all personnel are required to provide the employer with necessary identification documents, including documentation that proves they are of working age. Therefore, adherence to national legislation will ensure child labour will be avoided both by the Project Company and all Contractors. In addition, child or forced labour of refugees will also be avoided through adherence to national law, since refugees are now provided with work permits by the State, which ensures that only refugees that are of working age can be employed. The related HR personnel of the Project Company and Contractors will be responsible of ensuring proper

Risk/ Impact	Description
	documentation of age, legal status and health status is presented by all applicants, regardless of the position they are applying for. Since all Contractors are mandatorily required to comply with the Project standards set out by this ESIA, any contractor they will employ or any firm in the supply chain will also be responsible of this action. The Project Company is responsible of monitoring of the contractors' and supply chain firms' related practices, as well as follow-up of any identified actions to be taken by them. Within this regard, the Project Company will procure services from independent/ certified labour auditors to conduct regular labour audits, which will identify any noncompliance with PR2 and national legislation. In addition, supply chain firm evaluation procedures will be in place. Evaluation process will be implemented for any potential new supply chain firm and repeated periodically to ensure compliance with Project Standards is continuous. Nonemployee workers such as contracted workers may be employed within the scope of the Project. These employees, employed by the Project Company or by the Contractors, will have the same rights with employee workers in terms of their legal rights and OHS conditions, as well as equal access to the internal employee grievance mechanism.

14.3.2 Operation Phase

In identification of OHS risks and potential impacts of the Project for the operation phase, the WPP components have been considered. In the operation phase, Turkish Electricity Transmission Company (TEİAŞ) will be responsible of operation and maintenance of the ETL to be used by the Project (i.e. the existing ETL of Fuat WPP), including the access point and additional pylon to be constructed by the Project Company.

The potential OHS impacts/risks and their descriptions are provided below in Table 14-4. It should be noted that fire risk and related impacts are described in Chapter 15 of this ESIA Report.

Table 14-4. OHS Impacts and Risks Identified for Operation Phase

Risk/ Impact[1]	Description
Working at Height (and Falling Objects)	Working at height is an issue especially during the operation phase, since maintenance works of turbines is conducted regularly and frequently. Unfavourable weather conditions such as wind speed, extreme temperatures, humidity and moisture may increase the risk of falling. In addition, any object that may fall from height during works conducted at height presents a significant risk for individuals working below, in the case said individuals are working inside the set exclusion zones.
Working in Remote Locations	Although working in remote locations is mainly an issue for offshore WPP developments, the need for immediate access to health services can be considered as a risk for the Project too, as the Project is located in a generally hilly area. However, the area is completely accessible by road network and has good connection in terms of communications network. As described in detail in Chapter 13, there are a total of 3 state hospitals located in district centres of Bayındır, Kemalpaşa and Torbalı Districts. The Project access road (i.e. the existing access road of Fuat WPP) leads towards NW of the Project area towards Kemalpaşa district. Therefore, the Kemalpaşa State Hospital located approximately 16 km NW of the Project area will be the most likely option for the Project personnel use in case of emergencies and accidents/incidents. In addition to these hospitals, there are 2 community health centres present in Derekoy and Cinardibi neighbourhoods.
Hazardous Materials	Hazardous materials used potentially for daily operation and maintenance of plant components (e.g. turbines and transformers) pose risk to personnel involved in handling of related hazardous materials such as oils and lubricants, paint, hazardous liquid wastes, pesticides, etc.
Live Power Lines and Components	Contact with live power lines and components is the main and potentially the most fatal impact sourced from maintenance and operation activities of switchyards and ETLs, as electrocution from high voltage lines occur. It should be noted that operation and maintenance of the ETL will be under

Risk/ Impact[1]	Description
	the responsibility of the TEİAŞ during the operation phase.
Electric and Magnetic Fields (EMF)	According to the national Electricity Market Grid Regulation, energy transmission is controlled at 50 Hz by the Turkish Electricity Distribution Company (TEİAŞ). For assessment of EMF impacts, IFC's EHS Guidelines – Electric Power and Distribution recommends the International Commission on Non-ionizing Radiation Protection's (ICNIRP) "Guidelines For Limiting Exposure to Time-varying Electric, Magnetic and Electromagnetic Fields". The guideline suggests an upper occupational exposure value of 10 kV/m for 50 Hz (i.e. the hertz value of the Project ETL) and states that the provided value includes a sufficient safety margin to prevent stimulation effects from contact currents under all possible conditions (ICNIRP, 1998). The Electric and Magnetic Fields Associated with the Use of Electric Power prepared by US National Institute of Environmental Health Sciences (2002) provides typical EMF values right under the ETLs (i.e. where the EMF levels are highest) as 1 kV/m for 115 kV ETLs and 2 kV/m for 230 kV ETLs. Therefore the 154 kV Project ETL's EMF level is in the range of 1-2 kV/m and is well below the 10 kV/m limit suggested by ICNIRP (1998). In addition, EMF is also emitted from underground collector network cabling, electrical transformers and turbine generators at wind power plants. According to Australian Government National Health and Medical Research Centre (NHMRC), the EMF generated by underground cables is reduced effectively to zero at the surface. Transformers on the other hand generate the highest EMF levels. It is noted in the study that turbine generators are located 60-100 m above ground and therefore EMF impact at ground level due to turbine generators is also negligible (*Rideout et. al., 2010; from NHMRC, 2015*). The same study also states that magnetic field measurements conducted around wind turbines are resulting around 0.004 µT and acceptable EMF health threshold of 83.3 µT is significantly higher than measured values (*NHRMC, 2015*). In conclusion, the report draws attention to the fact that the level of extremely low-frequency electromagnetic radiation close to wind farms is actually lower than EMF generated by use of common household appliances (e.g. hair dryers, microwave ovens, etc.), and even more lower than the average level measured inside and outside suburban homes. Considering that the Project ETL EMF level is significantly below the suggested limit of 10 kV/m, and the fact that there is no study that suggests EMF is an issue for WPPs, impacts sourced from EMF are considered to be negligible for Mersinli WPP Project.

[1]The potential "blade and ice throw" impact and related mitigation are included under the Community Health and Safety impact assessment, provided in Chapter 15 of this ESIA Report.

In terms of labour management issues (i.e. child labour, forced labour, equal opportunity, wages and benefits, etc.), the Project operation phase potential impacts are the same with the construction phase. Within this regard, the Project will fully comply with requirements of the Turkish Labour law, EBRD PR 2 and IFC PS 2 during the operation phase too.

14.3.3 Closure Phase

All potential OHS risks/impacts identified for the construction phase are also applicable to the closure phase, since closure activities consist of decommissioning and dismantling/uninstalling of existing Project units and rehabilitation activities (i.e. identified construction phase impacts such as ergonomic injuries and illnesses, work at heights, etc. are also valid for closure phase). Therefore, the assessment for construction phase is also valid for closure phase.

14.4 Mitigation Measures

Receptors for identified impacts and their sensitivity values, impact magnitude and impact significance, related mitigation measures and assessment of residual impact significance are provided in Table 14-5. For any impact identified to have varying ranges of magnitude, reversibility, duration or frequency, the worst case was considered for identification of overall magnitude (e.g. impacts such as hazards due to incidents/accidents may result in very minor injuries to accidents resulting in deaths, or dust emissions in air may persist in the area for a long term or may disperse immediately based on meteorological conditions, etc.).

To ensure full compliance with universally accepted and implemented standards, the Project Company will establish an OHS Management System and obtain the related OHSAS 18001 - Occupational Health and Safety Management System certification. The Contractors and Subcontractors will also be responsible of conducting their activities under the principles of the management system applied by the Project Company.

In addition to the specific mitigation measures defined in this ESIA Report, the following plans in relation to OHS Management and the grievance mechanism will be in place during all three phases of the Project:

- Local Employment and Training Management Plan
- Occupational Health and Safety Plan
- Emergency Preparedness and Response Plan
- Traffic and Transport Management Plan
- Construction Camp Management Plan
- Contractor Management Framework Plan (The CMFP will be updated once all contractors have been selected and suitably qualified individuals employed for specific roles)
- Demobilisation Plan
- Stakeholder Engagement Plan

For transparent and constructive engagement with internal stakeholders of the Project, including direct employees of the Project Company, contractors and subcontractors and non-employee workers such as contracted workers, the Project SEP identified the following engagement methods:

- Regular meetings with the staff
- Distribution of staff handbook
- Email updates covering the Project Company personnel
- Posts on information boards
- Leaflets

In addition, the grievance mechanism laid out in the SEP will be in place throughout the Project life and will be accessible to all workers, including non-employee workers. Workers will be informed on the grievance mechanism through information dissemination methods listed above, with a section in the staff handbook focusing just on the grievance mechanism. The grievance procedure is described in detail in the Project SEP.

Table 14-5. Potential Labour Management and OHS Impacts, Proposed Mitigation Measures and Residual Impacts

Impact Description	Phase	Receptor	Impact Magnitude						Sensitivity / Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Magnitude	Reversibility	Duration	Frequency	Overall Magnitude				
OHS/ Risks Associated to General OHS Management	• Land Preparation and Construction • Operation • Closure	• Personnel	Restricted	Low to high	Short term reversible	Short term	Intermittent	High	High	Major	• Implement the OHS Plan. • Implement the Contractor Management Framework Plan. • Develop and implement an Emergency Preparedness and Response Plan. • Develop and Implement a Construction Camp Management Plan. • Develop and implement a Local Employment and Training Management Plan. • Provide general OHS trainings and first aid trainings. • Conduct periodic medical checks. • Conduct regular labour audits to contractors' workforce (by independent labour auditors assigned by the Project Company). • Develop and Implement the Demobilisation Plan. • Obtain OHSAS 18001 certification. • Implement the worker Grievance Mechanism.	Minor
OHS/ Hazards due to Accidents and Incidents (including ergonomic injuries, collision with moving machinery, being struck by heavy equipment, etc.)	• Land Preparation and Construction • Operation • Closure	• Personnel	Restricted	High (potential hazards that may result in major consequences)	Short term reversible to irreversible	Short term	One-off	Medium to High	High	Major	• Ensure use of related PPEs and other protective means such as sun blockers. • Implement limits on manual lifting/handling. • Install guard rails, signs. • Ensure sufficient illumination. • Conduct regular visual checks and maintenance/clean-up of excavation debris and other potential risk sources such as cables and ropes. • Restrict operation of heavy machinery to those that are trained and competent (licensed if required). • Provide regular OHS trainings, • Conduct regular labour audits to contractors' workforce (by independent labour auditors assigned by the Project Company).	Minor
	• Land Preparation and Construction • Operation • Closure	• Personnel	Restricted	Low (potential hazards that may result in minor to moderate consequences)	Short term reversible	Short term	Intermittent	Low	High	Moderate		Negligible
OHS/ Working at Height and Falling Objects (working at heights more than 2 m and objects falling on individuals working below)	• Land Preparation and Construction • Operation • Closure	• Personnel	Restricted	High	Short term reversible to irreversible	Short term	One-off	High	High	Major	• Provide specialised OHS trainings. • As possible to the extent and as considered feasible, assemble structures and carry out other suitable work at ground. • Allow only competent and trained personnel to conduct works at height. • Ensure fall protection systems are in place during works at height (e.g. guard rails, fall arrest equipment, etc.). • Consider additional safety equipment such as safety nets and airbags. • Provide workers with a suitable work-positioning device. • Ensure crane and other hoisting equipment are checked and maintained regularly. • Do not conduct related activities during heavy rain/storm and other poor/extreme weather conditions. • Set and maintain appropriate exclusion zones below any working at height activities to the extent possible (measure for falling objects). • Ensure all tools and equipment are attached by appropriate means to the personnel that is working at height (measure for falling objects). • Use approved tool bags for raising and lowering equipment. • Implement the worker Grievance Mechanism. • Conduct regular labour audits to contractors workforce (by independent	Minor

Impact Description	Phase	Receptor	Impact Magnitude						Sensitivity / Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Magnitude	Reversibility	Duration	Frequency	Overall Magnitude				
											labour auditors assigned by the Project Company).	
OHS/ Working in Remote Locations (difficulty in access to emergency services and communication)	• Land Preparation and Construction • Operation • Closure	• Personnel	Wide	Low	Short term reversible	Short term	One-off	Low	High	Moderate	• Ensure communications equipment are available for all personnel and maintained properly. • Keep a suitable patient transport vehicle on site.	Negligible
OHS/ Lifting Operations (risks associated with lifting objects to heights)	• Land Preparation and Construction • Closure	• Personnel	Restricted	High	Short term reversible to irreversible	Short term	One-off	High	High	Major	• Ensure personnel that conduct lifting operations receive special training and are competent. • Ensure all parties involved in the lifting operations hold a meeting prior to activities, to ensure the operation is well planned, risks discussed and communication methods provided. • Ensure all required information regarding the load is known (e.g. attachment points and weight). • Ensure lifting equipment is properly maintained and right for the material to be lifted (e.g. sufficient capacity to support the weight). • Set and maintain appropriate exclusion zones below any working at height activities (measure for falling objects). • Ensure weather condition limits set by the lifting equipment manufacturer are not exceeded; check prior to each lifting operation. • Implement the worker grievance mechanism. • Conduct regular labour audits to contractors' workforce (by independent labour auditors assigned by the Project Company).	Minor
OHS/ Air Quality (PM_{10} and exhaust gas emissions)	• Land Preparation and Construction • Closure	• Personnel	Restricted	Low	Short term reversible	Short to medium term	Intermittent	Low	High	Moderate	• Implement dust suppression techniques identified in Chapter 8 of this Report.	Negligible
OHS/ Noise and Vibration (noise and vibration caused by construction activities)	• Land Preparation and Construction • Operation • Closure	• Personnel	Restricted	Low	Short term reversible	Short to medium term	Intermittent	Low	High	Moderate	• Ensure use of related PPEs as required. • Consider changing equipment or implementing time limits in case of a grievance regarding vibration.	Negligible
OHS/ Site Traffic (traffic management related risks)	• Land Preparation and Construction • Closure	• Personnel	Local	Low to high	Short term reversible to irreversible	Short to medium term	Intermittent	Medium	High	Major	• Implement the Traffic and Transport Management Plan. • Restrict operation of heavy vehicles to those that are trained and competent (licensed if required). • Provide traffic trainings for all personnel and provide specialised trainings to personnel that will operate industrial vehicles. • Include traffic issues in the scope of the trainings that site visitors will receive and limit site visitors' mobility on construction sites. • Install and maintain signage and other traffic regulating means. • Set speed limits and implement right of way practices. • Conduct periodic vehicle maintenance.	Minor
OHS/ Live Power Lines and Components/ Electrocution (risks posed by contact with live power lines and electrical equipment)	• Land Preparation and Construction • Operation • Closure	• Personnel	Restricted	Medium to high	Short term reversible to irreversible	Short term	One-off	Medium	High	Major	• Ensure live power lines and components are shut down prior to conducting work. • Allow only trained and authorised personnel to conduct electrical works. • Ensure related PPEs are used. • Prohibit other workers from reaching the areas where live power lines or components exist and provide training to the ones that require to work in close proximity.	Negligible
OHS/ Diseases (potential	• Land Preparation	• Personnel	Local	Negligible/	Short term	Short term	Intermittent	Negligible	High	Minor	• Conduct periodic medical checks for personnel and provide vaccination	Negligible

Impact Description	Phase	Receptor	Impact Magnitude						Sensitivity / Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Magnitude	Reversibility	Duration	Frequency	Overall Magnitude				
increase in prevalence of communicable and vector borne diseases)	and Construction • Closure			None	reversible						and/or other mitigating measures when required. • Implement appropriate waste management practices and the Waste Management Plan. • Keep a suitable patient transport vehicle on site. • Conduct awareness raising activities on communicable diseases.	
OHS/ Hazardous Materials (risks associated with contact with hazardous materials)	• Operation	• Personnel	Restricted	Low	Short to medium term reversible	Short term	One off	Low	High	Moderate	• Ensure use of PPEs.	Negligible
OHS/ Electric and Magnetic Fields (risks associated with EMF emitted from high voltage equipment, including the Project ETL)	• Operation	• Personnel		Negligible/ None	-	-	-	No Impact	High	No impact	• Implement the workers grievance mechanism. • Conduct additional assessments in case multiple worker grievances are received.	No impact
Labour/ Worker's Accommodation (impacts related to inappropriate conditions that may result in illnesses and psychological impacts)	• Land Preparation and Construction • Closure	• Personnel	Restricted	Low	Short term reversible	Short term	One-off	Low	High	Moderate	• Ensure compliance with Workers' accommodation: processes and standards (IFC and EBRD, 2009) for on-site facilities (canteen, sanitary facilities). • Survey accommodation facilities to be provided off-site and ensure they are in compliance with Workers' accommodation: processes and standards (IFC and EBRD, 2009). • Ensure potable water and domestic purpose water to be supplied on site meet the requirements of the Turkish Regulation on Water Intended for Human Consumption. • Provide trainings to personnel on general waste management, housekeeping and first aid. • Conduct visual checks on site to ensure proper housekeeping. • Ensure proper first aid equipment is kept on site, at various related locations. • Implement the Grievance Mechanism. • Implement the Waste Management Plan.	Negligible
Labour/ Dismissal of workers on fixed term contracts at the end of construction phase	• Land Preparation and Construction • Closure	• Personnel	Restricted	Medium	Long term reversible/ Irreversible	Short term	One-off	Medium	Medium	Moderate	• Ensure a demobilisation plan is prepared and implemented. • Ensure construction and closure phase personnel's dismissal is conducted in compliance with all applicable legal requirements and EBRD PR 2. • Ensure contractual requirements are fulfilled during the process. • Ensure the personnel are aware of the process and dates (through appropriate and transparent information dissemination). • To the extent possible, ensure personnel that may also be employed during the operation phase (e.g. security personnel) are not included in the scope of retrenchment at the end of construction phase.	Minor

15. Community Health and Safety

This chapter details the identification and assessment of potential community health and safety risks and impacts of the Project. The following main sources were used to compile the baseline, identify the impacts and provide mitigation for identified impacts, in addition to GIIP approaches, expert knowledge of the sector and a review of the impacts caused by or expected to occur due to activities of similar projects:

- Social Field Survey (October 2017).
- General Directorate of Highways, Traffic Volume Maps (2016).
- IFC, Environmental, Health, and Safety (EHS) Guidelines, General EHS Guidelines: Community Health and Safety (April 30, 2007).
- IFC, Environmental Health and Safety Guidelines for Wind Energy (August 7, 2015).
- IFC, Environmental Health and Safety Guidelines for Electric Power Transmission and Distribution (April 30, 2007).

It should be noted that air emissions during construction and closure phases and noise, visual impact, natural hazards other than lightning and forest fires (i.e. earthquakes, rockfall events, avalanches, flooding and meteorological hazards) and water quality during construction, operation and closure phases are also identified as potential impact categories affective on community health and safety. All applicable legislation and standards, baseline conditions, impact assessment and mitigation measures for these impacts are assessed in respective chapters of this ESIA. Nevertheless, applicable standards and brief descriptions of these impacts are also provided below.

15.1 Project Standards and GIIP

Standards and limit values defined by various organisations and GIIP for community health and safety related aspects of the Project are described in this section. In addition to standards described below, the Project will fully comply with related national legislation, EU legislation and international standards such as IFI standards and guidance (see Chapter 2) for any identified community health and safety subject.

There is no national legislation regulating the management of shadow flicker and related impacts. Similarly, EBRD does not provide or recommend a shadow flicker impact methodology and/or exposure limits in terms of shadow flicker hours or days. However, in its “Eligibility Criteria for Wind Power Projects” procedure, provided as part of the Environmental and Social Risk Management Manual (E-Manual)[12], an eligibility criteria is listed as “generally wind turbines should be over 700 m from the nearest residential area”. Since the closest residential units in the vicinity are all located more than 700 m to respective turbines, the main applicable shadow flicker standard for the Project is identified as the IFC/World Bank limits, which states that the predicted duration of shadow flicker effects experienced at a sensitive receptor shall not exceed 30 hours per year and 30 minutes per day on the worst affected day, based on a worst-case scenario. The Project will comply with the both IFC/World Bank and EBRD standards (*IFC, 2015*).

According to the 2920 numbered Civil Aviation Law, “to construct buildings and structures that will prevent air traffic, aviation security, and telecommunication and endanger the navigation and air field security around the airports and related facility or equipment” is not allowed. Furthermore, in accordance with the Regulation on Construction, Operation and Certification of Airports published in the Official Gazette No. 24755 dated May 14th of 2002; the Ministry of Transport and Communication is authorized to remove buildings and structures that will endanger the aviation safety. Moreover, Ministry of Transport and Communication could ask for visible signs and radio and electrical signs on the defined obstacles and areas. In addition, International Standards and Recommended Practices, Annex 14 - Aerodrome Design and Operations (7th Edition) published by the International Civil Aviation Organization (ICAO) provides marking and lighting standards/methods for wind turbines and overhead cables (*ICAO, 2016*).

[12] *EBRD Environmental and Social Risk Management Manual (E-Manual), E&S Risk Management Procedures obtained on 22.02.2018 from the EBRD website; http://www.ebrd.com/cs/Satellite?c=Content&cid=1395246423851&d=Mobile&pagename=EBRD%2FContent%2FHublet*

The Turkish Regulation on Assessment and Management of Air Quality published on June 6th of 2008 in Official Gazette No 26898 and Industrial Air Pollution Control Regulation published on July 3rd of 2009 in Official Gazette No 27277 provide the national standards for air quality. Ambient air quality limit values for various pollutants defined in Turkish regulations are presented in Table 15-1, which are for 2024 and further years.

Table 15-1. Turkish Ambient Air Quality Values

Parameter	Duration	Limit Value* ($\mu g/m^3$)
SO_2	Hourly (cannot be exceeded more than 24 times a year)	350
	24 hour	125
	Long term limit	60
	Annual and winter season (October 1 - March 31)	20
NO_2	Hourly (cannot be exceeded more than 18 times a year)	200
	Annual	40
Particulate Matter (PM 10)	24 hour (cannot be exceeded more than 35 times a year)	50
	Annual	40
CO	8 hour daily maximum	10.000
O_3	8 hour daily maximum	120
VOC**	Hourly	280
	24-hour	70

* *Regulation on Assessment and Management of Air Quality*
*** Industrial Air Pollution Control Regulation*

On the other hand, the limit values recommended by the World Health Organization (WHO) Ambient Air Quality Guidelines are the applicable international standard for the Project and these limits are provided in Table 15-2.

Table 15-2. WHO Ambient Air Quality Guidelines

Parameter	Duration	($\mu g/m^3$)*
SO_2	10 minute	500
	24 hour	20
NO_2	Hourly	200
	Annual	40
Particulate Matter (PM_{10})	24 hour	50
	Annual	20
Particulate Matter ($PM_{2,5}$)	24 hour	25
	Annual	10
O_3	8 hour daily maximum	100

**IFC, Environmental, Health and Safety Guidelines, General EHS Guidelines: Environmental, Air Emissions and Ambient Air Quality*

As described in detail in Section 7.1 of this ESIA, there are a multitude of national and international noise limits applicable for different phases of the Project. The noise limits set by these standards and the stricter ones selected as Project standards are given in Table 15-3.

Table 15-3. Noise Standards for Residential Receptors

Time of the Day*	Noise Limits for Residential			Project Standards at Residential Areas	
	IFC EHS Guidelines*	Turkish RAMEN		Construction Period	Operation Period
		Construction	Operation		
Daytime	55 dBA	70 dBA	65 dBA	70 dBA	45 dBA (for La_{eq}) 43 dBA (for La_{90})
Evening	-	-	60 dBA	-	
Nighttime	45 dBA	-	55 dBA	45 dBA	

**IFC EHS Guidelines define the daytime as 07:00-22:00 and night-time as 22:00-07:00. Turkish RAMEN defines the daytime as 07:00-19:00, evening as 19:00-23:00 and night-time as 23:00-07:00. It should be also noted that the night-time absolute lower limit of 45 dBA is also based on World Health Organisation guidelines for the protection of sleep indoors with windows open.*

***Noise impacts should not exceed the levels presented in or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site.*

15.2 Baseline Conditions

15.2.1 Existing Transport Network

For Mersinli WPP Project, turbine components will be transported from three separate locations, which, if not managed appropriately, may result in health and safety risks for the communities on the transport route and other road users, as well as some potential impacts on road infrastructure due to the fact that turbine components are very large. Road survey studies were conducted by Borusan Lojistik to identify the most safe, suitable and efficient routes. For the selected three routes, following potential issues were identified by the transport surveys:

- On the transport route for hubs and nacelles, two pedestrian bridges in İzmir city were identified to have the lowest height on the entire route and these points will be included in the detailed road analysis.
- On the transport route for towers, the height of road sign located at Menemen-Manisa junction and the height of road sign located at Manisa-Turgutlu junction were identified to be the lowest on the entire route and these points will be included in the detailed road analysis.
- All three surveys state that very cautious and slow driving is required at the entry point to the Fuat WPP access road.

The road network to be used is presented in Figure 15-1 and the routes are described below:

- Hubs and nacelles will be manufactured abroad and shipped to Aliağa Batı Seaport. From the port, the trailer trucks will use the Aliağa-Menemen road, Menemen-İzmir road, Anadolu Avenue and Ankara Avenue in İzmir and İzmir-Kemalpaşa road (i.e. extension of Ankara Avenue) until a junction where they will turn south to smaller roads. The smaller state roads and village roads to be used from this point on are Taşlıyol Road, Torbalı Avenue and Kemalpaşa-Dağkızılca Road. On this road, a junction will be used to enter the existing Fuat WPP Access Road, which connects to the Mersinli WPP Project area. Existing traffic conditions of these roads are presented in Table 15-4. It should be noted that since the General Directorate of Highways (KGM) does not provide statistics on municipality related roads and smaller roads, Anadolu Avenue in İzmir, and all of the smaller state roads and village roads to be utilized from the junction on İzmir-Kemalpaşa road are not included in Table 15-4.
- Blades will be manufactured at a plant in Menemen and will be transported to the site via the same road network that will be used for transport of hubs and nacelles, except the Aliağa-Menemen road section that connects the Aliağa Batı Port to Menemen.

- Towers will be manufactured at a plant located on the İzmir-Çanakkale Road, Zeytindağ locality. The İzmir-Çanakkale Road will be used towards south to reach Yenişakran. From this point, a network of smaller roads will be used to reach a junction located west of Manisa, on the Manisa Menemen Road. The Manisa Menemen Road will be followed towards east and at north of Manisa, the vehicles will enter the Manisa Ring Road and follow this road towards east to reach the Manisa Turgutlu Road. This road eventually connects to İzmir-Kemalpaşa road (i.e. extension of Ankara Avenue). From here, the vehicles will go towards west, until the junction where the vehicles will transit through the smaller state roads, the village roads and Fuat WPP's existing access roads to reach the Project Area. Existing traffic conditions of these roads are presented in Table 15-5. As stated, KGM does not provide statistics on municipality related roads and smaller roads. Therefore, conditions for municipality related roads and smaller roads are not included in Table 15-5. These roads include the small road network between Yenişakran and Manisa-Menemen Road and all of the smaller state roads and village roads to be utilized starting from the junction on İzmir-Kemalpaşa road (i.e. the final smaller road network to reach the Project Area).

Table 15-4. Transport Route for Hubs, Nacelles and Blades (KGM, 2016)

Road Section	State Road Code	Busses	Trucks	Trailer Trucks	Total/ Heavy	Total/ Heavy and Light
Aliağa to Menemen	550-09[1]	515	3126	2956	6597	32047
	550-09[1]	577	3555	4760	8892	34371
	550-09[1]	589	3518	4211	8318	37717
Menemen to İzmir	550-09[2]	558	4808	3109	8475	49132
İzmir to Kemalpaşa	300-02[2]	383	6441	3713	10537	80410
	300-02[2]	688	5731	3187	9606	49130
	300-02[2]	604	4175	2396	7175	29650

[1] To be used only for transport of Hubs and Nacelles

[2] To be used for transport of Hubs, Nacelles and Blades

Source: General Directorate of State Highways, 2016

Table 15-5. Transport Route for Towers

Road Section	State Road Code	Busses	Trucks	Trailer Trucks	Total/ Heavy	Total/ Heavy and Light
Zeytindağ to Yenişakran	550-09	356	1346	1101	2803	13511
Osmancalı junction on 250-03 to Manisa	250-03	57	1896	1819	3772	17175
Manisa to Turgutlu	250-04	681	2520	2689	5890	21084
	250-04	103	1859	2347	4309	13209
Turgutlu to Kemalpaşa	300-02	729	3970	3327	8026	25562

Source: General Directorate of State Highways, 2016

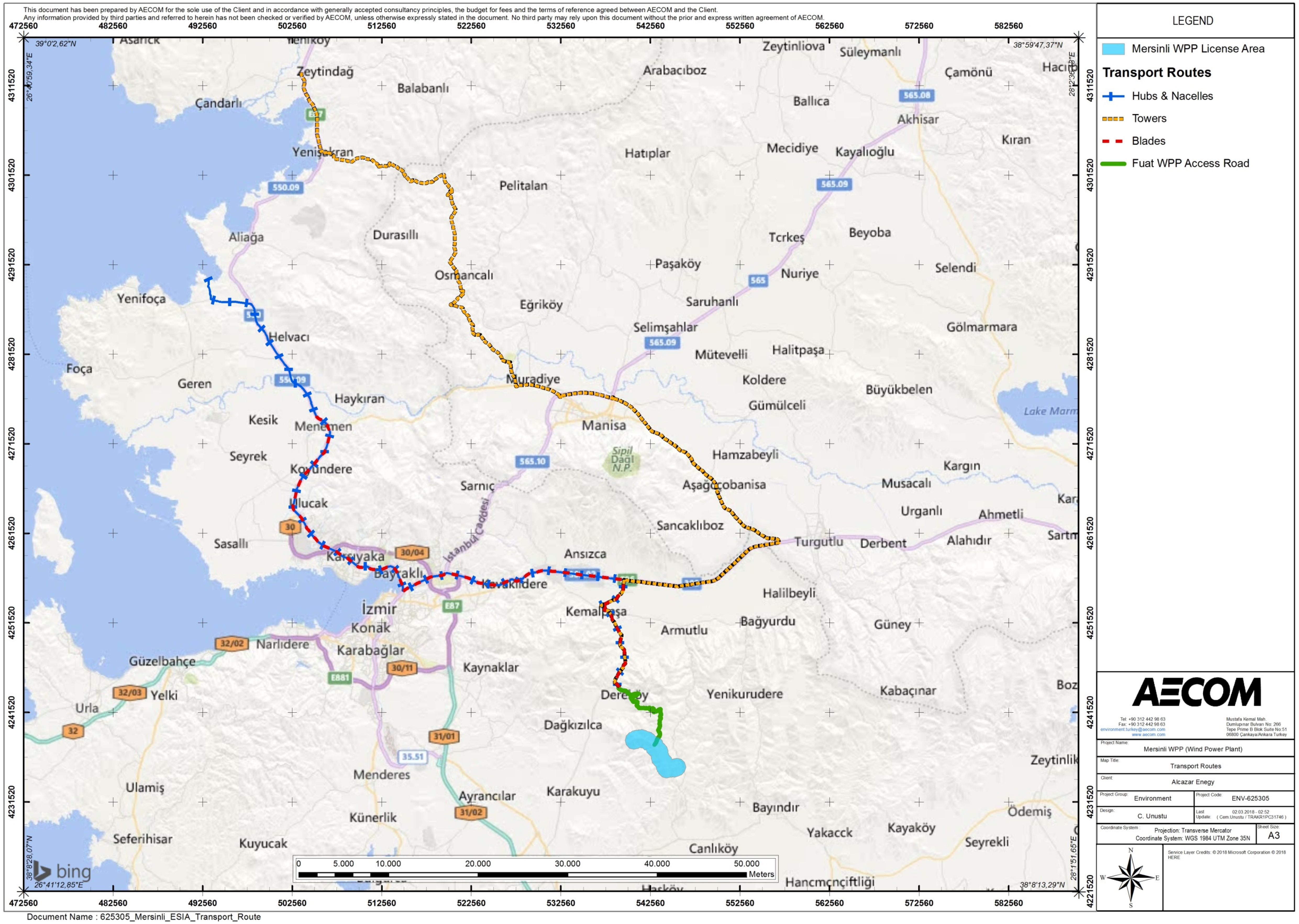


Figure 15-1. Turbine Component Transport Routes

15.2.2 Forest Fires

According to the information regarding forest fires that occurred between the years 2005-2010 in Aegean region of Turkey (Kurt, 2014), the main cause of the forest fires was observed to be due to human-induced activities such as smoking, stubble fires, sabotage and other firing incidents, which collectively caused over 65% of forest fires. Similarly, human related forest fires also constitute the majority of reasons according to data presented in Table 15-6, provided by General Directorate of Forestry.

Figure 15-2 shows the spatial distribution of forest fires during the studied years. Given the relatively intense vegetation in Aegean region, where the Project Area is located, the number of the forest fire incidents was therefore identified to be relatively high, compared to the inner parts of the country.

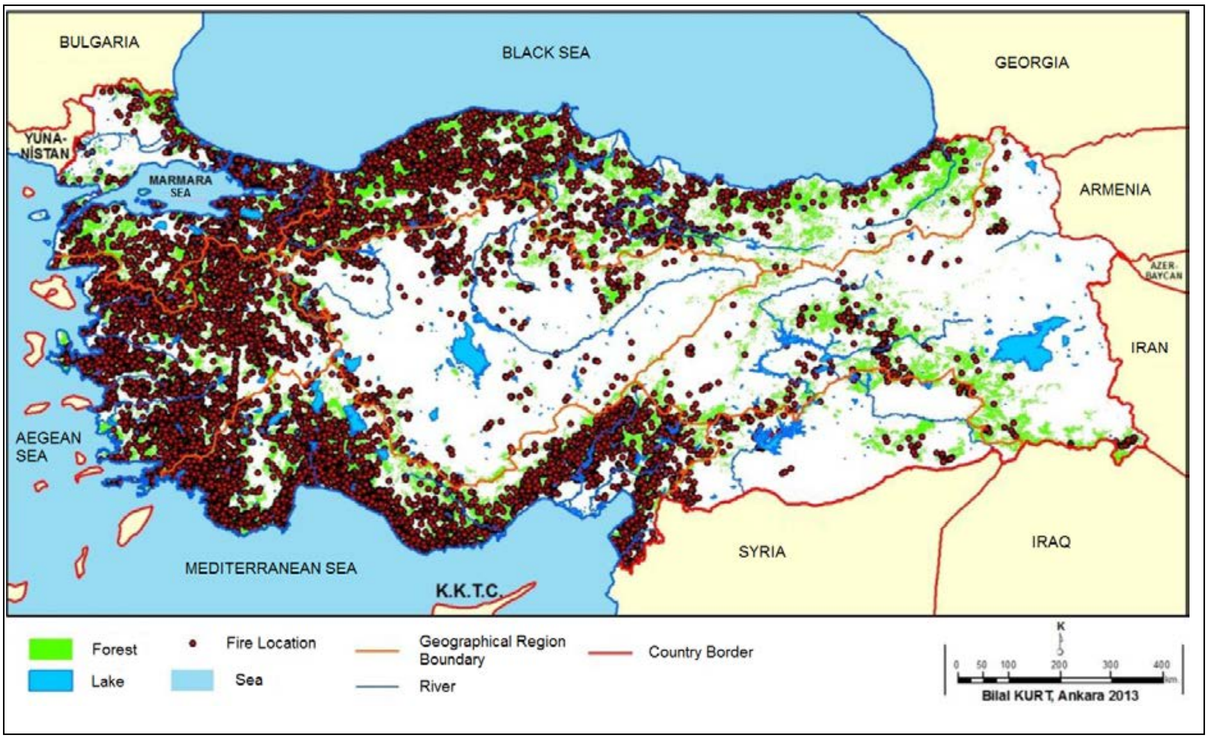


Figure 15-2. Distribution of Forest Fires in Turkey between the Years 2005 – 2010

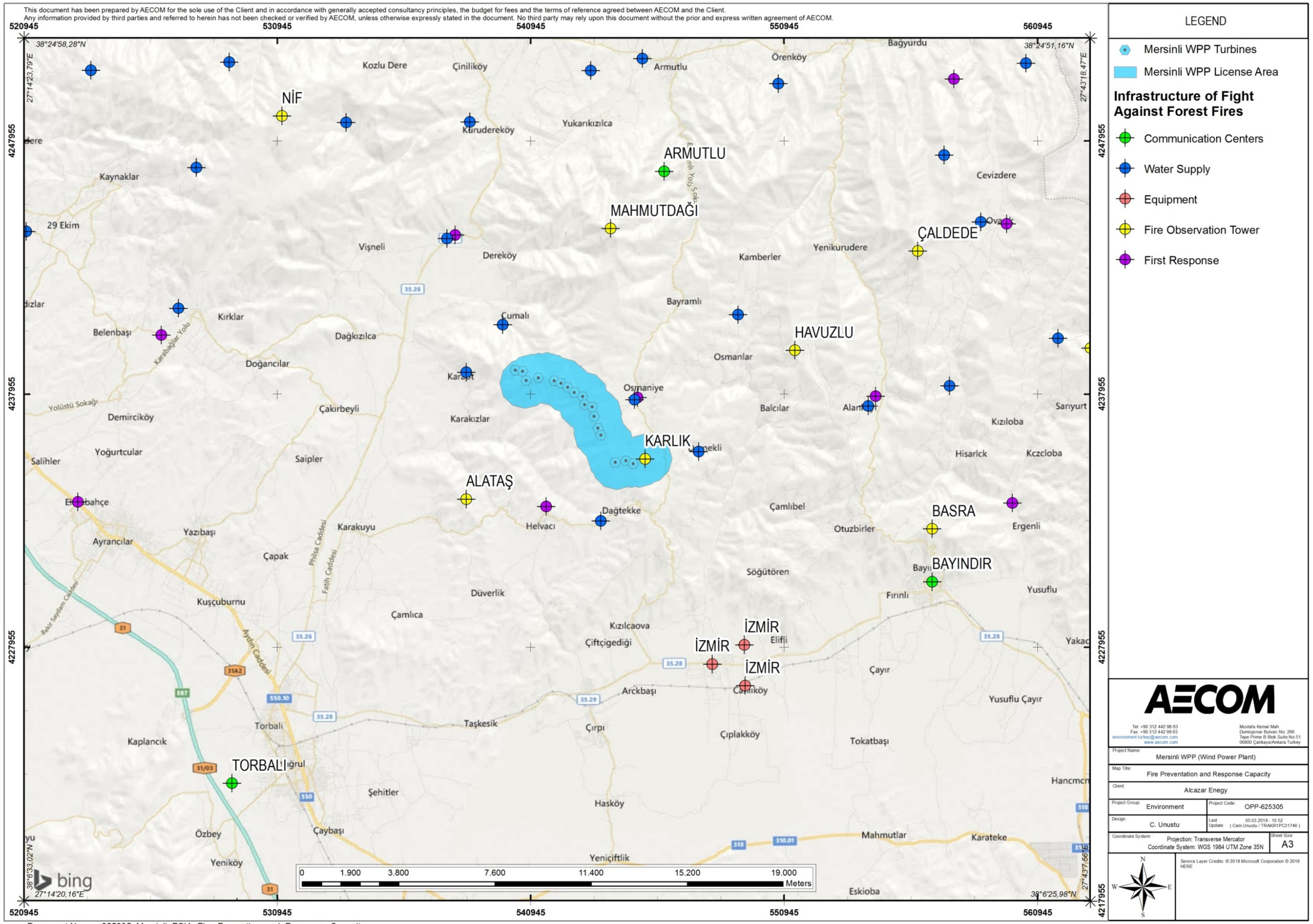
Source: Kurt, 2014

A map of fire observation towers, first response teams, water supply points, firefighting equipment, and communication centres is provided in Figure 15-3. As can be seen from this map, fire prevention and response capacity in the vicinity of the Project area is highly developed, with one fire observation tower located just 400 m east of Turbine-17, two first response teams located within 4 km and five water supply points located within 2 to 4 km distance to the closest point of the Project license area. In addition, the Bayındır and Kemalpaşa Fire Fighting Stations are located at approximate distances of 12 and 15 km respectively.

Table 15-6. Number of Forest Fires in İzmir Regional Directorate of Forestry Jurisdiction Area

Year	Negligence							Intentional				Accident			Unknown	Natural (Lightning)	Total
	Stubble fire	Dump	Hunting	Shepherd fire	Cigarette	Picnic	Other	Terror	Arson	Expanding	Other	Energy	Traffic	Other			
2016	27	8	-	21	81	6	165	-	20	-	16	5	-	6	2	20	377
2015	33	11	-	22	60	12	79	-	7	-	8	3	1	1	6	22	265
2014	49	10	-	21	73	5	73	-	5	-	8	4	1	4	8	23	284
2013	134	6	1	30	71	11	29	-	1	-	18	14	-	7	8	14	344

Source: General Directorate of Forestry website, https://www.ogm.gov.tr



Document Name : 625305_Mersinli_ESIA_Fire_Prevention_and_Response_Capacity

Figure 15-3. Fire Prevention and Response Capacity in the Project Vicinity

Source: Geodata application, http://geodata.ormansu.gov.tr/

15.2.3 Lightning Potential

Typically, more than 2,000 thunderstorms are active throughout the world at a given moment, producing on the order of 100 flashes per second (*NASA Global Hydrology Resource Center website, https://lightning.nsstc.nasa.gov/data/*). The average lightning discharge releases approximately 55 kWh in only 100 to 300 microseconds. The Regional map of annual lightning strike frequency is given in Figure 15-4 below. As can be seen, Turkey is generally in the range of 4 to 10 strikes per km^2 annually.

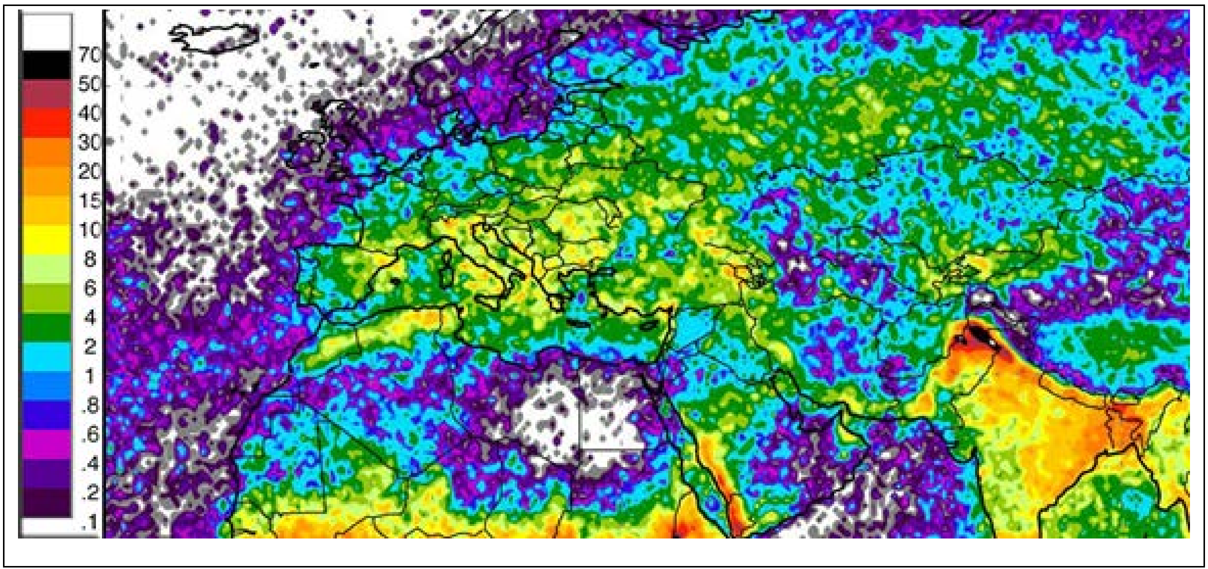


Figure 15-4. Regional map of annual lightning strike (average annual number of lightning flashes per km^2)

Source: NASA Global Hydrology Resource Center website, https://lightning.nsstc.nasa.gov/data/

Wind turbines are structures that are taller than any other natural or man-made structure around them and therefore, lightning may start a fire by striking them. As wind turbine increase in size they attract more lightning. However, modern turbines are equipped with lightning protection systems that transmit the lightning to the ground properly through the arrester and the earthing system and therefore, the effect of lightning does not change with size. Consequentially, since WTGs attract lightning more than their surroundings and that they use appropriate earthing systems, well maintained WPPs actually decrease the forest fire risk around them. However, damage by lightning to the turbines is still a possibility. According to statistics, up to 8% of modern European wind turbines are damaged annually by lightning (*Djalel, et. al.; 2014*). However, Cotton et. al. (2010) state that potential damage due to lightning is increasing in Europe due to the fact that the sector is moving towards off-shore installations. It is also stated that majority of the faults are caused in the control device, the generator and on the blades. (For the issue, IFC recommends ensuring that lightning protection systems are properly installed and maintained.

15.2.4 Aviation

The closest airport to the Project area is İzmir Adnan Menderes Airport, which is at a distance of approximately 27 km west of the Project area. İzmir Adnan Menderes Airport (IATA: ADB, ICAO: LTBJ) is an international airport. In addition, Izmir Gaziemir Air Base, a military air base, is located adjacent to ADB.

Detailed assessment of potential aviation interaction with the Project, based on aviation charts and radars, is provided below in Section 15.3.2.5.

15.2.5 Existing Electromagnetic Infrastructure

An initial review of telecommunication infrastructure and related uses located in the general area of the Project identified the following:

- Radio communication systems,
- Television broadcasting using transmission towers and repeater stations,
- Mobile phone services provided by a range of operators and
- Aircraft navigation systems and radio towers.

Following this initial review, the below listed infrastructure was identified in the Project vicinity through a more detailed study, including a site visit:

- Two GSM communication towers - approximately 400m E/NE of turbine 17 (see Figure 15-5);
- Two airport radars; one civil and one military - approximately 27 km W of the Project area and
- One meteorology radar - approximately 30 km W of the Project area.

Figure 15-5. Identified GSM Communication Towers

15.3 Impact Assessment

This section details the identified community health and safety risks and impacts associated with all phases of the Project. Mitigation measures for the identified impacts on the other hand, are presented in Section 15.4.

Impact identification process is based on related topics provided in EBRD PR 4, IFC PS 4, Related IFC General EHS Guidelines (Community Health and Safety and Construction and Decommissioning) related IFC sector specific guidelines (Wind Energy and Electric Power Transmission and Distribution), expert knowledge of the sector and WPP developments of the Project's scale.

Project related impacts on air quality, noise, water resources and visual amenity, which have the potential to affect communities, are assessed separately in respective chapters of this report, together with related mitigation measures. These impacts are summarized below in Table 15-7.

Table 15-7. Potential Community Health and Safety Impacts Assessed in Other Chapters of the ESIA

Impact	Project Phase	Impact Description
Noise	Land Preparation and Construction, Closure	Local communities may experience noise impacts as a result of operation of construction machinery and equipment. Impact significance for noise prior to implementation of mitigation measures is identified to be minor; while the residual impact significance is also assessed to be minor. See Chapter 7 for details.
	Operation	Operating wind turbines generate noise varying with wind speed, which may affect local communities. Impact significance for noise prior to implementation of mitigation measures is identified to be minor; whereas the residual impact significance is also assessed to be minor. See Chapter 7 for details.
Air Quality	Land Preparation and Construction, Closure	Land preparation, construction and closure activities, including transport activities, will result in PM_{10} and exhaust emissions, which may potentially impact community health, beekeeping and agricultural productivity. Considering a no mitigation case, impact significance for these has been assessed to range from moderate to negligible, based on various receptors. With mitigation in place, impacts significances reduced either to minor or to negligible. See Chapter 8 for details.
Water Resources	Land Preparation and Construction, Operation and Closure	Project activities may have potential impacts on water quality due to transport of uncontrolled sediments and improper management of wastes and hazardous materials. All related impacts are identified to have minor significance prior to mitigation and are considered to be negligible with proposed mitigation in place. See Chapter 9 for details.
Visual Impacts	Land Preparation and Construction, Closure	Land preparation, construction and closure activities consisting of cooperation of construction machinery and temporary construction compounds are assessed to have major visual impact on local communities prior to mitigation. With proposed mitigation, the impact significance is assessed to be reduced to minor. See Chapter 12 for details.
	Operation	The main visual impact of operation phase activities will be operation of turbines. This impact was assessed separately for each identified receptor (i.e. residents of various settlements, users of various roads and visitors of the 1st degree cultural heritage site located in the vicinity. In case of no mitigation, identified impact significance levels ranged from major to minor; whereas with mitigation in place the impact significance ranged from moderate to negligible. See Chapter 12 for details.

•

15.3.1 Land Preparation and Construction Phase

15.3.1.1 Abnormal Load Transportation and Traffic Load

As described in Section 15.2.1, turbine components such as hubs, blades and towers are required to be transported from 3 separate locations from İzmir province. As these components are very large and heavy, transportation presents unique risks for all of the communities located on the transport routes, other users of the roads and the local communities. In addition, damage to existing road infrastructure may also occur during transportation, especially in the case where a project's transport survey is not conducted or implemented appropriately.

As stated in Section 15.2.1, the existing Fuat WPP's access road will be utilized to reach the site. This WPP was installed by the same contractor, Vestas. Therefore, in addition to its experience coming from being one of the top manufacturers and installers of WPPs, the contractor is also experienced in terms of the Project area. In addition, other trucks will be utilized for transport of construction materials. In lack of proper traffic management and trainings, these also present a risk for local communities and users of the transport routes, especially in terms of accidents as the drivers have limited fields of view around these large vehicles.

The impact of turbine component transport requirements of the Project on the traffic conditions of the 3 separate transport routes are summarized in Table 15-8 and Table 15-9. Although some slight differences are in place for the time periods for transport of components, it is assumed that to reflect the highest potential impact that all component transport will be conducted in the same time frame. As can be seen from these tables, the Project's contribution to heavy vehicle traffic in the utilized roads varies between 0.04% and 0.21% and therefore, the Project's impact on traffic load is considered to be negligible.

Table 15-8. Increase in Traffic Volume of Hubs, Nacelles and Blades' Transport Routes

Road Section	State Road Code	Daily Total/ Heavy Vehicles (Baseline)	Daily Number of Heavy Vehicles Movements due to the Project[3]	Increase in Heavy Vehicle Total (%)
Aliağa to Menemen[1]	550-09[1]	6597	4	0.06
	550-09[1]	8892	4	0.04
	550-09[1]	8318	4	0.05
Menemen to İzmir[2]	550-09[2]	8475	10	0.12
İzmir to Kemalpaşa[2]	300-02[2]	10537	10	0.09
	300-02[2]	9606	10	0.10
	300-02[2]	7175	10	0.14

[1] To be used only for transport of Hubs and Nacelles

[2] To be used for transport of Hubs, Nacelles and Blades

[3] Provided numbers include roundtrip

Table 15-9. Increase in Traffic Volume of Towers' Transport Route

Road Section	State Road Code	Daily Total/ Heavy Vehicles – Baseline	Daily Number of Heavy Vehicles due to the Project[1]	Increase in Heavy Vehicle Total (%)
Zeytindağ to Yenişakran	550-09	2803	6	0.21
Osmancalı junction on 250-03 to Manisa	250-03	3772	6	0.16
Manisa to Turgutlu	250-04	5890	6	0.10
	250-04	4309	6	0.14
Turgutlu to Kemalpaşa	300-02	8026	6	0.07

[1] Provided numbers include roundtrip

15.3.1.2 Exposure to Diseases

The workforce will be recruited from the local communities to a large extent; therefore worker influx to the area is expected to be negligible during construction phase. However communicable and vector borne diseases may still present a risk for the communities due to their interaction with the workforce from other regions. Considering the measures, (i.e. local employment targets and code of conduct measures) the impact is considered to be of negligible significance and temporary, as the worker influx is small and limited only to the construction phase since operation phase personnel requirement for Mersinli WPP Project is very limited. It should be noted that the issue is also related to OHS, as assessed in Chapter 14 of this report.

15.3.1.3 Emergency Preparedness and Response

Potential emergency situations that may arise during construction phase of the Project include various subjects such as fires and natural hazards. In case these emergencies are not responded to appropriately within the context of an Emergency Preparedness and Response Plan, they may have consequences that reach outside of the Project area, with potential impacts on local communities.

15.3.1.4 Public Access

Local communities use the Project area and its vicinity for access and for grazing activities. Since large vehicles and equipment such as cranes will be used during construction and due ongoing increased vehicle movement in the construction areas, there will be heightened risk of incidents/ accidents for any person that may use the area for access or for other purposes. This impact is assessed to have moderate significance without any mitigation in place. However, since access of unauthorized persons to construction areas will be completely restricted, the impact significance is reduced to negligible.

15.3.1.5 Security Personnel

Relations of the Project security personnel and the local communities present risks in terms of social conduct and conflict since the security personnel have a certain degree of authority. Although the private security staff that will be recruited for the Project will not be armed, it is necessary to ensure that the security personnel are not involved in past abuses and are trained in terms of applicable law, appropriate conduct, gender sensitivity and cultural sensitivities of the region. The private security staff will also receive training on conflict management and basic human rights. The impact is considered to be of long term duration, since security personnel will be employed during all phases of the Project.

15.3.2 Operation Phase

15.3.2.1 Shadow Flicker

Wind turbines, like all other tall structures will cast a shadow on the neighbouring area when the sun is visible. The major difference between a tall structure and a wind turbine regarding their shadow casting potential is the rotating blades of the wind turbine. When the sun is behind a turbine, shadows repeatedly pass over the same points as the rotor blades rotate, causing an effect termed as shadow flicker. This phenomenon is regarded as an environmental impact and can create a disturbance/nuisance if the wind power plant is not situated and/or planned accordingly.

The UK Department of Energy and Climate Change (*2011*), commissioned an independent research study into the phenomenon of shadow flicker from wind turbines. The study identified that;

- The frequency of the flickering caused by the wind turbine rotation is such that it should not cause a significant risk to health;
- In the few cases where problems have arisen, they have been resolved effectively using mitigation measures, in particular turbine shut down systems.

In addition, a multitude of studies were conducted to identify potential risk of seizures in people with photosensitive epilepsy, which is considered to be the main health issue associated with shadow flicker (*Knopper et. al., 2014*). These studies suggested that "flicker from turbines that interrupt or reflect sunlight at frequencies more than 3 Hz pose a potential risk of inducing photosensitive seizures in 1.7 people per 100,000 of the photosensitive population. For turbines with three blades, this translates to a maximum speed of rotation of 60 rpm. Modern turbines commonly spin at rates well below this threshold."

Similarly, the Public Statement regarding "Wind Turbines and Health" issued by the Australian Government National Health and Medical Research Council (*NHMRC, 2010*) also states that "the evidence on shadow flicker does not support a health concern".

However, depending on its frequency, shadow flicker can be a significant source of nuisance for people living in close proximity to wind turbines. Regarding the issue, Knopper et. al. (*2014*) states in their review article that there has been little research conducted into how shadow flicker can heighten the annoyance factor. Therefore, shadow flicker modelling has been conducted for the Project to ensure the existing layout does not constitute a source of shadow flicker for the communities residing in the vicinity.

Similar to noise, the distance to a specific turbine is the major factor whilst assessing the shadow at a receptor location. Using WindPRO software, a modelling study was performed in order to estimate the shadow casting areas and to create a shadow model for each of the wind turbines. Regarding the maximum distance for influence of shadow flickering, various experiments have showed that the shadow impact is irrelevant at the areas which are ten times rotor diameter distance away from the wind turbine (*NHMRC, 2015*). Although the influence distance is 1,200 m according to this assumption, to be on the safe site, the distance of 2,000 m is taken as the maximum distance of influence for shadow flickering.

The Shadow Receptors, which are also determined as nearest sensitive receptors (NSR), are located at dwellings, as given in Table 15-10 below. The map showing locations of the identified shadow receptors are given in Figure 15-6.

Table 15-10. Shadow Receptor Coordinates

Name	X	Y	Z
Çınardibi	545245	4238213	694m
Dağtekke	544531	4233581	530m
NSR 1	544185	4237249	723m
NSR 2	544625	4237261	705m
NSR 4 (Marmariç)	546125	4234682	647m

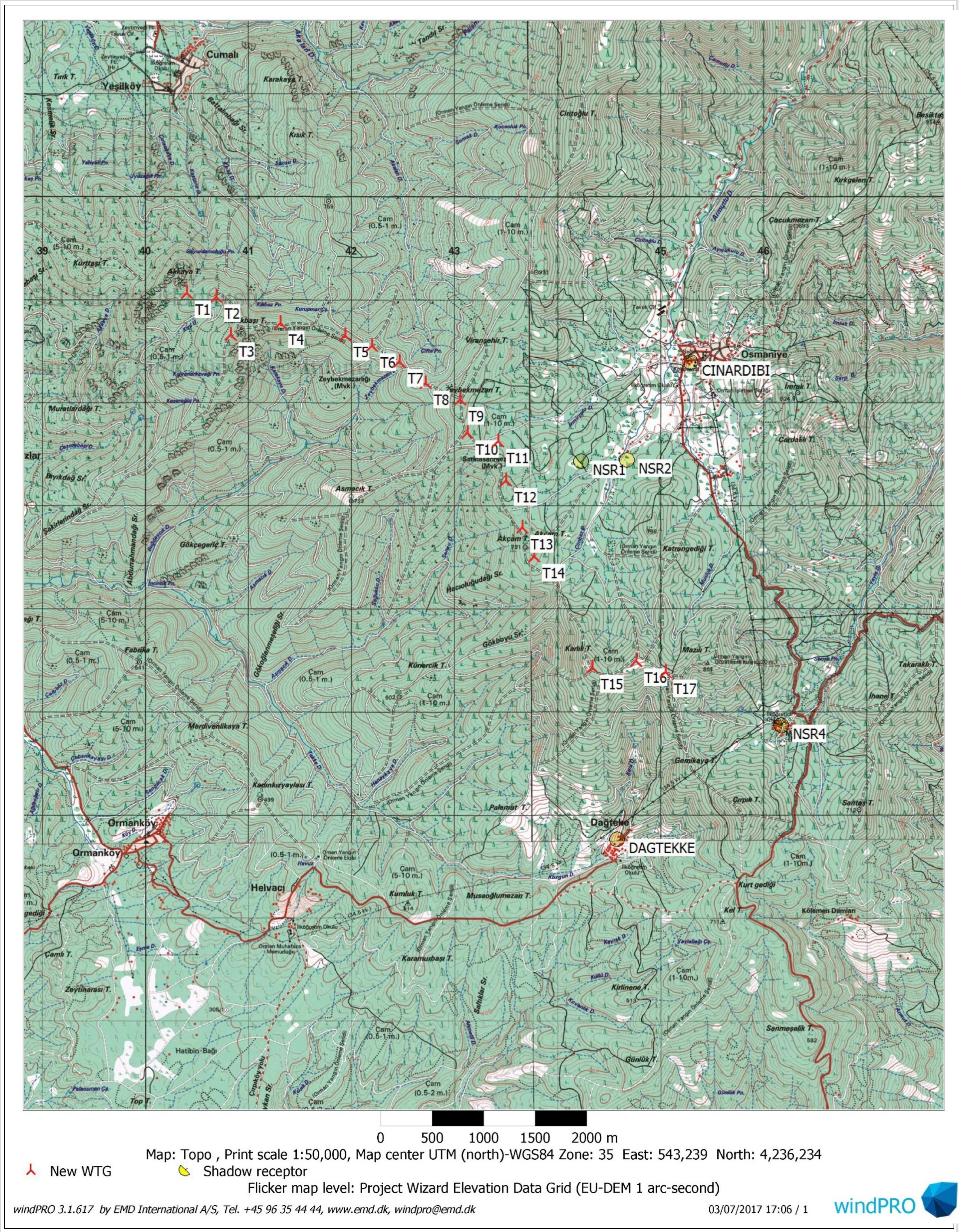


Figure 15-6. Shadow Receptors

Model Inputs

To run the shadow module of WindPRO software requires terrain data, monthly sun shine probabilities, annual operational times of turbines for each of 12 wind sectors, maximum distance of influence and minimum sun height over horizon for influence. Terrain data used in the model is 10 m contour data which provides accurate elevation values for both turbines and shadow receptors.

The shadow flickering was modelled for each minute of a day throughout a year, based on a worst case scenario and a realistic scenario. Model assumptions and inputs for the two scenarios are described below.

IFC's Environmental Health and Safety Guidelines for Wind Energy (2015) states that "If it is not possible to locate the wind energy facility/turbines such that neighbouring receptors experience no shadow flicker effects, it is recommended that the predicted duration of shadow flicker effects experienced at a sensitive receptor not exceed 30 hours per year and 30 minutes per day on the worst affected day, based on a worst-case scenario". Therefore, shadow flicker was modelled and predicted based on an astronomical worst-case scenario, which is also defined by the Guideline as follows:

- There is continual sunshine and permanently cloudless skies from sunrise to sunset.
- There is sufficient wind for continually rotating turbine blades.
- Rotor is perpendicular to the incident direction of the sunlight.
- Sun angles less than 3 degrees above the horizon level are disregarded (due to likelihood for vegetation and building screening).
- Distances between the rotor plane and the tower axis are negligible.
- Light refraction in the atmosphere is not considered.

The realistic scenario on the other hand, was defined as follows:

- Monthly sun shine probability values are acquired from long term meteorology data of İzmir Meteorological Station. Monthly sun shine probability values as average daily sun shine hours are provided in Table 15-11.
- Annual operational times of turbines for each of 12 wind sectors are obtained from data from MAST tower situated in the Project site. Annual operational times for each of the 12 wind sectors are provided in Table 15-12.
- Sun angles less than 3 degrees above the horizon level are disregarded (due to likelihood for vegetation and building screening).
- Distances between the rotor plane and the tower axis are negligible.
- Light refraction in the atmosphere is not considered.

Table 15-11. Average Daily Sunshine Hours

Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
4.2	5.1	6.2	7.5	9.5	11.4	12.2	11.6	10.1	7.3	5.3	4.1

Source: İzmir Meteorology Station Long Term Statistics

Table 15-12. Annual Operation Times for 12 Wind Sectors

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW
218	4061	570	243	369	619	793	854	643	197	81	112

In addition to the worst case and realistic case assumptions listed above, the predictions were based on each dwelling accepted as a "glass house" when modelling.

Model Results for Worst Case Scenario

For the worst case, the summary of the modelling results are provided in Table 15-13, the ranges in the year where shadow flicker impact will occur are plotted in the charts given in Figure 15-7 and the map showing the shadow contours (hour/year) is given in Figure 15-8.

2 receptors are expected to experience shadow flicker effect for durations above IFC recommended limits, based on the worst case scenario results. The shadow flicker will be effective for 55.56 hours/year and 44:39 hours/year (i.e. will be 25.56 hrs and 14.39 hrs above IFC recommendations) for NSR-1 and NSR-2 receptors respectively. In terms of maximum shadow hours experienced per day, only NSR-1 is above the 30 minute limit recommended by IFC, whereas NSR-2 is below the limit. On the other hand, Çınardibi and Dağtekke receptors will not be affected, whereas for NSR 4 (Marmariç) the Project’s annual impact will only be effective for 7 minutes.

Table 15-13. Shadow Flicker Modelling Results based on Worst Case

Receptor	Worst Case Shadow Hours (per year)	Shadow days (per year)	Maximum Shadow Hours (per day)	Effective Turbine
Cınardibi	0:00	0	0:00	-
Dağtekke	0:00	0	0:00	-
NSR 1	55:56	118	0:38	T11, T12
NSR 2	44:39	146	0:26	T10, T11, T12, T13
NSR 4 (Marmariç)	1:13	13	0:07	T12

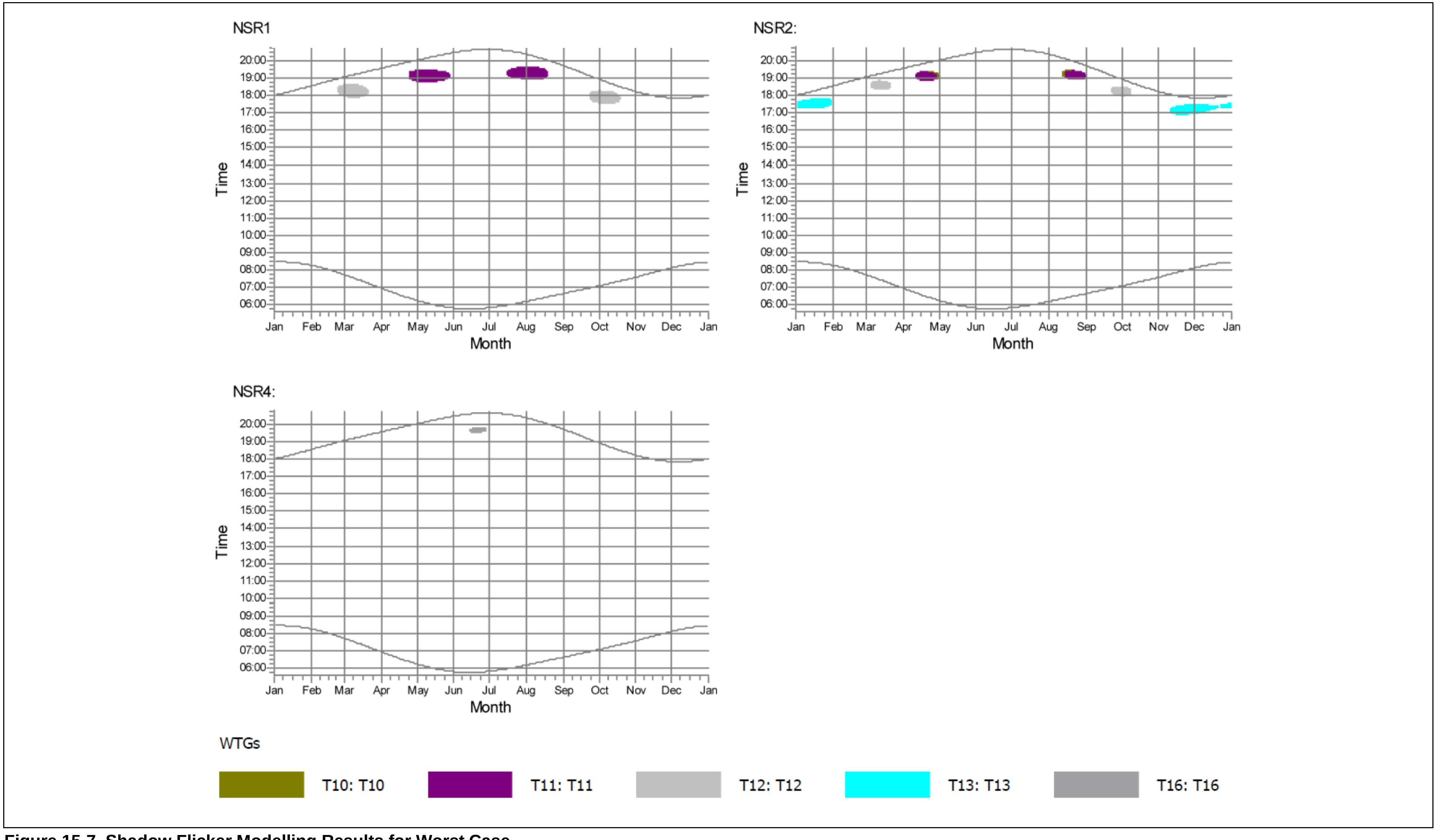


Figure 15-7. Shadow Flicker Modelling Results for Worst Case

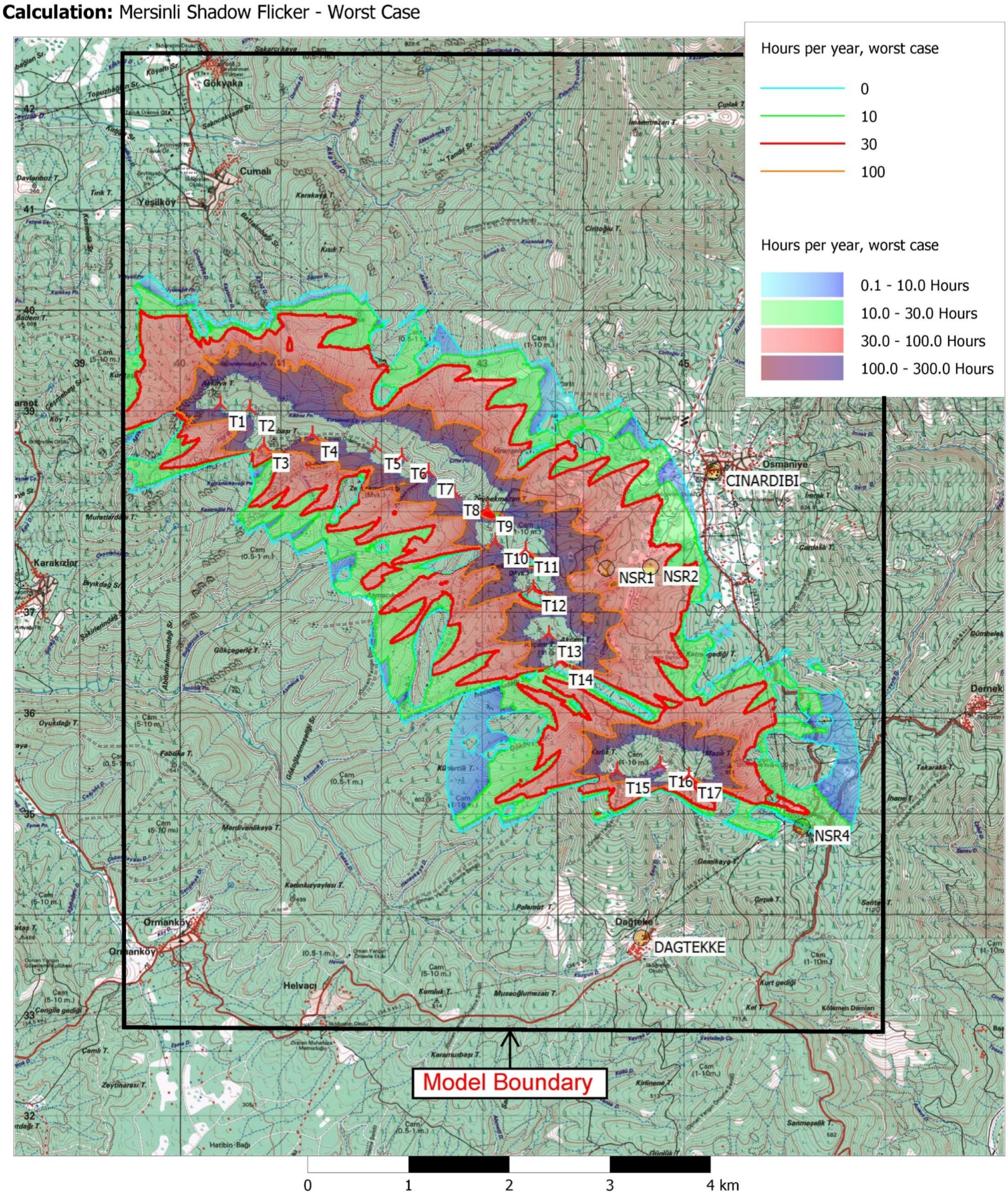
Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

AECOM

SHADOW - Map

Calculation: Mersinli Shadow Flicker - Worst Case



Map: Topo , Print scale 1:55,000, Map center UTM (north)-WGS84 Zone: 35 East: 543,220 North: 4,236,970

New WTG   Shadow receptor

Flicker map level: Project Wizard Elevation Data Grid (EU-DEM 1 arc-second)

windPRO 3.1.617 by EMD International A/S, Tel. +45 96 35 44 44, www.emd.dk, windpro@emd.dk   03/07/2017 17:13 / 1   windPRO

Figure 15-8. Shadow Flicker Modelling Results Map for Worst Case

Model Results for Realistic Scenario

For the realistic case, the summary of modelling results are provided in Table 15-7, the ranges in the year where shadow flicker impact will occur are plotted in the charts given in Figure 15-9 and the map showing the shadow contours (hour/year) is given in Figure 15-10.

According to these results, 3 receptors, namely NSR 1, NSR 2 and NSR 4 (Marmariç), are identified to be affected by shadow flicker. However, shadow flicker hours to be experienced at these receptors are significantly lower than the 30 hours per year limit provided by IFC. It should be noted that for the realistic case, the shadow module of Wind PRO software does not provide results on shadow days per year and maximum shadow hour to be experienced on a day.

Table 15-14. Shadow Flicker Modelling Results based on Realistic Case

Receptor	Shadow Hours (per year)	Effective Turbine
Çınardibi	0:00	-
Dağtekke	0:00	-
NSR 1	15.32	T11, T12
NSR 2	13.59	T10, T11, T12, T13
NSR 4 (Marmariç)	0.21	T12

The results of the modelling study are presented in Appendix F, which consists of several reports and graphical demonstrations, including information on which turbines will cause shadow flicker on which receptors and the months and time tables for shadow flicker to be experienced.

Mitigation measures for receptors identified to be affected by shadow flicker are provided in Section 15.4.

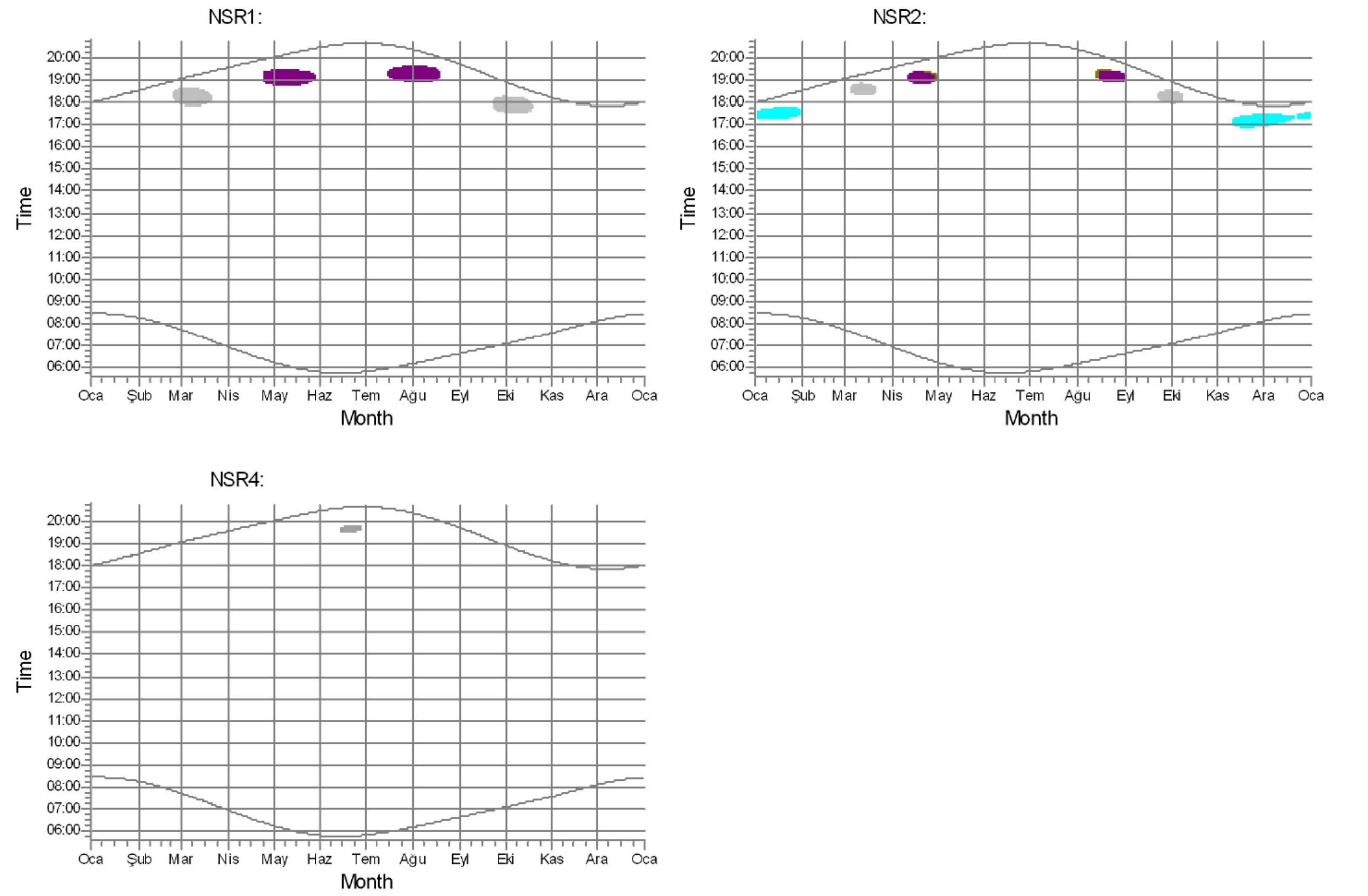


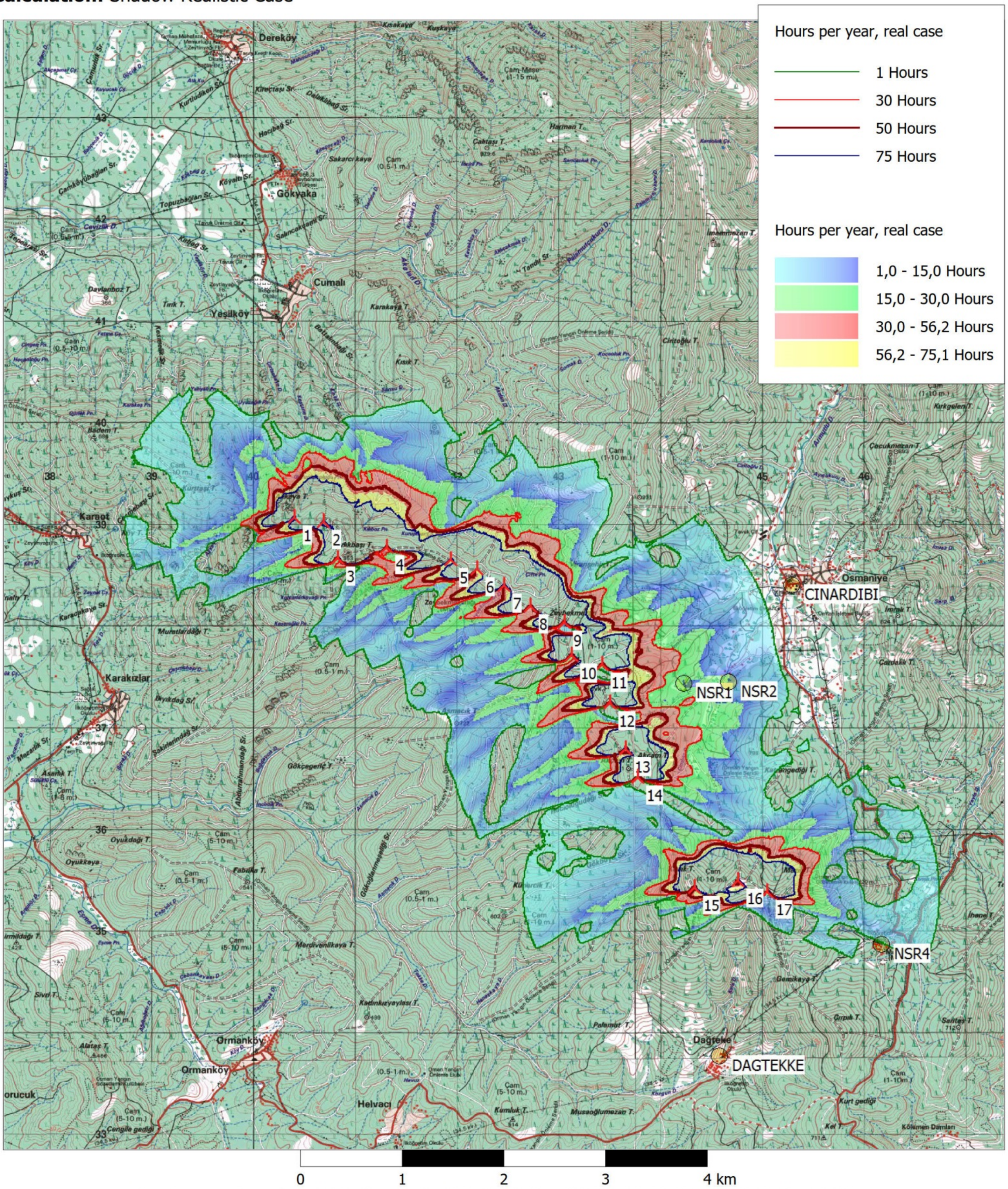
Figure 15-9. Shadow Flicker Modelling Results for Realistic Case

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Map

Calculation: Shadow Realistic Case



Map: Topo , Print scale 1:55.000, Map center UTM (north)-WGS84 Zone: 35 East: 542.415 North: 4.238.216

New WTG   Shadow receptor

Flicker map level: Project Wizard Elevation Data Grid (EU-DEM 1 arc-second)

windPRO 3.1.617 by EMD International A/S, Tel. +45 96 35 44 44, www.emd.dk, windpro@emd.dk   13.12.2017 16:13 / 1   windPRO

Figure 15-10. Shadow Flicker Modelling Results Map for Realistic Case

15.3.2.2 Blade and Ice Throw

In cold climates, build-up of ice can occur on wind turbine rotor blade surfaces and as a result, pieces or sheets of this ice may be ‘thrown’ from spinning rotating blades.

The Mersinli WPP turbines and access roads are not located close to any main roads. However, people living in nearby settlements and people using the area for recreational purposes may use the forest roads located in the vicinity and in the Project area, since access to roads will not be restricted during the operation phase (See Section 15.3.2.4 for public access). In addition, Mersinli WPP personnel will also be using the forest roads. Therefore, there is a risk of serious incidents and property damage within the maximum ice throw distance.

For a rotating turbine, the maximum ice throw distance is represented by the Seifert Formula (*IEA, 2017*). The maximum distance for ice throw from a rotating wind turbine can be estimated by the following method (using equation 1), in flat terrain:

(Equation 1) $d = 1.5(D+H)$

d: Maximum throwing distance of ice (m)

D: Rotor diameter

H: Hub High

$d = 1.5\,(126+87)$

$d = 319.5$ m

There are no dwellings or buildings located within the 319.5 m radius area around turbines. Therefore, there will be no ice throw risk for local settlements. However, mitigation measures are still required for forest road users, workers, hunters and other road users.

In case of turbine failures, the blades themselves can also be thrown and may result in impacts such as forest fires (e.g. blades thrown due to due to electrical failure, overheating, lightning strike, etc.) , accidents involving local communities and economic damage. Wild fires in the project area are relatively sparse; however, fire conditions will be monitored, in order to ensure that potential blade throw originated from burning of the related turbine tower is avoided. It should be noted since modern turbine designs include control systems that detect overheating, a turbine fire originating from the turbine is very unlikely. This system automatically shuts down the turbines once overheating is detected. In addition, other design related measures such as lightning protection systems will also be in place, in addition to carefully planned and implemented maintenance activities. Therefore, under normal operation conditions, blade throw impact is considered to be negligible.

15.3.2.3 Infrastructure and Equipment Design and Safety and Electrocution

The switchyard, the underground cable network and the ETL of the Project are potential sources for electrocution hazard, in case of contact with high voltage live components, power lines and any conducting equipment and tools such as ladders that are in contact with the live equipment.

Local communities use the Project area and its vicinity for access and for grazing activities. Therefore, any unauthorized access to close proximity of turbines and other Project units such as the switchyard and the ETL may constitute safety risks, especially in terms of falls from height, blade and ice throw, electrocution and traffic safety. As the Project transformers are housed inside the turbine hub, additional fencing will not be required. However, access to turbine ladders must be restricted, since communities, especially children may not be aware of potential risks and carefully planned community safety awareness activities such as distribution of leaflets, booklets and provision of awareness raising activities at local community centres and schools shall be conducted.

15.3.2.4 Public Access

Turbines and the license area will not be fenced off during the operation phase and access will not be restricted. Since the transformers of the turbines are located inside the turbine nacelle, there will be no need for fencing due to electrocution concerns. However, blade and ice throw risk is heightened during extreme weather conditions and therefore, access to turbine sites during these conditions are of concern during operation phase. In addition, community safety awareness activities to eb conducted shall also include the issue as a subject.

15.3.2.5 Aviation

For assessment of aviation risks, related aviation associated documents such as charts and topographic maps were reviewed, which are available for public access. Therefore, information and any assessments provided here are based on and limited by available public information.

Visual Flight Rules Chart

Visual flight rules (VFR) are defined as regulations that specify weather and visibility conditions for pilots. The VFR rules ensure the pilots to operate the aircraft with visual reference to the ground, and also by visually avoiding obstructions and other aircraft (*International Virtual Aviation Organization, 2015a*). In principle, any objects extending higher than 150 meters above the terrain cause an obstruction in the airspace. Therefore, the impact of wind power plants on aviation operations is required to be assessed to ensure aviation safety. At the minimum, the turbines shall be clearly visible by ensuring standard marking/lighting and if required, overhead cables marking. For the Project, marking and lighting will be installed in accordance with the recommendations of ICAO Annex 14 (*ICAO, 2016*). The Turkish Regulation on Mania Criteria on Communication, Navigation and Observation Systems also state that as per the International Civil Aviation Convention, the legislation and therefore any Project subject to this legislation must follow ICAO standards.

The VFR Map for Izmir Adnan Menderes Airport and İzmir Gaziemir Military Airport is given in Figure 15-11 below.

Instrument Flight Rules (IFR) Upper and Lower En-Routes

Instrument flight rules (IFR) are defined as regulations that pilots are required to adhere to when navigation by using visual references is not safe (*International Virtual Aviation Organization, 2015b*). En route flight is described by IFR charts showing navigation aids, fixes, and standard routes called airways. As seen in below maps given in Figure 15-12 and Figure 15-13), Mersinli WPP Project is not crossing the routes.

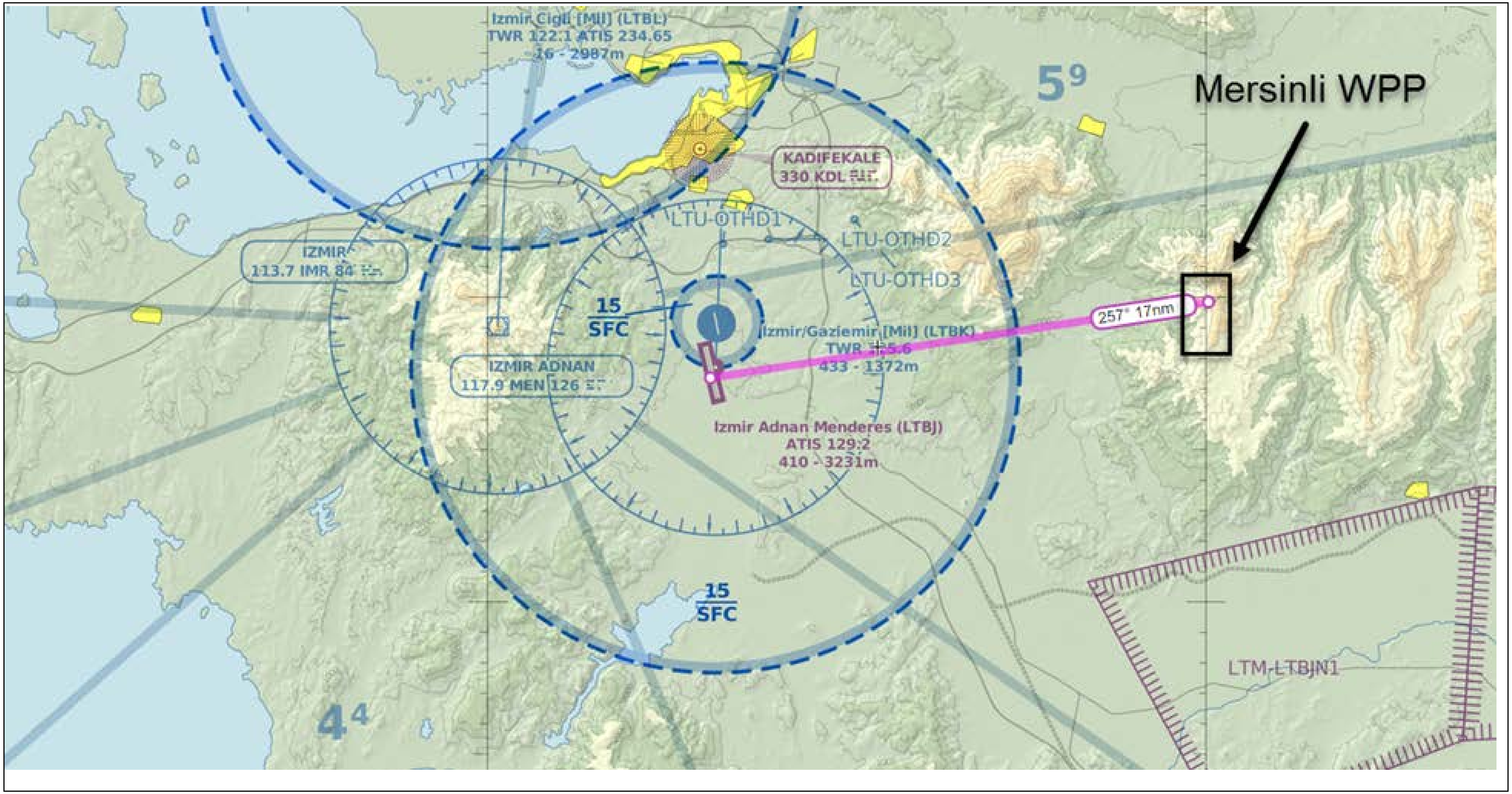


Figure 15-11. The VFR Map for Izmir Adnan Menderes Airport and İzmir Gaziemir Military Airport

Source: SkyVector Aeronautical Charts website, https://skyvector.com/

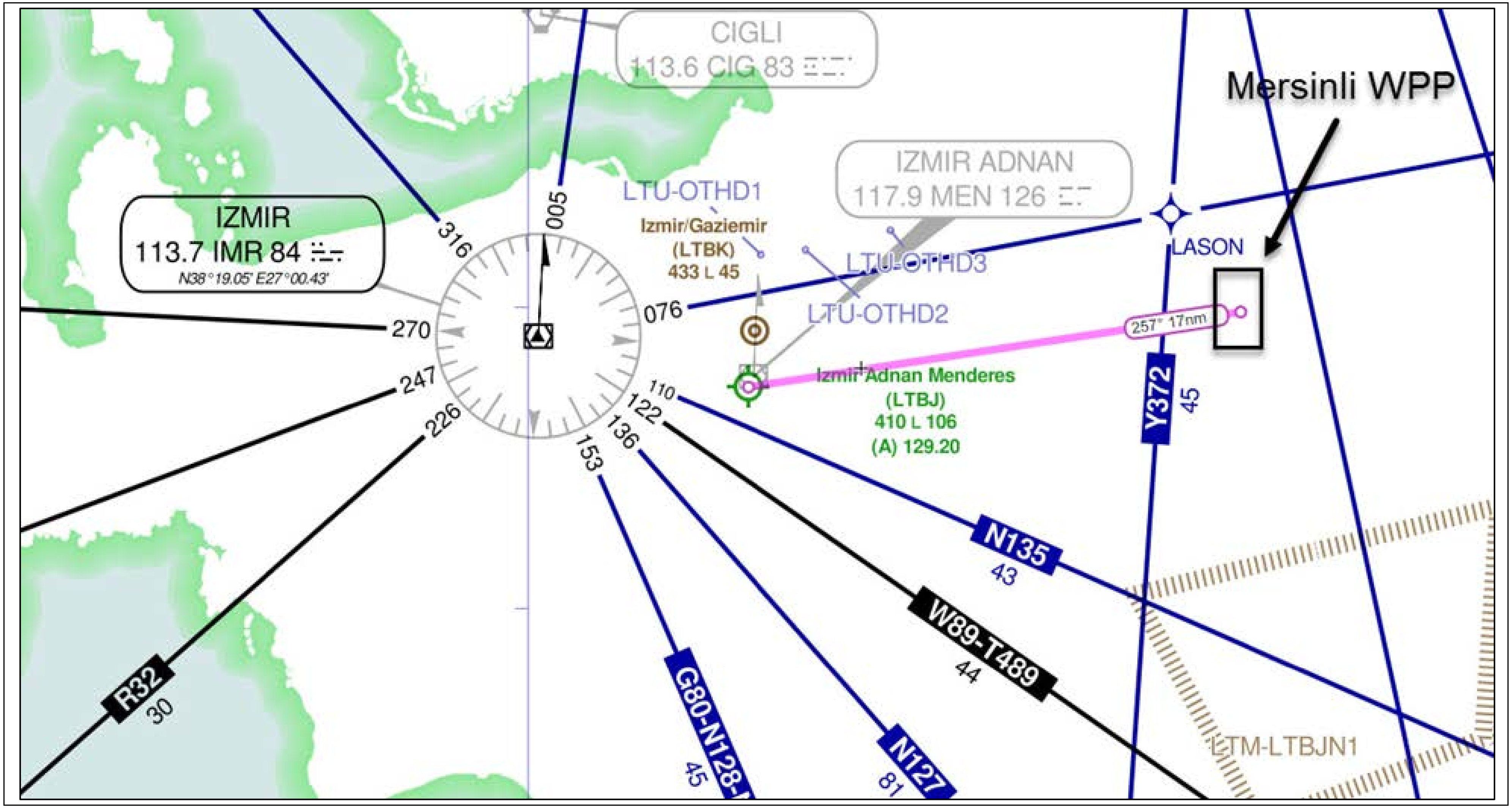


Figure 15-12. Lower En-Route Chart of Izmir Adnan Menderes Airport

Source: SkyVector Aeronautical Charts website, https://skyvector.com/

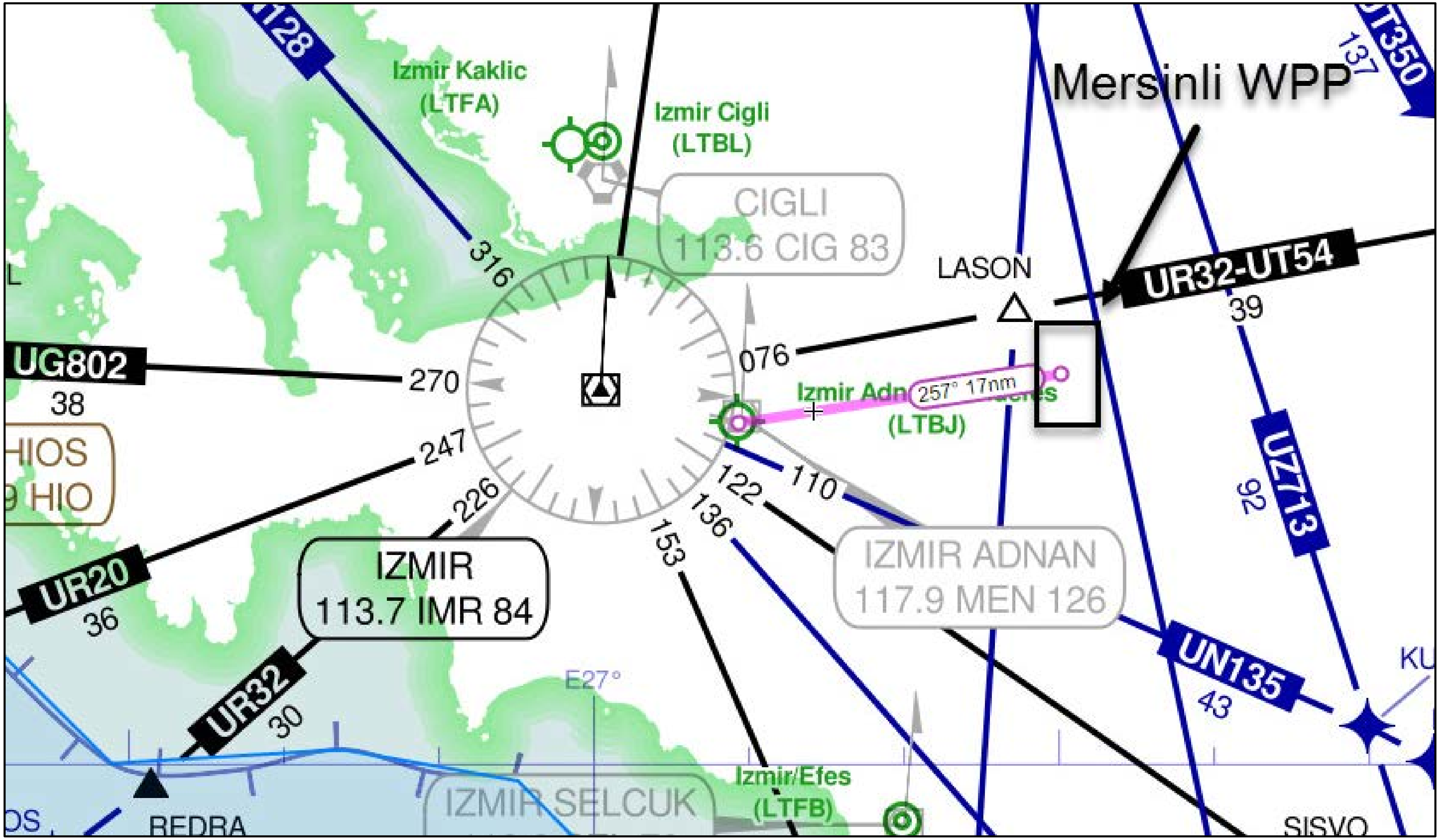


Figure 15-13. Upper En-Route Chart of Izmir Adnan Menderes Airport

Source: SkyVector Aeronautical Charts website, https://skyvector.com/

Air Traffic Control Primary Surveillance Radars

Air traffic control primary surveillance radars transmit a pulse of energy, the energy hits an object within its line of sight and is reflected back to the radar receiver. This way aircrafts can identify existence of other aircrafts in the air. The size, shape and orientation of the object affect the amount of energy that can be reflected, and consequentially picked up by the receiver. In general, larger objects reflect larger amounts of energy. Therefore, a large object such as a wind turbine may create false returns to radar (i.e. returns that are not aircraft). The issue may cumulatively be increased by large number of wind turbines (*Civil Aviation Authority, 2016*).

Via topographic assessments, it is identified that the Mersinli WPP Turbines have direct line of sights to Izmir Adnan Menderes Airport without any terrain shadow. The map of Line-of-Sight is given in Figure 15-14 below.

However, the technical details of Radar (range, frequencies etc.) are not available public documents for interference model studies. As per related legislation, the civil aviation/radar approval, if necessary, will be obtained as part of the zoning plan approval (no separate application is needed).

Military Flights

Izmir Gaziemir Air Base (GAB) (ICAO: LTBK) is an airbase, owned by the Turkish Air Force and operated by the Air Force Training Command, located approximately 27 km to Mersinli WPP Turbines. Flight route information of GAB isn’t available on public documents. As is the case with civil aviation, the necessary approval will be obtained from the Turkish General Staff (via evaluation of the Scientific and Technological Research Centre of Turkey).

Considering that the Project can only go forward with related authorities’ approvals in place, design based mitigation such as turbine marking and lighting will be in place (i.e. turbines are manufactured and installed with related mitigation in place) and the fact that Mersinli WPP Project is not crossing the flight routes used by ADB airport, impact significance for aviation is assessed to be negligible.

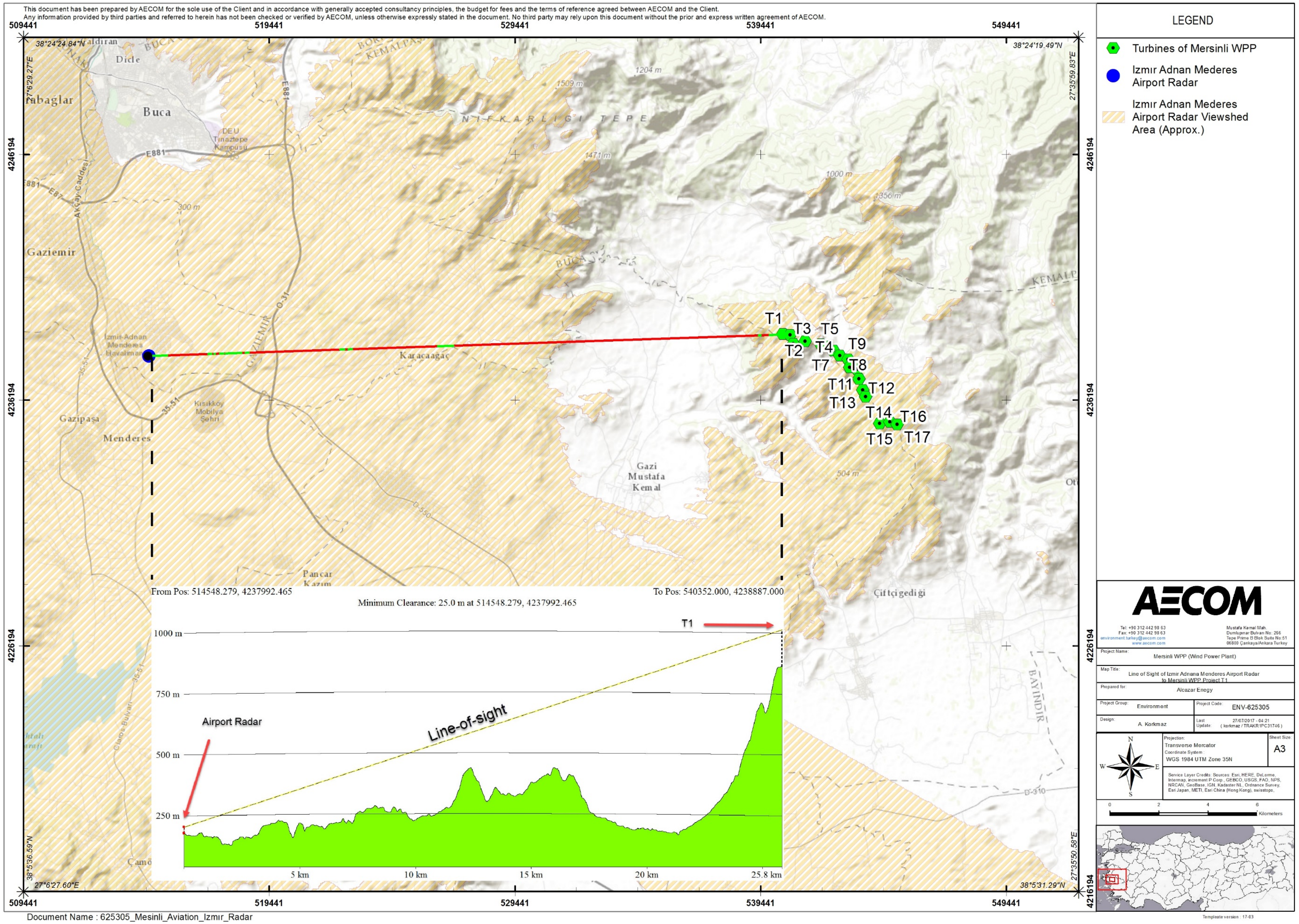


Figure 15-14. Line of sights from Izmir Adnan Menderes Airport to Mersinli WPP Turbines

15.3.2.6 Electromagnetic Interference

Wind turbines have the potential to cause Electromagnetic Interference (EMI) via three principal mechanisms described below (*International Energy Agency, 1986; Krug and Lewke, 2009; Adaramola; 2014)*:

- Near field effects: Electromagnetic fields emitted by the generator and switching components in the turbine nacelle or hub have the potential to cause interference to radio signals.
- Diffraction: Wind turbine can directly obstruct a wave's path of travel by either reflecting or absorbing the wave.
- Reflection/scattering: Rotating blades of a turbine can reflect and scatter a transmitted signal. This may cause the receiver to pick up two signals, with the signal scattered by the blades causing EMI since is delayed in time or distorted compared to the primary signal.

The following factors affect the nature and amount of EMI (*Krug and Lewke, 2009*):

- Location of the wind turbine relative to the transmitter and receiver
- Characteristics of the rotor blades
- Signal frequency
- Receiver characteristics
- Radio wave propagation characteristics in the local atmosphere

For the Project, potential for EMI impact is identified for two separate subjects:

- Aviation radars: Projects potential impact on aviation is described in Section 15.3.2.5. Related approvals will be obtained from relevant authorities as part of the zoning plan approval process (if required), which will ensure that the Project has no potential impacts with regards to this issue or the identified impacts are managed as per the provisions of these approvals.
- The existing GSM communication towers: There are two identified GSM towers, which transmit across the Mersinli WPP area. For the issue, the Project Company is required to obtain approval from the Institution of Information and Communication Technologies and/or the related GSM operators.

Therefore, EMI impacts of the Project are assessed to be negligible within the scope of this assessment.

Impacts related to electromagnetic fields (EMF) on the other hand are assessed in Chapter 14 of this ESIA Report and the assessment concludes that EMF impacts are negligible.

15.3.2.7 Emergency Preparedness and Response and Forest Fires

Project's emergency preparedness and response related risks and impacts will start during the construction phase and will also be affective during the entire operation phase.

Fire risk is the main emergency risk that may potentially be heightened by the Project in case of lack of related design and mitigation measures and a framework for management of emergencies, since the Project is located inside forest areas. Fire risk is important in terms of both a potential forest fire that may be sourced due to Project activities such as turbine fires or the turbines being affected from a forest fire sourced from outside the Project Area. In addition, since wind power plants are located in remote locations due to their unique impacts such as shadow flicker and due to being located in mountainous areas where wind potential is higher, fire response difficulty is also a significant issue.

Forest fires sourced from turbine operations and other Project activities may be caused due to following main factors:

- Electrical equipment failures and turbine component failures.
- Overheating or sparking of turbine components in combination with flammable fluid or vapour, most likely due to leaking oil pipes and loose connections. Turbine components that can burn are; rotor blade (composite structures with resin), gearbox (grease, oil), generator (insulation material), nacelle (cables, hydraulic oil) transformers (oil, cables, insulation material) and other electrical components.
- Hot surfaces induced by turbine components such as mechanical brakes and emergency brake.
- Project ETL's interaction with unmaintained vegetation.
- Direct contact with an uncontrolled forest fire sourced from outside the Project Area.
- Lack or insufficiency of a framework for emergency management, resulting in poor communications with related emergency services and authorities.
- General lack of Project personnel's fire safety awareness, including lack of attention during works welding.

As a result, following general and specific impacts may occur:

- Damage to turbines or complete loss of a turbine due to difficulties in response stemming from WPPs remote locations and turbines' significant height.
- During a fire sourced from Project activities, including fires related to turbines, burning debris can be drifted by the wind, causing a wild fire in the vicinity forests that may result in habitat loss, displacement of animal species, etc.
- Similarly, a fire caused by project activities may not be controlled easily due to remote location of the plant, resulting in potential risks to nearby settlements.
- In case of a turbine fire during a manned operation such as maintenance, a serious risk arises for personnel involved in the work, especially for those that are conducting work at height.

15.3.2.8 Hazardous Materials Management

Project maintenance and operation activities will require use of hazardous materials such as hydraulic oils and paints, as well as other hazardous material requirements such as vegetable oils (also applicable for construction and closure phases) and pesticides. If not managed properly or in case of a potential spill or leakage, these materials may result in soil, surface water and groundwater contamination, occupational health and safety risks and community health and safety risks. Contamination related impacts and relevant mitigation associated with hazardous materials are provided in Chapter 6 and Chapter 9, whereas hazardous waste related impacts and mitigation are presented in Chapter 10 of this report.

15.3.2.9 Security Personnel

Impacts related to use of security personnel during the operation phase are the same with construction and closure phase impacts for the same topic (see Section 15.3.1.4).

15.3.3 Closure Phase

All construction phase community health and safety risks/impacts identified in Section 13.3.1 are also applicable for the closure phase, since closure activities consist of decommissioning and dismantling/uninstalling of existing Project units and rehabilitation activities (i.e. identified construction phase impacts such as traffic management and abnormal load transportation, emergency preparedness and response, etc. are also valid for closure phase). Therefore, the assessment for construction phase is also valid for closure phase.

15.4 Mitigation Measures

Table 15-15 provides identified residual impact significance levels for community health and safety impacts that differ for various settlements in the overall impact area. It should be noted that community health and safety impacts that are equally affective for all communities or that cannot be quantified with respect to distance from the Project area (e.g. public access restrictions, exposure to disease, water quality deterioration, odour, etc.) are not included in this table. Detailed impact assessment and mitigation for these impacts are provided in detail in respective chapters of this ESIA Report, including this Chapter.

Receptors for identified impacts and their sensitivity values, impact magnitude and impact significance, related mitigation measures and assessment of residual impact significance are provided in Table 15-16. It should be noted mitigation for some of the community health and safety related impacts such as deterioration of air and water quality, noise, visual impacts, etc. are provided in corresponding impact assessment chapters of this Report.

In addition to the proposed mitigation measures, the following plans in relation to community health and safety will also be in place:

- Stakeholder Engagement Plan
- Traffic and Transport Management Plan
- Emergency Preparedness and Response Plan
- Waste Management Plan
- Noise Management Plan
- Air Quality Management Plan
- Erosion Control, Soil and Spoil Management Plan
- Contractor Management Framework Plan

During all phases of the Project, both internal and external audits (i.e. by independent experts and potentially by related governmental authorities) will be conducted and additional preventive/ mitigative measures will be developed to address any noncompliance identified during these audits. The audits will cover traffic safety audits, fire safety audits, waste management audits, OHS audits, etc.

As part of the Project SEP, an effective grievance mechanism will be in place throughout the life time of the Project, which will enable local communities and other stakeholders groups to easily convey their concerns and comments regarding the Project, including grievances on any community health and safety related issues.

Table 15-15. Anticipated Residual Impacts on Vicinity Settlements

Impact Category	Phase	Detailed Assessment Chapter in ESIA	Settlement									
			Marmaric	Cinardibi	Dagtekke	Yesilkoy	Cumali	Karaot	Karakizlar	Dernekli	Gokyaka	Derekoy
Noise	• Land Preparation and Construction • Operation • Closure	7	Minor	Minor	No impact	No impact	No impact	No impact	No impact	No impact	No impact	No impact
Air Quality/ PM_{10} Emissions	• Land Preparation and Construction • Closure	8	Minor	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Air Quality/ Exhaust Emissions	• Land Preparation and Construction • Closure	8	No impact	No impact	No impact	No impact	Negligible	No impact	No impact	No impact	Negligible	Negligible
Visual Impacts/ Temporary Construction Impacts	• Land Preparation and Construction • Closure	12	Minor	Minor	Minor	Minor	Minor	Minor	Minor	Minor	Minor	Minor
Visual Impacts/ Long Term Operation Impacts	• Operation	12	No impact to moderate	Moderate	No impact	No impact	Moderate	No impact	No impact	No impact	No impact	No impact
Abnormal Load Transportation	• Land Preparation and Construction • Closure	13, 15	Minor	Minor	Minor	Minor	Minor	Minor	Minor	Minor	Minor	Minor
Shadow Flicker	• Operation	15	Negligible	No impact at the settlement Minor impact at 2 points used for agricultural purposes	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Blade and Ice Throw	• Operation	15	No impact	No impact	No impact	No impact	No impact	No impact	No impact	No impact	No impact	No impact

Table 15-16. Community Health and Safety Impacts, Proposed Mitigation Measures and Residual Impacts

Impact Description	Project Phase	Receptor	Impact Magnitude						Sensitivity/ Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Magnitude	Reversibility	Duration	Frequency	Overall Magnitude				
Abnormal Load Transportation	• Land Preparation and Construction • Closure	• Local Communities on the Transport Route • Local Communities in the Vicinity of the Project (due to community activities such as grazing, beekeeping, gathering, etc.) • Road Users	• Wide	High	Short term reversible to irreversible	Short term	One off	High	High	Major	• Implement the Traffic and Transport Management Plan. • Implement the Stakeholder Engagement Plan and the external grievance mechanism. • Ensure detailed road surveys are conducted and findings of the existing road surveys and detailed road surveys to be conducted are taken into consideration and implemented. • Based on the results of the detailed road surveys, schedule abnormal road transportation and if required, other construction materials transportation to coincide with off-peak hours. • Based on the results of the detailed road surveys, implement traffic management practices. • Ensure abnormal road transportation is conducted with escort vehicles. • Ensure coordination with local authorities during abnormal road transportation (especially for scheduling and road selection). • Implement working hour limits for drivers and inform drivers periodically on working schedule. • Restrict operation of heavy vehicles to those that are trained and competent (licensed if required). • Provide traffic and road safety trainings for all personnel and provide specialized trainings to personnel that will operate industrial vehicles (such as defensive driving, of road and anti-skid etc.). • Include traffic issues in the scope of the trainings that site visitors will receive and limit site visitors' mobility on construction sites. • Install and maintain signage and other traffic regulating means. • Set speed limits and implement right of way practices. • Implement restrictions for night time driving. • Conduct periodic vehicle maintenance. • Conduct periodic medical checks for drivers. • Conduct awareness raising activities for affected communities through the Project Community Liaison Officer.	Minor
		• Road Infrastructure	• Wide	Low	Short term reversible	Short term	Intermittent	Medium	Low	Minor		Negligible
Traffic Load	• Land Preparation and Construction	• Road Users	• Wide	Negligible	Short term reversible	Short term	Continuous	Negligible	Medium	Negligible	• No measures required.	Negligible
Exposure to Disease	• Land Preparation and Construction • Closure	• Local Communities	• -	Negligible/ None	-	-	-	No Impact	High	No impact	These general measures will also provide for reduction of disease risk: • Provide trainings to personnel on healthcare. • Conduct periodic medical checks for personnel and provide vaccination and/or other mitigating measures when required. • Implement appropriate waste management practices and the Waste Management Plan. • Provide health related awareness raising activities aimed at local communities. • Implement the Stakeholder Engagement Plan and the external grievance mechanism.	No impact
Electromagnetic Interference	• Operation	• Aviation related receptors (due to interference with radars) • GSM Operators • Local Communities	• -	Negligible/ None	-	-	-	No Impact	High	No Impact	• Obtain relevant approvals from related authorities. • Conduct regular consultation and monitoring with communities. • Ensure related grievances are investigated and responded to appropriately.	No impact
Emergency Preparedness and Response and Fire Risk	• Land Preparation and Construction • Operation	• Local Communities	• Wide	Medium	Short term reversible to irreversible	Short term	One-off	High	High	Major	• Develop and implement an Emergency Preparedness and Response Plan. • Ensure sufficient communication tools are always in place and distributed throughout the site, with backup systems.	Minor

Impact Description	Project Phase	Receptor	Impact Magnitude						Sensitivity/ Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Magnitude	Reversibility	Duration	Frequency	Overall Magnitude				
	• Closure										• In case local communities are at risk due to an emergency situation; notify the communities by means of alarms/sirens, contacting authorities and select community members by using formerly prepared, up to date contact lists, etc. • Ensure fire detection systems and turbine overheating systems are maintained properly. • Take the fire preparedness and response measures in line with the requirements of the related forestry authorities. • Ensure cooperation with related authorities is achieved (both for prevention of emergencies and during emergency situations). • Engage key community members and relevant local authorities into drilling exercises during operations phase . • Implement the Stakeholder Engagement Plan and the external grievance mechanism.	
Public Access	• Land Preparation and Construction • Closure	• Local Communities	• Restricted	Low	Short term reversible	Short term	Continuous	Low	High	Moderate	• Restrict access to construction/rehabilitation areas. • Ensure adequate signage are in place. • Ensure proper traffic management practices are in place and implement the Traffic and Transport Management Plan. • Provide awareness raising activities for local communities. • Implement the Stakeholder Engagement Plan and the external grievance mechanism. • Ensure monitoring of the third party access to site through use of security personnel. • Conduct awareness raising activities for affected communities through the Project Community Liaison Officer.	Negligible
	• Operation	• Local Communities	• -	Negligible/ None	-	-	-	No Impact	High	No Impact	• Ensure access to turbine sites is restricted during extreme weather conditions that may lead to blade/ice throw and communities are informed about risks.	No impact
Hazardous Materials Management	• Land Preparation and Construction • Operation • Closure	• Local Communities	• Restricted	Negligible	Short term reversible	Short term	One-off	Negligible	High	Negligible	• Implement related mitigation measures provided in Chapter 6 (Land Use, Soils and Geology), Chapter 9 (Water Resources) and Chapter 10 (Waste). • Include hazardous materials management as a subject in EHS and OHS trainings to be provided to personnel. • Implement the Waste Management Plan.	Negligible
Security Personnel	• Land Preparation and Construction • Operation • Closure	• Local Communities	• Restricted	Low	Short term reversible	Short term	One-off	Low	High	Moderate	• Develop and implement a security management plan in compliance with Voluntary Principles on Security and Human rights. • Implement the Stakeholder Engagement Plan and the external grievance mechanism. • As also stipulated by AE's 's Quality Health Safety and Environment Management System requirements, ensure legal inquiries are in place during the hiring process of security guards (or the company the security service is procured from) to check competency and existence of any former abuse incidents. • As also stipulated by AE's s Quality Health Safety and Environment Management System requirements, the Contractor is to provide trainings to security personnel on code of conduct, gender sensitivities and local cultural sensitivities or ensure the company the security service is procured from provides its personnel with similar trainings.	Negligible
Shadow Flicker	• Operation	• Çınardibi • Dağtekke	-	Negligible/ None	-	-	-	No impact	High	No Impact	• Manage any complaint in relation to shadow flicker in accordance with the Project's Grievance Mechanism.	No Impact
		• Shadow Receptor: 4 (Marmariç)	Restricted	Negligible (Impact duration is 7 minutes per year in the worst case, without	Short term reversible	Short term	Intermittent (repetitive each year)	Negligible	High	Minor	• Verify line of sight from the receptors to respective turbines, since multiple long trees and strong vegetation are distributed between the turbines and these receptors. • Based on verification of line of sight, in case line of sight is determined to be not disrupted completely by vegetation (i.e. in case even a small partial line of sight exists), install a light	Negligible

Impact Description	Project Phase	Receptor	Impact Magnitude						Sensitivity/ Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Magnitude	Reversibility	Duration	Frequency	Overall Magnitude				
				considering vegetation)							sensor on the shadow receptor in order to monitor the shadow flicker impact during operation and shut down (based on shadow flicker hours) the turbine which causes the impact if the receptor receives more than 30 hrs. per year or more than 30 min per day shadow flicker . • In consultation with the affected communities and if required based on verification of sight and light sensor monitoring results, consider providing vegetation screening and other means of screening that may be considered appropriate by communities. • Implement the Stakeholder Engagement Plan and the external grievance mechanism.	
		• Shadow Receptor: 1 • Shadow Receptor: 2	Restricted	Medium	Short Term Reversible	Short Term	Intermittent (repetitive each year)	Medium	High	Major		Minor
Blade and Ice Throw	• Operation	• Forest Road Users • Workers of Mersinli WPP • Recreational users of the area (i.e. hunters)	Restricted	Medium	Short Term Reversible	Short Term	One-Off	Medium	High	Major	• Ensure that lightning protection systems are properly installed and maintained. • Carry out periodic blade inspections and repair any defects that could affect blade integrity. • Ensure vibration sensors that can react to any imbalance in the rotor blades and shut down the turbine are maintained properly. • Ensure heat control mechanism is maintained properly. • Ensure static and illuminated warning signs are used to inform/warn receptors. • Conduct awareness raising activities for affected communities through the Project Community Liaison Officer.Implement the Stakeholder Engagement Plan and the external grievance mechanism.	Negligible
Infrastructure and Equipment Design and Safety and Electrocution	• Operation	• Local Communities • Recreational users of the area (i.e. hunters)	Restricted	Medium	Long Term Reversible/ Irreversible	Short term	One-off	Medium	High	Major	• Ensure the switchyard is fenced off and related cautionary signs are in place. • Ensure access to turbine ladders is closed off and related cautionary signs are in place. • Ground conducting objects installed near the ETL. • Ensure maintenance schedule for turbines is followed strictly. • Design the administrative building in consideration of universal access principles, as this unit will be used for communal purposes. • Conduct awareness raising activities for affected communities through the Project Community Liaison Officer.Implement the Stakeholder Engagement Plan and the external grievance mechanism.	Minor
Aviation	• Operation	• Commercial and military aircraft users • Local communities	-	Negligible/ None	-	-	-	No Impact	High	No Impact	• Obtain relevant approvals from related authorities.	No impact

16. Cultural Heritage

16.1 Project Standards and GIIP

The main legislation concerning cultural heritage in Turkey is the Law on Conservation of Cultural and Natural Assets (Law No: 2863, Official Gazette 18113, Date: July 23, 1983). The Law defines cultural assets and sets provisions for their protection, including the procedure for notifying the Ministry of Culture and Tourism or the closest governmental administrative body in case a previously unidentified potential cultural asset is discovered.

EBRD PR 8 and IFC PS 8 both emphasize the importance of cultural heritage and require their clients to protect cultural heritage during all phases of projects and state the need for a chance finds procedure.

Within the scope of these applicable standards and legislation, implementation of a well laid out chance find procedure emerges as the main Project requirement in terms of protection of cultural heritage.

16.2 Baseline Conditions

According to the Turkish Law on Conservation of Cultural and Natural Property, archaeological site" shall mean an area where man-made cultural and natural property converges as the product of various prehistoric to present civilisations, that is adequately defined by topography and homogenous, at the same time historically, archeologically, artistically, scientifically, socially or technically valuable, and exhibits partial structures. In accordance with the Regulation Regarding the Identification and Registration of Immovable Cultural Assets and Sites, first (1st) degree archaeological sites shall be determined based on their environmental or scientific characteristics. They shall be the product of various civilisations from the pre-historical periods to date. They shall reflect the social, economic, architectural and other features of the period they belong to. They may include the cities, remains of cities or areas that have been stages of social life with a concentration of cultural property.

To identify the registered archaeological sites in the wider area of the Project, the Environmental Master Plan of Izmir was reviewed in the scope of the ESIA studies. As can be seen from Figure 16-1, there are no registered archaeological sites located within a 5 km buffer around the License Area. The closest archaeological sites are located in the Yukarikizilca neighbourhood (located approximately 9 km –air distance- north of the License Area) and Karakuyu neighbourhood (located approximately 10 km –air distance- southwest of the License Area.

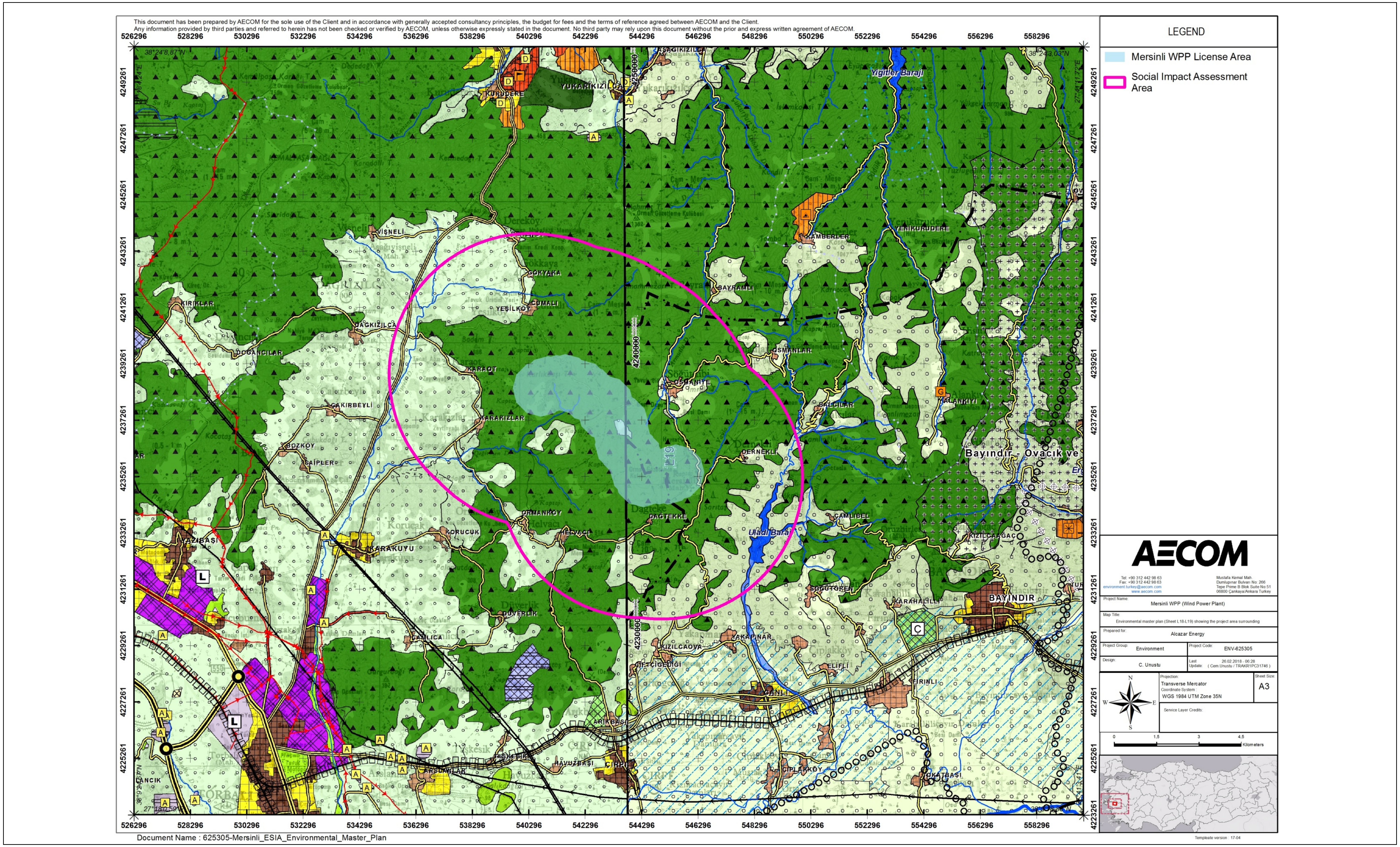


Figure 16-1. Location of the License Area on the Environmental Master Plan of Izmir (Sheets L18 and L19)

The License Area falls within the jurisdiction of the İzmir Regional Boards for Conservation of Cultural Assets No 1 (Bayindir and Torbali districts) and No 2 (Kemalpasa district) that serve under the Ministry of Culture and Tourism. As part of the national EIA studies experts of these Regional Boards conducted field surveys within the License Area to identify any cultural heritage site that could be potentially affected by the Mersinli WPP Project.

Within the national EIA process, the experts of the İzmir Regional Board No 1 identified a non-registered (as of the identification date) cultural heritage (archaeological) site in Zeybekmezarlığı locality of Bayındır district during the field surveys conducted for the Project. The Regional Board proposed this site for registration and stated in its official letter dated 14 April 2016 and numbered 1463 that no activities shall be conducted in this area until the registration works are completed by the Board. As a requirement of the relevant Law, the Board also consulted with the following authorities regarding the registration of the potential cultural heritage site:

- Izmir Regional Directorate of Forestry
- Izmir Provincial Directorate of Environment and Urbanisation
- Izmir Metropolitan Municipality
- Bayındır District Municipality
- General Directorate of Highways, Izmir 2nd Regional Directorate
- State Hydraulic Works
- Ministry of Energy and Natural Resources, General Directorate of Mining Affairs

As a result of the field survey conducted by the experts of the Board No 1 within the License Area, the experts prepared a site investigation report on 4 August 2017. Based on the report of the experts, the İzmir Regional Board for Conservation of Cultural Assets No 1 held a meeting on 15 August 2017 and made a decision (Decision no: 6402) to register the site as a 1st degree archaeological site. This decision became effective after being published in the Official Gazette dated 25 October 2017. As part of the consultations done with the authority, the officials of the İzmir Regional Board for Conservation of Cultural Assets No 1 informed that the site dates back to Hellenistic and Roman period and involves ruins of a settlement, necropolis (cemetery), road ruins and part of a wall.

The location of the registered 1st degree archaeological site, is shown on the map provided in Figure 16-2. The minimum distance between the foundation of the Turbine-9 and the boundary of registered archaeological site is 90 m. The distance between the turbine foundation and the northern boundary of the registered archaeological site is more than 1,100 m. An existing forest access road, which will also be used as an access road for the Project, is coinciding partially with the western border of the registered site. Another forest roads, crosses the site (from west to northeast,) at the northern part..

Other than this site, no other cultural heritage site has been identified by the authorities as a result of the field surveys conducted within the License Area.

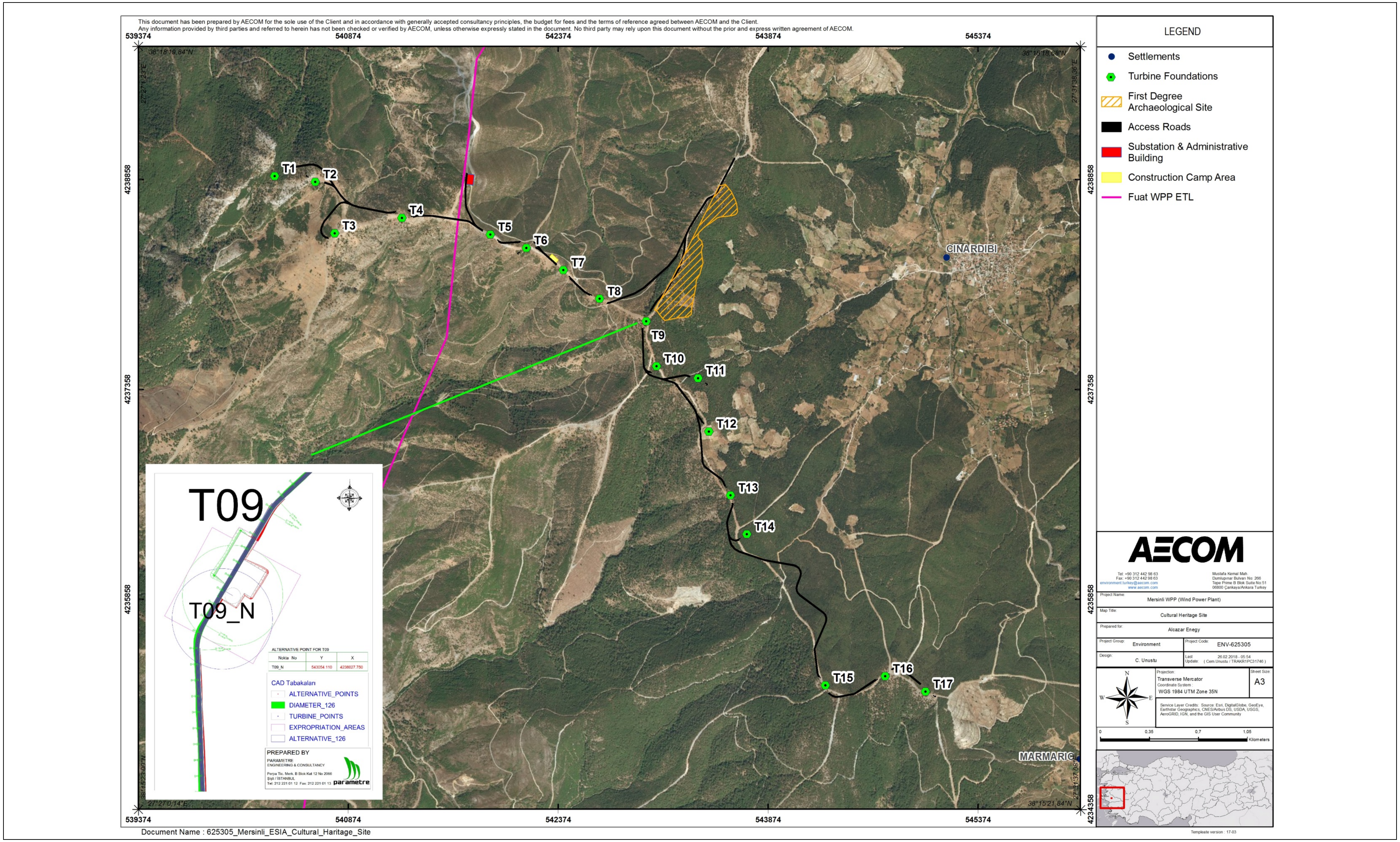


Figure 16-2. Location of the Registered 1st Degree Archaeological Site near Turbine-9

Intangible Cultural Heritage

The 2003 UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage, ratified by Turkey on 27 March 2006, aims to safeguard and ensure respect for the world’s Intangible Cultural Heritage (ICH), including raising awareness of the importance of intangible heritage and encouraging international cooperation and assistance. The Convention defines the intangible cultural heritage as the practices, representations, expressions, as well as the knowledge and skills (including instruments, objects, artefacts, cultural spaces), that communities, groups and, in some cases, individuals recognised as part of their cultural heritage. It is sometimes called living cultural heritage and includes oral traditions and expressions, including language; performing arts; social practices, rituals and festive events; knowledge and practices concerning nature and the universe; and traditional craftsmanship (*UNESCO, 2003*).

Turkey acceded to the 2005 UNESCO Convention on the Protection and Promotion of the Diversity of Cultural Expressions on 2 November 2017. The 2005 Convention recognises the rights of states to protect and promote the diversity of cultural expressions, encompassing cultural and natural heritage, movable cultural property, intangible cultural heritage and contemporary creativity. The executive body for the implementation of the Convention is the General Directorate of Research and Training, under the authority of the Ministry of Culture and Tourism (MoCT). An ICH Commission of Experts has been established, and local ICH Boards have been established in all administrative units of Turkey (e.g. Ege) in cooperation with the MoCT. These maintain provincial inventories of ICH.

In the scope of the ESIA studies, baseline ICH was aimed to be identified by means of desk based research and social field survey (see Chapter 13 for further information on the social field surveys). As part of the desk base research, the following national inventory to safeguard ICH was reviewed:

- The ICH National Inventory of Turkey;
- The Living Human Treasures National Inventory of Turkey.

As part of the social field survey, key informants (neighbourhood headmen) and community members have been identified and consulted with the aim of identifying intangible expressions of cultural heritage, including cultural sites which have not previously been recorded, sacred sites, religious/ceremonial areas, traditional stories, songs, etc. ancestral burials, cultural routes and significant/sacred landform features as well as traditional knowledge, including cultural and craft uses of natural resources, medicinal plants and areas used for harvesting them, have been considered in close collaboration with the ecology and social experts. In this scope, consultees were asked a series of open-ended questions including the following:

- Cultural Uses of Natural Resources
  - Are any plant species or other natural resources used by the local population for food, medicine and craft?
  - Are there any local traditional craftsmanship and artisanal handicrafts, outlets for sale/exchange purposes?
- Religious Practices
  - What religion(s) are practised in the area?
  - Where are the key places of worship? Who looks after these places (stewardship)?
  - Are there any former and current sacred sites and sites of religious, ritual or cultural importance in the area? Are there any culturally significant areas used for the performance of ceremonies and rituals?
- Community Use of Cultural Heritage
  - What festive and religious events, holidays and rituals are observed locally?
  - Burial grounds. Are there any memorials, burials (isolated graves) or cemeteries within or in the vicinity of the Study Area?
  - Are there any landmarks in the Study Area?
  - Places of memory – are there any places associated with historical and political characters?
  - Are there any expressions of music, song, stories or legends about the region's past and people who once lived here?

The baseline information collected on ICH through this process is presented below:

Elements in the ICH National Inventory

Among the elements found under the UNESCO Representative List of the Intangible Cultural Heritage for Turkey, Hıdrellez (Spring celebration) has been identified as an ICH that is being celebrated in the settlements located in the surroundings of the License Area. As part of the social field surveys, headmen of the Cumalı and Gökyaka informed that the local communities (including Dereköy) goes to the Akalandere locality every spring (on 6 May) to celebrate the Hıdrellez[13] as the awakening of nature. Akalandere is located between the neighbourhoods of Cumali and Gökyaka, approximately 2 km north of the Project's License Area boundary. Residents of Çınardibi, the largest settlement (in terms of population) located around the License Area, also celebrates the Hıdrellez. However, the interviews done with the community members did not indicate a common/specific place for celebration as it may change from year to year. Families celebrate this event separately at different locations and generally prefer the foothills of the forests surrounding the settlement.

Flatbread making and sharing culture (lavash, yufka) and Turkish coffee culture and tradition are other generic ICH elements identified to be present in all of the settlements located around the License Area.

Local Festive Events

Other than Hıdrellez, interviews held with the headmen and local people indicated that there are no other festive events held in Cumali or Gokyaka settlements. In Derekoy, honey festival is held annually in September for the last 3 years. Open markets are set at the neighbourhood square and natural products, traditional food, etc. are sold during the festive period. There are no festive events held in Çınardibi settlement.

Community Use of Cultural Heritage

There is a 1st degree archeological site registered within Project's License Area (north of Turbine-9) This site, located in Çınardibi neighbourhood, was not identified by the locals as a place used by the community for memorial or worshipping purposes and the place is not visited by the community members. Other than this, no other cultural heritage site was identified by the neighbourhood headmen or local people consulted within the scope of ESIA studies.

All the neighbourhoods in the study area are Sunni. Mosques located in settlement centres are the key places of worship. There is an entombed saint located in the centre of Gokyaka neighbourhood next to the neighbourhood mosque. This entombed saint was constructed in the memory of 40 martyr soldiers and a religious man named Sikh Ahmet. Married women, from both Gökyaka and nearby settlements, who cannot have children after marriage, visit the entombed saint to make a vow and pray for a child. Once they have a child, the women revisit this place and sacrifice an animal.

According to the headmen interviews, name of the Cumali (Cuma means Friday in Turkish) neighbourhood is originated from settlement's historical importance as the settlement was being visited by the nearby communities for Friday prayers, a congregational pray that Muslims hold every week. There is also a historical cemetery in Cumali neighbourhood's entrance.

Cultural Uses of Natural Resources

Local people indicated that they collect plant species (namely, sage and oregano) for own consumption (used as aromatic/herbal teas or culinary purposes). The flora expert who conducted the ecological field survey in and around the License Area identified only *Origanum onites (Turkish oregano or Izmir oregano)* within the study area during the survey period (see Chapter 11 for detailed information and assessment on flora species). This species exist generally within forest openings, as they prefer rocky and maquis habitats. In Turkey, this species is widespread in Mediterranean phytogeographical region and is not endemic. The turbine foundations are located within *Pinus brutia* (Turkish pine) forests.

Salvia fruticosa (sage), the plant species used by human as aromatic tea, was not identified by the flora expert within the study area during the survey period. However, based on literature and site survey conduct by experts previously in the region, *Salvia fruticosa* is expected to be present at higher elevations of Boz Mountains.

[13] 'Hidrellez' is a compound noun derived from 'Hidir' and 'Ilyas', which are believed to be the protectors of earth and water and the helpers of individuals, families and communities in need of them. To mark this occasion, various ceremonies and rituals connected with nature are performed, guaranteeing the wellbeing, fertility and prosperity of the family and community and protecting livestock and crops for the upcoming year (https://ich.unesco.org/en/RL/spring-celebration-hdrellez-01284).

Malva neglecta (dwarf mallow) and Malva sylvestris (common mallow) are also collected by local people from the sides of the agricultural fields and used for culinary purposes.

There is a fountain located on the main access road (around 1km west –air distance- of Gokyaka) of the Project (outside the License Area). According to the headman of Gokyaka neighbourhood, the local communities believe that the water from this fountain is curative for goiter. There is a fountain in the neighborhood centre of Çınardibi that is fed by water coming from the mountains. There are also water resources believed to be curative in Karaot and Dagtekke neighbourhood centres, which are located outside the License Area.

Çınardibi neighbourhood's population is formed of Pomaks[14], who have migrated to the region from Bulgaria. According to the information obtained by the headman, Çınardibi (also known as Osmanli) neighbouhood was established after the Ottoman-Russian War in 1878-79 (also known as 93 War). Çınardibi community members are still carrying their traditional food diets especially during important days such as birth, wedding etc. Example of these traditions are as follows:

- Fidulka: When the children start walking the first time, the parents bake a bread name Fidulka and the kids are expected to carry it to other neighbours.
- Simidal: It is a charity meal to serve for all neighbours. This meal is catered on the 40th day of the birth of a child.
- Maruniki: It is a traditional food made with pekmez (grape molasses) and pastry, which is usually served for an adult man before he joins to the army for to the military service.

There are also Pomak songs known by a few old women and transmitted to younger generations through daily communication.

In Cumali, the headman indicated that women produce needle point work (grep/çember) and sell these at the neighbourhood centre. In Dağtekke, there is a marketplace where local people, including women, sell natural products, traditional food, craftwork, etc.

16.3 Impact Assessment

16.3.1 Land Preparation and Construction Phase

The Project's land preparation and construction phase will involve earthworks and excavation activities, which may potentially have impacts on physical cultural heritage. Additionally, the registered 1st degree cultural heritage site will be within the License Area throughout the Project life.

Risk of Damaging Existing (Registered) Cultural Heritage due to Construction Activities

As described in Section 16.2, a non-registered (at the time of identification) cultural heritage site was identified by the authorities as part of the national EIA process in the northeast of Turbine-9. Before the registration of this site, which took place in October 2017, the Project Company identified an approximate area (located 250 m northeast of the current location of Turbine 9) and designated this area as restricted for design and construction. Based on this initial approximate location, the layout was designed to ensure that the construction ground for Turbine-9 does not coincide with this area. In this respect, foundation of Turbine-9 was shifted 30 m south of its originally planned position (see Figure 16-2).

Later, İzmir Regional Board for Conservation of Cultural Assets No 1 registered this area as a 1st degree archaeological site and identified the official protection boundaries. In the current situation, the archaeological site is located 90 m northeast of the turbine foundation. Thus, no physical impact is anticipated on the registered archaeological site due to construction and operation of Turbine-9 as a result of the micrositing studies conducted. Even though the turbine foundation does not coincide with the archaeological site, prior to the start of construction phase, the Project Company will also evaluate the feasibility of alternatives for locating the crane pad to a site, which would be at uttermost possible distance to the boundary of the archaeological site.

In the initial design, temporary construction camp site was located adjacent to the western border of the current archaeological site boundaries, which was registered after the siting of this compound. Following the registration of the archaeological site by the authorities and identification of exact borders, the Project Company reconsidered

[14] Pomak is the term used fo Slavic Muslim communities inhabiting Bulgaria, Greece and mostly Northwestern of Turkey.

the location of the temporary construction camp site as part of the ESIA process and decided to relocate the temporary camp site to an alternative site, which is located between Turbine-6 and Turbine-7. Final location and boundaries of the new camp site will be determined based on the results of the on-going topographical surveys. Thus, potential impact of the Project on the registered archaeological site due to the activities to be conducted by the construction workforce at the temporary construction camp site has been avoided by the redesign studies completed by the Project Company.

On the other hand, eventhough the locations of the turbine foundation (Turbine-9) and the camp site has already been revised to avoid impacts on the registered archaeological site, further measures will be taken by the Project Company to protect the registered area. Firstly, prior to the start of construction phase, the Project Company will evaluate the feasibility of alternatives for relocating the part of the access road (which is an existing forest road) that crosses the registered archaeological site boundaries to keep it outside if possible. Typical pre-design cross-section of for access roads was provided in Chapter 3 (see Figure 3-8). As can be seen the effective width (two lanes) of the access road will be 6 m, while the total width including the side ditches will be approximately 7.5 m. The existing forest road/breakers has an approximate width of 10 m. The improvement requirements of this road and the final design for the cross-section will be determined based on the results of geotechnical surveys to be completed. Preliminary surveys indicate that the ground is likely to have sufficient quality. If the results of the detailed geotechnical surveys confirm that the quality of the ground is sufficient, the road will be compacted and the layers indicated in the typical cross-section drawing (see Chapter 3, Figure 3-8) will be implemented. If the geotechnical survey results necessitate ground improvement, initially the first 20 cm of the ground will be excavated and then the compaction works will be conducted and the layers will be implemented.

Due to the compaction and/or improvement works planned for the access road and as the site will remain within the Project License Area throughout the operation phase, a Cultural Heritage Management Plan will be developed by qualified experts prior to the start of construction phase, if necessary based on archeological work to be conducted in advance of construction. This Management Plan will identify site specific measures ensuring avoidance/minimisation of potential impacts that may be caused by the use of the existing forests roads in the scope of the Project. Accordingly, mitigation measures will be in place to ensure earthworks and construction activities are restricted to designated sites, all personnel are informed about the work restriction at this cultural heritage area, and coordination with authorities is established so that access to the site is not prevented or restricted due to the Project. A Chance Find Procedure will also be implemented to prevent potential harm to any other undiscovered archaeological finds that might be present at the Project License Area. With the development and implementation of the Cultural Heritage Management Plan and the Chance Find Procedure, no significant impact is anticipated on the registered 1st degree archeological site.

Access Restrictions

Access to construction sites will not be allowed during the land preparation and construction phase. Since the identified cultural heritage site is located adjacent to the access road, communities' access to this site may be regulated in cooperation with the authorities. This impact will be temporary for the construction phase, as the Project will not interfere with public access during the operation phase.

Potential Impact on Intangible Cultural Heritage

Baseline information on the ICH within the study area is presented in Section 16.2. The Project is not anticipated to cause any impact on the traditional cultural resources or their access. All of the neighbourhood centres are located outside the License Area (a few houses of the Marmaric Permaculture Community that belongs to Dernekli neighbourhood, see Chapter 13 and 18 for information on this community) and there is no place identified within the License Area which is used for festive events or religious or traditional practices. Thus no impact is anticipated on the community use of cultural heritage due to the Project.

The location of the fountain identified on the main access road (around 1km west –air distance- of Gokyaka) of the Project (outside the License Area), which is believed by the locals to be curative for goiter, will be taken into consideration in the planning of construction activities. The Project Company will inform and consult with the Gokyaka neighbourhood headman if the availability/accessibility of this resource is to be temporarily affected due to construction activities. The Project Company will also take necessary measures to ensure that the availability/accessibility of this resource is not impacted by the Project during the operation phase.

As the plant species existing within the License Area (*Origanum onites-Turkish oregano)* and used by local people for culinary and aromatic purposes is widespread in the region and do prefer rocky and maquis habitats which do not generally correspond to turbine locations, access of local people to this species is not anticipated to be restricted due to the Project construction or operation. In the operation phase, there will be no access restriction within the License Area, any project-related impact to the free access to these resources is not anticipated due to the Project.

Risk of Damaging Potential Chance Finds

Chance finds are defined as physical cultural heritage encountered unexpectedly during project implementation (*EBRD, May 2014*). There is a potential for encountering chance finds during the Project's land preparation and construction phase. In case chance finds are discovered as a result of Project activities, management measures will be taken to avoid adverse impacts, as described in Section 16.4.

16.3.2 Operation Phase

The operation phase of the Project will not involve earthworks or excavation activities. Thus, the Project is not likely to have any physical impact on cultural heritage. On the other hand, since the 1st degree cultural heritage site will remain within Project's License Area throughout the operation phase. According to the zone of visibility study conducted as part of the visual impact assessment (see Chapter 12; Figure 12-1), a number of Project turbines (7-11) are likely to be visible from different points of the 1st degree archaeological site. Turbine-9 will be located approximately 90 m south-southwest of the southern boundary of the archaeological site. Similarly, visitors of the site may temporarily experience the noise impact caused by Turbine-9. A Cultural Heritage Management Plan will be developed and implemented to ensure that the visitors of this site and access to this site is not significantly affected by the Project activities.

16.3.3 Closure Phase

In the closure phase, decommissioning works could be conducted at the footprints of the Project facilities. Thus, no additional land disturbance that may cause damage to chance finds is likely to occur during the closure phase. On the other hand, in case chance finds are encountered during the decommissioning works, management measures will be taken to avoid adverse impacts as described in Section 16.4.

16.4 Mitigation Measures

Turkish Law on Conservation of Cultural and Natural Assets (Law No: 2863, Official Gazette 18113, Date: July 23, 1983) defines the notification obligation and procedures to be followed in case of discovery of cultural and natural property. According to Article 4 of the Law, "persons who discover movable and immovable cultural and natural property, owners, proprietors or occupants that know or have recently found out about the existence of cultural and natural property on the land they own or use shall be obliged to notify the nearest museum directorship or the neighbourhood headman or the local administrators of other places within at the latest three days. If such property is in military garrisons and restricted areas, the relevant command levels shall be notified in line with the relevant procedure. The neighbourhood headman, the local administrator receiving such notification or the relevant authorities that are directly notified of such property shall take the necessary measures to protect and secure such property. The neighbourhood headman shall notify the nearest local administrator of the situation and the measures taken on the same day. The local administrator and other authorities shall notify in writing the Ministry of Culture and Tourism and the nearest museum directorship within ten days. Upon receiving this notification, the Ministry and Museum Director shall instigate due proceedings as soon as possible in line with the provisions of this law". The Project will comply with the requirements of Turkish Law with regard to management of any probable chance finds that may be discovered during the Project works. Appendix F summarizes the Chance Finds Procedure to be followed in the scope of the Mersinli WPP Project.

The following mitigation measures will be implemented in order to ensure that existing cultural heritage site in the vicinity and potential chance finds that may be encountered during earthworks and construction activities are managed properly:

- A Cultural Heritage Management Plan will be developed by qualified experts prior to the start of construction phase, if necessary based on archeological work to be conducted in advance of construction.
- The Project Company will evaluate the feasibility of alternatives for relocating the part of the access road (which is an existing forest road) that crosses the registered archaeological site boundaries to keep it outside if possible.

- The Project Company will evaluate the feasibility of alternatives for locating the crane pad for Turbine-9 to a site, which would be at uttermost possible distance to the boundary of the archaeological site.
- During the ESIA disclosure meetings to be conducted, the communities will be informed with regards to the identified cultural heritage site and access restrictions to be implemented during the land preparation and construction phase.
- Strict speed limits will be set and implemented at the main access road.
- Install fencing between the access road and the cultural heritage site, with proper signage restricting access to the cultural heritage site.
- In coordination with the authorities, it will be ensured that access to the 1st degree archaeological site is not prevented or restricted due to the Project.
- Earthworks and construction activities will be limited to designated areas.
- Noise management measures identified in Chapter 7 of this ESIA will be implemented.Dust suppression measures identified in Chapter 8 of this ESIA will be implemented.
- The Chance Finds Procedure will be implemented by the Project Company and the contractor's environmental and social teams throughout the land preparation and construction phase of the Project.
- All the Project Company and the contractors' personnel will be informed about the implementation of the Chance Finds Procedure and related trainings will be provided.
- In case of a chance find, all activities that may potentially harm the archeological find will be ceased, the area will be secured, and the chance find will be recorded. The Museum Directorate will be notified immediately for further actions.
- The Project Company will collaborate with the authorities for the investigation of the site and will take relevant measures to avoid any further disturbance.
- Within the scope of stakeholder engagement to be conducted, ongoing information disclosure to communities will include any chance finds. If deemed necessary, consultations with local communities will also be done.
- The Project Company will inform and consult with the Gokyaka neighbourhood headman regarding the fountain located on the main access road, if the availability/accessibility of this resource is to be temporarily affected due to construction activities. The Project Company will also take necessary measures to ensure that the availability/accessibility of this resource is not impacted by the Project during the operation phase.
- In case of any grievance regarding intangible cultural heritage, the grievance will be responded to appropriately in compliance with the grievance procedure.

Assessment of potential impacts and relevant mitigation measures to be taken are summarized in Table 16-1.

Table 16-1. Potential Cultural Heritage Impacts, Proposed Mitigation Measures and Residual Impacts

Impact Description	Project Phase	Receptor	Impact Magnitude						Sensitivity/ Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Magnitude	Reversibility	Duration	Frequency	Overall Magnitude				
Damage risk to recognized cultural heritage due to earthworks, excavation activities, etc.	• Land preparation and construction • Closure	• Registered 1st degree archaeological site within the License Area	Restricted	Low	Irreversible	Short term	One-off	Low	High	Moderate	• Develop and implement a Cultural Heritage Management Plan • Evaluate the feasibility of alternatives for relocating the part of the access road (which is an existing forest road) that crosses the registered archaeological site boundaries to keep it outside if possible. • Evaluate the feasibility of alternatives for locating the crane pad for Turbine-9 to a site, which would be at uttermost possible distance to the boundary of the archaeological site • Limit earthworks and construction activities to designated areas and do not allow any work to be conducted on the cultural heritage area • Ensure all personnel are informed about the work restriction in the cultural heritage area • Install fencing between the access road and the cultural heritage site, with proper signage restricting access to the cultural heritage site during the construction phase. • In coordination with the authorities, it will be ensured that access to the 1st degree archaeological site is not prevented or restricted due to the Project during the operation phase. • Set strict speed limits at the main access road. • Implement the dust suppression and noise management measures identified in this ESIA	Minor
Restriction of access to recognized cultural heritage sites	• Land preparation and construction • Closure	• Visitors of the registered 1st degree archaeological site within the License Area	Local	Low	Short-term reversible	Short term	Intermittent	Low	Low	Minor	• During the ESIA disclosure meetings to be conducted, ensure that the communities are informed with regards to the identified cultural heritage site and access restrictions during the land preparation and construction phase. Coordination with the authorities to ensure that access to the 1st degree archaeological site is not prevented or restricted due to the Project during operation phase	Negligible
	• Operation					Long term		Medium		Minor		Negligible
Nuisance due to operation of turbines (noise and visual)	• Operation	• Visitors of the registered 1st degree archaeological site within the License Area	Local	Medium	Short-term reversible	Short-term	One-off	Medium	Low	Minor	• Develop and implement a Cultural Heritage Management Plan • Implement noise management measures identified in this ESIA	
Damage risk to chance finds to be encountered during Project works	• Land preparation and construction • Closure	• Chance finds	Restricted	Low	Irreversible	Short term	One-off	Medium	Low to High (depending on the value of the discovered assets)	Minor to Major (depending on the value of the discovered assets)	• Comply with the relevant provisions (Article 4) of the Turkish Law on Conservation of Cultural and Natural Assets (Law No: 2863) • Train all Project personnel including contractors on the implementation of Chance Finds Procedure • Implement Chance Finds Procedure • Collaborate with the authorities for the investigation of site and taking relevant measures to avoid any further disturbance • Ensure ongoing reporting to communities includes chance finds	Negligible
Impact on intangible cultural heritage	• Land preparation and construction • Operation • Closure	• Gokyaka neighbourhood (fountain located on the main access road)	Local	Low	Short-term reversible	Short term	Intermittent	Low	Low	Minor	• Implement the Stakeholder Engagement Plan (including grievance mechanism) • Inform and consult with the Gokyaka neighbourhood headman regarding the fountain located on the main access road, if the availability/accessibility of this resource is to be temporarily affected due to construction activities. • Take necessary measures to ensure that the availability/accessibility of this resource is not impacted by the Project during the operation phase.	Negligible

17. Cumulative Environmental and Social Impact Assessment

In parallel to the global energy trends, wind power developments have shown a rapid growth in Turkey in the last 10 years. The installed capacity of the wind power plants in the country has grown from about 150 MW in 2007 to more than 6,100 MW by the end of 2016. With its substantial potential, Aegean Region has gained a leading position with an installed capacity exceeding 2,375 MW (around 39% of the cumulative installed capacity in Turkey) (*Turkish Wind Energy Association, January 2017. Turkish Wind Energy Statistics Report*).

Mersinli Wind Power Plant (WPP) Project is planned in Izmir province of the Aegean Region. As of January 2017, Izmir, on its own, hosts 19% (around 1,170 MW) of the operational wind power plants in Turkey. An additional capacity of 190 MW is also under construction in the city. There are also wind power plant projects that are currently under evaluation by the relevant authorities (*Turkish Wind Energy Association, January 2017*).

The previous chapters of this ESIA have included assessments on the potential project-level impacts of the stand-alone Mersinli WPP. As the project is located in a region where multiple wind power plant projects are in operation, under construction or in evaluation/planning stages, potential cumulative environmental and social impacts of the Mersinli WPP on the Valued Environmental and Social Component (VESCs), together with other existing or future wind power developments have been given particular importance and assessed in this chapter of the ESIA Report.

17.1 Assessment Methodology and Data Sources

The Cumulative Environmental and Social Impact Assessment study to be conducted for Mersinli WPP will follow the methodologies specified by relevant international guidelines. Being one of the most recent and comprehensive documents, the Good Practice Handbook on the Cumulative Impact Assessment and Management (IFC, August 2013) and Cumulative Effects Assessment for (Tafila Region) Wind Power Projects (February 2017), published by the International Finance Corporation (*IFC, August 2013*), will be the main references for the methodology to be applied in the scope of Mersinli WPP, while the following additional key references will also be resorted:

- Scottish Natural Heritage’s (SNH) Guidance for Assessing the Cumulative Impact of Onshore Wind Energy Developments (March 2012);
- Cumulative Effects Assessment and Management Guidance published by International Association for Impact Assessment (IAIA) (Canter L., and William R., 2009; http://www.iaia.org/);
- European Commission’s (EC) Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions (May, 1999);
- Cumulative Effects Assessment Practitioners Guide prepared by the Cumulative Effects Assessment Working Group (Hegmann, G. C. Cockling, R. Creasey, S. Dupuis, Kennedy, L. Kingsley, W. Rodd, H. Spaling and D. Stalker; February and AXYS Environmental Consulting Ltd. for the Canadian Environmental Assessment Agency (1999).

IFC defines cumulative impacts as “those that result from the successive, incremental, and/or combined effects of an action, project, or activity (collectively referred as “developments”) when added to other existing, planned, and/or reasonably anticipated future ones. Multiple and successive environmental and social impacts from existing developments, combined with the potential incremental impacts resulting from proposed and/or anticipated future developments, may result in significant cumulative impacts that would not be expected in the case of a stand-alone development (IFC, August 2013) (see Figure 17-1).

As mentioned in Chapter 11, AECOM approached Doğa Derneği in October of 2017, to acquire information on the current status of Boz Dağlar KBA. In this scope, up-to-date information on other projects in the area that could be considered in assessment of cumulative impacts and potential cumulative impact assessment studies regarding impacts on birds and bats, and there are any bird/bat baseline and monitoring studies was requested. Currently, there is no information available from the database of the Doğa Derneği that could be considered in the scope of this CIA study.

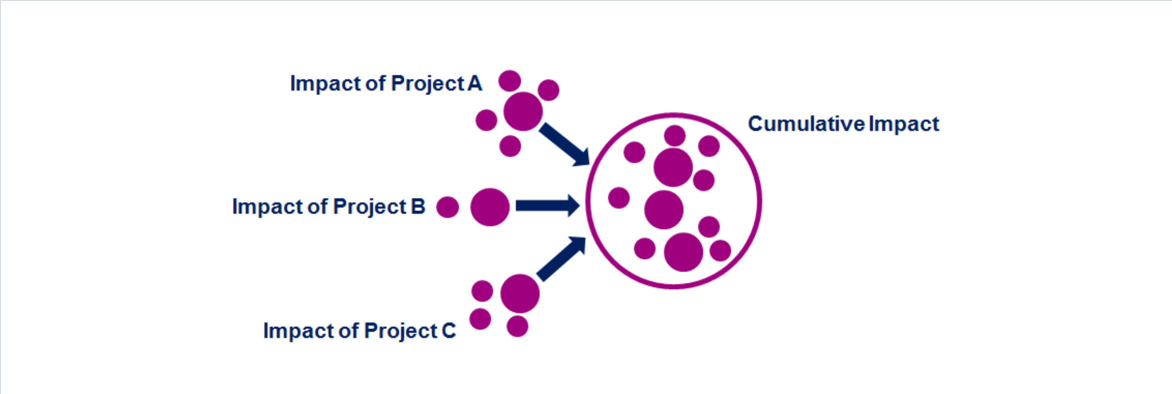


Figure 17-1. Illustration of Cumulative Impacts

The need for Cumulative Impact Assessment (CIA) emerges in circumstances where a series of developments, which may or may not be of the same type, is occurring, or being planned within an area where they would impact the same VESCs, which are defined as the environmental and social attributes that are considered to be important in assessing risks. The CIA process to be implemented in case of such circumstances is defined by IFC (August 2013) as (i) analyzing the potential impacts and risks of proposed developments in the context of the potential effects of other human activities and natural environmental and social drivers on the chosen VESCs over time, and (ii) proposing concrete measures to avoid, reduce, or mitigate such cumulative impacts and risk to the extent possible.

In light of the evolving global practice, IFC proposes a six-step approach for conducting Project-initiated CIA studies (IFC, August 2013). This approach, which will be adopted in the CIA study to be conducted as a part of the Mersinli WPP ESIA studies, is illustrated in Figure 17-2.

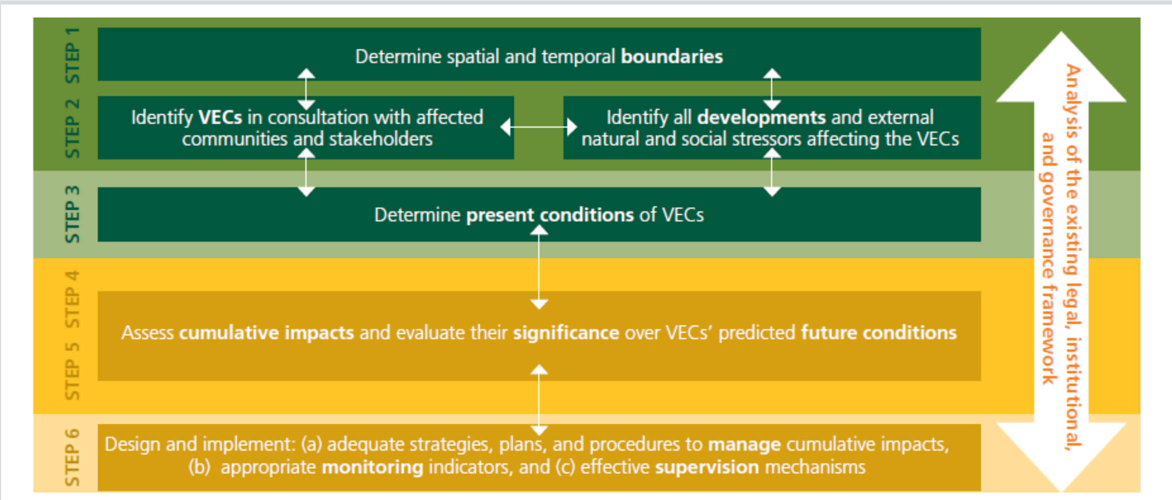


Figure 17-2. Six-step CIA Approach (*Source: IFC, August 2013*)

17.2 Cumulative Impact Assessment Study

The following section presents the implementation of the step-wise methodology and results of the CIA study for the Project. Steps to be followed are listed below:

- Step 1: Scoping Phase I – VESCs, Spatial and Temporal Boundaries
- Step 2: Scoping Phase II – Other Activities and Environmental Drivers
- Step 3: Establish Information on Baseline Status of VESCs
- Step 4: Assess Cumulative Impacts on VESCs
- Step 5: Assess Significance of Predicted Cumulative Impacts
- Step 6: Management of Cumulative Impacts

17.2.1 Step 1: Scoping Phase I – VESCs, Spatial and Temporal Boundaries

In the first step of the CIA study, initially VESCs will be identified in consideration of the environmental and social assessments done in the previous chapters of this ESIA Report. Afterwards, time frame (spatial boundaries) for the analysis will be determined and geographical scope (spatial boundaries) of the assessment will be established as the CIA Study Area. Details of the Step 1 assessments are provided in the following sections.

17.2.1.1 Valued Environmental and Social Components (VESCs)

The good CIA practice suggests that the CIA studies are conducted with a focus on the environmentally or socially important natural resources, ecosystems or human values, which are in this report referred to as Valued Environmental and Social Components (VESCs) and may include the following:

- Physical features (e.g. habitats, wildlife populations),
- Social conditions (e.g. health, economics), or
- Cultural aspects (e.g. archaeological sites).

This approach entails the CIA studies to be looked at “from the VESCs point of view”, instead of a Project-centered perspective as this is the case in the ESIA studies and allows assessment of combined (i.e., cumulative) impacts of various projects/activities on each VESC. The Project-centered perspective of the ESIA and the VEC-centered perspective of CIA processes are comparatively illustrated in Figure 17-3.

ESIA Perspective (Project-centered) CIA Perspective (VEC/VESC-Centered Perspective)

Figure 17-3. ESIA (Project-centered) vs. CIA (VESC-centered) Perspectives

In line with the good CIA perspectives as explained above, the CIA study for the Mersin WPP will focus on the impacts on the selected VESCs that are to be affected by the Project activities. In other words, any VESC that would be affected by other projects/activities, but not the Mersinli WPP, will not be assessed in the scope of the CIA. This approach of the study is illustrated in the sketch given in Figure 17-4. As can be seen, although the fish is affected by one of the other actions, it should not be considered as VEC in the scope of a cumulative impact assessment to be done for the proposed project, because it is not affected by the proposed action under review.

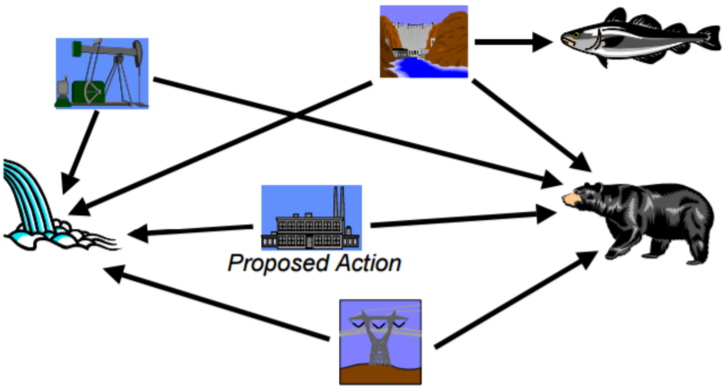


Figure 17-4. Focusing on Impacts on VECs

(Source: Effects Assessment Working Group for the Canadian Environmental Assessment Agency; Hegmann, G. C. Cockling, R. Creasey, S. Dupuis, Kennedy, L. Kingsley, W. Rodd, H. Spaling and D. Stalker, February 1999)

In consideration of the findings of the baseline and impact assessment studies conducted for the Mersinli WPP, valued environmental and social components to be considered in the CIA have been selected as presented in Table 17-1.

Table 17-1. Selected VESCs for the Mersinli WPP CIA Study

Environmental/ Social Subject	Valued Environmental/Social Components	Specific VESCs
Biodiversity and living resources	Key Biodiversity Areas (KBAs)	Boz Dağlar KBA Spil Dağı KBA Nif Dağı KBA
	Bird populations	*Ciconia nigra* *Ciconia ciconia* *Pandion haliaetus* *Pernis apivorus* *Hieraaetus pennatus* *Accipiter nisus* *Accipiter gentilis* *Circaetus gallicus* *Buteo rufinus* *Buteo buteo* *Falco tinnunculus* *Falco peregrinus* *Falco eleonorae*
	Bats	*Pipistrellus pygmaeus,* *Pipistrellus pipistrellus,* *Miniopterus schreibersii,* *Barbastella barbastellus*
Land Use	Forests	Coniferous Forests
Air emissions	Air quality in local settlements	Marmariç, Dereköy, Gökyaka, Cumalı

Environmental/ Social Subject	Valued Environmental/Social Components	Specific VESCs
Noise	Background noise levels at local settlements	Çınardibi, Marmariç
Visual environment	Visual amenity of local communities (visual receptors)	Marmariç, Çınardibi, Cumalı
Cultural heritage	Archaeological sites	1st Degree archaeological site in Zeybekmezarlığı locality located approximately 250 m northeast of T-9.
Social and economic environment	Agricultural activities	Users of the affected parcels
	Beekeeping	Local people in Cinardibi, Gokyaka, Derekoy, Dagtekke who are engaged in beekeeping activities

17.2.1.2 Spatial and Temporal Boundaries

Cumulative impacts can occur (a) when there is “spatial crowding” as a result of overlapping impacts from various actions on the same VESC in a limited area, (e.g., increased noise levels in a community from industrial developments, existing roads, and a new highway; or landscape fragmentation caused by the installation of several transmission lines in the same area) or (b) when there is “temporal crowding” as impacts on a VESC from different actions occur in a shorter period of time than the VESC needs to recover (e.g., impaired health of a fish’s downstream migration when subjected to several cascading hydropower plants) (*IFC, August 2013*).

For the determination of spatial boundaries of the CIA Study Area, an iterative process has been applied in consideration of applicable administrative, geographical, topographical, etc. boundaries. As the Mersinli WPP is located within the boundaries of three different districts of Izmir, namely Kemalpaşa, Torbalı and Bayındır, the area restricted by the outer borders of these districts have been determined as the wider CIA Study Area since this area would cover all other activities and environmental drivers (as identified in Step 2 of the CIA) that would affect the selected VESCs. As the second step, this CIA Study Area has been narrowed down or expanded at certain locations to include the Key Biodiversity Areas (KBAs) and consider habitat integrity. The license area is located within Boz Dağlar KBA and close to the Nif Dağı and Spil Dağı KBAs. Thus, considering habitat integrity; the CIA Study Area is identified considering the borders of the three KBAs; Boz Dağlar KBA, Nif Dağı KBA and Spil Dağı KBA. The CIA Study Area has a maximum width of approximately 125 km and the total area is 303.887 ha.

This way, the CIA Study Area was determined to ensure that the area is sufficiently large to cover the Mersinli WPP’s direct area of influence and the borders of the selected VESCs. The CIA Study Area is demonstrated on the map given in Figure 17-5.

The Electricity Generation License for the Mersinli WPP was issued by the electricity Market Regulatory Authority (EMRA) on July 5th, 2012 for 49 years on behalf of the former Project Owner. The Project Company has applied to the EMRA for the amendment of existing license based on the current layout.

Similar to Mersinli WPP, the Electricity Generation License duration for other wind power plant projects existing and planned in the region is generally 49 years. Accordingly, temporal boundary of the CIA study has been determined as the Project life of the Mersinli WPP, which will start with the beginning of land preparation activities and be limited with the duration of the applicable Electricity Generation License (assuming no license extension at the end of license duration). It should be noted that construction of wind power plant projects are typically completed in relatively short periods when compared to operation duration, thus the temporal crowding of the impacts resulting in cumulative impacts would occur during the operation phases of the contributing projects, if there is any. Hence, the operational phase of the Mersinli WPP will be the main focus of this CIA study.

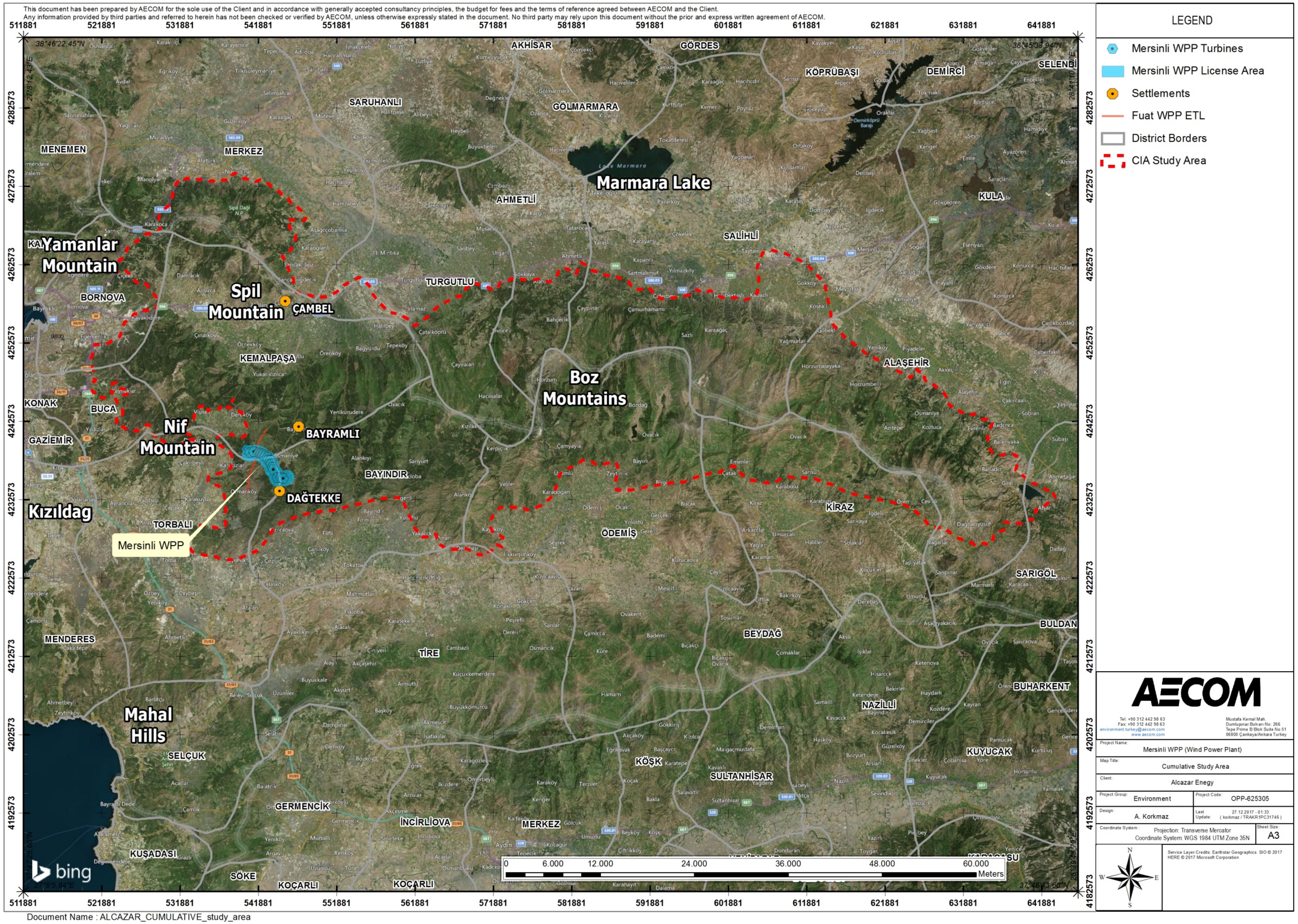


Figure 17-5. CIA Study Area

17.2.2 Step 2: Scoping Phase II – Other Activities and Environmental Drivers

Once the CIA Study Area and the spatial and temporal boundaries of the assessment were determined, other past, existing and foreseeable activities/developments and environmental drivers within these boundaries that would affect the condition of the selected VESCs were identified on the basis of a review of public databases of governmental organizations and relevant sectoral associations. Main sources resorted to in this process are listed below:

- Electricity Generation Licenses issued by the EMRA for wind power plant projects;
- EIA Positive Decisions issued by the Ministry of Environment and Urbanization (MoEU);
- Turkish Wind Energy Association's recent statistics reports and atlas
- GEODATA – Database of the Turkish Ministry of Forestry and Water Affairs

17.2.2.1 Other Activities

Mersinli WPP is the "Project under Assessment" in this CIA study prepared as a part of the Project ESIA. In identifying other contributing projects within the CIA Study Area, the study has focused primarily on the wind power sector projects, as they would have common types of impacts that would affect the same VESCs. Exceptionally, major electricity transmission line (ETL) projects associated with the identified wind power plant projects will also be included in the assessment, wherever possible. In addition to other wind power plant projects and ETL projects, the CIA study also considered hydroelectric power plants and mine projects in the CIA Study Area. Reasonable efforts have been made to determine and include both the existing (currently operational) and future projects in the CIA. With regard to selection of future projects, "Cumulative Effects Assessment Practitioners Guide" prepared for the Canadian Environmental Assessment Agency's (*Hegmann et al., AXYS Environmental Consulting Ltd. February 1999*) three future action categories have been considered; certain, reasonably foreseeable and/or hypothetical. Description of each category and their descriptors are depicted in Figure 17-6.

Certain	• The action will proceed or there is high probability the action will proceed	Descriptors for Certain (Existing) Projects o Projects that are currently in operation or under construction
Reasonably Foreseeable	• The action may proceed, but there is some uncertainty about this conclusion	Decriptors for Reasonably Foreseeable Projects o Projects that obtained EIA Positive/EIA not Required Decision in the last 5 years but not started construction yet o Projects that obtained Electricity Generation License/Pre-license in the last 5 years but not started construction yet
Hypothetical	• There is considerable uncertainty whether the action will ever proceed.	Descriptors for Hypothetical Projects o Projects discussed on a conceptual basis o Projects that obtained relevant EIA Decision or Electricity Generation License/Pre-license more than 5 years ago and not started construction yet o Projects for which Electricity Generation License applications are under evaluation by authorities

Figure 17-6. Categorisation of Future Projects

(Source: Adapted from (Hegmann et al., AXYS Environmental Consulting Ltd. February 1999)

The Guide further recommends inclusion of at least the certain scenario and at best the most likely future scenario, or in other words, “reasonably foreseeable projects” that could have a significant cumulative effect with the Project Under Assessment, in this case Mersinli WPP. Accordingly, the future projects included in this CIA study involved both the certain and reasonably foreseeable projects identified within the CIA Area.

WPP Projects located within the initial (wider) CIA Study Area including the reasonably foreseeable, existing and hypothetical projects are listed in Table 17-2. These projects are also presented in the Wind Atlas (2017) of the Turkish Wind Energy Association (see Figure 17-7).

The nearest WPP to Mersinli Project is the Fuat WPP (33 MW; 10 turbines), which is operating in the north/north-east of the License Area since 2015. Closest distance between the turbines of the Mersinli WPP and Fuat WPP is around 3.5 km (air distance). According to the information provided in the Project Description File dated 2009 (which was basis to the EIA not Required Decision dated March 5, 2009) Fuat WPP was first planned with 126 turbines and a total installed capacity of 252 MWe by the Project owner Fuatres Elektrik Üretim A.Ş. (Fuatres), a Borusan EnBW Enerji subsidiary. This Project Description File excluded the energy transmission line (ETL), since the EIA Regulation in force at the time required ETLs (having a voltage level of at least 154 kV and length of at least 15 km) to undergo a separate EIA process. Following review of the Project Description File by the former Ministry of Environment and Forestry, an “EIA not Required” decision was issued on March 5, 2009 with Decision No: 592 for the said 252 MWe capacity Fuat WPP Project. Later, the project was revised, number of turbines were decreased to 10 and the installed capacity was decreased to 30 MWe and relevant electricity generation license was obtained for the revised project on February 23, 2012 (License No EÜ/3703-17/2256) from the Energy Market Regulatory Authority. Following this, an application was made to the İzmir Provincial Directorate of Environment and Urbanization for a revision of its “EIA Not Required Decision” to cover the revised project, which resulted in provision of the required approval on November 4, 2013 with document No: 5108/25722. In addition and as stated above, a separate full EIA process was conducted for the 154 kV, 20 km Project ETL and the related “EIA Positive” certificate with decision number 3505 was obtained on June 13, 2014 (see Table 17-3). An IFC, Equator Principles and national legislation compliant ESIA Report was also prepared in 2014 for the revised Fuat WPP Project and the project is in operation since 2015, currently with 10 turbines and 30 MWe installed capacity, in line with its energy generation license.

Karabel WPP (3 MW; 1 turbine), which is in operation since 2016, is located around 7.5 km northwest (air distance) and Ege WPP (9.2 MW; 4 turbines), which is in operation since 2015, is located around 20 km north-east (air distance) of the Mersinli WPP Project. Information on WPP Projects located within the CIA Study Area are presented in Table 17-2.

Table 17-2. Wind Power Plant Projects Identified within the CIA Study Area

Project	Location (District)	Installed Capacity (MW)	Electricity Generation License Information			Relevant EIA Decision	Project Status	Project Category
			Start	End	Duration			
Mersinli WPP	Bayındır, Kemalpaşa, Torbalı	55	05/07/2012	05/07/2061	49 years	EIA Positive 18/07/2016	Pre-construction	Reasonably Foreseeable
Fuat WPP	Kemalpaşa	33	23/02/2012	23/02/2061	49 years	EIA not Required Decision 05/03/2009	In operation since 2015	Existing
Karabel WPP	Kemalpaşa	3,4	23.02.2012	23.02.2061	49 years	N/A	In operation since 2016	Existing
Ege WPP	Kemalpaşa	9.2	20.12.2011	20.12.2060	49 years	N/A	In operation since 2015	Existing
Sibel WPP	Kemalpaşa	102	23.11.2011	23.11.2060	49 years	N/A	N/A	Hypothetical
Beydağ WPP	Ödemiş	30.6	Pre-license application under evaluation			N/A	Planning	Hypothetical
Veliler WPP	Bayındır	15	Pre-license application under evaluation			N/A	Planning	Hypothetical

Project	Location (District)	Installed Capacity (MW)	Electricity Generation License Information			Relevant EIA Decision	Project Status	Project Category
			Start	End	Duration			
Beşpınar WPP	Kemalpaşa	50	Pre-license application under evaluation			N/A	Planning	Hypothetical
Kemalpaşa WPP	Kemalpaşa	50	Pre-license application under evaluation			N/A	Planning	Hypothetical
Turgutlu WPP	Turgutlu	30	Pre-license application under evaluation			N/A	Planning	Hypothetical
Salihli WPP	Salihli	28	Pre-license application under evaluation			N/A	Planning	Hypothetical

Source: EMRA License Database, September 2017 (http://www.epdk.org.tr/); MoEU EIA Decisions Database, September 2017 (http://www.csb.gov.tr/)

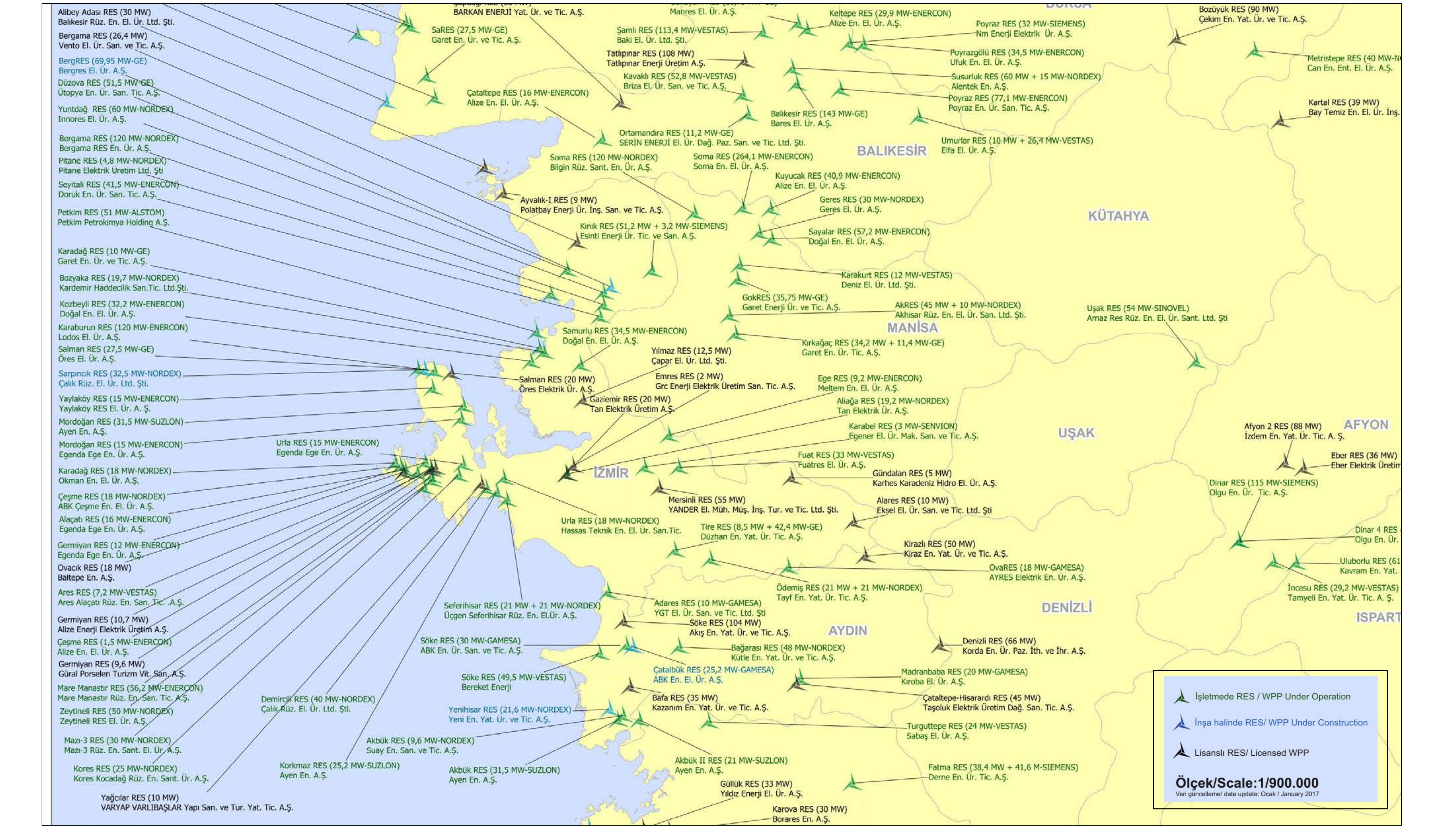


Figure 17-7. Wind Power Plant Projects Located in the Region According to the Wind Atlas *(Turkish Wind Energy Association, 2017)*

The 154 kV ETL of the Fuat WPP is crossing the Mersinli WPP License Area (between Turbine-4 and Turbine-5), through which Mersinli WPP will be connected to the national grid, has been identified as another activity to be considered in the scope of the CIA study (see Table 17-3). In addition, Alaşehir-Havza-Derbent-Bağyurdu ETL is a recent ETL Project located in the region.

Table 17-3. Associated ETL Projects Identified within the CIA Study Area

Project	Location (District)	Voltage	Relevant EIA Decision	Project Status	Project Category
Fuat WPP ETL	Bayındır, Kemalpaşa, Torbalı	154 kV	EIA Positive 13/06/2014	In operation	Existing
Alaşehir-Havza-Derbent-Bağyurdu ETL	Kemalpaşa, Alaşehir Turgutlu	154 kV	EIA Positive 16/08/2017	N/A	Reasonably Foreseeable

The wider region in which the Mersinli WPP is located is also rich in geothermal resources located within borders of districts close to Mersinli such as Alasehir, Manisa. Within the CIA Study Area, however, there is only one JES, details of which are presented in Table 17-4.

Table 17-4. Geothermal Power Plants located within the CIA Study Area

Project	Location (District)	Installed Capacity (MW)	Electricity Generation License Information			Relevant EIA Decision	Project Status	Project Category
			Start	End	Duration			
Özmen-1 JES	Alasehir	24	14.07.2016	22.01.2043	27	EIA Positive 05.02.2016	In operation	Existing

In addition to energy projects, other sectors such as mining and dams were also considered in the CIA study. In this regard, the mining Projects located within the CIA Study Area were identified as listed in Table 17-5 and the dam reservoirs and ponds located in the CIA Study area are listed in Table 17-6.

Table 17-5. Mining Projects Located within the CIA Study Area

Mine Project	Location	Project Category
Mine Area -1	Kavaklıdere Neighborhood, Bornova District, İzmir	Existing
Mine Area -2	Kavaklıdere Neighborhood, Bornova District, İzmir	Existing
Mine Area -3	Aşağıçobanisa Neighborhood, Şehzadeler District, Manisa	Existing
Mine Area -4	Sancaklıiğdecik Neighborhood, Şehzadeler District, Manisa	Existing
Mine Area -5	Yedieylül Neighborhood, Torbali District, İzmir	Existing
Mine Area -6	Helvacı Neighborhood, Torbali District, İzmir	Existing
Mine Area -7	Dağtekke Neighborhood, Torbali District, İzmir	Existing
Mine Area -8	Söğütören Neighborhood, Bayindir District, İzmir	Existing
Mine Area -9	Çamlıbel Neighborhood, Bayindir District, İzmir	Existing
Mine Area-10	Çamlıbel Neighborhood, Bayindir District, İzmir	Existing
Mine Area -11	Suçıktı Neighborhood, Ödemiş District, İzmir	Existing

Table 17-6. Dam Reservoir and Ponds Located within the CIA Study Area

Name	Project Phase	Province	District	Purpose	EIA Positive Decision Date	Project Category
Afşar Dam	Operation	Manisa	Alaşehiş	Irrigation, Drinking Water, Flood Control	N/A	Existing
Şahyar Pond	Master plan/Pre-investigation	Manisa	Merkez	Irrigation	N/A	Hypothetical
Kavaklıdere Pond	Operation	Manisa	Alaşehir	Irrigation	N/A	Existing
Yeşilkavak Dam	Project Stage	Manisa	Salihli	Irrigation	09.03.2011	Hypothetical
Çaypınar Pond	Planning Stage	Manisa	Salihli	Irrigation	N/A	Hypothetical
Akçapınar Dam	Master plan/Pre-investigation	Manisa	Ahmetli	Drinking Water	N/A	Hypothetical
Çıkrıkçı Dam	Planning Stage	Manisa	Gordes	Drinking Water	N/A	Hypothetical
Yiğitler Dam	Construction	İzmir	Kemalpaşa	Irrigation	28.06.2013	Existing
Armutlu Dam	Planning Stage	İzmir	Kemalpaşa	Irrigation	25.02.2014	Reasonably Foreseeable
Yukarıkızılca Pond	Construction	İzmir	Kemalpaşa	Irrigation	N/A	Existing
Savanda Pond	Operation	İzmir	Merkez	Irrigation	N/A	Existing
Vişneli Dam	Master plan/Pre-investigation	İzmir	Kemalpaşa	Irrigation	N/A	Hypothetical
Karakızlar Pond	Operation	İzmir	Torbalı	Irrigation	N/A	Existing
Aslanlar Pond	Operation	İzmir	Merkez	Irrigation	N/A	Existing
Uladı Dam	Operation	İzmir	Eşme	Irrigation	09.10.2007	Existing
Ergenli Dam	Construction	İzmir	Bayındır	Irrigation	17.11.2008	Existing
Burgaz (Zeytinova) Dam	Operation	İzmir	Ödemiş	Irrigation	N/A	Existing
Aktaş Dam	Construction	İzmir	Ödemiş	Irrigation	N/A	Existing
Rahmanlar Dam	Construction	İzmir	Ödemiş	Irrigation, Drinking Water	08.01.2010	Existing
Kiraz Pond	Planning Stage	İzmir	Banaz	Irrigation	N/A	Hypothetical
Kelebek Dam	Construction	Manisa	Ahmetli	Irrigation	N/A	Existing
Horzumalayaka Pond	Planning Stage	Manisa	Alaşehir	Irrigation	N/A	Hypothetical
Bağyurdu Pond	Operation	İzmir	Kemalpaşa	Irrigation	N/A	Existing

In light of this information, existing and future projects that have been identified as a result of the review of public databases of governmental organizations and relevant sectoral associations and included in the CIA together with the Mersinli WPP are presented in Table 17-7. The map given in Figure 17-8 demonstrates the CIA Study Area, selected VESCs and the projects to be included in the assessment. The projects included in the assessment are the ones that are categorized as existing and reasonably foreseeable. Hypothetical projects were not included in the further assessment as there was no readily available and sufficient technical information on their locations, capacities, characteristics etc. As it can be observed in Table 17-7, all existing and reasonably foreseeable mining projects, energy projects, dam reservoirs and ponds were considered in the CIA study. In this regard, apart from the existing projects, Alaşehir-Havza-Derbent-Bağyurdu ETL Project and Armutlu Dam Project was considered as reasonably foreseeable as the EIA Positive Decision was given, however, the project construction has not yet started.

Table 17-7. Projects to be included in the CIA Study

Project CIA Category	Projects
Project Under Assessment	Mersinli WPP (55 MW)
Certain (Existing) Projects	Fuat WPP (33 MW) Karabel WPP (3 MW) Ege WPP (9.2 MW) 154 kV Fuat WPP ETL Mine Area-1 Mine Area-2 Mine Area-3 Mine Area-4 Mine Area-5 Mine Area-6 Mine Area-7 Mine Area-8 Mine Area-9 Mine Area-10 Mine Area-11 Afşar Dam Kavaklıdere Pond Yukarıkızılca Pond Savanda Pond Karakızlar Pond Aslanlar Pond Uladı Dam Ergenli Dam Yiğitler Dam Burgaz Dam Aktaş Dam Rahmanlar Dam Kelebek Dam Bağyurdu Pond Özmen -1 JES
Reasonably Foreseeable Projects	154 kV Alaşehir-Havza-Derbent-Bağyurdu ETL Armutlu Dam

17.2.2.2 Environmental Drivers and Other Factors

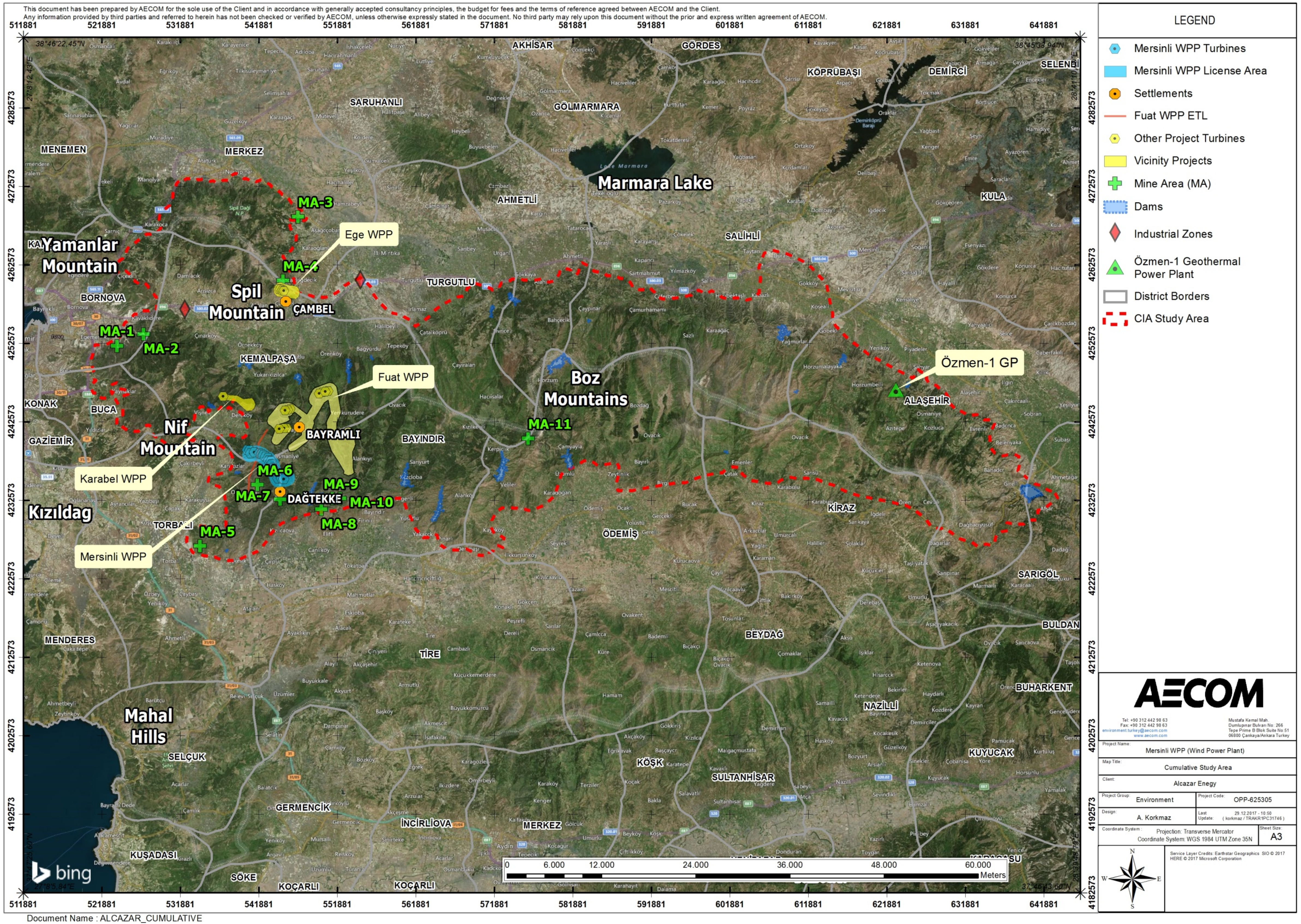
Environmental drivers refer to natural drivers and other stressors, such as fires, droughts, floods, predator interactions, human migration, new settlements, etc. that may exert an influence on the VESCs. For example, the fire regime in forested areas is a major driver that shapes social, ecological and economic systems (*IFC, August 2013*).

All the project units including the turbine foundations, access roads and substation etc. will be located on lands registered as forest in the Turkish Land Registry and Cadastre System. As stated in Chapter 6, forestry permits will be obtained from the relevant General Directorate of Forestry. The removal of top soil, vegetation and trees corresponding to the footprints of the Project units will be carried out by the Turkish Forestry authorities in accordance with the relevant provisions of the national Forestry Law. The number of trees to be logged in scope of the Project along with detailed assessment of impacts on forestlands is provided in Chapter 6.

It should be noted that the Regional Directorate of the Forestry, also conducts regular logging of the trees in line with the applicable Forestry Management Plans. An application was made to the authorities to obtain the related Forestry Management Plans and Forest Stand Maps to identify the forests within the License Area that have been designated with economic functions, which represent the forests operated/managed with the aim of production of forest products, having economic value.

On the other hand, it is known based on the field observations and the outcomes of the stakeholder meetings that the forest maintenance and regeneration works are conducted in these forests to ensure healthy growth of the forests, as well as to ensure social needs of the communities. Since the authorities have not provided the requested plans and maps, the forestlands that will already be degraded as a result of forestry activities could not be identified and assessed in the scope of this ESIA. Additional loss of trees within the License Area may become an issue in the case of unexpected forest fires especially when the cumulative impacts are considered. Unexpected forest fires may potentially contribute to cumulative impacts on the VESCs identified. Measures to be taken in the scope of the Project to avoid/minimize the risk of forest fires are discussed in Chapter 15.

Based on the existing knowledge of the ecology and/or natural dynamics of the selected VESCs, no other major environmental driver that may contribute to cumulative impacts has been identified for this CIA study.



*Exact location of the 154 kV Alaşehir-Havza-Derbent-Bağyurdu ETL could not be found in readily available resources, therefore, not included in the map.

Figure 17-8. VESCs and Projects Included in the CIA Study

17.2.3 Step 3: Establish Information on Baseline Status of VESCs

Information on the baseline status of the VESCs will be mainly based on the information gathered for each environmental and social subject in scope of the ESIA study. Thus, relevant information on the baseline status for VESCs are presented in the related chapters of this ESIA Report.

17.2.4 Step 4: Assess Cumulative Impacts on VESCs

Assessment of potential cumulative impacts of the Mersinli WPP Project together with other projects/activities identified in the CIA Study Area on the selected VESCs has been based on a qualitative approach. The cumulative impact potential on the VESCs has been evaluated considering the projects affecting the VESC along with the Mersinli WPP Project (the Project under Assessment). In this regard, the cumulative impact potential on each VESC has been classified as “yes” if the VESC is likely to be affected by other projects in addition to Mersinli WPP, or “no” is the VESC is to be affected only by Mersinli WPP Project.

The results of the assessment of cumulative impacts of the Mersinli WPP Project together with other projects identified in the CIA Study Area are summarized in Table 17-8. It is important to note that the cumulative impact assessment has been restricted to the level of technical information which is readily available through public information sources. Thus, the assessment has been based on the current status of the projects and any changes in the existing status may result in a change in the impact potential of the VESCs.

Impacts regarding air quality and potential impacts on the local people in Çınardibi, Gökyaka, Dereköy, and Dağtekke who are engaged in beekeeping activities are considered to be temporary as these impacts will be of concern only during the construction period which is 16 months including commissioning. With the operation of Mersinli WPP the impacts related to air quality as a result of construction works and transportation of materials are assumed to be negligible. Fuat WPP Project is currently in operation. Thus, when Mersinli WPP Project starts operation, the impacts associated with air quality (and beekeeping) are expected to be negligible. However, the assessment carried out in the below table considers the impacts on air quality and the impacts on the local people in Çınardibi, Gökyaka, Dereköy, Dağtekke who are engaged in beekeeping activities in order to provide a more comprehensive and long term cumulative impact assessment.

Table 17-8. Interaction of Projects with Selected VESCs

Projects		VESCs															
		Settlements (Impacts on Air Quality)				Settlements (Impacts on Noise)		Settlements (Visual Impacts)			Key Biodiversity Areas (KBAs)	Land Use	Bird Populations	Bats	Cultural Heritage	Agricultural Activities	Beekeeping
		Marmariç	Dereköy	Gökyaka	Cumalı	Marmariç	Çinardibi	Marmariç	Çinardibi	Cumalı	Boz Dağlar KBA	Coniferous Forests	*Ciconia nigra Ciconia ciconia Pandion haliaetus Pernis apivorus Hieraaetus pennatus Accipiter nisus Accipiter gentilis Circaetus gallicus Buteo rufinus Buteo buteo Falco tinnunculus Falco peregrinus Falco*	*Pipistrellus pygmaeus, Pipistrellus pipistrellus, Miniopterus schreibersii, Barbastella barbastellus*	1st Degree archaeological site in Zeybekmezarlığı locality located approximately 250 m northeast of T-9.	Users of the affected parcels	Local people in Cinardibi, Gokyaka, Derekoy, Dagtekke who are engaged in beekeeping activities
Project Under Assessment	Mersinli WPP Project	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Certain (Existing) Projects	Fuat WPP		√	√	√				√		√	√	√	√			
	Karabel WPP									√	√	√	√	√			
	Ege WPP											√	√	√			
	154 kV Fuat WPP ETL									√	√						
	Mine Area-1											√					
	Mine Area-2											√					
	Mine Area-3											√					
	Mine Area-4											√					
	Mine Area-5											√					
	Mine Area-6											√					
	Mine Area-7											√					
	Mine Area-8											√					
	Mine Area-9											√					
	Mine Area-10											√					
	Mine Area-11											√					
	Afşar Dam										√						
	Kavaklıdere Pond										√						
	Yukarıkızılca Pond										√						
	Savanda Pond										√						
	Karakızlar Pond										√						
	Aslanlar Pond										√						
	Uladı Dam										√						
	Ergenli Dam		√								√						
	Yiğitler Dam										√						
	Burgaz Dam										√						
	Aktaş Dam										√						
	Rahmanlar Dam										√						
	Kelebek Dam										√						
	Bağyurdu										√						
	Özmen-1 JES										√						
Reasonably Foreseeable Projects	154 kV Alaşehir-Havza-Derbent-Bağyurdu ETL										√		√	√			
	Armutlu Dam										√						
Cumulative Impact Potential		No	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No

17.2.5 Step 5: Assess Significance of Predicted Cumulative Impacts

The environmental impacts of any single projects on any single receptor and/or resource may not be significant. However when the individual impacts are considered in combination, the resulting cumulative impacts may be significant. At this point, the significance of cumulative impacts should be determined by the extent to which the impacts can be accommodated by the receptor and/or resource. Thresholds and indicative levels of acceptable performance of a receptor and/or resource may also contribute to the assessment process (*UK Highways Agency 205/08: Design Manual for Roads and Bridges; http://www.standardsforhighways. co.uk /ha/standards/dmrb/*).

Significance of the predicted cumulative impacts are determined according to the significance levels presented in Table 17-9. In this regard, significance of predicted cumulative impacts will be estimated in terms of the vulnerability and/or risk to the sustainability of the VESC assessed. Thus, cumulative impact assessment will be directly related with the existing sensitivity/vulnerability conditions of the VESCs.

Table 17-9. Criteria for the Determination of Significance of Cumulative Impacts

Significance	Impact
Severe	Impacts that the decision-maker must take into account as the receptor/resource is irretrievably compromised.
Major	Impacts that may become key decision –making issue.
Moderate	Impacts that are unlikely to become issues on whether the project design should be selected, but where future work may be needed to improve on current performance.
Minor	Impacts that are locally significant.
Not Significant	Impacts that are beyond the current forecasting ability or are within the ability of the resource to absorb such change.

Source: *UK Highways Agency 205/08: Design Manual for Roads and Bridges; http://www.standardsforhighways. co.uk /ha/standards/dmrb/*

Grouping of Mersinli WPP with other wind power plants, and developments that have considerable effects on biodiversity, widen the range and extent of impacts on flora and fauna elements. Some of the widely observed cumulative impacts can be listed as, but are not limited to the following:

- Fragmentation of habitats into higher number of patches, which limit individual species' ranges in a given area
- Synergistic effect of multiple turbine risk zones experience by migratory species
- Increased number of collisions for especially birds and bats
- Cumulative result of multiple infrastructure (increased risk of direct mortality for animals, isolation of populations, extended barrier effect)

Among the VESCs having cumulative impact potential, the Boz Dağlar KBA and the coniferous forests within the KBA is under stress of multiple actions, thus optimization of projects would be required to minimize the cumulative impacts to the extent possible.

Significance of cumulative impacts on VESCs with cumulative impact potential (marked as "yes" in Table 17-8) is evaluated as moderate such that according to Table 17-9, these impacts are considered as unlikely to become issues on whether the project design should be selected. However, it should also be noted that future work may be needed to improve the current performance.

WPP projects in the wider region are implemented as individual projects, by different developers, each of which has a separate ESIA process. However, the sum of wind turbines and their associated infrastructure, even when dealt separately, they do have cumulative impacts on mainly landscape and biodiversity. Therefore, for the impact assessment to be complete, impacts of different projects, whether WPP or other kind, must be assessed together.

In Turkey, neither the legislation, nor the private initiatives currently support such an approach. Cumulative impact assessment conducted within the scope of Mersinli WPP Project relies on a qualitative approach and quantitative data to make a thorough assessment of the identified developments in the wider region on biodiversity elements is currently not available. The assessment, however, is an attempt to put forward a framework for how cumulative impact assessment in the region should be conducted with joined efforts of private project owners, as well as government authorities.

In line with this approach, a joint effort is required to assess potential impacts on protected areas in the region. As identified in Chapter 11 of the ESIA Report, Mersinli WPP alone does not impact Bozdağlar KBA. Yet, biodiversity data from other developments would be required to assess cumulative impacts, which at this point in time are not available.

International best practices suggest that, when several wind power plants in a region are projected to be realized, as in the case of the Aegean Region of Turkey, it is more effective for different project owners to come to an agreement on a single cumulative impact assessment, which can also be supervised by the related authorities. Especially during operation of WPPs, government supervised monitoring of wind power plant impacts on various biodiversity elements, as well as protected areas, would be necessary to take more effective measures for mitigation.

This usually means assessment of a joint effect on the same natural element, for example the same migratory bird species population, whose territory, distribution, and population status would be identified to assess impacts of different developments. When each project in question provides its individual data on species' populations, collision risk analysis, habitat loss, and other related impacts on biodiversity, it would be possible to construct models on a few different scenarios on how existing and planned projects would contribute to the cumulative impact assessment. .

17.2.6 Step 6: Management of Cumulative Impacts

For the management of cumulative impacts, it is important to underline that the responsibility of the management/mitigation of the cumulative impacts resulting from the actions of multiple stakeholders involves a collective responsibility which requires individual actions to eliminate or minimize the contribution of each action/development. Project level actions to minimize the impacts of Mersinli WPP Project are described in relevant chapters of this ESIA Report.

In addition to the discussions above, there are a number of WPPs in development stage. Thus, these may include capacity extensions of the currently operation power plants. In case an already licensed WPP project plans capacity extension, modernization, refurbishment and project alterations, revision process for the already existing license is regulated by Article 24, Clause 5 of the Electricity Market License Regulation. The license can be revised only if the following conditions are fulfilled:

- Obtaining positive connection opinions of TEİAŞ and related electricity distribution company for the revised Project.
- Existence of no other license application in the first license area the original Project applied for.
- Use of existing ETL and existing connection point with the existing voltage level for electricity to be generated by capacity extension.
- Ensuring that the extension remains within the generation facility area included in the license.

It should be noted that revision of a license only covers the license area of the existing license, meaning that the license area cannot be expanded but activities in the existing license area can be altered, given that the capacity expansion is in compliance with the above mentioned provisions. Thus the possible future capacity extensions and project modifications shall be planned by the governmental authorities by taking into consideration the management of potential cumulative impacts.

18. Stakeholder Engagement

The stakeholder engagement activities for the Mersinli Wind Power Plant (WPP) Project were started by the former Project Owner in the scope of the national Environmental Impact Assessment (EIA) process conducted in line with the then-current Turkish EIA Regulation. Alcazar Energy acquired the Project Company ("Yander Elektrik") established by previous developer of the Project to implement Mersinli WPP in May 2017. As the Project Company is committed to communicating openly and actively with workers, communities and governmental and non-governmental organisations on all topics under its Environmental and Social Sustainability Policy, The Project Company has started conducting stakeholder engagement activities in line with its corporate standards in the period following the Project's acquisition. A Community Liaison Officer (CLO), who will be specifically responsible for maintaining the stakeholder activities, was appointed by the Project Company in November 2017. Information on the stakeholder engagement activities conducted to date is provided in the following sections. A stand-alone Stakeholder Engagement Plan (SEP) has also been developed for the Mersinli WPP Project in line with the requirements and standards of the EBRD and IFC in order to ensure that strong, constructive, and responsive relationships are built with Project's stakeholders, which is a key for successful implementation of the Project.

In line with the definitions of international standards, the Project Company recognizes a stakeholder as any individual, organization or group that is potentially affected by the Project or that has an interest in the Project and its impacts. The purpose of stakeholder identification is to determine and prioritize Project stakeholders for consultation that may be affected (either directly or indirectly in positive or negative way) by the Project or that have an interest in the Project but are not necessarily directly impacted by the Project. As part of the stakeholder identification process, it is also important to identify individuals and groups that may be differentially or disproportionately affected by the Project because of their disadvantaged or vulnerable status. Within the scope of the SEP developed as part of the ESIA process, key Project stakeholders have been identified and given in the Plan (see Chapter 4 – Stakeholder Identification) in detail.

18.1 Stakeholder Engagement According to National EIA Process

18.1.1 Public Participation Meeting (Çınardibi Neighbourhood)

- Following the national Environmental Impact Assessment (EIA) process conducted in accordance with the then current Turkish EIA Regulation, EIA Positive Decision was issued by the Ministry of Environment and Urbanization (MoEU) for the Mersinli WPP Project in July 2016. This EIA Positive Decision was based on the national EIA Report, which was prepared in consideration of the Project layout with 22 turbines (55 MWe).
- The Final EIA Report (dated April 2016) and the associated EIA Positive Decision issued by the Ministry of Environment and Urbanization (dated July 2016) is based on a different Project layout with 22 turbines (55 MWe). The validity of the existing EIA Positive Decision for the current layout with 17 turbines (55 MWe) was confirmed by the Ministry on 1 November 2017.

In line with the requirements of the Turkish EIA Regulation, a Public Participation Meeting was planned by the local EIA Consultant for the Mersinli WPP Project. The meeting was planned to be held on the 30 July 2015 in Cinardibi neighbourhood of Bayindir district in Izmir province. According to the Turkish EIA Regulation, the meeting location and time was determined in collaboration with the Provincial Directorate of the Ministry of Environment and Urbanization (MoEU). This Public Participation Meeting could not be conducted as planned as the local people did not attend. Afterwards, a second Public Participation Meeting was planned and held on 24 August 2015 with the participation of the Project Company (Yander Elektrik A.S.), the Provincial Directorate of the MoEU, the State Meteorological Service and the local EIA Consultant. It is understood from the meeting photographs that around 10 people attended the second meeting. As mentioned in the EIA Report, the questions of the participants raised during this meeting were responded by the Project Owner.

18.1.2 Correspondence with the Governmental Authorities

In line with the national EIA Regulation, a Review and Evaluation Commission is established by the MoEU General Directorate of EIA, Permitting and Auditing at the scoping stage of the EIA process. This Commission, besides the EIA Consultant and the Project Owner, includes representatives from related governmental agencies and institutes (if deemed necessary depending on the scope and type of the project university representatives, representatives of the relevant research organizations, experts, professional chambers, unions, associations and non-governmental organizations may be asked to participate in the Commission). This Commission is involved in the process at several stages, including scoping and review and evaluation (detailed information on the national EIA process is presented in Chapter 2). Thus, as part of the national EIA process, consultations with the Commission members, as representatives of the governmental institutions relevant to the Project, are conducted through official correspondence or meetings. The Commission established by the MoEU for the Mersinli WPP Project as part of the national EIA process and official views documented within the national EIA Report are summarized in Table 18-1. In addition to the official views provided in the national EIA process, additional correspondence with relevant institutions and service providing companies to obtain their views on the Project are also provided in the table. It should be noted that the previous consultations were done based on the previous Project layout with 22 turbines, however the license area has not changed since the date of consultation and additional consultation are being/will be carried out with any related governmental institutiton for the new layout as necessary.

Table 18-1. Official Views of Governmental Institutions Given in the Scope of National EIA Process

Governmental Institutions/ Companies	Type of Institution	Date of the Official View	Subject	Summary of the Official View Regarding the Project
Ministry of Environment and Urbanization, General Directorate for Protection of Natural Assets	Central Government	14/07/2015	Project location with respect to legally protected areas	Project Area is not located within the boundaries of any Special Protection Zone.
Ministry of Energy and Natural Resources, General Directorate of Mining Affairs	Central Government	11/02/2016	Impacts on mining activities	Institution approved the content of the EIA Report in consideration of the mining activities and geological-geotechnical conditions.
Ministry of Transport, Maritime and communication, General Directorate of Infrastructural Investments	Central Government	25/08/2014	Infrastructure	There is no survey or project planned by the institution within the Project Area.
Ministry of Culture and Tourism, General Directorate of Investments and Operations	Central Government	28/05/2014	Project location with respect to cultural and tourism sites	Project Area is not located within the boundaries of any designated tourism centre or any area conserved or spared for development of cultural and touristic sites. The Ministry does not plan any future study within the Project Area.
İzmir Governorate, Provincial Directorate of Environment and Urbanization	Local Government	17/02/2016 21/04/2014	Project location with respect to legally protected areas	According to the 1/25,000 scale Environmental Master Plan, Project Area does not correspond to natural protected area. No natural asset is present within the Project Area.
Ministry of Forestry and Water Affairs, General Directorate of Forestry, İzmir Regional Directorate	Local Government	11/01/2016	Impact on forestlands	Project shall be located at a distance of minimum 400 m from the Karlik Watching Tower. Project is located at 1st Degree Fire Sensitive Area. Sufficient number of firefighting equipment and personnel (as specified in the official view) has to be kept ready on-site
İzmir Greater Municipality	Local Government	07/03/2016	Impact on water resources Impact on existing infrastructure	There are several river beds located within the License Area. Excavated materials shall not be disposed of at river beds and measures shall be taken at the storage sites to prevent transportation of materials to the river beds. İZSU (Water and Wastewater Administration of İzmir Metropolitan Municipality) and 2nd Regional Directorate of State Hydraulic Works (DSI) shall be informed about any engineering structure (e.g. bridge, culvert, etc.) to be planned for the crossing of rivers. İZSU (Water and Wastewater Administration of İzmir Metropolitan Municipality) shall be contacted to identify existing above or underground structures before execution of any excavation, drilling, etc. study to be conducted at the Project Area to avoid any damage on the wastewater and storm water lines or existing infrastructure.
		06/10/2015	Water resources	Drinking water well and the package wastewater treatment plant located in Dernekli neighbourhood shall be protected from all physical and construction works planned in the scope of the Project.
Bayındır Municipality	Local Government	04/11/2015	Zoning plan	There is no approved 1/5,000 or 1/1,000 scaled zoning plan for the Project Area.
Kemalpaşa Municipality	Local Government	26/10/2015	Zoning plan	There is no approved 1/5,000 or 1/1,000 scaled zoning plan for the Project Area. Project Area is marked as “Forest Area” on the 1/100,000 scale İzmir-Manisa Planning Zone Environmental Master Plan.

Governmental Institutions/ Companies	Type of Institution	Date of the Official View	Subject	Summary of the Official View Regarding the Project
Torbalı Municipality	Local Government	21/10/2015	Zoning plan	There is no approved 1/5,000 or 1/1,000 scaled zoning plan for the Project Area.
Ministry of Culture and Tourism, General Directorate of Cultural Assets and Museums	Local Government	20/04/2016	Project location with respect to cultural heritage sites Protection of cultural heritage sites	Project Area is not located within any protected cultural heritage site or protection area. There is a cultural heritage site proposed for registration. No activity shall be conducted at this area until the registration is completed. In case any cultural heritage is encountered during the studies, works shall be ceased immediately and the local authorities or the closest Museum Directorate shall be informed in accordance with the relevant law.
Ministry of Forestry and Water Affairs, General Directorate of Meteorology	Central Government	29/04/2014	Minimum interference distance to meteorology radars	Wind turbines have to be installed at a distance of minimum 20 km from the meteorology radars.
Ministry of National Defence, İzmir Regional Directorate for Construction Real Estate	Local Government	09/04/2014	Project location with respect to military zones	There is no military zone, prohibited military or security zones (except the General Command of Gendarmerie and Command of Coast Guard) within the planned Project Area.
İzmir Governorate, Provincial Directorate of Food, Agriculture and Livestock	Local Government	26/08/2014 06/10/2015	Land use	Since the Project Area is located on forest lands that under the scope of Forestry Law, there is no requirement to be fulfilled by the Directorate in the scope of Law on Soil Protection and Land Use.
TEİAŞ	Turkish Electricity Transmission Company	09/04/2014	Existing infrastructure	Electricity Transmission Line (154 kV) of Fuat WPP Corresponds to the Project Area. On the other hand, the Company approves the implementation of the Mersinli WPP Project.
BOTAŞ İzmir Directorate	Petroleum Pipeline Corporation	27/03/2014	Existing infrastructure	There are no above or underground infrastructure facilities within the boundaries or in the surroundings of the Project Area.
İZMİRGAZ	Natural Gas Distribution Company	25/03/2014	Existing infrastructure	There is no infrastructure facility in the Project Area. Following the development of zoning plan, infrastructure design projects will be prepared along the roads. The Company shall be informed about the implementation of new plans.
GEDİZ İzmir Provincial Directorate	Electricity Distribution Company	10/03/2014	Existing infrastructure	There are no low or high voltage transmission lines affecting the turbine locations. This official letter is valid for two years. In case new electricity lines are installed at the area, the Directorate has to be consulted.

Source: Final EIA Report, April 2016.

18.1.3 Stakeholder Concerns Identified in the Lawsuit Petition Challenging National EIA Report

Once the Project obtained an EIA Positive Decision from the MoEU in July 2016, Marmariç Ecological Life Association and several individuals including some of the residents of the Marmariç Permaculture Village, filed a lawsuit against the Ministry for its decision in the same month (July 2016) requesting the cancellation of the EIA Positive Decision. A first instance court interim decision was taken in September 2016 that allowed Yander Elektrik to become an intervener, an experts site visit report was issued in November 2016 and the first instance court final decision (rejecting claims) was given in June 2017. The claimants appealed first instance decision in June 2017 asking for injunction. The Council of State then issued an interim appeal court decision in August 2017 which rejected the plaintiffs' claim for suspension of execution and decided not to suspend the EIA Positive Decision until the final decision is made.The final decision was issued by the court in January 2018, rejecting the appeal request of the plaintiffs and closing the court case against the EIA Positive Decision issued for the Project.

Concerns of the stakeholders that were the basis of the court case are summarized in Table 18-2, where the last column shows the chapter/section of the ESIA Report addressing the relevant environmental and/or social subjects.

Table 18-2. Stakeholder Concerns Identified in the Lawsuit Petition

Subject	Stakeholder Concerns Raised	ESIA Section Addressing the Concern/Issue
Project Alternatives (Location and Technology)	Lack of alternatives assessment	Chapter 4 (“Project Alternatives”)
Lack of Assessments and Mitigation	What units other than turbines will be built, what are their construction phase impacts? Impacts of the ETL and the access roads are not addressed (especially in terms of habitat loss) Impacts of underground cable network not addressed (especially in terms of habitat loss, underground impacts and H&S) Impacts of other Project units (substation, administrative building additional roads, etc.) not addressed (especially in terms of habitat loss).	Chapter 3 (“Project Description”)
ETL EIA Process	Lack of impact assessments	Chapter 3 (“Project Description”) Chapter 6 (“Landuse, Soils and Geology”) Chapter 15 (“Community Health and Safety”)
Forest Areas	General Loss	Chapter 6 (“Landuse, Soils and Geology”) Chapter 11 (“Biodiversity”)
	Value of trees to be cut down in terms of climate change	
	Habitat Fragmentation	
	Sustainability	
	Potential increase in erosion and landslide risk due to tree cutting	
Greenhouse Gas Emissions (GHGs)	Lack of GHG impact assessments more detailed in appeal, with references to international conventions, agreements, etc.	Chapter 8 (“Air Quality and GHGs)
	Discussed as “value of trees to be cut down in terms of climate change” (see Forest Areas above)	
Biodiversity	Objectivity of the existing ecosystem assessment reports regarding flora/fauna assessments	Chapter 11 (“Biodiversity”)
	Not mentioning some of the endemic plant species in the Project area	
	Project area to be located on a bird migration route.	
	Lack of assessment regarding Bayindir-Ovacik-Arpadag Wildlife Development Area which is 11 km to the Project Area	

Subject	Stakeholder Concerns Raised	ESIA Section Addressing the Concern/Issue
Project Area	“The claim that the Project Area is moved away from forest areas, privately owned lands and agricultural areas is not consistent with real site data”	Chapter 3 (“Project Description”) Chapter 6 (“Landuse, Soils and Geology” Chapter 15 (“Community Health and Safety”) Chapter 4 (“Project Alternatives”)
	“Distance estimations given in the EIA are wrong, not up to standards and the assessments in this regard, concerning agricultural areas, pasture areas and rural settlements are not sufficient and against the law”	
Excavation	Insufficiency of assessments/calculations on excavations/earthworks during construction phase	Chapter 6 (“Landuse, Soils and Geology” Chapter 8 (“Air Quality and GHGs”)
Dust	Insufficiency of assessments/calculations on dust emissions during construction phase	Chapter 8 (“Air Quality and GHGs”)
Noise	Insufficiency of assessments/calculations on noise impact during construction phase	Chapter 7 (“Noise”)
Electromagnetic and Infrasound	The appeal states that “electromagnetic impacts not assessed since the EIA deemed the assessment unnecessary due to the fact that “no proven impacts” exist (no scientific data exists regarding electromagnetic impacts and this is what the EIA states, following a review of related literature). Stakeholders claim that an assessment and preventive measures based on this assessment are required.	Chapter 15 (“Community Health and Safety”)
	Insufficiency of assessments/calculations on electromagnetic and infrasound impacts to be sourced both from the turbines and from the ETL	
Water Resources	General lack of environmental assessment on Uladı Dam Reservoir, Mersinli Drinking Water Well, package WWTP interaction	Chapter 9 (“Water and Wastewater”)
Fire Risk	Mitigation regarding fire risk is incompliant with the legislation	Chapter 15 (“Community Health and Safety”)
Cumulative Impacts	Cumulative impact assessment only covers impacts in terms of energy generation (no assessment regarding environment, habitats and community H&S) Project units other than turbines not included in the cumulative impact assessment ETL of FuatRES coincides with Mersinli WPP Project area and this proves that no other plant in the area was included in the assessments	Chapter 17 (“Cumulative Impact Assessment”)
Cumulative impacts	“Existence of Fuatres and Karabel WPPs are not considered as a factor during site selection and CIA is against the law”	
Environmental Cost-Benefit Analysis/ Forest Areas	There is no cost-benefit analysis in terms of the “value of forest habitats” and “the value of the development”.	Chapter 11 (“Biodiversity”)
Environmental Cost-Benefit Analysis	“The Environmental Cost-Benefit Analysis is insufficient and does not meet the requirements of EIA process.	Chapter 4 (“Project Alternatives”)
Public Participation	“The EIA Positive decision is against public participation principle”	Chapter 18 (“Stakeholder Engagement (stand-alone “Stakeholder Engagement Plan”)
Public Interest	“The EIA Positive decision is against public interest”	Chapter 13 (“Socio-economic Environment”)

Source: Lawsuit Petition.

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18.2 Stakeholder Engagement in the scope of ESIA Process

18.2.1 Public Consultation Meetings

As part of the Environmental and Social Impact Assessment (ESIA) studies conducted by the ESIA Consultant two Public Consultation Meetings (PCMs or Scoping Meetings) have been planned, one in Cumali neighbourhood and the other in Cinardibi neighbourhood. The Public Consultation (Scoping) Meeting in Cumali neighbourhood was conducted on 4 October 2017, while the Cinardibi meeting has been rescheduled to take place during the ESIA disclosure period in consideration of the feedback received during the consultations conducted with the neighbourhood headman and the local community.

In the selection of the meeting locations, face to face meetings were initially conducted by Project Company with the headmen of the neighbourhoods located in the vicinity of the Mersinli WPP's electricity generation license area. In consultation with the neighbourhood headmen, except the headmen of Cinardibi, the Cumali neighbourhood has been identified as a central settlement to which residents of the surrounding settlements can access to attend the meeting. On the other hand, Cinardibi neighbourhood, with a population of 822 that is formed of Pomaks[15], is both demographically and socio-economically different from other local settlements. Thus, a separate future meeting is planned specifically for Cinardibi neighbourhood, which is intended to be held within the ESIA disclosure period.

18.2.1.1 Scoping Meeting at Cumali Neighbourhood

For the Public Consultation Meeting held in Cumali neighbourhood, following communications done with the neighbourhood headmen, announcements were posted 10 days before the meeting date in Cumali, Dagtekke, Dernekli, Karakizlar and Karaot neighbourhoods at public places such as offices of the headmen, teahouses or mosques to inform the local people about the meeting venue, date and time as well as the purpose of the meeting (see Figure 18-1). In addition, official letters were sent to relevant local administrations and representatives of local communities were invited through individual communication (see Appendix H). Table 18-3 summarizes the methods used to inform stakeholders about the PCM.

A Neighbourhood teahouse was selected as the meeting venue in Cumali neighbourhood as this place, which is commonly used by locals, has proper capacity and physical conditions for a public consultation meeting. A shuttle bus was provided by Project Company to transfer interested parties/local people to the meeting location from surrounding settlements.

The Scoping Meeting was held with the participation of representatives of the Project Company (representatives from Dubai and Turkey offices including technical and environmental project managers) and the Independent ESIA Consultant (AECOM). AECOM acted as the moderator of the meeting. The meeting started with an explanation of the purpose and scope of the meeting and followed by a presentation given by AECOM. Following the presentation, questions, concerns and suggestions of the participants were received one by one. The presentation template used during the PCMs is provided in Appendix I. The main topics covered in the presentation were as follows:

- What is the Mersinli WPP Project?
- Who is the Project Owner?
- What are the anticipated benefits of the Project?
- What is the Environmental and Social Impact Assessment process?
- Stakeholder Engagement: How to Participate in the Process?
- Questions and Answers Session

[15] Pomaks in Turkey refers to an ethnic group, who migrated from Bulgaria to Turkey, speak their own dialect of Bulgarian and are predominantly Muslim.

Dagtekke Neighbourhood

Karakizlar Neighbourhood

Karaot Neighbourhood

Dernekli Neighbourhood

Figure 18-1. Announcements Posted at the Neighbourhoods

Table 18-3. Methods Used to Inform Stakeholders about the Public Consultation Meeting

Stakeholder Group	Type of Stakeholder	Information Method
Izmir Governorate, Provincial Directorate of Environment and Urbanization	Governmental	Official Letter
Izmir Governorate, Provincial Directorate of Food, Agricul. and Livestock	Governmental	Official Letter
Izmir Governorate, Provincial Directorate of Culture and Tourism	Governmental	Official Letter
Bayindir District Governorate	Governmental	Official Letter
Bayindir Municipality	Governmental	Official Letter
Kemalpasa District Governorate	Governmental	Official Letter
Kemalpasa Municipality	Governmental	Official Letter
Torbali District Governorate	Governmental	Official Letter
Torbali Municipality	Governmental	Official Letter
Izmir Regional Directorate of Forestry	Governmental	Official Letter
Cumali Neighbourhood Headman Office	Local Community	Official Letter, Individual Meeting
Karakizlar Neighbourhood Headman Office	Local Community	Official Letter, Individual Meeting
Karaot Neighbourhood Headman Office	Local Community	Official Letter, Individual Meeting
Yesilkoy Neighbourhood Headman Office	Local Community	Official Letter, Individual Meeting
Project Affected People in Cinardibi Neighbourhood	Local Community	Individual Meeting
Marmaric Permaculture Village	Local Community	Individual Meeting

A large-scale map (in A0 format), showing the Mersinli WPP's license area and the turbine locations, was posted on the wall of the teahouse during the meeting (see Figure 18-2). Comment/suggestion forms in Turkish (see Appendix J for English translation) were available to ensure that any party who would prefer to submit opinions in written would have this opportunity. However, no additional feedback was provided, thus no revisions were made in ESIA.

Figure 18-2. Map of the Project Area Posted at the Meeting Venue

The number of people attending the meeting was around 30. Even though the announcements were posted at public places that could be seen by all community members including women and the neighbourhood headmen were informed that participation of all interested parties including women is expected by the Project Company, no women participated in the meeting possibly due to cultural boundaries/norms. Participants were from the Cumali and Yesilkoy neighbourhoods. The headman of the Cumali neighbourhood also attended. A list of participants was kept for the participants who preferred to document their attendance (see Appendix K); 23 local people signed the list). Photographs taken during the meetings are presented in Figure 18-3 to Figure 18-6.

Figure 18-3. Participants of the Meeting

Figure 18-4. Presentation Given by ESIA Consultant

Figure 18-5. Questions and Answers Session (Question by Local People)

Figure 18-6. Questions and Answers Session (Project Company Addressing Questions)

The questions, issues, concerns and suggestions raised by the participants during the meeting, which are noted in Table 18-4 in details, were focused on the following main subjects:

- Benefits of the Project to the local people
- Locations of the turbines and access roads
- Potential environmental impacts (i.e. noise, dust)
- Impacts due to traffic
- Access restrictions

Table 18-4. Questions/Issues/Concerns/Suggestions Raised During the Meeting

No.	Party who Raised the Question/ Issues/Concern/Suggestion	Subject	Description of the Question/ Issues/Concern/Suggestion	Response of the Project Owner/ ESIA Consultant	ESIA Section Addressing the Concern/Issue
1.	Headman of Cumali Neighbourhood	Project benefits	1.1. What will be the benefits of the Project to Cumali neighbourhood?	Information on the employment opportunities to be provided and goods and services to be procured by the Project was given by Project Company and the ESIA Consultant.	Chapter 13 (Socio-economic Environment)
			1.2. Would the neighbourhood benefit from the electricity to be produced?	State policy and procedures under the existing laws and regulations were explained to clarify that Project Company will not have the authority to provide electricity to local settlements.	Chapter 13 (Socio-economic Environment)
			1.3. Would it be possible to pave certain roads with asphalt?	Project Company explained that the improvement works to be done on forest roads are under the authority of the Forestry Directorate and the authorities generally allow only road widening and do not lean towards asphalt paving. On the other hand, the request was noted for consideration during future discussions with Forestry Authorities and development of community development projects.	Chapter 3 (Project Description)
2.	Resident of Yesilkoy neighbourhood (Herder)	Safety risks	2.1. The resident reported that he has a herd of goats. He has concerns about the safety risks that may posed by Project components on the animals.	Project Company explained that the transformers will be inside the turbines thus no risk (i.e. electrocution) will be posed by Project on animals. Additionally, it was informed that this design will allow that there will be no fences that may cause access restrictions for the herders.	Chapter 15 (Community Health and Safety)
		Impacts due to traffic	2.2. The resident requested runways to be placed on the access roads to be constructed in order to ensure that he can keep his herd out of the way whenever it is necessary.	Project Company stated that feasibility of this suggestion would be considered in the design.	-
				ESIA Consultant explained that a Traffic Management Plan would be developed and implemented in the scope of the Project.	Chapter 15 (Community Health and Safety)
3.	Resident of Cumali Neighbour	Noise impact	3.1. Will the Project cause noise impact?	ESIA Consultant explained that the turbines will cause noise generation at the source, which will decrease as	Chapter 7 (Noise)

No.	Party who Raised the Question/ Issues/Concern/Suggestion	Subject	Description of the Question/ Issues/Concern/Suggestion	Response of the Project Owner/ ESIA Consultant	ESIA Section Addressing the Concern/Issue
	hood			it propagates. Information was provided on the computer-based noise modelling studies to be conducted as part of the ESIA and explained that the report will identify the distances where turbine noise would reduce under regulatory limit values.	
			3.2. Concern was raised regarding the dust to be caused during construction works, which may affect the beekeeping activities.	It was explained that computer based dust modelling studies will be conducted to assess potential dust impact of the Project. Socio-economic surveys will be conducted to identify any potential beekeeping activities that may be affected by the construction works.	Chapter 8 (Air Quality and GHG Emissions)
4.	Resident of Cumali Neighbourhood	Employment opportunities	4.1. Information was requested on the timeline and procedure for job applications.	Project Company provided information on the Project's current status (i.e. completion of required permits before start of construction) and explained that the Project would start accepting job applications in 2018 Q1/Q2. It was mentioned that the local people would be kept informed about Project's timeline and upcoming employment opportunities through information of neighbourhood headmen and other applicable methods.	Chapter 13 (Socio-economic Environment) Stakeholder Engagement Plan (standalone)
5.	Resident of Yesilkoy Neighbourhood	Employment opportunities	5.1. Resident provided information about his son (who is a mining engineer having expertise in health and safety and working in another province) and asked if there would be opportunities for him in this Project.	Project Company explained their preference for local employment and procurement opportunities to ensure social integration of the Project and reduce associated costs. Importance of availability of skilled persons in the local community was emphasized and information on the timeline and general procedure for future job applications was provided one more time.	Chapter 13 (Socio-economic Environment)
6.	Resident of Cumali Neighbourhood	Project location	6.1. Information was requested regarding the proximity of the Project to local settlements.	ESIA Consultant showed the location of the turbines and other Project units on the large scale map layout map posted on the wall of the meeting venue. Distance of nearby neighbourhoods, and especially Cumali neighbourhood, to turbines was explained on the map.	Chapter 3 (Project Description)
		Project Owner	6.2. Information was requested on the structure of Project Company (i.e. relationship with the state)	Project Company explained the structure Project Management, by explaining that the company is private and there is no relationship between the company and the state.	Chapter 3 (Project Description)

The meeting lasted approximately 1 hour. After responding to all the questions and concerns of the participants, it was confirmed that there were no remaining issues and the meeting was closed. Following the meeting, questions and concerns of the participants were continued to be responded through one-to-one conversations in and outside the meeting venue.

18.2.2 Meetings with Marmariç Permaculture Village Community

The Marmariç Permaculture Village, located in Mersinli Locality of Dernekli neighbourhood in Bayındır, Izmir, is the closest settlement to the Mersinli WPP Project Area. The closest building to Project Area is located around 1 km southeast of Turbine-17.

The first members of the community moved to Mersinli Locality, which was a hamlet of the Dernekli neighbourhood that was abandoned more than 20 years ago, in 2003 with the aim of establishing and maintaining a sustainable ecological settlement based on permaculture principles, which would be an example in Turkey and allow sharing experiences among interested parties. To support the community in liaising and cooperating with public and private institutions whenever necessary to achieve its aims, a legal entity, Marmariç Ecological Life Association, was founded in 2005. In 2010, Marmariç Village started hosting the Permaculture Research Institute of Turkey for providing trainings to interested parties. Currently, there are 8 houses located in the village that are inhabited by 14 community members.

Marmariç Permaculture Village Community has been identified as a key stakeholder group at the scoping phase of the ESIA. The Marmariç Ecological Life Association together with several individuals including some of the residents of the Marmariç Permaculture Village filed a lawsuit against the Ministry of Environment and Urbanization for its EIA decision in July 2016, requesting to cancel the existing EIA Positive Decision (dated July 2016) issued for the Mersinli WPP Project. Concerns stated in the court petition were concentrated on the environmental aspects and assessments (such as alternatives assessment; description and assessment of Project and/or associated facilities including access roads, cabling system, substation, administrative building; baseline characterization and assessment of impacts on forests and biodiversity, greenhouse gas assessment, assessment of potential dust emissions, noise, infrasound and electromagnetic impacts; cumulative impact assessment) that have not been covered within the national EIA Report, which was prepared and approved in accordance with the then-current Turkish EIA Regulation. By the decision of the court, the case was concluded in January 2018, in favour of the Ministry.. In addition, residential houses and agricultural lands of the settlement are located within the boundaries of Project's Electricity Generation License Area, which has raised concerns among the community regarding urgent expropriation[16] right of the Project in accordance with Article 27 of national Expropriation Law.

Having been identified as a key stakeholder group, consultations with Marmariç Permaculture Village Community started early in the ESIA process. Since July 2017, several stakeholder meetings have been conducted in the scope of ESIA with the community and their representatives as listed in Table 18-5.

[16] Article 27 of the Expropriation Law, states that; for the expropriation of immovable properties in situations for which Minister of Councils takes decision regarding the need or urgency for national defense in the scope of the implementation of the Law on National Defense Obligations (Law No: 3634) or during emergencies foreseen by special laws, the immovable property subject to expropriation may be seized by the related administration on condition that the procedures other than valuation shall be completed afterwards. In this process, following the request of the related administration, compensation amount for the immovable property shall be appraised by the court within 7 days through the experts assigned as per Article 10 and 15 of the Expropriation Law. Seizure shall only be made following the invitation to be done in accordance with Article 10 and the amount is deposited to the bank specified in the announcement.

Table 18-5. Stakeholder Meetings Conducted by ESIA Consultant with Marmariç Permaculture Village Community and their Representatives

Stakeholder Type/Group Consulted	Date	Location	Purpose of the Meeting	Attendees
Representative of Marmariç Village Community	13 July 2017	İstanbul	Initial meeting to introduce changes in the Project and Project Owner; consultation regarding the major concerns of the community and proper stakeholder engagement strategy to be developed for Marmariç Permaculture Village.	Alcazar Energy Senior Management (Dubai) Alcazar Energy Turkey to represent Project Company AECOM Turkey (ESIA Consultant)
Marmariç Village Community Members	28 July 2017	İzmir (Marmariç Village)	Introduction with community members; presentation of the changes in the Project and Project Owner and consultation regarding the environmental and social concerns of the community.	Alcazar Energy Senior Management (Dubai) Alcazar Energy Turkey to represent Project Company AECOM Turkey (ESIA Consultant)
Marmariç Village Community Members	3 October 2017	İzmir (Marmariç Village)	Invitation to the Public Consultation (Scoping) meeting to be held in Cumali neighbourhood on 4 October, 2017; informing the community member regarding the scope and methodology of the ESIA studies in details with a focus on the requirements of international environmental and social standards/guidelines (noise, visual, electromagnetics, dust, social, etc.).	Alcazar Energy Senior Management, Technical Team, Project Environmental Specialist (Dubai) Alcazar Energy Turkey to represent Project Company AECOM Turkey (ESIA Consultant)

During the meetings held with the Marmariç Permaculture Village Community, it was identified that the previous Project Owner also communicated with them regarding the Project. With the acquisition of the Project Company, a constructive and transparent consultation process has been initiated. During the meetings conducted to date, the environmental and social concerns and expectations raised by the community members have been noted in Table 18-6.

Table 18-6. Concerns, Questions and Expectations Raised by Marmariç Permaculture Village Community during the Meetings

Main Environmental and Social Subject	Concern/Questions/Expectation
Project Design	Possibility of increase in turbine numbers and installed capacity of the WPP
Visual Impacts	Distance of the turbines and their visibility from the Marmariç Permaculture Village and residential houses
Transportation	Location of access roads to be used for transportation during construction phase
Socio-economic conditions	Impact of potential dust generation on agricultural activities (i.e. cherry orchards and gardens)
	Potential conflict of Project personnel with local communities
	Physiological stress on local communities (especially for women) due to presence of construction camps
	Potential impact of the Project on livestock activities
Biodiversity	Potential impact of the Project on fauna components (i.e. mammals)
	Loss of trees due to Project will be relatively limited in comparison to deforestation activities conducted by Forestry authorities in the scope of relevant Forestry Management Plans
	Concerns regarding the baseline flora and fauna data contained in the national EIA Report
Community Health and Safety	Impact of potential dust and noise generation on local communities located in the proximity of construction access roads due to earthworks and transportation

Main Environmental and Social Subject	Concern/Questions/Expectation
	Noise impact potential of turbines on the village
	Electromagnetic impact potential of the WPP on the village
	Shadow-flicker impact potential of the WPP on the village
Cumulative Impacts	Potential visual impacts in case of capacity extension of existing projects (i.e. Fuat WPP)
	Impact of the wind turbines on climatic conditions due to airflow that would be caused by multiple WPPs with significant numbers of turbines
Land Acquisition	Concerns for loss of lands located within Project's License Area through urgent expropriation; community has an expectation for a commitment for avoidance of expropriation of lands within the License Area for any Project facility including turbines, access roads, administrative building, etc.
	Possibility of change of license borders

In addition to the consultations done by the ESIA Consultant, the Project Company, through the CLO and other Company officials, conducted several meetings and conversations with the Marmariç Permaculture Village Community between November 2017 and February 2018 to understand their concerns about the Project and developed measures to properly address them wherever technically and administratively possible. As a result of this process, the following have remained as the key concerns/issues that are to be addressed by the Project Company:

- Lands of the community that are located within the License Area boundary and thus may be expropriated or affected by the Project (due to planned activities or future capacity increase)
- Noise impact due to construction and operation activities
- Potential change in electromagnetic impacts standards
- Tree cutting

Through the process, the Project Company considered the concerns of the community and committed to address them in line with proper administrative and technical processes. The following measures were committed to be taken and the community was informed about these measures during the meetings conducted and also in written:

- Ensure that the agricultural activities of the community (on the parcels located within the License Area) are not affected by the Project in cooperation with the related governmental institutions where necessary
- Inform the community regarding any tree cutting activities
- Inform the community about all the monitoring activities and their results,

Additionally, the following mitigation measures will be taken by the Project Company the address the concerns and mitigated potential impacts associated with biodiversity, visual amenity and environmental noise:

- Implement Biodiversity Action Plan
- Sign Reforestation Protocol with the Forestry Authorities
- Implement Reforestation Programme
- Conduct construction activities at the work sites located closest to the noise sensitive receptors only during day time
- Optimise turbine operation in consideration of wind speed to avoid noise becoming unacceptable
- Implement Noise Management Plan
- Implement the Stakeholder Engagement Plan to collect complaints and suggestions through the grievance mechanism to be established
- Conduct noise monitoring programme to verify compliance with regulatory limits and Project standards

- Use underground cable system.

Consultation with the Marmariç Permaculture Community will be continued on an ongoing basis through the Project.

Within the process, specific engagement activities will be designed by the Project Company to ensure that all the relevant issues/concerns have been properly addressed and where possible resolved. Duration and frequency of these activities will be decided on the base of mutual agreements.

18.2.3 Consultations with Key Informants

In October 2017, key informant meetings were conducted by the social expert of the ESIA Consultant with the neighbourhood headmen of the Çınardibi, Dernekli, Cumalı, Dereköy, Gökyaka, Yeşilköy, Dağtekke, Helvacı, Karakızlar, Karaot and Ormanköy, which are the settlements located within a 5 km radius around the Project Area. The main aim of these consultations was to collect information on the local socio-economic conditions of the settlements, to have some insight about the perception and expectations of the settlements consulted to outline future stakeholder engagement activities and community development strategies. The outcome of the consultations is presented in Chapter 13.

18.2.4 Consultations with Project Affected Persons (PAPs)

As previously identified within the ESIA, cherry plantation activities have been conducted on registered forest lands (2 different parcels registered with lot/parcel numbers 277/1 and 277/2) by informal users at the location of Turbine-12. Several consultations have been conducted with the land users by the Project Company as well as ESIA Consultant to understand the ownership status of the corresponding parcels, identify affected persons (land users) and their socio-economic conditions, significance of impacts to be caused by land acquisition and the potential mitigation alternatives that may be developed for the restoration of livelihoods. The findings of the socio-economic surveys conducted by the ESIA Consultant are provided in Chapter 13.

As part of ESIA consultations, a meeting was conducted with one of the Project Affected Persons (PAPs), who lives in Çınardibi neighbourhood and reportedly use one of the two affected forest parcels for cherry plantation activities, on 3 October 2017 at the Çınardibi teahouse (see Figure 18-7).

In order to identify the actual owners of the cherry plantation, additional site visit held on 20-22 December 2017. During the site visit, all PAP's were interviewed and actual borders of the plots (depending on the illegal ownership) were identified.

18.2.5 Consultations with the District Governmental Offices and Local Associations

Additional meeting was planned and held with the District Directorate of Agriculture of Kemalpasa and Bayindir districts on 20-22 December 2017. During the meetings, baseline information on agriculture and livestock activities that have been carrying out in the region was obtained. On the other hand, governmental officials were also informed about the potential environmental and social impacts of the proposed Project. A large-scale map (in A3 format), showing the Mersinli WPP's license area and the turbine locations, was presented during the meeting and potential environmental and social risks were discussed with the officials. Concerns and comments of the governmental officials that addressed during the meetings are summarized in Table 18-7 below:

Figure 18-7. View from the Meeting with PAPs in Çınardibi Neighbourhood (3 October 2017)

Table 18-7. Concerns and Comments Raised by Governmental Officials during the Meetings

Main Environmental and Social Subject	Concern/Comments
Livelihood Impact	Beekeeping activity is one of the important livelihoods for some households in the region. Impact of potential dust generation could affect these livelihoods. Relevant mitigation measures should be taken during the construction phase of the Project
	It should be noted that, previous WPP Projects within the region have not observable adverse impacts on beekeeping so far.
Restriction of Access	Grazing activities within the region should be also taken into account during the establishment of Project specific mitigation measures.
Stakeholder Notification	Beekeepers must apply to the District Directorate of Agriculture while deciding to situate their beehives. So, Directorate should be informed on locations of the upcoming Project construction activities in order to notify the beekeepers.
Community Development	In order to increase Project benefits, following community development projects were offered by the officials: Provide training for beekeepers; Encouraging people living in the project affected settlements to establish organizations such as agriculture and livestock cooperatives; and Employment opportunities should be available during the construction phase of the Project.

Additional meetings were held with the Izmir General Directorate of National Estate. During the meeting, possible livelihood restoration and compensation strategies can be developed during the construction phase of the Project were discussed.

Apart from abovementioned meetings, additional interview was held with the board member of Izmir Beekeepers Association (an Agricultural Engineer with MSc degree). Potential impacts of the Project on beekeeping activities and possible community development activities were discussed with the board member. Following issues were emphasized by the board member during the meeting:

- Relevant mitigation measures should be taken during the construction activities such as dust suppression;
- Beekeepers should be informed in timely manner on the location of the upcoming Project construction activities;
- Queen bees can be provided to the beekeepers by the Project Company at the beginning of the season; and
- Specific flowers (such as lavender) can be planted at certain areas where beekeepers situate their hives.

18.3 Grievance Mechanism for Stakeholders

Information regarding the procedure and channels (e.g. phone, e-mail address, and website) that can be used to lodge grievances will be provided in all nearby settlements within the Project Impact Area and on the Project Company website. A Public Grievance Form, which will be used to receive a grievance, is provided, in Appendix C in SEP. Once the Grievance Form is received, a Grievance Register Form will be filled by the CLO.

The Project Company has already employed a CLO, who will also be responsible for the management of potential grievances and for the Grievance Procedure. Each complaint whether from an individual, entity or a community will be considered. A response to each specific complaint will be communicated to the party that raised it (complainant). A formal procedure will be used to log the key information provided by a complainant and to record any related incoming communications. A record of actions taken and resolutions agreed as a result of the grievance investigation will also be documented. Once the grievance will be resolved in agreed with the complainant, a grievance close-out form (see Appendix E in SEP) will be filled by the CLO. Monitoring of the necessary actions that need to be taken will be carried out by the responsible party. Asample leaflet on how to report a grievance is presented in Appendix F in SEP.

The Project Company aims to establish a formalized procedure, ensuring that it is responsive to any concerns and complaints from affected stakeholders and communities. Where training is necessary for the staff involved in the management of the grievance mechanism, The Project Company will ensure that such training is provided in a timely manner.

The implementation of the Grievance Procedure by the Project Company for the Project will be under the day to day responsibility of the formally designated CLO. Grievance boxes will be placed by the Project Company (main entrance), at the neighbourhood headmen’s offices in selected settlements (e.g. Cumalı and Çınardibi) to facilitate collection of grievances. The grievance process for the Project is presented in Figure 18-8.

If the complainant is not satisfied with the solutions proposed and implemented by the Project Company to address the raised comment or grievance, the complainant is free to seek other mediation or legal remedies in accordance with Turkish law.

The grievance procedure will also cover employee and non-employee grievances. Internal grievances will be handled by the Project Company’s HR Department. Employee suggestion boxes will be available at the construction camp sites and grievance mechanism for workers will be relying on following aspects:

- Transparency
- Impartiality
- Confidentiality
- Accessibility

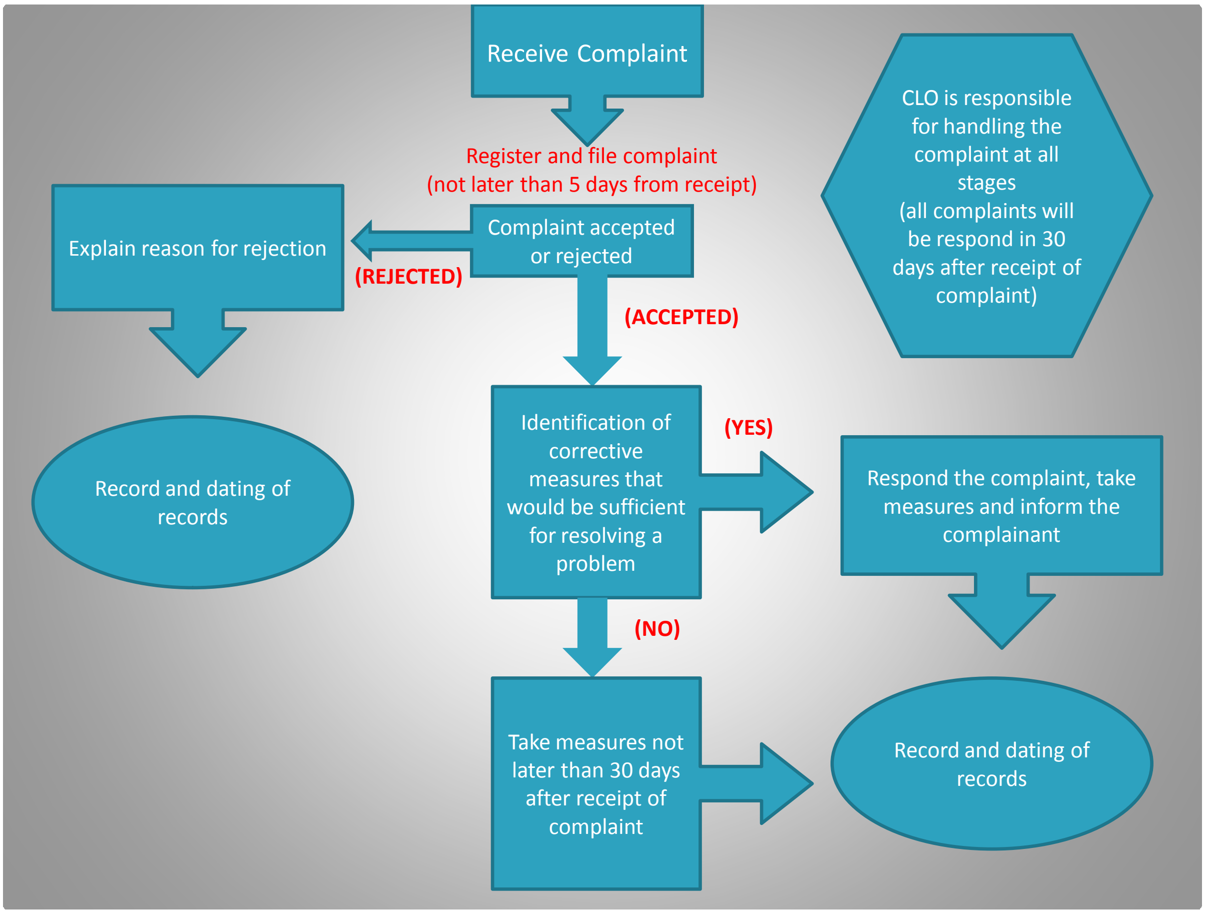

Figure 18-8. Grievance Procedure Diagram

19. Environmental and Social Management System

The Mersinli WPP Project Environmental and Social Management System (ESMS) has been developed as a part of the Project's ESIA process and aims to provide processes for environmental and social (E&S) management to be implemented throughout all phases of the Project to achieve the Project Company's E&S objectives. The purposes of the ESMS are as follows:

- Defining environment, health, safety and social objectives of the Project Company.
- Providing a framework management tool to achieve these objectives in the most effective way in all phases of the Project, in compliance with Project standards consisting of national legislation, IFC and EBRD requirements and other international standards and GIIP.
- Assigning responsibilities and personnel for ESMS implementation.
- Providing a guide for reassessment and as required update of existing management processes such as the ESMS itself and the management plans developed for successful implementation of it.

The policy framework was described, potential environmental and health and safety risks associated with the Project activities were assessed and related prevention/mitigation measures and monitoring practices were proposed as part of the ESIA studies. To help assess, control and continually improve the overall environmental and social performance of the Project, the ESMS is structured to include the following subjects in a comprehensive but compact and integrated manner:

- Policy,
- Identification of Risks and Impacts,
- Management Programs,
- Organisational Capacity and Competency,
- Emergency Preparedness and Response,
- Stakeholder Engagement,
- External Communications and Grievance Mechanism,
- Ongoing Reporting to Affected Communities and
- Monitoring and Review.

This document is not a definitive version of the ESMS, as it will continually be improved and modified through ongoing reviews conducted both periodically and in case of a major change in Project E&S conditions that may prompt an immediate review (e.g. change in applicable standards and legislation).

The Project Company, all contractors and all sub-contractors are responsible for implementation of the ESMS including each implementation document from the more general policies to Management Plans (MPs) and more specific implementation documents such as procedures.

19.1 Policy

In pursuit of assured compliance with the international standards, the Project Company has in place a set of policies outlining its commitments aimed towards the sustainable and sound management of environmental and social subjects, issues related to its projects and responsibilities with regards to meeting its stakeholders' expectations. These corporate level policies are already in line with international standards and IFI requirements, as IFC is one of the shareholders of AE. The policies are listed below; whereas full versions can be accessed through the Company website (http://alcazarenergy.com/what-we-do/our-policies):

- Human Resources Policy,
- Health and Safety Policy,
- Environmental and Social Sustainability Policy, and
- Quality Policy.

The Project Company and the Contractors will also develop Project specific policies listed below:

- Human Resources Policy: The policy to be developed will cover forced labour, child labour, equal opportunity and equal treatment of workers, right to join workers organisations, wages, retrenchment, benefits and conditions of work. It should be noted that the Turkish labour law and related regulations cover these main principles of international labour standards, the EBRD PR2, EBRD PR4 and IFC PS2.
- Health and Safety Policy: The health and safety policy will address both the OHS and community health and safety requirements of the Project. The policy will ensure commitment of both the Project Company and all contractors that any applicable legislative requirement will be met with best practices and international standards. In addition, related convention provisions will also be acknowledged and integrated into the policy.
- Environmental and Social Sustainability Policy: The project specific environmental and social sustainability policy's objective is to set out a framework for implementation of Project activities in accordance with national and international environmental and social requirements and best practice with sustainability principle at the fore.

Within the overarching scope of its policies, AE is in the process of developing its own internal Quality, Health, Safety and Environment (QHSE) Management System, which applies to all corporate and project level operations the Company conducts, including the Mersinli WPP Project. In addition, to improve the existing system and to ensure full compliance with universally accepted and implemented standards, the Project Company is planning to obtain the following certifications by the end of Q1 2018:

- ISO 9001 Quality Management System
- ISO 14001 Environmental Management System
- OHSAS 18001 Occupational Health and Safety Management System

19.2 Identification of Risks and Impacts

The standards and legislative requirements are provided in Chapter 2 and in "Project Standards and GIIP" sections of each impact chapter, whereas the Project's environmental and social impacts were identified, assessed and mitigation measures for management of these impacts were also proposed in each impact chapter presented in this ESIA Report. The impact assessment is based on the methodology provided in Chapter 5.

Prevention and mitigation measures, together with the ESMS, its implementation documents and the Environmental and Social Action Plan (ESAP), will ensure full compliance with identified Project standards.

19.3 Management Plans

The main approach in ESMS implementation is ensuring consistency of all adopted E&S processes and procedures throughout the Project phases, with the required adaptation flexibility to ensure a management system that can cater to any transforming E&S issue related to the Project. A general structure for ESMS implementation hierarchy is presented in the chart given in Figure 19–1 and a full list of Management Plans to be implemented in the upcoming Project phases are provided in Table 19-1.

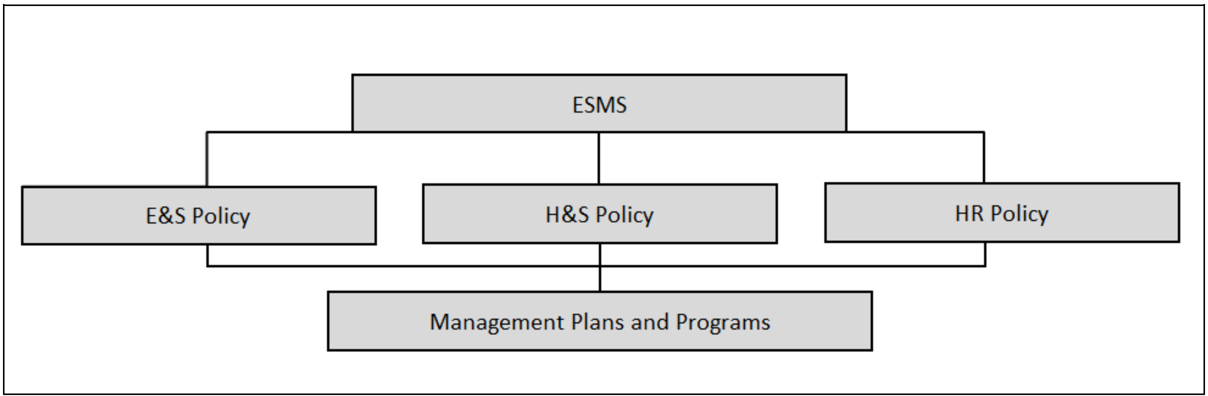

Figure 19–1. General ESMS Implementation Hierarchy

Table 19-1.Management Plans and Programs

Plan/ Program	Description
Environmental and Social Management and Monitoring Plan (ESMMP)	See Section 19.9 for details and Appendix L for the Plan.
Biodiversity Action Plan (BAP)	The BAP aims to achieve no-net-loss, and if possible net gain, of biodiversity at the Biodiversity Study Area due to Project-related activities over the course of the Project life-cycle. It stands as an open-ended live document, which in consultation with Project stakeholders and input from ongoing biodiversity studies, will be updated on a regular basis as the Project proceeds. Mersinli BAP is in place to ensure that all possible mitigation measures are implemented to ensure Project impacts on biodiversity features are avoided, minimized, repaired or offset through effective adaptive management strategies. Accordingly, the BAP is structured to include; • General characteristics of Mersinli WPP Project, and concept of biodiversity action planning, • Aims and objectives of Mersinli BAP, • National and international legislative framework in line with EBRD PR 6 and IFC PS 6, • Methodology and results of biodiversity baseline surveys, and identification of priority ecosystems, • Details of the Critical Habitat Assessment, and • Habitats and species of higher priority and conservation importance, and action plans developed for their conservation.
Erosion Control, Soil and Spoil Management Plan	This plan sets out the management practices associated with prevention or reduction of erosion, minimisation of sediment related impacts and excavated material management (including topsoil management). Within its scope, the legal framework and applicable standards are described, roles and

Plan/ Program	Description
	responsibilities are set, baseline conditions are summarised and erosion control, soil and spoil management practices are detailed, in addition to monitoring and reporting, training and review/update sections. The management practices are set under the following main categories: • Erosion and sediment management, • Landscape reinstatement and topsoil management, and • Spoil management.
Noise Management Plan	The main purpose of this Management Plan is to describe in detail the mitigation measures and control practices aimed at minimisation and management of noise to be sourced from the Project construction and operation activities. It includes sections on regulatory framework, roles and responsibilities, noise management approach, practices and measures, monitoring and reporting, training, review and update.
Air Quality Management Plan	The Plan aims to provide management practices associated with prevention or reduction of impacts on air quality to be sourced from Project construction activities. It describes the regulatory framework and standards, sets roles and responsibilities for implementation, defines air quality impact resources, provides management approach and related measures and details monitoring and reporting, training, review and update.
Waste Management Plan	The Plan sets out the primary applicable requirements associated with waste management. It provides details and requirements of applicable national legislation and international standards, sets roles and responsibilities for implementation, provides the waste management approach and waste types to be generated, describes waste management measures for collection, segregation, storage, transport and disposal, in addition to monitoring and reporting, training and review/update sections. A sample Waste Log Form and Waste Management Checklist are also appended to the Plan.
Emergency Preparedness and Response Plan	The Emergency Preparedness and Response Plan is developed to provide a comprehensive tool including procedures and actions that are to be taken prior, during and after an emergency situation, to prevent and mitigate the impacts of such an event. The plan outlines applicable legislation, sets roles and responsibilities for implementation, identifies potential hazards, lists related measures, provides information on how external communication with related emergency services and local communities that may be affected in case of emergencies and sections on record keeping with regards to emergencies, review and update of the plan and emergency preparedness and response trainings.
Occupational Health and Safety Plan	Developed to ensure health and safety of the Project workforce, this Plan summarises applicable OHS legislation and Project standards, sets roles and responsibilities for OHS management, including for contractors, identifies potential OHS risks and prevention/mitigation measures for these and provides training, recordkeeping and monitoring requirements.
Traffic and Transport Management Plan	The Project construction phase will involve transport of large turbine components and construction materials in a relatively short schedule, as well as transport of the workforce since worker accommodation will be provided outside of the Project area, a Traffic and Transport Management Plan is required. The plan provides information on applicable legislation and standards, sets roles and responsibilities, identifies transport routes and measures required for safety on these routes, lists measures for on-site traffic management, provides training requirements for drivers and workers, and includes sections on monitoring/reporting and review/update.
Contractor Management Framework Plan	As all contractors are responsible of implementation of the Project ESMS, this plan provides a systematic approach with respect to the selection, evaluation and management of the contractors in accordance with the Project ESMS. It provides details

Plan/ Program	Description
	and requirements of applicable national legislation and international standards, sets roles and responsibilities for implementation, describes contractor selection criteria and implementation methods including contractual agreements, sets how the contractors inform the Project Company of a potential non-conformance with the ESMS and Project standards and provides details on audits of contractors, in addition to sections on monitoring and reporting, training and review/update.
Stakeholder Engagement Plan (SEP)	The Project Company is committed to communicating openly and actively with workers, communities, governmental/non-governmental organisations and other identified stakeholders of the Project, on all topics in all Project related activities. The SEP will guide the Project Company towards implementing a structured stakeholder consultation and engagement process during the period of the ESIA studies, as well as during the further stages of the Project implementation. The SEP includes the following main subjects: • Regulatory requirements and standards, • Previous stakeholder activities, • Stakeholder identification, • Stakeholder engagement methods and processes, • Grievance mechanism, • Monitoring and reporting, and • Responsibilities.
Grievance Mechanism	Based on the grievance mechanism described by the Project SEP, the Project Company aims to establish a formalized procedure, ensuring that it is responsive to any concerns and complaints from affected stakeholders, including the Project Company workers, Contractor workers, non-employee workers and communities. Methods described by the SEP will be used to provide information regarding the procedure and channels (e.g. phone, e-mail address, and website) that can be used to lodge grievances. The Grievances will be recorded and responded to in a timely manner, as described the SEP.
Community Development Plan	Project Company recognises that there is need for consultation with local communities to build and strengthen mutual trust. Thus, Project Company employed a Community Liaison Officer (CLO) to focus on community relations. This will also allow to develop a culturally appropriate consultation and to understand local needs to improve livelihood resources. Utilising the consultation activities provided by the Project SEP, a Community Development Plan will be prepared by the Project Company. The CDP will include following items: • Identify and describe all related livelihood resources that are used by the local community; • Prioritize the community needs and assistance; • Describe the possible community development activities that may provide to the local community members; • Clearly identify the roles and responsibilities of Project Company staff, government, local authorities, local and national NGOs and other stakeholders in relation to managing community development activities in the region; • Describe the consultation and stakeholder engagement process that will be used during the project related CDP activities; • Identify potential additional sources of finance and technical assistance support; and • Describe how Project's community development initiatives should be monitored

Plan/ Program	Description
	and evaluated.
Reforestation Programme	To be prepared in cooperation with the Forestry authorities, This plan will set how the Project reforestation activities will be conducted, including timetables, areas for plantations and plantation types.
Livelihood Restoration and Compensation Framework (LRCF)	The Project Company recognises that the Project may have land access and livelihoods impact across the Project footprint. The Project Company has already sought to minimise the area of land required for the project components. However, the Project may cause restrictions on land access or loss of livelihoods. Therefore, a Livelihood Restoration and Compensation Framework was prepared with the following aims: • Avoid or minimise resettlement or economic displacement; • Mitigate adverse social and economic impacts of the Project; • Provide timely compensation for loss of assets at replacement cost; and • Improve or, at a minimum, restore the livelihood and standards of living within the region.
Chance Finds Procedure	The purpose of this procedure is to provide the Project Company and its contractors with a guidance that outlines the procedures that shall be implemented in the event of a chance find, since they are responsible of management and protection of any archaeological and heritage resources that may be encountered during the land preparation and construction phase. The procedure provides the legal framework and describes the process to be followed in case of a chance find, based on attributed importance of a chance find.

Of the above listed management plans and programs, the following were prepared within the scope of the ESIA studies and will be disclosed as part of the ESIA Disclosure Package:

- Environmental and Social Management and Monitoring Plan (ESMMP) (to be disclosed as part of the ESIA Report – see Appendix L),
- Contractor Management Plan,
- Erosion Control, Soil and Spoil Management Plan,
- Noise Management Plan,
- Air Quality Management Plan,
- Stakeholder Engagement Plan (including the Grievance Procedure),
- Waste Management Plan,
- Livelihood Restoration and Compensation Framework, and
- Chance Finds Procedure (to be disclosed as part of the ESIA Report – see Appendix F).

Development timeframes for the remaining plans and programs, on the other hand, are provided in Table 19-2.

Table 19-2. Timescale for Plans/ Programs to be Developed

Plan/ Program	Timeframe
Emergency Preparedness and Response Plan	Prior to initiation of land preparation and construction phase
Occupational Health and Safety Plan	Prior to initiation of land preparation and construction phase
Traffic and Transport Management Plan	Prior to initiation of land preparation and construction phase
Community Development Plan	Prior to initiation of land preparation and construction phase
Reforestation Programme	Depends on the Forestry Authority, which the program will be prepared in cooperation with

19.4 Organisational Capacity and Competency

The Project Company will take full responsibility for E&S management of the Project, through its Project Execution Manager‘s coordinative role, its own corporate level E&S personnel and its own site personnel such as the community liaison officer. Being the Project owner, the key responsibilities of the Project Company will include the following:

- Provision of technical and legal supervision to contractors for works to be conducted;
- Initiation and approval of land preparation and construction works;
- Obtaining permits and approvals including land use permits in accordance with relevant Turkish legislation;
- Planning information disclosure and stakeholder engagement activities (in cooperation with the contractors);
- Ensuring the Project ESMS and ESMMP are implemented by contractors with strict adherence to the Project standards identified throughout this ESIA study; and
- Periodical review and as required update/modification of the ESMS and all its management programs (in consultation with the contractors).

The main Project activities will be conducted by either the TSA Contractor (Vestas) or the BoP Contractor (EMTA). Within this regard; and as required by contractual agreements, IFI requirements and the Contractor Management Framework Plan, the contractors are also responsible of ESMS implementation. The Project Company will provide assistance to the Contractors in implementation of the ESMS and the ESMMP, in line with the identified Project standards. In addition, the Project Company will monitor the Contractors' ESMS implementation performance. For this purpose, the Contractors will establish mechanisms to inform the Project Company management about the environmental and social performance of the Project and the Project Company will establish mechanisms to manage the overall ESMS implementation by contractors.

Detailed roles and responsibilities for implementation of the Project ESMS are summarised in Table 19-3 and organisational structure of the Project is provided in Figure 19–2.

Table 19-3. Roles and Responsibilities for ESMS Implementation

Position	Roles and Responsibilities
Project Execution Manager	• Ensure adequate resources required for ESMS implementation are provided. • Provide information on ESMS implementation to top management of the Project Company. • Direct contract oversight in ensuring that Mersinli WPP receives the deliverables and services identified in the contracts including full compliance with the Project ESMS.

Position	Roles and Responsibilities
Project Company / QHSE Manager and team	• Oversee HSE issues through implementation, review, update and monitoring of the ESMS. • Ensure management of HSE issues at the Project complies with the national legislation and IFI standards, as reflected in the Project ESAP and ESIA commitments. • Conduct internal HSE reporting for upper management. • Approve implementation of specific actions (identified by the Contractors) in accordance with the HSE policies of the Project, in line with the ESMS. • As required, develop, review and update detailed and specific HSE Management Plans and related documents (in consultation with the contractors) and approve the final documents. • Ensure HSE awareness and competency trainings are conducted by the contractors and the Project Company, through review of training records and related training documents. • Oversee contractors' HSE compliance with Project requirements through contractor monitoring and reports.
Project Company / Environmental Specialist	• Assist the QHSE Manager in overseeing environmental issues through implementation, review, update and monitoring of the ESMS. • Assist the QHSE Manager in the implementation of specific environmental actions in accordance with the environmental and social sustainability policy of the Project Company. • Assist the QHSE Manager in conducting internal environmental reporting for the Project. • Assist the QHSE Manager in development, review and update of environmental MPs and related documents.
Project Company / HR Manager and team	• Ensure Project labour management practices adhere to the Project standards. • Ensure contractors implement the Project grievance mechanisms, through review of grievance records reports.
Project Company / Community Liaison Officer	• Conduct routine stakeholder engagement. • Ensure community grievances are recorded and responded to appropriately, both by the Project Company and the contractors. • Review and assess monthly contractor monitoring for social issues including local labour force, internal grievances and workers accommodation.
Contractor / Project Director	• Ensure compliance with the Project-specific environmental and social policies, ESMS and environmental and social management plans and Project HSE, labour and social standards in accordance with the contractual requirements. • Ensure competent and skilled HSE personnel are employed for implementation of the ESMS in line with Project standards. • Ensure resources are allocated to implementation the ESMS, including resources for provision of generalised and specialised HSE trainings.
Contractors / QHSE Managers and teams	• Ensure that ESMS, MPs and other management processes are abided by and implemented during all contractor activities. • Ensure HSE non-compliances are recorded and responded to immediately. • As required, participate in development, review and update of HSE Management Plans and related documents (in consultation with the Project

Position	Roles and Responsibilities
	Company). • Provide HSE trainings (in line with Project standards) to own personnel and keep records of provided HSE trainings. • Conduct internal audits and daily inspections and record identified incompliances. • As required (e.g. in case incompliances are identified, a change in applicable legislation occurs, etc.), participate in development of corrective and/or enhancement actions. • Prepare monthly HSE review and incident reports for the Project Company Environmental Specialist and the Project Company QHSE Manager (reports to cover OHS and EHS statistics, identified incompliances, actions to be taken, implementation success of previous actions, etc.)
Contractors / HR Managers and teams	• Ensure that ESMS, MPs and other management processes are abided by and implemented during all contractor activities. • Ensure grievances are recorded and responded to appropriately. • Ensure contractor labour management practices are in line with Project standards. • Ensure the grievances are recorded and responded to appropriately and shared with the Project Company Community Liaison Officer.
All Employees	• Comply with Project HSE standards. • Complete all required trainings.

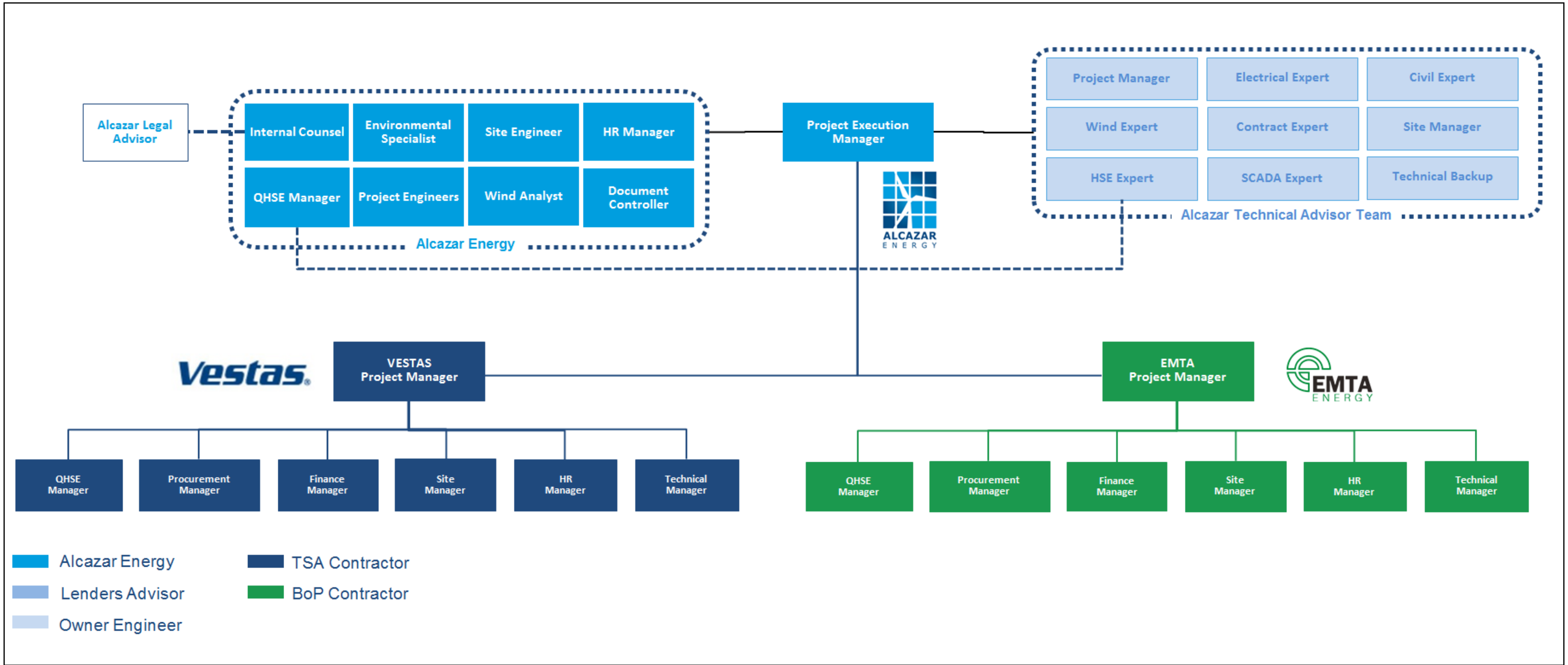

Figure 19–2. Mersinli WPP Management Structure

19.5 Emergency Preparedness and Response

An Emergency Preparedness and Response Plan will be developed, providing preventive measures and response strategies in case of accidents that may likely occur at a WPP of the Project’s scale, as well as preparedness and response measures to protect the public health, safety and environment on and off the Project area in the situation of a disaster such as a potential natural hazard, including forest fires, or sabotage. The Plan will detail the following main aspects of emergency management:

- Roles and responsibilities for emergency management.
- Identification of potential emergencies and key areas prone to emergency situations.
- Actions to be taken prior to an emergency (preventive and preparatory measures).
- Actions to be taken during an emergency (response measures).
- Actions to be taken after an emergency (recovery and assessment measures).
- Contact lists for emergency situations.

19.6 Stakeholder Engagement

A Stakeholder Engagement Plan (SEP) has been developed to manage the relations with all stakeholders of the Project. The Stakeholder Engagement Plan is designed to ensure the following:

- Identification of all stakeholders such as individuals, groups or entities which are, or which consider themselves to be, affected by the Project or have a direct or indirect influence/impact on the Project.
- Defining activities for appropriate engagement with identified stakeholders during the lifetime of the Project, with an ultimate aim of establishing and maintaining constructive relationships, including public consultation and information disclosure strategies.
- Establishing a grievance mechanism, including separate modules for internal and external grievances, to ensure timely and appropriate response is provided for grievances

19.7 External Communications and Grievance Mechanism

A Community Liaison Officer (CLO) was appointed by the Project Company in November 2017 to ensure effective communication with the external stakeholders. Project activities, the national EIA, the ESIA, the NTS, the SEP and all relevant documentation, will be disclosed on the website of the Company (http://alcazarenergy.com/our-projects/). Information will also be made available for affected communities through contextually appropriate methods (e.g. through the CLO, meetings, newspapers, leaflets/ brochures, notifications at neighbourhood headmen’s offices and teahouses, etc) throughout the lifetime of the Project. Hard copies of the Disclosure Package documents and other relevant documentation will be kept on Project site for any stakeholder to review. In addition, hard copies of the Disclosure Package documents will also be distributed to the neighbourhood headmen offices and related municipalities. Further information on the Project can always be obtained by contacting the Project Company. Disclosure activities, disclosure strategy and contact details are provided in the SEP.

Stakeholder engagement activities and means of communicating with the key stakeholders will be regularly reviewed, updated and reflected accordingly in the next revisions of the SEP. A grievance mechanism tailored for the local communities, comprising of the grievance procedure and associated grievance form and record of grievances will be in place throughout all phases of the Project. The grievance mechanism covers both external and internal grievances. Grievances and details of responses will be recorded and reported internally on a regular basis. The grievance mechanism will be easily accessible for all stakeholders through disclosure activities detailed in the SEP.

The Project Company will ensure that the following are in place for the Project:

- A person responsible for community-liaison and responding to both community and worker grievances, which will receive verbal complaints and if necessary fill out forms on behalf of the community members as required.
- Information on the grievance procedure and a mechanism for online submission of grievances posted on the Company website.
- Providing information on the grievance mechanism to the local communities through appropriate stakeholder engagement activities.

19.8 Ongoing Reporting to Affected Communities

The key to maintaining good, constructive relations with Project Affected People (PAPs) is ensuring that Project affected communities are kept informed with regards to Project activities and follow up actions on any ongoing grievances in a regular and periodic schedule. Within this regard, the Project will communicate its activities at least annually to the related stakeholders. In case, environmental and social aspect changes or new risks emerge that require to be urgently communicated, additional information dissemination activities will be planned, through disclosure methods provided in the SEP. All ongoing reporting for communities will be in Turkish, easily understandable and non-technical.

The scope of regular, annual reporting will comprise of the following subjects:

- Implementation progress of related commitments provided in the Project ESIA, ESAP, national EIA, etc.
- Monitoring results for subjects the communities are interested in.
- Benefits gained by the Project in the reporting year.

19.9 Monitoring and Review

Tools such as site audits, monitoring activities and grievance records will be used to monitor implementation performance of the ESMS. Monitoring and subsequent reporting will ensure the following:

- Check and ensure major elements of the ESMS are in place.
- Check and ensure the MPs and other sub-management documents are being implemented by both the Project Company and contractor personnel.
- Ensure continuous compliance with Project standards; consisting of national legislation, IFI standards and other international standards and GIIP.
- Check progress towards overall objectives and targets set out by the Project ESIA and ESAP.

To ensure the highest continuous performance, the ESMS will be reviewed annually and additionally in case assessed to be required in the event of important changes to Project HSE and social conditions and applicable legislation and standards. As stated above in Table 19-3, the Project Company QHSE Manager, QHSE team and Environmental Specialist will together contribute to development, review and update of ESMS components (in consultation with the contractors). The social components of the ESMS, on the other hand, will be reviewed and updated as required, by the HR Manager.

For monitoring of ESMS performance and to identify if the goals and outcomes set by the ESMS are achieved, the Project Company will conduct internal inspections and audits. In addition to internal monitoring to be conducted for the Project, Lenders will also be monitoring the Project through their technical, E&S and legal consultants.

An Environmental and Social Management and Monitoring Plan (ESMMP) has been prepared as part of the ESIA and presented in Appendix L. The main aim of the ESMMP is, providing a tool for implementation of environmentally and socially sound practices that are required to avoid and where not possible, minimise the Project's potential impacts on the environment, the workforce and the local communities. The ESMMP reflects and measures the implementation performance of mitigation measures addressing the identified environmental and social impacts and outlines an overall approach to monitoring. It will be implemented jointly with subject specific environmental and social management plans listed above in Section 19.3. Implementation effectiveness of the environmental and social mitigation measures and compliance with Project standards will be identified by using the monitoring parameters and Key Performance Indicators (KPIs) defined in the ESMMP.

In case any non-compliance with Project standards or any measurement above limits provided by related legislation or standard is identified during monitoring of key environmental, OHS and community HS performance indicators, the non-compliance will be recorded and reported. Follow up activities will include investigation of the non-compliance immediately and in the next monitoring term to ensure E&S safety. Implementation performance of any recommended action proposed against a non-compliance by the Project Company and/or the contractors' E&S management personnel will also be monitored and recorded in the following monitoring terms. In this scope, HSE and social performance and progress reports will be prepared by the Project Company (by QHSE Manager, HR Manager, Environmental Specialist and their teams), and submitted to senior management and the Lenders, in line with monitoring terms identified by the Lenders. The contractors, on the other hand, will provide monthly HSE performance reports, which will constitute the basis for the Project Company's HSE and social performance and progress reports.

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- European Commission website, https://ec.europa.eu
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- Geodata application, http://geodata.ormansu.gov.tr/
- Ministry of Environment and Urbanization (MoEU) EIA Positive Decisions Database, http://www.csb.gov.tr/gm/ced/index.php?Sayfa=sayfaicerik&IcId=673
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Appendix A Ministry of Environment and Urbanization's Official Letter of Confirmation for the Validity of Existing EIA Positive Decision (in Turkish)

T.C.
ÇEVRE VE ŞEHİRCİLİK
BAKANLIĞI

T.C.
ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI
Çevresel Etki Değerlendirmesi, İzin ve Denetim Genel Müdürlüğü

Sayı :48331039-220.01-E.16562 01.11.2017
Konu :Mersinli RES Projesi

DAĞITIM YERLERİNE

İlgi : Yander Elektrik Müh. Müş. İnş. Turz. ve Tic. A. Ş.'nin 06.10.2017 tarihli ve 2017-20 sayılı yazısı.

İlgi yazı ile İzmir İli, Bayındır, Kemalpaşa ve Torbalı İlçeleri sınırları içerisinde Çardaklı Tepe, Kartal Tepe, Mersinli Mahallesi, Karlık Tepe ve Akçam Tepe mevkii'nde Yander Elektrik Müh. Müş. İnş. Tur. ve Tic. A. Ş. tarafından yapılması planlanan "Mersinli Rüzgar Enerji Santrali (22 türbin*2,5 MWm/türbin=55 MWm)" projesi hakkında Bakanlığımızca verilen 18.07.2016 tarih ve 4234 nolu "ÇED Olumlu" kararının bulunduğu, söz konusu proje için kati projelerin hazırlanması aşamasında Nihai ÇED Raporu'nda verilen etki alanı koordinatları içinde kalmak şartıyla, her biri 2,5 MWm olan 22 adet türbin sayısının herbiri 3,45 MWm olan 17 adet türbine düşürüldüğü, buna karşılık tesisin toplam kurulu gücünün 55 MWm'den 58,65 MWm'ye çıkarıldığı belirtilerek, projede yapılan değişikliklerle ilgili olarak ÇED Yönetmeliği kapsamında izlenecek prosedür hakkında tarafınıza bilgi verilmesi talep edilmektedir.

Bilindiği üzere, ÇED Yönetmeliği'nin Ek-1 listesinin 43. maddesinde (Değişik:RG-26/5/2017-30077) "Türbin sayısı 20 adet ve üzerinde veya kurulu gücü 50 MWm ve üzerinde olan rüzgar enerji santralleri" ve Ek-2 listesinin 42. maddesinde (Değişik:RG-26/5/2017-30077) "Türbin sayısı 5 adet ve üzerinde veya kurulu gücü 10 MWm ve üzerinde 50 MWm altında olan rüzgar enerji santralleri" hükümleri yer almaktadır.

İlgi yazı ve eklerinin incelenmesi neticesinde, proje kapsamında herbiri 2,5 MWm olan 22 adet türbin sayısının herbiri 3,45 MWm olan 17 adet türbine düştüğü, tesisin toplam kurulu gücünün 55 MWm'den 58,65 MWm'ye çıkarak 3,65 MWm arttığı, proje kapsamında yer alan türbin koordinatlarının 18.07.2016 tarih ve 4234 karar nolu "ÇED Olumlu" kararına esas Nihai ÇED Raporu'nda belirlenen aynı etki alanında (lisans alanı) kaldığı tespit edilmiştir.

Bu itibarla, "Mersinli Rüzgar Enerji Santrali" projesi kapsamında projenin kurulu gücünde yapılması düşünülen 3,65 MWm kapasite artışı ÇED Yönetmeliğinin 20. maddesi kapsamında değerlendirilmiş olup, artış miktarının Yönetmeliğin Ek-1 ve Ek-2 listesinde belirtilen eşik değerler altından kalması nedeniyle ÇED Yönetmeliği hükümlerinin uygulanmasına gerek bulunmamaktadır. Yine türbin sayısının düşürülmesi ve bazı türbinlerin koordinatlarının yer değiştirilmesina dair değişiklikte aynı etki alanı içerisinde planlanması nedeniyle uygun görülmektedir.

Ancak, proje kapsamında yapılması planlanan değişiklikler ile ilgili olarak 5491 sayılı Kanunla Değişik 2872 sayılı Çevre Kanunu ile bu Kanuna istinaden çıkarılan Yönetmeliklerin ilgili

Not: 5070 sayılı Elektronik İmza Kanunu gereği bu belge elektronik imza ile imzalanmıştır.

Mustafa Kemal Mahallesi Eskişehir Devlet Yolu (Dumlupınar Bulvarı) 9. km No:278
Çankaya /ANKARA Telefon No: (0312) 410 10 00 Faks:(0312) 419 21 92

Bilgi için:Ramazan OKUR
Mühendis
Telefon No:(312) 410 00 00-1866

1 / 2

T.C.
ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI
Çevresel Etki Değerlendirmesi, İzin ve Denetim Genel Müdürlüğü

Sayı : 48331039-220.01-E.16562
Konu : Mersinli RES Projesi

01.11.2017

hükümlerine uyulması ve diğer mer'i mevzuat çerçevesinde öngörülen gerekli izinlerin alınması, ekolojik dengenin bozulmamasına, çevrenin korunmasına ve geliştirilmesine yönelik tedbirlere riayet edilmesi gerekmektedir.

Bilgilerinizi ve gereğimi rica ederim.

e-imzalıdır
M. Mustafa SATILMIŞ
Bakan a.
Genel Müdür

Ek :
1 - Eski Yeni Koordinatlar (1 adet CD)
2 - Karşılaştırılmalı Harita (1 adet)

Dağıtım:

Gereği:
YANDER ELEKTRİK MÜHENDİSLİK MÜŞAVİRLİK İNŞAAT TURİZM VE TİCARET A. Ş.NE

Bilgi:
Çevre Envanteri ve Bilgi Yönetimi Daire Başkanlığına
İZMİR VALİLİĞİNE
(Çevre ve Şehircilik İl Müdürlüğü)

Mustafa Kemal Mahallesi Eskişehir Devlet Yolu (Dumlupınar Bulvarı) 9. km No:278
Çankaya /ANKARA Telefon No: (0312) 410 10 00 Faks:(0312) 419 21 92

Bilgi için:Ramazan OKUR
Mühendis
Telefon No:(312) 410 00 00-1866

Appendix B Noise Measurement Device Calibration Certificates

PROTOS

KALİBRASYON ÖLÇÜM EĞİTİM VE DANIŞMANLIK HİZMETLERİ TİCARET LTD. ŞTİ.
KALİBRASYON LABORATUVARI

AB-0078-K
1041/2017
03-17

1. Kalibrasyon Sonuçları

Tablo 1. SLK Seviye Kontrolü Sonuçları

Nominal Değer (dB)	Ölçülen (dB)	Tolerans (dB)	Seviye Kararlılığı (dB)		Tolerans (dB)
			|UL-ML|	|LL-ML|	
94.0	94.37	± 0,4	0.001	0.000	± 0,1
114.0	114.40	± 0,4	0.000	0.000	± 0,1

|UL-ML| : 20 saniye süresince kalibratörün en yüksek seviyesi ile ortalama seviyesi arasındaki fark
|LL-ML| : 20 saniye süresince kalibratörün en küçük seviyesi ile ortalama seviyesi arasındaki fark

Tablo 2. SLK Frekans Kontrolü Sonuçları

Seviye (dB)	Nominal Değer (Hz)	Ölçülen (Hz)	Tolerans (%)	Frekans Kararlılığı (%)	
				|UF-MF|	|LF-MF|
94.0	1000.0	1000.00	± 1,0	0.003	0.004
114.0	1000.0	1000.04	± 1,0	0.000	0.000

|UF-MF| : 20 saniye süresince kalibratörün en yüksek frekansı ile ortalama frekansı arasındaki fark
|LF-MF| : 20 saniye süresince kalibratörün en küçük frekansı ile ortalama frekansı arasındaki fark

8. Ölçüm Belirsizliği

Ses kalibratörün seviye belirlenmesindeki belirsizlik 0,13 dB'dir.

Beyan edilen genişletilmiş ölçüm belirsizliği, standart belirsizliğin k=2 olarak alınan genişletme katsayısı ile çarpımı sonucunda bulunan değerdir ve %95 oranında güvenilirlik sağlamaktadır.

9. Görüşler, Açıklamalar ve Uygunluk Beyanı

Ölçüm sonuçları IEC 60942 standartında 1.Sınıf Ses Kalibratörleri için verilen toleranslarla karşılaştırılmıştır.

Kalibrasyon sonuçları sadece kalibrasyonu yapılan cihazına aittir. Cihazın performansı için gerekli çevre şartlarında kullanımından ve uygun aralıklarla kalibrasyonunun sağlanmasından kullanıcı sorumludur.

PROTOS KALİBRASYON

PROTOS

KALİBRASYON ÖLÇÜM EĞİTİM VE DANIŞMANLIK HİZMETLERİ TİCARET LTD. ŞTİ.
KALİBRASYON LABORATUVARI

AB-0078-K
1041/2017
03-17

1. Test Edilen Cihaz

Adı	Üretici	Model / Tip	Seri No	Ölçme aralığı veya Tanımlama
SES KALİBRATÖRÜ	SVANTEK	SV 30A	17632	SINIF:1 Frekans : 1000Hz Seviye : 94 dB, 114dB

2. Kalibrasyonun Yapıldığı Yer : Protos Kalibrasyon Laboratuvarı

3. Cihazın Laboratuvara Kabul Tarihi : 31/03/2017

4. Kalibrasyonda Kullanılan Referans Cihazlar :

Adı	Üretici	Model / Tip	Seri No	İzlenebilirlik
Kapasitif Mikrofon	B&K	40AU	81140	TUBİTAK-UME-G2AK 0033-06.02.2015

5. Kalibrasyon Prosedürü : PR504.09

Ses kalibratörünün (SLK) kalibrasyonu referans mikrofon kullanılarak karşılaştırma yöntemi ile yapılmıştır. Ses Kalibratörün ürettiği ses basınç düzeyleri ve frekansı ile seviye ve frekans kararlılığı kontrol edildi.

Kalibrasyon sırasında referans cihaz tarafından üretilen ses basınç düzeyi değerleri ortam şartlarına göre düzeltilerek dikkate alınmıştır.

6. Çevre Şartları

Sıcaklık: (24.1 ±1,0)°C

Basınç: (1006.7 ±1,0)hPa

Bağıl Nem:(34.1 ±5,0)%RH

7. Kalibrasyon Sonuçları

Ayar Öncesi Değer : - **dB**
Ayar Sonrası Değer : - **dB**

PROTOS KALİBRASYON

2/3

FR510.02
rev00/02.08.2010

TÜRKAK
TÜRK AKREDİTASYON KURUMU
TURKISH ACCREDITATION AGENCY
tarafından akredite edilmiş

PROTOS

TÜRKAK
Kalibrasyon
TS EN ISO/IEC 17025
AB-0078-K

KALİBRASYON ÖLÇÜM EĞİTİM VE DANIŞMANLIK HİZMETLERİ TİCARET LTD. ŞTİ.
KALİBRASYON LABORATUVARI

Mehmet Akif Mh. Tavukçuyolu Cd. No: 150/1 Ümraniye İSTANBUL
Telefon: 0216 415 4949 (Pbx), Faks: 0216 415 4950
e-posta: info@protos.com.tr, internet: www.protos.com.tr

AB-0078-K
1041/2017
03-17

Kalibrasyon Sertifikası
Calibration Certificate

Cihazın Sahibi/ adresi *Customer / address*	**: FREKANS ÇEVRE LABORATUVARI** Rüzgarlıbahçe Mah. Cumhuriyet Cad. 39/60 Hasoğlu Plaza Kat: 5 Kavacık Beykoz/ İSTANBUL
Talep Numarası *Order Number*	**: 341/2017**
Makine/Cihaz *Instrument/Device*	**: SES KALİBRATÖRÜ**
İmalatçı *Manufacturer*	**: SVANTEK**
Tip *Type*	**: SV 30A**
Seri Numarası *Serial Number*	**: 17632**
Kalibrasyon Tarihi *Date of Calibration*	**: 31/03/2017**
Sertifikanın Sayfa Sayısı *Number of pages of the Certificate*	**: 3**

Bu kalibrasyon sertifikası, Uluslararası Birimler Sisteminde(SI) tanımlanmış birimleri realize eden ulusal ölçüm standardlarına izlenebilirliği belgeler.
This calibration certificate documents the traceabilty to national standards,which realize the unit of measurement to the International System of Units (SI).

Türk Akreditasyon Kurumu (TÜRKAK) kalibrasyon sertifikalarının tanınması konusunda Avrupa Akreditasyon Birliği(EA) ve Uluslararası Laboratuvar Akreditasyon Birliği(ILAC) ile karşılıklı tanınma antlaşmasını imzalamıştır.
The Turkish Accreditation Acency (TURKAK) is signatory to the multilateral agreements of the European co-operation for the Accreditation(EA) and of the International Laboratory Accreditation(ILAC) for the Mutual recognation of calibration certificates.

Ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve kalibrasyon metodları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.
The measurements, the uncertainties with confidence probability and calibration methods are given on the following which are part of this certificate.

Mühür *Seal*	**Tarih** *Date*	**Kalibrasyonu Yapan** *Calibrated by*	**Laboratuvar Müdürü V.** *Head of Calibration Laboratory*
PROTOS KALİBRASYON	31/03/2017	Cengiz ALTUN	Nebahat YETGİN

Bu sertifika, laboratuvarın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz. 1/3
İmzasız ve mühürsüz sertifikalar geçersizdir.
This certificate shall not be reproduced other than in full except with the permission of the laboratory FR510.02
Calibration certificates without signature and seal are not valid. rev00/02.08.2010

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160713G0092
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3. Ses Düzeyi Ölçerin Lineer Filtresinin Frekans Cevabı

Frekans (Hz)	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB) ±
31,5	94,09	94,1	0,01	1,5
63	94,10	94,0	-0,10	1,0
125	94,07	93,9	-0,17	1,0
250	94,05	93,9	-0,15	1,0
500	94,04	93,8	-0,24	1,0
1000	94,05	94,0	-0,05	0,7
2000	94,02	94,0	-0,02	1,0
4000	94,06	94,6	0,54	1,0
8000	94,04	93,5	-0,54	1,5 ; -2,5
12500	94,03	95,3	1,27	2,0 ; -5,0
16000	93,98	95,7	1,72	2,5 ; -16,0

4. Ses Düzeyi Ölçerin 1 kHz deki Doğrusallığı

Frekans (Hz)	Uygulanan (dB)		Ölçülen (dB)		Doğrusallık Tepkisi Farkı (dB)	Tolerans (dB) ±
	SPL (dB)	Seviye Artışı (dB)	SPL (dB)	Seviye Artışı (dB)		
1000	94,05	0,0	94,0	0,0	-0,05	0,8
	104,05	10,0	104,0	10,0	-0,05	
	114,01	20,0	114,0	20,0	-0,01	

5. Ses Düzeyi Ölçerin Hızlı (Fast) ve Yavaş (Slow) Zaman Ağırlıklı Filtrelerinin Frekans Cevabı

Frekans (Hz)	Hızlı				Yavaş			
	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tölerans (dB) ±	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tölerans (dB) ±
1000	105,0	105,0	0,0	0,5	102,0	102,0	0,0	0,5
2000	105,0	105,1	0,1		102,0	102,1	0,1	
4000	105,0	105,0	0,0		102,0	102,0	0,0	

6. Ses Düzeyi Ölçerin "Crest Factor CF=3" Ölçümü

Frekans (Hz)	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tölerans (dB) ±
2000	94,05	94,1	0,0	0,5
	104,02	104,1	0,1	

7. Ses Düzeyi Ölçerin Bir Saatlik Çalışması Sonucunda Elde Edilen Maksimum Sapma

Nominal SPL (dB)	Ölçülen SPL (dB)	Maksimum Sapma (dB)	Tölerans (dB) ±
94,01	94,0	0,0	0,3

Ölçüm Belirsizliği / *Measurement Uncertainty*

0,16	dB

Beyan edilen genişletilmiş Belirsizlik değeri, standart belirsizliğin normal dağılım için yaklaşık %95 güvenilirlik seviyesini sağlayan k=2 kapsam faktörü ile çarpımı sonucudur. Standart ölçüm belirsizliği GUM ve EA-04/02 dokümanlarına uygun olarak belirlenmiştir.

Açıklamalar / *Notes*

Ölçüm sonuçları IEC 61672-1 standardında 1. Sınıf Ses Düzeyi Ölçerler için verilen töleranslarla karşılaştırılmıştır. Cihazın tüm özelliklerinin standartta belirtilen şartlara uygun olduğu tespit edilmiştir.

Kalibrasyon sonuçları sadece kalibrasyonu yapılan Ses Düzeyi Ölçere aittir. Cihazın performansı için gerekli çevre şartlarında kullanımından ve uygun aralıklarla kalibre edilmesinden kullanıcı sorumludur.

FRG-02 Rev.No: 02 Rev.Tarihi: 23.10.2014

PENTA OTOMASYON VE ENDÜSTRİYEL ÜRÜNLER
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penta KALİBRASYON

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Makine / Cihaz *Instrument / Device*

Cihazın Adı / *Object*	Ses Seviyesi Ölçer	**İmalatçısı** / *Manufacturer*	SVANTEK
Model / *Model*	SVAN 971	**Seri No** / Serial No	44477
Yer / *Place*	-	**Kabul Tarihi** / *Accept Date*	22.3.2016
Ölçme Aralığı / *Range*	40 dB ile 130 dB	**Çözünürlük** / *Resolution*	0,1 dB

Prosedür ve Çevre Şartları / *Procedure and Environmental Conditions*

Cihazın kalibrasyonu, PRG01.01 dokümanına göre ve 20,3 ± 3 °C çevre şartlarında yapılmıştır.
51,2 ± 15 %RH
1014 ± 10 mbar

Referans Cihazlar *Reference Devices*

Cihazın Adı / *Device*	**Cihaz Kodu** / *Device ID*	**Sertifika Tarihi** / *Date*	**İzlenebilirlik** / *Traceability*
Çok Fonksiyonlu Akustik Kalibratör	REF.G.01 / 2931345	UME.G2AK-0099 / 07-14	UME

Metot / *Method*

Ses Düzeyi Ölçerin kalibrasyonu PRG01.01 "Ses Düzeyi Ölçer Kalibrasyon Prosedürü" ne göre gerçekleştirilmiştir.
Ses Düzeyi Ölçerin (SLM) mikrofonu B&K 4226 tip akustik kalibratörünün bağlaşımı (coupler) içine takılmıştır. 31,5 Hz ile16 kHz aralığında üretilen frekanslar ile 94 dB düzeyindeki ses basıncı (SPL), SLM ile ölçülerek A-ağırlıklı, C-ağırlıklı ve Lineer filtrelerinin frekans cevapları kontrol edilmiştir.
Akustik Kalibratörün bağlaşımı içerisinde 1 kHz frekansında 94 dB, 104 dB ve 114 dB ses basıncı düzeylerinde referans değerler üretilerek SLM nin doğrusallığı kontrol edilmiştir.
Bağlaşım içinde 1, 2 ve 4 kHz frekanslarında ve 106 dB ses basıncı düzeyinde SLM nin Hızlı (Fast) ve Yavaş (Slow) zaman ağırlıkları kontrol edilmiştir.
Bağlaşım içerisinde 2 kHz frekansında 94 ve 104 dB ses basıncı düzeylerinde referans değerler üretilerek "Crest" faktörü ölçülmüştür.
Bağlaşım içerisinde 1 kHz frekansında 94 dB ses basıncı düzeyinde üretilen referans değer 1 saat gözlenip, maksimum sapma ölçülmüştür.
Akustik Kalibratör tarafından üretilen ses basınç düzeyi değerleri çevre şartlarına göre düzeltilerek dikkate alınmıştır.

Kalibrasyon Sonuçları / *Calibration Results*

1. Ses Düzeyi Ölçerin A-ağırlıklı Filtresinin Frekans Cevabı

Frekans (Hz)	Nominal SPL (dB)	A-ağırlıklı Filtrenin Karakteristiği (dB)	Hesaplanan SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB) ±
31,5	94,10	-39,4	54,7	54,8	0,1	1,5
63	94,11	-26,2	67,9	67,9	0,0	1,0
125	94,08	-16,1	78,0	77,8	-0,2	1,0
250	94,06	-8,6	85,5	85,2	-0,3	1,0
500	94,05	-3,2	90,8	91	-0,2	1,0
1000	94,06	0,0	94,1	94	-0,1	0,7
2000	94,03	1,2	95,2	95,2	0,0	1,0
4000	94,07	1,0	95,1	95,7	0,6	1,0
8000	94,05	-1,1	92,9	92,6	-0,3	1,5 ; -2,5
12500	94,04	-4,3	89,7	90,9	1,2	2,0 ; -5,0
16000	93,99	-6,6	87,4	88,9	1,5	2,5 ; -16,0

2. Ses Düzeyi Ölçerin C-ağırlıklı Filtresinin Frekans Cevabı

Frekans (Hz)	Nominal SPL (dB)	C-ağırlıklı Filtrenin Karakteristiği (dB)	Hesaplanan SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB) ±
31,5	94,10	-3,0	91,1	91,1	0,0	1,5
63	94,11	-0,8	93,3	93,2	-0,1	1,0
125	94,08	-0,2	93,9	93,8	-0,1	1,0
250	94,06	0,0	94,1	93,9	-0,2	1,0
500	94,05	0,0	94,0	93,9	-0,1	1,0
1000	94,06	0,0	94,1	94,0	-0,1	0,7
2000	94,03	-0,2	93,8	93,9	0,1	1,0
4000	94,07	-0,8	93,3	93,9	0,6	1,0
8000	94,05	-3,0	91,0	90,7	-0,3	1,5 ; -2,5
12500	94,04	-6,2	87,8	89,0	1,2	2,0 ; -5,0
16000	93,99	-8,5	85,5	87,0	1,5	2,5 ; -16,0

FRG-02 Rev.No: 02 Rev.Tarihi: 23.10.2014

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Necatibey Cd. No:32 34425 Karaköy - İSTANBUL
Tel: 0 212 243 63 47 (pbx) - Lab.Tel: 0 212 243 17 06 - Fax: 0 212 243 63 41
e-mail: info@pentaotomasyon.com.tr
www.pentaotomasyon.com.tr

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Kalibrasyon Sertifikası
Calibration Certificate

Cihazın Sahibi / Adresi *Customer / Adress*	:	Frekans Çevre Ölçüm Müh. Dan. Tic.Ltd.Şti. Rüzgarlıbahçe Mah.Cumhuriyet Cad. 39/60 Hasoğlu Plaza K:5 Kavacık Beykoz/İSTANBUL
İstek Numarası *Order Number*	:	160713
Makine / Cihaz *Instrument / Device*	:	Ses Seviyesi Ölçer
İmalatçı *Manufacturer*	:	SVANTEK
Tip / Model *Type / Model*	:	SVAN 971
Seri Numarası *Serial Number*	:	44477
Kalibrasyon Tarihi *Date of Calibration*	:	23.3.2016
Sertifikanın Sayfa Sayısı *Total Number of Pages*	:	3

Bu kalibrasyon sertifikası, Uluslararası Birimler Sisteminde (SI) tanımlanmış birimleri gerçekleştiren ulusal ölçüm standartlarına izlenebilirliği belgeler. *This calibration certificate documents traceability to national standards, which realize unit of measurement according to the International System of Units (SI),* Türk Akreditasyon Kurumu (TÜRKAK) kalibrasyon sertifikalarının tanınması konusunda Avrupa Akreditasyon Birliği (EA) ve Uluslararası Laboratuvar Akreditasyon Birliği (ILAC) ile Karşılıklı Tanınma Anlaşmasını imzalamıştır. *The Turkish Accreditation Agency (TURKAK) is signatory to the multilaral agreements of the European co-operation for the Accreditation (EA) and of the International Laboratory Accreditation (ILAC) for the Mutual recognation of calibration certificates.* **Ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve kalibrasyon metotları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.** *Measurement results, expanded uncertainties and calibration methods are given on the following pages, which are part of this certificates.*

Mühür Seal	**Tarih** Date	**Kalibrasyonu Yapan** Calibrated By	**Laboratuvar Müdürü** Head of Calibration Laboratory
KALİBRASYON LABORATUVARI penta İSTANBUL	23.3.2016	Alaaddin DUYSAK	İrem EVCİ

FRG-02 Rev.No: 02 Rev.Tarihi: 23.10.2014

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3. Ses Düzeyi Ölçerin Lineer Filtresinin Frekans Cevabı

Frekans (Hz)	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB) ±
31,5	94,09	94,5	0,41	1,5
63	94,10	94,2	0,10	1,0
125	94,07	93,9	-0,17	1,0
250	94,05	93,7	-0,35	1,0
500	94,04	93,7	-0,34	1,0
1000	94,05	93,8	-0,25	0,7
2000	94,02	93,7	-0,32	1,0
4000	94,06	94,0	-0,06	1,0
8000	94,04	94,6	0,56	1,5 ; -2,5
12500	94,03	94,0	-0,03	2,0 ; -5,0
16000	93,98	92,9	-1,08	2,5 ; -16,0

4. Ses Düzeyi Ölçerin 1 kHz deki Doğrusallığı

Frekans (Hz)	Uygulanan (dB)		Ölçülen (dB)		Doğrusallık Tepkisi Farkı (dB)	Tolerans (dB) ±
	SPL (dB)	Seviye Artışı (dB)	SPL (dB)	Seviye Artışı (dB)		
1000	94,05	0,0	93,8	0,0	-0,25	0,8
	104,05	10,0	103,8	10,0	-0,25	
	114,01	20,0	113,8	20,0	-0,21	

5. Ses Düzeyi Ölçerin Hızlı (Fast) ve Yavaş (Slow) Zaman Ağırlıklı Filtrelerinin Frekans Cevabı

Frekans (Hz)	Hızlı				Yavaş			
	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tölerans (dB) ±	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tölerans (dB) ±
1000	105,0	105,0	0,0	0,5	102,0	102,0	0,0	0,5
2000	105,0	105,0	0,0		102,0	102,0	0,0	
4000	105,0	105,0	0,0		102,0	102,0	0,0	

6. Ses Düzeyi Ölçerin "Crest Factor CF=3" Ölçümü

Frekans (Hz)	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tölerans (dB) ±
2000	94,05	94,1	0,0	0,5
	104,02	104,1	0,1	

7. Ses Düzeyi Ölçerin Bir Saatlik Çalışması Sonucunda Elde Edilen Maksimum Sapma

Nominal SPL (dB)	Ölçülen SPL (dB)	Maksimum Sapma (dB)	Tölerans (dB) ±
94,01	93,8	-0,2	0,3

Ölçüm Belirsizliği / *Measurement Uncertainty*

0,16	dB

Beyan edilen genişletilmiş Belirsizlik değeri, standart belirsizliğin normal dağılım için yaklaşık %95 güvenilirlik seviyesini sağlayan k=2 kapsam faktörü ile çarpımı sonucudur. Standart ölçüm belirsizliği GUM ve EA-04/02 dokümanlarına uygun olarak belirlenmiştir.

Açıklamalar / *Notes*

Ölçüm sonuçları IEC 61672-1 standardındı 1. Sınıf Ses Düzeyi Ölçerler için verilen töleranslarla karşılaştırılmıştır. Cihazın tüm özelliklerinin standartta belirtilen şartlara uygun olduğu tespit edilmiştir.

Kalibrasyon sonuçları sadece kalibrasyonu yapılan Ses Düzeyi Ölçere aittir. Cihazın performansı için gerekli çevre şartlarında kullanımından ve uygun aralıklarla kalibre edilmesinden kullanıcı sorumludur.

FRG-02 Rev.No: 02 Rev.Tarihi: 23.10.2014

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Makine / Cihaz *Instrument / Device*

Cihazın Adı / *Object*	Ses Seviyesi Ölçer	**İmalatçısı** / *Manufacturer*	SVANTEK
Model / *Model*	SVAN 971	**Seri No** / Serial No	34907
Yer / *Place*	-	**Kabul Tarihi** / *Accept Date*	22.3.2016
Ölçme Aralığı / *Range*	40 dB ile 130 dB	**Çözünürlük** / *Resolution*	0,1 dB

Prosedür ve Çevre Şartları / *Procedure and Environmental Conditions*

Cihazın kalibrasyonu, PRG01.01 dokümanına göre ve 20,3 ± 3 ºC çevre şartlarında yapılmıştır.
51,2 ± 15 %RH
1014 ± 10 mbar

Referans Cihazlar *Reference Devices*

Cihazın Adı / *Device*	**Cihaz Kodu** / *Device ID*	**Sertifika Tarihi** / *Date*	**İzlenebilirlik** / *Traceability*
Çok Fonksiyonlu Akustik Kalibratör	REF.G.01 / 2931345	UME.G2AK-0099 / 07-14	UME

Metot / *Method*

Ses Düzeyi Ölçerin kalibrasyonu PRG01.01 "Ses Düzeyi Ölçer Kalibrasyon Prosedürü" ne göre gerçekleştirilmiştir.
Ses Düzeyi Ölçerin (SLM) mikrofonu B&K 4226 tip akustik kalibratörünün bağlaşımı (coupler) içine takılmıştır. 31,5 Hz ile16 kHz aralığında üretilen frekanslar ile 94 dB düzeyindeki ses basıncı (SPL), SLM ile ölçülerek A-ağırlıklı, C-ağırlıklı ve Lineer filtrelerinin frekans cevapları kontrol edilmiştir.
Akustik Kalibratörün bağlaşımı içerisinde 1 kHz frekansında 94 dB, 104 dB ve 114 dB ses basıncı düzeylerinde referans değerler üretilerek SLM nin doğrusallığı kontrol edilmiştir.
Bağlaşım içinde 1, 2 ve 4 kHz frekanslarında ve 106 dB ses basıncı düzeyinde SLM nin Hızlı (Fast) ve Yavaş (Slow) zaman ağırlıkları kontrol edilmiştir.
Bağlaşım içerisinde 2 kHz frekansında 94 ve 104 dB ses basıncı düzeylerinde referans değerler üretilerek "Crest" faktörü ölçülmüştür.
Bağlaşım içerisinde 1 kHz frekansında 94 dB ses basıncı düzeyinde üretilen referans değer 1 saat gözlenip, maksimum sapma ölçülmüştür.
Akustik Kalibratör tarafından üretilen ses basınç düzeyi değerleri çevre şartlarına göre düzeltilerek dikkate alınmıştır.

Kalibrasyon Sonuçları / *Calibration Results*

1. Ses Düzeyi Ölçerin A-ağırlıklı Filtresinin Frekans Cevabı

Frekans (Hz)	Nominal SPL (dB)	A-ağırlıklı Filtrenin Karakteristiği (dB)	Hesaplanan SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB) ±
31,5	94,10	-39,4	54,7	55,1	0,4	1,5
63	94,11	-26,2	67,9	68	0,1	1,0
125	94,08	-16,1	78,0	77,8	-0,2	1,0
250	94,06	-8,6	85,5	85,1	-0,4	1,0
500	94,05	-3,2	90,8	90	-0,4	1,0
1000	94,06	0,0	94,1	93,8	-0,3	0,7
2000	94,03	1,2	95,2	95	-0,2	1,0
4000	94,07	1,0	95,1	95	-0,1	1,0
8000	94,05	-1,1	92,9	93,7	0,8	1,5 ; -2,5
12500	94,04	-4,3	89,7	89,6	-0,1	2,0 ; -5,0
16000	93,99	-6,6	87,4	86,1	-1,3	2,5 ; -16,0

2. Ses Düzeyi Ölçerin C-ağırlıklı Filtresinin Frekans Cevabı

Frekans (Hz)	Nominal SPL (dB)	C-ağırlıklı Filtrenin Karakteristiği (dB)	Hesaplanan SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB) ±
31,5	94,10	-3,0	91,1	91,5	0,4	1,5
63	94,11	-0,8	93,3	93,4	0,1	1,0
125	94,08	-0,2	93,9	93,7	-0,2	1,0
250	94,06	0,0	94,1	93,7	-0,4	1,0
500	94,05	0,0	94,0	93,7	-0,3	1,0
1000	94,06	0,0	94,1	93,8	-0,3	0,7
2000	94,03	-0,2	93,8	93,6	-0,2	1,0
4000	94,07	-0,8	93,3	93,2	-0,1	1,0
8000	94,05	-3,0	91,0	91,8	0,8	1,5 ; -2,5
12500	94,04	-6,2	87,8	87,7	-0,1	2,0 ; -5,0
16000	93,99	-8,5	85,5	84,2	-1,3	2,5 ; -16,0

FRG-02 Rev.No: 02 Rev.Tarihi: 23.10.2014

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TÜRKAK Kalibrasyon TS EN ISO/IEC 17025 AB-0113-K

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ve Endüstriyel Ürünler San. Tic. Ltd. Şti.

Necatibey Cd. No:32 34425 Karaköy - İSTANBUL
Tel: 0 212 243 63 47 (pbx) - Lab.Tel: 0 212 243 17 06 - Fax: 0 212 243 63 41
e-mail: info@pentaotomasyon.com.tr
www.pentaotomasyon.com.tr

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Kalibrasyon Sertifikası
Calibration Certificate

Cihazın Sahibi / Adresi *Customer / Adress*	:	Frekans Çevre Ölçüm Müh. Dan. Tic.Ltd.Şti. Rüzgarlıbahçe Mah.Cumhuriyet Cad. 39/60 Hasoğlu Plaza K:5 Kavacık Beykoz/İSTANBUL
İstek Numarası *Order Number*	:	160713
Makine / Cihaz *Instrument / Device*	:	Ses Seviyesi Ölçer
İmalatçı *Manufacturer*	:	SVANTEK
Tip / Model *Type / Model*	:	SVAN 971
Seri Numarası *Serial Number*	:	34907
Kalibrasyon Tarihi *Date of Calibration*	:	23.3.2016
Sertifikanın Sayfa Sayısı *Total Number of Pages*	:	3

Bu kalibrasyon sertifikası, Uluslararası Birimler Sisteminde (SI) tanımlanmış birimleri gerçekleştiren ulusal ölçüm standartlarına izlenebilirliği belgeler. *This calibration certificate documents traceability to national standards, which realize unit of measurement according to the International System of Units (SI),* Türk Akreditasyon Kurumu (TÜRKAK) kalibrasyon sertifikalarının tanınması konusunda Avrupa Akreditasyon Birliği (EA) ve Uluslararası Laboratuvar Akreditasyon Birliği (ILAC) ile Karşılıklı Tanınma Anlaşmasını imzalamıştır. *The Turkish Accreditation Agency (TURKAK) is signatory to the multilaral agreements of the European co-operation for the Accreditation (EA) and of the International Laboratory Accreditation (ILAC) for the Mutual recognation of calibration certificates.* **Ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve kalibrasyon metotları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.** *Measurement results, expanded uncertainties and calibration methods are given on the following pages, which are part of this certificates.*

Mühür Seal	**Tarih** Date	**Kalibrasyonu Yapan** Calibrated By	**Laboratuvar Müdürü** Head of Calibration Laboratory
KALİBRASYON LABORATUVARI penta İSTANBUL	23.3.2016	Alaaddin DUYSAK	İrem EVCİ

FRG-02 Rev.No: 02 Rev.Tarihi: 23.10.2014

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3. Ses Düzeyi Ölçerin Lineer Filtresinin Frekans Cevabı

Frekans (Hz)	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB) ±
31,5	94,09	94,7	0,61	1,5
63	94,10	94,6	0,50	1,0
125	94,07	94,5	0,43	1,0
250	94,05	94,4	0,35	1,0
500	94,04	94,3	0,26	1,0
1000	94,05	94,0	-0,05	0,7
2000	94,02	92,8	-1,22	1,0
4000	94,06	91,1	-2,96	1,0
8000	94,04	91,0	-3,04	1,5 ; -2,5
12500	94,03	93,3	-0,73	2,0 ; -5,0
16000	93,98	92,6	-1,38	2,5 ; -16,0

4. Ses Düzeyi Ölçerin 1 kHz deki Doğrusallığı

Frekans (Hz)	Uygulanan (dB)		Ölçülen (dB)		Doğrusallık Tepkisi Farkı (dB)	Tolerans (dB) ±
	SPL (dB)	Seviye Artışı (dB)	SPL (dB)	Seviye Artışı (dB)		
1000	94,05	0,0	94,0	0,0	-0,05	0,8
	104,05	10,0	104,0	10,0	-0,05	
	114,01	20,0	114,0	20,0	-0,01	

5. Ses Düzeyi Ölçerin Hızlı (Fast) ve Yavaş (Slow) Zaman Ağırlıklı Filtrelerinin Frekans Cevabı

Frekans (Hz)	Hızlı				Yavaş			
	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tölerans (dB) ±	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tölerans (dB) ±
1000	105,0	105,1	0,1	0,5	102,0	102,0	0,0	0,5
2000	105,0	105,1	0,1		102,0	102,0	0,0	
4000	105,0	105,0	0,0		102,0	101,9	-0,1	

6. Ses Düzeyi Ölçerin "Crest Factor CF=3" Ölçümü

Frekans (Hz)	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tölerans (dB) ±
2000	94,05	94,1	0,05	0,5
	104,02	104,1	0,18	

7. Ses Düzeyi Ölçerin Bir Saatlik Çalışması Sonucunda Elde Edilen Maksimum Sapma

Nominal SPL (dB)	Ölçülen SPL (dB)	Maksimum Sapma (dB)	Tölerans (dB) ±
94,01	94,0	0,0	0,3

Ölçüm Belirsizliği / *Measurement Uncertainty*

0,16	dB

Beyan edilen genişletilmiş Belirsizlik değeri, standart belirsizliğin normal dağılım için yaklaşık %95 güvenilirlik seviyesini sağlayan k=2 kapsam faktörü ile çarpımı sonucudur. Standart ölçüm belirsizliği GUM ve EA-04/02 dokümanlarına uygun olarak belirlenmiştir.

Açıklamalar / *Notes*

Ölçüm sonuçları IEC 61672-1 standardındı 1. Sınıf Ses Düzeyi Ölçerler için verilen töleranslarla karşılaştırılmıştır. Cihazın tüm özelliklerinin standartta belirtilen şartlara uygun olduğu tespit edilmiştir.

Kalibrasyon sonuçları sadece kalibrasyonu yapılan Ses Düzeyi Ölçere aittir. Cihazın performansı için gerekli çevre şartlarında kullanımından ve uygun aralıklarla kalibre edilmesinden kullanıcı sorumludur.

FRG-02 Rev.No: 02 Rev.Tarihi: 23.10.2014

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Makine / Cihaz *Instrument / Device*

Cihazın Adı / *Object*	Ses Seviyesi Ölçer	**İmalatçısı** / *Manufacturer*	SVANTEK
Model / *Model*	SVAN 971	**Seri No** / Serial No	34797
Yer / *Place*	-	**Kabul Tarihi** / *Accept Date*	22.3.2016
Ölçme Aralığı / *Range*	40 dB ile 130 dB	**Çözünürlük** / *Resolution*	0,1 dB

Prosedür ve Çevre Şartları / *Procedure and Environmental Conditions*

Cihazın kalibrasyonu, PRG01.01 dokümanına göre ve 20,3 ± 3 ºC ; 51,2 ± 15 %RH ; 1014 ± 10 mbar çevre şartlarında yapılmıştır.

Referans Cihazlar *Reference Devices*

Cihazın Adı / *Device*	Cihaz Kodu / *Device ID*	Sertifika Tarihi / *Date*	İzlenebilirlik / *Traceability*
Çok Fonksiyonlu Akustik Kalibratör	REF.G.01 / 2931345	UME.G2AK-0099 / 07-14	UME

Metot / *Method*

Ses Düzeyi Ölçerin kalibrasyonu PRG01.01 "Ses Düzeyi Ölçer Kalibrasyon Prosedürü" ne göre gerçekleştirilmiştir.
Ses Düzeyi Ölçerin (SLM) mikrofonu B&K 4226 tip akustik kalibratörünün bağlaşımı (coupler) içine takılmıştır. 31,5 Hz ile16 kHz aralığında üretilen frekanslar ile 94 dB düzeyindeki ses basıncı (SPL), SLM ile ölçülerek A-ağırlıklı, C-ağırlıklı ve Lineer filtrelerinin frekans cevapları kontrol edilmiştir.
Akustik Kalibratörün bağlaşımı içerisinde 1 kHz frekansında 94 dB, 104 dB ve 114 dB ses basıncı düzeylerinde referans değerler üretilerek SLM nin doğrusallığı kontrol edilmiştir.
Bağlaşım içinde 1, 2 ve 4 kHz frekanslarında ve 106 dB ses basıncı düzeyinde SLM nin Hızlı (Fast) ve Yavaş (Slow) zaman ağırlıkları kontrol edilmiştir.
Bağlaşım içerisinde 2 kHz frekansında 94 ve 104 dB ses basıncı düzeylerinde referans değerler üretilerek "Crest" faktörü ölçülmüştür.
Bağlaşım içerisinde 1 kHz frekansında 94 dB ses basıncı düzeyinde üretilen referans değer 1 saat gözlenip, maksimum sapma ölçülmüştür.
Akustik Kalibratör tarafından üretilen ses basınç düzeyi değerleri çevre şartlarına göre düzeltilerek dikkate alınmıştır.

Kalibrasyon Sonuçları / *Calibration Results*

1. Ses Düzeyi Ölçerin A-ağırlıklı Filtresinin Frekans Cevabı

Frekans (Hz)	Nominal SPL (dB)	A-ağırlıklı Filtrenin Karakteristiği (dB)	Hesaplanan SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB) ±
31,5	94,10	-39,4	54,7	55,4	0,7	1,5
63	94,11	-26,2	67,9	68,4	0,5	1,0
125	94,08	-16,1	78,0	78,4	0,4	1,0
250	94,06	-8,6	85,5	85,8	0,3	1,0
500	94,05	-3,2	90,8	91	0,2	1,0
1000	94,06	0,0	94,1	94	-0,1	0,7
2000	94,03	1,2	95,2	94	-1,2	1,0
4000	94,07	1,0	95,1	92,1	-3,0	1,0
8000	94,05	-1,1	92,9	90	-2,9	1,5 ; -2,5
12500	94,04	-4,3	89,7	88,9	-0,8	2,0 ; -5,0
16000	93,99	-6,6	87,4	85,8	-1,6	2,5 ; -16,0

2. Ses Düzeyi Ölçerin C-ağırlıklı Filtresinin Frekans Cevabı

Frekans (Hz)	Nominal SPL (dB)	C-ağırlıklı Filtrenin Karakteristiği (dB)	Hesaplanan SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB) ±
31,5	94,10	-3,0	91,1	91,7	0,6	1,5
63	94,11	-0,8	93,3	93,8	0,5	1,0
125	94,08	-0,2	93,9	94,3	0,4	1,0
250	94,06	0,0	94,1	94,4	0,3	1,0
500	94,05	0,0	94,0	94,3	0,3	1,0
1000	94,06	0,0	94,1	94,0	-0,1	0,7
2000	94,03	-0,2	93,8	92,7	-1,1	1,0
4000	94,07	-0,8	93,3	90,3	-3,0	1,0
8000	94,05	-3,0	91,0	88,1	-2,9	1,5 ; -2,5
12500	94,04	-6,2	87,8	86,9	-0,9	2,0 ; -5,0
16000	93,99	-8,5	85,5	83,9	-1,6	2,5 ; -16,0

FRG-02 Rev.No: 02 Rev.Tarihi: 23.10.2014

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Kalibrasyon TS EN ISO/IEC 17025 AB-0113-K

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Necatibey Cd. No:32 34425 Karaköy - İSTANBUL
Tel: 0 212 243 63 47 (pbx) - Lab.Tel: 0 212 243 17 06 - Fax: 0 212 243 63 41
e-mail: info@pentaotomasyon.com.tr
www.pentaotomasyon.com.tr

AB-0113-K
160713G0094
03 - 16

Kalibrasyon Sertifikası
Calibration Certificate

Cihazın Sahibi / Adresi *Customer / Adress*	:	Frekans Çevre Ölçüm Müh. Dan. Tic.Ltd.Şti. Rüzgarlıbahçe Mah.Cumhuriyet Cad. 39/60 Hasoğlu Plaza K:5 Kavacık Beykoz/İSTANBUL
İstek Numarası *Order Number*	:	160713
Makine / Cihaz *Instrument / Device*	:	Ses Seviyesi Ölçer
İmalatçı *Manufacturer*	:	SVANTEK
Tip / Model *Type / Model*	:	SVAN 971
Seri Numarası *Serial Number*	:	34797
Kalibrasyon Tarihi *Date of Calibration*	:	23.3.2016
Sertifikanın Sayfa Sayısı *Total Number of Pages*	:	3

Bu kalibrasyon sertifikası, Uluslararası Birimler Sisteminde (SI) tanımlanmış birimleri gerçekleştiren ulusal ölçüm standartlarına izlenebilirliği belgeler. *This calibration certificate documents traceability to national standards, which realize unit of measurement according to the International System of Units (SI),* Türk Akreditasyon Kurumu (TÜRKAK) kalibrasyon sertifikalarının tanınması konusunda Avrupa Akreditasyon Birliği (EA) ve Uluslararası Laboratuvar Akreditasyon Birliği (ILAC) ile Karşılıklı Tanınma Anlaşmasını imzalamıştır. *The Turkish Accerditation Agency (TURKAK) is signatory to the multilaral agreements of the European co-operation for the Accreditation (EA) and of the International Laboratory Accreditation (ILAC) for the Mutual recognation of calibration certificates.* **Ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve kalibrasyon metotları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.** *Measurement results, expanded uncertainties and calibration methods are given on the following pages, which are part of this certificates.*

Mühür Seal	**Tarih** Date	**Kalibrasyonu Yapan** Calibrated By	**Laboratuvar Müdürü** Head of Calibration Laboratory
KALİBRASYON LABORATUVARI penta İSTANBUL	23.3.2016	Alaaddin DUYSAK	İrem EVCİ

Bu sertifika, laboratuvarın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz. İmzasız ve mühürsüz sertifikalar geçersizdir.
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FRG-02 Rev.No: 02 Rev.Tarihi: 23.10.2014

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Sayfa / *Page:* 3/3

3. Ses Düzeyi Ölçerin Lineer Filtresinin Frekans Cevabı

Frekans (Hz)	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB) ±
31,5	94,09	94,0	-0,09	1,5
63	94,10	93,9	-0,20	1,0
125	94,07	93,8	-0,27	1,0
250	94,05	93,8	-0,25	1,0
500	94,04	93,7	-0,34	1,0
1000	94,05	94,0	-0,05	0,7
2000	94,02	94,0	-0,02	1,0
4000	94,06	94,7	0,64	1,0
8000	94,04	93,8	-0,24	1,5 ; -2,5
12500	94,03	95,6	1,57	2,0 ; -5,0
16000	93,98	96,1	2,12	2,5 ; -16,0

4. Ses Düzeyi Ölçerin 1 kHz deki Doğrusallığı

Frekans (Hz)	Uygulanan (dB)		Ölçülen (dB)		Doğrusallık Tepkisi Farkı (dB)	Tolerans (dB) ±
	SPL (dB)	Seviye Artışı (dB)	SPL (dB)	Seviye Artışı (dB)		
1000	94,05	0,0	94,0	0,0	-0,05	0,8
	104,05	10,0	104,0	10,0	-0,05	
	114,01	20,0	114,0	20,0	-0,01	

5. Ses Düzeyi Ölçerin Hızlı (Fast) ve Yavaş (Slow) Zaman Ağırlıklı Filtrelerinin Frekans Cevabı

Frekans (Hz)	Hızlı				Yavaş			
	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tölerans (dB) ±	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tölerans (dB) ±
1000	105,0	105,0	0,0	0,5	102,0	102,0	0,0	0,5
2000	105,0	105,0	0,0		102,0	102,0	0,0	
4000	105,0	105,0	0,0		102,0	102,0	0,0	

6. Ses Düzeyi Ölçerin "Crest Factor CF=3" Ölçümü

Frekans (Hz)	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tölerans (dB) ±
2000	94,05	94,1	0,0	0,5
	104,02	104,1	0,1	

7. Ses Düzeyi Ölçerin Bir Saatlik Çalışması Sonucunda Elde Edilen Maksimum Sapma

Nominal SPL (dB)	Ölçülen SPL (dB)	Maksimum Sapma (dB)	Tölerans (dB) ±
94,01	94,0	0,0	0,3

Ölçüm Belirsizliği / *Measurement Uncertainty*

0,16	dB

Beyan edilen genişletilmiş Belirsizlik değeri, standart belirsizliğin normal dağılım için yaklaşık %95 güvenilirlik seviyesini sağlayan k=2 kapsam faktörü ile çarpımı sonucudur. Standart ölçüm belirsizliği GUM ve EA-04/02 dokümanlarına uygun olarak belirlenmiştir.

Açıklamalar / *Notes*

Ölçüm sonuçları IEC 61672-1 standardındı 1. Sınıf Ses Düzeyi Ölçerler için verilen töleranslarla karşılaştırılmıştır. Cihazın tüm özelliklerinin standartta belirtilen şartlara uygun olduğu tespit edilmiştir.

Kalibrasyon sonuçları sadece kalibrasyonu yapılan Ses Düzeyi Ölçere aittir. Cihazın performansı için gerekli çevre şartlarında kullanımından ve uygun aralıklarla kalibre edilmesinden kullanıcı sorumludur.

FRG-02 Rev.No: 02 Rev.Tarihi: 23.10.2014

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Sayfa / Page: 2/3

Makine / Cihaz *Instrument / Device*

Cihazın Adı / Object	Ses Seviyesi Ölçer	**İmalatçısı** / Manufacturer	SVANTEK
Model / Model	SVAN 971	**Seri No** / Serial No	34768
Yer / Place	-	**Kabul Tarihi** / Accept Date	22.3.2016
Ölçme Aralığı / Range	40 dB ile 130 dB	**Çözünürlük** / Resolution	0,1 dB

Prosedür ve Çevre Şartları / *Procedure and Environmental Conditions*

Cihazın kalibrasyonu, PRG01.01 dokümanına göre ve 20,3 ± 3 °C, 51,2 ± 15 %RH, 1014 ± 10 mbar çevre şartlarında yapılmıştır.

Referans Cihazlar *Reference Devices*

Cihazın Adı / Device	Cihaz Kodu / Device ID	Sertifika Tarihi / Date	İzlenebilirlik / Traceability
Çok Fonksiyonlu Akustik Kalibratör	REF.G.01 / 2931345	UME.G2AK-0099 / 07-14	UME

Metot / *Method*

Ses Düzeyi Ölçerin kalibrasyonu PRG01.01 "Ses Düzeyi Ölçer Kalibrasyon Prosedürü" ne göre gerçekleştirilmiştir.
Ses Düzeyi Ölçerin (SLM) mikrofonu B&K 4226 tip akustik kalibratörünün bağlaşımı (coupler) içine takılmıştır. 31,5 Hz ile16 kHz aralığında üretilen frekanslar ile 94 dB düzeyindeki ses basıncı (SPL), SLM ile ölçülerek A-ağırlıklı, C-ağırlıklı ve Lineer filtrelerinin frekans cevapları kontrol edilmiştir.
Akustik Kalibratörün bağlaşımı içerisinde 1 kHz frekansında 94 dB, 104 dB ve 114 dB ses basıncı düzeylerinde referans değerler üretilerek SLM nin doğrusallığı kontrol edilmiştir.
Bağlaşım içinde 1, 2 ve 4 kHz frekanslarında ve 106 dB ses basıncı düzeyinde SLM nin Hızlı (Fast) ve Yavaş (Slow) zaman ağırlıkları kontrol edilmiştir.
Bağlaşım içerisinde 2 kHz frekansında 94 ve 104 dB ses basıncı düzeylerinde referans değerler üretilerek "Crest" faktörü ölçülmüştür.
Bağlaşım içerisinde 1 kHz frekansında 94 dB ses basıncı düzeyinde üretilen referans değer 1 saat gözlenip, maksimum sapma ölçülmüştür.
Akustik Kalibratör tarafından üretilen ses basınç düzeyi değerleri çevre şartlarına göre düzeltilerek dikkate alınmıştır.

Kalibrasyon Sonuçları / *Calibration Results*

1. Ses Düzeyi Ölçerin A-ağırlıklı Filtresinin Frekans Cevabı

Frekans (Hz)	Nominal SPL (dB)	A-ağırlıklı Filtrenin Karakteristiği (dB)	Hesaplanan SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB) ±
31,5	94,10	-39,4	54,7	55,2	0,5	1,5
63	94,11	-26,2	67,9	67,8	-0,1	1,0
125	94,08	-16,1	78,0	77,7	-0,3	1,0
250	94,06	-8,6	85,5	85,1	-0,4	1,0
500	94,05	-3,2	90,8	91	-0,3	1,0
1000	94,06	0,0	94,1	94	-0,1	0,7
2000	94,03	1,2	95,2	95,2	0,0	1,0
4000	94,07	1,0	95,1	95,7	0,6	1,0
8000	94,05	-1,1	92,9	92,8	-0,1	1,5 ; -2,5
12500	94,04	-4,3	89,7	91,2	1,5	2,0 ; -5,0
16000	93,99	-6,6	87,4	89,2	1,8	2,5 ; -16,0

2. Ses Düzeyi Ölçerin C-ağırlıklı Filtresinin Frekans Cevabı

Frekans (Hz)	Nominal SPL (dB)	C-ağırlıklı Filtrenin Karakteristiği (dB)	Hesaplanan SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB) ±
31,5	94,10	-3,0	91,1	91,0	-0,1	1,5
63	94,11	-0,8	93,3	93,1	-0,2	1,0
125	94,08	-0,2	93,9	93,7	-0,2	1,0
250	94,06	0,0	94,1	93,8	-0,3	1,0
500	94,05	0,0	94,0	93,8	-0,2	1,0
1000	94,06	0,0	94,1	94,0	-0,1	0,7
2000	94,03	-0,2	93,8	93,8	0,0	1,0
4000	94,07	-0,8	93,3	93,9	0,6	1,0
8000	94,05	-3,0	91,0	90,9	-0,1	1,5 ; -2,5
12500	94,04	-6,2	87,8	89,3	1,5	2,0 ; -5,0
16000	93,99	-8,5	85,5	87,3	1,8	2,5 ; -16,0

FRG-02 Rev.No: 02 Rev.Tarihi: 23.10.2014

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Tel: 0 212 243 63 47 (pbx) - Lab.Tel: 0 212 243 17 06 - Fax: 0 212 243 63 41
e-mail: info@pentaotomasyon.com.tr
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Kalibrasyon Sertifikası
Calibration Certificate

Cihazın Sahibi / Adresi *Customer / Adress*	:	Frekans Çevre Ölçüm Müh. Dan. Tic.Ltd.Şti. Rüzgarlıbahçe Mah.Cumhuriyet Cad. 39/60 Hasoğlu Plaza K:5 Kavacık Beykoz/İSTANBUL
İstek Numarası *Order Number*	:	160713
Makine / Cihaz *Instrument / Device*	:	Ses Seviyesi Ölçer
İmalatçı *Manufacturer*	:	SVANTEK
Tip / Model *Type / Model*	:	SVAN 971
Seri Numarası *Serial Number*	:	34768
Kalibrasyon Tarihi *Date of Calibration*	:	23.3.2016
Sertifikanın Sayfa Sayısı *Total Number of Pages*	:	3

Bu kalibrasyon sertifikası, Uluslararası Birimler Sisteminde (SI) tanımlanmış birimleri gerçekleştiren ulusal ölçüm standartlarına izlenebilirliği belgeler. *This calibration certificate documents traceability to national standards, which realize unit of measurement according to the International System of Units (SI),* Türk Akreditasyon Kurumu (TÜRKAK) kalibrasyon sertifikalarının tanınması konusunda Avrupa Akreditasyon Birliği (EA) ve Uluslararası Laboratuvar Akreditasyon Birliği (ILAC) ile Karşılıklı Tanınma Anlaşmasını imzalamıştır. *The Turkish Accreditation Agency (TURKAK) is signatory to the multilaral agreements of the European co-operation for the Accreditation (EA) and of the International Laboratory Accreditation (ILAC) for the Mutual recognation of calibration certificates.* **Ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve kalibrasyon metotları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.** *Measurement results, expanded uncertainties and calibration methods are given on the following pages, which are part of this certificates.*

Mühür Seal	**Tarih** Date	**Kalibrasyonu Yapan** Calibrated By	**Laboratuvar Müdürü** Head of Calibration Laboratory
KALİBRASYON LABORATUVARI penta İSTANBUL	23.3.2016	Alaaddin DUYSAK	İrem EVCİ

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PRG-02 Rev.No. 02 Rev.Tarihi. 23.10.2014

Appendix C Noise Model Results

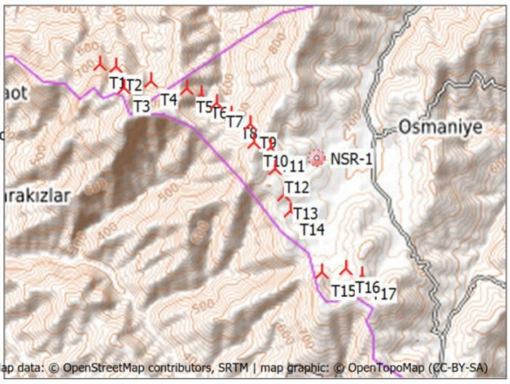
Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
13.12.2017 12:42/3.1.617

DECIBEL - Main Result

Calculation: Mersinli WPP v3

Noise calculation model:
ISO 9613-2 General
Wind speed:
3,0 m/s - 10,0 m/s, step 1,0 m/s
Ground attenuation:
General, terrain specific
Ground factor for porous ground: 0,5
Area object with hard ground: Project Wizard Roughness Areas (Corine land c
Area type with hard ground: 0,0000m(cl.0,0) Lake 5.1.2
Meteorological coefficient, C0:
0,0 dB
Type of demand in calculation:
1: WTG noise is compared to demand (DK, DE, SE, NL etc.)
Noise values in calculation:
All noise values are 90% exeedance values (L90)
Pure tones:
Fixed penalty added to source noise of WTGs with pure tones: 0,0 dB(A)
Height above ground level, when no value in NSA object:
4,0 m Allow override of model height with height from NSA object
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)



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)]	
T1	540.352	4.238.887	869,8	T1	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	USER	Level 0 - - Mode 0 - 2017-04-04	3,0	94,6	10,0	108,5	No h
T10	543.080	4.237.527	832,3	T10	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	USER	Level 0 - - Mode 0 - 2017-04-04	3,0	94,6	10,0	108,5	No h
T11	543.378	4.237.442	791,0	T11	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	USER	Level 0 - - Mode 0 - 2017-04-04	3,0	94,6	10,0	108,5	No h
T12	543.454	4.237.061	767,0	T12	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	USER	Level 0 - - Mode 0 - 2017-04-04	3,0	94,6	10,0	108,5	No h
T13	543.610	4.236.605	758,0	T13	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	USER	Level 0 - - Mode 0 - 2017-04-04	3,0	94,6	10,0	108,5	No h
T14	543.726	4.236.327	775,4	T14	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	USER	Level 0 - - Mode 0 - 2017-04-04	3,0	94,6	10,0	108,5	No h
T15	544.288	4.235.247	851,8	T15	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	USER	Level 0 - - Mode 0 - 2017-04-04	3,0	94,6	10,0	108,5	No h
T16	544.714	4.235.312	850,4	T16	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	USER	Level 0 - - Mode 0 - 2017-04-04	3,0	94,6	10,0	108,5	No h
T17	545.003	4.235.202	829,1	T17	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	USER	Level 0 - - Mode 0 - 2017-04-04	3,0	94,6	10,0	108,5	No h
T2	540.643	4.238.846	894,2	T2	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	USER	Level 0 - - Mode 0 - 2017-04-04	3,0	94,6	10,0	108,5	No h
T3	540.781	4.238.478	936,7	T3	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	USER	Level 0 - - Mode 0 - 2017-04-04	3,0	94,6	10,0	108,5	No h
T4	541.262	4.238.589	889,9	T4	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	USER	Level 0 - - Mode 0 - 2017-04-04	3,0	94,6	10,0	108,5	No h
T5	541.894	4.238.469	796,2	T5	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	USER	Level 0 - - Mode 0 - 2017-04-04	3,0	94,6	10,0	108,5	No h
T6	542.151	4.238.373	785,6	T6	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	USER	Level 0 - - Mode 0 - 2017-04-04	3,0	94,6	10,0	108,5	No h
T7	542.415	4.238.216	755,3	T7	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	USER	Level 0 - - Mode 0 - 2017-04-04	3,0	94,6	10,0	108,5	No h
T8	542.674	4.238.009	780,5	T8	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	USER	Level 0 - - Mode 0 - 2017-04-04	3,0	94,6	10,0	108,5	No h
T9	543.006	4.237.849	861,6	T9	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	USER	Level 0 - - Mode 0 - 2017-04-04	3,0	94,6	10,0	108,5	No h

h) Generic octave distribution used

Calculation Results

Sound level

Noise sensitive area No.	Name	Easting	Northing	Z	Imission height	Demands Min Noise	Sound level Max From WTGs	Demands fulfilled ? Noise
				[m]	[m]	[dB(A)]	[dB(A)]	
B	NSR-2	545.650	4.234.448	677,1	1,6	43,0	35,6	Yes
NSR-1	NSR-1	544.185	4.237.249	723,7	1,6	43,0	41,6	Yes

Distances (m)

WTG	NSR-1	B
T1	4168	6912
T10	1139	4010
T11	830	3758
T12	755	3413
T13	863	2969
T14	1030	2689
T15	2005	1579
T16	2008	1274
T17	2204	993
T2	3885	6664
T3	3619	6320
T4	3216	6033
T5	2596	5502
T6	2324	5258

To be continued on next page...

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
13.12.2017 12:42/3.1.617

DECIBEL - Main Result

Calculation: Mersinli WPP v3

...continued from previous page

WTG	NSR-1	B
T7	2017	4966
T8	1691	4641
T9	1323	4308

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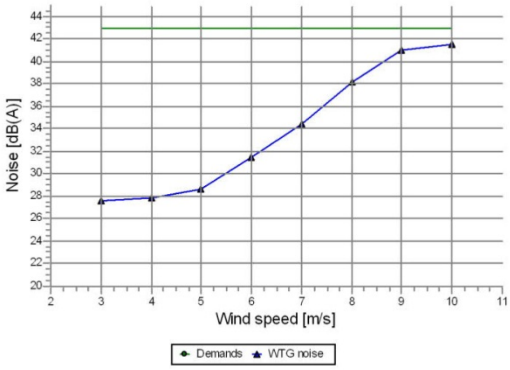
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
13.12.2017 12:42/3.1.617

DECIBEL - Detailed results, graphic

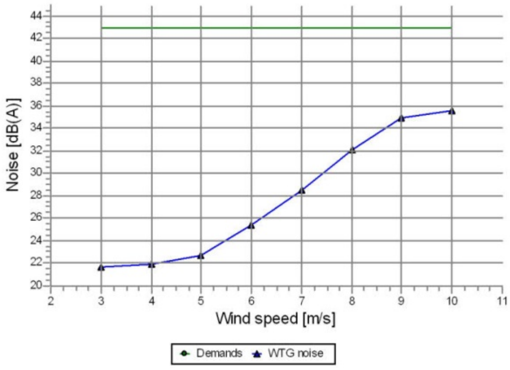
Calculation: Mersinli WPP v3**Noise calculation model:** ISO 9613-2 General

NSR-1 (NSR-1)



Wind speed [m/s]	Demands [dB(A)]	Sound level WTG noise [dB(A)]	Demands fulfilled ?
3,0	43,0	27,7	Yes
4,0	43,0	27,9	Yes
5,0	43,0	28,7	Yes
6,0	43,0	31,5	Yes
7,0	43,0	34,5	Yes
8,0	43,0	38,2	Yes
9,0	43,0	40,9	Yes
10,0	43,0	41,6	Yes

NSR-2 (B)



Wind speed [m/s]	Demands [dB(A)]	Sound level WTG noise [dB(A)]	Demands fulfilled ?
3,0	43,0	21,7	Yes
4,0	43,0	21,9	Yes
5,0	43,0	22,7	Yes
6,0	43,0	25,5	Yes
7,0	43,0	28,5	Yes
8,0	43,0	32,2	Yes
9,0	43,0	35,0	Yes
10,0	43,0	35,6	Yes

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First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
13.12.2017 12:42/3.1.617

DECIBEL - Detailed results

Calculation: Mersinli WPP v3**Noise calculation model:** ISO 9613-2 General

Assumptions

Cmet: Meteorological correction

Calculation Results

Noise sensitive area: B NSR-2

WTG			Wind speed: 3,0 m/s									
No.	Distance	Sound distance	Calculated	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB(A)]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
T1	6.912	6.917	**-4,56**	92,6	0,00	87,80	-	0,00	0,00	0,00	-
T10	4.010	4.017	**2,15**	92,6	0,00	83,08	-	0,00	0,00	0,00	-
T11	3.758	3.763	**2,94**	92,6	0,00	82,51	-	0,00	0,00	0,00	-
T12	3.413	3.417	**4,08**	92,6	0,00	81,67	-	0,00	0,00	0,00	-
T13	2.969	2.973	**5,69**	92,6	0,00	80,46	-	0,00	0,00	0,00	-
T14	2.689	2.695	**6,79**	92,6	0,00	79,61	-	0,00	0,00	0,00	-
T15	1.579	1.599	**13,19**	92,6	0,00	75,08	-	0,00	0,00	0,00	-
T16	1.274	1.299	**15,62**	92,6	0,00	73,27	-	0,00	0,00	0,00	-
T17	993	1.020	**18,36**	92,6	0,00	71,18	-	0,00	0,00	0,00	-
T2	6.664	6.671	**-4,11**	92,6	0,00	87,48	-	0,00	0,00	0,00	-
T3	6.320	6.329	**-3,45**	92,6	0,00	87,03	-	0,00	0,00	0,00	-
T4	6.033	6.040	**-2,87**	92,6	0,00	86,62	-	0,00	0,00	0,00	-
T5	5.502	5.506	**-1,71**	92,6	0,00	85,82	-	0,00	0,00	0,00	-
T6	5.258	5.261	**-1,15**	92,6	0,00	85,42	-	0,00	0,00	0,00	-
T7	4.966	4.969	**-0,44**	92,6	0,00	84,92	-	0,00	0,00	0,00	-
T8	4.641	4.644	**0,39**	92,6	0,00	84,34	-	0,00	0,00	0,00	-
T9	4.308	4.316	**1,28**	92,6	0,00	83,70	-	0,00	0,00	0,00	-

Sum 21,68

- Data undefined due to calculation with octave data

Noise sensitive area: NSR-1 NSR-1

WTG			Wind speed: 3,0 m/s								
No.	Distance	Sound distance	Calculated	LwA,ref	Dc	Adiv	Aatm	Agr	Abar	Amisc	A
	[m]	[m]	[dB(A)]	[dB(A)]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
T1	4.168	4.175	**1,69**	92,6	0,00	83,41	-	0,00	0,00	0,00	-
T10	1.139	1.156	**16,96**	92,6	0,00	72,26	-	0,00	0,00	0,00	-
T11	830	844	**20,47**	92,6	0,00	69,52	-	0,00	0,00	0,00	-
T12	755	766	**21,52**	92,6	0,00	68,68	-	0,00	0,00	0,00	-
T13	863	872	**20,11**	92,6	0,00	69,81	-	0,00	0,00	0,00	-
T14	1.030	1.039	**18,16**	92,6	0,00	71,33	-	0,00	0,00	0,00	-
T15	2.005	2.016	**10,40**	92,6	0,00	77,09	-	0,00	0,00	0,00	-
T16	2.008	2.019	**10,38**	92,6	0,00	77,10	-	0,00	0,00	0,00	-
T17	2.204	2.213	**9,26**	92,6	0,00	77,90	-	0,00	0,00	0,00	-
T2	3.885	3.894	**2,53**	92,6	0,00	82,81	-	0,00	0,00	0,00	-
T3	3.619	3.631	**3,36**	92,6	0,00	82,20	-	0,00	0,00	0,00	-
T4	3.216	3.225	**4,75**	92,6	0,00	81,17	-	0,00	0,00	0,00	-
T5	2.596	2.600	**7,23**	92,6	0,00	79,30	-	0,00	0,00	0,00	-
T6	2.324	2.329	**8,62**	92,6	0,00	78,34	-	0,00	0,00	0,00	-
T7	2.017	2.020	**10,38**	92,6	0,00	77,11	-	0,00	0,00	0,00	-
T8	1.691	1.697	**12,48**	92,6	0,00	75,60	-	0,00	0,00	0,00	-
T9	1.323	1.342	**15,25**	92,6	0,00	73,55	-	0,00	0,00	0,00	-

Sum 27,67

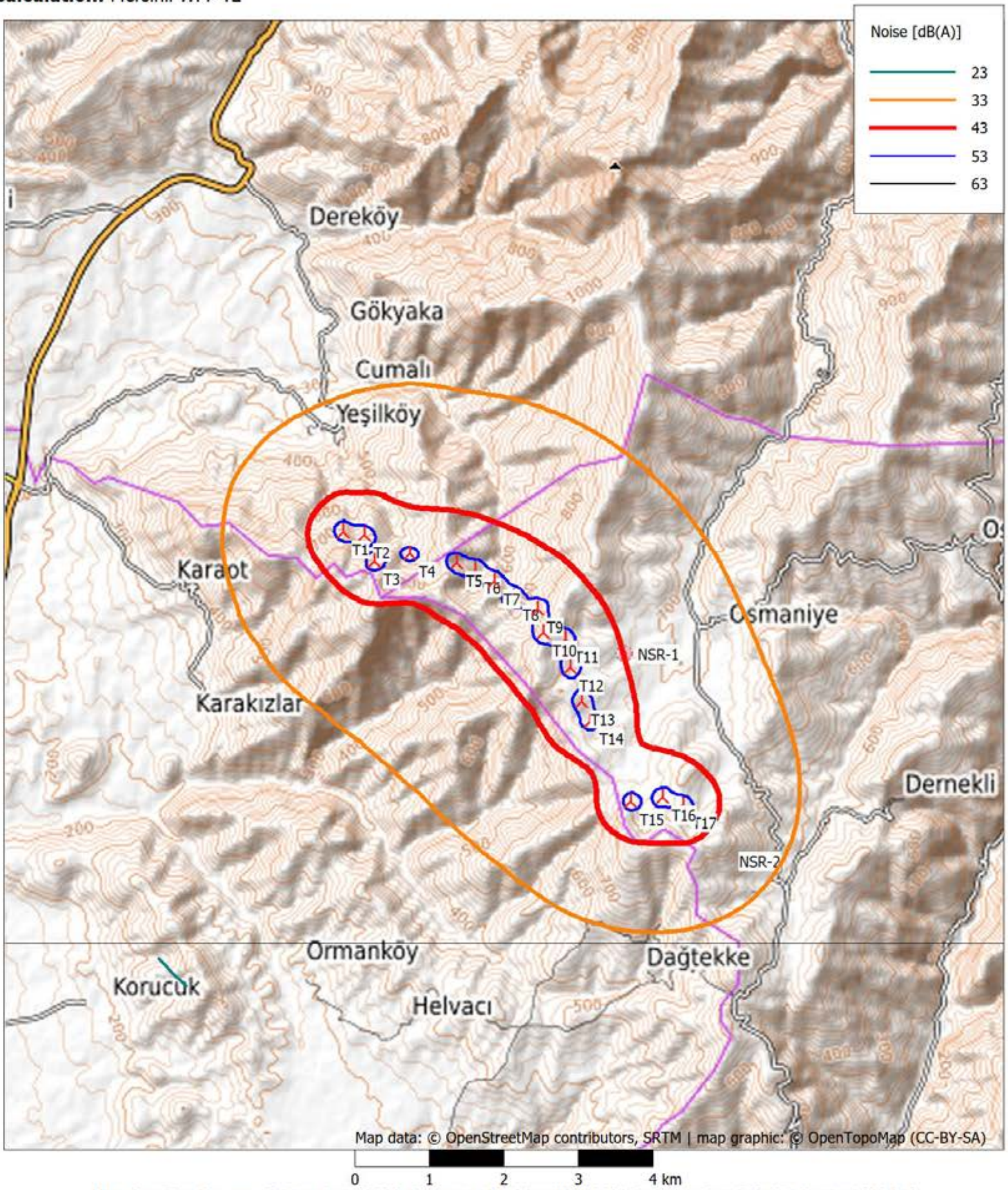
- Data undefined due to calculation with octave data

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
29.11.2017 17:42/3.1.617

DECIBEL - Map 10,0 m/s

Calculation: Mersinli WPP v2



Map: OpenTopoMap.org , Print scale 1:75.000, Map center UTM (north)-WGS84 Zone: 35 East: 542.415 North: 4.238.216

New WTG   Noise sensitive area

Noise calculation model: ISO 9613-2 General. Wind speed: 10,0 m/s
Height above sea level from active line object

windPRO 3.1.617 by EMD International A/S, Tel. +45 96 35 44 44, www.emd.dk, windpro@emd.dk   29.11.2017 18:07 / 1   windPRO

Appendix D Avifauna Data

D.1 Avifauna Survey Dates, Times, Durations and Weather Conditions*

Date	VP	TStr	Tfin	Dur (min)	Cloud (%)	Wind	Temp (oC)	Vis (km)	Note
4 Apr	VP1	14:40	16:00	01:20	100	S-1	20	10	
5 Apr	VP1	09:50	17:30	07:40	50	S-2	18	10	
5 Apr	VP2	10:35	16:15	04:40	60	S-1	16	10	
5 Apr	VP3	09:00	17:45	06:30	50	S-2	16	10	
6 Apr	VP1	09:45	16:15	04:20	50	W-SW-2	20	10	
6 Apr	VP2	09:15	16:30	05:50	90	0	20	10	
6 Apr	VP3	09:00	16:45	07:45	50	S-1	20	10	
19 Apr	VP1	13:30	17:20	03:50	90	S-4	18	10	
19 Apr	VP2	13:20	17:25	04:05	50	W-SW-2	18	10	
20 Apr	VP2	09:40	17:20	06:40	90	S-4	14	10	
20 Apr	VP3	09:40	17:30	06:50	90	S-4	14	10	
21 Apr	VP1	09:20	14:10	04:50	90	S-4	14	10	
10 May	VP2	13:00	18:20	05:20	70	S-2	21	5	
10 May	VP3	12:50	18:00	05:10	70	S-2	20	10	
11 May	VP1	08:45	18:40	08:55	5	S-2	25	9	
11 May	VP2	08:35	18:05	08:30	5	E-2	26	10	
12 May	VP1	08:45	18:10	08:25	30	S-1	17	10	
12 May	VP3	08:25	14:45	05:20	30	S-2	24	5	
24 May	VP1	13:35	18:10	04:35	60	N-1	25	10	
24 May	VP2	12:35	18:35	06:00	20	S-3	23	10	
25 May	VP2	08:40	18:05	08:25	90	S-2	17	10	
25 May	VP3	08:25	18:20	08:55	90	S-3	21	5	
26 May	VP1	08:30	14:40	05:10	30	S-4	23	5	
26 May	VP3	08:40	14:30	04:50	30	S-1	17	8	
5 Jun	VP1	13:00	18:00	05:00	70	N-1	25	10	
5 Jun	VP2	12:15	18:20	06:05	90	S-2	23	5	
5 Jun	VP3	12:00	18:05	06:05	98	E-1	21	10	
6 Jun	VP1	09:00	18:00	09:00	50	N-2	28	5	
6 Jun	VP2	08:45	18:15	08:30	5	N-0	22	9	
7 Jun	VP1	09:10	18:00	07:50	0	S-1	25	4	
7 Jun	VP2	08:50	18:00	08:10	0	S-0	26	5	
7 Jun	VP3	08:40	18:20	08:40	15	S-2	29	5	
8 Jun	VP2	08:50	18:00	08:10	40	N-3	24	5	Rain 13:00-16:20
8 Jun	VP3	08:35	18:20	08:45	100	N-1	21	6	
9 Jun	VP1	08:55	16:30	06:35	50	N-2	25	5	
9 Jun	VP3	08:45	16:15	06:30	35	N-2	20	5	
AUTUMN SURVEY									
26 Jul	VP1	13:15	18:10	04:55	0	S-2	30	6	
26 Jul	VP2	13:30	18:00	04:30	0	S-3	35	5	
27 Jul	VP2	08:40	18:10	08:30	(blank)	S-3	26	5	
27 Jul	VP3	08:40	18:00	08:20	30	S-3	26	5	
28 Jul	VP1	09:00	17:00	07:00	50	S-3	27	10	
28 Jul	VP3	08:45	17:15	07:30	80	SW-1	25	8	
11 Aug	VP1	12:45	17:00	04:15	0	S-2	30		
11 Aug	VP2	12:15	17:15	05:00		NE-2	27	(blank)	
12 Aug	VP2	08:50	17:25	07:35	0	NE-4	30		
12 Aug	VP3	09:07	17:30	07:23		NE-3	28	(blank)	
13 Aug	VP1	09:05	13:30	03:25		NE-1	27	10	
13 Aug	VP3	08:45	14:30	04:45		NE-2	32	açık	
26 Aug	VP1	11:45	17:15	05:30	0	N-3	28	5	
26 Aug	VP2	11:30	17:30	06:00	0	NE-3	27	9	
27 Aug	VP1	09:15	17:00	06:45		?-3	25	9	
27 Aug	VP3	09:00	17:30	07:30	0	N-4	28	5	
28 Aug	VP2	09:00	16:15	06:15	0	N-4	26	5	
28 Aug	VP3	08:50	16:30	06:40		NE-3	25	10	
13 Sep	VP1	11:30	17:15	05:45	0	N-2	28	10	
13 Sep	VP2	11:10	17:50	06:40		S-1	26	10	
14 Sep	VP2	09:00	17:00	07:00	0	N-3	26	10	
14 Sep	VP3	08:40	17:15	07:35		N-2	20	10	
15 Sep	VP1	08:45	15:30	05:45		S-1	21	9	
15 Sep	VP3	09:00	16:00	06:00	0	N-1	27	10	
26 Sep	VP1	11:45	17:35	05:50	20	S-1	20	8	Rain 15:30 16:30
26 Sep	VP2	11:30	17:50	06:20	50	S-3	22		Rain 15:30 16:30
27 Sep	VP2	09:55	17:33	06:38	15		20	9	
27 Sep	VP3	09:15	17:15	07:00	20	SW , later N-2	25	10	

Date	VP	TStr	Tfin	Dur (min)	Cloud (%)	Wind	Temp (oC)	Vis (km)	Note
28 Sep	VP1	09:10	14:15	04:05	15	N-3	26	5	
28 Sep	VP3	08:50	14:30	04:40	10	NE-2	18	10	
11 Oct	VP1	11:15	17:30	06:15	5	N-3	20	10	
11 Oct	VP2	11:00	17:45	06:45	10	N-4	21	5	
12 Oct	VP2	08:50	17:35	07:45	2	NE-3	19	10	
12 Oct	VP3	09:05	17:10	07:05	10	N-4	24	5	
13 Oct	VP1	08:50	16:30	06:40	5	N-3	23	5	
13 Oct	VP3	09:20	18:00	07:40		NE-2		10	

**TStr: Time of Start, Tfin: Time of finish, Dur: Duration, Wind (Direction and speed at Beaufort Scale), Temp: Temperature , Vis: Visibility in km..*

D.2 Bird Observations During Vantage Point Counts

VP	Date	Time	Num.	Species*	Behaviour	Dur1 (sec)	Dur2 (sec)	Height during Flight (15 sec intervals)
VP1	4 Apr	14:50	3	ButBu	hunting	30	0	cc----------------------
VP2	5 Apr	10:46	1	CirGa	hunting	15	15	b-----------------------
VP1	5 Apr	11:00	2	CirGa	display	180	0	cccccccccccc------------
VP2	5 Apr	11:04	1	FalTi	hunting	30	30	bb----------------------
VP1	5 Apr	11:05	1	CirGa	gliding	15	0	c-----------------------
VP2	5 Apr	11:08	1	Cir spp.	migration	30	30	bb----------------------
VP1	5 Apr	11:10	1	FalTi	hunting	15	15	b-----------------------
VP1	5 Apr	11:55	1	CirGa	hunting	30	0	cccccc------------------
VP3	5 Apr	11:55	1	ButBu		90	0	cccccc------------------
VP3	5 Apr	11:55	1	AccGe		90	0	cc----------------------
VP1	5 Apr	11:57	1	FalTi	hunting	60	0	cccc--------------------
VP1	5 Apr	12:12	1	CicNi	gliding	15	15	b-----------------------
VP2	5 Apr	12:12	1	Ac spp	soaring	10	0	c-----------------------
VP3	5 Apr	12:13	1	AccNi		60	0	cccc--------------------
VP2	5 Apr	12:30	1	FalPe	hunting	35	30	bb----------------------
VP1	5 Apr	12:50	1	FalPe	hunting	15	15	b-----------------------
VP1	5 Apr	12:52	1	CirGa	hunting	30	0	cc----------------------
VP2	5 Apr	14:20	1	FalPe		90	0	cccccc------------------
VP1	5 Apr	14:58	1	ButBu	hunting	30	0	cc----------------------
VP3	5 Apr	15:18	1	ButBu	display	45	0	aaa---------------------
VP1	5 Apr	15:30	1	ButBu	migration	15	0	c-----------------------
VP2	5 Apr	15:40	1	ButBu	gliding	45	45	bbb---------------------
VP3	5 Apr	15:43	2	CirGa	display	45	45	bbb---------------------
VP2	5 Apr	17:25	1	CirGa		60	0	cccc--------------------
VP2	5 Apr	18:01	1	CirGa		60	60	bbbb--------------------
VP2	5 Apr	18:01	1	CirGa		60	60	bbbb--------------------
VP3	6 Apr	09:43	1	CirGa	gliding	15	0	c-----------------------
VP3	6 Apr	09:43	1	CirGa	gliding	15	0	c-----------------------
VP2	6 Apr	09:48	1	Ac spp	gliding	75	75	bbbbb-------------------
VP2	6 Apr	09:58	1	AccNi	soaring	40	45	bbb---------------------
VP1	6 Apr	10:24	2	Corco	patroling	180	150	aabbbbbbbbbb------------
VP3	6 Apr	10:25	1	Cir??	soaring	45	0	ccc---------------------
VP3	6 Apr	10:35	2	CirGa	patroling	30	0	cc----------------------
VP2	6 Apr	10:38	1	CirGa	gliding	30	15	ba----------------------
VP2	6 Apr	10:45	1	CirGa	hunting	35	15	ba----------------------
VP1	6 Apr	10:51	1	FalTi	soaring	90	0	aaaaaa------------------
VP3	6 Apr	10:55	1	ButBu	hunting	30	0	cc----------------------
VP2	6 Apr	11:02	1	ButBu	migration	100	30	aabbaaa-----------------
VP3	6 Apr	11:04	2	ButBu	patroling	45	15	cbc---------------------
VP2	6 Apr	11:12	2	CirGa	hunting	135	45	aabbbcccc---------------
VP3	6 Apr	11:27	1	AccNi	hunting	45	15	ccb---------------------
VP3	6 Apr	11:30	2	AccNi	migration	15	0	c-----------------------
VP2	6 Apr	11:37	2	ButBu	hunting	105	30	aabbaaa-----------------
VP2	6 Apr	12:00	4	ButBu	migration	255	75	aaaabbbbbccccccccc-------
VP2	6 Apr	12:17	1	FalPe	hunting	10	0	a-----------------------
VP1	6 Apr	12:19	1	Corco		45	0	aaa---------------------
VP3	6 Apr	12:32	2	CirAe	migration	30	0	cc----------------------
VP2	6 Apr	12:42	1	AccNi	hunting	75	45	aabbb-------------------
VP3	6 Apr	12:53	2	AccNi	migration	15	0	c-----------------------
VP3	6 Apr	14:00	1	ButBu	migration	15	0	c-----------------------
VP1	6 Apr	14:35	1	Corco		15	0	a-----------------------
VP1	6 Apr	14:37	2	Corco		165	120	aaabbbbbbbbcc-----------
VP3	6 Apr	15:20	1	ButBu	hunting	30	15	cb----------------------
VP1	6 Apr	15:24	1	Corco		60	0	aaaa--------------------
VP1	6 Apr	15:24	1	AccGe		360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP2	6 Apr	15:55	3	ButBu	patroling	90	0	aaaaaa------------------
VP1	19 Apr	14:07	1	Corco	gliding	55	0	aaaa--------------------
VP1	19 Apr	14:15	2	FalTi	young training	360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP1	19 Apr	15:49	1	CirGa	hunting	60	0	cccc--------------------
VP1	19 Apr	15:59	1	Corco	hunting	105	0	aaaaaaa-----------------
VP1	19 Apr	16:19	2	CicNi	gliding	45	45	bbb---------------------
VP1	19 Apr	16:20	1	Corco	gliding	30	0	aa----------------------
VP2	19 Apr	16:27	1	CirGa		45	45	bbb---------------------
VP2	19 Apr	16:50	1	ButBu		60	0	cccc--------------------
VP1	19 Apr	17:12	1	ButBu	hunting	15	0	a-----------------------
VP2	20 Apr	09:51	1	ButBu	hunting	30	0	aa----------------------
VP3	20 Apr	10:20	1	ButBu		60	0	cccc--------------------
VP2	20 Apr	10:23	1	Corco	gliding	120	0	aaaaaaaa----------------
VP2	20 Apr	10:55	1	CirGa	gliding	360	360	bbbbbbbbbbbbbbbbbbbbbbbb

VP	Date	Time	Num.	Species*	Behaviour	Dur1 (sec)	Dur2 (sec)	Height during Flight (15 sec intervals)
VP3	20 Apr	10:56	1	ButBu		45	0	ccc---------------------
VP2	20 Apr	13:50	1	AccNi	gliding	130	30	aaaaabbcc---------------
VP3	20 Apr	14:13	1	CirGa		45	45	bbb---------------------
VP2	20 Apr	14:22	1	ButBu	hunting	60	0	aaaa--------------------
VP3	20 Apr	14:28	1	ButBu		60	0	cccc--------------------
VP2	20 Apr	14:38	1	ButBu	hunting	90	45	aaabbb------------------
VP3	20 Apr	15:30	1	AccNi		30	0	aa----------------------
VP3	20 Apr	15:48	1	ButBu		90	90	bbbbbb------------------
VP2	20 Apr	16:01	1	Corco	gliding	300	135	aaaaabbbbbbbbbccccccc---
VP1	21 Apr	13:10	1	ButBu		15	15	b-----------------------
VP2	10 May	13:40	1	Corco		45	45	bbb---------------------
VP2	10 May	13:45	1	CirGa	hunting	90	0	cccccc------------------
VP2	10 May	13:46	1	Fal??	gliding	45	0	ccc---------------------
VP3	10 May	14:07	1	PerAp	hunting	60	0	aaaa--------------------
VP2	10 May	14:13	1	Corco		45	0	ccc---------------------
VP3	10 May	14:31	1	ButBu	hunting	360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP2	10 May	14:34	1	ButBu		30	30	bb----------------------
VP2	10 May	14:42	1	CirGa	hunting	120	0	cccccccc----------------
VP2	10 May	15:23	1	ButBu		60	60	bbbb--------------------
VP3	10 May	15:45	1	FalEl	gliding	30	30	bb----------------------
VP2	10 May	15:54	1	CirGa	hunting	90	30	bbcccc------------------
VP3	10 May	17:26	1	FalEl	hunting	80	0	aaaaaa------------------
VP2	11 May	09:01	1	PerAp	hunting	30	0	aa----------------------
VP1	11 May	10:25	1	ButBu		120	60	ccccbbbb----------------
VP1	11 May	10:55	2	PerAp	migration	150	0	cccccccccc--------------
VP1	11 May	11:00	1	ButBu		90	0	cccccc------------------
VP1	11 May	11:30	1	FalTi	gliding	45	45	bbb---------------------
VP2	11 May	11:30	1	FalTi	gliding	180	15	aaaaaaaaaabc------------
VP1	11 May	11:35	1	ButBu	hunting	120	30	ccccbbaa----------------
VP1	11 May	11:42	1	CirGa	gliding	60	0	cccc--------------------
VP2	11 May	11:52	1	ButBu	hunting	360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP1	11 May	12:30	2	PerAp		210	90	bbbbaaabbccccc----------
VP1	11 May	12:38	1	CirGa	hunting	150	0	cccccccccc--------------
VP1	11 May	12:40	1	ButBu		45	45	bbb---------------------
VP2	11 May	14:20	1	Corco	hunting	300	0	aaaaaaaaaaaaaaaaaaaa----
VP1	11 May	15:05	1	ButBu		45	45	bbb---------------------
VP1	11 May	15:38	1	AccNi		30	0	aa----------------------
VP1	11 May	16:03	2	CirGa	patroling	210	75	bbbbbccccccccc----------
VP1	11 May	16:10	2	Corco		45	0	aaa---------------------
VP2	11 May	16:24	1	CirGa	hunting	360	75	cccccccccccccccbbbbbaaaa
VP2	11 May	16:40	1	ButBu	hunting	180	60	bbbbcccccccc------------
VP1	11 May	16:55	1	ButBu	hunting	120	75	bbbbbccc----------------
VP2	11 May	17:10	1	FalEl	gliding	100	0	ccccccc-----------------
VP1	11 May	17:30	1	CirGa		60	60	bbbb--------------------
VP2	11 May	17:50	1	Corco	gliding	360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP1	11 May	18:15	2	ButBu	patroling	120	120	bbbbbbbb----------------
VP1	11 May	18:37	1	FalEl		90	0	cccccc------------------
VP3	12 May	09:12	1	ButBu		90	90	bbbbbb------------------
VP1	12 May	09:28	1	FalTi	hunting	360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP3	12 May	09:55	1	ButBu	hunting	60	30	bbaa--------------------
VP3	12 May	11:10	1	CirGa	hunting	90	90	bbbbbb------------------
VP1	12 May	11:15	1	FalTi	hunting	360	75	aaaaaabbbbbaaaaaaaaaaaaa
VP1	12 May	11:29	2	Corco	gliding	45	0	aaaaaabbbbbccccccccbbbbb
VP1	12 May	11:29	1	FalPe	hunting	270	150	aaa---------------------
VP1	12 May	11:44	1	ButBu	hunting	210	0	aaaaaaaaaaaaaa----------
VP1	12 May	11:45	2	PerAp	hunting	135	0	aaaaaaaaa---------------
VP3	12 May	12:20	1	CirGa	hunting	120	60	bbbbcccc----------------
VP1	12 May	12:49	2	PerAp	gliding	360	75	aaaaaaaaaabbbbbccccccccc
VP3	12 May	13:20	1	ButBu		45	0	ccc---------------------
VP1	12 May	13:40	2	PerAp	display	360	60	aa----------------------
VP1	12 May	13:40	1	CirGa	hunting	30	0	aaaaaaaaaaaaaaaabbbbcccc
VP1	12 May	14:15	1	Corco	gliding	360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP1	24 May	13:45	1	FalPe	hunting	30	0	aa----------------------
VP1	24 May	13:45	1	Corco		15	0	a-----------------------
VP1	24 May	13:45	1	ButBu		30	0	aa----------------------
VP2	24 May	13:48	1	FalEl		30	0	aa----------------------
VP1	24 May	13:58	2	PerAp		80	0	ccccc-------------------
VP1	24 May	13:58	1	ButBu		15	0	a-----------------------
VP1	24 May	14:10	2	CirGa	gliding	45	0	ccc---------------------
VP1	24 May	14:20	1	CirGa	gliding	75	75	bbbbb-------------------
VP1	24 May	14:21	1	FalTi	gliding	135	135	bbbbbbbbb---------------
VP2	24 May	14:34	1	ButBu		60	60	bbbb--------------------

VP	Date	Time	Num.	Species*	Behaviour	Dur1 (sec)	Dur2 (sec)	Height during Flight (15 sec intervals)
VP1	24 May	14:50	1	ButRu		50	0	aaaa--------------------
VP1	24 May	14:50	1	ButBu		30	0	aa----------------------
VP1	24 May	15:03	1	PerAp	migration	267	135	aaaabbbbbbbbbcccc-------
VP1	24 May	15:21	1	FalPe	hunting	115	105	b-bbbbbb----------------
VP1	24 May	15:33	1	PerAp	migration	30	0	aa----------------------
VP1	24 May	15:34	1	Corco	migration	90	0	aaaaaa------------------
VP2	24 May	15:50	2	Corco		90	0	cccccc------------------
VP2	24 May	16:05	1	CirGa	hunting	60	0	cccc--------------------
VP2	24 May	16:38	1	ButBu		90	30	bbcccc------------------
VP1	24 May	16:47	1	FalTi		45	0	aaa---------------------
VP1	24 May	16:50	2	ButBu		75	0	aaaaa-------------------
VP1	24 May	17:00	3	PerAp	gliding	240	150	bbbbbbbbbbcccccc--------
VP1	24 May	17:05	1	PerAp	gliding	90	0	aaaaaa------------------
VP1	24 May	17:10	1	FalTi	landed	15	0	a-----------------------
VP2	24 May	17:12	1	Corco		60	0	cccc--------------------
VP2	24 May	18:30	1	FalEl		90	0	cccccc------------------
VP3	25 May	08:38	1	ButBu		30	0	aa----------------------
VP2	25 May	09:20	1	Corco	landed	360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP3	25 May	09:24	1	CirGa	hunting	60	0	cccc--------------------
VP2	25 May	10:27	1	PerAp	landed	360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP3	25 May	10:50	1	ButBu		90	30	bbcccc------------------
VP2	25 May	10:55	1	PerAp	landed	360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP3	25 May	11:18	1	CirGa		90	0	cccccc------------------
VP2	25 May	12:07	1	PerAp	gliding	30	0	aa----------------------
VP2	25 May	12:32	1	CicNi	gliding	75	30	bbaaa-------------------
VP2	25 May	15:28	1	FalPe	gliding	135	45	aaaaaabbb---------------
VP2	25 May	15:38	1	FalTi	gliding	30	30	bb----------------------
VP3	25 May	15:48	1	CirGa	hunting	120	0	cccccccc----------------
VP2	25 May	16:20	3	Corco	landed	360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP3	25 May	17:01	1	FalEl		45	0	ccc---------------------
VP2	25 May	17:06	1	CirGa	hunting	240	30	bbaaaaaaaaaaaaaa--------
VP3	25 May	17:38	1	ButBu		90	0	cccccc------------------
VP1	26 May	08:38	1	ButBu		60	0	cccc--------------------
VP1	26 May	08:45	1	ButBu		120	0	cccccccc----------------
VP1	26 May	08:45	1	ButBu		120	0	cccccccc----------------
VP1	26 May	09:15	2	Corco		60	60	bbbb--------------------
VP1	26 May	09:37	1	ButBu		60	0	cccc--------------------
VP1	26 May	09:58	1	CirGa		120	0	cccccccc----------------
VP1	26 May	10:32	1	PerAp		60	30	bbcc--------------------
VP1	26 May	10:50	2	PerAp		90	0	cccccc------------------
VP1	26 May	11:08	1	Corco		60	0	ccccc-------------------
VP3	26 May	11:25	1	FalEl	hunting	135	60	aaaabbbba---------------
VP3	26 May	12:00	1	FalEl	hunting	30	0	aa----------------------
VP1	26 May	12:45	4	FalEl		120	0	cccccccc----------------
VP1	26 May	12:45	2	FalEl		180	0	cccccccccccc------------
VP3	26 May	12:56	1	CirGa	gliding	45	45	bbb---------------------
VP1	5 Jun	13:10	2	ButBu	patroling	15	0	c-----------------------
VP1	5 Jun	13:20	1	ButBu	gliding	15	0	c-----------------------
VP1	5 Jun	13:31	1	ButRu	hunting	30	0	cc----------------------
VP3	5 Jun	13:40	2	Corco	patroling	30	0	aa----------------------
VP2	5 Jun	13:50	1	ButBu	hunting	90	45	bbbccc------------------
VP2	5 Jun	14:38	1	ButBu		60	60	bbbb--------------------
VP3	5 Jun	14:46	1	CirGa	hunting	45	0	aaa---------------------
VP1	5 Jun	14:53	1	FalTi	hunting	15	0	c-----------------------
VP3	5 Jun	15:03	1	FalEl	hunting	180	105	aaabbbbaabbb------------
VP3	5 Jun	15:06	3	FalEl	hunting	60	30	bbaa--------------------
VP3	5 Jun	15:43	2	CirGa	young training	360	105	aaaaabbbbbbbaaaaaaaaaaaa
VP2	5 Jun	15:50	2	CirGa		120	0	cccccccc----------------
VP1	5 Jun	16:20	1	ButBu	gliding	15	0	c-----------------------
VP2	5 Jun	16:23	1	CirGa		60	0	cccc--------------------
VP2	5 Jun	16:58	1	ButBu		90	0	cccccc------------------
VP3	5 Jun	17:17	1	FalEl	patroling	90	15	aaaabc------------------
VP3	5 Jun	17:18	1	CirGa	patroling	30	0	aa----------------------
VP1	6 Jun	09:15	1	ButBu		90	60	bbbbcc------------------
VP1	6 Jun	09:30	1	Hiepe		180	0	cccccccccccc------------
VP1	6 Jun	09:30	1	FalPe		210	0	cccccccccccccc----------
VP1	6 Jun	09:36	1	ButBu		60	0	cccc--------------------
VP1	6 Jun	09:38	1	FalPe		180	60	bbbbaaaaaaaa------------
VP2	6 Jun	09:43	3	ButBu	gliding	210	90	aaaabbbaabbbaa----------
VP2	6 Jun	09:47	1	ButBu	hunting	30	0	aa----------------------
VP2	6 Jun	09:55	3	ButBu		360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP1	6 Jun	10:22	2	FalPe	display	180	90	bbbbccccbbaa------------

VP	Date	Time	Num.	Species*	Behaviour	Dur1 (sec)	Dur2 (sec)	Height during Flight (15 sec intervals)
VP1	6 Jun	10:50	1	CirGa		120	0	cccccccc----------------
VP2	6 Jun	11:01	1	ButBu		75	0	aaaaa-------------------
VP2	6 Jun	11:11	5	Corco	gliding	180	0	aaaaaaaaaaaa------------
VP2	6 Jun	11:12	3	ButBu		225	90	aaaaaaaaabbbbbbb---------
VP1	6 Jun	11:40	3	FalPe	young training	120	120	bbbbbbbb----------------
VP1	6 Jun	13:00	1	CirGa	young training	150	0	cccccccccc--------------
VP1	6 Jun	13:04	1	CicNi		180	0	cccccccccccc------------
VP1	6 Jun	13:07	1	CirGa		90	0	cccccc------------------
VP2	6 Jun	14:39	4	Corco		90	0	aaaaaa------------------
VP1	6 Jun	15:20	1	CirGa		120	0	cccccccc----------------
VP2	6 Jun	16:19	5	Corco	juv	120	0	aaaaaaaa----------------
VP1	6 Jun	16:50	1	ButBu		90	90	bbbbbb------------------
VP2	6 Jun	17:08	1	ButBu	soaring	240	75	aabbbbbcccccccccc--------
VP3	7 Jun	09:03	1	ButBu		60	60	bbbb--------------------
VP1	7 Jun	09:10	2	FalPe	display	360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP1	7 Jun	09:15	2	ButBu	patroling	75	0	aaaaa-------------------
VP3	7 Jun	10:07	1	CirGa		90	0	cccccc------------------
VP1	7 Jun	10:10	1	CirGa	landed	360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP1	7 Jun	10:17	1	ButBu		45	0	aaa---------------------
VP3	7 Jun	10:21	1	ButBu		60	0	cccc--------------------
VP2	7 Jun	10:45	1	ButBu	soaring	15	0	c-----------------------
VP1	7 Jun	10:50	1	PerAp	hunting	150	0	aaaaaaaaaa--------------
VP1	7 Jun	11:27	1	PerAp		75	45	aabbb-------------------
VP1	7 Jun	11:28	1	FalEl		60	60	bbbb--------------------
VP1	7 Jun	11:44	3	FalPe	young training	15	0	a-----------------------
VP2	7 Jun	11:50	2	CirGa	young training	120	0	cccccccc----------------
VP3	7 Jun	11:50	1	ButBu		90	90	bbbbbb------------------
VP1	7 Jun	11:54	1	PerAp	soaring	240	60	aaabbbbcccccccccc--------
VP1	7 Jun	12:20	4	FalPe	young training	360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP3	7 Jun	12:40	2	CirGa		120	0	cccccccc----------------
VP2	7 Jun	12:41	2	PerAp	display	180	0	cccccccccccc------------
VP1	7 Jun	13:00	3	Corco	landed	30	0	aa----------------------
VP2	7 Jun	15:00	4	Corco	patroling	120	30	ccbbcccc----------------
VP1	7 Jun	15:05	2	ButBu	gliding	60	0	aaaa--------------------
VP1	7 Jun	15:20	2	FalPe	young training	45	0	aaa---------------------
VP2	7 Jun	15:28	1	PerAp	hunting	180	0	cccccccccccc------------
VP2	7 Jun	15:30	1	FalPe	hunting	60	0	cccc--------------------
VP3	7 Jun	15:30	1	CirGa		120	0	cccccccc----------------
VP3	7 Jun	15:55	1	CirGa		90	0	cccccc------------------
VP1	7 Jun	16:02	1	ButBu		60	0	aaaa--------------------
VP2	7 Jun	16:24	1	ButBu	hunting	30	0	cc----------------------
VP3	7 Jun	16:40	3	ButBu	young training	240	0	cccccccccccccccc--------
VP2	7 Jun	16:48	3	ButBu	patroling	120	30	ccbcbccc----------------
VP3	7 Jun	16:54	2	ButBu		180	0	cccccccccccc------------
VP2	7 Jun	17:06	1	FalPe	hunting	15	0	c-----------------------
VP2	7 Jun	17:14	3	CirGa	young training	120	0	cccccccc----------------
VP3	8 Jun	09:58	1	PhaCa	gliding	45	15	bcc---------------------
VP3	8 Jun	10:15	1	PerAp		90	0	aaaaaa------------------
VP2	8 Jun	10:48	1	ButBu		60	0	aaaa--------------------
VP2	8 Jun	11:15	2	ButBu		60	0	aaaa--------------------
VP2	8 Jun	11:50	2	PerAp		120	90	bbbbaabb----------------
VP3	8 Jun	12:10	1	PerAp	soaring	60	15	aabc--------------------
VP2	8 Jun	12:20	1	ButBu		90	0	cccccc------------------
VP3	8 Jun	16:33	1	But??		35	0	aa----------------------
VP2	8 Jun	16:40	1	ButBu		30	0	cc----------------------
VP2	8 Jun	17:05	1	ButBu		60	30	bbcc--------------------
VP2	8 Jun	17:40	1	ButBu		60	0	cccc--------------------
VP1	9 Jun	09:05	1	ButBu		15	0	a-----------------------
VP3	9 Jun	11:05	1	ButBu	hunting	15	0	a-----------------------
VP1	9 Jun	11:40	1	CirGa	hunting	90	60	bbaabb------------------
VP1	9 Jun	12:20	1	CirGa	hunting	90	0	cccccc------------------
VP1	9 Jun	15:08	1	ButRu		75	30	abbcc-------------------
VP1	9 Jun	15:47	1	ButBu		180	60	bbbbcccccccc------------
VP1	9 Jun	15:50	1	ButBu		45	0	ccc---------------------
VP1	9 Jun	16:20	1	FalTi		30	30	bb----------------------
VP1	26 Jul	13:40	1	CirGa		30	0	aa----------------------
VP1	26 Jul	13:45	2	Corco		75	0	aaaaa-------------------
VP1	26 Jul	13:48	2	FalPe		360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP2	26 Jul	13:55	1	PerAp		120	120	bbbbbbbb----------------
VP2	26 Jul	14:15	1	Fal??		15	0	c-----------------------
VP1	26 Jul	14:30	3	Corco		45	0	aaa---------------------
VP2	26 Jul	14:45	1	PerAp		120	45	cccbbbaa----------------

VP	Date	Time	Num.	Species*	Behaviour	Dur1 (sec)	Dur2 (sec)	Height during Flight (15 sec intervals)
VP2	26 Jul	15:03	1	ButBu		60	0	cccc--------------------
VP2	26 Jul	15:04	2	PerAp		45	0	ccc---------------------
VP1	26 Jul	15:40	2	Corco		360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP2	26 Jul	15:45	1	CirGa		90	30	cccbbc------------------
VP2	26 Jul	16:55	1	PerAp		60	0	cccc--------------------
VP2	26 Jul	17:30	1	CirGa		120	30	ccccccbb----------------
VP2	27 Jul	10:05	1	FalTi		135	60	bbaaabbaa---------------
VP3	27 Jul	10:25	1	AccNi		15	0	a-----------------------
VP2	27 Jul	10:30	2	ButBu		360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP3	27 Jul	10:40	1	Fal??		30	0	cc----------------------
VP2	27 Jul	10:48	3	ButBu		360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP2	27 Jul	11:04	1	PerAp		150	60	aaaaabbbbc--------------
VP2	27 Jul	11:48	1	ButBu		120	0	aaaaaaaa----------------
VP2	27 Jul	11:51	1	FalPe		45	15	aab---------------------
VP2	27 Jul	11:56	3	Corco		60	60	bbbb--------------------
VP2	27 Jul	12:13	1	PerAp		90	0	aaaaaa------------------
VP3	27 Jul	12:25	1	PerAp		60	0	cccc--------------------
VP2	27 Jul	12:36	1	AccGe		145	0	aaaaaaaaaa--------------
VP2	27 Jul	12:40	1	CirGa		15	0	a-----------------------
VP3	27 Jul	12:40	1	PerAp		60	30	bbcc--------------------
VP3	27 Jul	12:42	4	FalEl		300	0	cccccccccccccccccccc----
VP2	27 Jul	13:20	2	ButBu		75	0	aaaaa-------------------
VP3	27 Jul	13:35	1	CirGa		30	0	cc----------------------
VP3	27 Jul	13:35	1	FalEl		15	0	c-----------------------
VP3	27 Jul	13:47	1	FalEl		30	0	cc----------------------
VP2	27 Jul	15:25	2	CicNi		180	0	cccccccccccc------------
VP3	27 Jul	15:27	1	ButBu		45	0	ccc---------------------
VP3	27 Jul	16:14	1	CirGa		90	0	cccccc------------------
VP2	27 Jul	16:41	1	CirGa		200	0	aaaaaaaaaaaaa-----------
VP2	27 Jul	16:46	1	FalEl		90	30	bbaaaa------------------
VP3	27 Jul	16:58	1	PerAp		60	30	ccbb--------------------
VP3	27 Jul	17:23	1	Fal??		30	0	cc----------------------
VP2	27 Jul	17:40	1	FalEl		15	15	b-----------------------
VP3	28 Jul	09:32	2	Corco		360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP3	28 Jul	09:40	1	FalEl		60	45	bbba--------------------
VP3	28 Jul	10:08	1	ButBu		75	0	aaaaa-------------------
VP1	28 Jul	10:37	2	FalPe		90	0	aaaaaa------------------
VP3	28 Jul	10:54	2	Corco		180	0	aaaaaaaaaaaa------------
VP1	28 Jul	11:50	2	Corco		60	0	aaaa--------------------
VP3	28 Jul	13:43	1	AccNi		30	0	aa----------------------
VP3	28 Jul	14:41	1	CirGa		135	0	aaaaaaaaa---------------
VP1	28 Jul	15:17	1	FalPe		45	0	aaa---------------------
VP2	11 Aug	12:40	2	Butbu	hunting/patrolling	75	45	bbbaa-------------------
VP2	11 Aug	13:05	1	AccNi	possibly hunting	15	0	a-----------------------
VP1	11 Aug	13:40	1	FalSp	hunting/patrolling	30	30	bb----------------------
VP1	11 Aug	14:20	4	FalEl	hunting/patrolling	45	45	bbb---------------------
VP1	11 Aug	15:45	1	FalPe	landed	60	30	bbaa--------------------
VP2	11 Aug	15:55	1	FalEl	landed	360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP2	11 Aug	16:08	1	AccGe	landed	30	0	aa----------------------
VP2	11 Aug	16:09	1	FalEl	hunting/patrolling	180	45	aaaabbaaabaa------------
VP2	11 Aug	16:30	1	ButBu	gliding	150	45	aaaaaabbba--------------
VP2	12 Aug	09:34	1	ButPer	hunting/patrolling	45	45	bbb---------------------
VP2	12 Aug	09:55	1	ButBu	hunting/patrolling	60	0	cccc--------------------
VP3	12 Aug	10:34	1	tanımsız	gliding	60	0	cccc--------------------
VP2	12 Aug	10:40	1	CirGa	hunting/patrolling	180	60	ccccbbbbcccc------------
VP3	12 Aug	10:49	2	FalEl	hunting/patrolling	180	105	aaabbbbaabbb------------
VP3	12 Aug	10:53	1	ButBu	gliding	75	45	abbbc-------------------
VP2	12 Aug	11:15	1	AccNi	gliding	30	0	aa----------------------
VP2	12 Aug	12:20	1	CirGa	hunting/patrolling	60	0	cccc--------------------
VP2	12 Aug	13:17	1	PerAp	hunting/patrolling	60	60	bbbb--------------------
VP2	12 Aug	15:48	1	ButBu	landed	150	60	bbbbaaaaaa--------------
VP3	12 Aug	16:15	1	HiePe	migration	90	0	cccccc------------------
VP3	12 Aug	16:28	1	PerAp	gliding	60	60	bbbb--------------------
VP3	12 Aug	16:30	1	tanımsız	hunting/patrolling	15	0	a-----------------------
VP3	12 Aug	16:35	1	FalEl	hunting/patrolling	60	60	bbbb--------------------
VP2	12 Aug	16:50	1	CirGa	hunting/patrolling	60	0	cccc--------------------
VP3	12 Aug	17:07	1	ButSp	hunting/patrolling	15	0	a-----------------------
VP1	13 Aug	09:27	10	FalEl	hunting/patrolling	360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP1	13 Aug	09:55	1	FalEl	hunting/patrolling	75	0	aaaaa-------------------
VP1	13 Aug	09:57	1	ButSp	soaring	30	30	bb----------------------
VP1	13 Aug	10:06	4	FalTi	young involved	180	30	aaaaaaaabbcc------------
VP1	13 Aug	10:07	1	AccNi	gliding	60	0	cccc--------------------

VP	Date	Time	Num.	Species*	Behaviour	Dur1 (sec)	Dur2 (sec)	Height during Flight (15 sec intervals)
VP3	13 Aug	10:40	1	ButBu	hunting/patrolling	60	60	bbbb--------------------
VP1	13 Aug	10:45	1	ButBu	soaring	105	30	aabbccc-----------------
VP1	13 Aug	11:15	1	FalTi	harrasing	360	210	aaaabbbbbbbbbbbbbbaaaaaa
VP1	13 Aug	11:15	2	PerAp	display	360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP1	13 Aug	11:20	1	AccNi	gliding	60	60	bbbb--------------------
VP1	13 Aug	11:20	1	FalEl	hunting/patrolling	30	30	bb----------------------
VP1	13 Aug	11:21	1	PerAp	hunting/patrolling	75	75	bbbbb-------------------
VP1	13 Aug	11:21	1	FalEl	hunting/patrolling	90	45	aabbba------------------
VP1	13 Aug	11:44	2	FalEl	hunting/patrolling	60	0	aaaa--------------------
VP1	13 Aug	12:07	1	FalTi	landed	360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP1	13 Aug	12:10	1	PerAp	gliding	30	0	aa----------------------
VP1	13 Aug	12:12	2	FalEl	hunting/patrolling	180	0	aaaaaaaaaaaa------------
VP1	13 Aug	12:20	2	FalTi	hunting/patrolling	360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP1	13 Aug	12:21	2	FalEl	hunting/patrolling	360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP1	13 Aug	12:24	1	PerAp	gliding	360	90	aaaaaaaaaaaabbbbbbaaaaaa
VP1	13 Aug	12:29	2	CorCo	display	45	0	aaa---------------------
VP3	13 Aug	13:25	4	FalEl	hunting/patrolling	150	0	cccccccccc--------------
VP3	13 Aug	14:10	1	FalEl	hunting/patrolling	120	60	bbbaaaab----------------
VP2	26 Aug	11:50	1	CorCo	hunting/patrolling	30	0	aa----------------------
VP1	26 Aug	12:30	1	FalTi	hunting/patrolling	30	30	bb----------------------
VP1	26 Aug	12:55	1	FalTi	hunting/patrolling	45	15	baa---------------------
VP2	26 Aug	13:18	1	PerAp	hunting/patrolling	300	0	aaaaaaaaaaaaaaaaaaaa----
VP2	26 Aug	15:05	1	ButBu	landed	360	0	aaaaaaaaaaaaaaaaaaaa----
VP1	26 Aug	15:35	1	FalTi	hunting/patrolling	90	90	bbbbbb------------------
VP1	27 Aug	10:45	1	CorCo	display	30	0	aa----------------------
VP1	27 Aug	11:06	1	ButBu	hunting/patrolling	75	0	aaaaa-------------------
VP3	27 Aug	11:15	1	ButBu	hunting/patrolling	45	45	bbb---------------------
VP1	27 Aug	11:18	1	FalTi	hunting/patrolling	45	0	aaa---------------------
VP1	27 Aug	11:25	1	PerAp	gliding	240	135	aaaaaaabbbbbbbbb--------
VP1	27 Aug	11:25	2	FalTi	harrasing	240	0	aaaaaaaaaaaaaaaa--------
VP1	27 Aug	11:42	2	CirGa	display	180	150	aabbbbbbbbbb------------
VP1	27 Aug	14:47	1	CorCo	landed	360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP3	27 Aug	16:34	1	PerAp	hunting/patrolling	45	0	ccc---------------------
VP3	27 Aug	16:36	1	PerAp	hunting/patrolling	45	0	ccc---------------------
VP2	28 Aug	10:50	1	CirGa	hunting/patrolling	300	0	cccccccccccccccccccc----
VP2	28 Aug	11:18	2	PerAp	hunting/patrolling	60	60	bbbb--------------------
VP3	28 Aug	12:52	1	ButBu	hunting/patrolling	30	0	aa----------------------
VP3	28 Aug	14:06	1	FalEl	hunting/patrolling	90	0	aaaaaa------------------
VP3	28 Aug	14:35	1	CirGa	hunting/patrolling	60	0	aaaa--------------------
VP1	13 Sep	11:54	1	FalTi	hunting/patrolling	15	15	b-----------------------
VP1	13 Sep	12:05	2	PerAp	migration	345	0	ccccccccccccccccccccccc-
VP1	13 Sep	12:07	1	tanımsız	migration	30	0	cc----------------------
VP2	13 Sep	12:15	1	CirGa	hunting/patrolling	360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP1	13 Sep	12:50	2	CorCo	gliding	240	0	cccccccccccccccc--------
VP2	13 Sep	13:08	2	CorCo	display	120	30	aaaaaabb----------------
VP1	13 Sep	13:20	1	ButBu	hunting/patrolling	15	0	c-----------------------
VP1	13 Sep	13:21	1	tanımsız	hunting/patrolling	30	0	aa----------------------
VP1	13 Sep	16:15	1	CorCo	hunting/patrolling	60	0	cccc--------------------
VP2	13 Sep	16:18	1	AccNi	hunting/patrolling	75	0	aaaaa-------------------
VP2	13 Sep	17:50	1	ButBu	hunting/patrolling	15	0	a-----------------------
VP2	14 Sep	11:05	1	CorCo	gliding	15	0	c-----------------------
VP3	14 Sep	13:44	1	CorCo	display	45	0	aaa---------------------
VP2	14 Sep	13:45	1	CorCo	gliding	15	0	c-----------------------
VP3	14 Sep	14:50	1	FalEl	hunting/patrolling	360	90	aaaaabbbbbbccccccccccccc
VP3	14 Sep	15:30	4	PerAp	migration	60	0	cccc--------------------
VP3	14 Sep	15:30	1	CirCy	migration	30	0	cc----------------------
VP3	14 Sep	15:33	1	CirGa	hunting/patrolling	15	0	a-----------------------
VP2	14 Sep	15:40	1	AccNi	hunting/patrolling	15	15	b-----------------------
VP3	15 Sep	09:40	1	PanHa	migration	150	0	cccccccccc--------------
VP3	15 Sep	09:42	2	CirAe	migration	90	0	cccccc------------------
VP3	15 Sep	09:42	1	FalSp	soaring	30	0	cc----------------------
VP3	15 Sep	09:50	1	FalEl	hunting/patrolling	900	0	cccccccccccccccccccccccc
VP1	15 Sep	10:39	2	CorCo	landed	360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP3	15 Sep	10:42	1	AquPo	migration	120	0	cccccccc----------------
VP1	15 Sep	10:55	1	FalPe	gliding	90	45	bbbaaa------------------
VP3	15 Sep	11:15	1	FalEl	hunting/patrolling	60	0	cccc--------------------
VP1	15 Sep	11:27	2	FalPe	landed	360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP1	15 Sep	11:42	1	ButBu	took of	60	0	aaaa--------------------
VP1	15 Sep	11:42	1	AccNi	harrasing	75	30	aaabb-------------------
VP3	15 Sep	12:55	1	MilMg	migration	90	0	cccccc------------------
VP3	15 Sep	14:05	2	CorCo	gliding	15	0	c-----------------------
VP2	26 Sep	11:40	1	ButSp	gliding	60	60	bbbb--------------------

VP	Date	Time	Num.	Species*	Behaviour	Dur1 (sec)	Dur2 (sec)	Height during Flight (15 sec intervals)
VP1	26 Sep	12:00	1	ButBu	hunting/patrolling	75	30	aaabb-------------------
VP1	26 Sep	12:12	2	CorCo	display	150	0	aaaaaaaaaa--------------
VP1	26 Sep	12:13	1	cicni	migration	90	0	cccccc------------------
VP2	26 Sep	12:20	2	FalPe	harrasing	45	0	ccc---------------------
VP2	26 Sep	12:50	1	ButBu	hunting/patrolling	90	90	bbbbbb------------------
VP2	26 Sep	13:15	1	CorCo	hunting/patrolling	60	60	bbbb--------------------
VP2	26 Sep	13:55	1	ButBu	hunting/patrolling	60	60	bbbb--------------------
VP1	26 Sep	14:03	1	FalTi	hunting/patrolling	45	0	aaa---------------------
VP2	26 Sep	16:42	1	FalTi	hunting/patrolling	75	0	ccccc-------------------
VP2	26 Sep	17:12	1	FalSp	gliding	30	30	bb----------------------
VP2	26 Sep	17:12	2	FalTi	hunting/patrolling	30	30	bb----------------------
VP2	27 Sep	09:50	2	CorCo	hunting/patrolling	300	120	aaaaaaaaabbbbbbbbaaa----
VP3	27 Sep	11:30	1	CorCo	gliding	15	0	c-----------------------
VP2	27 Sep	12:16	1	ButBu	hunting/patrolling	210	15	aaaaaaaaaaaaab----------
VP3	27 Sep	15:45	2	CirAe	migration	75	0	ccccc-------------------
VP3	27 Sep	15:46	1	tanımsız	migration	75	0	ccccc-------------------
VP2	27 Sep	16:52	1	AccNi	harrasing	180	135	aaabbbbbbbbb------------
VP2	27 Sep	16:53	1	AccGe	hunting/patrolling	120	120	bbbbbbbb----------------
VP1	28 Sep	09:50	1	AccNi	hunting/patrolling	15	0	a-----------------------
VP1	28 Sep	10:20	1	ButBu	hunting/patrolling	45	45	bbb---------------------
VP3	28 Sep	11:10	2	CorCo	display	60	0	aaaa--------------------
VP1	28 Sep	11:15	2	FalPe	landed	60	30	aabb--------------------
VP1	28 Sep	11:40	1	AccNi	hunting/patrolling	45	0	aaa---------------------
VP3	28 Sep	12:41	1	CirAe	migration	90	30	bbcccc------------------
VP1	11 Oct	12:25	1	ButBu	hunting/patrolling	30	0	aa----------------------
VP2	11 Oct	12:35	1	AccNi	hunting/patrolling	45	0	aaa---------------------
VP1	11 Oct	13:45	2	ButRu	soaring	135	75	aaaabbbbb---------------
VP1	11 Oct	14:15	1	FalPe	hunting/patrolling	60	0	aaaa--------------------
VP2	11 Oct	15:20	1	ButBu	hunting/patrolling	90	90	bbbbbb------------------
VP1	11 Oct	15:37	2	ButRu	hunting/patrolling	120	120	bbbbbbbb----------------
VP2	11 Oct	15:45	1	ButBu	hunting/patrolling	75	75	bbbbb-------------------
VP2	11 Oct	16:10	1	AccNi	migration	90	0	cccccc------------------
VP1	11 Oct	16:21	1	ButBu	migration	150	75	aaabbbbbaa--------------
VP1	11 Oct	16:47	2	ButBu	harrasing	360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP1	11 Oct	16:49	2	AccNi	harrasing	360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP1	11 Oct	16:49	2	CorCo	hunting/patrolling	120	0	aaaaaaaa----------------
VP1	11 Oct	17:10	1	AccGe	hunting/patrolling	45	0	aaa---------------------
VP2	12 Oct	11:05	1	FalPe	hunting/patrolling	30	0	aa----------------------
VP2	12 Oct	11:45	1	ButBu	soaring	150	60	bbbbcccccc--------------
VP3	12 Oct	11:50	1	ButBu	gliding	15	0	a-----------------------
VP3	12 Oct	12:35	1	CirCy	hunting/patrolling	45	0	aaa---------------------
VP2	12 Oct	13:10	1	ButBu	hunting/patrolling	60	0	aaaa--------------------
VP2	12 Oct	13:46	2	AccNi	harrasing	30	0	aa----------------------
VP2	12 Oct	14:44	2	CorCo	display	90	45	aabbba------------------
VP3	12 Oct	16:05	1	ButBu	gliding	30	0	aa----------------------
VP1	13 Oct	09:40	1	AccNi	migration	60	0	cccc--------------------
VP1	13 Oct	10:15	1	ButBu	hunting/patrolling	90	90	bbbbbb------------------
VP3	13 Oct	10:51	1	AccNi	hunting/patrolling	75	45	aabbb-------------------
VP3	13 Oct	11:16	1	PanHa	gliding	45	0	aaa---------------------
VP1	13 Oct	11:40	1	AccNi	hunting/patrolling	15	0	a-----------------------
VP1	13 Oct	12:05	1	FalPe	hunting/patrolling	45	45	bbb---------------------
VP3	13 Oct	12:25	3	AccGe	same bird	150	30	aabbcccccc--------------
VP3	13 Oct	12:25	3	AccGe	soaring	120	30	aaabbccc----------------
VP1	13 Oct	12:35	10	CorCo	young involved	90	0	cccccc------------------
VP3	13 Oct	12:35	1	AccNi	harrasing	240	75	bbbbbccccccccccc--------
VP3	13 Oct	12:35	1	AccGe	harrasing	240	75	abbbbbcccccccccc--------
VP3	13 Oct	13:33	1	AccGe	gliding	60	60	bbbb--------------------
VP3	13 Oct	13:50	1	AccNi	landed	360	0	aaaaaaaaaaaaaaaaaaaaaaaa
VP3	13 Oct	15:05	1	ButBu	hunting/patrolling	105	30	bbaaaaa-----------------
VP1	13 Oct	15:50	1	ButBu	hunting/patrolling	45	45	bbb---------------------

**Buteo buteo* (Butbu), *Circateous gallicus* (CirGa), *Corvus corax* (CorCo), *Pernis apivorus* (PerAp), *Falco peregrinus* (FalPe), *Falco eleonorae* (FalEl), *Falco tinnunculus* (FalTi).

D.3 Calculation of Collision Risk for *Buteo buteo*

Only enter input parameters in blue											
K: [1D or [3D] (0 or 1)	1		Calculation of alpha and p(collision) as a function of radius								
NoBlades	3					Upwind:			Downwind:		
MaxChord	4	m	r/R	c/C	□	collide		contribution	collide		contribution
Pitch (degrees)	30		radius	chord	alpha	length	p(collision)	from radius r	length	p(collision)	from radius r
BirdLength	0,44	m	0,025	0,575	5,90	17,13	0,88	0,00110	14,83	0,76	0,00095
Wingspan	1,13	m	0,075	0,575	1,97	6,48	0,33	0,00250	4,18	0,21	0,00161
F: Flapping (0) or gliding (+1)	1		0,125	0,702	1,18	5,12	0,26	0,00329	2,31	0,12	0,00148
			0,175	0,860	0,84	4,84	0,25	0,00435	1,40	0,07	0,00125
Bird speed	14,6	m/sec	0,225	0,994	0,66	4,72	0,24	0,00545	0,74	0,04	0,00085
RotorDiam	126	m	0,275	0,947	0,54	4,04	0,21	0,00570	0,52	0,03	0,00073
RotationPeriod	4,00	sec	0,325	0,899	0,45	3,54	0,18	0,00590	0,71	0,04	0,00118
			0,375	0,851	0,39	3,14	0,16	0,00606	0,82	0,04	0,00159
			0,425	0,804	0,35	3,01	0,15	0,00658	1,08	0,06	0,00236
			0,475	0,756	0,31	2,76	0,14	0,00675	1,14	0,06	0,00278
Bird aspect ratioo: β	0,39		0,525	0,708	0,28	2,55	0,13	0,00687	1,17	0,06	0,00315
			0,575	0,660	0,26	2,35	0,12	0,00694	1,17	0,06	0,00347
			0,625	0,613	0,24	2,17	0,11	0,00696	1,16	0,06	0,00374
			0,675	0,565	0,22	2,00	0,10	0,00693	1,14	0,06	0,00396
			0,725	0,517	0,20	1,84	0,09	0,00685	1,11	0,06	0,00413
			0,775	0,470	0,19	1,69	0,09	0,00672	1,07	0,05	0,00426
			0,825	0,422	0,18	1,55	0,08	0,00655	1,02	0,05	0,00433
			0,875	0,374	0,17	1,41	0,07	0,00632	0,97	0,05	0,00436
			0,925	0,327	0,16	1,27	0,07	0,00605	0,91	0,05	0,00434
			0,975	0,279	0,15	1,14	0,06	0,00573	0,85	0,04	0,00426
				Overall p(collision) =			Upwind	**11,4%**		Downwind	**5,5%**
								Average	**8,4%**		

Appendix E Visual Impact Images

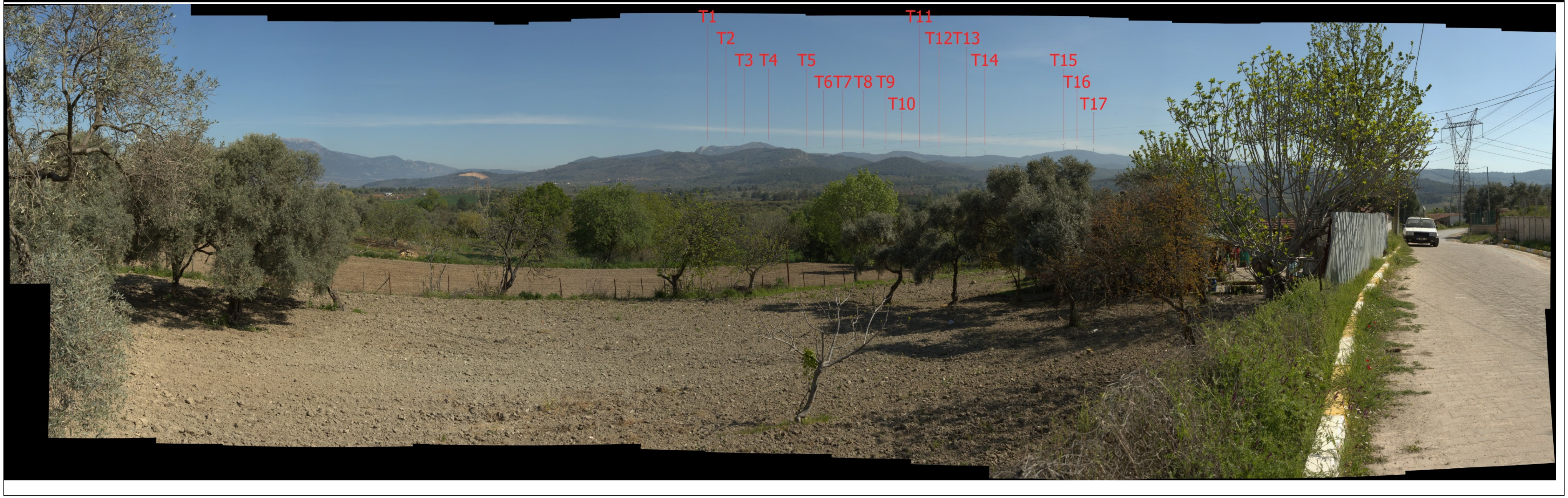
E.1 Photomontages

View Point-1: Latitude=38.290749N, Longutude=27.516964E, View Direction=61.77

View Point-2: Latitude=38.183562N, Longutude=27.353539E, View Direction=72.82

View Point-3: Latitude=38.214743N, Longutude=27.369060E, View Direction=66.54

View Point-4: Latitude=38.210715N, Longutude=27.414991E, View Direction=60.17

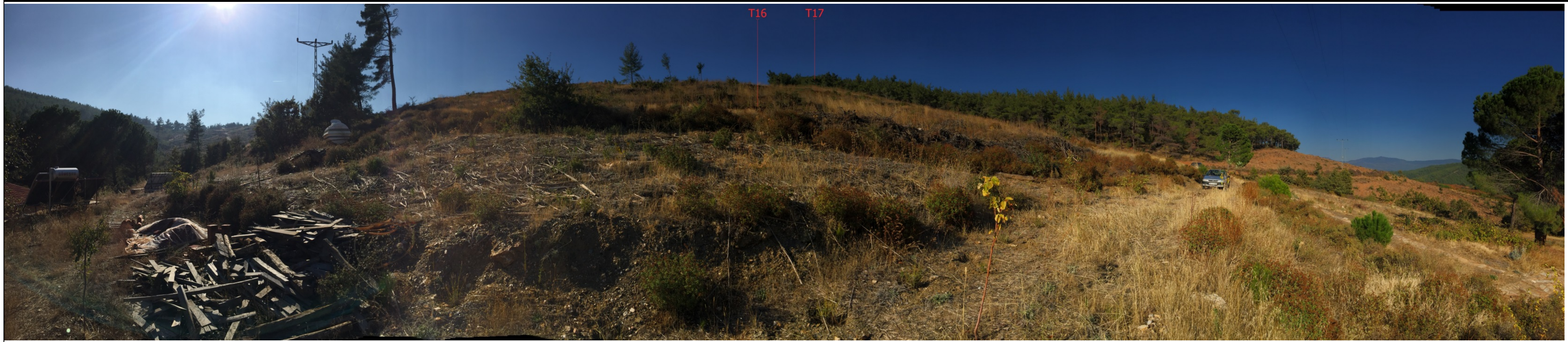


View Point-5: Latitude=38.316393N, Longutude=27.461218E, View Direction=199.90

View Point-6: Latitude=38.245278N, Longutude=27.504167E, View Direction=13.71

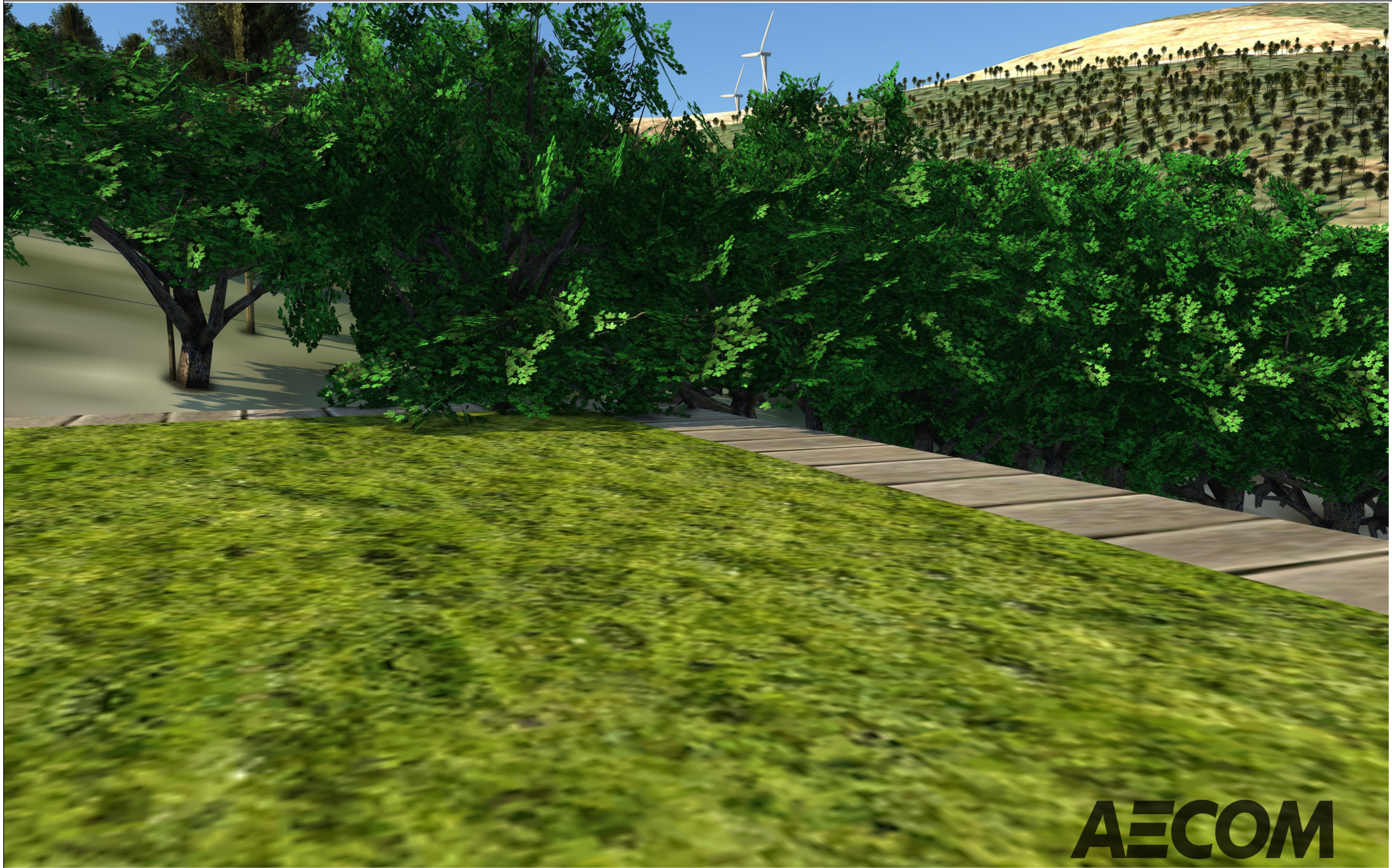
View Point-7: Latitude=38.259128N, Longutude=27.525481E, View Direction=324.02

View Point-8: Latitude=38.257292N, Longutude=27.521756E, View Direction=310.99

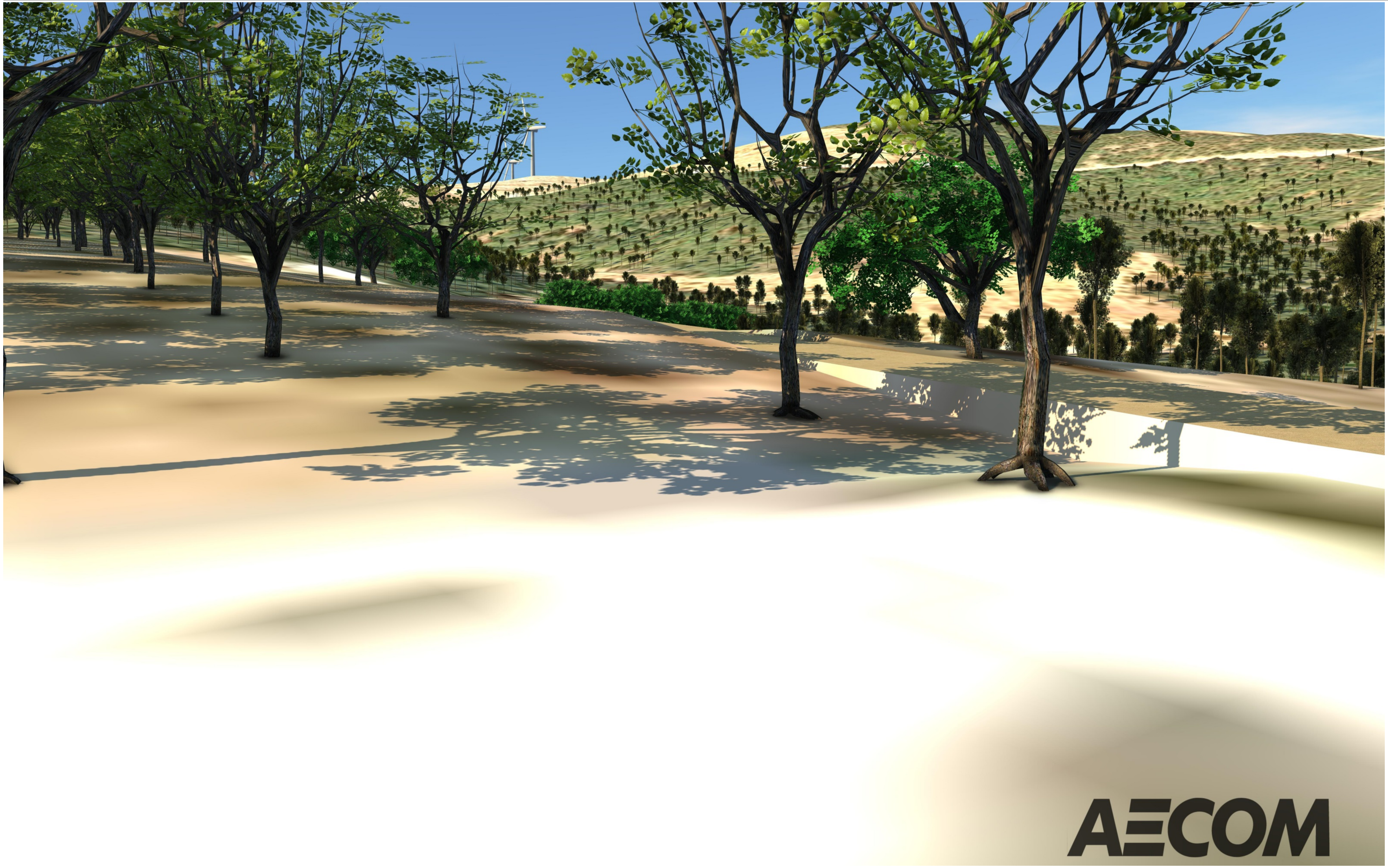


E.2 Visualizations

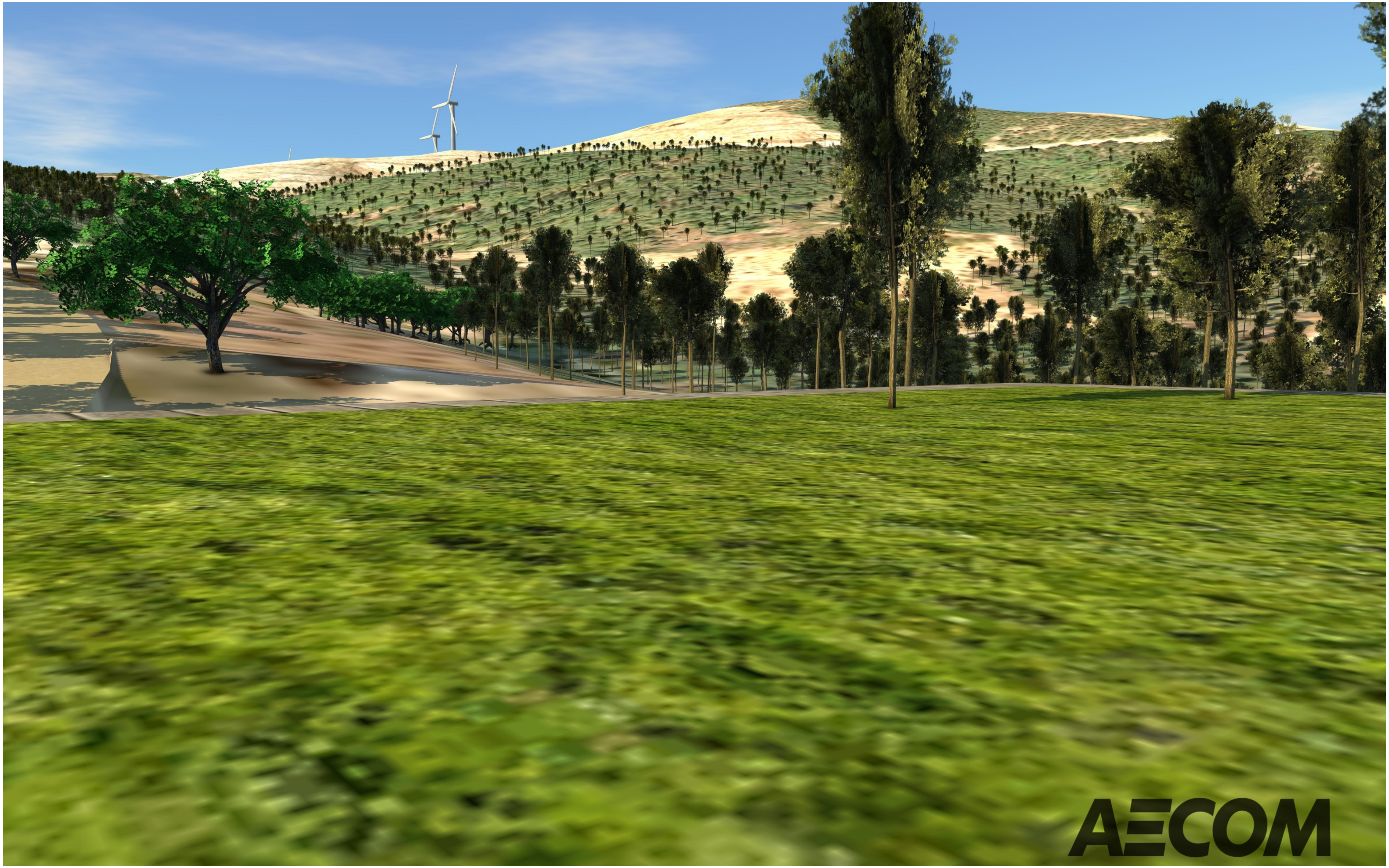
1



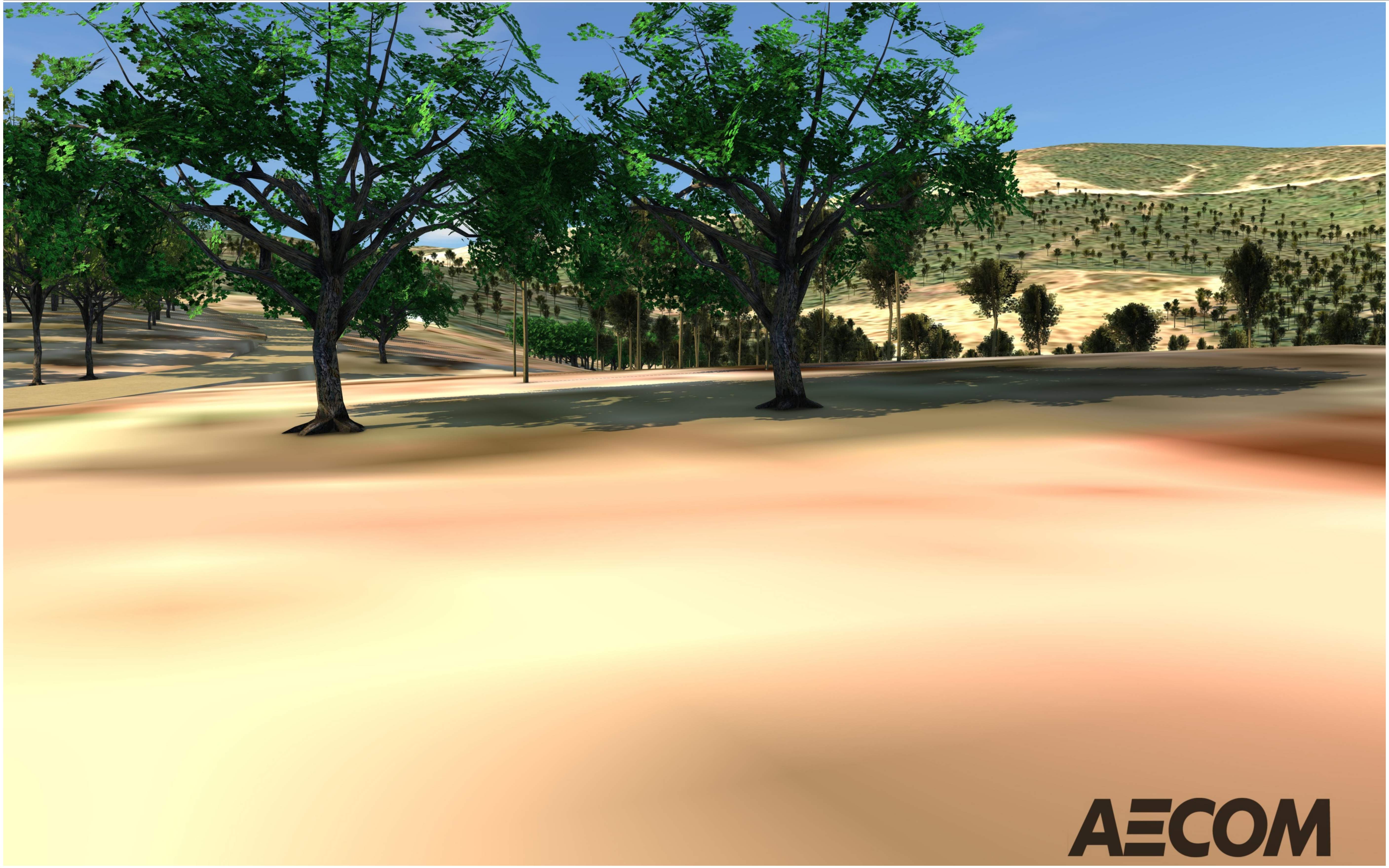
2



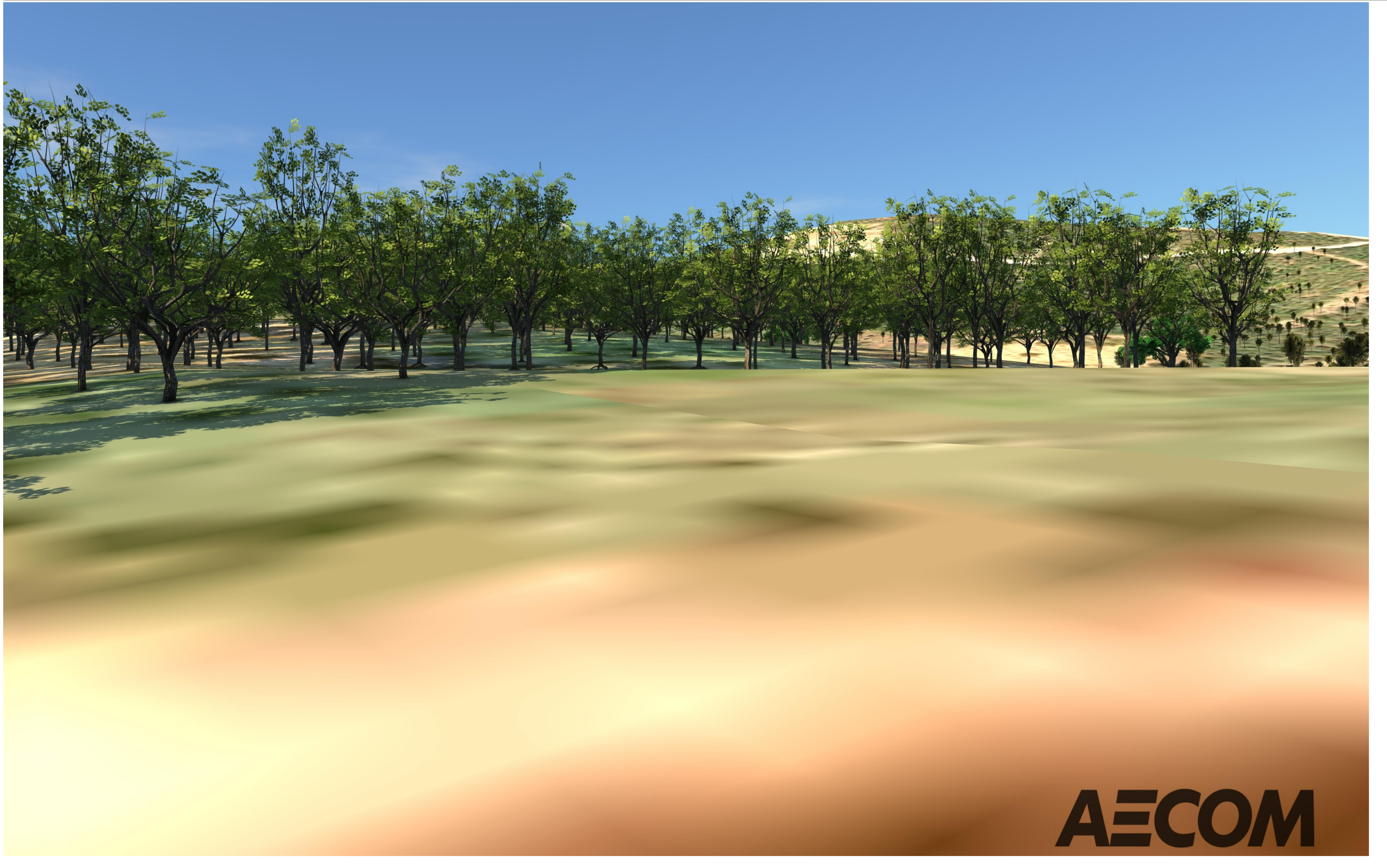
3



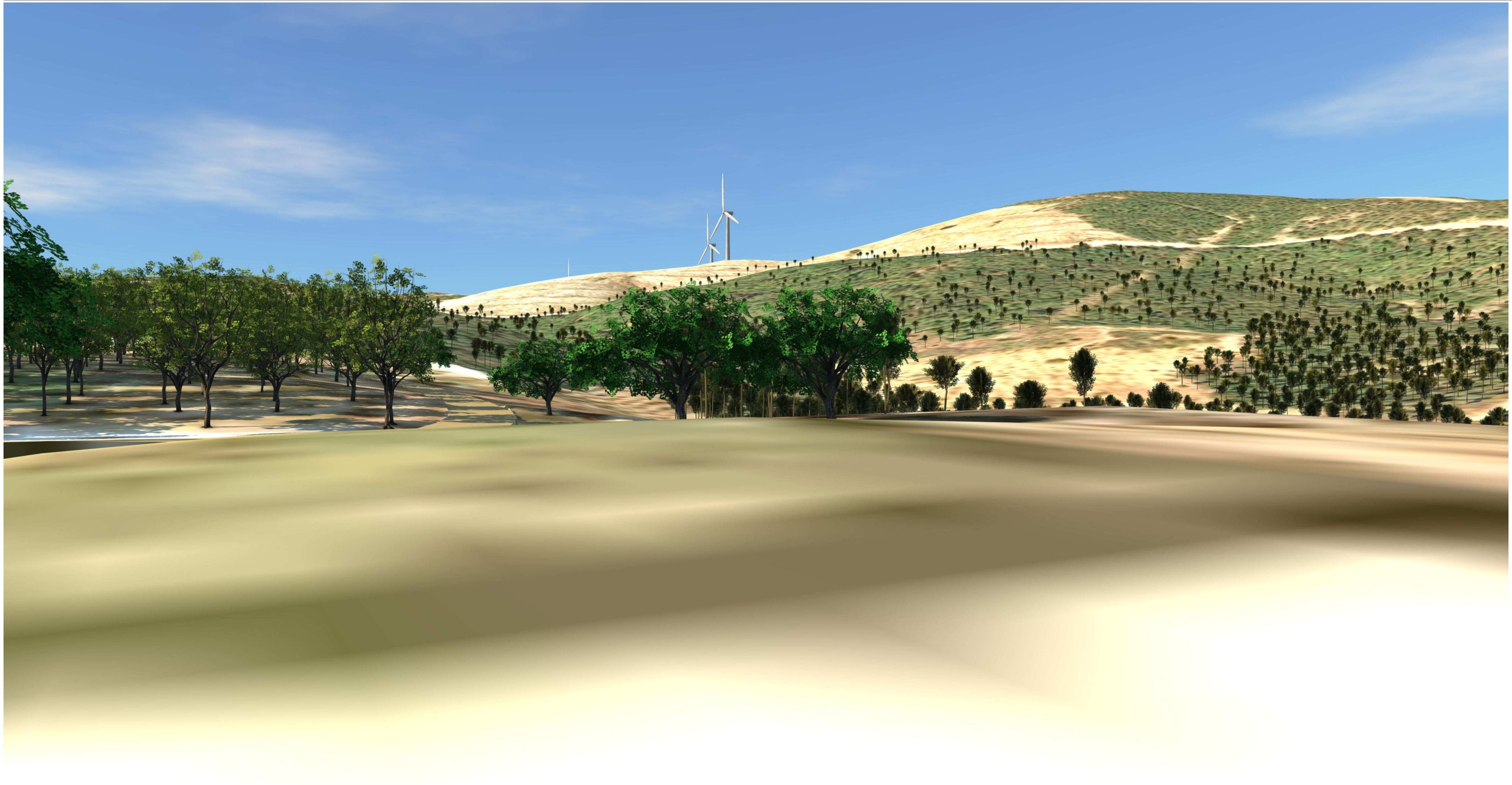
4



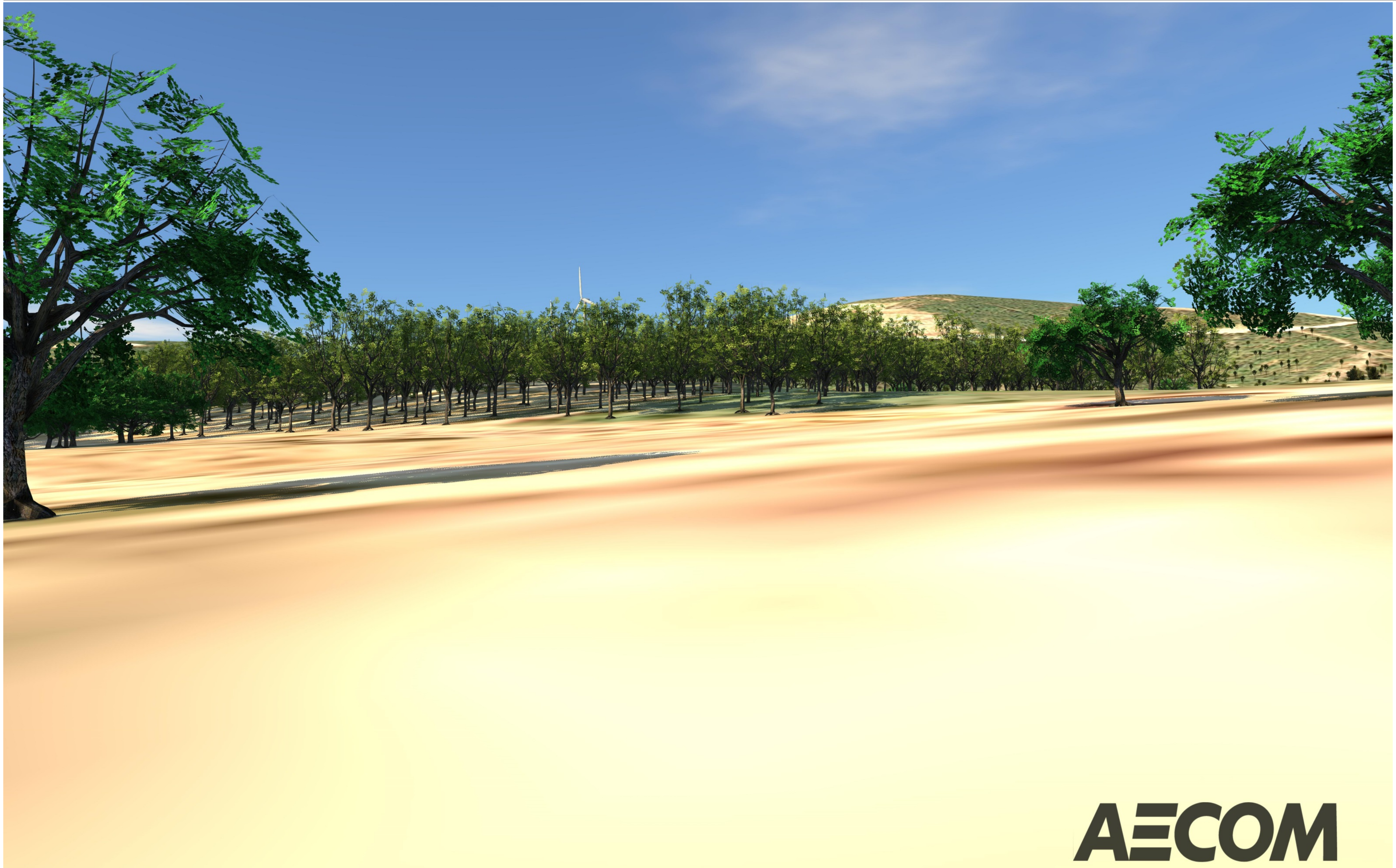
5



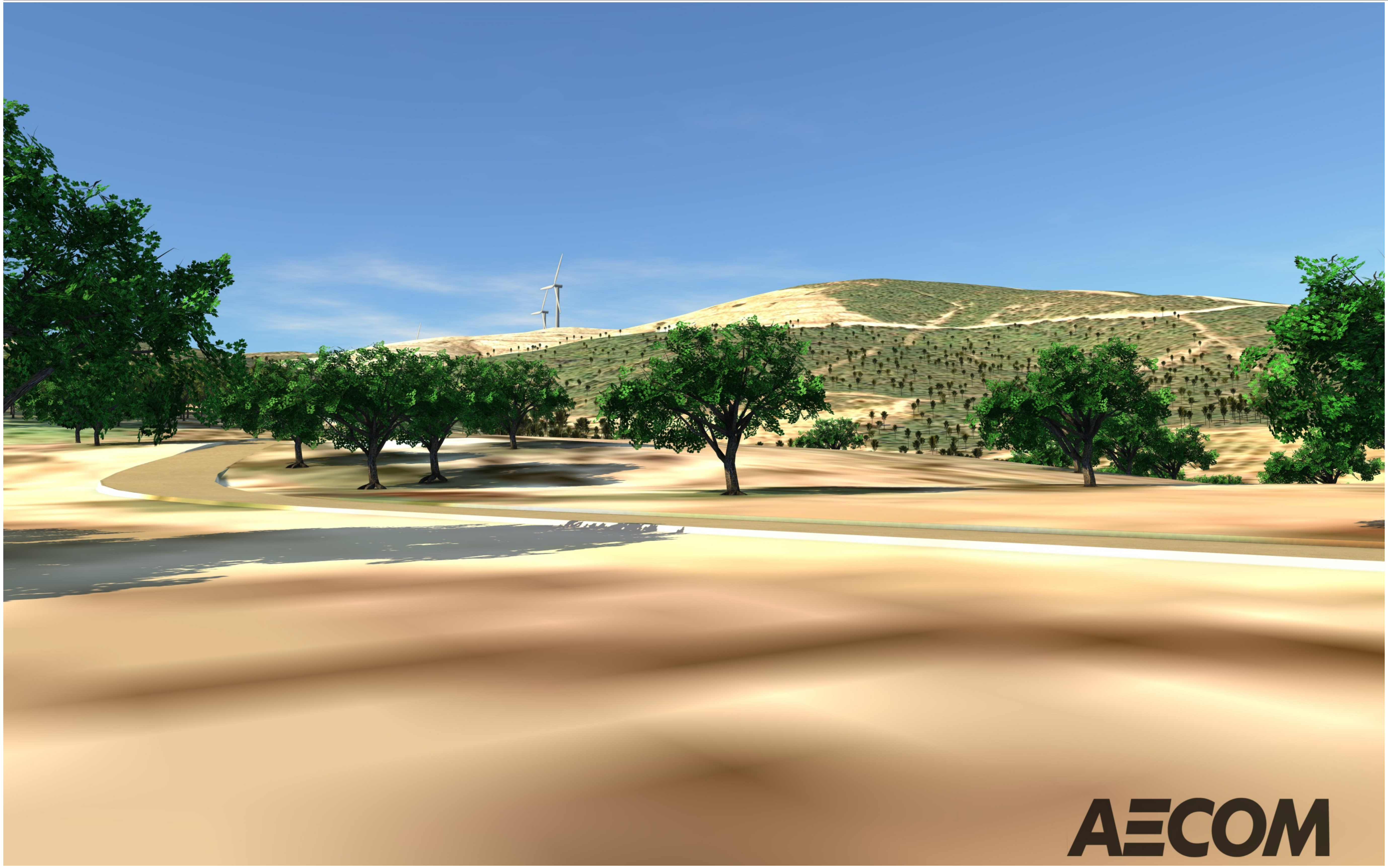
6



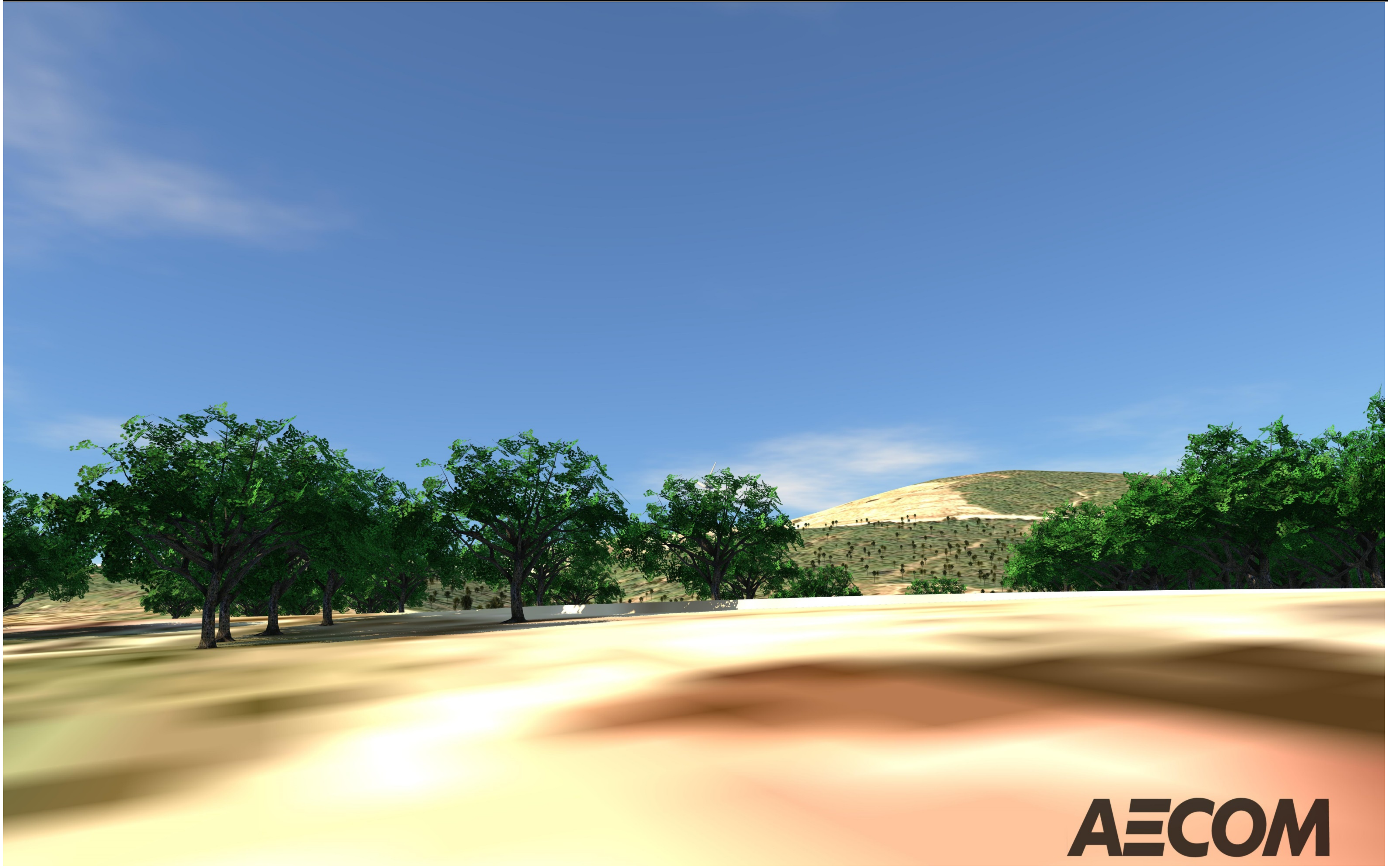
7



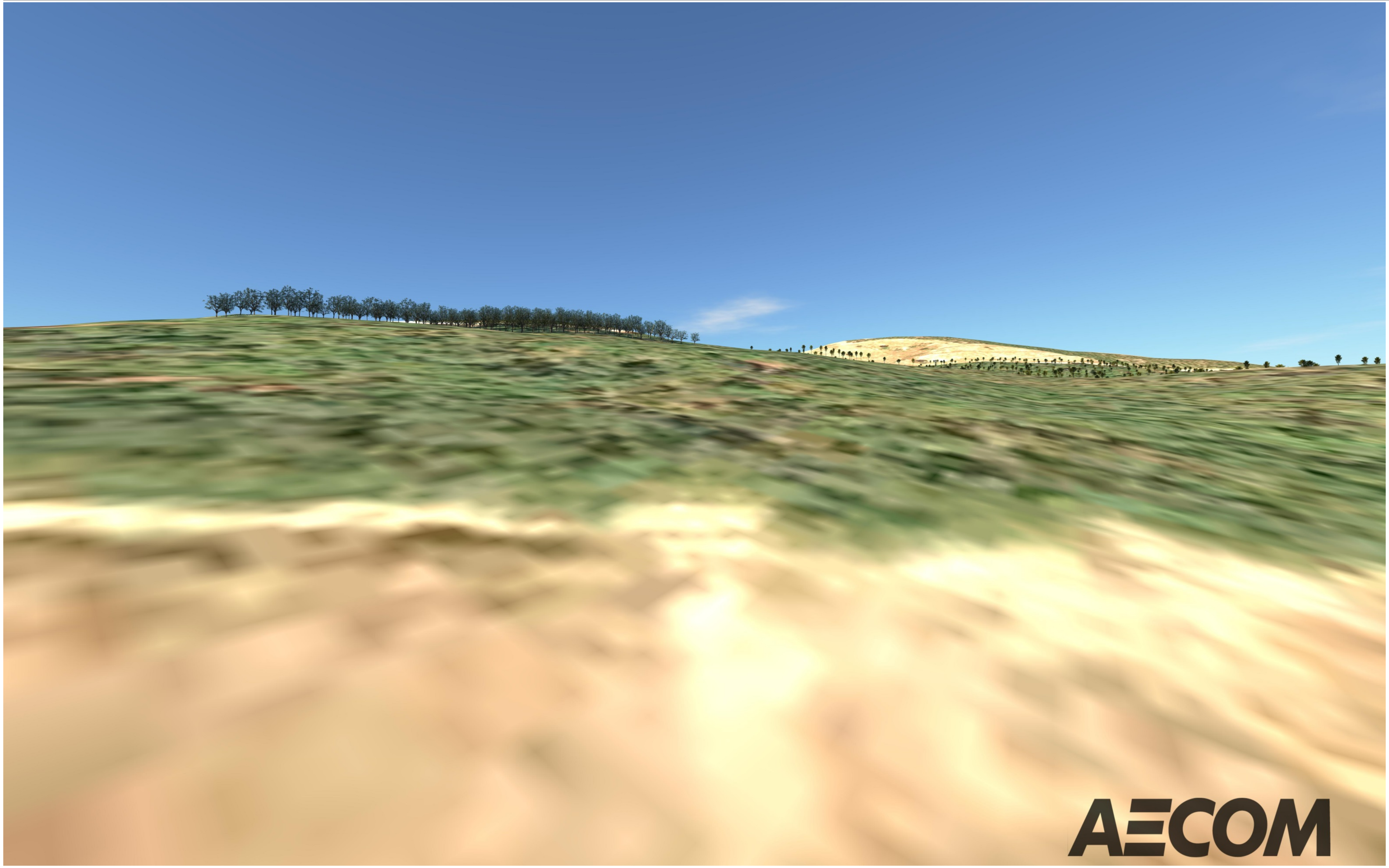
8



9



10



Appendix F Shadow Flicker Model Results

F.1 Worst-Case Shadow Flicker Model Results

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
17/06/2017 04:54/3.1.617

SHADOW - Main Result

Calculation: Cumulative Shadow Flicker (Mersinli WPP and Fuat WPP)

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]
CINARDIBI	0:00	0	0:00
DAGTEKKE	0:00	0	0:00
NSR1	55:56	118	0:38
NSR2	44:39	146	0:26
NSR4	1:13	13	0:07

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]
FUAT_WF_T1	FUAT_WF_T1	0:00
FUAT_WF_T10	FUAT_WF_T10	0:00
FUAT_WF_T2	FUAT_WF_T2	0:00
FUAT_WF_T3	FUAT_WF_T3	0:00
FUAT_WF_T4	FUAT_WF_T4	0:00
FUAT_WF_T5	FUAT_WF_T5	0:00
FUAT_WF_T6	FUAT_WF_T6	0:00
FUAT_WF_T7	FUAT_WF_T7	0:00
FUAT_WF_T8	FUAT_WF_T8	0:00
FUAT_WF_T9	FUAT_WF_T9	0:00
T1	T1	0:00
T10	T10	22:52
T11	T11	40:10
T12	T12	31:05
T13	T13	22:57
T14	T14	0:00
T15	T15	0:00
T16	T16	1:13
T17	T17	0:00
T2	T2	0:00
T3	T3	0:00
T4	T4	0:00
T5	T5	0:00
T6	T6	0:00
T7	T7	0:00
T8	T8	0:00
T9	T9	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.

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
17/06/2017 04:54/3.1.617

AECOM

SHADOW - Main Result

Calculation: Cumulative Shadow Flicker (Mersinli WPP and Fuat WPP)

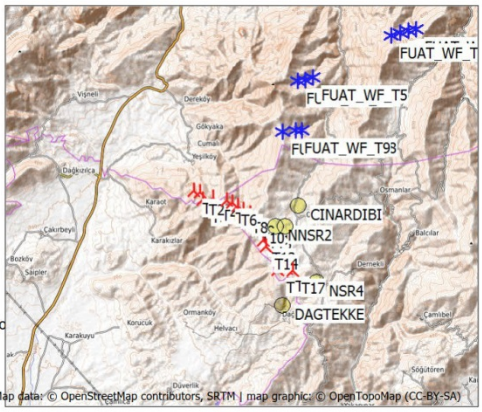
Assumptions for shadow calculations

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 0 °
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: Project Wizard Elevation Data Grid (EU-DEM 1 arc-seco
Obstacles used in calculation
Eye height: 1.5 m
Grid resolution: 20.0 m

All coordinates are in
UTM (north)-WGS84 Zone: 35



Scale 1:250,000
New WTG Existing 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]
FUAT_WF_T1	550,708	4,246,502	1,116.3	FUAT_WF_T1	Yes	VESTAS	V112_Fuat_WF-3,300	3,300	112.0	84.0	1,712	12.8
FUAT_WF_T10	544,485	4,241,659	1,087.0	FUAT_WF_T10	Yes	VESTAS	V112_Fuat_WF-3,300	3,300	112.0	84.0	1,712	12.8
FUAT_WF_T2	550,333	4,246,408	1,130.1	FUAT_WF_T2	Yes	VESTAS	V112_Fuat_WF-3,300	3,300	112.0	84.0	1,712	12.8
FUAT_WF_T3	549,959	4,246,328	1,117.0	FUAT_WF_T3	Yes	VESTAS	V112_Fuat_WF-3,300	3,300	112.0	84.0	1,712	12.8
FUAT_WF_T4	549,554	4,246,189	1,185.3	FUAT_WF_T4	Yes	VESTAS	V112_Fuat_WF-3,300	3,300	112.0	84.0	1,712	12.8
FUAT_WF_T5	545,878	4,244,214	1,024.4	FUAT_WF_T5	Yes	VESTAS	V112_Fuat_WF-3,300	3,300	112.0	84.0	1,712	12.8
FUAT_WF_T6	545,548	4,244,091	1,066.8	FUAT_WF_T6	Yes	VESTAS	V112_Fuat_WF-3,300	3,300	112.0	84.0	1,712	12.8
FUAT_WF_T7	545,193	4,244,044	1,102.9	FUAT_WF_T7	Yes	VESTAS	V112_Fuat_WF-3,300	3,300	112.0	84.0	1,712	12.8
FUAT_WF_T8	545,400	4,241,758	1,007.1	FUAT_WF_T8	Yes	VESTAS	V112_Fuat_WF-3,300	3,300	112.0	84.0	1,712	12.8
FUAT_WF_T9	545,092	4,241,739	1,014.1	FUAT_WF_T9	Yes	VESTAS	V112_Fuat_WF-3,300	3,300	112.0	84.0	1,712	12.8
T1	540,352	4,238,887	869.8	T1	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T10	543,080	4,237,527	832.3	T10	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T11	543,378	4,237,442	791.0	T11	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T12	543,454	4,237,061	767.0	T12	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T13	543,610	4,236,605	758.0	T13	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T14	543,726	4,236,327	775.4	T14	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T15	544,288	4,235,247	851.8	T15	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T16	544,714	4,235,312	850.4	T16	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T17	545,003	4,235,202	829.1	T17	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T2	540,643	4,238,846	894.2	T2	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T3	540,781	4,238,478	936.7	T3	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T4	541,262	4,238,589	889.9	T4	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T5	541,894	4,238,469	796.2	T5	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T6	542,151	4,238,373	785.6	T6	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T7	542,415	4,238,216	755.3	T7	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T8	542,674	4,238,009	780.5	T8	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T9	543,006	4,237,849	861.6	T9	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0

Shadow receptor-Input

No.	Easting	Northing	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
CINARDIBI	545,245	4,238,213	694.7	1.0	1.0	1.0	0.0	90.0	"Green house mode"
DAGTEKKE	544,531	4,233,581	530.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
NSR1	544,185	4,237,249	723.7	1.0	1.0	1.0	0.0	90.0	"Green house mode"
NSR2	544,625	4,237,261	705.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
NSR4	546,125	4,234,682	647.8	1.0	1.0	1.0	0.0	90.0	"Green house mode"

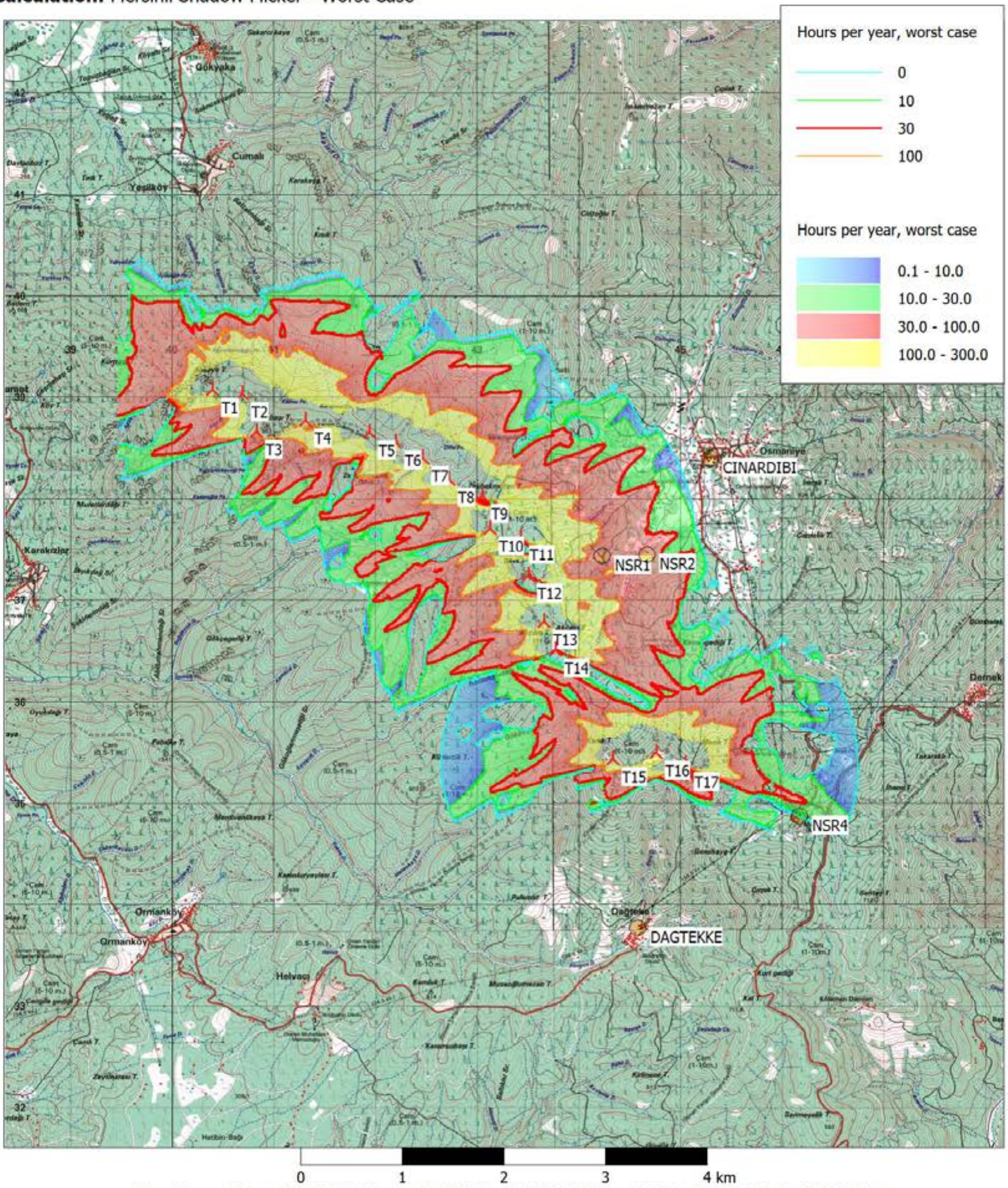
Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

AECOM

SHADOW - Map

Calculation: Mersinli Shadow Flicker - Worst Case



Map: Topo , Print scale 1:55,000, Map center UTM (north)-WGS84 Zone: 35 East: 543,220 North: 4,236,970

New WTG   Shadow receptor

Flicker map level: Project Wizard Elevation Data Grid (EU-DEM 1 arc-second)

Project:
Mersinli WPP

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Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

SHADOW - Calendar per WTG

Calculation: Mersinli Shadow Flicker - Worst Case**WTG:** T9 - T9

Assumptions for shadow calculations

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:27	08:17	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:08
	18:00	18:32	19:03	19:33	20:01	20:28	20:38	20:21	19:42	18:55	18:12	17:51
2	08:28	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:09
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:54	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:48	05:51	06:14	06:41	07:07	07:38	08:09
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39	08:10
	18:03	18:36	19:06	19:36	20:04	20:30	20:38	20:18	19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51	06:10	05:48	05:52	06:15	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:38	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:43	07:10	07:41	08:12
	18:05	18:38	19:08	19:38	20:06	20:31	20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:05	18:39	19:09	19:38	20:07	20:31	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39	20:08	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45	06:06	05:47	05:54	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:08	20:33	20:36	20:13	19:30	18:43	18:04	17:50
10	08:28	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03	17:50
11	08:27	08:07	07:29	06:42	06:04	05:47	05:56	06:21	06:48	07:15	07:46	08:17
	18:09	18:43	19:13	19:42	20:10	20:34	20:36	20:10	19:27	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:47	05:56	06:22	06:49	07:16	07:48	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:35	20:09	19:25	18:38	18:01	17:50
13	08:27	08:05	07:26	06:39	06:02	05:46	05:57	06:22	06:50	07:16	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:34	20:35	20:08	19:23	18:37	18:00	17:51
14	08:27	08:03	07:25	06:38	06:01	05:46	05:58	06:23	06:50	07:17	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:35	20:07	19:22	18:36	18:00	17:51
15	08:27	08:02	07:23	06:36	06:00	05:46	05:58	06:24	06:51	07:18	07:51	08:20
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:06	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	06:00	05:46	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36	20:34	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:34	05:59	05:47	06:00	06:26	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:57	17:52
18	08:25	07:59	07:19	06:32	05:58	05:47	06:01	06:27	06:54	07:21	07:54	08:22
	18:17	18:51	19:20	19:49	20:17	20:36	20:32	20:02	19:16	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:17	20:37	20:32	20:00	19:14	18:29	17:56	17:52
20	08:25	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:56	07:23	07:56	08:23
	18:19	18:53	19:22	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:55	17:53
21	08:24	07:55	07:14	06:28	05:56	05:47	06:03	06:29	06:56	07:24	07:57	08:23
	18:20	18:54	19:23	19:52	20:19	20:37	20:30	19:58	19:11	18:26	17:55	17:53
22	08:24	07:54	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:55	19:23	19:53	20:20	20:37	20:30	19:56	19:09	18:25	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:47	06:04	06:31	06:58	07:26	07:59	08:24
	18:22	18:57	19:24	19:53	20:21	20:38	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:10	06:24	05:53	05:48	06:05	06:32	06:59	07:27	08:00	08:25
	18:23	18:58	19:25	19:54	20:22	20:38	20:28	19:53	19:06	18:22	17:53	17:55
25	08:22	07:50	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:01	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:28	19:52	19:04	18:21	17:53	17:55
26	08:21	07:48	07:06	06:21	05:52	05:48	06:07	06:34	07:01	07:29	08:03	08:26
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:30	08:04	08:26
	18:26	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:45	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:31	08:05	08:26
	18:28	19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49	06:09	06:37	07:04	07:33	08:06	08:27
	18:29		19:30	19:59	20:25	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:04	07:34	08:07	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51	17:59
31	08:17		06:59		05:50		06:11	06:38		07:35		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	443	451	423	374	348	304	296
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

AECOM

SHADOW - Calendar per WTG

Calculation: Mersinli Shadow Flicker - Worst Case**WTG:** T8 - T8

Assumptions for shadow calculations

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:27	08:17	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:08
	18:00	18:32	19:03	19:33	20:01	20:28	20:38	20:21	19:42	18:55	18:12	17:51
2	08:28	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:09
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:54	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:48	05:51	06:14	06:41	07:07	07:38	08:10
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39	08:10
	18:03	18:36	19:06	19:36	20:04	20:30	20:38	20:18	19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51	06:11	05:48	05:52	06:15	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:38	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:43	07:10	07:41	08:12
	18:05	18:38	19:08	19:38	20:06	20:31	20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:05	18:39	19:09	19:39	20:07	20:31	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39	20:08	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45	06:06	05:47	05:55	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:08	20:33	20:37	20:13	19:30	18:43	18:04	17:50
10	08:28	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03	17:50
11	08:28	08:07	07:29	06:42	06:04	05:47	05:56	06:21	06:48	07:15	07:46	08:17
	18:09	18:43	19:13	19:42	20:10	20:34	20:36	20:10	19:27	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:47	05:56	06:22	06:49	07:16	07:48	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:35	20:09	19:25	18:38	18:01	17:50
13	08:27	08:05	07:26	06:39	06:02	05:46	05:57	06:22	06:50	07:16	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:35	20:35	20:08	19:23	18:37	18:00	17:51
14	08:27	08:03	07:25	06:38	06:01	05:46	05:58	06:23	06:50	07:17	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:35	20:07	19:22	18:36	18:00	17:51
15	08:27	08:02	07:23	06:36	06:00	05:46	05:58	06:24	06:51	07:18	07:51	08:20
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:06	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	06:00	05:46	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36	20:34	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:34	05:59	05:47	06:00	06:26	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:57	17:52
18	08:25	07:59	07:19	06:32	05:58	05:47	06:01	06:27	06:54	07:21	07:54	08:22
	18:17	18:51	19:20	19:49	20:17	20:36	20:32	20:02	19:16	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:17	20:37	20:32	20:00	19:14	18:29	17:56	17:52
20	08:25	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:56	07:23	07:56	08:23
	18:19	18:53	19:22	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:55	17:53
21	08:24	07:55	07:14	06:28	05:56	05:47	06:03	06:30	06:56	07:24	07:57	08:23
	18:20	18:54	19:23	19:52	20:19	20:37	20:30	19:58	19:11	18:26	17:55	17:53
22	08:24	07:54	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:55	19:23	19:53	20:20	20:37	20:30	19:56	19:09	18:25	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:47	06:04	06:31	06:58	07:26	07:59	08:24
	18:22	18:57	19:24	19:53	20:21	20:38	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:10	06:24	05:53	05:48	06:05	06:32	06:59	07:27	08:00	08:25
	18:23	18:58	19:25	19:54	20:22	20:38	20:28	19:53	19:06	18:22	17:53	17:55
25	08:22	07:50	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:02	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:28	19:52	19:04	18:21	17:53	17:55
26	08:21	07:48	07:06	06:21	05:52	05:48	06:07	06:34	07:01	07:29	08:03	08:26
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:30	08:04	08:26
	18:26	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:45	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:31	08:05	08:26
	18:28	19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49	06:09	06:37	07:04	07:33	08:06	08:27
	18:29		19:30	19:59	20:25	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:04	07:34	08:07	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51	17:59
31	08:17		06:59		05:50		06:11	06:38		07:35		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	444	451	423	374	348	304	296
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

AECOM

SHADOW - Calendar per WTG

Calculation: Mersinli Shadow Flicker - Worst Case**WTG:** T7 - T7

Assumptions for shadow calculations

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:27	08:17	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:08
	18:00	18:32	19:03	19:33	20:01	20:28	20:38	20:21	19:42	18:55	18:12	17:51
2	08:28	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:09
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:54	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:48	05:51	06:14	06:41	07:07	07:38	08:10
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39	08:10
	18:03	18:36	19:06	19:36	20:04	20:30	20:38	20:18	19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51	06:11	05:48	05:52	06:15	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:38	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:43	07:10	07:41	08:12
	18:05	18:38	19:08	19:38	20:06	20:31	20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:05	18:39	19:09	19:39	20:07	20:31	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39	20:08	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45	06:06	05:47	05:55	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:09	20:33	20:37	20:13	19:30	18:43	18:04	17:50
10	08:28	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03	17:50
11	08:28	08:07	07:29	06:42	06:04	05:47	05:56	06:21	06:48	07:15	07:46	08:17
	18:09	18:43	19:13	19:42	20:10	20:34	20:36	20:11	19:27	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:47	05:56	06:22	06:49	07:16	07:48	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:35	20:09	19:25	18:38	18:01	17:50
13	08:27	08:05	07:26	06:39	06:02	05:47	05:57	06:22	06:50	07:17	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:35	20:35	20:08	19:23	18:37	18:00	17:51
14	08:27	08:03	07:25	06:38	06:01	05:46	05:58	06:23	06:50	07:17	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:35	20:07	19:22	18:36	18:00	17:51
15	08:27	08:02	07:23	06:36	06:00	05:46	05:58	06:24	06:51	07:18	07:51	08:20
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:06	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	06:00	05:46	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36	20:34	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:34	05:59	05:47	06:00	06:26	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:57	17:52
18	08:25	07:59	07:19	06:32	05:58	05:47	06:01	06:27	06:54	07:21	07:54	08:22
	18:17	18:51	19:20	19:49	20:17	20:36	20:32	20:02	19:16	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:17	20:37	20:32	20:00	19:14	18:29	17:56	17:52
20	08:25	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:56	07:23	07:56	08:23
	18:19	18:53	19:22	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:55	17:53
21	08:24	07:55	07:14	06:28	05:56	05:47	06:03	06:30	06:56	07:24	07:57	08:23
	18:20	18:54	19:23	19:52	20:19	20:37	20:30	19:58	19:11	18:26	17:55	17:53
22	08:24	07:54	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:55	19:23	19:53	20:20	20:37	20:30	19:56	19:09	18:25	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:47	06:04	06:31	06:58	07:26	07:59	08:24
	18:22	18:57	19:24	19:54	20:21	20:38	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:10	06:24	05:53	05:48	06:05	06:32	06:59	07:27	08:00	08:25
	18:23	18:58	19:25	19:54	20:22	20:38	20:28	19:54	19:06	18:22	17:53	17:55
25	08:22	07:50	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:02	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:28	19:52	19:04	18:21	17:53	17:55
26	08:21	07:48	07:06	06:21	05:52	05:48	06:07	06:34	07:01	07:29	08:03	08:26
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:30	08:04	08:26
	18:26	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:45	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:32	08:05	08:26
	18:28	19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49	06:09	06:37	07:04	07:33	08:06	08:27
	18:29		19:30	19:59	20:25	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:04	07:34	08:07	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51	17:59
31	08:17		06:59		05:50		06:11	06:38		07:35		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	444	451	423	374	348	304	296
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

AECOM

SHADOW - Calendar per WTG

Calculation: Mersinli Shadow Flicker - Worst Case**WTG:** T6 - T6

Assumptions for shadow calculations

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:27	08:17	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:08
	18:00	18:32	19:03	19:33	20:01	20:28	20:38	20:21	19:42	18:55	18:12	17:51
2	08:28	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:09
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:54	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:48	05:51	06:14	06:41	07:07	07:38	08:10
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39	08:10
	18:03	18:36	19:06	19:36	20:04	20:30	20:38	20:18	19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51	06:11	05:48	05:52	06:15	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:38	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:44	07:10	07:41	08:12
	18:05	18:38	19:08	19:38	20:06	20:31	20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:06	18:39	19:09	19:39	20:07	20:31	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39	20:08	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45	06:06	05:47	05:55	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:09	20:33	20:37	20:13	19:30	18:43	18:04	17:50
10	08:28	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03	17:50
11	08:28	08:07	07:30	06:42	06:04	05:47	05:56	06:21	06:48	07:15	07:47	08:17
	18:09	18:43	19:13	19:42	20:10	20:34	20:36	20:11	19:27	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:47	05:56	06:22	06:49	07:16	07:48	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:35	20:09	19:25	18:38	18:01	17:50
13	08:27	08:05	07:26	06:39	06:02	05:47	05:57	06:22	06:50	07:17	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:35	20:35	20:08	19:23	18:37	18:00	17:51
14	08:27	08:03	07:25	06:38	06:01	05:46	05:58	06:23	06:50	07:17	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:35	20:07	19:22	18:36	18:00	17:51
15	08:27	08:02	07:23	06:36	06:00	05:46	05:58	06:24	06:51	07:18	07:51	08:20
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:06	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	06:00	05:47	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36	20:34	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:34	05:59	05:47	06:00	06:26	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:57	17:52
18	08:25	07:59	07:19	06:32	05:58	05:47	06:01	06:27	06:54	07:21	07:54	08:22
	18:17	18:51	19:20	19:49	20:17	20:36	20:32	20:02	19:16	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:17	20:37	20:32	20:00	19:14	18:29	17:56	17:52
20	08:25	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:56	07:23	07:56	08:23
	18:19	18:53	19:22	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:55	17:53
21	08:24	07:55	07:14	06:28	05:56	05:47	06:03	06:30	06:56	07:24	07:57	08:23
	18:20	18:54	19:23	19:52	20:19	20:37	20:31	19:58	19:11	18:26	17:55	17:53
22	08:24	07:54	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:55	19:24	19:53	20:20	20:37	20:30	19:56	19:09	18:25	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:48	06:04	06:31	06:58	07:26	07:59	08:24
	18:22	18:57	19:24	19:54	20:21	20:38	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:10	06:24	05:53	05:48	06:05	06:32	06:59	07:27	08:00	08:25
	18:23	18:58	19:25	19:54	20:22	20:38	20:28	19:54	19:06	18:22	17:53	17:55
25	08:22	07:50	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:02	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:28	19:52	19:04	18:21	17:53	17:55
26	08:21	07:48	07:07	06:21	05:52	05:48	06:07	06:34	07:01	07:29	08:03	08:26
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:30	08:04	08:26
	18:26	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:45	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:32	08:05	08:26
	18:28	19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49	06:09	06:37	07:04	07:33	08:06	08:27
	18:29		19:30	19:59	20:25	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:04	07:34	08:07	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51	17:59
31	08:17		06:59		05:50		06:11	06:38		07:35		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	444	451	423	374	348	304	296
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

AECOM

SHADOW - Calendar per WTG

Calculation: Mersinli Shadow Flicker - Worst Case**WTG:** T5 - T5

Assumptions for shadow calculations

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

	January	February	March	April	May	June	July	August	Septembe	October	Novembe	December
1	08:27	08:17	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:08
	18:00	18:32	19:03	19:33	20:01	20:28	20:38	20:21	19:42	18:55	18:12	17:51
2	08:28	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:09
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:54	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:49	05:51	06:14	06:41	07:07	07:38	08:10
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39	08:10
	18:03	18:36	19:06	19:36	20:04	20:30	20:38	20:18	19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51	06:11	05:48	05:52	06:15	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:38	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:44	07:10	07:41	08:12
	18:05	18:38	19:08	19:38	20:06	20:31	20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:06	18:39	19:09	19:39	20:07	20:31	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39	20:08	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45	06:06	05:47	05:55	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:09	20:33	20:37	20:13	19:30	18:43	18:04	17:50
10	08:28	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03	17:50
11	08:28	08:07	07:30	06:42	06:04	05:47	05:56	06:21	06:48	07:15	07:47	08:17
	18:09	18:43	19:13	19:42	20:10	20:34	20:36	20:11	19:27	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:47	05:56	06:22	06:49	07:16	07:48	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:35	20:09	19:25	18:39	18:01	17:50
13	08:27	08:05	07:26	06:39	06:02	05:47	05:57	06:22	06:50	07:17	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:35	20:35	20:08	19:23	18:37	18:00	17:51
14	08:27	08:03	07:25	06:38	06:01	05:46	05:58	06:23	06:50	07:17	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:35	20:07	19:22	18:36	18:00	17:51
15	08:27	08:02	07:23	06:36	06:00	05:46	05:58	06:24	06:51	07:18	07:51	08:20
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:06	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	06:00	05:47	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36	20:34	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:34	05:59	05:47	06:00	06:26	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:57	17:52
18	08:26	07:59	07:19	06:32	05:58	05:47	06:01	06:27	06:54	07:21	07:54	08:22
	18:17	18:51	19:20	19:49	20:17	20:36	20:32	20:02	19:16	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:17	20:37	20:32	20:00	19:14	18:29	17:56	17:52
20	08:25	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:56	07:23	07:56	08:23
	18:19	18:53	19:22	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:55	17:53
21	08:24	07:55	07:14	06:28	05:56	05:47	06:03	06:30	06:57	07:24	07:57	08:23
	18:20	18:54	19:23	19:52	20:19	20:37	20:31	19:58	19:11	18:26	17:55	17:53
22	08:24	07:54	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:56	19:24	19:53	20:20	20:37	20:30	19:56	19:09	18:25	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:48	06:04	06:31	06:58	07:26	07:59	08:24
	18:22	18:57	19:24	19:54	20:21	20:38	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:10	06:24	05:54	05:48	06:05	06:32	06:59	07:27	08:01	08:25
	18:23	18:58	19:25	19:54	20:22	20:38	20:28	19:54	19:06	18:22	17:53	17:55
25	08:22	07:50	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:02	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:28	19:52	19:05	18:21	17:53	17:55
26	08:21	07:48	07:07	06:21	05:52	05:48	06:07	06:34	07:01	07:29	08:03	08:26
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:30	08:04	08:26
	18:26	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:45	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:32	08:05	08:26
	18:28	19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49	06:09	06:37	07:04	07:33	08:06	08:27
	18:29		19:30	19:59	20:25	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:04	07:34	08:07	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51	17:59
31	08:17		06:59		05:50		06:11	06:38		07:35		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	444	451	423	374	348	304	296
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

SHADOW - Calendar per WTG

Calculation: Mersinli Shadow Flicker - Worst Case**WTG:** T4 - T4

Assumptions for shadow calculations

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:28	08:17	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:08
	18:00	18:32	19:03	19:33	20:01	20:28	20:38	20:21	19:42	18:55	18:12	17:51
2	08:28	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:09
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:54	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:49	05:51	06:14	06:41	07:07	07:38	08:10
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39	08:11
	18:03	18:36	19:06	19:36	20:04	20:30	20:38	20:18	19:37	18:51	18:09	17:50
5	08:28	08:13	07:38	06:51	06:11	05:48	05:52	06:15	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:38	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:44	07:10	07:41	08:12
	18:05	18:38	19:08	19:38	20:06	20:31	20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:06	18:39	19:09	19:39	20:07	20:32	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:40	20:08	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:33	06:45	06:06	05:47	05:55	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:09	20:33	20:37	20:13	19:30	18:43	18:04	17:50
10	08:28	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03	17:50
11	08:28	08:07	07:30	06:42	06:04	05:47	05:56	06:21	06:48	07:15	07:47	08:17
	18:09	18:44	19:13	19:42	20:10	20:34	20:36	20:11	19:27	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:47	05:56	06:22	06:49	07:16	07:48	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:35	20:09	19:25	18:39	18:01	17:50
13	08:27	08:05	07:27	06:39	06:02	05:47	05:57	06:23	06:50	07:17	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:35	20:35	20:08	19:23	18:37	18:01	17:51
14	08:27	08:04	07:25	06:38	06:01	05:47	05:58	06:23	06:50	07:18	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:35	20:07	19:22	18:36	18:00	17:51
15	08:27	08:02	07:23	06:36	06:00	05:47	05:59	06:24	06:51	07:18	07:51	08:20
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:06	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	06:00	05:47	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36	20:34	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:34	05:59	05:47	06:00	06:26	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:57	17:52
18	08:26	07:59	07:19	06:32	05:58	05:47	06:01	06:27	06:54	07:21	07:54	08:22
	18:17	18:51	19:20	19:49	20:17	20:36	20:32	20:02	19:16	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:17	20:37	20:32	20:00	19:14	18:29	17:56	17:52
20	08:25	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:56	07:23	07:56	08:23
	18:19	18:53	19:22	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:56	17:53
21	08:24	07:55	07:14	06:28	05:56	05:47	06:03	06:30	06:57	07:24	07:57	08:23
	18:20	18:54	19:23	19:52	20:19	20:37	20:31	19:58	19:11	18:26	17:55	17:53
22	08:24	07:54	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:56	19:24	19:53	20:20	20:38	20:30	19:56	19:09	18:25	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:48	06:05	06:31	06:58	07:26	07:59	08:24
	18:22	18:57	19:24	19:54	20:21	20:38	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:10	06:24	05:54	05:48	06:05	06:32	06:59	07:27	08:01	08:25
	18:23	18:58	19:25	19:55	20:22	20:38	20:28	19:54	19:06	18:22	17:53	17:55
25	08:22	07:50	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:02	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:28	19:52	19:05	18:21	17:53	17:55
26	08:21	07:48	07:07	06:21	05:52	05:48	06:07	06:34	07:01	07:29	08:03	08:26
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:31	08:04	08:26
	18:27	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:45	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:32	08:05	08:26
	18:28	19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49	06:09	06:37	07:04	07:33	08:06	08:27
	18:29		19:30	19:59	20:26	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:05	07:34	08:07	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51	17:59
31	08:17		06:59		05:50		06:11	06:38		07:35		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	444	451	423	374	348	304	296
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

AECOM

SHADOW - Calendar per WTG

Calculation: Mersinli Shadow Flicker - Worst Case**WTG:** T3 - T3

Assumptions for shadow calculations

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:28	08:17	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:08
	18:00	18:32	19:03	19:33	20:01	20:28	20:38	20:21	19:42	18:55	18:12	17:51
2	08:28	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:09
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:54	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:49	05:51	06:14	06:41	07:07	07:38	08:10
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39	08:11
	18:03	18:36	19:06	19:36	20:04	20:30	20:38	20:18	19:37	18:51	18:09	17:50
5	08:28	08:13	07:38	06:51	06:11	05:48	05:52	06:16	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:38	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:44	07:10	07:41	08:12
	18:05	18:38	19:08	19:38	20:06	20:31	20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:06	18:39	19:09	19:39	20:07	20:32	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:40	20:08	20:32	20:37	20:14	19:31	18:44	18:05	17:50
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	18:07	18:41	19:11	19:40	20:09	20:33	20:37	20:13	19:30	18:43	18:04	17:50
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	18:08	18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03	17:50
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	18:09	18:44	19:13	19:42	20:10	20:34	20:36	20:11	19:27	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:47	05:56	06:22	06:49	07:16	07:48	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:36	20:09	19:25	18:39	18:01	17:50
13	08:27	08:05	07:27	06:39	06:02	05:47	05:57	06:23	06:50	07:17	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:35	20:35	20:08	19:23	18:37	18:01	17:51
14	08:27	08:04	07:25	06:38	06:01	05:47	05:58	06:23	06:50	07:18	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:35	20:07	19:22	18:36	18:00	17:51
15	08:27	08:02	07:24	06:36	06:01	05:47	05:59	06:24	06:51	07:19	07:51	08:20
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:06	19:20	18:34	17:59	17:51
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17	08:26	08:00	07:20	06:34	05:59	05:47	06:00	06:26	06:53	07:20	07:53	08:21
	18:16	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:58	17:52
18	08:26	07:59	07:19	06:32	05:58	05:47	06:01	06:27	06:54	07:21	07:54	08:22
	18:17	18:51	19:20	19:49	20:17	20:36	20:32	20:02	19:16	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:18	20:37	20:32	20:00	19:14	18:29	17:56	17:52
20	08:25	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:56	07:23	07:56	08:23
	18:19	18:53	19:22	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:56	17:53
21	08:24	07:55	07:14	06:28	05:56	05:47	06:03	06:30	06:57	07:24	07:57	08:23
	18:20	18:54	19:23	19:52	20:19	20:37	20:31	19:58	19:11	18:26	17:55	17:53
22	08:24	07:54	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:56	19:24	19:53	20:20	20:38	20:30	19:56	19:09	18:25	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:48	06:05	06:31	06:58	07:26	08:00	08:24
	18:22	18:57	19:25	19:54	20:21	20:38	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:10	06:24	05:54	05:48	06:05	06:32	06:59	07:27	08:01	08:25
	18:23	18:58	19:25	19:55	20:22	20:38	20:28	19:54	19:06	18:22	17:53	17:55
25	08:22	07:50	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:02	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:28	19:52	19:05	18:21	17:53	17:55
26	08:21	07:48	07:07	06:21	05:52	05:48	06:07	06:34	07:01	07:30	08:03	08:26
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:21	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:31	08:04	08:26
	18:27	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:46	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:32	08:05	08:26
	18:28	19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49	06:09	06:37	07:04	07:33	08:06	08:27
	18:29		19:30	19:59	20:26	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:05	07:34	08:07	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51	17:59
31	08:17		06:59		05:50		06:11	06:38		07:35		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	444	451	423	374	348	304	296
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

AECOM

SHADOW - Calendar per WTG

Calculation: Mersinli Shadow Flicker - Worst Case**WTG:** T2 - T2

Assumptions for shadow calculations

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:28	08:17	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:08
	18:00	18:32	19:03	19:33	20:01	20:28	20:38	20:21	19:42	18:55	18:12	17:51
2	08:28	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:09
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:54	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:49	05:51	06:14	06:41	07:07	07:38	08:10
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39	08:11
	18:03	18:36	19:06	19:36	20:04	20:30	20:38	20:18	19:37	18:51	18:09	17:50
5	08:28	08:13	07:38	06:51	06:11	05:48	05:52	06:16	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:38	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:44	07:10	07:41	08:12
	18:05	18:38	19:08	19:38	20:06	20:31	20:37	20:16	19:34	18:48	18:07	17:50
7	08:28	08:11	07:36	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:06	18:39	19:09	19:39	20:07	20:32	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:40	20:08	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:33	06:45	06:06	05:47	05:55	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:09	20:33	20:37	20:13	19:30	18:43	18:04	17:50
10	08:28	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41	20:10	20:33	20:36	20:12	19:28	18:41	18:03	17:50
11	08:28	08:07	07:30	06:42	06:04	05:47	05:56	06:21	06:48	07:15	07:47	08:17
	18:09	18:44	19:13	19:42	20:10	20:34	20:36	20:11	19:27	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:47	05:56	06:22	06:49	07:16	07:48	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:36	20:09	19:25	18:39	18:01	17:50
13	08:27	08:05	07:27	06:39	06:02	05:47	05:57	06:23	06:50	07:17	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:35	20:35	20:08	19:24	18:37	18:01	17:51
14	08:27	08:04	07:25	06:38	06:01	05:47	05:58	06:23	06:50	07:18	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:35	20:07	19:22	18:36	18:00	17:51
15	08:27	08:02	07:24	06:36	06:01	05:47	05:59	06:24	06:51	07:19	07:51	08:20
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:06	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	06:00	05:47	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36	20:34	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:34	05:59	05:47	06:00	06:26	06:53	07:20	07:53	08:21
	18:16	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:57	17:52
18	08:26	07:59	07:19	06:32	05:58	05:47	06:01	06:27	06:54	07:21	07:54	08:22
	18:17	18:51	19:20	19:49	20:17	20:37	20:33	20:02	19:16	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:18	20:37	20:32	20:00	19:14	18:29	17:56	17:52
20	08:25	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:56	07:23	07:56	08:23
	18:19	18:53	19:22	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:56	17:53
21	08:24	07:55	07:14	06:28	05:56	05:47	06:03	06:30	06:57	07:24	07:57	08:23
	18:20	18:54	19:23	19:52	20:19	20:37	20:31	19:58	19:11	18:26	17:55	17:53
22	08:24	07:54	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:56	19:24	19:53	20:20	20:38	20:30	19:56	19:09	18:25	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:48	06:05	06:31	06:58	07:26	08:00	08:24
	18:22	18:57	19:25	19:54	20:21	20:38	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:10	06:24	05:54	05:48	06:05	06:32	06:59	07:27	08:01	08:25
	18:23	18:58	19:25	19:55	20:22	20:38	20:28	19:54	19:06	18:22	17:53	17:55
25	08:22	07:50	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:02	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:28	19:52	19:05	18:21	17:53	17:55
26	08:21	07:48	07:07	06:21	05:52	05:48	06:07	06:34	07:01	07:30	08:03	08:26
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:21	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:31	08:04	08:26
	18:27	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:46	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:32	08:05	08:26
	18:28	19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49	06:09	06:37	07:04	07:33	08:06	08:27
	18:29		19:30	19:59	20:26	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:05	07:34	08:07	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51	17:59
31	08:17		06:59		05:50		06:11	06:38		07:35		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	444	451	423	374	348	304	296
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

AECOM

SHADOW - Calendar per WTG

Calculation: Mersinli Shadow Flicker - Worst Case**WTG:** T17 - T17

Assumptions for shadow calculations

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:27	08:16	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:07
	18:00	18:32	19:03	19:33	20:01	20:27	20:38	20:21	19:42	18:55	18:12	17:51
2	08:27	08:16	07:42	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:08
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:53	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:48	05:51	06:14	06:41	07:07	07:38	08:09
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39	08:10
	18:03	18:35	19:06	19:36	20:04	20:29	20:38	20:18	19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51	06:10	05:48	05:52	06:15	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:37	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:43	07:10	07:41	08:12
	18:05	18:38	19:08	19:37	20:06	20:31	20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:05	18:39	19:09	19:38	20:06	20:31	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39	20:07	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45	06:06	05:47	05:54	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:08	20:32	20:36	20:13	19:30	18:43	18:04	17:50
10	08:27	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03	17:50
11	08:27	08:07	07:29	06:42	06:04	05:47	05:56	06:21	06:48	07:14	07:46	08:16
	18:09	18:43	19:13	19:42	20:10	20:33	20:36	20:10	19:26	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:47	05:56	06:22	06:49	07:15	07:47	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:35	20:09	19:25	18:38	18:01	17:50
13	08:27	08:04	07:26	06:39	06:02	05:46	05:57	06:22	06:49	07:16	07:48	08:18
	18:11	18:46	19:15	19:44	20:12	20:34	20:35	20:08	19:23	18:37	18:00	17:51
14	08:27	08:03	07:25	06:38	06:01	05:46	05:58	06:23	06:50	07:17	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:34	20:07	19:22	18:35	18:00	17:51
15	08:26	08:02	07:23	06:36	06:00	05:46	05:58	06:24	06:51	07:18	07:51	08:19
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:05	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	06:00	05:46	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36	20:33	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:33	05:59	05:47	06:00	06:26	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:57	17:52
18	08:25	07:58	07:19	06:32	05:58	05:47	06:01	06:27	06:54	07:21	07:54	08:21
	18:16	18:51	19:20	19:49	20:16	20:36	20:32	20:02	19:15	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:17	20:37	20:32	20:00	19:14	18:28	17:56	17:52
20	08:24	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:55	07:23	07:56	08:23
	18:19	18:53	19:21	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:55	17:53
21	08:24	07:55	07:14	06:28	05:56	05:47	06:03	06:29	06:56	07:24	07:57	08:23
	18:20	18:54	19:22	19:51	20:19	20:37	20:30	19:58	19:11	18:26	17:55	17:53
22	08:23	07:53	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:55	19:23	19:52	20:20	20:37	20:30	19:56	19:09	18:24	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:47	06:04	06:31	06:58	07:26	07:59	08:24
	18:22	18:56	19:24	19:53	20:21	20:37	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:09	06:24	05:53	05:48	06:05	06:32	06:59	07:27	08:00	08:25
	18:23	18:58	19:25	19:54	20:21	20:38	20:28	19:53	19:06	18:22	17:53	17:55
25	08:22	07:49	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:01	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:27	19:52	19:04	18:21	17:53	17:55
26	08:21	07:48	07:06	06:21	05:52	05:48	06:07	06:34	07:01	07:29	08:02	08:25
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:30	08:03	08:26
	18:26	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:45	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:31	08:04	08:26
	18:28	19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49	06:09	06:36	07:03	07:32	08:05	08:26
	18:29		19:30	19:59	20:25	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:04	07:33	08:06	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:14	17:51	17:59
31	08:17		06:59		05:50		06:11	06:38		07:34		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	443	451	423	374	348	304	296
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

AECOM

SHADOW - Calendar per WTG

Calculation: Mersinli Shadow Flicker - Worst Case**WTG:** T16 - T16

Assumptions for shadow calculations

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

	January	February	March	April	May	June		July	August	Septembe	October	Novembe	December
1	08:27	08:16	07:44	06:57	06:15	05:49		05:50	06:12	06:39	07:05	07:36	08:07
	18:00	18:32	19:03	19:33	20:01	20:27		20:38	20:21	19:42	18:55	18:12	17:51
2	08:27	08:16	07:43	06:56	06:14	05:49		05:51	06:13	06:40	07:06	07:37	08:08
	18:01	18:33	19:04	19:34	20:02	20:28		20:38	20:20	19:40	18:53	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:48		05:51	06:14	06:41	07:07	07:38	08:09
	18:02	18:34	19:05	19:35	20:03	20:29		20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48		05:52	06:15	06:42	07:08	07:39	08:10
	18:03	18:35	19:06	19:36	20:04	20:29		20:38	20:18	19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51	06:10	05:48		05:52	06:15	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30		20:37	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48		05:53	06:16	06:43	07:10	07:41	08:12
	18:05	18:38	19:08	19:37	20:06	20:31		20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47		05:53	06:17	06:44	07:11	07:42	08:13
	18:05	18:39	19:09	19:38	20:06	20:31		20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47		05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39	20:07	20:32		20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45	06:06	05:47		05:54	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:08	20:32		20:36	20:13	19:30	18:43	18:04	17:50
10	08:28	08:08	07:31	06:44	06:05	05:47		05:55	06:20	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41	20:09	20:33		20:36	20:12	19:28	18:41	18:03	17:50
11	08:27	08:07	07:29	06:42	06:04	05:47		05:56	06:21	06:48	07:14	07:46	08:16
	18:09	18:43	19:13	19:42	20:10	20:33		20:36	20:10	19:26	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:47		05:56	06:22	06:49	07:15	07:47	08:17
	18:10	18:45	19:14	19:43	20:11	20:34		20:35	20:09	19:25	18:38	18:01	17:50
13	08:27	08:04	07:26	06:39	06:02	05:46		05:57	06:22	06:49	07:16	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:34		20:35	20:08	19:23	18:37	18:00	17:51
14	08:27	08:03	07:25	06:38	06:01	05:46		05:58	06:23	06:50	07:17	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35		20:34	20:07	19:22	18:36	18:00	17:51
15	08:26	08:02	07:23	06:36	06:00	05:46	19:36-19:38/2	05:58	06:24	06:51	07:18	07:51	08:19
	18:13	18:48	19:17	19:46	20:14	20:35		20:34	20:05	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	06:00	05:46	19:35-19:39/4	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36		20:33	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:33	05:59	05:47	19:35-19:40/5	06:00	06:26	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48	20:16	20:36		20:33	20:03	19:17	18:31	17:57	17:52
18	08:25	07:59	07:19	06:32	05:58	05:47	19:34-19:41/7	06:01	06:27	06:54	07:21	07:54	08:21
	18:16	18:51	19:20	19:49	20:16	20:36		20:32	20:02	19:15	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	19:34-19:41/7	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:17	20:37		20:32	20:00	19:14	18:28	17:56	17:52
20	08:24	07:56	07:16	06:29	05:56	05:47	19:34-19:41/7	06:02	06:29	06:56	07:23	07:56	08:23
	18:19	18:53	19:21	19:51	20:18	20:37		20:31	19:59	19:12	18:27	17:55	17:53
21	08:24	07:55	07:14	06:28	05:56	05:47	19:34-19:41/7	06:03	06:29	06:56	07:24	07:57	08:23
	18:20	18:54	19:22	19:51	20:19	20:37		20:30	19:58	19:11	18:26	17:55	17:53
22	08:23	07:53	07:13	06:27	05:55	05:47	19:35-19:42/7	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:55	19:23	19:52	20:20	20:37		20:30	19:56	19:09	18:24	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:47	19:35-19:42/7	06:04	06:31	06:58	07:26	07:59	08:24
	18:22	18:56	19:24	19:53	20:21	20:37		20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:09	06:24	05:53	05:48	19:35-19:42/7	06:05	06:32	06:59	07:27	08:00	08:25
	18:23	18:58	19:25	19:54	20:21	20:38		20:28	19:53	19:06	18:22	17:53	17:55
25	08:22	07:49	07:08	06:23	05:53	05:48	19:36-19:41/5	06:06	06:33	07:00	07:28	08:01	08:25
	18:24	18:59	19:26	19:55	20:22	20:38		20:27	19:52	19:04	18:21	17:53	17:55
26	08:21	07:48	07:06	06:21	05:52	05:48	19:37-19:42/5	06:07	06:34	07:01	07:29	08:02	08:25
	18:25	19:00	19:27	19:56	20:23	20:38		20:27	19:51	19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	05:52	05:49	19:38-19:41/3	06:08	06:35	07:02	07:30	08:03	08:26
	18:26	19:01	19:28	19:57	20:24	20:38		20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:45	07:03	06:19	05:51	05:49		06:09	06:36	07:03	07:31	08:04	08:26
	18:28	19:02	19:29	19:58	20:25	20:38		20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49		06:09	06:36	07:03	07:32	08:05	08:26
	18:29		19:30	19:59	20:25	20:38		20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50		06:10	06:37	07:04	07:33	08:06	08:27
	18:30		19:31	20:00	20:26	20:38		20:23	19:45	18:57	18:14	17:51	17:59
31	08:17		06:59		05:50			06:11	06:38		07:35		08:27
	18:31		19:32		20:27			20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	443		451	423	374	348	304	296
Sum of minutes with flicker	0	0	0	0	0		73	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

SHADOW - Calendar per WTG

Calculation: Mersinli Shadow Flicker - Worst Case**WTG:** T15 - T15

Assumptions for shadow calculations

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:27	08:16	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:07
	18:00	18:32	19:03	19:33	20:01	20:27	20:38	20:21	19:42	18:55	18:12	17:51
2	08:27	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:08
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:53	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:48	05:51	06:14	06:41	07:07	07:38	08:09
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39	08:10
	18:03	18:36	19:06	19:36	20:04	20:29	20:38	20:18	19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51	06:10	05:48	05:52	06:15	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:37	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:43	07:10	07:41	08:12
	18:05	18:38	19:08	19:37	20:06	20:31	20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:05	18:39	19:09	19:38	20:07	20:31	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39	20:07	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45	06:06	05:47	05:55	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:08	20:32	20:36	20:13	19:30	18:43	18:04	17:50
10	08:28	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03	17:50
11	08:27	08:07	07:29	06:42	06:04	05:47	05:56	06:21	06:48	07:14	07:46	08:16
	18:09	18:43	19:13	19:42	20:10	20:33	20:36	20:10	19:26	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:47	05:56	06:22	06:49	07:15	07:47	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:35	20:09	19:25	18:38	18:01	17:50
13	08:27	08:04	07:26	06:39	06:02	05:47	05:57	06:22	06:49	07:16	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:34	20:35	20:08	19:23	18:37	18:00	17:51
14	08:27	08:03	07:25	06:38	06:01	05:46	05:58	06:23	06:50	07:17	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:34	20:07	19:22	18:36	18:00	17:51
15	08:26	08:02	07:23	06:36	06:00	05:46	05:58	06:24	06:51	07:18	07:51	08:19
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:05	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	06:00	05:46	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36	20:33	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:33	05:59	05:47	06:00	06:26	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:57	17:52
18	08:25	07:59	07:19	06:32	05:58	05:47	06:01	06:27	06:54	07:21	07:54	08:21
	18:17	18:51	19:20	19:49	20:16	20:36	20:32	20:02	19:15	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:17	20:37	20:32	20:00	19:14	18:29	17:56	17:52
20	08:24	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:56	07:23	07:56	08:23
	18:19	18:53	19:22	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:55	17:53
21	08:24	07:55	07:14	06:28	05:56	05:47	06:03	06:29	06:56	07:24	07:57	08:23
	18:20	18:54	19:22	19:52	20:19	20:37	20:30	19:58	19:11	18:26	17:55	17:53
22	08:23	07:53	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:55	19:23	19:52	20:20	20:37	20:30	19:56	19:09	18:24	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:47	06:04	06:31	06:58	07:26	07:59	08:24
	18:22	18:56	19:24	19:53	20:21	20:37	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:10	06:24	05:53	05:48	06:05	06:32	06:59	07:27	08:00	08:25
	18:23	18:58	19:25	19:54	20:21	20:38	20:28	19:53	19:06	18:22	17:53	17:55
25	08:22	07:49	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:01	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:27	19:52	19:04	18:21	17:53	17:55
26	08:21	07:48	07:06	06:21	05:52	05:48	06:07	06:34	07:01	07:29	08:02	08:25
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:30	08:03	08:26
	18:26	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:45	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:31	08:04	08:26
	18:28	19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49	06:09	06:36	07:03	07:32	08:05	08:26
	18:29		19:30	19:59	20:25	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:04	07:33	08:06	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51	17:59
31	08:17		06:59		05:50		06:11	06:38		07:35		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	443	451	423	374	348	304	296
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

AECOM

SHADOW - Calendar per WTG

Calculation: Mersinli Shadow Flicker - Worst Case**WTG:** T14 - T14

Assumptions for shadow calculations

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:27	08:16	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:07
	18:00	18:32	19:03	19:33	20:01	20:28	20:38	20:21	19:42	18:55	18:12	17:51
2	08:28	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:08
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:53	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:48	05:51	06:14	06:41	07:07	07:38	08:09
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39	08:10
	18:03	18:36	19:06	19:36	20:04	20:30	20:38	20:18	19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51	06:10	05:48	05:52	06:15	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:37	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:43	07:10	07:41	08:12
	18:05	18:38	19:08	19:38	20:06	20:31	20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:05	18:39	19:09	19:38	20:07	20:31	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39	20:07	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45	06:06	05:47	05:54	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:08	20:32	20:36	20:13	19:30	18:43	18:04	17:50
10	08:28	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03	17:50
11	08:27	08:07	07:29	06:42	06:04	05:47	05:56	06:21	06:48	07:15	07:46	08:16
	18:09	18:43	19:13	19:42	20:10	20:33	20:36	20:10	19:26	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:47	05:56	06:22	06:49	07:15	07:47	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:35	20:09	19:25	18:38	18:01	17:50
13	08:27	08:05	07:26	06:39	06:02	05:46	05:57	06:22	06:49	07:16	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:34	20:35	20:08	19:23	18:37	18:00	17:51
14	08:27	08:03	07:25	06:38	06:01	05:46	05:58	06:23	06:50	07:17	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:34	20:07	19:22	18:36	18:00	17:51
15	08:26	08:02	07:23	06:36	06:00	05:46	05:58	06:24	06:51	07:18	07:51	08:19
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:05	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	06:00	05:46	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36	20:33	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:33	05:59	05:47	06:00	06:26	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:57	17:52
18	08:25	07:59	07:19	06:32	05:58	05:47	06:01	06:27	06:54	07:21	07:54	08:21
	18:17	18:51	19:20	19:49	20:16	20:36	20:32	20:02	19:15	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:17	20:37	20:32	20:00	19:14	18:29	17:56	17:52
20	08:24	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:56	07:23	07:56	08:23
	18:19	18:53	19:22	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:55	17:53
21	08:24	07:55	07:14	06:28	05:56	05:47	06:03	06:29	06:56	07:24	07:57	08:23
	18:20	18:54	19:22	19:52	20:19	20:37	20:30	19:58	19:11	18:26	17:55	17:53
22	08:23	07:53	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:55	19:23	19:52	20:20	20:37	20:30	19:56	19:09	18:24	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:47	06:04	06:31	06:58	07:26	07:59	08:24
	18:22	18:57	19:24	19:53	20:21	20:38	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:10	06:24	05:53	05:48	06:05	06:32	06:59	07:27	08:00	08:25
	18:23	18:58	19:25	19:54	20:21	20:38	20:28	19:53	19:06	18:22	17:53	17:55
25	08:22	07:49	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:01	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:27	19:52	19:04	18:21	17:53	17:55
26	08:21	07:48	07:06	06:21	05:52	05:48	06:07	06:34	07:01	07:29	08:02	08:26
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:30	08:03	08:26
	18:26	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:45	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:31	08:05	08:26
	18:28	19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49	06:09	06:36	07:03	07:32	08:06	08:27
	18:29		19:30	19:59	20:25	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:04	07:34	08:07	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51	17:59
31	08:17		06:59		05:50		06:11	06:38		07:35		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	443	451	423	374	348	304	296
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

AECOM

SHADOW - Calendar per WTG

Calculation: Mersinli Shadow Flicker - Worst Case**WTG:** T13 - T13

Assumptions for shadow calculations

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

	January		February	March	April	May	June	July	August	September	October	November		December	
1	08:27	17:19-17:32/13	08:16	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36		08:08	17:01-17:24/23
	18:00		18:32	19:03	19:33	20:01	20:28	20:38	20:21	19:42	18:55	18:12		17:51	
2	08:28	17:19-17:33/14	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37		08:08	17:01-17:24/23
	18:01		18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:53	18:11		17:51	
3	08:28	17:18-17:34/16	08:15	07:41	06:54	06:13	05:48	05:51	06:14	06:41	07:07	07:38		08:09	17:02-17:24/22
	18:02		18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10		17:50	
4	08:28	17:18-17:35/17	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39		08:10	17:03-17:24/21
	18:03		18:36	19:06	19:36	20:04	20:30	20:38	20:18	19:37	18:50	18:09		17:50	
5	08:28	17:18-17:36/18	08:13	07:38	06:51	06:10	05:48	05:52	06:15	06:43	07:09	07:40		08:11	17:04-17:24/20
	18:04		18:37	19:07	19:37	20:05	20:30	20:37	20:17	19:36	18:49	18:08		17:50	
6	08:28	17:18-17:37/19	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:43	07:10	07:41		08:12	17:04-17:23/19
	18:05		18:38	19:08	19:38	20:06	20:31	20:37	20:16	19:34	18:47	18:07		17:50	
7	08:28	17:18-17:38/20	08:11	07:35	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42		08:13	17:05-17:23/18
	18:05		18:39	19:09	19:38	20:07	20:31	20:37	20:15	19:33	18:46	18:06		17:50	
8	08:28	17:18-17:39/21	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43		08:14	17:06-17:23/17
	18:06		18:40	19:10	19:39	20:07	20:32	20:37	20:14	19:31	18:44	18:05		17:50	
9	08:28	17:18-17:40/22	08:09	07:32	06:45	06:06	05:47	05:54	06:19	06:46	07:13	07:44		08:15	17:07-17:23/16
	18:07		18:41	19:11	19:40	20:08	20:32	20:36	20:13	19:30	18:43	18:04		17:50	
10	08:28	17:18-17:41/23	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:45		08:16	17:09-17:23/14
	18:08		18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03		17:50	
11	08:27	17:19-17:41/22	08:07	07:29	06:42	06:04	05:47	05:56	06:21	06:48	07:15	07:46		08:16	17:10-17:23/13
	18:09		18:43	19:13	19:42	20:10	20:33	20:36	20:10	19:26	18:40	18:02		17:50	
12	08:27	17:19-17:42/23	08:06	07:28	06:41	06:03	05:47	05:56	06:22	06:49	07:15	07:47	17:03-17:12/9	08:17	17:10-17:22/12
	18:10		18:45	19:14	19:43	20:11	20:34	20:35	20:09	19:25	18:38	18:01		17:50	
13	08:27	17:18-17:42/24	08:05	07:26	06:39	06:02	05:46	05:57	06:22	06:50	07:16	07:49	17:01-17:15/14	08:18	17:11-17:22/11
	18:11		18:46	19:15	19:44	20:12	20:34	20:35	20:08	19:23	18:37	18:00		17:51	
14	08:27	17:19-17:43/24	08:03	07:25	06:38	06:01	05:46	05:58	06:23	06:50	07:17	07:50	16:59-17:16/17	08:19	17:13-17:22/9
	18:12		18:47	19:16	19:45	20:13	20:35	20:34	20:07	19:22	18:36	18:00		17:51	
15	08:26	17:19-17:44/25	08:02	07:23	06:36	06:00	05:46	05:58	06:24	06:51	07:18	07:51	16:58-17:17/19	08:19	17:13-17:22/9
	18:13		18:48	19:17	19:46	20:14	20:35	20:34	20:05	19:20	18:34	17:59		17:51	
16	08:26	17:19-17:44/25	08:01	07:22	06:35	06:00	05:46	05:59	06:25	06:52	07:19	07:52	16:57-17:18/21	08:20	17:15-17:22/7
	18:14		18:49	19:18	19:47	20:15	20:36	20:33	20:04	19:19	18:33	17:58		17:51	
17	08:26	17:19-17:45/26	08:00	07:20	06:33	05:59	05:47	06:00	06:26	06:53	07:20	07:53	16:57-17:19/22	08:21	17:16-17:22/6
	18:15		18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:57		17:52	
18	08:25	17:20-17:46/26	07:59	07:19	06:32	05:58	05:47	06:01	06:27	06:54	07:21	07:54	16:56-17:20/24	08:21	17:17-17:21/4
	18:17		18:51	19:20	19:49	20:16	20:36	20:32	20:02	19:15	18:30	17:57		17:52	
19	08:25	17:20-17:45/25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	16:56-17:20/24	08:22	17:18-17:21/3
	18:18		18:52	19:21	19:50	20:17	20:37	20:32	20:00	19:14	18:29	17:56		17:52	
20	08:24	17:21-17:46/25	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:56	07:23	07:56	16:56-17:21/25	08:23	17:19-17:20/1
	18:19		18:53	19:22	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:55		17:53	
21	08:24	17:21-17:46/25	07:55	07:14	06:28	05:56	05:47	06:03	06:29	06:56	07:24	07:57	16:57-17:22/25	08:23	
	18:20		18:54	19:22	19:52	20:19	20:37	20:30	19:58	19:11	18:26	17:55		17:53	
22	08:23	17:22-17:47/25	07:53	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	16:57-17:22/25	08:24	
	18:21		18:55	19:23	19:52	20:20	20:37	20:30	19:56	19:09	18:24	17:54		17:54	
23	08:23	17:22-17:46/24	07:52	07:11	06:25	05:54	05:47	06:04	06:31	06:58	07:26	07:59	16:57-17:22/25	08:24	
	18:22		18:57	19:24	19:53	20:21	20:38	20:29	19:55	19:08	18:23	17:54		17:54	
24	08:22	17:22-17:46/24	07:51	07:10	06:24	05:53	05:48	06:05	06:32	06:59	07:27	08:00	16:57-17:23/26	08:25	17:21-17:23/2
	18:23		18:58	19:25	19:54	20:21	20:38	20:28	19:53	19:06	18:22	17:53		17:55	
25	08:22	17:24-17:46/22	07:49	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:01	16:57-17:23/26	08:25	17:21-17:25/4
	18:24		18:59	19:26	19:55	20:22	20:38	20:27	19:52	19:04	18:21	17:53		17:55	
26	08:21	17:24-17:45/21	07:48	07:06	06:21	05:52	05:48	06:07	06:34	07:01	07:29	08:02	16:58-17:23/25	08:26	17:20-17:26/6
	18:25		19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52		17:56	
27	08:20	17:25-17:44/19	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:30	08:03	16:58-17:23/25	08:26	17:20-17:26/6
	18:26		19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52		17:57	
28	08:20	17:27-17:44/17	07:45	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:31	08:05	16:59-17:23/24	08:26	17:19-17:27/8
	18:28		19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52		17:57	
29	08:19	17:29-17:43/14		07:02	06:18	05:51	05:49	06:09	06:37	07:04	07:32	08:06	16:59-17:23/24	08:27	17:20-17:29/9
	18:29			19:30	19:59	20:25	20:38	20:24	19:46	18:58	18:16	17:51		17:58	
30	08:18	17:31-17:40/9		07:00	06:16	05:50	05:50	06:10	06:37	07:04	07:34	08:07	17:00-17:23/23	08:27	17:19-17:30/11
	18:30			19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51		17:59	
31	08:17			06:59		05:50		06:11	06:38		07:35			08:27	17:19-17:31/12
	18:31			19:32		20:27		20:22	19:43		18:13			17:59	
Potential sun hours	305		301	370	395	441	443	451	423	374	348	304		296	
Sum of minutes with flicker		628	0	0	0	0	0	0	0	0	0		423		326

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

AECOM

SHADOW - Calendar per WTG

Calculation: Mersinli Shadow Flicker - Worst Case**WTG:** T12 - T12

Assumptions for shadow calculations

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:27	08:16	07:44 18:01-18:32/31	06:57	06:15	05:49	05:50	06:12	06:39	07:05 17:37-18:26/49	07:36	08:08
	18:00	18:32	19:03	19:33	20:01	20:28	20:38	20:21	19:42	18:55	18:12	17:51
2	08:28	08:16	07:43 18:00-18:34/34	06:56	06:14	05:49	05:51	06:13	06:40	07:06 17:36-18:25/49	07:37	08:08
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:54	18:11	17:51
3	08:28	08:15	07:41 17:59-18:34/35	06:54	06:13	05:48	05:51	06:14	06:41	07:07 17:34-18:24/50	07:38	08:09
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40 17:59-18:34/35	06:53	06:12	05:48	05:52	06:15	06:42	07:08 17:34-18:23/49	07:39	08:10
	18:03	18:36	19:06	19:36	20:04	20:30	20:38	20:18	19:37	18:50	18:09	17:50
5	08:28	08:13	07:38 17:57-18:34/37	06:51	06:10	05:48	05:52	06:15	06:43	07:09 17:33-18:22/49	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:37	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37 17:57-18:41/44	06:50	06:09	05:48	05:53	06:16	06:43	07:10 17:33-18:20/47	07:41	08:12
	18:05	18:38	19:08	19:38	20:06	20:31	20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35 17:56-18:43/47	06:48	06:08	05:47	05:53	06:17	06:44	07:11 17:33-18:18/45	07:42	08:13
	18:05	18:39	19:09	19:38	20:07	20:31	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34 17:57-18:45/48	06:47	06:07	05:47	05:54	06:18	06:45	07:12 17:33-18:14/41	07:43	08:14
	18:06	18:40	19:10	19:39	20:08	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:32 17:57-18:45/48	06:45	06:06	05:47	05:54	06:19	06:46	07:13 17:33-18:09/36	07:44	08:15
	18:07	18:41	19:11	19:40	20:08	20:32	20:36	20:13	19:30	18:43	18:04	17:50
10	08:28	08:08	07:31 17:56-18:46/50	06:44	06:05	05:47	05:55	06:20	06:47	07:14 17:33-18:09/36	07:45	08:16
	18:08	18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03	17:50
11	08:27	08:07	07:29 17:57-18:46/49	06:42	06:04	05:47	05:56	06:21	06:48	07:15 17:34-18:08/34	07:46	08:16
	18:09	18:43	19:13	19:42	20:10	20:34	20:36	20:10	19:27	18:40	18:02	17:50
12	08:27	08:06	07:28 17:57-18:47/50	06:41	06:03	05:47	05:56	06:22	06:49	07:15 17:34-18:07/33	07:48	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:35	20:09	19:25	18:38	18:01	17:50
13	08:27	08:05	07:26 17:57-18:46/49	06:39	06:02	05:46	05:57	06:22	06:50	07:16 17:35-18:05/30	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:34	20:35	20:08	19:23	18:37	18:00	17:51
14	08:27	08:03	07:25 17:58-18:46/48	06:38	06:01	05:46	05:58	06:23	06:50	07:17 17:36-18:04/28	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:34	20:07	19:22	18:36	18:00	17:51
15	08:26	08:02	07:23 17:58-18:45/47	06:36	06:00	05:46	05:58	06:24	06:51	07:18 17:38-18:02/24	07:51	08:19
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:06	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22 18:00-18:45/45	06:35	06:00	05:46	05:59	06:25	06:52	07:19 17:39-18:00/21	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36	20:33	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20 18:01-18:43/42	06:34	05:59	05:47	06:00	06:26	06:53	07:20 17:42-17:57/15	07:53	08:21
	18:15	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:57	17:52
18	08:25	07:59	07:19 18:03-18:42/39	06:32	05:58	05:47	06:01	06:27	06:54	07:21 17:49-17:50/1	07:54	08:21
	18:16	18:51	19:20	19:49	20:16	20:36	20:32	20:02	19:15	18:30	17:57	17:52
19	08:25	07:57	07:17 18:25-18:40/15	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21 18:05-18:21/16	19:50	20:17	20:37	20:32	20:00	19:14	18:29	17:56	17:52
20	08:25	07:56	07:16 18:27-18:38/11	06:29	05:56	05:47	06:02	06:29	06:56	07:23	07:56	08:23
	18:19	18:53	19:22 18:10-18:16/6	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:55	17:53
21	08:24	07:55	07:14	06:28	05:56	05:47	06:03	06:29	06:56	07:24	07:57	08:23
	18:20	18:54	19:23	19:52	20:19	20:37	20:30	19:58	19:11	18:26	17:55	17:53
22	08:23	07:53	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:55	19:23	19:53	20:20	20:37	20:30	19:56	19:09	18:24	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:47	06:04	06:31	06:58 18:13-18:21/8	07:26	07:59	08:24
	18:22	18:57	19:24	19:53	20:21	20:38	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51 18:13-18:22/9	07:10	06:24	05:53	05:48	06:05	06:32	06:59 18:09-18:23/14	07:27	08:00	08:25
	18:23	18:58	19:25	19:54	20:22	20:38	20:28	19:53	19:06 17:49-18:03/14	18:22	17:53	17:55
25	08:22	07:50 18:09-18:26/17	07:08	06:23	05:53	05:48	06:06	06:33	07:00 18:07-18:24/17	07:28	08:01	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:27	19:52	19:04 17:46-18:06/20	18:21	17:53	17:55
26	08:21	07:48 18:06-18:28/22	07:06	06:21	05:52	05:48	06:07	06:34	07:01 17:44-18:25/41	07:29	08:02	08:26
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:20	07:47 18:04-18:30/26	07:05	06:20	05:52	05:49	06:08	06:35	07:02 17:42-18:26/44	07:30	08:04	08:26
	18:26	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:45 18:02-18:31/29	07:03	06:19	05:51	05:49	06:09	06:36	07:03 17:40-18:26/46	07:31	08:05	08:26
	18:28	19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49	06:09	06:37	07:04 17:39-18:26/47	07:32	08:06	08:27
	18:29		19:30	19:59	20:25	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:04 17:38-18:26/48	07:34	08:07	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51	17:59
31	08:17		06:59		05:50		06:11	06:38		07:35		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	443	451	423	374	348	304	296
Sum of minutes with flicker	0	103	826	0	0	0	0	0	299	637	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

AECOM

SHADOW - Calendar per WTG

Calculation: Mersinli Shadow Flicker - Worst Case**WTG:** T11 - T11

Assumptions for shadow calculations

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

	January	February	March	April		May		June	July		August		September	October	November	December
1	08:27	08:17	07:44	06:57		06:15	18:52-19:23/31	05:49	05:50		06:12	18:59-19:34/35	06:39	07:05	07:36	08:08
	18:00	18:32	19:03	19:33		20:01		20:28	20:38		20:21		19:42	18:55	18:12	17:51
2	08:28	08:16	07:43	06:56		06:14	18:51-19:23/32	05:49	05:51		06:13	18:59-19:35/36	06:40	07:06	07:37	08:09
	18:01	18:33	19:04	19:34		20:02		20:28	20:38		20:20		19:40	18:54	18:11	17:51
3	08:28	08:15	07:41	06:54		06:13	18:51-19:24/33	05:48	05:51		06:14	18:59-19:35/36	06:41	07:07	07:38	08:09
	18:02	18:34	19:05	19:35		20:03		20:29	20:38		20:19		19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53		06:12	18:49-19:23/34	05:48	05:52		06:15	18:59-19:35/36	06:42	07:08	07:39	08:10
	18:03	18:36	19:06	19:36		20:04		20:30	20:38		20:18		19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51		06:10	18:49-19:24/35	05:48	05:52		06:15	18:59-19:35/36	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37		20:05		20:30	20:37		20:17		19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50		06:09	18:49-19:24/35	05:48	05:53		06:16	18:58-19:34/36	06:43	07:10	07:41	08:12
	18:05	18:38	19:08	19:38		20:06		20:31	20:37		20:16		19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48		06:08	18:49-19:24/35	05:47	05:53		06:17	18:58-19:34/36	06:44	07:11	07:42	08:13
	18:05	18:39	19:09	19:38		20:07		20:31	20:37		20:15		19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47		06:07	18:48-19:24/36	05:47	05:54		06:18	18:59-19:33/34	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39		20:08		20:32	20:37		20:14		19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45		06:06	18:48-19:24/36	05:47	05:54		06:19	18:59-19:33/34	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40		20:08		20:32	20:36		20:13		19:30	18:43	18:04	17:50
10	08:28	08:08	07:31	06:44		06:05	18:48-19:24/36	05:47	05:55		06:20	18:59-19:33/34	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41		20:09		20:33	20:36		20:12		19:28	18:41	18:03	17:50
11	08:27	08:07	07:29	06:42		06:04	18:49-19:24/35	05:47	05:56		06:21	19:00-19:32/32	06:48	07:15	07:46	08:16
	18:09	18:43	19:13	19:42		20:10		20:34	20:36		20:10		19:27	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	19:05-19:08/3	06:03	18:49-19:24/35	05:47	05:56		06:22	19:01-19:31/30	06:49	07:15	07:48	08:17
	18:10	18:45	19:14	19:43		20:11		20:34	20:35		20:09		19:25	18:38	18:01	17:50
13	08:27	08:05	07:26	06:39	19:01-19:13/12	06:02	18:49-19:23/34	05:46	05:57		06:22	19:01-19:30/29	06:50	07:16	07:49	08:18
	18:11	18:46	19:15	19:44		20:12		20:34	20:35		20:08		19:23	18:37	18:00	17:51
14	08:27	08:03	07:25	06:38	18:58-19:14/16	06:01	18:49-19:23/34	05:46	05:58		06:23	19:01-19:28/27	06:50	07:17	07:50	08:19
	18:12	18:47	19:16	19:45		20:13		20:35	20:34		20:07		19:22	18:36	18:00	17:51
15	08:26	08:02	07:23	06:36	18:57-19:15/18	06:00	18:50-19:23/33	05:46	05:58		06:24	19:02-19:27/25	06:51	07:18	07:51	08:19
	18:13	18:48	19:17	19:46		20:14		20:35	20:34		20:06		19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	18:56-19:17/21	06:00	18:51-19:23/32	05:46	05:59	19:12-19:21/9	06:25	19:04-19:25/21	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47		20:15		20:36	20:33		20:04		19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:33	18:55-19:16/21	05:59	18:51-19:22/31	05:47	06:00	19:10-19:23/13	06:26	19:02-19:23/21	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48		20:16		20:36	20:33		20:03		19:17	18:31	17:57	17:52
18	08:25	07:59	07:19	06:32	18:55-19:17/22	05:58	18:52-19:21/29	05:47	06:01	19:08-19:24/16	06:27	19:01-19:20/19	06:54	07:21	07:54	08:21
	18:16	18:51	19:20	19:49		20:16		20:36	20:32		20:02		19:15	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	18:53-19:17/24	05:57	18:52-19:21/29	05:47	06:01	19:07-19:26/19	06:28	19:00-19:21/21	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50		20:17		20:37	20:32		20:00		19:14	18:29	17:56	17:52
20	08:25	07:56	07:16	06:29	18:53-19:17/24	05:56	18:54-19:21/27	05:47	06:02	19:06-19:27/21	06:29	18:59-19:21/22	06:56	07:23	07:56	08:23
	18:19	18:53	19:22	19:51		20:18		20:37	20:31		19:59		19:12	18:27	17:55	17:53
21	08:24	07:55	07:14	06:28	18:54-19:17/23	05:56	18:54-19:20/26	05:47	06:03	19:06-19:29/23	06:29	18:59-19:22/23	06:56	07:24	07:57	08:23
	18:20	18:54	19:23	19:52		20:19		20:37	20:30		19:58		19:11	18:26	17:55	17:53
22	08:23	07:53	07:13	06:27	18:53-19:16/23	05:55	18:55-19:19/24	05:47	06:04	19:05-19:30/25	06:30	18:58-19:21/23	06:57	07:25	07:58	08:24
	18:21	18:55	19:23	19:53		20:20		20:37	20:30		19:56		19:09	18:24	17:54	17:54
23	08:23	07:52	07:11	06:25	18:54-19:15/21	05:54	18:56-19:18/22	05:47	06:04	19:03-19:30/27	06:31	18:57-19:21/24	06:58	07:26	07:59	08:24
	18:22	18:57	19:24	19:53		20:21		20:38	20:29		19:55		19:08	18:23	17:54	17:54
24	08:22	07:51	07:10	06:24	18:54-19:15/21	05:53	18:57-19:17/20	05:48	06:05	19:03-19:31/28	06:32	18:57-19:20/23	06:59	07:27	08:00	08:25
	18:23	18:58	19:25	19:54		20:22		20:38	20:28		19:53		19:06	18:22	17:53	17:55
25	08:22	07:50	07:08	06:23	18:54-19:14/20	05:53	18:58-19:16/18	05:48	06:06	19:02-19:32/30	06:33	18:57-19:20/23	07:00	07:28	08:01	08:25
	18:24	18:59	19:26	19:55		20:22		20:38	20:27		19:52		19:04	18:21	17:53	17:55
26	08:21	07:48	07:06	06:21	18:56-19:17/21	05:52	19:00-19:15/15	05:48	06:07	19:02-19:32/30	06:34	18:58-19:19/21	07:01	07:29	08:03	08:26
	18:25	19:00	19:27	19:56		20:23		20:38	20:27		19:51		19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	18:57-19:19/22	05:52	19:02-19:13/11	05:49	06:08	19:02-19:33/31	06:35	18:58-19:18/20	07:02	07:30	08:04	08:26
	18:26	19:01	19:28	19:57		20:24		20:38	20:26		19:49		19:01	18:18	17:52	17:57
28	08:20	07:45	07:03	06:19	18:55-19:20/25	05:51	19:05-19:10/5	05:49	06:09	19:01-19:34/33	06:36	18:59-19:17/18	07:03	07:31	08:05	08:26
	18:28	19:02	19:29	19:58		20:25		20:38	20:25		19:48		19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	18:53-19:21/28	05:51		05:49	06:09	19:00-19:33/33	06:37	18:59-19:15/16	07:04	07:32	08:06	08:27
	18:29		19:30	19:59		20:25		20:38	20:24		19:46		18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	18:52-19:22/30	05:50		05:50	06:10	19:00-19:34/34	06:37	19:01-19:13/12	07:04	07:34	08:07	08:27
	18:30		19:31	20:00		20:26		20:38	20:23		19:45		18:57	18:15	17:51	17:59
31	08:17		06:59			05:50			06:11	18:59-19:34/35	06:38	19:06-19:08/2		07:35		08:27
	18:31		19:32			20:27			20:22		19:43			18:13		17:59
Potential sun hours	305	301	370	395		441		443	451		423		374	348	304	296
Sum of minutes with flicker	0	0	0		395		803	0		407		805	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

AECOM

SHADOW - Calendar per WTG

Calculation: Mersinli Shadow Flicker - Worst Case**WTG:** T10 - T10

Assumptions for shadow calculations

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

	January	February	March	April		May		June	July		August		September	October	November	December
1	08:27	08:17	07:44	06:57		06:15	19:02-19:21/19	05:49	05:50		06:12	19:08-19:34/26	06:39	07:05	07:36	08:08
	18:00	18:32	19:03	19:33		20:01		20:28	20:38		20:21		19:42	18:55	18:12	17:51
2	08:28	08:16	07:43	06:56		06:14	19:01-19:22/21	05:49	05:51		06:13	19:08-19:34/26	06:40	07:06	07:37	08:09
	18:01	18:33	19:04	19:34		20:02		20:28	20:38		20:20		19:40	18:54	18:11	17:51
3	08:28	08:15	07:41	06:54		06:13	19:00-19:23/23	05:48	05:51		06:14	19:08-19:34/26	06:41	07:07	07:38	08:09
	18:02	18:34	19:05	19:35		20:03		20:29	20:38		20:19		19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53		06:12	18:59-19:22/23	05:48	05:52		06:15	19:08-19:34/26	06:42	07:08	07:39	08:10
	18:03	18:36	19:06	19:36		20:04		20:30	20:38		20:18		19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51		06:11	18:58-19:23/25	05:48	05:52		06:15	19:08-19:34/26	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37		20:05		20:30	20:37		20:17		19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50		06:09	18:58-19:23/25	05:48	05:53		06:16	19:07-19:33/26	06:43	07:10	07:41	08:12
	18:05	18:38	19:08	19:38		20:06		20:31	20:37		20:16		19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48		06:08	18:58-19:24/26	05:47	05:53		06:17	19:08-19:33/25	06:44	07:11	07:42	08:13
	18:05	18:39	19:09	19:38		20:07		20:31	20:37		20:15		19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47		06:07	18:57-19:24/27	05:47	05:54		06:18	19:08-19:32/24	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39		20:08		20:32	20:37		20:14		19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45		06:06	18:57-19:24/27	05:47	05:54		06:19	19:08-19:32/24	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40		20:08		20:33	20:36		20:13		19:30	18:43	18:04	17:50
10	08:28	08:08	07:31	06:44		06:05	18:57-19:24/27	05:47	05:55		06:20	19:09-19:31/22	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41		20:09		20:33	20:36		20:12		19:28	18:41	18:03	17:50
11	08:27	08:07	07:29	06:42		06:04	18:58-19:23/25	05:47	05:56		06:21	19:10-19:30/20	06:48	07:15	07:46	08:16
	18:09	18:43	19:13	19:42		20:10		20:34	20:36		20:10		19:27	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41		06:03	18:58-19:23/25	05:47	05:56		06:22	19:11-19:29/18	06:49	07:16	07:48	08:17
	18:10	18:45	19:14	19:43		20:11		20:34	20:35		20:09		19:25	18:38	18:01	17:50
13	08:27	08:05	07:26	06:39		06:02	18:58-19:23/25	05:46	05:57		06:22	19:11-19:27/16	06:50	07:16	07:49	08:18
	18:11	18:46	19:15	19:44		20:12		20:34	20:35		20:08		19:23	18:37	18:00	17:51
14	08:27	08:03	07:25	06:38		06:01	18:58-19:22/24	05:46	05:58		06:23	19:08-19:24/16	06:50	07:17	07:50	08:19
	18:12	18:47	19:16	19:45		20:13		20:35	20:35		20:07		19:22	18:36	18:00	17:51
15	08:27	08:02	07:23	06:36		06:00	19:00-19:22/22	05:46	05:58		06:24	19:07-19:22/15	06:51	07:18	07:51	08:20
	18:13	18:48	19:17	19:46		20:14		20:35	20:34		20:06		19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35		06:00	19:00-19:22/22	05:46	05:59		06:25	19:06-19:23/17	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47		20:15		20:36	20:33		20:04		19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:34	19:07-19:12/5	05:59	19:01-19:21/20	05:47	06:00		06:26	19:06-19:23/17	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48		20:16		20:36	20:33		20:03		19:17	18:31	17:57	17:52
18	08:25	07:59	07:19	06:32	19:04-19:15/11	05:58	19:02-19:20/18	05:47	06:01		06:27	19:05-19:24/19	06:54	07:21	07:54	08:21
	18:17	18:51	19:20	19:49		20:17		20:36	20:32		20:02		19:16	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	19:02-19:16/14	05:57	19:03-19:18/15	05:47	06:01		06:28	19:05-19:24/19	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50		20:17		20:37	20:32		20:00		19:14	18:29	17:56	17:52
20	08:25	07:56	07:16	06:29	19:01-19:17/16	05:56	19:05-19:18/13	05:47	06:02		06:29	19:05-19:23/18	06:56	07:23	07:56	08:23
	18:19	18:53	19:22	19:51		20:18		20:37	20:31		19:59		19:12	18:27	17:55	17:53
21	08:24	07:55	07:14	06:28	19:00-19:18/18	05:56	19:06-19:16/10	05:47	06:03		06:29	19:05-19:23/18	06:56	07:24	07:57	08:23
	18:20	18:54	19:23	19:52		20:19		20:37	20:30		19:58		19:11	18:26	17:55	17:53
22	08:24	07:54	07:13	06:27	18:59-19:17/18	05:55	19:09-19:13/4	05:47	06:04	19:18-19:25/7	06:30	19:04-19:22/18	06:57	07:25	07:58	08:24
	18:21	18:55	19:23	19:53		20:20		20:37	20:30		19:56		19:09	18:25	17:54	17:54
23	08:23	07:52	07:11	06:25	18:59-19:18/19	05:54		05:47	06:04	19:15-19:26/11	06:31	19:05-19:21/16	06:58	07:26	07:59	08:24
	18:22	18:57	19:24	19:53		20:21		20:38	20:29		19:55		19:08	18:23	17:54	17:54
24	08:22	07:51	07:10	06:24	18:59-19:18/19	05:53		05:48	06:05	19:14-19:28/14	06:32	19:06-19:19/13	06:59	07:27	08:00	08:25
	18:23	18:58	19:25	19:54		20:22		20:38	20:28		19:53		19:06	18:22	17:53	17:55
25	08:22	07:50	07:08	06:23	18:58-19:17/19	05:53		05:48	06:06	19:13-19:30/17	06:33	19:07-19:18/11	07:00	07:28	08:01	08:25
	18:24	18:59	19:26	19:55		20:22		20:38	20:28		19:52		19:04	18:21	17:53	17:55
26	08:21	07:48	07:06	06:21	18:59-19:16/17	05:52		05:48	06:07	19:12-19:31/19	06:34	19:10-19:14/4	07:01	07:29	08:03	08:26
	18:25	19:00	19:27	19:56		20:23		20:38	20:27		19:51		19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	19:00-19:16/16	05:52		05:49	06:08	19:11-19:32/21	06:35		07:02	07:30	08:04	08:26
	18:26	19:01	19:28	19:57		20:24		20:38	20:26		19:49		19:01	18:18	17:52	17:57
28	08:20	07:45	07:03	06:19	19:01-19:15/14	05:51		05:49	06:09	19:11-19:33/22	06:36		07:03	07:31	08:05	08:26
	18:28	19:02	19:29	19:58		20:25		20:38	20:25		19:48		19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	19:01-19:17/16	05:51		05:49	06:09	19:09-19:32/23	06:37		07:04	07:33	08:06	08:27
	18:29		19:30	19:59		20:25		20:38	20:24		19:46		18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	19:03-19:19/16	05:50		05:50	06:10	19:09-19:33/24	06:37		07:04	07:34	08:07	08:27
	18:30		19:31	20:00		20:26		20:38	20:23		19:45		18:57	18:15	17:51	17:59
31	08:17		06:59			05:50			06:11	19:09-19:33/24	06:38			07:35		08:27
	18:31		19:32			20:27			20:22		19:43			18:13		17:59
Potential sun hours	305	301	370	395		441		443	451		423		374	348	304	296
Sum of minutes with flicker	0	0	0	218		466		0	182		506		0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

AECOM

SHADOW - Calendar per WTG

Calculation: Mersinli Shadow Flicker - Worst Case**WTG:** T1 - T1

Assumptions for shadow calculations

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

	January	February	March	April	May	June	July	August	Septembe	October	Novembe	December
1	08:28	08:17	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:08
	18:00	18:32	19:03	19:33	20:01	20:28	20:38	20:21	19:42	18:55	18:12	17:51
2	08:28	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:09
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:54	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:49	05:51	06:14	06:41	07:07	07:38	08:10
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39	08:11
	18:03	18:36	19:06	19:36	20:04	20:30	20:38	20:18	19:37	18:51	18:09	17:50
5	08:28	08:13	07:38	06:51	06:11	05:48	05:52	06:16	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:38	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:44	07:10	07:41	08:12
	18:05	18:38	19:08	19:38	20:06	20:31	20:37	20:16	19:34	18:48	18:07	17:50
7	08:28	08:11	07:36	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:06	18:39	19:09	19:39	20:07	20:32	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:40	20:08	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:33	06:45	06:06	05:47	05:55	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:09	20:33	20:37	20:13	19:30	18:43	18:04	17:50
10	08:28	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:46	08:16
	18:08	18:42	19:12	19:41	20:10	20:33	20:36	20:12	19:28	18:42	18:03	17:50
11	08:28	08:07	07:30	06:42	06:04	05:47	05:56	06:21	06:48	07:15	07:47	08:17
	18:09	18:44	19:13	19:42	20:10	20:34	20:36	20:11	19:27	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:47	05:56	06:22	06:49	07:16	07:48	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:36	20:09	19:25	18:39	18:01	17:50
13	08:27	08:05	07:27	06:39	06:02	05:47	05:57	06:23	06:50	07:17	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:35	20:35	20:08	19:24	18:37	18:01	17:51
14	08:27	08:04	07:25	06:38	06:01	05:47	05:58	06:23	06:51	07:18	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:35	20:07	19:22	18:36	18:00	17:51
15	08:27	08:02	07:24	06:36	06:01	05:47	05:59	06:24	06:51	07:19	07:51	08:20
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:06	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	06:00	05:47	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36	20:34	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:34	05:59	05:47	06:00	06:26	06:53	07:20	07:53	08:21
	18:16	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:58	17:52
18	08:26	07:59	07:19	06:32	05:58	05:47	06:01	06:27	06:54	07:21	07:54	08:22
	18:17	18:51	19:20	19:49	20:17	20:37	20:33	20:02	19:16	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:18	20:37	20:32	20:00	19:14	18:29	17:56	17:52
20	08:25	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:56	07:23	07:56	08:23
	18:19	18:53	19:22	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:56	17:53
21	08:24	07:55	07:14	06:28	05:56	05:47	06:03	06:30	06:57	07:24	07:57	08:23
	18:20	18:55	19:23	19:52	20:19	20:37	20:31	19:58	19:11	18:26	17:55	17:53
22	08:24	07:54	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:56	19:24	19:53	20:20	20:38	20:30	19:56	19:09	18:25	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:48	06:05	06:31	06:58	07:26	08:00	08:24
	18:22	18:57	19:25	19:54	20:21	20:38	20:29	19:55	19:08	18:23	17:54	17:54
24	08:23	07:51	07:10	06:24	05:54	05:48	06:05	06:32	06:59	07:27	08:01	08:25
	18:23	18:58	19:25	19:55	20:22	20:38	20:28	19:54	19:06	18:22	17:53	17:55
25	08:22	07:50	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:02	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:28	19:52	19:05	18:21	17:53	17:55
26	08:21	07:48	07:07	06:21	05:52	05:48	06:07	06:34	07:01	07:30	08:03	08:26
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:21	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:31	08:04	08:26
	18:27	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:46	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:32	08:05	08:26
	18:28	19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49	06:09	06:37	07:04	07:33	08:06	08:27
	18:29		19:30	19:59	20:26	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:05	07:34	08:07	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51	17:59
31	08:18		06:59		05:50		06:11	06:38		07:35		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	444	451	423	374	348	304	296
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

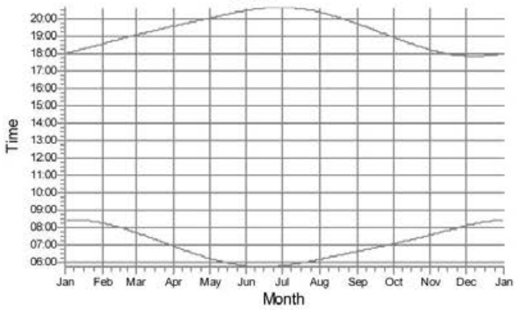
Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

AECOM

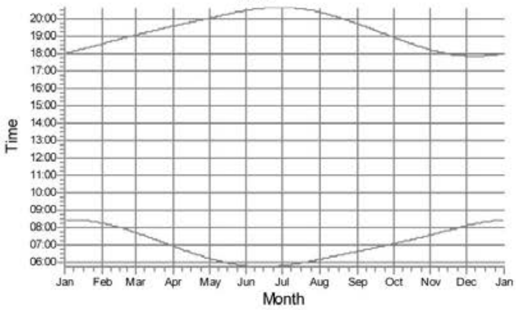
SHADOW - Calendar per WTG, graphical

Calculation: Mersinli Shadow Flicker - Worst Case

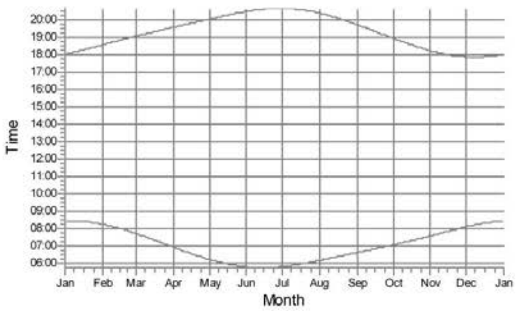
T5: T5



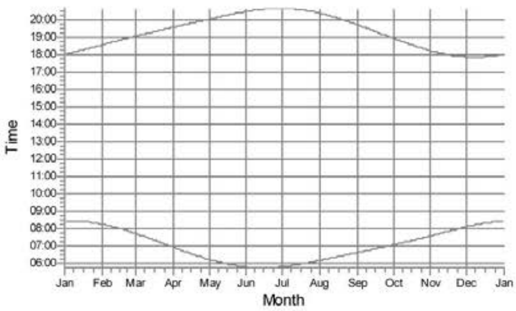
T6: T6



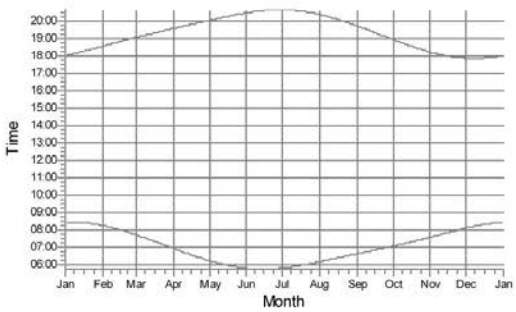
T7: T7



T8: T8



T9: T9



Shadow receptors

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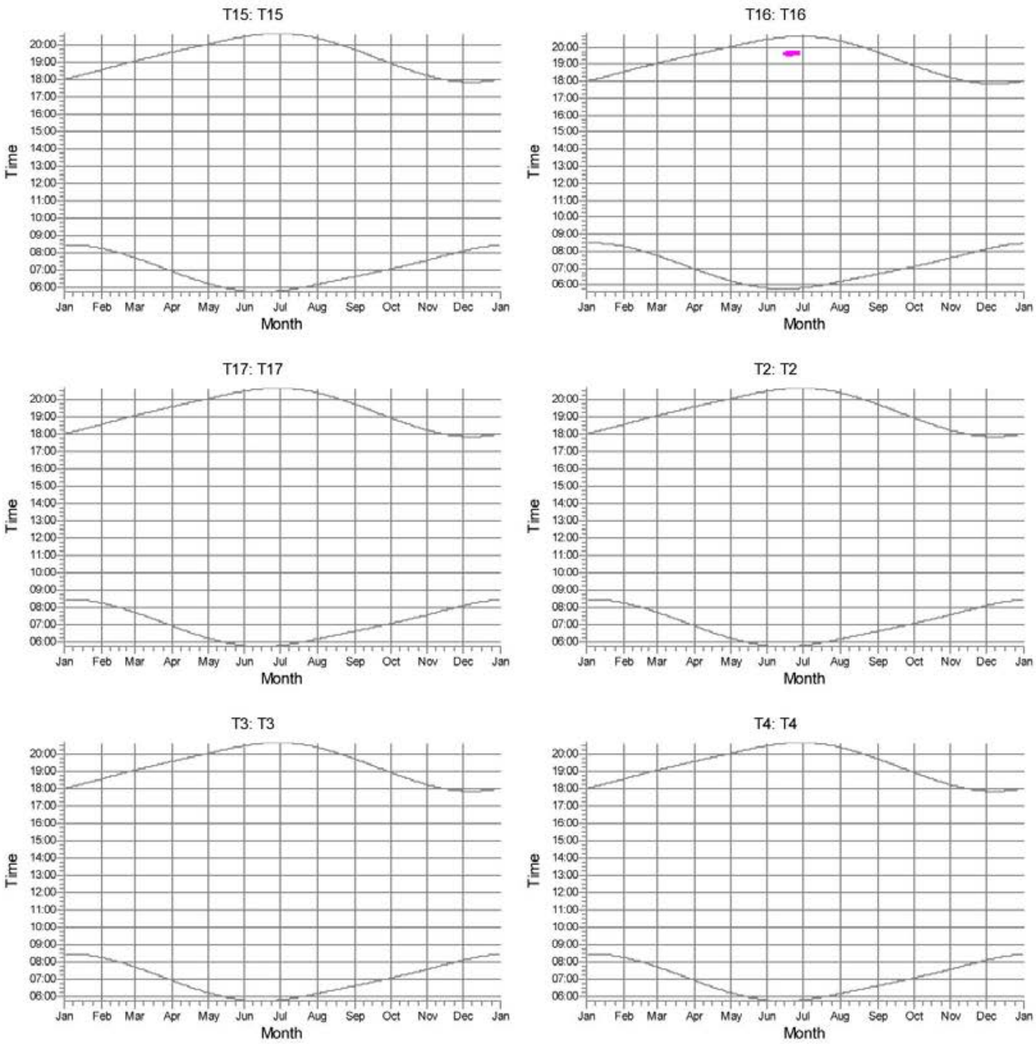
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

SHADOW - Calendar per WTG, graphical

Calculation: Mersinli Shadow Flicker - Worst Case



Shadow receptors

NSR4: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 90.0° (1)

Project:
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AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
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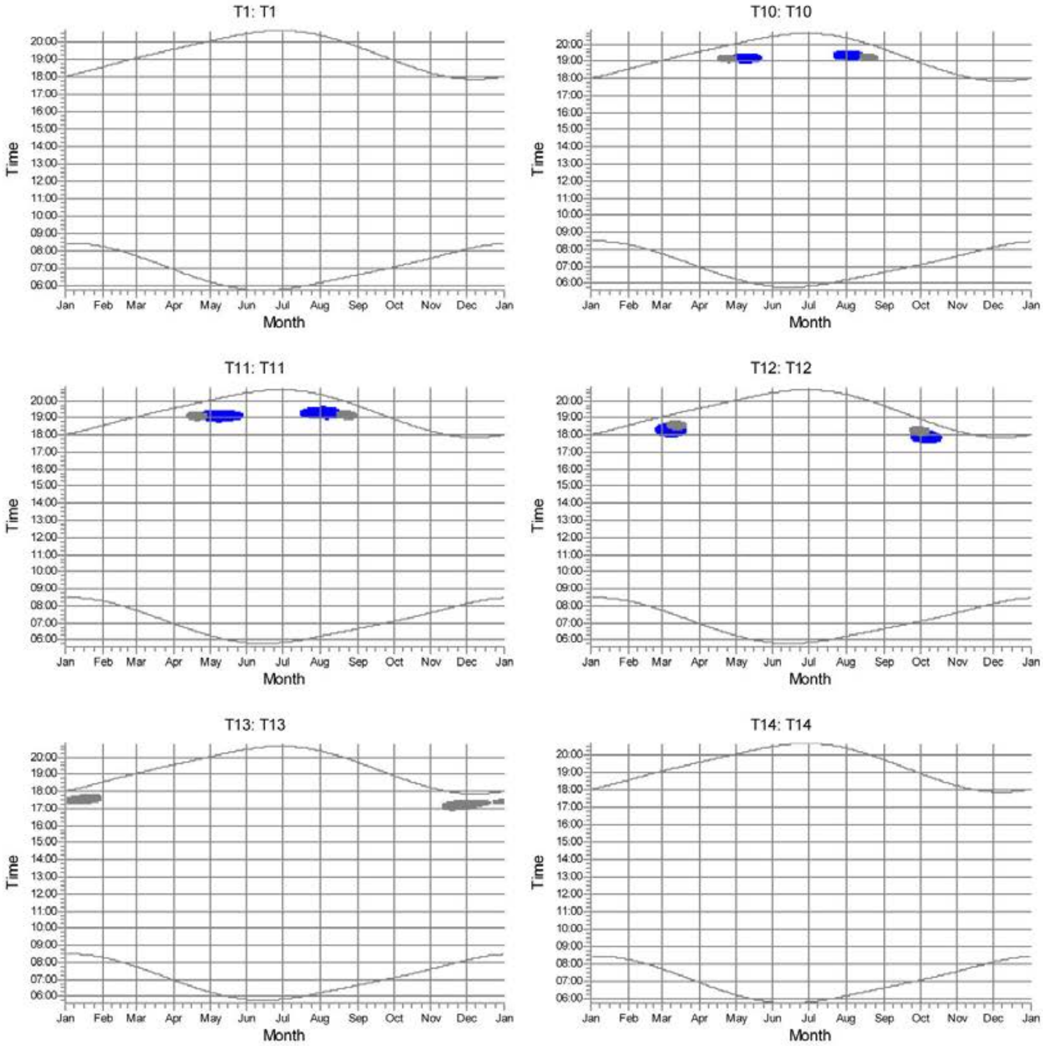
SHADOW - Calendar per WTG, graphical

Calculation: Mersinli Shadow Flicker - Worst Case



Shadow receptors

NSR1: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 90.0° (2)

NSR2: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 90.0° (3)

Project:
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+44 191 224 6610
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Calculated:
19/06/2017 12:19/3.1.617

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SHADOW - Calendar

Calculation: Mersinli Shadow Flicker - Worst Case**Shadow receptor:** NSR4 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 90.0° (1)

Assumptions for shadow calculations

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

	January	February	March	April	May	June			July	August	September	October	November	December
1	08:27	08:16	07:44	06:57	06:15	05:49			05:50	06:12	06:39	07:05	07:35	08:07
	18:00	18:32	19:03	19:33	20:01	20:27			20:38	20:21	19:42	18:55	18:12	17:51
2	08:27	08:15	07:42	06:56	06:14	05:49			05:51	06:13	06:40	07:06	07:37	08:08
	18:01	18:33	19:04	19:34	20:02	20:28			20:38	20:20	19:40	18:53	18:11	17:51
3	08:27	08:15	07:41	06:54	06:13	05:48			05:51	06:14	06:41	07:07	07:38	08:09
	18:02	18:34	19:05	19:35	20:03	20:29			20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48			05:52	06:14	06:42	07:08	07:39	08:10
	18:03	18:35	19:06	19:36	20:04	20:29			20:37	20:18	19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51	06:10	05:48			05:52	06:15	06:42	07:09	07:40	08:11
	18:04	18:37	19:07	19:36	20:05	20:30			20:37	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:49	06:09	05:47			05:53	06:16	06:43	07:10	07:41	08:12
	18:05	18:38	19:08	19:37	20:05	20:31			20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47			05:53	06:17	06:44	07:11	07:42	08:13
	18:05	18:39	19:09	19:38	20:06	20:31			20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47			05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39	20:07	20:32			20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45	06:06	05:47			05:54	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:08	20:32			20:36	20:13	19:29	18:43	18:04	17:50
10	08:27	08:08	07:31	06:44	06:05	05:47			05:55	06:20	06:47	07:13	07:45	08:15
	18:08	18:42	19:12	19:41	20:09	20:33			20:36	20:11	19:28	18:41	18:03	17:50
11	08:27	08:07	07:29	06:42	06:04	05:47			05:56	06:21	06:48	07:14	07:46	08:16
	18:09	18:43	19:13	19:42	20:10	20:33			20:36	20:10	19:26	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:46			05:56	06:21	06:49	07:15	07:47	08:17
	18:10	18:44	19:14	19:43	20:11	20:34			20:35	20:09	19:25	18:38	18:01	17:50
13	08:27	08:04	07:26	06:39	06:02	05:46			05:57	06:22	06:49	07:16	07:48	08:18
	18:11	18:46	19:15	19:44	20:12	20:34			20:35	20:08	19:23	18:37	18:00	17:50
14	08:27	08:03	07:25	06:38	06:01	05:46			05:58	06:23	06:50	07:17	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35			20:34	20:07	19:22	18:35	18:00	17:51
15	08:26	08:02	07:23	06:36	06:00	05:46		19:36 (T16)	05:58	06:24	06:51	07:18	07:51	08:19
	18:13	18:48	19:17	19:46	20:14	20:35	2	19:38 (T16)	20:34	20:05	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	05:59	05:46		19:35 (T16)	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:35	4	19:39 (T16)	20:33	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:33	05:59	05:46		19:35 (T16)	06:00	06:26	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48	20:15	20:36	5	19:40 (T16)	20:33	20:03	19:17	18:31	17:57	17:52
18	08:25	07:58	07:19	06:32	05:58	05:47		19:34 (T16)	06:01	06:27	06:54	07:21	07:54	08:21
	18:16	18:51	19:20	19:49	20:16	20:36	7	19:41 (T16)	20:32	20:01	19:15	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47		19:34 (T16)	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:20	19:50	20:17	20:36	7	19:41 (T16)	20:32	20:00	19:14	18:28	17:56	17:52
20	08:24	07:56	07:16	06:29	05:56	05:47		19:34 (T16)	06:02	06:29	06:55	07:23	07:56	08:22
	18:19	18:53	19:21	19:50	20:18	20:37	7	19:41 (T16)	20:31	19:59	19:12	18:27	17:55	17:53
21	08:24	07:55	07:14	06:28	05:55	05:47		19:34 (T16)	06:03	06:29	06:56	07:24	07:57	08:23
	18:20	18:54	19:22	19:51	20:19	20:37	7	19:41 (T16)	20:30	19:57	19:11	18:26	17:55	17:53
22	08:23	07:53	07:13	06:27	05:55	05:47		19:35 (T16)	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:55	19:23	19:52	20:20	20:37	7	19:42 (T16)	20:30	19:56	19:09	18:24	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:47		19:35 (T16)	06:04	06:31	06:58	07:26	07:59	08:24
	18:22	18:56	19:24	19:53	20:21	20:37	7	19:42 (T16)	20:29	19:55	19:07	18:23	17:54	17:54
24	08:22	07:51	07:09	06:24	05:53	05:48		19:35 (T16)	06:05	06:32	06:59	07:27	08:00	08:25
	18:23	18:57	19:25	19:54	20:21	20:38	7	19:42 (T16)	20:28	19:53	19:06	18:22	17:53	17:55
25	08:22	07:49	07:08	06:23	05:53	05:48		19:36 (T16)	06:06	06:33	07:00	07:28	08:01	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	5	19:41 (T16)	20:27	19:52	19:04	18:21	17:53	17:55
26	08:21	07:48	07:06	06:21	05:52	05:48		19:37 (T16)	06:07	06:34	07:01	07:29	08:02	08:25
	18:25	19:00	19:27	19:56	20:23	20:38	5	19:42 (T16)	20:26	19:50	19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	05:52	05:49		19:38 (T16)	06:08	06:35	07:02	07:30	08:03	08:26
	18:26	19:01	19:28	19:57	20:24	20:38	3	19:41 (T16)	20:26	19:49	19:01	18:18	17:52	17:56
28	08:19	07:45	07:03	06:19	05:51	05:49			06:08	06:36	07:02	07:31	08:04	08:26
	18:27	19:02	19:29	19:58	20:24	20:38			20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:17	05:51	05:49			06:09	06:36	07:03	07:32	08:05	08:26
	18:29		19:30	19:59	20:25	20:38			20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50			06:10	06:37	07:04	07:33	08:06	08:27
	18:30		19:31	20:00	20:26	20:38			20:23	19:45	18:56	18:14	17:51	17:59
31	08:17		06:59		05:50				06:11	06:38		07:34		08:27
	18:31		19:32		20:27				20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	443			451	423	374	348	304	296
Total, worst case							73							

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
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Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

AECOM

SHADOW - Calendar

Calculation: Mersinli Shadow Flicker - Worst Case**Shadow receptor:** NSR2 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 90.0° (3)

Assumptions for shadow calculations

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

	July	August			September			October			November			December		
1	05:50	06:12			06:39			07:05		18:02 (T12)	07:36			08:07		17:01 (T13)
	20:38	20:21			19:42			18:55	24	18:26 (T12)	18:12			17:51	23	17:24 (T13)
2	05:51	06:13			06:40			07:06		18:01 (T12)	07:37			08:08		17:01 (T13)
	20:38	20:20			19:40			18:53	24	18:25 (T12)	18:11			17:51	23	17:24 (T13)
3	05:51	06:14			06:41			07:07		18:01 (T12)	07:38			08:09		17:02 (T13)
	20:38	20:19			19:39			18:52	23	18:24 (T12)	18:10			17:50	22	17:24 (T13)
4	05:52	06:14			06:42			07:08		18:02 (T12)	07:39			08:10		17:03 (T13)
	20:38	20:18			19:37			18:50	21	18:23 (T12)	18:09			17:50	21	17:24 (T13)
5	05:52	06:15			06:43			07:09		18:02 (T12)	07:40			08:11		17:04 (T13)
	20:37	20:17			19:36			18:49	20	18:22 (T12)	18:08			17:50	20	17:24 (T13)
6	05:53	06:16			06:43			07:10		18:03 (T12)	07:41			08:12		17:04 (T13)
	20:37	20:16			19:34			18:47	17	18:20 (T12)	18:07			17:50	19	17:23 (T13)
7	05:53	06:17			06:44			07:11		18:05 (T12)	07:42			08:13		17:05 (T13)
	20:37	20:15			19:33			18:46	13	18:18 (T12)	18:06			17:50	18	17:23 (T13)
8	05:54	06:18			06:45			07:12		18:09 (T12)	07:43			08:14		17:06 (T13)
	20:37	20:14			19:31			18:44	5	18:14 (T12)	18:05			17:50	17	17:23 (T13)
9	05:54	06:19			06:46			07:13			07:44			08:15		17:07 (T13)
	20:36	20:13			19:30			18:43			18:04			17:50	16	17:23 (T13)
10	05:55	06:20			06:47			07:14			07:45			08:16		17:09 (T13)
	20:36	20:12			19:28			18:41			18:03			17:50	14	17:23 (T13)
11	05:56	06:21			06:48			07:14			07:46			08:16		17:10 (T13)
	20:36	20:10			19:26			18:40			18:02			17:50	13	17:23 (T13)
12	05:56	06:22			06:49			07:15			07:47		17:03 (T13)	08:17		17:10 (T13)
	20:35	20:09			19:25			18:38			18:01	9	17:12 (T13)	17:50	12	17:22 (T13)
13	05:57	06:22		19:11 (T10)	06:49			07:16			07:49		17:01 (T13)	08:18		17:11 (T13)
	20:35	20:08	9	19:20 (T10)	19:23			18:37			18:00	14	17:15 (T13)	17:50	11	17:22 (T13)
14	05:58	06:23		19:08 (T10)	06:50			07:17			07:50		16:59 (T13)	08:19		17:13 (T13)
	20:34	20:07	13	19:21 (T10)	19:22			18:35			18:00	17	17:16 (T13)	17:51	9	17:22 (T13)
15	05:58	06:24		19:06 (T11)	06:51			07:18			07:51		16:58 (T13)	08:19		17:13 (T13)
	20:34	20:05	16	19:22 (T10)	19:20			18:34			17:59	19	17:17 (T13)	17:51	9	17:22 (T13)
16	05:59	06:25		19:04 (T11)	06:52			07:19			07:52		16:57 (T13)	08:20		17:15 (T13)
	20:33	20:04	19	19:23 (T10)	19:19			18:33			17:58	21	17:18 (T13)	17:51	7	17:22 (T13)
17	06:00	06:26		19:02 (T11)	06:53			07:20			07:53		16:57 (T13)	08:21		17:16 (T13)
	20:33	20:03	21	19:23 (T10)	19:17			18:31			17:57	22	17:19 (T13)	17:52	6	17:22 (T13)
18	06:01	06:27		19:01 (T11)	06:54			07:21			07:54		16:56 (T13)	08:21		17:17 (T13)
	20:32	20:02	23	19:24 (T10)	19:15			18:30			17:57	24	17:20 (T13)	17:52	4	17:21 (T13)
19	06:01	06:28		19:00 (T11)	06:55			07:22			07:55		16:56 (T13)	08:22		17:18 (T13)
	20:32	20:00	24	19:24 (T10)	19:14			18:28			17:56	24	17:20 (T13)	17:52	3	17:21 (T13)
20	06:02	06:29		18:59 (T11)	06:56			07:23			07:56		16:56 (T13)	08:23		17:19 (T13)
	20:31	19:59	24	19:23 (T10)	19:12			18:27			17:55	25	17:21 (T13)	17:53	1	17:20 (T13)
21	06:03	06:29		18:59 (T11)	06:56			07:24			07:57		16:57 (T13)	08:23		
	20:30	19:58	24	19:23 (T10)	19:11			18:26			17:55	25	17:22 (T13)	17:53		
22	06:04	06:30		18:58 (T11)	06:57			07:25			07:58		16:57 (T13)	08:24		
	20:30	19:56	24	19:22 (T10)	19:09			18:24			17:54	25	17:22 (T13)	17:54		
23	06:04	06:31		18:57 (T11)	06:58		18:13 (T12)	07:26			07:59		16:57 (T13)	08:24		
	20:29	19:55	24	19:21 (T11)	19:08	8	18:21 (T12)	18:23			17:54	25	17:22 (T13)	17:54		
24	06:05	06:32		18:57 (T11)	06:59		18:09 (T12)	07:27			08:00		16:57 (T13)	08:25		17:21 (T13)
	20:28	19:53	23	19:20 (T11)	19:06	14	18:23 (T12)	18:22			17:53	26	17:23 (T13)	17:55	2	17:23 (T13)
25	06:06	06:33		18:57 (T11)	07:00		18:07 (T12)	07:28			08:01		16:57 (T13)	08:25		17:21 (T13)
	20:27	19:52	23	19:20 (T11)	19:04	17	18:24 (T12)	18:21			17:53	26	17:23 (T13)	17:55	4	17:25 (T13)
26	06:07	06:34		18:58 (T11)	07:01		18:05 (T12)	07:29			08:02		16:58 (T13)	08:26		17:20 (T13)
	20:27	19:51	21	19:19 (T11)	19:03	20	18:25 (T12)	18:19			17:52	25	17:23 (T13)	17:56	6	17:26 (T13)
27	06:08	06:35		18:58 (T11)	07:02		18:04 (T12)	07:30			08:03		16:58 (T13)	08:26		17:20 (T13)
	20:26	19:49	20	19:18 (T11)	19:01	22	18:26 (T12)	18:18			17:52	25	17:23 (T13)	17:56	6	17:26 (T13)
28	06:08	06:36		18:59 (T11)	07:03		18:03 (T12)	07:31			08:04		16:59 (T13)	08:26		17:19 (T13)
	20:25	19:48	18	19:17 (T11)	19:00	23	18:26 (T12)	18:17			17:52	24	17:23 (T13)	17:57	8	17:27 (T13)
29	06:09	06:36		18:59 (T11)	07:03		18:03 (T12)	07:32			08:05		16:59 (T13)	08:27		17:20 (T13)
	20:24	19:46	16	19:15 (T11)	18:58	23	18:26 (T12)	18:16			17:51	24	17:23 (T13)	17:58	9	17:29 (T13)
30	06:10	06:37		19:01 (T11)	07:04		18:02 (T12)	07:33			08:06		17:00 (T13)	08:27		17:19 (T13)
	20:23	19:45	12	19:13 (T11)	18:57	24	18:26 (T12)	18:14			17:51	23	17:23 (T13)	17:59	11	17:30 (T13)
31	06:11	06:38		19:06 (T11)				07:35						08:27		17:19 (T13)
	20:22	19:43	2	19:08 (T11)				18:13						17:59	12	17:31 (T13)
Potential sun hours	451	423			374			348			304			296		
Total, worst case			356			151			147			423			326	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

AECOM

SHADOW - Calendar

Calculation: Mersinli Shadow Flicker - Worst Case**Shadow receptor:** NSR2 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 90.0° (3)

Assumptions for shadow calculations

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

	January			February	March			April			May	June
1	08:27 18:00	13	17:19 (T13) 17:32 (T13)	08:16 18:32	07:44 19:03			06:57 19:33			06:15 20:01	05:49 20:27
2	08:28 18:01	14	17:19 (T13) 17:33 (T13)	08:16 18:33	07:43 19:04			06:56 19:34			06:14 20:02	05:49 20:28
3	08:28 18:02	16	17:18 (T13) 17:34 (T13)	08:15 18:34	07:41 19:05			06:54 19:35			06:13 20:03	05:48 20:29
4	08:28 18:03	17	17:18 (T13) 17:35 (T13)	08:14 18:35	07:40 19:06			06:53 19:36			06:12 20:04	05:48 20:29
5	08:28 18:04	18	17:18 (T13) 17:36 (T13)	08:13 18:37	07:38 19:07			06:51 19:37			06:10 20:05	05:48 20:30
6	08:28 18:05	19	17:18 (T13) 17:37 (T13)	08:12 18:38	07:37 19:08	10	18:31 (T12) 18:41 (T12)	06:50 19:37			06:09 20:06	05:47 20:31
7	08:28 18:05	20	17:18 (T13) 17:38 (T13)	08:11 18:39	07:35 19:09	15	18:28 (T12) 18:43 (T12)	06:48 19:38			06:08 20:07	05:47 20:31
8	08:28 18:06	21	17:18 (T13) 17:39 (T13)	08:10 18:40	07:34 19:10	19	18:26 (T12) 18:45 (T12)	06:47 19:39			06:07 20:07	05:47 20:32
9	08:28 18:07	22	17:18 (T13) 17:40 (T13)	08:09 18:41	07:32 19:11	21	18:24 (T12) 18:45 (T12)	06:45 19:40			06:06 20:08	05:47 20:32
10	08:28 18:08	23	17:18 (T13) 17:41 (T13)	08:08 18:42	07:31 19:12	22	18:24 (T12) 18:46 (T12)	06:44 19:41			06:05 20:09	05:47 20:33
11	08:27 18:09	22	17:19 (T13) 17:41 (T13)	08:07 18:43	07:29 19:13	23	18:23 (T12) 18:46 (T12)	06:42 19:42			06:04 20:10	05:47 20:33
12	08:27 18:10	23	17:19 (T13) 17:42 (T13)	08:06 18:44	07:28 19:14	25	18:22 (T12) 18:47 (T12)	06:41 19:43	3	19:05 (T11) 19:08 (T11)	06:03 20:11	05:46 20:34
13	08:27 18:11	24	17:18 (T13) 17:42 (T13)	08:04 18:46	07:26 19:15	24	18:22 (T12) 18:46 (T12)	06:39 19:44	12	19:01 (T11) 19:13 (T11)	06:02 20:12	05:46 20:34
14	08:27 18:12	24	17:19 (T13) 17:43 (T13)	08:03 18:47	07:25 19:16	24	18:22 (T12) 18:46 (T12)	06:38 19:45	16	18:58 (T11) 19:14 (T11)	06:01 20:13	05:46 20:35
15	08:26 18:13	25	17:19 (T13) 17:44 (T13)	08:02 18:48	07:23 19:17	23	18:22 (T12) 18:45 (T12)	06:36 19:46	18	18:57 (T11) 19:15 (T11)	06:00 20:14	05:46 20:35
16	08:26 18:14	25	17:19 (T13) 17:44 (T13)	08:01 18:49	07:22 19:18	23	18:22 (T12) 18:45 (T12)	06:35 19:47	21	18:56 (T11) 19:17 (T11)	05:59 20:15	05:46 20:36
17	08:26 18:15	26	17:19 (T13) 17:45 (T13)	08:00 18:50	07:20 19:19	21	18:22 (T12) 18:43 (T12)	06:33 19:48	21	18:55 (T11) 19:16 (T11)	05:59 20:16	05:46 20:36
18	08:25 18:16	26	17:20 (T13) 17:46 (T13)	07:59 18:51	07:19 19:20	18	18:24 (T12) 18:42 (T12)	06:32 19:49	22	18:55 (T11) 19:17 (T11)	05:58 20:16	05:47 20:36
19	08:25 18:18	25	17:20 (T13) 17:45 (T13)	07:57 18:52	07:17 19:21	15	18:25 (T12) 18:40 (T12)	06:31 19:50	24	18:53 (T11) 19:17 (T11)	05:57 20:17	05:47 20:37
20	08:24 18:19	25	17:21 (T13) 17:46 (T13)	07:56 18:53	07:16 19:22	11	18:27 (T12) 18:38 (T12)	06:29 19:51	24	18:53 (T11) 19:17 (T11)	05:56 20:18	05:47 20:37
21	08:24 18:20	25	17:21 (T13) 17:46 (T13)	07:55 18:54	07:14 19:22			06:28 19:52	24	18:54 (T11) 19:18 (T10)	05:55 20:19	05:47 20:37
22	08:23 18:21	25	17:22 (T13) 17:47 (T13)	07:53 18:55	07:13 19:23			06:27 19:52	24	18:53 (T11) 19:17 (T10)	05:55 20:20	05:47 20:37
23	08:23 18:22	24	17:22 (T13) 17:46 (T13)	07:52 18:56	07:11 19:24			06:25 19:53	24	18:54 (T11) 19:18 (T10)	05:54 20:21	05:47 20:38
24	08:22 18:23	24	17:22 (T13) 17:46 (T13)	07:51 18:58	07:09 19:25			06:24 19:54	24	18:54 (T11) 19:18 (T10)	05:53 20:21	05:48 20:38
25	08:22 18:24	22	17:24 (T13) 17:46 (T13)	07:49 18:59	07:08 19:26			06:23 19:55	23	18:54 (T11) 19:17 (T10)	05:53 20:22	05:48 20:38
26	08:21 18:25	21	17:24 (T13) 17:45 (T13)	07:48 19:00	07:06 19:27			06:21 19:56	20	18:56 (T11) 19:16 (T10)	05:52 20:23	05:48 20:38
27	08:20 18:26	19	17:25 (T13) 17:44 (T13)	07:47 19:01	07:05 19:28			06:20 19:57	19	18:57 (T11) 19:16 (T10)	05:52 20:24	05:49 20:38
28	08:20 18:28	17	17:27 (T13) 17:44 (T13)	07:45 19:02	07:03 19:29			06:19 19:58	15	19:00 (T11) 19:15 (T10)	05:51 20:25	05:49 20:38
29	08:19 18:29	14	17:29 (T13) 17:43 (T13)		07:02 19:30			06:17 19:59	12	19:01 (T10) 19:13 (T10)	05:51 20:25	05:49 20:38
30	08:18 18:30	9	17:31 (T13) 17:40 (T13)		07:00 19:31			06:16 20:00	8	19:03 (T10) 19:11 (T10)	05:50 20:26	05:50 20:38
31	08:17 18:31				06:59 19:32						05:50 20:27	
Potential sun hours	305			301	370			395			441	443
Total, worst case		628				294			354			

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm) Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker Last time (hh:mm) with flicker	(WTG causing flicker first time) (WTG causing flicker last time)

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

AECOM

SHADOW - Calendar

Calculation: Mersinli Shadow Flicker - Worst Case**Shadow receptor:** NSR1 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 90.0° (2)

Assumptions for shadow calculations

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

	July			August			September			October			November	December
1	05:50			06:12		18:59 (T11)	06:39			07:05		17:37 (T12)	07:36	08:07
	20:38			20:21	35	19:34 (T11)	19:42			18:55	35	18:12 (T12)	18:12	17:51
2	05:51			06:13		18:59 (T11)	06:40			07:06		17:36 (T12)	07:37	08:08
	20:38			20:20	36	19:35 (T11)	19:40			18:53	36	18:12 (T12)	18:11	17:51
3	05:51			06:14		18:59 (T11)	06:41			07:07		17:34 (T12)	07:38	08:09
	20:38			20:19	36	19:35 (T11)	19:39			18:52	37	18:11 (T12)	18:10	17:50
4	05:52			06:15		18:59 (T11)	06:42			07:08		17:34 (T12)	07:39	08:10
	20:38			20:18	36	19:35 (T11)	19:37			18:50	37	18:11 (T12)	18:09	17:50
5	05:52			06:15		18:59 (T11)	06:43			07:09		17:33 (T12)	07:40	08:11
	20:37			20:17	36	19:35 (T11)	19:36			18:49	38	18:11 (T12)	18:08	17:50
6	05:53			06:16		18:58 (T11)	06:43			07:10		17:33 (T12)	07:41	08:12
	20:37			20:16	36	19:34 (T11)	19:34			18:47	38	18:11 (T12)	18:07	17:50
7	05:53			06:17		18:58 (T11)	06:44			07:11		17:33 (T12)	07:42	08:13
	20:37			20:15	36	19:34 (T11)	19:33			18:46	38	18:11 (T12)	18:06	17:50
8	05:54			06:18		18:59 (T11)	06:45			07:12		17:33 (T12)	07:43	08:14
	20:37			20:14	34	19:33 (T11)	19:31			18:44	37	18:10 (T12)	18:05	17:50
9	05:54			06:19		18:59 (T11)	06:46			07:13		17:33 (T12)	07:44	08:15
	20:36			20:13	34	19:33 (T11)	19:30			18:43	36	18:09 (T12)	18:04	17:50
10	05:55			06:20		18:59 (T11)	06:47			07:14		17:33 (T12)	07:45	08:16
	20:36			20:12	34	19:33 (T11)	19:28			18:41	36	18:09 (T12)	18:03	17:50
11	05:56			06:21		19:00 (T11)	06:48			07:15		17:34 (T12)	07:46	08:16
	20:36			20:10	32	19:32 (T11)	19:26			18:40	34	18:08 (T12)	18:02	17:50
12	05:56			06:22		19:01 (T11)	06:49			07:15		17:34 (T12)	07:47	08:17
	20:35			20:09	30	19:31 (T11)	19:25			18:38	33	18:07 (T12)	18:01	17:50
13	05:57			06:22		19:01 (T11)	06:49			07:16		17:35 (T12)	07:49	08:18
	20:35			20:08	29	19:30 (T11)	19:23			18:37	30	18:05 (T12)	18:00	17:51
14	05:58			06:23		19:01 (T11)	06:50			07:17		17:36 (T12)	07:50	08:19
	20:34			20:07	27	19:28 (T11)	19:22			18:36	28	18:04 (T12)	18:00	17:51
15	05:58			06:24		19:02 (T11)	06:51			07:18		17:38 (T12)	07:51	08:19
	20:34			20:05	25	19:27 (T11)	19:20			18:34	24	18:02 (T12)	17:59	17:51
16	05:59		19:12 (T11)	06:25		19:04 (T11)	06:52			07:19		17:39 (T12)	07:52	08:20
	20:33	9	19:21 (T11)	20:04	21	19:25 (T11)	19:19			18:33	21	18:00 (T12)	17:58	17:51
17	06:00		19:10 (T11)	06:26		19:06 (T11)	06:53			07:20		17:42 (T12)	07:53	08:21
	20:33	13	19:23 (T11)	20:03	17	19:23 (T11)	19:17			18:31	15	17:57 (T12)	17:57	17:52
18	06:01		19:08 (T11)	06:27		19:09 (T11)	06:54			07:21		17:49 (T12)	07:54	08:21
	20:32	16	19:24 (T11)	20:02	11	19:20 (T11)	19:15			18:30	1	17:50 (T12)	17:57	17:52
19	06:01		19:07 (T11)	06:28			06:55			07:22			07:55	08:22
	20:32	19	19:26 (T11)	20:00			19:14			18:28			17:56	17:52
20	06:02		19:06 (T11)	06:29			06:56			07:23			07:56	08:23
	20:31	21	19:27 (T11)	19:59			19:12			18:27			17:55	17:53
21	06:03		19:06 (T11)	06:29			06:56			07:24			07:57	08:23
	20:30	23	19:29 (T11)	19:58			19:11			18:26			17:55	17:53
22	06:04		19:05 (T11)	06:30			06:57			07:25			07:58	08:24
	20:30	25	19:30 (T11)	19:56			19:09			18:24			17:54	17:54
23	06:04		19:03 (T11)	06:31			06:58			07:26			07:59	08:24
	20:29	27	19:30 (T11)	19:55			19:08			18:23			17:54	17:54
24	06:05		19:03 (T11)	06:32			06:59		17:49 (T12)	07:27			08:00	08:25
	20:28	28	19:31 (T11)	19:53			19:06	14	18:03 (T12)	18:22			17:53	17:55
25	06:06		19:02 (T11)	06:33			07:00		17:46 (T12)	07:28			08:01	08:25
	20:27	30	19:32 (T11)	19:52			19:04	20	18:06 (T12)	18:21			17:53	17:55
26	06:07		19:02 (T11)	06:34			07:01		17:44 (T12)	07:29			08:02	08:26
	20:27	30	19:32 (T11)	19:51			19:03	23	18:07 (T12)	18:19			17:52	17:56
27	06:08		19:02 (T11)	06:35			07:02		17:42 (T12)	07:30			08:03	08:26
	20:26	31	19:33 (T11)	19:49			19:01	27	18:09 (T12)	18:18			17:52	17:57
28	06:09		19:01 (T11)	06:36			07:03		17:40 (T12)	07:31			08:05	08:26
	20:25	33	19:34 (T11)	19:48			19:00	30	18:10 (T12)	18:17			17:52	17:57
29	06:09		19:00 (T11)	06:36			07:03		17:39 (T12)	07:32			08:06	08:27
	20:24	33	19:33 (T11)	19:46			18:58	32	18:11 (T12)	18:16			17:51	17:58
30	06:10		19:00 (T11)	06:37			07:04		17:38 (T12)	07:34			08:07	08:27
	20:23	34	19:34 (T11)	19:45			18:57	33	18:11 (T12)	18:14			17:51	17:59
31	06:11		18:59 (T11)	06:38						07:35				08:27
	20:22	35	19:34 (T11)	19:43						18:13				17:59
Potential sun hours	451			423			374			348			304	296
Total, worst case		407			545			179			554			

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

AECOM

SHADOW - Calendar

Calculation: Mersinli Shadow Flicker - Worst Case**Shadow receptor:** NSR1 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 90.0° (2)

Assumptions for shadow calculations

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

	January	February			March			April			May			June
1	08:27	08:16			07:44		18:01 (T12)	06:57			06:15		18:52 (T11)	05:49
	18:00	18:32			19:03	31	18:32 (T12)	19:33			20:01	31	19:23 (T11)	20:28
2	08:28	08:16			07:43		18:00 (T12)	06:56			06:14		18:51 (T11)	05:49
	18:01	18:33			19:04	34	18:34 (T12)	19:34			20:02	32	19:23 (T11)	20:28
3	08:28	08:15			07:41		17:59 (T12)	06:54			06:13		18:51 (T11)	05:48
	18:02	18:34			19:05	35	18:34 (T12)	19:35			20:03	33	19:24 (T11)	20:29
4	08:28	08:14			07:40		17:59 (T12)	06:53			06:12		18:49 (T11)	05:48
	18:03	18:35			19:06	35	18:34 (T12)	19:36			20:04	34	19:23 (T11)	20:30
5	08:28	08:13			07:38		17:57 (T12)	06:51			06:10		18:49 (T11)	05:48
	18:04	18:37			19:07	37	18:34 (T12)	19:37			20:05	35	19:24 (T11)	20:30
6	08:28	08:12			07:37		17:57 (T12)	06:50			06:09		18:49 (T11)	05:48
	18:05	18:38			19:08	38	18:35 (T12)	19:37			20:06	35	19:24 (T11)	20:31
7	08:28	08:11			07:35		17:56 (T12)	06:48			06:08		18:49 (T11)	05:47
	18:05	18:39			19:09	38	18:34 (T12)	19:38			20:07	35	19:24 (T11)	20:31
8	08:28	08:10			07:34		17:57 (T12)	06:47			06:07		18:48 (T11)	05:47
	18:06	18:40			19:10	38	18:35 (T12)	19:39			20:07	36	19:24 (T11)	20:32
9	08:28	08:09			07:32		17:57 (T12)	06:45			06:06		18:48 (T11)	05:47
	18:07	18:41			19:11	38	18:35 (T12)	19:40			20:08	36	19:24 (T11)	20:32
10	08:28	08:08			07:31		17:56 (T12)	06:44			06:05		18:48 (T11)	05:47
	18:08	18:42			19:12	38	18:34 (T12)	19:41			20:09	36	19:24 (T11)	20:33
11	08:27	08:07			07:29		17:57 (T12)	06:42			06:04		18:49 (T11)	05:47
	18:09	18:43			19:13	37	18:34 (T12)	19:42			20:10	35	19:24 (T11)	20:33
12	08:27	08:06			07:28		17:57 (T12)	06:41			06:03		18:49 (T11)	05:47
	18:10	18:45			19:14	36	18:33 (T12)	19:43			20:11	35	19:24 (T11)	20:34
13	08:27	08:05			07:26		17:57 (T12)	06:39			06:02		18:49 (T11)	05:46
	18:11	18:46			19:15	34	18:31 (T12)	19:44			20:12	34	19:23 (T11)	20:34
14	08:27	08:03			07:25		17:58 (T12)	06:38			06:01		18:49 (T11)	05:46
	18:12	18:47			19:16	33	18:31 (T12)	19:45			20:13	34	19:23 (T11)	20:35
15	08:26	08:02			07:23		17:58 (T12)	06:36			06:00		18:50 (T11)	05:46
	18:13	18:48			19:17	31	18:29 (T12)	19:46			20:14	33	19:23 (T11)	20:35
16	08:26	08:01			07:22		18:00 (T12)	06:35			06:00		18:51 (T11)	05:46
	18:14	18:49			19:18	28	18:28 (T12)	19:47			20:15	32	19:23 (T11)	20:36
17	08:26	08:00			07:20		18:01 (T12)	06:33			05:59		18:51 (T11)	05:47
	18:15	18:50			19:19	25	18:26 (T12)	19:48			20:16	31	19:22 (T11)	20:36
18	08:25	07:59			07:19		18:03 (T12)	06:32			05:58		18:52 (T11)	05:47
	18:16	18:51			19:20	21	18:24 (T12)	19:49			20:16	29	19:21 (T11)	20:36
19	08:25	07:57			07:17		18:05 (T12)	06:31			05:57		18:52 (T11)	05:47
	18:18	18:52			19:21	16	18:21 (T12)	19:50			20:17	29	19:21 (T11)	20:37
20	08:24	07:56			07:16		18:10 (T12)	06:29			05:56		18:54 (T11)	05:47
	18:19	18:53			19:22	6	18:16 (T12)	19:51			20:18	27	19:21 (T11)	20:37
21	08:24	07:55			07:14			06:28			05:56		18:54 (T11)	05:47
	18:20	18:54			19:22			19:52			20:19	26	19:20 (T11)	20:37
22	08:23	07:53			07:13			06:27			05:55		18:55 (T11)	05:47
	18:21	18:55			19:23			19:52			20:20	24	19:19 (T11)	20:37
23	08:23	07:52			07:11			06:25			05:54		18:56 (T11)	05:47
	18:22	18:56			19:24			19:53			20:21	22	19:18 (T11)	20:38
24	08:22	07:51		18:13 (T12)	07:10			06:24			05:53		18:57 (T11)	05:48
	18:23	18:58	9	18:22 (T12)	19:25			19:54			20:21	20	19:17 (T11)	20:38
25	08:22	07:49		18:09 (T12)	07:08			06:23		19:01 (T11)	05:53		18:58 (T11)	05:48
	18:24	18:59	17	18:26 (T12)	19:26			19:55	13	19:14 (T11)	20:22	18	19:16 (T11)	20:38
26	08:21	07:48		18:06 (T12)	07:06			06:21		18:59 (T11)	05:52		19:00 (T11)	05:48
	18:25	19:00	22	18:28 (T12)	19:27			19:56	18	19:17 (T11)	20:23	15	19:15 (T11)	20:38
27	08:20	07:47		18:04 (T12)	07:05			06:20		18:57 (T11)	05:52		19:02 (T11)	05:49
	18:26	19:01	26	18:30 (T12)	19:28			19:57	22	19:19 (T11)	20:24	11	19:13 (T11)	20:38
28	08:20	07:45		18:02 (T12)	07:03			06:19		18:55 (T11)	05:51		19:05 (T11)	05:49
	18:28	19:02	29	18:31 (T12)	19:29			19:58	25	19:20 (T11)	20:25	5	19:10 (T11)	20:38
29	08:19				07:02			06:18		18:53 (T11)	05:51			05:49
	18:29				19:30			19:59	28	19:21 (T11)	20:25			20:38
30	08:18				07:00			06:16		18:52 (T11)	05:50			05:50
	18:30				19:31			20:00	30	19:22 (T11)	20:26			20:38
31	08:17				06:59						05:50			
	18:31				19:32						20:27			
Potential sun hours	305	301			370			395			441			443
Total, worst case			103			629			136			803		

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

AECOM

SHADOW - Calendar

Calculation: Mersinli Shadow Flicker - Worst Case**Shadow receptor:** DAGTEKKE - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 90.0° (4)

Assumptions for shadow calculations

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:27	08:16	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:07
	18:00	18:32	19:03	19:33	20:01	20:27	20:38	20:21	19:42	18:55	18:12	17:51
2	08:27	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:08
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:53	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:49	05:51	06:14	06:41	07:07	07:38	08:09
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39	08:10
	18:03	18:36	19:06	19:36	20:04	20:29	20:38	20:18	19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51	06:11	05:48	05:52	06:15	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:37	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:43	07:10	07:41	08:12
	18:05	18:38	19:08	19:37	20:06	20:31	20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:06	18:39	19:09	19:38	20:06	20:31	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39	20:07	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45	06:06	05:47	05:55	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:08	20:32	20:36	20:13	19:30	18:43	18:04	17:50
10	08:27	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03	17:50
11	08:27	08:07	07:29	06:42	06:04	05:47	05:56	06:21	06:48	07:14	07:46	08:16
	18:09	18:43	19:13	19:42	20:10	20:33	20:36	20:10	19:26	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:47	05:56	06:22	06:49	07:15	07:47	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:35	20:09	19:25	18:38	18:01	17:50
13	08:27	08:04	07:26	06:39	06:02	05:47	05:57	06:22	06:49	07:16	07:48	08:18
	18:11	18:46	19:15	19:44	20:12	20:34	20:35	20:08	19:23	18:37	18:00	17:51
14	08:27	08:03	07:25	06:38	06:01	05:47	05:58	06:23	06:50	07:17	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:34	20:07	19:22	18:36	18:00	17:51
15	08:26	08:02	07:23	06:36	06:00	05:47	05:58	06:24	06:51	07:18	07:51	08:19
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:05	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	06:00	05:47	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36	20:33	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:33	05:59	05:47	06:00	06:26	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48	20:15	20:36	20:33	20:03	19:17	18:31	17:57	17:52
18	08:25	07:58	07:19	06:32	05:58	05:47	06:01	06:27	06:54	07:21	07:54	08:21
	18:17	18:51	19:20	19:49	20:16	20:36	20:32	20:02	19:15	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:17	20:36	20:32	20:00	19:14	18:29	17:56	17:52
20	08:24	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:56	07:23	07:56	08:23
	18:19	18:53	19:22	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:55	17:53
21	08:24	07:55	07:14	06:28	05:56	05:47	06:03	06:29	06:56	07:24	07:57	08:23
	18:20	18:54	19:22	19:51	20:19	20:37	20:30	19:58	19:11	18:26	17:55	17:53
22	08:23	07:53	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:55	19:23	19:52	20:20	20:37	20:30	19:56	19:09	18:24	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:48	06:04	06:31	06:58	07:26	07:59	08:24
	18:22	18:56	19:24	19:53	20:21	20:37	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:09	06:24	05:54	05:48	06:05	06:32	06:59	07:27	08:00	08:25
	18:23	18:58	19:25	19:54	20:21	20:38	20:28	19:53	19:06	18:22	17:53	17:55
25	08:22	07:49	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:01	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:27	19:52	19:04	18:21	17:53	17:55
26	08:21	07:48	07:06	06:21	05:52	05:48	06:07	06:34	07:01	07:29	08:02	08:25
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:30	08:03	08:26
	18:26	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:45	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:31	08:04	08:26
	18:28	19:02	19:29	19:58	20:24	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49	06:09	06:36	07:03	07:32	08:05	08:26
	18:29		19:30	19:59	20:25	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:04	07:33	08:06	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51	17:59
31	08:17		06:59		05:50		06:11	06:38		07:34		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	443	451	423	374	348	304	296
Total, worst case												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

SHADOW - Calendar

Calculation: Mersinli Shadow Flicker - Worst Case**Shadow receptor:** CINARDIBI - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 90.0° (5)

Assumptions for shadow calculations

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:27	08:16	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:07
	18:00	18:32	19:03	19:33	20:01	20:27	20:38	20:21	19:42	18:55	18:12	17:51
2	08:28	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:08
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:53	18:11	17:50
3	08:28	08:15	07:41	06:54	06:13	05:48	05:51	06:14	06:41	07:07	07:38	08:09
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:14	06:42	07:08	07:39	08:10
	18:03	18:35	19:06	19:36	20:04	20:29	20:38	20:18	19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51	06:10	05:48	05:52	06:15	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:37	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:47	05:53	06:16	06:43	07:10	07:41	08:12
	18:04	18:38	19:08	19:37	20:06	20:31	20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:05	18:39	19:09	19:38	20:07	20:31	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39	20:07	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45	06:06	05:47	05:54	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:08	20:32	20:36	20:13	19:30	18:43	18:04	17:50
10	08:28	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03	17:50
11	08:27	08:07	07:29	06:42	06:04	05:47	05:56	06:21	06:48	07:14	07:46	08:16
	18:09	18:43	19:13	19:42	20:10	20:33	20:36	20:10	19:26	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:46	05:56	06:21	06:49	07:15	07:47	08:17
	18:10	18:44	19:14	19:43	20:11	20:34	20:35	20:09	19:25	18:38	18:01	17:50
13	08:27	08:04	07:26	06:39	06:02	05:46	05:57	06:22	06:49	07:16	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:34	20:35	20:08	19:23	18:37	18:00	17:50
14	08:27	08:03	07:25	06:38	06:01	05:46	05:58	06:23	06:50	07:17	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:34	20:07	19:22	18:35	18:00	17:51
15	08:26	08:02	07:23	06:36	06:00	05:46	05:58	06:24	06:51	07:18	07:51	08:19
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:05	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	05:59	05:46	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36	20:33	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:33	05:59	05:46	06:00	06:26	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:57	17:51
18	08:25	07:59	07:19	06:32	05:58	05:47	06:00	06:27	06:54	07:21	07:54	08:21
	18:16	18:51	19:20	19:49	20:16	20:36	20:32	20:02	19:15	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:17	18:52	19:21	19:50	20:17	20:37	20:32	20:00	19:14	18:28	17:56	17:52
20	08:24	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:55	07:23	07:56	08:23
	18:19	18:53	19:21	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:55	17:53
21	08:24	07:55	07:14	06:28	05:55	05:47	06:03	06:29	06:56	07:24	07:57	08:23
	18:20	18:54	19:22	19:52	20:19	20:37	20:30	19:58	19:11	18:26	17:55	17:53
22	08:23	07:53	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:55	19:23	19:52	20:20	20:37	20:30	19:56	19:09	18:24	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:47	06:04	06:31	06:58	07:26	07:59	08:24
	18:22	18:56	19:24	19:53	20:21	20:37	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:09	06:24	05:53	05:48	06:05	06:32	06:59	07:27	08:00	08:25
	18:23	18:57	19:25	19:54	20:21	20:38	20:28	19:53	19:06	18:22	17:53	17:55
25	08:22	07:49	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:01	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:27	19:52	19:04	18:21	17:53	17:55
26	08:21	07:48	07:06	06:21	05:52	05:48	06:07	06:34	07:01	07:29	08:02	08:26
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:30	08:03	08:26
	18:26	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:56
28	08:20	07:45	07:03	06:19	05:51	05:49	06:08	06:36	07:03	07:31	08:04	08:26
	18:27	19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:17	05:50	05:49	06:09	06:36	07:03	07:32	08:05	08:27
	18:29		19:30	19:59	20:25	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:04	07:33	08:06	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:14	17:51	17:58
31	08:17		06:59		05:50		06:11	06:38		07:35		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	444	451	423	374	348	304	296
Total, worst case												

Table layout: For each day in each month the following matrix apply

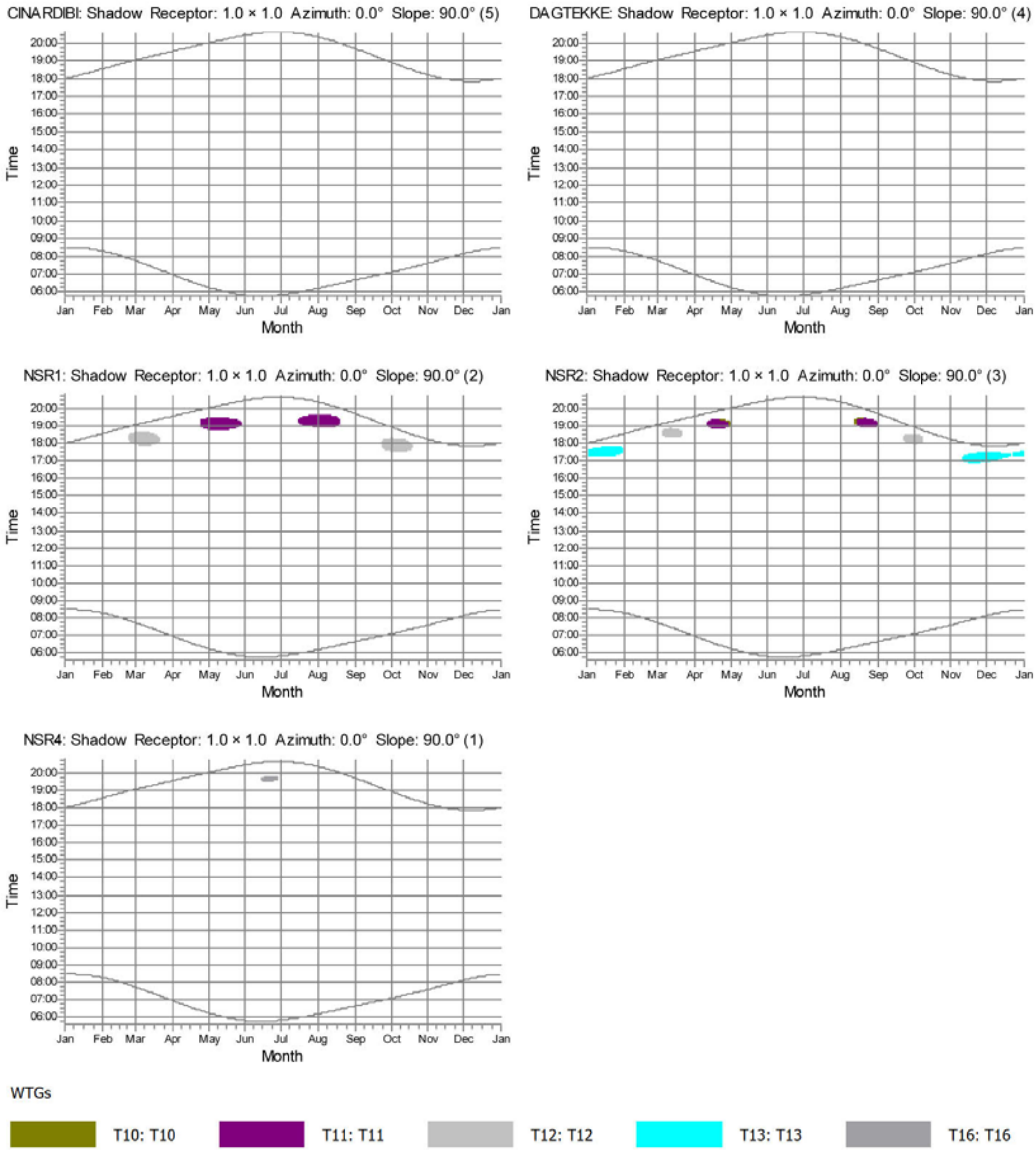
Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

SHADOW - Calendar, graphical

Calculation: Mersinli Shadow Flicker - Worst Case



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Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

SHADOW - Main Result

Calculation: Mersinli Shadow Flicker - Worst Case

Calculation Results

Shadow receptor

No.	Shadow, worst case Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
CINARDIBI	0:00	0	0:00
DAGTEKKE	0:00	0	0:00
NSR1	55:56	118	0:38
NSR2	44:39	146	0:26
NSR4	1:13	13	0:07

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]
T1	T1	0:00
T10	T10	22:52
T11	T11	40:10
T12	T12	31:05
T13	T13	22:57
T14	T14	0:00
T15	T15	0:00
T16	T16	1:13
T17	T17	0:00
T2	T2	0:00
T3	T3	0:00
T4	T4	0:00
T5	T5	0:00
T6	T6	0:00
T7	T7	0:00
T8	T8	0:00
T9	T9	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.

Project:
Mersinli WPP

Licensed user:
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Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
19/06/2017 12:19/3.1.617

AECOM

SHADOW - Main Result

Calculation: Mersinli Shadow Flicker - Worst Case

Assumptions for shadow calculations

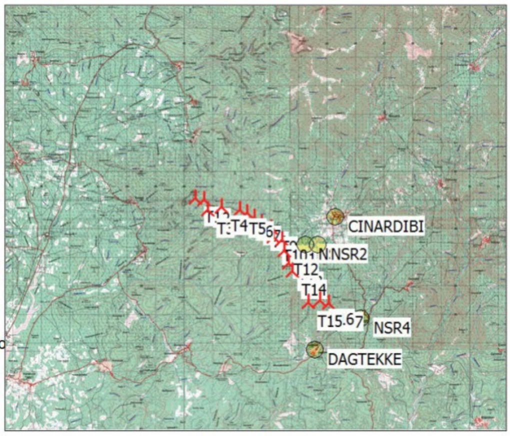
Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	0 °
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: Project Wizard Elevation Data Grid (EU-DEM 1 arc-seco
Obstacles used in calculation
Eye height: 1.5 m
Grid resolution: 10.0 m

All coordinates are in
UTM (north)-WGS84 Zone: 35



Scale 1:200,000
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]
T1	540,352	4,238,887	869.8	T1	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T10	543,080	4,237,527	832.3	T10	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T11	543,378	4,237,442	791.0	T11	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T12	543,454	4,237,061	767.0	T12	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T13	543,610	4,236,605	758.0	T13	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T14	543,726	4,236,327	775.4	T14	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T15	544,288	4,235,247	851.8	T15	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T16	544,714	4,235,312	850.4	T16	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T17	545,003	4,235,202	829.1	T17	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T2	540,643	4,238,846	894.2	T2	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T3	540,781	4,238,478	936.7	T3	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T4	541,262	4,238,589	889.9	T4	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T5	541,894	4,238,469	796.2	T5	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T6	542,151	4,238,373	785.6	T6	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T7	542,415	4,238,216	755.3	T7	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T8	542,674	4,238,009	780.5	T8	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0
T9	543,006	4,237,849	861.6	T9	Yes	VESTAS	V126-3.45mw-Mersinli-3,450	3,450	126.0	87.0	1,718	0.0

Shadow receptor-Input

No.	Easting	Northing	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
CINARDIBI	545,245	4,238,213	694.7	1.0	1.0	1.0	0.0	90.0	"Green house mode"
DAGTEKKE	544,531	4,233,581	530.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
NSR1	544,185	4,237,249	723.7	1.0	1.0	1.0	0.0	90.0	"Green house mode"
NSR2	544,625	4,237,261	705.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
NSR4	546,125	4,234,682	647.8	1.0	1.0	1.0	0.0	90.0	"Green house mode"

F.2 Realistic-Case Shadow Flicker Model Results

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Main Result

Calculation: Shadow Realistic Case

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

Sunshine probability S (Average daily sunshine hours) []

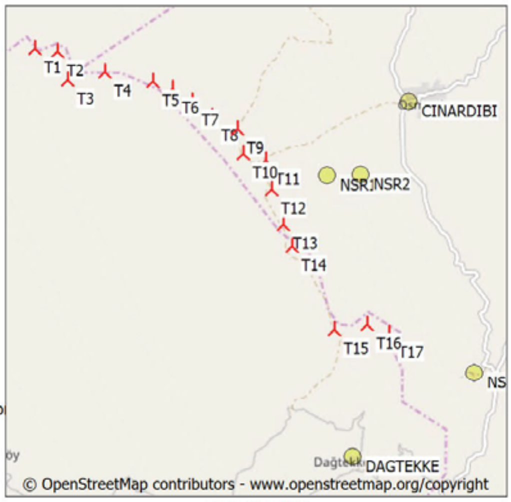
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,20	5,10	6,20	7,50	9,50	11,40	12,20	11,60	10,10	7,30	5,30	4,10

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
218	4.061	570	243	369	619	793	854	643	197	81	112	8.760

Idle start wind speed: Cut in wind speed from power curve

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: Project Wizard Elevation Data Grid (EU-DEM 1 arc-seco
Obstacles used in calculation
Eye height: 1,5 m
Grid resolution: 10,0 m



Scale 1:75.000
New WTG   Shadow receptor

All coordinates are in
UTM (north)-WGS84 Zone: 35

WTGs

	Easting	Northing	Z [m]	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data Calculation distance [m]	RPM [RPM]
T1	540.352	4.238.887	869,8	T1	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	1.718	0,0
T10	543.080	4.237.527	832,3	T10	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	1.718	0,0
T11	543.378	4.237.442	791,0	T11	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	1.718	0,0
T12	543.454	4.237.061	767,0	T12	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	1.718	0,0
T13	543.610	4.236.605	758,0	T13	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	1.718	0,0
T14	543.726	4.236.327	775,4	T14	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	1.718	0,0
T15	544.288	4.235.247	851,8	T15	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	1.718	0,0
T16	544.714	4.235.312	850,4	T16	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	1.718	0,0
T17	545.003	4.235.202	829,1	T17	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	1.718	0,0
T2	540.643	4.238.846	894,2	T2	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	1.718	0,0
T3	540.781	4.238.478	936,7	T3	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	1.718	0,0
T4	541.262	4.238.589	889,9	T4	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	1.718	0,0
T5	541.894	4.238.469	796,2	T5	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	1.718	0,0
T6	542.151	4.238.373	785,6	T6	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	1.718	0,0
T7	542.415	4.238.216	755,3	T7	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	1.718	0,0
T8	542.674	4.238.009	780,5	T8	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	1.718	0,0
T9	543.006	4.237.849	861,6	T9	Yes	VESTAS	V126-3.45mw-Mersinli-3.450	3.450	126,0	87,0	1.718	0,0

Shadow receptor-Input

No.	Name	Easting	Northing	Z [m]	Width [m]	Height [m]	Height a.g.l. [m]	Degrees from south cw [°]	Slope of window [°]	Direction mode
CINARDIBI	Shadow Receptor: D	545.245	4.238.213	694,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DAGTEKKE	Shadow Receptor: C	544.531	4.233.581	530,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
NSR1	Shadow Receptor: A	544.185	4.237.249	723,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
NSR2	Shadow Receptor: B	544.625	4.237.261	705,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
NSR4	Shadow Receptor: E	546.125	4.234.682	647,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
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Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Main Result

Calculation: Shadow Realistic Case

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values Shadow hours per year [h/year]
CINARDIBI	Shadow Receptor: D	0:00
DAGTEKKE	Shadow Receptor: C	0:00
NSR1	Shadow Receptor: A	15:32
NSR2	Shadow Receptor: B	13:59
NSR4	Shadow Receptor: E	0:21

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
T1	T1	0:00	0:00
T10	T10	22:46	5:18
T11	T11	40:03	9:31
T12	T12	31:13	9:53
T13	T13	23:00	7:13
T14	T14	0:00	0:00
T15	T15	0:00	0:00
T16	T16	1:13	0:21
T17	T17	0:00	0:00
T2	T2	0:00	0:00
T3	T3	0:00	0:00
T4	T4	0:00	0:00
T5	T5	0:00	0:00
T6	T6	0:00	0:00
T7	T7	0:00	0:00
T8	T8	0:00	0:00
T9	T9	0:00	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.

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
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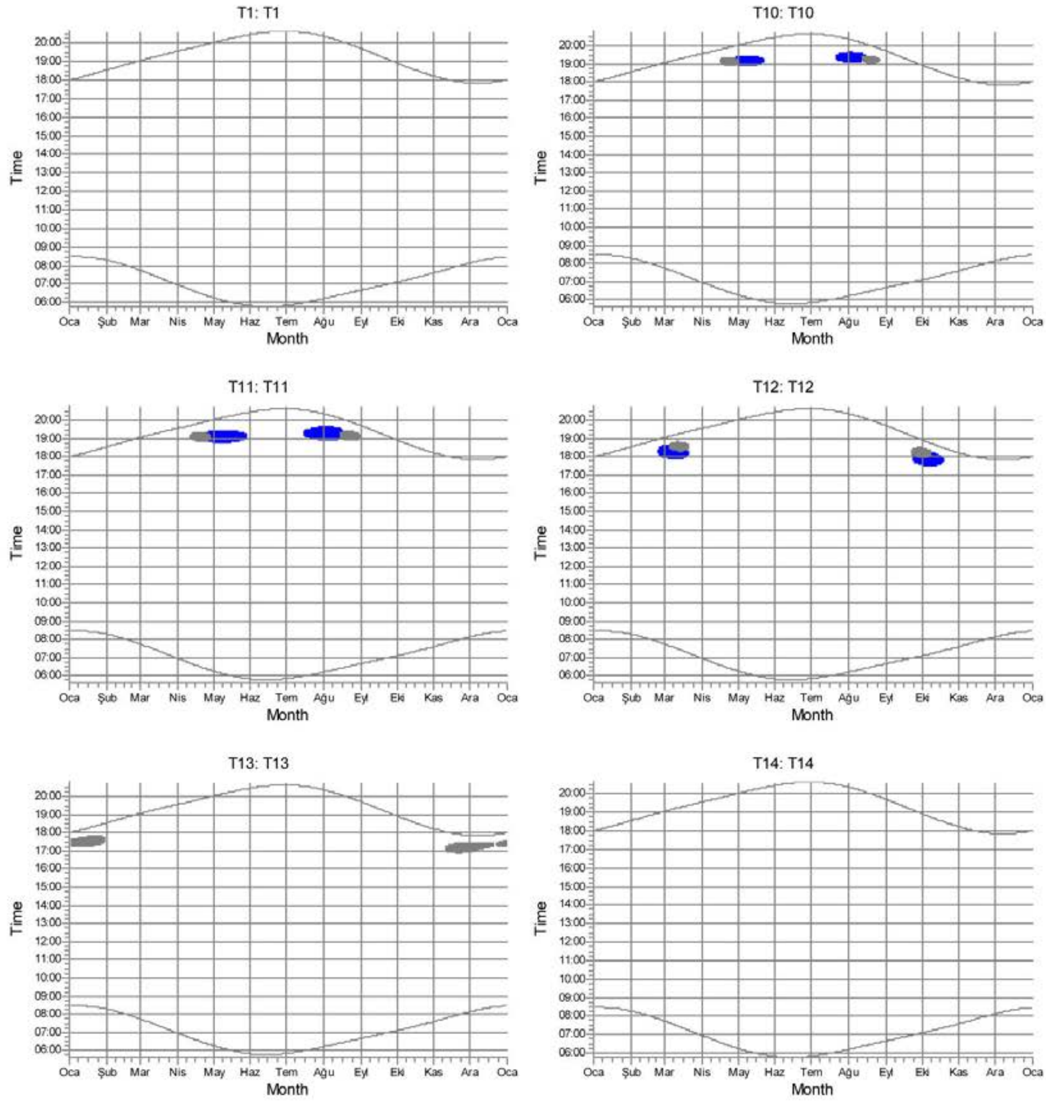
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Calendar per WTG, graphical

Calculation: Shadow Realistic Case



Shadow receptors

NSR1: Shadow Receptor: A

NSR2: Shadow Receptor: B

Project:
Mersinli WPP

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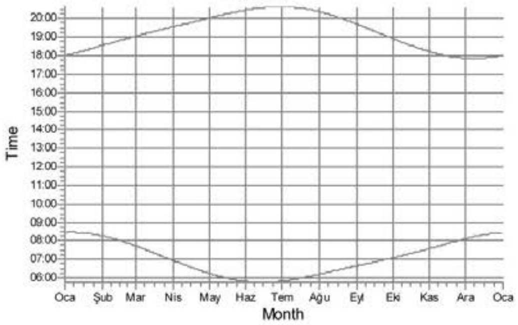
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

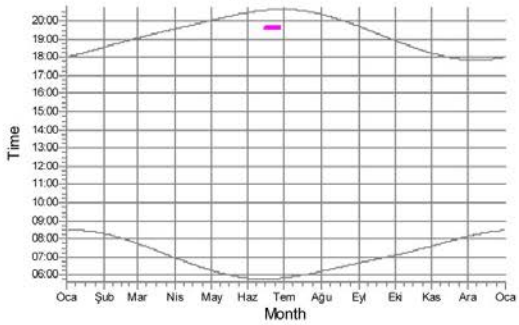
SHADOW - Calendar per WTG, graphical

Calculation: Shadow Realistic Case

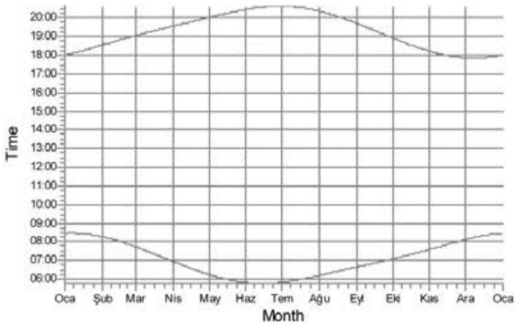
T15: T15



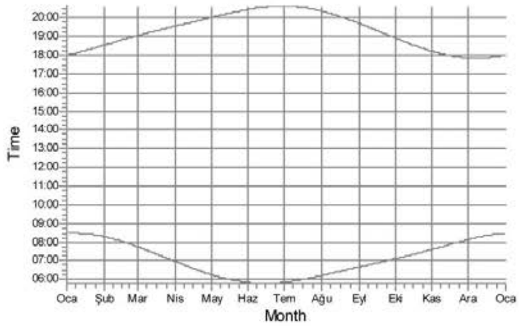
T16: T16



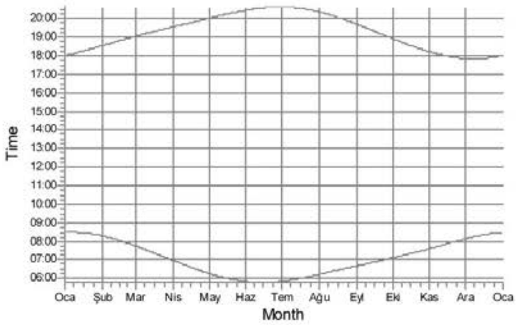
T17: T17



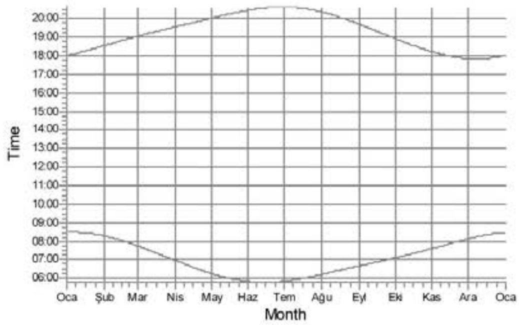
T2: T2



T3: T3



T4: T4



Shadow receptors

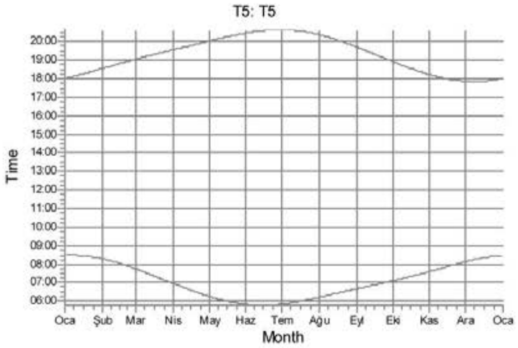
NSR4: Shadow Receptor: E

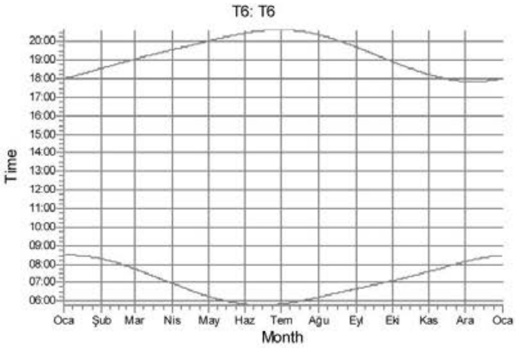
Project:
Mersinli WPP

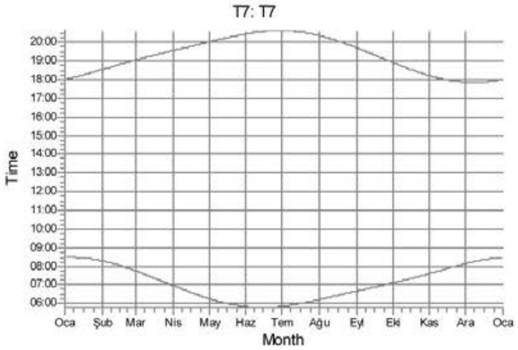
Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

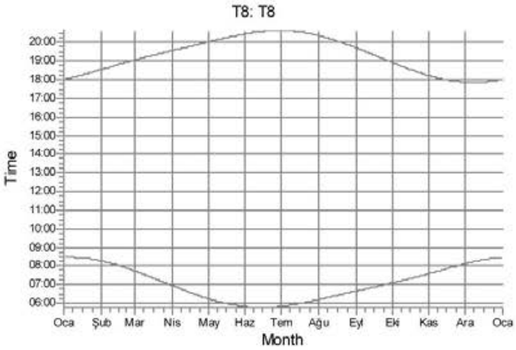
SHADOW - Calendar per WTG, graphical

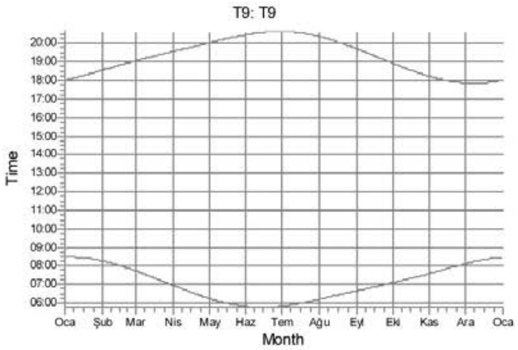
Calculation: Shadow Realistic Case











Shadow receptors

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Calendar per WTG

Calculation: Shadow Realistic Case**WTG:** T1 - T1
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,20	5,10	6,20	7,50	9,50	11,40	12,20	11,60	10,10	7,30	5,30	4,10

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
218	4.061	570	243	369	619	793	854	643	197	81	112	8.760

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:28	08:17	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:08
	18:00	18:32	19:03	19:33	20:01	20:28	20:38	20:21	19:42	18:55	18:12	17:51
2	08:28	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:09
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:54	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:49	05:51	06:14	06:41	07:07	07:38	08:10
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39	08:11
	18:03	18:36	19:06	19:36	20:04	20:30	20:38	20:18	19:37	18:51	18:09	17:50
5	08:28	08:13	07:38	06:51	06:11	05:48	05:52	06:16	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:38	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:44	07:10	07:41	08:12
	18:05	18:38	19:08	19:38	20:06	20:31	20:37	20:16	19:34	18:48	18:07	17:50
7	08:28	08:11	07:36	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:06	18:39	19:09	19:39	20:07	20:32	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:40	20:08	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:33	06:45	06:06	05:47	05:55	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:09	20:33	20:37	20:13	19:30	18:43	18:04	17:50
10	08:28	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:46	08:16
	18:08	18:42	19:12	19:41	20:10	20:33	20:36	20:12	19:28	18:42	18:03	17:50
11	08:28	08:07	07:30	06:42	06:04	05:47	05:56	06:21	06:48	07:15	07:47	08:17
	18:09	18:44	19:13	19:42	20:10	20:34	20:36	20:11	19:27	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:47	05:56	06:22	06:49	07:16	07:48	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:36	20:09	19:25	18:39	18:01	17:50
13	08:27	08:05	07:27	06:39	06:02	05:47	05:57	06:23	06:50	07:17	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:35	20:35	20:08	19:24	18:37	18:01	17:51
14	08:27	08:04	07:25	06:38	06:01	05:47	05:58	06:23	06:51	07:18	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:35	20:07	19:22	18:36	18:00	17:51
15	08:27	08:02	07:24	06:36	06:01	05:47	05:59	06:24	06:51	07:19	07:51	08:20
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:06	19:20	18:34	17:59	17:51
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17	08:26	08:00	07:20	06:34	05:59	05:47	06:00	06:26	06:53	07:20	07:53	08:21
	18:16	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:58	17:52
18	08:26	07:59	07:19	06:32	05:58	05:47	06:01	06:27	06:54	07:21	07:54	08:22
	18:17	18:51	19:20	19:49	20:17	20:37	20:33	20:02	19:16	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:18	20:37	20:32	20:00	19:14	18:29	17:56	17:52
20	08:25	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:56	07:23	07:56	08:23
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	18:20	18:55	19:23	19:52	20:19	20:37	20:31	19:58	19:11	18:26	17:55	17:53
22	08:24	07:54	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:56	19:24	19:53	20:20	20:38	20:30	19:56	19:09	18:25	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:48	06:05	06:31	06:58	07:26	08:00	08:24
	18:22	18:57	19:25	19:54	20:21	20:38	20:29	19:55	19:08	18:23	17:54	17:54
24	08:23	07:51	07:10	06:24	05:54	05:48	06:05	06:32	06:59	07:27	08:01	08:25
	18:23	18:58	19:25	19:55	20:22	20:38	20:28	19:54	19:06	18:22	17:53	17:55
25	08:22	07:50	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:02	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:28	19:52	19:05	18:21	17:53	17:55
26	08:21	07:48	07:07	06:21	05:52	05:48	06:07	06:34	07:01	07:30	08:03	08:26
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:21	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:31	08:04	08:26
	18:27	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:46	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:32	08:05	08:26
	18:28	19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49	06:09	06:37	07:04	07:33	08:06	08:27
	18:29		19:30	19:59	20:26	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:05	07:34	08:07	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51	17:59
31	08:18		06:59		05:50		06:11	06:38		07:35		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	444	451	423	374	348	304	296
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

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Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Calendar per WTG

Calculation: Shadow Realistic Case**WTG:** T10 - T10
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,20	5,10	6,20	7,50	9,50	11,40	12,20	11,60	10,10	7,30	5,30	4,10

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
218	4.061	570	243	369	619	793	854	643	197	81	112	8.760

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April		May		June	July		August		September	October	November	December
1	08:27	08:17	07:44	06:57		06:15	19:02-19:20/18	05:49	05:50		06:12	19:08-19:34/26	06:39	07:05	07:36	08:08
	18:00	18:32	19:03	19:33		20:01		20:28	20:38		20:21		19:42	18:55	18:12	17:51
2	08:28	08:16	07:43	06:56		06:14	19:00-19:21/21	05:49	05:51		06:13	19:08-19:34/26	06:40	07:06	07:37	08:09
	18:01	18:33	19:04	19:34		20:02		20:28	20:38		20:20		19:40	18:54	18:11	17:51
3	08:28	08:15	07:41	06:54		06:13	19:00-19:22/22	05:48	05:51		06:14	19:08-19:34/26	06:41	07:07	07:38	08:09
	18:02	18:34	19:05	19:35		20:03		20:29	20:38		20:19		19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53		06:12	18:59-19:23/24	05:48	05:52		06:15	19:07-19:33/26	06:42	07:08	07:39	08:10
	18:03	18:36	19:06	19:36		20:04		20:30	20:38		20:18		19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51		06:11	18:58-19:23/25	05:48	05:52		06:15	19:07-19:33/26	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37		20:05		20:30	20:37		20:17		19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50		06:09	18:58-19:24/26	05:48	05:53		06:16	19:08-19:33/25	06:43	07:10	07:41	08:12
	18:05	18:38	19:08	19:38		20:06		20:31	20:37		20:16		19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48		06:08	18:58-19:24/26	05:47	05:53		06:17	19:08-19:33/25	06:44	07:11	07:42	08:13
	18:05	18:39	19:09	19:38		20:07		20:31	20:37		20:15		19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47		06:07	18:58-19:24/26	05:47	05:54		06:18	19:08-19:33/25	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39		20:08		20:32	20:37		20:14		19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45		06:06	18:58-19:24/26	05:47	05:54		06:19	19:09-19:32/23	06:46	07:13	07:44	08:15
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10	08:28	08:08	07:31	06:44		06:05	18:58-19:24/26	05:47	05:55		06:20	19:10-19:32/22	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41		20:09		20:33	20:36		20:12		19:28	18:41	18:03	17:50
11	08:27	08:07	07:29	06:42		06:04	18:58-19:23/25	05:47	05:56		06:21	19:09-19:30/21	06:48	07:15	07:46	08:16
	18:09	18:43	19:13	19:42		20:10		20:34	20:36		20:10		19:27	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41		06:03	18:58-19:23/25	05:47	05:56		06:22	19:11-19:29/18	06:49	07:16	07:48	08:17
	18:10	18:45	19:14	19:43		20:11		20:34	20:35		20:09		19:25	18:38	18:01	17:50
13	08:27	08:05	07:26	06:39		06:02	18:58-19:23/25	05:46	05:57		06:22	19:11-19:27/16	06:50	07:16	07:49	08:18
	18:11	18:46	19:15	19:44		20:12		20:34	20:35		20:08		19:23	18:37	18:00	17:51
14	08:27	08:03	07:25	06:38		06:01	18:58-19:22/24	05:46	05:58		06:23	19:09-19:25/16	06:50	07:17	07:50	08:19
	18:12	18:47	19:16	19:45		20:13		20:35	20:35		20:07		19:22	18:36	18:00	17:51
15	08:27	08:02	07:23	06:36		06:00	19:00-19:22/22	05:46	05:58		06:24	19:08-19:23/15	06:51	07:18	07:51	08:20
	18:13	18:48	19:17	19:46		20:14		20:35	20:34		20:06		19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35		06:00	19:00-19:21/21	05:46	05:59		06:25	19:07-19:23/16	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47		20:15		20:36	20:33		20:04		19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:34	19:07-19:12/5	05:59	19:01-19:21/20	05:47	06:00		06:26	19:05-19:23/18	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48		20:16		20:36	20:33		20:03		19:17	18:31	17:57	17:52
18	08:25	07:59	07:19	06:32	19:04-19:15/11	05:58	19:01-19:19/18	05:47	06:01		06:27	19:05-19:23/18	06:54	07:21	07:54	08:21
	18:17	18:51	19:20	19:49		20:17		20:36	20:32		20:02		19:16	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	19:03-19:17/14	05:57	19:03-19:19/16	05:47	06:01		06:28	19:05-19:23/18	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50		20:17		20:37	20:32		20:00		19:14	18:29	17:56	17:52
20	08:25	07:56	07:16	06:29	19:01-19:17/16	05:56	19:04-19:18/14	05:47	06:02		06:29	19:04-19:23/19	06:56	07:23	07:56	08:23
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21	08:24	07:55	07:14	06:28	19:00-19:18/18	05:56	19:06-19:16/10	05:47	06:03		06:29	19:05-19:23/18	06:56	07:24	07:57	08:23
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22	08:24	07:54	07:13	06:27	19:00-19:18/18	05:55	19:09-19:12/3	05:47	06:04	19:18-19:25/7	06:30	19:05-19:22/17	06:57	07:25	07:58	08:24
	18:21	18:55	19:23	19:53		20:20		20:37	20:30		19:56		19:09	18:25	17:54	17:54
23	08:23	07:52	07:11	06:25	18:59-19:17/18	05:54		05:47	06:04	19:16-19:27/11	06:31	19:05-19:20/15	06:58	07:26	07:59	08:24
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	18:23	18:58	19:25	19:54		20:22		20:38	20:28		19:53		19:06	18:22	17:53	17:55
25	08:22	07:50	07:08	06:23	18:59-19:17/18	05:53		05:48	06:06	19:12-19:29/17	06:33	19:07-19:18/11	07:00	07:28	08:01	08:25
	18:24	18:59	19:26	19:55		20:22		20:38	20:28		19:52		19:04	18:21	17:53	17:55
26	08:21	07:48	07:06	06:21	18:59-19:16/17	05:52		05:48	06:07	19:12-19:31/19	06:34	19:10-19:14/4	07:01	07:29	08:03	08:26
	18:25	19:00	19:27	19:56		20:23		20:38	20:27		19:51		19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	18:59-19:16/17	05:52		05:49	06:08	19:11-19:32/21	06:35		07:02	07:30	08:04	08:26
	18:26	19:01	19:28	19:57		20:24		20:38	20:26		19:49		19:01	18:18	17:52	17:57
28	08:20	07:45	07:03	06:19	19:00-19:15/15	05:51		05:49	06:09	19:11-19:32/21	06:36		07:03	07:31	08:05	08:26
	18:28	19:02	19:29	19:58		20:25		20:38	20:25		19:48		19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	19:02-19:18/16	05:51		05:49	06:09	19:09-19:32/23	06:37		07:04	07:33	08:06	08:27
	18:29		19:30	19:59		20:25		20:38	20:24		19:46		18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	19:04-19:20/16	05:50		05:50	06:10	19:09-19:33/24	06:37		07:04	07:34	08:07	08:27
	18:30		19:31	20:00		20:26		20:38	20:23		19:45		18:57	18:15	17:51	17:59
31	08:17		06:59			05:50			06:11	19:09-19:33/24	06:38			07:35		08:27
	18:31		19:32			20:27			20:22		19:43			18:13		17:59
Potential sun hours	305	301	370	395		441		443	451		423		374	348	304	296
Sum of minutes with flicker	0	0	0		218		463	0		182		503	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Calendar per WTG

Calculation: Shadow Realistic Case**WTG:** T11 - T11
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,20	5,10	6,20	7,50	9,50	11,40	12,20	11,60	10,10	7,30	5,30	4,10

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
218	4.061	570	243	369	619	793	854	643	197	81	112	8.760

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	Septembe	October	Novembe	December
1	08:27	08:17	07:44	06:57	06:15 18:51-19:22/31	05:49	05:50	06:12 18:59-19:34/35	06:39	07:05	07:36	08:08
	18:00	18:32	19:03	19:33	20:01	20:28	20:38	20:21	19:42	18:55	18:12	17:51
2	08:28	08:16	07:43	06:56	06:14 18:50-19:23/33	05:49	05:51	06:13 18:59-19:35/36	06:40	07:06	07:37	08:09
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:54	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13 18:50-19:23/33	05:48	05:51	06:14 18:59-19:35/36	06:41	07:07	07:38	08:09
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12 18:49-19:24/35	05:48	05:52	06:15 18:58-19:34/36	06:42	07:08	07:39	08:10
	18:03	18:36	19:06	19:36	20:04	20:30	20:38	20:18	19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51	06:10 18:49-19:24/35	05:48	05:52	06:15 18:58-19:34/36	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:37	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09 18:49-19:24/35	05:48	05:53	06:16 18:58-19:34/36	06:43	07:10	07:41	08:12
	18:05	18:38	19:08	19:38	20:06	20:31	20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08 18:49-19:24/35	05:47	05:53	06:17 18:59-19:34/35	06:44	07:11	07:42	08:13
	18:05	18:39	19:09	19:38	20:07	20:31	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07 18:49-19:24/35	05:47	05:54	06:18 18:59-19:34/35	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39	20:08	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45	06:06 18:49-19:24/35	05:47	05:54	06:19 18:59-19:33/34	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:08	20:32	20:36	20:13	19:30	18:43	18:04	17:50
10	08:28	08:08	07:31	06:44	06:05 18:49-19:24/35	05:47	05:55	06:20 19:00-19:33/33	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03	17:50
11	08:27	08:07	07:29	06:42	06:04 18:49-19:24/35	05:47	05:56	06:21 18:59-19:31/32	06:48	07:15	07:46	08:16
	18:09	18:43	19:13	19:42	20:10	20:34	20:36	20:10	19:27	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41 19:05-19:08/3	06:03 18:49-19:24/35	05:47	05:56	06:22 19:00-19:31/31	06:49	07:15	07:48	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:35	20:09	19:25	18:38	18:01	17:50
13	08:27	08:05	07:26	06:39 19:01-19:13/12	06:02 18:49-19:23/34	05:46	05:57	06:22 19:01-19:30/29	06:50	07:16	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:34	20:35	20:08	19:23	18:37	18:00	17:51
14	08:27	08:03	07:25	06:38 18:59-19:15/16	06:01 18:49-19:23/34	05:46	05:58	06:23 19:02-19:29/27	06:50	07:17	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:34	20:07	19:22	18:36	18:00	17:51
15	08:26	08:02	07:23	06:36 18:57-19:15/18	06:00 18:50-19:23/33	05:46	05:58	06:24 19:03-19:27/24	06:51	07:18	07:51	08:19
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:06	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35 18:56-19:17/21	06:00 18:51-19:23/32	05:46	05:59 19:12-19:20/8	06:25 19:04-19:26/22	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36	20:33	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:33 18:55-19:16/21	05:59 18:51-19:22/31	05:47	06:00 19:10-19:23/13	06:26 19:02-19:23/21	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:57	17:52
18	08:25	07:59	07:19	06:32 18:54-19:17/23	05:58 18:51-19:21/30	05:47	06:01 19:09-19:25/16	06:27 19:01-19:20/19	06:54	07:21	07:54	08:21
	18:16	18:51	19:20	19:49	20:16	20:36	20:32	20:02	19:15	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31 18:54-19:17/23	05:57 18:53-19:21/28	05:47	06:01 19:08-19:26/18	06:28 19:00-19:21/21	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:17	20:37	20:32	20:00	19:14	18:29	17:56	17:52
20	08:25	07:56	07:16	06:29 18:53-19:17/24	05:56 18:53-19:21/28	05:47	06:02 19:06-19:27/21	06:29 18:59-19:21/22	06:56	07:23	07:56	08:23
	18:19	18:53	19:22	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:55	17:53
21	08:24	07:55	07:14	06:28 18:54-19:17/23	05:56 18:54-19:20/26	05:47	06:03 19:05-19:28/23	06:29 18:59-19:21/22	06:56	07:24	07:57	08:23
	18:20	18:54	19:23	19:52	20:19	20:37	20:30	19:58	19:11	18:26	17:55	17:53
22	08:23	07:53	07:13	06:27 18:54-19:16/22	05:55 18:54-19:18/24	05:47	06:04 19:05-19:29/24	06:30 18:58-19:21/23	06:57	07:25	07:58	08:24
	18:21	18:55	19:23	19:53	20:20	20:37	20:30	19:56	19:09	18:24	17:54	17:54
23	08:23	07:52	07:11	06:25 18:53-19:15/22	05:54 18:56-19:18/22	05:47	06:04 19:04-19:31/27	06:31 18:57-19:20/23	06:58	07:26	07:59	08:24
	18:22	18:57	19:24	19:53	20:21	20:38	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:10	06:24 18:54-19:15/21	05:53 18:57-19:17/20	05:48	06:05 19:03-19:31/28	06:32 18:57-19:20/23	06:59	07:27	08:00	08:25
	18:23	18:58	19:25	19:54	20:22	20:38	20:28	19:53	19:06	18:22	17:53	17:55
25	08:22	07:50	07:08	06:23 18:55-19:15/20	05:53 18:59-19:16/17	05:48	06:06 19:02-19:31/29	06:33 18:57-19:20/23	07:00	07:28	08:01	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:27	19:52	19:04	18:21	17:53	17:55
26	08:21	07:48	07:06	06:21 18:55-19:17/22	05:52 19:00-19:14/14	05:48	06:07 19:02-19:32/30	06:34 18:58-19:19/21	07:01	07:29	08:03	08:26
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20 18:56-19:19/23	05:52 19:02-19:13/11	05:49	06:08 19:01-19:33/32	06:35 18:58-19:18/20	07:02	07:30	08:04	08:26
	18:26	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:45	07:03	06:19 18:55-19:20/25	05:51 19:05-19:10/5	05:49	06:09 19:01-19:34/33	06:36 18:59-19:17/18	07:03	07:31	08:05	08:26
	18:28	19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18 18:54-19:21/27	05:51	05:49	06:09 19:00-19:33/33	06:37 18:59-19:15/16	07:04	07:32	08:06	08:27
	18:29		19:30	19:59	20:25	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16 18:53-19:22/29	05:50	05:50	06:10 19:00-19:34/34	06:37 19:01-19:13/12	07:04	07:34	08:07	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51	17:59
31	08:17		06:59		05:50		06:11 18:59-19:34/35	06:38 19:06-19:08/2		07:35		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	443	451	423	374	348	304	296
Sum of minutes with flicker	0	0	0	395	801	0	404	803	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Calendar per WTG

Calculation: Shadow Realistic Case**WTG:** T12 - T12
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,20	5,10	6,20	7,50	9,50	11,40	12,20	11,60	10,10	7,30	5,30	4,10

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
218	4.061	570	243	369	619	793	854	643	197	81	112	8.760

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:27	08:16	07:44 18:01-18:32/31	06:57	06:15	05:49	05:50	06:12	06:39	07:05 17:36-18:25/49	07:36	08:08
	18:00	18:32	19:03	19:33	20:01	20:28	20:38	20:21	19:42	18:55	18:12	17:51
2	08:28	08:16	07:43 18:00-18:34/34	06:56	06:14	05:49	05:51	06:13	06:40	07:06 17:35-18:25/50	07:37	08:08
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:54	18:11	17:51
3	08:28	08:15	07:41 17:59-18:34/35	06:54	06:13	05:48	05:51	06:14	06:41	07:07 17:34-18:24/50	07:38	08:09
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40 17:59-18:34/35	06:53	06:12	05:48	05:52	06:15	06:42	07:08 17:34-18:23/49	07:39	08:10
	18:03	18:36	19:06	19:36	20:04	20:30	20:38	20:18	19:37	18:50	18:09	17:50
5	08:28	08:13	07:38 17:57-18:34/37	06:51	06:10	05:48	05:52	06:15	06:43	07:09 17:33-18:22/49	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:37	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37 17:57-18:41/44	06:50	06:09	05:48	05:53	06:16	06:43	07:10 17:33-18:20/47	07:41	08:12
	18:05	18:38	19:08	19:38	20:06	20:31	20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35 17:56-18:43/47	06:48	06:08	05:47	05:53	06:17	06:44	07:11 17:33-18:18/45	07:42	08:13
	18:05	18:39	19:09	19:38	20:07	20:31	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34 17:57-18:45/48	06:47	06:07	05:47	05:54	06:18	06:45	07:12 17:33-18:14/41	07:43	08:14
	18:06	18:40	19:10	19:39	20:08	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:32 17:56-18:45/49	06:45	06:06	05:47	05:54	06:19	06:46	07:13 17:33-18:09/36	07:44	08:15
	18:07	18:41	19:11	19:40	20:08	20:32	20:36	20:13	19:30	18:43	18:04	17:50
10	08:28	08:08	07:31 17:57-18:46/49	06:44	06:05	05:47	05:55	06:20	06:47	07:14 17:33-18:09/36	07:45	08:16
	18:08	18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03	17:50
11	08:27	08:07	07:29 17:56-18:46/50	06:42	06:04	05:47	05:56	06:21	06:48	07:15 17:34-18:08/34	07:46	08:16
	18:09	18:43	19:13	19:42	20:10	20:34	20:36	20:10	19:27	18:40	18:02	17:50
12	08:27	08:06	07:28 17:57-18:47/50	06:41	06:03	05:47	05:56	06:22	06:49	07:15 17:34-18:07/33	07:48	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:35	20:09	19:25	18:38	18:01	17:50
13	08:27	08:05	07:26 17:57-18:46/49	06:39	06:02	05:46	05:57	06:22	06:50	07:16 17:35-18:05/30	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:34	20:35	20:08	19:23	18:37	18:00	17:51
14	08:27	08:03	07:25 17:58-18:46/48	06:38	06:01	05:46	05:58	06:23	06:50	07:17 17:36-18:04/28	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:34	20:07	19:22	18:36	18:00	17:51
15	08:26	08:02	07:23 17:58-18:45/47	06:36	06:00	05:46	05:58	06:24	06:51	07:18 17:37-18:02/25	07:51	08:19
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:06	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22 18:00-18:45/45	06:35	06:00	05:46	05:59	06:25	06:52	07:19 17:39-18:00/21	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36	20:33	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20 18:01-18:43/42	06:34	05:59	05:47	06:00	06:26	06:53	07:20 17:42-17:57/15	07:53	08:21
	18:15	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:57	17:52
18	08:25	07:59	07:19 18:03-18:43/40	06:32	05:58	05:47	06:01	06:27	06:54	07:21 17:48-17:50/2	07:54	08:21
	18:16	18:51	19:20	19:49	20:16	20:36	20:32	20:02	19:15	18:30	17:57	17:52
19	08:25	07:57	07:17 18:25-18:40/15	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21 18:05-18:21/16	19:50	20:17	20:37	20:32	20:00	19:14	18:29	17:56	17:52
20	08:25	07:56	07:16 18:27-18:37/10	06:29	05:56	05:47	06:02	06:29	06:56	07:23	07:56	08:23
	18:19	18:53	19:22 18:10-18:16/6	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:55	17:53
21	08:24	07:55	07:14	06:28	05:56	05:47	06:03	06:29	06:56	07:24	07:57	08:23
	18:20	18:54	19:23	19:52	20:19	20:37	20:30	19:58	19:11	18:26	17:55	17:53
22	08:23	07:53	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:55	19:23	19:53	20:20	20:37	20:30	19:56	19:09	18:24	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:47	06:04	06:31	06:58 18:12-18:20/8	07:26	07:59	08:24
	18:22	18:57	19:24	19:53	20:21	20:38	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51 18:13-18:22/9	07:10	06:24	05:53	05:48	06:05	06:32	06:59 18:09-18:23/14	07:27	08:00	08:25
	18:23	18:58	19:25	19:54	20:22	20:38	20:28	19:53	19:06 17:50-18:03/13	18:22	17:53	17:55
25	08:22	07:50 18:09-18:26/17	07:08	06:23	05:53	05:48	06:06	06:33	07:00 18:07-18:25/18	07:28	08:01	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:27	19:52	19:04 17:46-18:06/20	18:21	17:53	17:55
26	08:21	07:48 18:06-18:28/22	07:06	06:21	05:52	05:48	06:07	06:34	07:01 17:44-18:26/42	07:29	08:02	08:26
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:20	07:47 18:04-18:30/26	07:05	06:20	05:52	05:49	06:08	06:35	07:02 17:42-18:26/44	07:30	08:04	08:26
	18:26	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:45 18:03-18:32/29	07:03	06:19	05:51	05:49	06:09	06:36	07:03 17:40-18:27/47	07:31	08:05	08:26
	18:28	19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49	06:09	06:37	07:04 17:39-18:27/48	07:32	08:06	08:27
	18:29		19:30	19:59	20:25	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:04 17:38-18:27/49	07:34	08:07	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51	17:59
31	08:17		06:59		05:50		06:11	06:38		07:35		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	443	451	423	374	348	304	296
Sum of minutes with flicker	0	103	827	0	0	0	0	0	303	640	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Calendar per WTG

Calculation: Shadow Realistic Case**WTG:** T13 - T13
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,20	5,10	6,20	7,50	9,50	11,40	12,20	11,60	10,10	7,30	5,30	4,10

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
218	4.061	570	243	369	619	793	854	643	197	81	112	8.760

Idle start wind speed: Cut in wind speed from power curve

	January		February	March	April	May	June	July	August	Septembe	October	November		December	
1	08:27	17:19-17:33/14	08:16	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36		08:08	17:01-17:24/23
	18:00		18:32	19:03	19:33	20:01	20:28	20:38	20:21	19:42	18:55	18:12		17:51	
2	08:28	17:19-17:34/15	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37		08:08	17:01-17:24/23
	18:01		18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:53	18:11		17:51	
3	08:28	17:19-17:35/16	08:15	07:41	06:54	06:13	05:48	05:51	06:14	06:41	07:07	07:38		08:09	17:02-17:24/22
	18:02		18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10		17:50	
4	08:28	17:19-17:36/17	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39		08:10	17:03-17:24/21
	18:03		18:36	19:06	19:36	20:04	20:30	20:38	20:18	19:37	18:50	18:09		17:50	
5	08:28	17:19-17:37/18	08:13	07:38	06:51	06:10	05:48	05:52	06:15	06:43	07:09	07:40		08:11	17:04-17:24/20
	18:04		18:37	19:07	19:37	20:05	20:30	20:37	20:17	19:36	18:49	18:08		17:50	
6	08:28	17:19-17:38/19	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:43	07:10	07:41		08:12	17:05-17:24/19
	18:05		18:38	19:08	19:38	20:06	20:31	20:37	20:16	19:34	18:47	18:07		17:50	
7	08:28	17:19-17:39/20	08:11	07:35	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42		08:13	17:05-17:23/18
	18:05		18:39	19:09	19:38	20:07	20:31	20:37	20:15	19:33	18:46	18:06		17:50	
8	08:28	17:18-17:38/20	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43		08:14	17:06-17:23/17
	18:06		18:40	19:10	19:39	20:07	20:32	20:37	20:14	19:31	18:44	18:05		17:50	
9	08:28	17:18-17:39/21	08:09	07:32	06:45	06:06	05:47	05:54	06:19	06:46	07:13	07:44		08:15	17:07-17:23/16
	18:07		18:41	19:11	19:40	20:08	20:32	20:36	20:13	19:30	18:43	18:04		17:50	
10	08:28	17:18-17:40/22	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:45		08:16	17:08-17:23/15
	18:08		18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03		17:50	
11	08:27	17:19-17:41/22	08:07	07:29	06:42	06:04	05:47	05:56	06:21	06:48	07:15	07:46		08:16	17:09-17:23/14
	18:09		18:43	19:13	19:42	20:10	20:33	20:36	20:10	19:26	18:40	18:02		17:50	
12	08:27	17:19-17:42/23	08:06	07:28	06:41	06:03	05:47	05:56	06:22	06:49	07:15	07:47	17:03-17:12/9	08:17	17:11-17:23/12
	18:10		18:45	19:14	19:43	20:11	20:34	20:35	20:09	19:25	18:38	18:01		17:50	
13	08:27	17:18-17:42/24	08:05	07:26	06:39	06:02	05:46	05:57	06:22	06:50	07:16	07:49	17:00-17:14/14	08:18	17:11-17:22/11
	18:11		18:46	19:15	19:44	20:12	20:34	20:35	20:08	19:23	18:37	18:00		17:51	
14	08:27	17:19-17:43/24	08:03	07:25	06:38	06:01	05:46	05:58	06:23	06:50	07:17	07:50	16:59-17:16/17	08:19	17:12-17:22/10
	18:12		18:47	19:16	19:45	20:13	20:35	20:34	20:07	19:22	18:36	18:00		17:51	
15	08:26	17:19-17:44/25	08:02	07:23	06:36	06:00	05:46	05:58	06:24	06:51	07:18	07:51	16:58-17:17/19	08:19	17:14-17:22/8
	18:13		18:48	19:17	19:46	20:14	20:35	20:34	20:05	19:20	18:34	17:59		17:51	
16	08:26	17:19-17:44/25	08:01	07:22	06:35	06:00	05:46	05:59	06:25	06:52	07:19	07:52	16:57-17:18/21	08:20	17:14-17:21/7
	18:14		18:49	19:18	19:47	20:15	20:36	20:33	20:04	19:19	18:33	17:58		17:51	
17	08:26	17:20-17:45/25	08:00	07:20	06:33	05:59	05:47	06:00	06:26	06:53	07:20	07:53	16:57-17:19/22	08:21	17:16-17:22/6
	18:15		18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:57		17:52	
18	08:25	17:19-17:45/26	07:59	07:19	06:32	05:58	05:47	06:01	06:27	06:54	07:21	07:54	16:57-17:20/23	08:21	17:17-17:22/5
	18:17		18:51	19:20	19:49	20:16	20:36	20:32	20:02	19:15	18:30	17:57		17:52	
19	08:25	17:20-17:46/26	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	16:57-17:21/24	08:22	17:18-17:21/3
	18:18		18:52	19:21	19:50	20:17	20:37	20:32	20:00	19:14	18:29	17:56		17:52	
20	08:24	17:20-17:46/26	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:56	07:23	07:56	16:56-17:21/25	08:23	17:20-17:21/1
	18:19		18:53	19:22	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:55		17:53	
21	08:24	17:21-17:46/25	07:55	07:14	06:28	05:56	05:47	06:03	06:29	06:56	07:24	07:57	16:56-17:21/25	08:23	
	18:20		18:54	19:22	19:52	20:19	20:37	20:30	19:58	19:11	18:26	17:55		17:53	
22	08:23	17:21-17:46/25	07:53	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	16:56-17:22/26	08:24	
	18:21		18:55	19:23	19:52	20:20	20:37	20:30	19:56	19:09	18:24	17:54		17:54	
23	08:23	17:22-17:46/24	07:52	07:11	06:25	05:54	05:47	06:04	06:31	06:58	07:26	07:59	16:56-17:22/26	08:24	
	18:22		18:57	19:24	19:53	20:21	20:38	20:29	19:55	19:08	18:23	17:54		17:54	
24	08:22	17:23-17:46/23	07:51	07:10	06:24	05:53	05:48	06:05	06:32	06:59	07:27	08:00	16:56-17:22/26	08:25	17:21-17:23/2
	18:23		18:58	19:25	19:54	20:21	20:38	20:28	19:53	19:06	18:22	17:53		17:55	
25	08:22	17:23-17:45/22	07:49	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:01	16:58-17:23/25	08:25	17:20-17:24/4
	18:24		18:59	19:26	19:55	20:22	20:38	20:27	19:52	19:04	18:21	17:53		17:55	
26	08:21	17:24-17:45/21	07:48	07:06	06:21	05:52	05:48	06:07	06:34	07:01	07:29	08:02	16:58-17:23/25	08:26	17:20-17:25/5
	18:25		19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52		17:56	
27	08:20	17:26-17:45/19	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:30	08:03	16:58-17:23/25	08:26	17:20-17:27/7
	18:26		19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52		17:57	
28	08:20	17:27-17:44/17	07:45	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:31	08:05	16:59-17:23/24	08:26	17:20-17:28/8
	18:28		19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52		17:57	
29	08:19	17:29-17:42/13		07:02	06:18	05:51	05:49	06:09	06:37	07:04	07:32	08:06	16:59-17:23/24	08:27	17:19-17:29/10
	18:29			19:30	19:59	20:25	20:38	20:24	19:46	18:58	18:16	17:51		17:58	
30	08:18	17:31-17:40/9		07:00	06:16	05:50	05:50	06:10	06:37	07:04	07:34	08:07	17:00-17:24/24	08:27	17:19-17:30/11
	18:30			19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51		17:59	
31	08:17			06:59		05:50		06:11	06:38		07:35			08:27	17:19-17:31/12
	18:31			19:32		20:27		20:22	19:43		18:13			17:59	
Potential sun hours	305		301	370	395	441	443	451	423	374	348	304		296	
Sum of minutes with flicker		626	0	0	0	0	0	0	0	0	0		424		330

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Calendar per WTG

Calculation: Shadow Realistic Case**WTG:** T14 - T14
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,20	5,10	6,20	7,50	9,50	11,40	12,20	11,60	10,10	7,30	5,30	4,10

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
218	4.061	570	243	369	619	793	854	643	197	81	112	8.760

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:27	08:16	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:07
	18:00	18:32	19:03	19:33	20:01	20:28	20:38	20:21	19:42	18:55	18:12	17:51
2	08:28	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:08
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:53	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:48	05:51	06:14	06:41	07:07	07:38	08:09
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39	08:10
	18:03	18:36	19:06	19:36	20:04	20:30	20:38	20:18	19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51	06:10	05:48	05:52	06:15	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:37	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:43	07:10	07:41	08:12
	18:05	18:38	19:08	19:38	20:06	20:31	20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:05	18:39	19:09	19:38	20:07	20:31	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39	20:07	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45	06:06	05:47	05:54	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:08	20:32	20:36	20:13	19:30	18:43	18:04	17:50
10	08:28	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03	17:50
11	08:27	08:07	07:29	06:42	06:04	05:47	05:56	06:21	06:48	07:15	07:46	08:16
	18:09	18:43	19:13	19:42	20:10	20:33	20:36	20:10	19:26	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:47	05:56	06:22	06:49	07:15	07:47	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:35	20:09	19:25	18:38	18:01	17:50
13	08:27	08:05	07:26	06:39	06:02	05:46	05:57	06:22	06:49	07:16	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:34	20:35	20:08	19:23	18:37	18:00	17:51
14	08:27	08:03	07:25	06:38	06:01	05:46	05:58	06:23	06:50	07:17	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:34	20:07	19:22	18:36	18:00	17:51
15	08:26	08:02	07:23	06:36	06:00	05:46	05:58	06:24	06:51	07:18	07:51	08:19
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:05	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	06:00	05:46	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36	20:33	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:33	05:59	05:47	06:00	06:26	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:57	17:52
18	08:25	07:59	07:19	06:32	05:58	05:47	06:01	06:27	06:54	07:21	07:54	08:21
	18:17	18:51	19:20	19:49	20:16	20:36	20:32	20:02	19:15	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:17	20:37	20:32	20:00	19:14	18:29	17:56	17:52
20	08:24	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:56	07:23	07:56	08:23
	18:19	18:53	19:22	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:55	17:53
21	08:24	07:55	07:14	06:28	05:56	05:47	06:03	06:29	06:56	07:24	07:57	08:23
	18:20	18:54	19:22	19:52	20:19	20:37	20:30	19:58	19:11	18:26	17:55	17:53
22	08:23	07:53	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:55	19:23	19:52	20:20	20:37	20:30	19:56	19:09	18:24	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:47	06:04	06:31	06:58	07:26	07:59	08:24
	18:22	18:57	19:24	19:53	20:21	20:38	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:10	06:24	05:53	05:48	06:05	06:32	06:59	07:27	08:00	08:25
	18:23	18:58	19:25	19:54	20:21	20:38	20:28	19:53	19:06	18:22	17:53	17:55
25	08:22	07:49	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:01	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:27	19:52	19:04	18:21	17:53	17:55
26	08:21	07:48	07:06	06:21	05:52	05:48	06:07	06:34	07:01	07:29	08:02	08:26
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:30	08:03	08:26
	18:26	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:45	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:31	08:05	08:26
	18:28	19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49	06:09	06:36	07:03	07:32	08:06	08:27
	18:29		19:30	19:59	20:25	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:04	07:34	08:07	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51	17:59
31	08:17		06:59		05:50		06:11	06:38		07:35		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	443	451	423	374	348	304	296
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Calendar per WTG

Calculation: Shadow Realistic Case**WTG:** T15 - T15
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,20	5,10	6,20	7,50	9,50	11,40	12,20	11,60	10,10	7,30	5,30	4,10

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
218	4.061	570	243	369	619	793	854	643	197	81	112	8.760

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:27	08:16	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:07
	18:00	18:32	19:03	19:33	20:01	20:27	20:38	20:21	19:42	18:55	18:12	17:51
2	08:27	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:08
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:53	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:48	05:51	06:14	06:41	07:07	07:38	08:09
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39	08:10
	18:03	18:36	19:06	19:36	20:04	20:29	20:38	20:18	19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51	06:10	05:48	05:52	06:15	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:37	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:43	07:10	07:41	08:12
	18:05	18:38	19:08	19:37	20:06	20:31	20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:05	18:39	19:09	19:38	20:07	20:31	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39	20:07	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45	06:06	05:47	05:55	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:08	20:32	20:36	20:13	19:30	18:43	18:04	17:50
10	08:28	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03	17:50
11	08:27	08:07	07:29	06:42	06:04	05:47	05:56	06:21	06:48	07:14	07:46	08:16
	18:09	18:43	19:13	19:42	20:10	20:33	20:36	20:10	19:26	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:47	05:56	06:22	06:49	07:15	07:47	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:35	20:09	19:25	18:38	18:01	17:50
13	08:27	08:04	07:26	06:39	06:02	05:47	05:57	06:22	06:49	07:16	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:34	20:35	20:08	19:23	18:37	18:00	17:51
14	08:27	08:03	07:25	06:38	06:01	05:46	05:58	06:23	06:50	07:17	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:34	20:07	19:22	18:36	18:00	17:51
15	08:26	08:02	07:23	06:36	06:00	05:46	05:58	06:24	06:51	07:18	07:51	08:19
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:05	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	06:00	05:46	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36	20:33	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:33	05:59	05:47	06:00	06:26	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:57	17:52
18	08:25	07:59	07:19	06:32	05:58	05:47	06:01	06:27	06:54	07:21	07:54	08:21
	18:17	18:51	19:20	19:49	20:16	20:36	20:32	20:02	19:15	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:17	20:37	20:32	20:00	19:14	18:29	17:56	17:52
20	08:24	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:56	07:23	07:56	08:23
	18:19	18:53	19:22	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:55	17:53
21	08:24	07:55	07:14	06:28	05:56	05:47	06:03	06:29	06:56	07:24	07:57	08:23
	18:20	18:54	19:22	19:52	20:19	20:37	20:30	19:58	19:11	18:26	17:55	17:53
22	08:23	07:53	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:55	19:23	19:52	20:20	20:37	20:30	19:56	19:09	18:24	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:47	06:04	06:31	06:58	07:26	07:59	08:24
	18:22	18:56	19:24	19:53	20:21	20:37	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:10	06:24	05:53	05:48	06:05	06:32	06:59	07:27	08:00	08:25
	18:23	18:58	19:25	19:54	20:21	20:38	20:28	19:53	19:06	18:22	17:53	17:55
25	08:22	07:49	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:01	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:27	19:52	19:04	18:21	17:53	17:55
26	08:21	07:48	07:06	06:21	05:52	05:48	06:07	06:34	07:01	07:29	08:02	08:25
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:30	08:03	08:26
	18:26	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:45	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:31	08:04	08:26
	18:28	19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49	06:09	06:36	07:03	07:32	08:05	08:26
	18:29		19:30	19:59	20:25	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:04	07:33	08:06	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51	17:59
31	08:17		06:59		05:50		06:11	06:38		07:35		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	443	451	423	374	348	304	296
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Calendar per WTG

Calculation: Shadow Realistic Case**WTG:** T16 - T16
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,20	5,10	6,20	7,50	9,50	11,40	12,20	11,60	10,10	7,30	5,30	4,10

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
218	4.061	570	243	369	619	793	854	643	197	81	112	8.760

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June		July	August	September	October	November	December
1	08:27	08:16	07:44	06:57	06:15	05:49		05:50	06:12	06:39	07:05	07:36	08:07
	18:00	18:32	19:03	19:33	20:01	20:27		20:38	20:21	19:42	18:55	18:12	17:51
2	08:27	08:16	07:43	06:56	06:14	05:49		05:51	06:13	06:40	07:06	07:37	08:08
	18:01	18:33	19:04	19:34	20:02	20:28		20:38	20:20	19:40	18:53	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:48		05:51	06:14	06:41	07:07	07:38	08:09
	18:02	18:34	19:05	19:35	20:03	20:29		20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48		05:52	06:15	06:42	07:08	07:39	08:10
	18:03	18:35	19:06	19:36	20:04	20:29		20:38	20:18	19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51	06:10	05:48		05:52	06:15	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30		20:37	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48		05:53	06:16	06:43	07:10	07:41	08:12
	18:05	18:38	19:08	19:37	20:06	20:31		20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47		05:53	06:17	06:44	07:11	07:42	08:13
	18:05	18:39	19:09	19:38	20:06	20:31		20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47		05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39	20:07	20:32		20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45	06:06	05:47		05:54	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:08	20:32		20:36	20:13	19:30	18:43	18:04	17:50
10	08:28	08:08	07:31	06:44	06:05	05:47		05:55	06:20	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41	20:09	20:33		20:36	20:12	19:28	18:41	18:03	17:50
11	08:27	08:07	07:29	06:42	06:04	05:47		05:56	06:21	06:48	07:14	07:46	08:16
	18:09	18:43	19:13	19:42	20:10	20:33		20:36	20:10	19:26	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:47		05:56	06:22	06:49	07:15	07:47	08:17
	18:10	18:45	19:14	19:43	20:11	20:34		20:35	20:09	19:25	18:38	18:01	17:50
13	08:27	08:04	07:26	06:39	06:02	05:46		05:57	06:22	06:49	07:16	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:34		20:35	20:08	19:23	18:37	18:00	17:51
14	08:27	08:03	07:25	06:38	06:01	05:46		05:58	06:23	06:50	07:17	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35		20:34	20:07	19:22	18:36	18:00	17:51
15	08:26	08:02	07:23	06:36	06:00	05:46	19:35-19:37/2	05:58	06:24	06:51	07:18	07:51	08:19
	18:13	18:48	19:17	19:46	20:14	20:35		20:34	20:05	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	06:00	05:46	19:34-19:39/5	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36		20:33	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:33	05:59	05:47	19:35-19:40/5	06:00	06:26	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48	20:16	20:36		20:33	20:03	19:17	18:31	17:57	17:52
18	08:25	07:59	07:19	06:32	05:58	05:47	19:35-19:41/6	06:01	06:27	06:54	07:21	07:54	08:21
	18:16	18:51	19:20	19:49	20:16	20:36		20:32	20:02	19:15	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	19:34-19:41/7	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:17	20:37		20:32	20:00	19:14	18:28	17:56	17:52
20	08:24	07:56	07:16	06:29	05:56	05:47	19:34-19:41/7	06:02	06:29	06:56	07:23	07:56	08:23
	18:19	18:53	19:21	19:51	20:18	20:37		20:31	19:59	19:12	18:27	17:55	17:53
21	08:24	07:55	07:14	06:28	05:56	05:47	19:34-19:41/7	06:03	06:29	06:56	07:24	07:57	08:23
	18:20	18:54	19:22	19:51	20:19	20:37		20:30	19:58	19:11	18:26	17:55	17:53
22	08:23	07:53	07:13	06:27	05:55	05:47	19:34-19:41/7	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:55	19:23	19:52	20:20	20:37		20:30	19:56	19:09	18:24	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:47	19:35-19:42/7	06:04	06:31	06:58	07:26	07:59	08:24
	18:22	18:56	19:24	19:53	20:21	20:37		20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:09	06:24	05:53	05:48	19:35-19:42/7	06:05	06:32	06:59	07:27	08:00	08:25
	18:23	18:58	19:25	19:54	20:21	20:38		20:28	19:53	19:06	18:22	17:53	17:55
25	08:22	07:49	07:08	06:23	05:53	05:48	19:36-19:41/5	06:06	06:33	07:00	07:28	08:01	08:25
	18:24	18:59	19:26	19:55	20:22	20:38		20:27	19:52	19:04	18:21	17:53	17:55
26	08:21	07:48	07:06	06:21	05:52	05:48	19:37-19:42/5	06:07	06:34	07:01	07:29	08:02	08:25
	18:25	19:00	19:27	19:56	20:23	20:38		20:27	19:51	19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	05:52	05:49	19:38-19:41/3	06:08	06:35	07:02	07:30	08:03	08:26
	18:26	19:01	19:28	19:57	20:24	20:38		20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:45	07:03	06:19	05:51	05:49		06:09	06:36	07:03	07:31	08:04	08:26
	18:28	19:02	19:29	19:58	20:25	20:38		20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49		06:09	06:36	07:03	07:32	08:05	08:26
	18:29		19:30	19:59	20:25	20:38		20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50		06:10	06:37	07:04	07:33	08:06	08:27
	18:30		19:31	20:00	20:26	20:38		20:23	19:45	18:57	18:14	17:51	17:59
31	08:17		06:59		05:50			06:11	06:38		07:35		08:27
	18:31		19:32		20:27			20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	443		451	423	374	348	304	296
Sum of minutes with flicker	0	0	0	0	0	73		0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Calendar per WTG

Calculation: Shadow Realistic Case**WTG:** T17 - T17

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,20	5,10	6,20	7,50	9,50	11,40	12,20	11,60	10,10	7,30	5,30	4,10

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
218	4.061	570	243	369	619	793	854	643	197	81	112	8.760

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:27	08:16	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:07
	18:00	18:32	19:03	19:33	20:01	20:27	20:38	20:21	19:42	18:55	18:12	17:51
2	08:27	08:16	07:42	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:08
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:53	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:48	05:51	06:14	06:41	07:07	07:38	08:09
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39	08:10
	18:03	18:35	19:06	19:36	20:04	20:29	20:38	20:18	19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51	06:10	05:48	05:52	06:15	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:37	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:43	07:10	07:41	08:12
	18:05	18:38	19:08	19:37	20:06	20:31	20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:05	18:39	19:09	19:38	20:06	20:31	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39	20:07	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45	06:06	05:47	05:54	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:08	20:32	20:36	20:13	19:30	18:43	18:04	17:50
10	08:27	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03	17:50
11	08:27	08:07	07:29	06:42	06:04	05:47	05:56	06:21	06:48	07:14	07:46	08:16
	18:09	18:43	19:13	19:42	20:10	20:33	20:36	20:10	19:26	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:47	05:56	06:22	06:49	07:15	07:47	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:35	20:09	19:25	18:38	18:01	17:50
13	08:27	08:04	07:26	06:39	06:02	05:46	05:57	06:22	06:49	07:16	07:48	08:18
	18:11	18:46	19:15	19:44	20:12	20:34	20:35	20:08	19:23	18:37	18:00	17:51
14	08:27	08:03	07:25	06:38	06:01	05:46	05:58	06:23	06:50	07:17	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:34	20:07	19:22	18:35	18:00	17:51
15	08:26	08:02	07:23	06:36	06:00	05:46	05:58	06:24	06:51	07:18	07:51	08:19
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:05	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	06:00	05:46	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36	20:33	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:33	05:59	05:47	06:00	06:26	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:57	17:52
18	08:25	07:58	07:19	06:32	05:58	05:47	06:01	06:27	06:54	07:21	07:54	08:21
	18:16	18:51	19:20	19:49	20:16	20:36	20:32	20:02	19:15	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:17	20:37	20:32	20:00	19:14	18:28	17:56	17:52
20	08:24	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:55	07:23	07:56	08:23
	18:19	18:53	19:21	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:55	17:53
21	08:24	07:55	07:14	06:28	05:56	05:47	06:03	06:29	06:56	07:24	07:57	08:23
	18:20	18:54	19:22	19:51	20:19	20:37	20:30	19:58	19:11	18:26	17:55	17:53
22	08:23	07:53	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:55	19:23	19:52	20:20	20:37	20:30	19:56	19:09	18:24	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:47	06:04	06:31	06:58	07:26	07:59	08:24
	18:22	18:56	19:24	19:53	20:21	20:37	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:09	06:24	05:53	05:48	06:05	06:32	06:59	07:27	08:00	08:25
	18:23	18:58	19:25	19:54	20:21	20:38	20:28	19:53	19:06	18:22	17:53	17:55
25	08:22	07:49	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:01	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:27	19:52	19:04	18:21	17:53	17:55
26	08:21	07:48	07:06	06:21	05:52	05:48	06:07	06:34	07:01	07:29	08:02	08:25
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:30	08:03	08:26
	18:26	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:45	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:31	08:04	08:26
	18:28	19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49	06:09	06:36	07:03	07:32	08:05	08:26
	18:29		19:30	19:59	20:25	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:04	07:33	08:06	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:14	17:51	17:59
31	08:17		06:59		05:50		06:11	06:38		07:34		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	443	451	423	374	348	304	296
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Calendar per WTG

Calculation: Shadow Realistic Case**WTG:** T2 - T2

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,20	5,10	6,20	7,50	9,50	11,40	12,20	11,60	10,10	7,30	5,30	4,10

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
218	4.061	570	243	369	619	793	854	643	197	81	112	8.760

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:28	08:17	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:08
	18:00	18:32	19:03	19:33	20:01	20:28	20:38	20:21	19:42	18:55	18:12	17:51
2	08:28	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:09
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:54	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:49	05:51	06:14	06:41	07:07	07:38	08:10
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39	08:11
	18:03	18:36	19:06	19:36	20:04	20:30	20:38	20:18	19:37	18:51	18:09	17:50
5	08:28	08:13	07:38	06:51	06:11	05:48	05:52	06:16	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:38	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:44	07:10	07:41	08:12
	18:05	18:38	19:08	19:38	20:06	20:31	20:37	20:16	19:34	18:48	18:07	17:50
7	08:28	08:11	07:36	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:06	18:39	19:09	19:39	20:07	20:32	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:40	20:08	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:33	06:45	06:06	05:47	05:55	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:09	20:33	20:37	20:13	19:30	18:43	18:04	17:50
10	08:28	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41	20:10	20:33	20:36	20:12	19:28	18:41	18:03	17:50
11	08:28	08:07	07:30	06:42	06:04	05:47	05:56	06:21	06:48	07:15	07:47	08:17
	18:09	18:44	19:13	19:42	20:10	20:34	20:36	20:11	19:27	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:47	05:56	06:22	06:49	07:16	07:48	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:36	20:09	19:25	18:39	18:01	17:50
13	08:27	08:05	07:27	06:39	06:02	05:47	05:57	06:23	06:50	07:17	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:35	20:35	20:08	19:24	18:37	18:01	17:51
14	08:27	08:04	07:25	06:38	06:01	05:47	05:58	06:23	06:50	07:18	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:35	20:07	19:22	18:36	18:00	17:51
15	08:27	08:02	07:24	06:36	06:01	05:47	05:59	06:24	06:51	07:19	07:51	08:20
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:06	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	06:00	05:47	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36	20:34	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:34	05:59	05:47	06:00	06:26	06:53	07:20	07:53	08:21
	18:16	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:57	17:52
18	08:26	07:59	07:19	06:32	05:58	05:47	06:01	06:27	06:54	07:21	07:54	08:22
	18:17	18:51	19:20	19:49	20:17	20:37	20:33	20:02	19:16	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:18	20:37	20:32	20:00	19:14	18:29	17:56	17:52
20	08:25	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:56	07:23	07:56	08:23
	18:19	18:53	19:22	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:56	17:53
21	08:24	07:55	07:14	06:28	05:56	05:47	06:03	06:30	06:57	07:24	07:57	08:23
	18:20	18:54	19:23	19:52	20:19	20:37	20:31	19:58	19:11	18:26	17:55	17:53
22	08:24	07:54	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:56	19:24	19:53	20:20	20:38	20:30	19:56	19:09	18:25	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:48	06:05	06:31	06:58	07:26	08:00	08:24
	18:22	18:57	19:25	19:54	20:21	20:38	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:10	06:24	05:54	05:48	06:05	06:32	06:59	07:27	08:01	08:25
	18:23	18:58	19:25	19:55	20:22	20:38	20:28	19:54	19:06	18:22	17:53	17:55
25	08:22	07:50	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:02	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:28	19:52	19:05	18:21	17:53	17:55
26	08:21	07:48	07:07	06:21	05:52	05:48	06:07	06:34	07:01	07:30	08:03	08:26
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:21	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:31	08:04	08:26
	18:27	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:46	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:32	08:05	08:26
	18:28	19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49	06:09	06:37	07:04	07:33	08:06	08:27
	18:29		19:30	19:59	20:26	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:05	07:34	08:07	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51	17:59
31	08:17		06:59		05:50		06:11	06:38		07:35		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	444	451	423	374	348	304	296
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

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Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Calendar per WTG

Calculation: Shadow Realistic Case**WTG:** T3 - T3

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,20	5,10	6,20	7,50	9,50	11,40	12,20	11,60	10,10	7,30	5,30	4,10

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
218	4.061	570	243	369	619	793	854	643	197	81	112	8.760

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:28	08:17	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:08
	18:00	18:32	19:03	19:33	20:01	20:28	20:38	20:21	19:42	18:55	18:12	17:51
2	08:28	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:09
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:54	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:49	05:51	06:14	06:41	07:07	07:38	08:10
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39	08:11
	18:03	18:36	19:06	19:36	20:04	20:30	20:38	20:18	19:37	18:51	18:09	17:50
5	08:28	08:13	07:38	06:51	06:11	05:48	05:52	06:16	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:38	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:44	07:10	07:41	08:12
	18:05	18:38	19:08	19:38	20:06	20:31	20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:06	18:39	19:09	19:39	20:07	20:32	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:40	20:08	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:33	06:45	06:06	05:47	05:55	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:09	20:33	20:37	20:13	19:30	18:43	18:04	17:50
10	08:28	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03	17:50
11	08:28	08:07	07:30	06:42	06:04	05:47	05:56	06:21	06:48	07:15	07:47	08:17
	18:09	18:44	19:13	19:42	20:10	20:34	20:36	20:11	19:27	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:47	05:56	06:22	06:49	07:16	07:48	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:36	20:09	19:25	18:39	18:01	17:50
13	08:27	08:05	07:27	06:39	06:02	05:47	05:57	06:23	06:50	07:17	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:35	20:35	20:08	19:23	18:37	18:01	17:51
14	08:27	08:04	07:25	06:38	06:01	05:47	05:58	06:23	06:50	07:18	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:35	20:07	19:22	18:36	18:00	17:51
15	08:27	08:02	07:24	06:36	06:01	05:47	05:59	06:24	06:51	07:19	07:51	08:20
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:06	19:20	18:34	17:59	17:51
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	18:14	18:49	19:18	19:47	20:15	20:36	20:34	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:34	05:59	05:47	06:00	06:26	06:53	07:20	07:53	08:21
	18:16	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:58	17:52
18	08:26	07:59	07:19	06:32	05:58	05:47	06:01	06:27	06:54	07:21	07:54	08:22
	18:17	18:51	19:20	19:49	20:17	20:36	20:32	20:02	19:16	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:18	20:37	20:32	20:00	19:14	18:29	17:56	17:52
20	08:25	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:56	07:23	07:56	08:23
	18:19	18:53	19:22	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:56	17:53
21	08:24	07:55	07:14	06:28	05:56	05:47	06:03	06:30	06:57	07:24	07:57	08:23
	18:20	18:54	19:23	19:52	20:19	20:37	20:31	19:58	19:11	18:26	17:55	17:53
22	08:24	07:54	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:56	19:24	19:53	20:20	20:38	20:30	19:56	19:09	18:25	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:48	06:05	06:31	06:58	07:26	08:00	08:24
	18:22	18:57	19:25	19:54	20:21	20:38	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:10	06:24	05:54	05:48	06:05	06:32	06:59	07:27	08:01	08:25
	18:23	18:58	19:25	19:55	20:22	20:38	20:28	19:54	19:06	18:22	17:53	17:55
25	08:22	07:50	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:02	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:28	19:52	19:05	18:21	17:53	17:55
26	08:21	07:48	07:07	06:21	05:52	05:48	06:07	06:34	07:01	07:30	08:03	08:26
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:21	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:31	08:04	08:26
	18:27	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:46	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:32	08:05	08:26
	18:28	19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49	06:09	06:37	07:04	07:33	08:06	08:27
	18:29		19:30	19:59	20:26	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:05	07:34	08:07	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51	17:59
31	08:17		06:59		05:50		06:11	06:38		07:35		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	444	451	423	374	348	304	296
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Calendar per WTG

Calculation: Shadow Realistic Case**WTG:** T4 - T4

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,20	5,10	6,20	7,50	9,50	11,40	12,20	11,60	10,10	7,30	5,30	4,10

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
218	4.061	570	243	369	619	793	854	643	197	81	112	8.760

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	Septembe	October	Novembe	December
1	08:28	08:17	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:08
	18:00	18:32	19:03	19:33	20:01	20:28	20:38	20:21	19:42	18:55	18:12	17:51
2	08:28	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:09
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:54	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:49	05:51	06:14	06:41	07:07	07:38	08:10
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39	08:11
	18:03	18:36	19:06	19:36	20:04	20:30	20:38	20:18	19:37	18:51	18:09	17:50
5	08:28	08:13	07:38	06:51	06:11	05:48	05:52	06:15	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:38	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:44	07:10	07:41	08:12
	18:05	18:38	19:08	19:38	20:06	20:31	20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:06	18:39	19:09	19:39	20:07	20:32	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:40	20:08	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:33	06:45	06:06	05:47	05:55	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:09	20:33	20:37	20:13	19:30	18:43	18:04	17:50
10	08:28	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03	17:50
11	08:28	08:07	07:30	06:42	06:04	05:47	05:56	06:21	06:48	07:15	07:47	08:17
	18:09	18:44	19:13	19:42	20:10	20:34	20:36	20:11	19:27	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:47	05:56	06:22	06:49	07:16	07:48	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:35	20:09	19:25	18:39	18:01	17:50
13	08:27	08:05	07:27	06:39	06:02	05:47	05:57	06:23	06:50	07:17	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:35	20:35	20:08	19:23	18:37	18:01	17:51
14	08:27	08:04	07:25	06:38	06:01	05:47	05:58	06:23	06:50	07:18	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:35	20:07	19:22	18:36	18:00	17:51
15	08:27	08:02	07:23	06:36	06:00	05:47	05:59	06:24	06:51	07:18	07:51	08:20
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:06	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	06:00	05:47	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36	20:34	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:34	05:59	05:47	06:00	06:26	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:57	17:52
18	08:26	07:59	07:19	06:32	05:58	05:47	06:01	06:27	06:54	07:21	07:54	08:22
	18:17	18:51	19:20	19:49	20:17	20:36	20:32	20:02	19:16	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:17	20:37	20:32	20:00	19:14	18:29	17:56	17:52
20	08:25	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:56	07:23	07:56	08:23
	18:19	18:53	19:22	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:56	17:53
21	08:24	07:55	07:14	06:28	05:56	05:47	06:03	06:30	06:57	07:24	07:57	08:23
	18:20	18:54	19:23	19:52	20:19	20:37	20:31	19:58	19:11	18:26	17:55	17:53
22	08:24	07:54	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:56	19:24	19:53	20:20	20:38	20:30	19:56	19:09	18:25	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:48	06:05	06:31	06:58	07:26	07:59	08:24
	18:22	18:57	19:24	19:54	20:21	20:38	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:10	06:24	05:54	05:48	06:05	06:32	06:59	07:27	08:01	08:25
	18:23	18:58	19:25	19:55	20:22	20:38	20:28	19:54	19:06	18:22	17:53	17:55
25	08:22	07:50	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:02	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:28	19:52	19:05	18:21	17:53	17:55
26	08:21	07:48	07:07	06:21	05:52	05:48	06:07	06:34	07:01	07:29	08:03	08:26
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:31	08:04	08:26
	18:27	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:45	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:32	08:05	08:26
	18:28	19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49	06:09	06:37	07:04	07:33	08:06	08:27
	18:29		19:30	19:59	20:26	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:05	07:34	08:07	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51	17:59
31	08:17		06:59		05:50		06:11	06:38		07:35		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	444	451	423	374	348	304	296
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Calendar per WTG

Calculation: Shadow Realistic Case**WTG:** T5 - T5

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,20	5,10	6,20	7,50	9,50	11,40	12,20	11,60	10,10	7,30	5,30	4,10

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
218	4.061	570	243	369	619	793	854	643	197	81	112	8.760

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:27	08:17	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:08
	18:00	18:32	19:03	19:33	20:01	20:28	20:38	20:21	19:42	18:55	18:12	17:51
2	08:28	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:09
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:54	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:49	05:51	06:14	06:41	07:07	07:38	08:10
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39	08:10
	18:03	18:36	19:06	19:36	20:04	20:30	20:38	20:18	19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51	06:11	05:48	05:52	06:15	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:38	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:44	07:10	07:41	08:12
	18:05	18:38	19:08	19:38	20:06	20:31	20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:06	18:39	19:09	19:39	20:07	20:31	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39	20:08	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45	06:06	05:47	05:55	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:09	20:33	20:37	20:13	19:30	18:43	18:04	17:50
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	18:08	18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03	17:50
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	18:09	18:43	19:13	19:42	20:10	20:34	20:36	20:11	19:27	18:40	18:02	17:50
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13	08:27	08:05	07:26	06:39	06:02	05:47	05:57	06:22	06:50	07:17	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:35	20:35	20:08	19:23	18:37	18:00	17:51
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	18:12	18:47	19:16	19:45	20:13	20:35	20:35	20:07	19:22	18:36	18:00	17:51
15	08:27	08:02	07:23	06:36	06:00	05:46	05:58	06:24	06:51	07:18	07:51	08:20
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	18:21	18:56	19:24	19:53	20:20	20:37	20:30	19:56	19:09	18:25	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:48	06:04	06:31	06:58	07:26	07:59	08:24
	18:22	18:57	19:24	19:54	20:21	20:38	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:10	06:24	05:54	05:48	06:05	06:32	06:59	07:27	08:01	08:25
	18:23	18:58	19:25	19:54	20:22	20:38	20:28	19:54	19:06	18:22	17:53	17:55
25	08:22	07:50	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:02	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:28	19:52	19:05	18:21	17:53	17:55
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	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:30	08:04	08:26
	18:26	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:45	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:32	08:05	08:26
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29	08:19		07:02	06:18	05:51	05:49	06:09	06:37	07:04	07:33	08:06	08:27
	18:29		19:30	19:59	20:25	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:04	07:34	08:07	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51	17:59
31	08:17		06:59		05:50		06:11	06:38		07:35		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	444	451	423	374	348	304	296
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Calendar per WTG

Calculation: Shadow Realistic Case**WTG:** T6 - T6
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,20	5,10	6,20	7,50	9,50	11,40	12,20	11,60	10,10	7,30	5,30	4,10

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
218	4.061	570	243	369	619	793	854	643	197	81	112	8.760

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:27	08:17	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:08
	18:00	18:32	19:03	19:33	20:01	20:28	20:38	20:21	19:42	18:55	18:12	17:51
2	08:28	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:09
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:54	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:48	05:51	06:14	06:41	07:07	07:38	08:10
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39	08:10
	18:03	18:36	19:06	19:36	20:04	20:30	20:38	20:18	19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51	06:11	05:48	05:52	06:15	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:38	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:44	07:10	07:41	08:12
	18:05	18:38	19:08	19:38	20:06	20:31	20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:06	18:39	19:09	19:39	20:07	20:31	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39	20:08	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45	06:06	05:47	05:55	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:09	20:33	20:37	20:13	19:30	18:43	18:04	17:50
10	08:28	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03	17:50
11	08:28	08:07	07:30	06:42	06:04	05:47	05:56	06:21	06:48	07:15	07:47	08:17
	18:09	18:43	19:13	19:42	20:10	20:34	20:36	20:11	19:27	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:47	05:56	06:22	06:49	07:16	07:48	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:35	20:09	19:25	18:38	18:01	17:50
13	08:27	08:05	07:26	06:39	06:02	05:47	05:57	06:22	06:50	07:17	07:49	08:18
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15	08:27	08:02	07:23	06:36	06:00	05:46	05:58	06:24	06:51	07:18	07:51	08:20
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:06	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	06:00	05:47	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36	20:34	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:34	05:59	05:47	06:00	06:26	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:57	17:52
18	08:25	07:59	07:19	06:32	05:58	05:47	06:01	06:27	06:54	07:21	07:54	08:22
	18:17	18:51	19:20	19:49	20:17	20:36	20:32	20:02	19:16	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:17	20:37	20:32	20:00	19:14	18:29	17:56	17:52
20	08:25	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:56	07:23	07:56	08:23
	18:19	18:53	19:22	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:55	17:53
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	18:20	18:54	19:23	19:52	20:19	20:37	20:31	19:58	19:11	18:26	17:55	17:53
22	08:24	07:54	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:55	19:24	19:53	20:20	20:37	20:30	19:56	19:09	18:25	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:48	06:04	06:31	06:58	07:26	07:59	08:24
	18:22	18:57	19:24	19:54	20:21	20:38	20:29	19:55	19:08	18:23	17:54	17:54
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	18:23	18:58	19:25	19:54	20:22	20:38	20:28	19:54	19:06	18:22	17:53	17:55
25	08:22	07:50	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:02	08:25
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	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:30	08:04	08:26
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28	08:20	07:45	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:32	08:05	08:26
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29	08:19		07:02	06:18	05:51	05:49	06:09	06:37	07:04	07:33	08:06	08:27
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30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:04	07:34	08:07	08:27
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31	08:17		06:59		05:50		06:11	06:38		07:35		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	444	451	423	374	348	304	296
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Calendar per WTG

Calculation: Shadow Realistic Case**WTG:** T7 - T7
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,20	5,10	6,20	7,50	9,50	11,40	12,20	11,60	10,10	7,30	5,30	4,10

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
218	4.061	570	243	369	619	793	854	643	197	81	112	8.760

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:27	08:17	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:08
	18:00	18:32	19:03	19:33	20:01	20:28	20:38	20:21	19:42	18:55	18:12	17:51
2	08:28	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:09
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:54	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:48	05:51	06:14	06:41	07:07	07:38	08:10
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39	08:10
	18:03	18:36	19:06	19:36	20:04	20:30	20:38	20:18	19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51	06:11	05:48	05:52	06:15	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:38	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:43	07:10	07:41	08:12
	18:05	18:38	19:08	19:38	20:06	20:31	20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:05	18:39	19:09	19:39	20:07	20:31	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39	20:08	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45	06:06	05:47	05:55	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:09	20:33	20:37	20:13	19:30	18:43	18:04	17:50
10	08:28	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03	17:50
11	08:28	08:07	07:29	06:42	06:04	05:47	05:56	06:21	06:48	07:15	07:46	08:17
	18:09	18:43	19:13	19:42	20:10	20:34	20:36	20:11	19:27	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:47	05:56	06:22	06:49	07:16	07:48	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:35	20:09	19:25	18:38	18:01	17:50
13	08:27	08:05	07:26	06:39	06:02	05:47	05:57	06:22	06:50	07:17	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:35	20:35	20:08	19:23	18:37	18:00	17:51
14	08:27	08:03	07:25	06:38	06:01	05:46	05:58	06:23	06:50	07:17	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:35	20:07	19:22	18:36	18:00	17:51
15	08:27	08:02	07:23	06:36	06:00	05:46	05:58	06:24	06:51	07:18	07:51	08:20
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:06	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	06:00	05:46	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36	20:34	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:34	05:59	05:47	06:00	06:26	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:57	17:52
18	08:25	07:59	07:19	06:32	05:58	05:47	06:01	06:27	06:54	07:21	07:54	08:22
	18:17	18:51	19:20	19:49	20:17	20:36	20:32	20:02	19:16	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:17	20:37	20:32	20:00	19:14	18:29	17:56	17:52
20	08:25	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:56	07:23	07:56	08:23
	18:19	18:53	19:22	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:55	17:53
21	08:24	07:55	07:14	06:28	05:56	05:47	06:03	06:30	06:56	07:24	07:57	08:23
	18:20	18:54	19:23	19:52	20:19	20:37	20:30	19:58	19:11	18:26	17:55	17:53
22	08:24	07:54	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:55	19:23	19:53	20:20	20:37	20:30	19:56	19:09	18:25	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:47	06:04	06:31	06:58	07:26	07:59	08:24
	18:22	18:57	19:24	19:54	20:21	20:38	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:10	06:24	05:53	05:48	06:05	06:32	06:59	07:27	08:00	08:25
	18:23	18:58	19:25	19:54	20:22	20:38	20:28	19:54	19:06	18:22	17:53	17:55
25	08:22	07:50	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:02	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:28	19:52	19:04	18:21	17:53	17:55
26	08:21	07:48	07:06	06:21	05:52	05:48	06:07	06:34	07:01	07:29	08:03	08:26
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:30	08:04	08:26
	18:26	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:45	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:32	08:05	08:26
	18:28	19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49	06:09	06:37	07:04	07:33	08:06	08:27
	18:29		19:30	19:59	20:25	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:04	07:34	08:07	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51	17:59
31	08:17		06:59		05:50		06:11	06:38		07:35		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	444	451	423	374	348	304	296
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Calendar per WTG

Calculation: Shadow Realistic Case**WTG:** T8 - T8
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,20	5,10	6,20	7,50	9,50	11,40	12,20	11,60	10,10	7,30	5,30	4,10

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
218	4.061	570	243	369	619	793	854	643	197	81	112	8.760

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:27	08:17	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:08
	18:00	18:32	19:03	19:33	20:01	20:28	20:38	20:21	19:42	18:55	18:12	17:51
2	08:28	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:09
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:54	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:48	05:51	06:14	06:41	07:07	07:38	08:10
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39	08:10
	18:03	18:36	19:06	19:36	20:04	20:30	20:38	20:18	19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51	06:11	05:48	05:52	06:15	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:38	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:43	07:10	07:41	08:12
	18:05	18:38	19:08	19:38	20:06	20:31	20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:05	18:39	19:09	19:39	20:07	20:31	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39	20:08	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45	06:06	05:47	05:55	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:08	20:33	20:37	20:13	19:30	18:43	18:04	17:50
10	08:28	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03	17:50
11	08:28	08:07	07:29	06:42	06:04	05:47	05:56	06:21	06:48	07:15	07:46	08:17
	18:09	18:43	19:13	19:42	20:10	20:34	20:36	20:10	19:27	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:47	05:56	06:22	06:49	07:16	07:48	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:35	20:09	19:25	18:38	18:01	17:50
13	08:27	08:05	07:26	06:39	06:02	05:46	05:57	06:22	06:50	07:16	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:35	20:35	20:08	19:23	18:37	18:00	17:51
14	08:27	08:03	07:25	06:38	06:01	05:46	05:58	06:23	06:50	07:17	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:35	20:07	19:22	18:36	18:00	17:51
15	08:27	08:02	07:23	06:36	06:00	05:46	05:58	06:24	06:51	07:18	07:51	08:20
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:06	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	06:00	05:46	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36	20:34	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:34	05:59	05:47	06:00	06:26	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:57	17:52
18	08:25	07:59	07:19	06:32	05:58	05:47	06:01	06:27	06:54	07:21	07:54	08:22
	18:17	18:51	19:20	19:49	20:17	20:36	20:32	20:02	19:16	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:17	20:37	20:32	20:00	19:14	18:29	17:56	17:52
20	08:25	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:56	07:23	07:56	08:23
	18:19	18:53	19:22	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:55	17:53
21	08:24	07:55	07:14	06:28	05:56	05:47	06:03	06:30	06:56	07:24	07:57	08:23
	18:20	18:54	19:23	19:52	20:19	20:37	20:30	19:58	19:11	18:26	17:55	17:53
22	08:24	07:54	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:55	19:23	19:53	20:20	20:37	20:30	19:56	19:09	18:25	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:47	06:04	06:31	06:58	07:26	07:59	08:24
	18:22	18:57	19:24	19:53	20:21	20:38	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:10	06:24	05:53	05:48	06:05	06:32	06:59	07:27	08:00	08:25
	18:23	18:58	19:25	19:54	20:22	20:38	20:28	19:53	19:06	18:22	17:53	17:55
25	08:22	07:50	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:02	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:28	19:52	19:04	18:21	17:53	17:55
26	08:21	07:48	07:06	06:21	05:52	05:48	06:07	06:34	07:01	07:29	08:03	08:26
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:30	08:04	08:26
	18:26	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:45	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:31	08:05	08:26
	18:28	19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49	06:09	06:37	07:04	07:33	08:06	08:27
	18:29		19:30	19:59	20:25	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:04	07:34	08:07	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51	17:59
31	08:17		06:59		05:50		06:11	06:38		07:35		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	444	451	423	374	348	304	296
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Calendar per WTG

Calculation: Shadow Realistic Case**WTG:** T9 - T9
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,20	5,10	6,20	7,50	9,50	11,40	12,20	11,60	10,10	7,30	5,30	4,10

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
218	4.061	570	243	369	619	793	854	643	197	81	112	8.760

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:27	08:17	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:08
	18:00	18:32	19:03	19:33	20:01	20:28	20:38	20:21	19:42	18:55	18:12	17:51
2	08:28	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:09
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:54	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:48	05:51	06:14	06:41	07:07	07:38	08:09
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39	08:10
	18:03	18:36	19:06	19:36	20:04	20:30	20:38	20:18	19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51	06:10	05:48	05:52	06:15	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:38	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:43	07:10	07:41	08:12
	18:05	18:38	19:08	19:38	20:06	20:31	20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:05	18:39	19:09	19:38	20:07	20:31	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39	20:08	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45	06:06	05:47	05:54	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:08	20:33	20:36	20:13	19:30	18:43	18:04	17:50
10	08:28	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03	17:50
11	08:27	08:07	07:29	06:42	06:04	05:47	05:56	06:21	06:48	07:15	07:46	08:17
	18:09	18:43	19:13	19:42	20:10	20:34	20:36	20:10	19:27	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:47	05:56	06:22	06:49	07:16	07:48	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:35	20:09	19:25	18:38	18:01	17:50
13	08:27	08:05	07:26	06:39	06:02	05:46	05:57	06:22	06:50	07:16	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:34	20:35	20:08	19:23	18:37	18:00	17:51
14	08:27	08:03	07:25	06:38	06:01	05:46	05:58	06:23	06:50	07:17	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:35	20:07	19:22	18:36	18:00	17:51
15	08:27	08:02	07:23	06:36	06:00	05:46	05:58	06:24	06:51	07:18	07:51	08:20
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:06	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	06:00	05:46	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36	20:34	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:34	05:59	05:47	06:00	06:26	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:57	17:52
18	08:25	07:59	07:19	06:32	05:58	05:47	06:01	06:27	06:54	07:21	07:54	08:22
	18:17	18:51	19:20	19:49	20:17	20:36	20:32	20:02	19:16	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:17	20:37	20:32	20:00	19:14	18:29	17:56	17:52
20	08:25	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:56	07:23	07:56	08:23
	18:19	18:53	19:22	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:55	17:53
21	08:24	07:55	07:14	06:28	05:56	05:47	06:03	06:29	06:56	07:24	07:57	08:23
	18:20	18:54	19:23	19:52	20:19	20:37	20:30	19:58	19:11	18:26	17:55	17:53
22	08:24	07:54	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:55	19:23	19:53	20:20	20:37	20:30	19:56	19:09	18:25	17:54	17:54
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	18:22	18:57	19:24	19:53	20:21	20:38	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:10	06:24	05:53	05:48	06:05	06:32	06:59	07:27	08:00	08:25
	18:23	18:58	19:25	19:54	20:22	20:38	20:28	19:53	19:06	18:22	17:53	17:55
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26	08:21	07:48	07:06	06:21	05:52	05:48	06:07	06:34	07:01	07:29	08:03	08:26
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:30	08:04	08:26
	18:26	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:45	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:31	08:05	08:26
	18:28	19:02	19:29	19:58	20:25	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49	06:09	06:37	07:04	07:33	08:06	08:27
	18:29		19:30	19:59	20:25	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:04	07:34	08:07	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51	17:59
31	08:17		06:59		05:50		06:11	06:38		07:35		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	443	451	423	374	348	304	296
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Calendar

Calculation: Shadow Realistic Case**Shadow receptor:** CINARDIBI - Shadow Receptor: D

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,20	5,10	6,20	7,50	9,50	11,40	12,20	11,60	10,10	7,30	5,30	4,10

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
218	4.061	570	243	369	619	793	854	643	197	81	112	8.760

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:27	08:16	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:07
	18:00	18:32	19:03	19:33	20:01	20:27	20:38	20:21	19:42	18:55	18:12	17:51
2	08:28	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:08
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:53	18:11	17:50
3	08:28	08:15	07:41	06:54	06:13	05:48	05:51	06:14	06:41	07:07	07:38	08:09
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:14	06:42	07:08	07:39	08:10
	18:03	18:35	19:06	19:36	20:04	20:29	20:38	20:18	19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51	06:10	05:48	05:52	06:15	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:37	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:47	05:53	06:16	06:43	07:10	07:41	08:12
	18:04	18:38	19:08	19:37	20:06	20:31	20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:05	18:39	19:09	19:38	20:07	20:31	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39	20:07	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45	06:06	05:47	05:54	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:08	20:32	20:36	20:13	19:30	18:43	18:04	17:50
10	08:28	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03	17:50
11	08:27	08:07	07:29	06:42	06:04	05:47	05:56	06:21	06:48	07:14	07:46	08:16
	18:09	18:43	19:13	19:42	20:10	20:33	20:36	20:10	19:26	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:46	05:56	06:21	06:49	07:15	07:47	08:17
	18:10	18:44	19:14	19:43	20:11	20:34	20:35	20:09	19:25	18:38	18:01	17:50
13	08:27	08:04	07:26	06:39	06:02	05:46	05:57	06:22	06:49	07:16	07:49	08:18
	18:11	18:46	19:15	19:44	20:12	20:34	20:35	20:08	19:23	18:37	18:00	17:50
14	08:27	08:03	07:25	06:38	06:01	05:46	05:58	06:23	06:50	07:17	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:34	20:07	19:22	18:35	18:00	17:51
15	08:26	08:02	07:23	06:36	06:00	05:46	05:58	06:24	06:51	07:18	07:51	08:19
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:05	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	05:59	05:46	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36	20:33	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:33	05:59	05:46	06:00	06:26	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48	20:16	20:36	20:33	20:03	19:17	18:31	17:57	17:51
18	08:25	07:59	07:19	06:32	05:58	05:47	06:00	06:27	06:54	07:21	07:54	08:21
	18:16	18:51	19:20	19:49	20:16	20:36	20:32	20:02	19:15	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:17	18:52	19:21	19:50	20:17	20:37	20:32	20:00	19:14	18:28	17:56	17:52
20	08:24	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:55	07:23	07:56	08:23
	18:19	18:53	19:21	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:55	17:53
21	08:24	07:55	07:14	06:28	05:55	05:47	06:03	06:29	06:56	07:24	07:57	08:23
	18:20	18:54	19:22	19:52	20:19	20:37	20:30	19:58	19:11	18:26	17:55	17:53
22	08:23	07:53	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:55	19:23	19:52	20:20	20:37	20:30	19:56	19:09	18:24	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:47	06:04	06:31	06:58	07:26	07:59	08:24
	18:22	18:56	19:24	19:53	20:21	20:37	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:09	06:24	05:53	05:48	06:05	06:32	06:59	07:27	08:00	08:25
	18:23	18:57	19:25	19:54	20:21	20:38	20:28	19:53	19:06	18:22	17:53	17:55
25	08:22	07:49	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:01	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:27	19:52	19:04	18:21	17:53	17:55
26	08:21	07:48	07:06	06:21	05:52	05:48	06:07	06:34	07:01	07:29	08:02	08:26
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:30	08:03	08:26
	18:26	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:56
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29	08:19		07:02	06:17	05:50	05:49	06:09	06:36	07:03	07:32	08:05	08:27
	18:29		19:30	19:59	20:25	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:04	07:33	08:06	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:14	17:51	17:58
31	08:17		06:59		05:50		06:11	06:38		07:35		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	444	451	423	374	348	304	296
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Calendar

Calculation: Shadow Realistic Case**Shadow receptor:** DAGTEKKE - Shadow Receptor: C

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,20	5,10	6,20	7,50	9,50	11,40	12,20	11,60	10,10	7,30	5,30	4,10

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
218	4.061	570	243	369	619	793	854	643	197	81	112	8.760

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:27	08:16	07:44	06:57	06:15	05:49	05:50	06:12	06:39	07:05	07:36	08:07
	18:00	18:32	19:03	19:33	20:01	20:27	20:38	20:21	19:42	18:55	18:12	17:51
2	08:27	08:16	07:43	06:56	06:14	05:49	05:51	06:13	06:40	07:06	07:37	08:08
	18:01	18:33	19:04	19:34	20:02	20:28	20:38	20:20	19:40	18:53	18:11	17:51
3	08:28	08:15	07:41	06:54	06:13	05:49	05:51	06:14	06:41	07:07	07:38	08:09
	18:02	18:34	19:05	19:35	20:03	20:29	20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48	05:52	06:15	06:42	07:08	07:39	08:10
	18:03	18:36	19:06	19:36	20:04	20:29	20:38	20:18	19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51	06:11	05:48	05:52	06:15	06:43	07:09	07:40	08:11
	18:04	18:37	19:07	19:37	20:05	20:30	20:37	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:50	06:09	05:48	05:53	06:16	06:43	07:10	07:41	08:12
	18:05	18:38	19:08	19:37	20:06	20:31	20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47	05:53	06:17	06:44	07:11	07:42	08:13
	18:06	18:39	19:09	19:38	20:06	20:31	20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47	05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39	20:07	20:32	20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45	06:06	05:47	05:55	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:08	20:32	20:36	20:13	19:30	18:43	18:04	17:50
10	08:27	08:08	07:31	06:44	06:05	05:47	05:55	06:20	06:47	07:14	07:45	08:16
	18:08	18:42	19:12	19:41	20:09	20:33	20:36	20:12	19:28	18:41	18:03	17:50
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12	08:27	08:06	07:28	06:41	06:03	05:47	05:56	06:22	06:49	07:15	07:47	08:17
	18:10	18:45	19:14	19:43	20:11	20:34	20:35	20:09	19:25	18:38	18:01	17:50
13	08:27	08:04	07:26	06:39	06:02	05:47	05:57	06:22	06:49	07:16	07:48	08:18
	18:11	18:46	19:15	19:44	20:12	20:34	20:35	20:08	19:23	18:37	18:00	17:51
14	08:27	08:03	07:25	06:38	06:01	05:47	05:58	06:23	06:50	07:17	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35	20:34	20:07	19:22	18:36	18:00	17:51
15	08:26	08:02	07:23	06:36	06:00	05:47	05:58	06:24	06:51	07:18	07:51	08:19
	18:13	18:48	19:17	19:46	20:14	20:35	20:34	20:05	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	06:00	05:47	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:36	20:33	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:33	05:59	05:47	06:00	06:26	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48	20:15	20:36	20:33	20:03	19:17	18:31	17:57	17:52
18	08:25	07:58	07:19	06:32	05:58	05:47	06:01	06:27	06:54	07:21	07:54	08:21
	18:17	18:51	19:20	19:49	20:16	20:36	20:32	20:02	19:15	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:21	19:50	20:17	20:36	20:32	20:00	19:14	18:29	17:56	17:52
20	08:24	07:56	07:16	06:29	05:56	05:47	06:02	06:29	06:56	07:23	07:56	08:23
	18:19	18:53	19:22	19:51	20:18	20:37	20:31	19:59	19:12	18:27	17:55	17:53
21	08:24	07:55	07:14	06:28	05:56	05:47	06:03	06:29	06:56	07:24	07:57	08:23
	18:20	18:54	19:22	19:51	20:19	20:37	20:30	19:58	19:11	18:26	17:55	17:53
22	08:23	07:53	07:13	06:27	05:55	05:47	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:55	19:23	19:52	20:20	20:37	20:30	19:56	19:09	18:24	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:48	06:04	06:31	06:58	07:26	07:59	08:24
	18:22	18:56	19:24	19:53	20:21	20:37	20:29	19:55	19:08	18:23	17:54	17:54
24	08:22	07:51	07:09	06:24	05:54	05:48	06:05	06:32	06:59	07:27	08:00	08:25
	18:23	18:58	19:25	19:54	20:21	20:38	20:28	19:53	19:06	18:22	17:53	17:55
25	08:22	07:49	07:08	06:23	05:53	05:48	06:06	06:33	07:00	07:28	08:01	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	20:27	19:52	19:04	18:21	17:53	17:55
26	08:21	07:48	07:06	06:21	05:52	05:48	06:07	06:34	07:01	07:29	08:02	08:25
	18:25	19:00	19:27	19:56	20:23	20:38	20:27	19:51	19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	05:52	05:49	06:08	06:35	07:02	07:30	08:03	08:26
	18:26	19:01	19:28	19:57	20:24	20:38	20:26	19:49	19:01	18:18	17:52	17:57
28	08:20	07:45	07:03	06:19	05:51	05:49	06:09	06:36	07:03	07:31	08:04	08:26
	18:28	19:02	19:29	19:58	20:24	20:38	20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:18	05:51	05:49	06:09	06:36	07:03	07:32	08:05	08:26
	18:29		19:30	19:59	20:25	20:38	20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50	06:10	06:37	07:04	07:33	08:06	08:27
	18:30		19:31	20:00	20:26	20:38	20:23	19:45	18:57	18:15	17:51	17:59
31	08:17		06:59		05:50		06:11	06:38		07:34		08:27
	18:31		19:32		20:27		20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	443	451	423	374	348	304	296
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Calendar

Calculation: Shadow Realistic Case**Shadow receptor:** NSR1 - Shadow Receptor: A

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,20	5,10	6,20	7,50	9,50	11,40	12,20	11,60	10,10	7,30	5,30	4,10

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
218	4.061	570	243	369	619	793	854	643	197	81	112	8.760

Idle start wind speed: Cut in wind speed from power curve

	January	February			March			April			May			June
1	08:27	08:16			07:44		18:01 (T12)	06:57			06:15		18:51 (T11)	05:49
	18:00	18:32			19:03	31	18:32 (T12)	19:33			20:01	31	19:22 (T11)	20:28
2	08:28	08:16			07:43		18:00 (T12)	06:56			06:14		18:50 (T11)	05:49
	18:01	18:33			19:04	34	18:34 (T12)	19:34			20:02	33	19:23 (T11)	20:28
3	08:28	08:15			07:41		17:59 (T12)	06:54			06:13		18:50 (T11)	05:48
	18:02	18:34			19:05	35	18:34 (T12)	19:35			20:03	33	19:23 (T11)	20:29
4	08:28	08:14			07:40		17:59 (T12)	06:53			06:12		18:49 (T11)	05:48
	18:03	18:35			19:06	35	18:34 (T12)	19:36			20:04	35	19:24 (T11)	20:30
5	08:28	08:13			07:38		17:57 (T12)	06:51			06:10		18:49 (T11)	05:48
	18:04	18:37			19:07	37	18:34 (T12)	19:37			20:05	35	19:24 (T11)	20:30
6	08:28	08:12			07:37		17:57 (T12)	06:50			06:09		18:49 (T11)	05:48
	18:05	18:38			19:08	38	18:35 (T12)	19:37			20:06	35	19:24 (T11)	20:31
7	08:28	08:11			07:35		17:56 (T12)	06:48			06:08		18:49 (T11)	05:47
	18:05	18:39			19:09	38	18:34 (T12)	19:38			20:07	35	19:24 (T11)	20:31
8	08:28	08:10			07:34		17:57 (T12)	06:47			06:07		18:49 (T11)	05:47
	18:06	18:40			19:10	38	18:35 (T12)	19:39			20:07	35	19:24 (T11)	20:32
9	08:28	08:09			07:32		17:56 (T12)	06:45			06:06		18:49 (T11)	05:47
	18:07	18:41			19:11	38	18:34 (T12)	19:40			20:08	35	19:24 (T11)	20:32
10	08:28	08:08			07:31		17:57 (T12)	06:44			06:05		18:49 (T11)	05:47
	18:08	18:42			19:12	37	18:34 (T12)	19:41			20:09	35	19:24 (T11)	20:33
11	08:27	08:07			07:29		17:56 (T12)	06:42			06:04		18:49 (T11)	05:47
	18:09	18:43			19:13	37	18:33 (T12)	19:42			20:10	35	19:24 (T11)	20:33
12	08:27	08:06			07:28		17:57 (T12)	06:41			06:03		18:49 (T11)	05:47
	18:10	18:45			19:14	36	18:33 (T12)	19:43			20:11	35	19:24 (T11)	20:34
13	08:27	08:05			07:26		17:57 (T12)	06:39			06:02		18:49 (T11)	05:46
	18:11	18:46			19:15	34	18:31 (T12)	19:44			20:12	34	19:23 (T11)	20:34
14	08:27	08:03			07:25		17:58 (T12)	06:38			06:01		18:49 (T11)	05:46
	18:12	18:47			19:16	33	18:31 (T12)	19:45			20:13	34	19:23 (T11)	20:35
15	08:26	08:02			07:23		17:58 (T12)	06:36			06:00		18:50 (T11)	05:46
	18:13	18:48			19:17	31	18:29 (T12)	19:46			20:14	33	19:23 (T11)	20:35
16	08:26	08:01			07:22		18:00 (T12)	06:35			06:00		18:51 (T11)	05:46
	18:14	18:49			19:18	28	18:28 (T12)	19:47			20:15	32	19:23 (T11)	20:36
17	08:26	08:00			07:20		18:01 (T12)	06:33			05:59		18:51 (T11)	05:47
	18:15	18:50			19:19	25	18:26 (T12)	19:48			20:16	31	19:22 (T11)	20:36
18	08:25	07:59			07:19		18:03 (T12)	06:32			05:58		18:51 (T11)	05:47
	18:16	18:51			19:20	21	18:24 (T12)	19:49			20:16	30	19:21 (T11)	20:36
19	08:25	07:57			07:17		18:05 (T12)	06:31			05:57		18:53 (T11)	05:47
	18:18	18:52			19:21	16	18:21 (T12)	19:50			20:17	28	19:21 (T11)	20:37
20	08:24	07:56			07:16		18:10 (T12)	06:29			05:56		18:53 (T11)	05:47
	18:19	18:53			19:22	6	18:16 (T12)	19:51			20:18	28	19:21 (T11)	20:37
21	08:24	07:55			07:14			06:28			05:56		18:54 (T11)	05:47
	18:20	18:54			19:22			19:52			20:19	26	19:20 (T11)	20:37
22	08:23	07:53			07:13			06:27			05:55		18:54 (T11)	05:47
	18:21	18:55			19:23			19:52			20:20	24	19:18 (T11)	20:37
23	08:23	07:52			07:11			06:25			05:54		18:56 (T11)	05:47
	18:22	18:56			19:24			19:53			20:21	22	19:18 (T11)	20:38
24	08:22	07:51		18:13 (T12)	07:10			06:24			05:53		18:57 (T11)	05:48
	18:23	18:58	9	18:22 (T12)	19:25			19:54			20:21	20	19:17 (T11)	20:38
25	08:22	07:49		18:09 (T12)	07:08			06:23		19:02 (T11)	05:53		18:59 (T11)	05:48
	18:24	18:59	17	18:26 (T12)	19:26			19:55	13	19:15 (T11)	20:22	17	19:16 (T11)	20:38
26	08:21	07:48		18:06 (T12)	07:06			06:21		18:58 (T11)	05:52		19:00 (T11)	05:48
	18:25	19:00	22	18:28 (T12)	19:27			19:56	19	19:17 (T11)	20:23	14	19:14 (T11)	20:38
27	08:20	07:47		18:04 (T12)	07:05			06:20		18:56 (T11)	05:52		19:02 (T11)	05:49
	18:26	19:01	26	18:30 (T12)	19:28			19:57	23	19:19 (T11)	20:24	11	19:13 (T11)	20:38
28	08:20	07:45		18:03 (T12)	07:03			06:19		18:55 (T11)	05:51		19:05 (T11)	05:49
	18:28	19:02	29	18:32 (T12)	19:29			19:58	25	19:20 (T11)	20:25	5	19:10 (T11)	20:38
29	08:19				07:02			06:18		18:54 (T11)	05:51			05:49
	18:29				19:30			19:59	27	19:21 (T11)	20:25			20:38
30	08:18				07:00			06:16		18:53 (T11)	05:50			05:50
	18:30				19:31			20:00	29	19:22 (T11)	20:26			20:38
31	08:17				06:59						05:50			
	18:31				19:32						20:27			
Potential sun hours	305	301			370			395			441			443
Total, worst case			103			628			136			801		
Sun reduction			0,47			0,52			0,57			0,67		
Oper. time red.			1,00			1,00			1,00			1,00		
Wind dir. red.			0,53			0,53			0,31			0,31		
Total reduction			0,26			0,29			0,18			0,21		
Total, real			27			179			25			169		

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Calendar

Calculation: Shadow Realistic Case**Shadow receptor:** NSR1 - Shadow Receptor: A

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,20	5,10	6,20	7,50	9,50	11,40	12,20	11,60	10,10	7,30	5,30	4,10

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
218	4.061	570	243	369	619	793	854	643	197	81	112	8.760

Idle start wind speed: Cut in wind speed from power curve

	July			August			September			October			November	December
1	05:50			06:12		18:59 (T11)	06:39			07:05		17:36 (T12)	07:36	08:07
	20:38			20:21	35	19:34 (T11)	19:42			18:55	35	18:11 (T12)	18:12	17:51
2	05:51			06:13		18:59 (T11)	06:40			07:06		17:35 (T12)	07:37	08:08
	20:38			20:20	36	19:35 (T11)	19:40			18:53	36	18:11 (T12)	18:11	17:51
3	05:51			06:14		18:59 (T11)	06:41			07:07		17:34 (T12)	07:38	08:09
	20:38			20:19	36	19:35 (T11)	19:39			18:52	37	18:11 (T12)	18:10	17:50
4	05:52			06:15		18:58 (T11)	06:42			07:08		17:34 (T12)	07:39	08:10
	20:38			20:18	36	19:34 (T11)	19:37			18:50	37	18:11 (T12)	18:09	17:50
5	05:52			06:15		18:58 (T11)	06:43			07:09		17:33 (T12)	07:40	08:11
	20:37			20:17	36	19:34 (T11)	19:36			18:49	38	18:11 (T12)	18:08	17:50
6	05:53			06:16		18:58 (T11)	06:43			07:10		17:33 (T12)	07:41	08:12
	20:37			20:16	36	19:34 (T11)	19:34			18:47	38	18:11 (T12)	18:07	17:50
7	05:53			06:17		18:59 (T11)	06:44			07:11		17:33 (T12)	07:42	08:13
	20:37			20:15	35	19:34 (T11)	19:33			18:46	38	18:11 (T12)	18:06	17:50
8	05:54			06:18		18:59 (T11)	06:45			07:12		17:33 (T12)	07:43	08:14
	20:37			20:14	35	19:34 (T11)	19:31			18:44	37	18:10 (T12)	18:05	17:50
9	05:54			06:19		18:59 (T11)	06:46			07:13		17:33 (T12)	07:44	08:15
	20:36			20:13	34	19:33 (T11)	19:30			18:43	36	18:09 (T12)	18:04	17:50
10	05:55			06:20		19:00 (T11)	06:47			07:14		17:33 (T12)	07:45	08:16
	20:36			20:12	33	19:33 (T11)	19:28			18:41	36	18:09 (T12)	18:03	17:50
11	05:56			06:21		18:59 (T11)	06:48			07:15		17:34 (T12)	07:46	08:16
	20:36			20:10	32	19:31 (T11)	19:26			18:40	34	18:08 (T12)	18:02	17:50
12	05:56			06:22		19:00 (T11)	06:49			07:15		17:34 (T12)	07:47	08:17
	20:35			20:09	31	19:31 (T11)	19:25			18:38	33	18:07 (T12)	18:01	17:50
13	05:57			06:22		19:01 (T11)	06:49			07:16		17:35 (T12)	07:49	08:18
	20:35			20:08	29	19:30 (T11)	19:23			18:37	30	18:05 (T12)	18:00	17:51
14	05:58			06:23		19:02 (T11)	06:50			07:17		17:36 (T12)	07:50	08:19
	20:34			20:07	27	19:29 (T11)	19:22			18:36	28	18:04 (T12)	18:00	17:51
15	05:58			06:24		19:03 (T11)	06:51			07:18		17:37 (T12)	07:51	08:19
	20:34			20:05	24	19:27 (T11)	19:20			18:34	25	18:02 (T12)	17:59	17:51
16	05:59		19:12 (T11)	06:25		19:05 (T11)	06:52			07:19		17:39 (T12)	07:52	08:20
	20:33	8	19:20 (T11)	20:04	21	19:26 (T11)	19:19			18:33	21	18:00 (T12)	17:58	17:51
17	06:00		19:10 (T11)	06:26		19:06 (T11)	06:53			07:20		17:42 (T12)	07:53	08:21
	20:33	13	19:23 (T11)	20:03	17	19:23 (T11)	19:17			18:31	15	17:57 (T12)	17:57	17:52
18	06:01		19:09 (T11)	06:27		19:08 (T11)	06:54			07:21		17:48 (T12)	07:54	08:21
	20:32	16	19:25 (T11)	20:02	12	19:20 (T11)	19:15			18:30	2	17:50 (T12)	17:57	17:52
19	06:01		19:08 (T11)	06:28			06:55			07:22			07:55	08:22
	20:32	18	19:26 (T11)	20:00			19:14			18:28			17:56	17:52
20	06:02		19:06 (T11)	06:29			06:56			07:23			07:56	08:23
	20:31	21	19:27 (T11)	19:59			19:12			18:27			17:55	17:53
21	06:03		19:05 (T11)	06:29			06:56			07:24			07:57	08:23
	20:30	23	19:28 (T11)	19:58			19:11			18:26			17:55	17:53
22	06:04		19:05 (T11)	06:30			06:57			07:25			07:58	08:24
	20:30	24	19:29 (T11)	19:56			19:09			18:24			17:54	17:54
23	06:04		19:04 (T11)	06:31			06:58			07:26			07:59	08:24
	20:29	27	19:31 (T11)	19:55			19:08			18:23			17:54	17:54
24	06:05		19:03 (T11)	06:32			06:59		17:50 (T12)	07:27			08:00	08:25
	20:28	28	19:31 (T11)	19:53			19:06	13	18:03 (T12)	18:22			17:53	17:55
25	06:06		19:02 (T11)	06:33			07:00		17:46 (T12)	07:28			08:01	08:25
	20:27	29	19:31 (T11)	19:52			19:04	20	18:06 (T12)	18:21			17:53	17:55
26	06:07		19:02 (T11)	06:34			07:01		17:44 (T12)	07:29			08:02	08:26
	20:27	30	19:32 (T11)	19:51			19:03	24	18:08 (T12)	18:19			17:52	17:56
27	06:08		19:01 (T11)	06:35			07:02		17:42 (T12)	07:30			08:03	08:26
	20:26	32	19:33 (T11)	19:49			19:01	27	18:09 (T12)	18:18			17:52	17:57
28	06:09		19:01 (T11)	06:36			07:03		17:40 (T12)	07:31			08:05	08:26
	20:25	33	19:34 (T11)	19:48			19:00	30	18:10 (T12)	18:17			17:52	17:57
29	06:09		19:00 (T11)	06:36			07:03		17:39 (T12)	07:32			08:06	08:27
	20:24	33	19:33 (T11)	19:46			18:58	32	18:11 (T12)	18:16			17:51	17:58
30	06:10		19:00 (T11)	06:37			07:04		17:38 (T12)	07:34			08:07	08:27
	20:23	34	19:34 (T11)	19:45			18:57	34	18:12 (T12)	18:14			17:51	17:59
31	06:11		18:59 (T11)	06:38						07:35				08:27
	20:22	35	19:34 (T11)	19:43						18:13				17:59
Potential sun hours	451			423			374			348			304	296
Total, worst case		404			545			180			556			
Sun reduction		0,84			0,85			0,81			0,65			
Oper. time red.		1,00			1,00			1,00			1,00			
Wind dir. red.		0,31			0,31			0,53			0,53			
Total reduction		0,27			0,27			0,45			0,36			
Total, real		107			147			80			199			

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Calendar

Calculation: Shadow Realistic Case**Shadow receptor:** NSR2 - Shadow Receptor: B

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,20	5,10	6,20	7,50	9,50	11,40	12,20	11,60	10,10	7,30	5,30	4,10

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
218	4.061	570	243	369	619	793	854	643	197	81	112	8.760

Idle start wind speed: Cut in wind speed from power curve

	January			February	March			April			May	June
1	08:27		17:19 (T13)	08:16	07:44			06:57			06:15	05:49
	18:00	14	17:33 (T13)	18:32	19:03			19:33			20:01	20:27
2	08:28		17:19 (T13)	08:16	07:43			06:56			06:14	05:49
	18:01	15	17:34 (T13)	18:33	19:04			19:34			20:02	20:28
3	08:28		17:19 (T13)	08:15	07:41			06:54			06:13	05:48
	18:02	16	17:35 (T13)	18:34	19:05			19:35			20:03	20:29
4	08:28		17:19 (T13)	08:14	07:40			06:53			06:12	05:48
	18:03	17	17:36 (T13)	18:35	19:06			19:36			20:04	20:29
5	08:28		17:19 (T13)	08:13	07:38			06:51			06:10	05:48
	18:04	18	17:37 (T13)	18:37	19:07			19:37			20:05	20:30
6	08:28		17:19 (T13)	08:12	07:37		18:31 (T12)	06:50			06:09	05:47
	18:05	19	17:38 (T13)	18:38	19:08	10	18:41 (T12)	19:37			20:06	20:31
7	08:28		17:19 (T13)	08:11	07:35		18:28 (T12)	06:48			06:08	05:47
	18:05	20	17:39 (T13)	18:39	19:09	15	18:43 (T12)	19:38			20:07	20:31
8	08:28		17:18 (T13)	08:10	07:34		18:26 (T12)	06:47			06:07	05:47
	18:06	20	17:38 (T13)	18:40	19:10	19	18:45 (T12)	19:39			20:07	20:32
9	08:28		17:18 (T13)	08:09	07:32		18:24 (T12)	06:45			06:06	05:47
	18:07	21	17:39 (T13)	18:41	19:11	21	18:45 (T12)	19:40			20:08	20:32
10	08:28		17:18 (T13)	08:08	07:31		18:24 (T12)	06:44			06:05	05:47
	18:08	22	17:40 (T13)	18:42	19:12	22	18:46 (T12)	19:41			20:09	20:33
11	08:27		17:19 (T13)	08:07	07:29		18:23 (T12)	06:42			06:04	05:47
	18:09	22	17:41 (T13)	18:43	19:13	23	18:46 (T12)	19:42			20:10	20:33
12	08:27		17:19 (T13)	08:06	07:28		18:23 (T12)	06:41		19:05 (T11)	06:03	05:46
	18:10	23	17:42 (T13)	18:44	19:14	24	18:47 (T12)	19:43	3	19:08 (T11)	20:11	20:34
13	08:27		17:18 (T13)	08:04	07:26		18:22 (T12)	06:39		19:01 (T11)	06:02	05:46
	18:11	24	17:42 (T13)	18:46	19:15	24	18:46 (T12)	19:44	12	19:13 (T11)	20:12	20:34
14	08:27		17:19 (T13)	08:03	07:25		18:22 (T12)	06:38		18:59 (T11)	06:01	05:46
	18:12	24	17:43 (T13)	18:47	19:16	24	18:46 (T12)	19:45	16	19:15 (T11)	20:13	20:35
15	08:26		17:19 (T13)	08:02	07:23		18:22 (T12)	06:36		18:57 (T11)	06:00	05:46
	18:13	25	17:44 (T13)	18:48	19:17	23	18:45 (T12)	19:46	18	19:15 (T11)	20:14	20:35
16	08:26		17:19 (T13)	08:01	07:22		18:23 (T12)	06:35		18:56 (T11)	05:59	05:46
	18:14	25	17:44 (T13)	18:49	19:18	22	18:45 (T12)	19:47	21	19:17 (T11)	20:15	20:36
17	08:26		17:20 (T13)	08:00	07:20		18:23 (T12)	06:33		18:55 (T11)	05:59	05:46
	18:15	25	17:45 (T13)	18:50	19:19	20	18:43 (T12)	19:48	21	19:16 (T11)	20:16	20:36
18	08:25		17:19 (T13)	07:59	07:19		18:24 (T12)	06:32		18:54 (T11)	05:58	05:47
	18:16	26	17:45 (T13)	18:51	19:20	19	18:43 (T12)	19:49	23	19:17 (T11)	20:16	20:36
19	08:25		17:20 (T13)	07:57	07:17		18:25 (T12)	06:31		18:54 (T11)	05:57	05:47
	18:18	26	17:46 (T13)	18:52	19:21	15	18:40 (T12)	19:50	23	19:17 (T11)	20:17	20:37
20	08:24		17:20 (T13)	07:56	07:16		18:27 (T12)	06:29		18:53 (T11)	05:56	05:47
	18:19	26	17:46 (T13)	18:53	19:22	10	18:37 (T12)	19:51	24	19:17 (T11)	20:18	20:37
21	08:24		17:21 (T13)	07:55	07:14			06:28		18:54 (T11)	05:55	05:47
	18:20	25	17:46 (T13)	18:54	19:22			19:52	24	19:18 (T10)	20:19	20:37
22	08:23		17:21 (T13)	07:53	07:13			06:27		18:54 (T11)	05:55	05:47
	18:21	25	17:46 (T13)	18:55	19:23			19:52	24	19:18 (T10)	20:20	20:37
23	08:23		17:22 (T13)	07:52	07:11			06:25		18:53 (T11)	05:54	05:47
	18:22	24	17:46 (T13)	18:56	19:24			19:53	24	19:17 (T10)	20:21	20:38
24	08:22		17:23 (T13)	07:51	07:09			06:24		18:54 (T11)	05:53	05:48
	18:23	23	17:46 (T13)	18:58	19:25			19:54	24	19:18 (T10)	20:21	20:38
25	08:22		17:23 (T13)	07:49	07:08			06:23		18:55 (T11)	05:53	05:48
	18:24	22	17:45 (T13)	18:59	19:26			19:55	22	19:17 (T10)	20:22	20:38
26	08:21		17:24 (T13)	07:48	07:06			06:21		18:55 (T11)	05:52	05:48
	18:25	21	17:45 (T13)	19:00	19:27			19:56	21	19:16 (T10)	20:23	20:38
27	08:20		17:26 (T13)	07:47	07:05			06:20		18:57 (T11)	05:52	05:49
	18:26	19	17:45 (T13)	19:01	19:28			19:57	19	19:16 (T10)	20:24	20:38
28	08:20		17:27 (T13)	07:45	07:03			06:19		18:59 (T11)	05:51	05:49
	18:28	17	17:44 (T13)	19:02	19:29			19:58	16	19:15 (T10)	20:25	20:38
29	08:19		17:29 (T13)		07:02			06:17		19:02 (T10)	05:51	05:49
	18:29	13	17:42 (T13)		19:30			19:59	11	19:13 (T10)	20:25	20:38
30	08:18		17:31 (T13)		07:00			06:16		19:04 (T10)	05:50	05:50
	18:30	9	17:40 (T13)		19:31			20:00	7	19:11 (T10)	20:26	20:38
31	08:17				06:59						05:50	
	18:31				19:32						20:27	
Potential sun hours	305			301	370			395			441	443
Total, worst case		626				291			353			
Sun reduction		0,43				0,52			0,57			
Oper. time red.		1,00				1,00			1,00			
Wind dir. red.		0,69				0,50			0,35			
Total reduction		0,31				0,28			0,21			
Total, real		193				80			75			

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Calendar

Calculation: Shadow Realistic Case**Shadow receptor:** NSR2 - Shadow Receptor: B

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,20	5,10	6,20	7,50	9,50	11,40	12,20	11,60	10,10	7,30	5,30	4,10

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
218	4.061	570	243	369	619	793	854	643	197	81	112	8.760

Idle start wind speed: Cut in wind speed from power curve

	July	August			September			October			November			December		
1	05:50	06:12			06:39			07:05		18:01 (T12)	07:36			08:07		17:01 (T13)
	20:38	20:21			19:42			18:55	24	18:25 (T12)	18:12			17:51	23	17:24 (T13)
2	05:51	06:13			06:40			07:06		18:01 (T12)	07:37			08:08		17:01 (T13)
	20:38	20:20			19:40			18:53	24	18:25 (T12)	18:11			17:51	23	17:24 (T13)
3	05:51	06:14			06:41			07:07		18:01 (T12)	07:38			08:09		17:02 (T13)
	20:38	20:19			19:39			18:52	23	18:24 (T12)	18:10			17:50	22	17:24 (T13)
4	05:52	06:14			06:42			07:08		18:02 (T12)	07:39			08:10		17:03 (T13)
	20:38	20:18			19:37			18:50	21	18:23 (T12)	18:09			17:50	21	17:24 (T13)
5	05:52	06:15			06:43			07:09		18:02 (T12)	07:40			08:11		17:04 (T13)
	20:37	20:17			19:36			18:49	20	18:22 (T12)	18:08			17:50	20	17:24 (T13)
6	05:53	06:16			06:43			07:10		18:04 (T12)	07:41			08:12		17:05 (T13)
	20:37	20:16			19:34			18:47	16	18:20 (T12)	18:07			17:50	19	17:24 (T13)
7	05:53	06:17			06:44			07:11		18:05 (T12)	07:42			08:13		17:05 (T13)
	20:37	20:15			19:33			18:46	13	18:18 (T12)	18:06			17:50	18	17:23 (T13)
8	05:54	06:18			06:45			07:12		18:09 (T12)	07:43			08:14		17:06 (T13)
	20:37	20:14			19:31			18:44	5	18:14 (T12)	18:05			17:50	17	17:23 (T13)
9	05:54	06:19			06:46			07:13			07:44			08:15		17:07 (T13)
	20:36	20:13			19:30			18:43			18:04			17:50	16	17:23 (T13)
10	05:55	06:20			06:47			07:14			07:45			08:16		17:08 (T13)
	20:36	20:12			19:28			18:41			18:03			17:50	15	17:23 (T13)
11	05:56	06:21			06:48			07:14			07:46			08:16		17:09 (T13)
	20:36	20:10			19:26			18:40			18:02			17:50	14	17:23 (T13)
12	05:56	06:22			06:49			07:15			07:47		17:03 (T13)	08:17		17:11 (T13)
	20:35	20:09			19:25			18:38			18:01	9	17:12 (T13)	17:50	12	17:23 (T13)
13	05:57	06:22		19:11 (T10)	06:49			07:16			07:49		17:00 (T13)	08:18		17:11 (T13)
	20:35	20:08	9	19:20 (T10)	19:23			18:37			18:00	14	17:14 (T13)	17:50	11	17:22 (T13)
14	05:58	06:23		19:09 (T10)	06:50			07:17			07:50		16:59 (T13)	08:19		17:12 (T13)
	20:34	20:07	13	19:22 (T10)	19:22			18:35			18:00	17	17:16 (T13)	17:51	10	17:22 (T13)
15	05:58	06:24		19:06 (T11)	06:51			07:18			07:51		16:58 (T13)	08:19		17:14 (T13)
	20:34	20:05	17	19:23 (T10)	19:20			18:34			17:59	19	17:17 (T13)	17:51	8	17:22 (T13)
16	05:59	06:25		19:04 (T11)	06:52			07:19			07:52		16:57 (T13)	08:20		17:14 (T13)
	20:33	20:04	19	19:23 (T10)	19:19			18:33			17:58	21	17:18 (T13)	17:51	7	17:21 (T13)
17	06:00	06:26		19:02 (T11)	06:53			07:20			07:53		16:57 (T13)	08:21		17:16 (T13)
	20:33	20:03	21	19:23 (T10)	19:17			18:31			17:57	22	17:19 (T13)	17:52	6	17:22 (T13)
18	06:01	06:27		19:01 (T11)	06:54			07:21			07:54		16:57 (T13)	08:21		17:17 (T13)
	20:32	20:02	22	19:23 (T10)	19:15			18:30			17:57	23	17:20 (T13)	17:52	5	17:22 (T13)
19	06:01	06:28		19:00 (T11)	06:55			07:22			07:55		16:57 (T13)	08:22		17:18 (T13)
	20:32	20:00	23	19:23 (T10)	19:14			18:28			17:56	24	17:21 (T13)	17:52	3	17:21 (T13)
20	06:02	06:29		18:59 (T11)	06:56			07:23			07:56		16:56 (T13)	08:23		17:20 (T13)
	20:31	19:59	24	19:23 (T10)	19:12			18:27			17:55	25	17:21 (T13)	17:53	1	17:21 (T13)
21	06:03	06:29		18:59 (T11)	06:56			07:24			07:57		16:56 (T13)	08:23		
	20:30	19:58	24	19:23 (T10)	19:11			18:26			17:55	25	17:21 (T13)	17:53		
22	06:04	06:30		18:58 (T11)	06:57			07:25			07:58		16:56 (T13)	08:24		
	20:30	19:56	24	19:22 (T10)	19:09			18:24			17:54	26	17:22 (T13)	17:54		
23	06:04	06:31		18:57 (T11)	06:58		18:12 (T12)	07:26			07:59		16:56 (T13)	08:24		
	20:29	19:55	23	19:20 (T11)	19:08	8	18:20 (T12)	18:23			17:54	26	17:22 (T13)	17:54		
24	06:05	06:32		18:57 (T11)	06:59		18:09 (T12)	07:27			08:00		16:56 (T13)	08:25		17:21 (T13)
	20:28	19:53	23	19:20 (T11)	19:06	14	18:23 (T12)	18:22			17:53	26	17:22 (T13)	17:55	2	17:23 (T13)
25	06:06	06:33		18:57 (T11)	07:00		18:07 (T12)	07:28			08:01		16:58 (T13)	08:25		17:20 (T13)
	20:27	19:52	23	19:20 (T11)	19:04	18	18:25 (T12)	18:21			17:53	25	17:23 (T13)	17:55	4	17:24 (T13)
26	06:07	06:34		18:58 (T11)	07:01		18:05 (T12)	07:29			08:02		16:58 (T13)	08:26		17:20 (T13)
	20:27	19:51	21	19:19 (T11)	19:03	21	18:26 (T12)	18:19			17:52	25	17:23 (T13)	17:56	5	17:25 (T13)
27	06:08	06:35		18:58 (T11)	07:02		18:04 (T12)	07:30			08:03		16:58 (T13)	08:26		17:20 (T13)
	20:26	19:49	20	19:18 (T11)	19:01	22	18:26 (T12)	18:18			17:52	25	17:23 (T13)	17:56	7	17:27 (T13)
28	06:08	06:36		18:59 (T11)	07:03		18:03 (T12)	07:31			08:04		16:59 (T13)	08:26		17:20 (T13)
	20:25	19:48	18	19:17 (T11)	19:00	24	18:27 (T12)	18:17			17:52	24	17:23 (T13)	17:57	8	17:28 (T13)
29	06:09	06:36		18:59 (T11)	07:03		18:03 (T12)	07:32			08:05		16:59 (T13)	08:27		17:19 (T13)
	20:24	19:46	16	19:15 (T11)	18:58	24	18:27 (T12)	18:16			17:51	24	17:23 (T13)	17:58	10	17:29 (T13)
30	06:10	06:37		19:01 (T11)	07:04		18:02 (T12)	07:33			08:06		17:00 (T13)	08:27		17:19 (T13)
	20:23	19:45	12	19:13 (T11)	18:57	25	18:27 (T12)	18:14			17:51	24	17:24 (T13)	17:59	11	17:30 (T13)
31	06:11	06:38		19:06 (T11)				07:35						08:27		17:19 (T13)
	20:22	19:43	2	19:08 (T11)				18:13						17:59	12	17:31 (T13)
Potential sun hours	451	423			374			348			304			296		
Total, worst case			354			156			146			424			330	
Sun reduction			0,85			0,81			0,65			0,52			0,43	
Oper. time red.			1,00			1,00			1,00			1,00			1,00	
Wind dir. red.			0,35			0,50			0,50			0,69			0,69	
Total reduction			0,32			0,43			0,34			0,38			0,31	
Total, real			112			67			50			160			102	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Calendar

Calculation: Shadow Realistic Case**Shadow receptor:** NSR4 - Shadow Receptor: E

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,20	5,10	6,20	7,50	9,50	11,40	12,20	11,60	10,10	7,30	5,30	4,10

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
218	4.061	570	243	369	619	793	854	643	197	81	112	8.760

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June			July	August	September	October	November	December
1	08:27	08:16	07:44	06:57	06:15	05:49			05:50	06:12	06:39	07:05	07:35	08:07
	18:00	18:32	19:03	19:33	20:01	20:27			20:38	20:21	19:42	18:55	18:12	17:51
2	08:27	08:15	07:42	06:56	06:14	05:49			05:51	06:13	06:40	07:06	07:37	08:08
	18:01	18:33	19:04	19:34	20:02	20:28			20:38	20:20	19:40	18:53	18:11	17:51
3	08:27	08:15	07:41	06:54	06:13	05:48			05:51	06:14	06:41	07:07	07:38	08:09
	18:02	18:34	19:05	19:35	20:03	20:29			20:38	20:19	19:39	18:52	18:10	17:50
4	08:28	08:14	07:40	06:53	06:12	05:48			05:52	06:14	06:42	07:08	07:39	08:10
	18:03	18:35	19:06	19:36	20:04	20:29			20:37	20:18	19:37	18:50	18:09	17:50
5	08:28	08:13	07:38	06:51	06:10	05:48			05:52	06:15	06:42	07:09	07:40	08:11
	18:04	18:37	19:07	19:36	20:05	20:30			20:37	20:17	19:36	18:49	18:08	17:50
6	08:28	08:12	07:37	06:49	06:09	05:47			05:53	06:16	06:43	07:10	07:41	08:12
	18:05	18:38	19:08	19:37	20:05	20:31			20:37	20:16	19:34	18:47	18:07	17:50
7	08:28	08:11	07:35	06:48	06:08	05:47			05:53	06:17	06:44	07:11	07:42	08:13
	18:05	18:39	19:09	19:38	20:06	20:31			20:37	20:15	19:33	18:46	18:06	17:50
8	08:28	08:10	07:34	06:47	06:07	05:47			05:54	06:18	06:45	07:12	07:43	08:14
	18:06	18:40	19:10	19:39	20:07	20:32			20:37	20:14	19:31	18:44	18:05	17:50
9	08:28	08:09	07:32	06:45	06:06	05:47			05:54	06:19	06:46	07:13	07:44	08:15
	18:07	18:41	19:11	19:40	20:08	20:32			20:36	20:13	19:29	18:43	18:04	17:50
10	08:27	08:08	07:31	06:44	06:05	05:47			05:55	06:20	06:47	07:13	07:45	08:15
	18:08	18:42	19:12	19:41	20:09	20:33			20:36	20:11	19:28	18:41	18:03	17:50
11	08:27	08:07	07:29	06:42	06:04	05:47			05:56	06:21	06:48	07:14	07:46	08:16
	18:09	18:43	19:13	19:42	20:10	20:33			20:36	20:10	19:26	18:40	18:02	17:50
12	08:27	08:06	07:28	06:41	06:03	05:46			05:56	06:21	06:49	07:15	07:47	08:17
	18:10	18:44	19:14	19:43	20:11	20:34			20:35	20:09	19:25	18:38	18:01	17:50
13	08:27	08:04	07:26	06:39	06:02	05:46			05:57	06:22	06:49	07:16	07:48	08:18
	18:11	18:46	19:15	19:44	20:12	20:34			20:35	20:08	19:23	18:37	18:00	17:50
14	08:27	08:03	07:25	06:38	06:01	05:46			05:58	06:23	06:50	07:17	07:50	08:19
	18:12	18:47	19:16	19:45	20:13	20:35			20:34	20:07	19:22	18:35	18:00	17:51
15	08:26	08:02	07:23	06:36	06:00	05:46		19:35 (T16)	05:58	06:24	06:51	07:18	07:51	08:19
	18:13	18:48	19:17	19:46	20:14	20:35	2	19:37 (T16)	20:34	20:05	19:20	18:34	17:59	17:51
16	08:26	08:01	07:22	06:35	05:59	05:46		19:34 (T16)	05:59	06:25	06:52	07:19	07:52	08:20
	18:14	18:49	19:18	19:47	20:15	20:35	5	19:39 (T16)	20:33	20:04	19:19	18:33	17:58	17:51
17	08:26	08:00	07:20	06:33	05:59	05:46		19:35 (T16)	06:00	06:26	06:53	07:20	07:53	08:21
	18:15	18:50	19:19	19:48	20:15	20:36	5	19:40 (T16)	20:33	20:03	19:17	18:31	17:57	17:52
18	08:25	07:58	07:19	06:32	05:58	05:47		19:35 (T16)	06:01	06:27	06:54	07:21	07:54	08:21
	18:16	18:51	19:20	19:49	20:16	20:36	6	19:41 (T16)	20:32	20:01	19:15	18:30	17:57	17:52
19	08:25	07:57	07:17	06:31	05:57	05:47		19:34 (T16)	06:01	06:28	06:55	07:22	07:55	08:22
	18:18	18:52	19:20	19:50	20:17	20:36	7	19:41 (T16)	20:32	20:00	19:14	18:28	17:56	17:52
20	08:24	07:56	07:16	06:29	05:56	05:47		19:34 (T16)	06:02	06:29	06:55	07:23	07:56	08:22
	18:19	18:53	19:21	19:50	20:18	20:37	7	19:41 (T16)	20:31	19:59	19:12	18:27	17:55	17:53
21	08:24	07:55	07:14	06:28	05:55	05:47		19:34 (T16)	06:03	06:29	06:56	07:24	07:57	08:23
	18:20	18:54	19:22	19:51	20:19	20:37	7	19:41 (T16)	20:30	19:57	19:11	18:26	17:55	17:53
22	08:23	07:53	07:13	06:27	05:55	05:47		19:34 (T16)	06:04	06:30	06:57	07:25	07:58	08:24
	18:21	18:55	19:23	19:52	20:20	20:37	7	19:41 (T16)	20:30	19:56	19:09	18:24	17:54	17:54
23	08:23	07:52	07:11	06:25	05:54	05:47		19:35 (T16)	06:04	06:31	06:58	07:26	07:59	08:24
	18:22	18:56	19:24	19:53	20:21	20:37	7	19:42 (T16)	20:29	19:55	19:07	18:23	17:54	17:54
24	08:22	07:51	07:09	06:24	05:53	05:48		19:35 (T16)	06:05	06:32	06:59	07:27	08:00	08:25
	18:23	18:57	19:25	19:54	20:21	20:38	7	19:42 (T16)	20:28	19:53	19:06	18:22	17:53	17:55
25	08:22	07:49	07:08	06:23	05:53	05:48		19:36 (T16)	06:06	06:33	07:00	07:28	08:01	08:25
	18:24	18:59	19:26	19:55	20:22	20:38	5	19:41 (T16)	20:27	19:52	19:04	18:21	17:53	17:55
26	08:21	07:48	07:06	06:21	05:52	05:48		19:37 (T16)	06:07	06:34	07:01	07:29	08:02	08:25
	18:25	19:00	19:27	19:56	20:23	20:38	5	19:42 (T16)	20:26	19:50	19:03	18:19	17:52	17:56
27	08:20	07:47	07:05	06:20	05:52	05:49		19:38 (T16)	06:08	06:35	07:02	07:30	08:03	08:26
	18:26	19:01	19:28	19:57	20:24	20:38	3	19:41 (T16)	20:26	19:49	19:01	18:18	17:52	17:56
28	08:19	07:45	07:03	06:19	05:51	05:49			06:08	06:36	07:02	07:31	08:04	08:26
	18:27	19:02	19:29	19:58	20:24	20:38			20:25	19:48	19:00	18:17	17:52	17:57
29	08:19		07:02	06:17	05:51	05:49			06:09	06:36	07:03	07:32	08:05	08:26
	18:29		19:30	19:59	20:25	20:38			20:24	19:46	18:58	18:16	17:51	17:58
30	08:18		07:00	06:16	05:50	05:50			06:10	06:37	07:04	07:33	08:06	08:27
	18:30		19:31	20:00	20:26	20:38			20:23	19:45	18:56	18:14	17:51	17:59
31	08:17		06:59		05:50				06:11	06:38		07:34		08:27
	18:31		19:32		20:27				20:22	19:43		18:13		17:59
Potential sun hours	305	301	370	395	441	443			451	423	374	348	304	296
Total, worst case							73							
Sun reduction							0,77							
Oper. time red.							1,00							
Wind dir. red.							0,38							
Total reduction							0,29							
Total, real							21							

Table layout: For each day in each month the following matrix apply

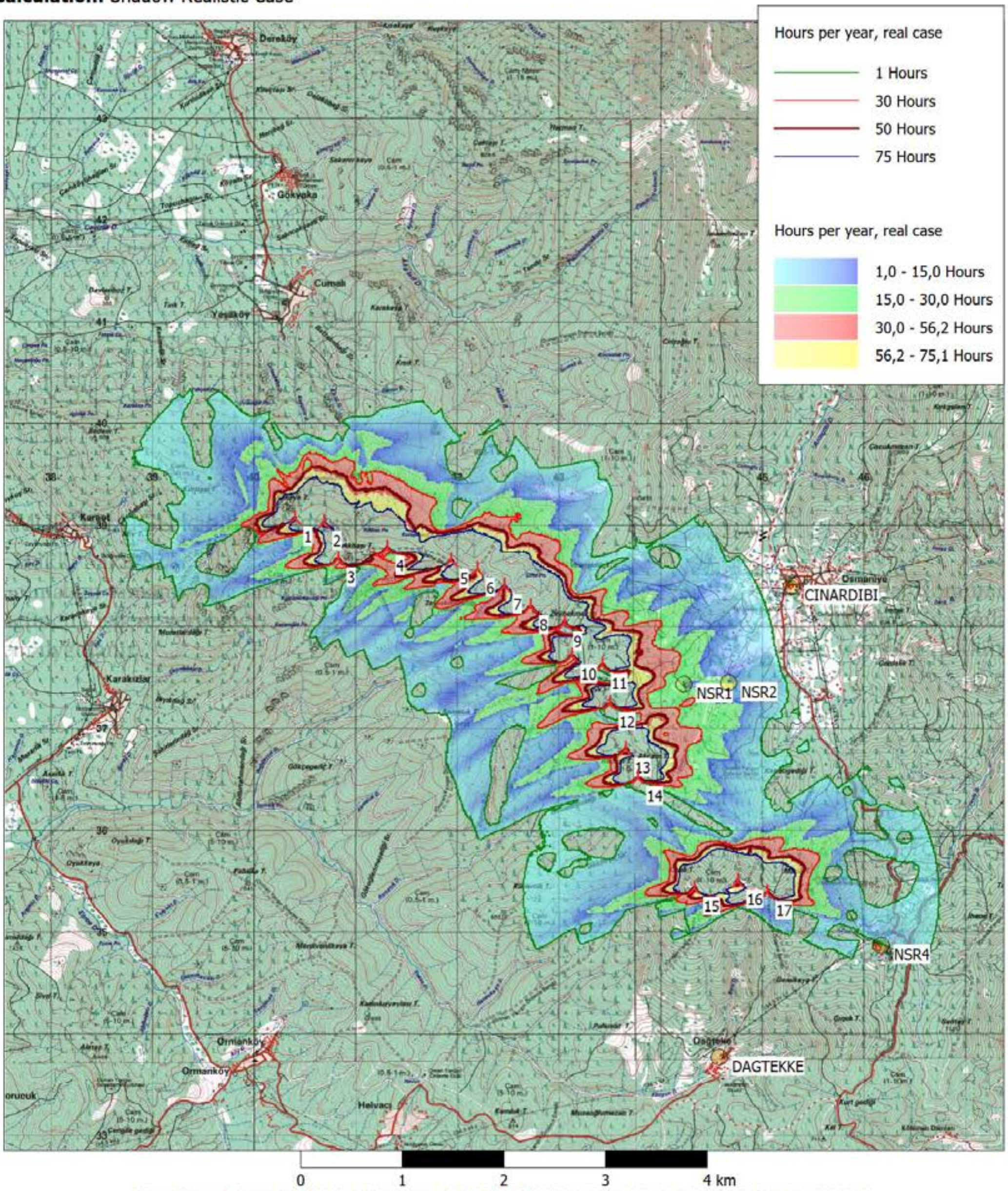
Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Map

Calculation: Shadow Realistic Case



Map: Topo , Print scale 1:55.000, Map center UTM (north)-WGS84 Zone: 35 East: 542.415 North: 4.238.216

New WTG   Shadow receptor

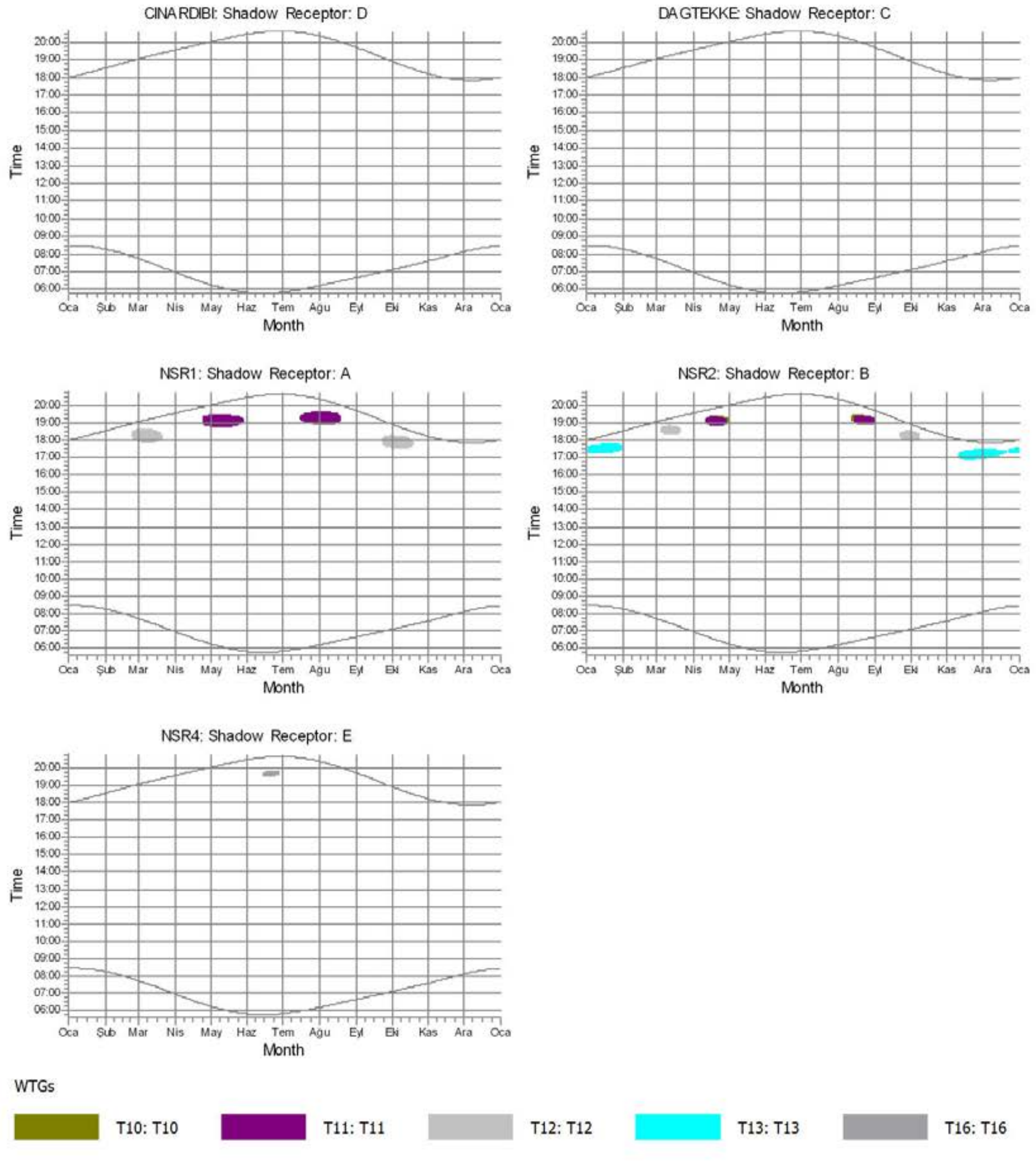
Flicker map level: Project Wizard Elevation Data Grid (EU-DEM 1 arc-second)

Project:
Mersinli WPP

Licensed user:
AECOM Accounts Payable
First Floor, One Trinity Gardens, Quayside
GB-NEWCASTLE upon Tyne NE1 2HF
+44 191 224 6610
Ahmet Korkmaz / ahmet.korkmaz@aecom.com
Calculated:
12.12.2017 17:41/3.1.617

SHADOW - Calendar, graphical

Calculation: Shadow Realistic Case



Appendix G Chance Find Procedure

1. Introduction

The Project Company is responsible of management and protection of any archaeological and heritage resources that may be encountered in the Mersinli Wind Power Plant Project area. The purpose of this document is to provide the Project Company and its Contractors with a guidance that outlines the procedures that shall be implemented in the event of a chance find.

2. Definitions

Item	Definition
Chance Find	Potential cultural and natural heritage sites, features or objects that may be encountered during earthworks activities. Within this scope, chance finds may include archaeological objects, archaeological sites, fossils, burial grounds, etc.
Project Company	Yander Elektrik Muh. Mus. Ins. Tur. ve Tic. A.S
Museum Directorate	İzmir Museum Directorate Ödemiş Museum Directorate (to be confirmed) Tire Museum Directorate (to be confirmed)
Preservation Board	İzmir Regional Board for Conservation of Cultural Assets No 1 İzmir Regional Board for Conservation of Cultural Assets No 2

3. Legal Framework

The following national legislation and international standards are applicable for potential chance finds:

- Turkish Law on Preservation of Cultural and Natural Assets, Law No:2863
- Archaeological Sites, Conditions of Protection and Usage, Ministry of Culture and Tourism, Principle Decision No: 658
- European Bank for Reconstruction and Development, Environmental and Social Policy (2014), PR8 - Cultural Heritage
- International Finance Corporation, Sustainability Framework (2012), PS8 – Cultural Heritage
- European Convention on the Protection of the Archaeological Heritage (as per EBRD compliance, since Turkey is not a party to this Convention)

4. Roles and Responsibilities

All Project personnel, including Project Company and contractors, are required to comply with the Turkish Law on Preservation of Cultural and Natural Assets (Law No:2863)

The Project Company will have the primary responsibility for ensuring implementation of the Chance Finds Procedure by all Project personnel including the contractors. The QHSE specialist of the Construction Contract will coordinate the implementation of the Procedure (i.e. internal and external communication, documentation) and collaborate with the Environmental Specialist of the Project Company. The Environmental Specialist of the Project Company will be responsible from informing senior Project management about the process conducted.

5. Procedure

The chance finds procedure is provided in the table given below, whereas a sample form for recording any chance find is provided in Table G.1.

The Procedure is intended to ensure that if archaeological remains are encountered in the scoped of the Project they are reported and protected until a satisfactory strategy, which is in line with the requirements of the national legislation and international standards/requirements, is identified, agreed, implemented, and completed.

Table G - 1. Chance Find Procedure

1. After a chance find	• All related work is ceased by the Construction Contractor's QHSE Specialist immediately. • A temporary restriction zone is established around the potential chance find, with appropriate signage. • The Construction Contractor's QHSE Specialist will inform the Project Company's Environmental Specialist and the Museum Directorate • All related site personnel and workers are informed by the Construction Contractor's QHSE Specialist of the chance find • Moving or disturbing the chance find is not allowed.		
2. Decision of the museum authority	• a) The museum archaeologist inspects the chance find on site and decides the chance find is not of importance: – Project Company's Environmental Specialist is informed by the Construction Contractor's QHSE Specialist of the decision – Chance Find Form is completed by the Construction Contractor's QHSE Specialist and the form is archived for the Project Company records. – The temporary restriction zone is removed and work can continue. – Chance Find Procedure is closed.	• b) The museum archaeologist inspects the chance find on site and decides the chance find is of importance. – The museum archaeologist identifies further actions to be taken. – Project Company's Environmental Specialist is informed by the Construction Contractor's QHSE Specialist of the decision – Implementation of procedure continues from Step 3 under the responsibility of Construction Contractor's QHSE Specialist of the decision	
3. Site Investigations	• a) Either directly or following further site investigation, the museum archaeologist declares that the site has minor significance: – Project Company's Environmental Specialist is informed by the Construction Contractor's	• b) Either directly or following further site investigation, the museum archaeologist declares that the site has moderate significance: – Project Company's Environmental Specialist is informed by the Construction Contractor's	• c) Either directly or following further site investigation, the museum archaeologist declares that the site has major significance: – Law on the Conservation of Cultural and Natural Property" and related regulations

	QHSE Specialist of the decision – Chance Find Form is completed and the form is archived by the Construction Contractor's QHSE Specialist for the Project Company records. – The temporary restriction zone is removed and work can continue. – Chance Find Procedure is closed.	QHSE Specialist of the decision – Museum archaeologist and the Museum Directorate determine what further site studies will be required. – Depending on the decision of the Directorate, the Construction Contractor can be responsible of providing a survey team consisting of qualified archaeologists and any other required experts (to be ensured and monitored by the Project Company). – Museum archaeologist and the survey team conducts the required site studies and provides information to the Construction Contractor's QHSE Specialist on the progress. – Following the completion of excavation studies, the survey team prepares a report and submits it to the Museum Directorate. – The Museum Directorate reports the outcome to İzmir Regional Preservation Board of Cultural Assets No 1 or No 2. The board declares that excavation and recovery work is completed and informs the Project management. – Chance Find Form is completed and the form is archived for the Project Company records. – Chance Find Procedure is closed and work can continue.	apply for the site. – Project Company's Environmental Specialist is informed by the Construction Contractor's QHSE Specialist of the decision – Museum archaeologist and the Museum Directorate determine what further site studies will be required. – Depending on the decision of the Directorate, the Construction Contractor can be responsible of providing a survey team consisting of qualified archaeologists and any other required experts (to be ensured and monitored by the Project Company). – Museum archaeologist and the survey team conduct the required site studies and provide information to the Construction Contractor's QHSE Specialist on the progress. – Following the completion of excavation studies, the survey team prepares a report and submits it to the Museum Directorate. – The Museum Directorate reports the outcome to İzmir Regional Preservation Board of Cultural Assets No 1 or No 2. – The site is officially recorded and protected as per related regulations. – Chance Find Form is completed and the form is archived for the Project Company records. – Based on decision of the Directorate, work may completely be stopped in the area or may continue with further actions recommended by the Directorate.

6. Monitoring and Reporting

Any identified chance find will be recorded by the Construction Contractor's QHSE Specialist in the Chance Find Form (sample form provided in G.1). Hard copies of the form will be kept on the Project site office and all forms will be scanned to keep electronic records as well. Construction Contractor's QHSE Specialist will send the electronic copies to he Project Company's Environmental Specialist.

In case of a chance find that may have potential importance for the local communities (i.e. graves, burial grounds, religious artefacts, etc.), the communities will be informed for further engagement through information disclosure activities identified by the Project Stakeholder Engagement Plan (SEP).

Details of all chance finds will also be reported within the scope of annual reporting to Lenders.

G.1 Sample Chance Find Form

Chance Find Form

Date: (Tarih) | Form No:

Name of person reporting the chance find:
(Rastlantısal buluntuyu rapor eden kişinin ismi)

Chance Find GPS Coordinates:
(Rastlanısal Bulgu GPS Koordinatları)

Photo record: (Fotoğraf kaydı) ☐ Yes ☐ No

Photo No:

Description of the chance find and the site
(Rastlantısal buluntunun ve sahanın tanımı)

Activities stopped in the immediate vicinity of the chance find ☐ Yes ☐ No
(Rastlantısal buluntunun hemen çevresinde iş durduruldu)

Temporary restriction zone created around the chance find ☐ Yes ☐ No
(Rastlantısal buluntu çevresinde geçici tampon bölge oluşturuldu)

Site QHSE managers contacted ☐ Yes ☐ No
(Saha müdürü ile irtibata geçildi)

Museum Directorate contacted ☐ Yes ☐ No
(Müze Müdürlüğü ile irtibata geçildi)

Date of notification:
(Bildirim tarihi)

Name of Museum Directorate archaeologist :
(Müze Müdürlüğü arkeoloğunun ismi)

Contact details of museum directorate archaeologist (phone number/ email):
(Müze müdürlüğü arkeoloğunun iletişim detayları (telefon numarası/ email))

Date of site visit by Museum Directorate archaeologist:
(Müze Müdürlüğü arkeoloğu saha ziyaret tarihi)

Result:

☐ Site of no significance (Önemsiz saha) ☐ Site of minor significance (Az önemli saha) ☐ Site of moderate significance -----(Orta derecede önemli saha) ☐Site of major significance (Çok önemli saha)

Will the construction work continue? ☐ Yes ☐ No
(İnşaat çalışmaları devam edecek mi?)

If yes, date of notice to resume work:
(Evet ise, işe başlama tarihi bildirisi)

Appendix H Official Invitation Letters for Public Consultation Meetings

H.1 Torbali Municipality

YANDER ELEKTRİK

YANDER ELEKTRİK MÜHENDİSLİK MÜŞAVİRLİK İNŞAAT TURZ. VE TİC. AŞ.

Sayı : MERS-2017-009
Konu : Mersinli RES Bilgilendirme toplantısı hakkında

Tarih: 25/09/2017

T.C.
TORBALI BELEDİYE BAŞKANLIĞI
TORBALI/İZMİR

İzmir İli, Bayındır İlçesinde kurulacak olan Mersinli RES projemiz ile ilgili izinlerin tamamlanması ile yapım süreci başlayacaktır. Söz konusu proje ile ilgili halkı önceden bilgilendirmek, görüş ve önerilerini almak için çevre köylerde toplantı yapılacaktır.

Toplantı 4 Ekim 2017 tarihinde yapılacak olup, katılımınız durumunda aşağıdaki telefon numarasından toplantı yeri ve saati ile ilgili bilgi alabilirsiniz.

Bilgilerinize arz ederiz.

10325
25-09-2017
FEN İŞl. Md.

YANDER ELEKTRİK MÜHENDİSLİK MÜŞ. İNŞ. TURZ. VE TİC. A.Ş.
Esentepe Mah. Büyükdere Cad. No:185 K:6
Kanyon Ofis Binası Şişli / İSTANBUL
Zincirlikuyu V.D. 936 068 0606 Tic.Sic.No:639200

Onur MUSTAFAOĞLU
Yönetim Kurulu Üyesi

Yander Elektrik Müh. Müş. İnş. Turz. ve Tic. A.Ş.

Bilgi İçin Telefon:
0533 331 57 03
0533 426 38 53

Büyükdere Caddesi, No:185, Kanyon Ofis Binası, Kat:6, Levent, İstanbul 34394

H.2 Torbali District Governorate

YANDER ELEKTRİK

YANDER ELEKTRİK MÜHENDİSLİK MÜŞAVİRLİK İNŞAAT TURZ. VE TİC. AŞ.

Sayı : **MERS-2017-010**
Konu : Mersinli RES Bilgilendirme toplantısı hakkında **Tarih:** 25/09/2017

T.C.
TORBALI KAYMAKAMLIĞI
TORBALI/İZMİR

İzmir İli, Bayındır İlçesinde kurulacak olan Mersinli RES projemiz ile ilgili izinlerin tamamlanması ile yapım süreci başlayacaktır. Söz konusu proje ile ilgili halkı önceden bilgilendirmek, görüş ve önerilerini almak için çevre köylerde toplantı yapılacaktır.

Toplantı 4 Ekim 2017 tarihinde yapılacak olup, katılımınız durumunda aşağıdaki telefon numarasından toplantı yeri ve saati ile ilgili bilgi alabilirsiniz.

Bilgilerinize arz ederiz.

YANDER ELEKTRİK MÜHENDİSLİK
MÜŞ. İNŞ. TURZ. VE TİC. A.Ş.
Esentepe Mah. Büyükdere Cad. No:185 K:6
Kanyon Ofis Binası Şişli / İSTANBUL
Zincirlikuyu V.D. 936 065 0606 Tic.Sic.No:639200

Onur MUSTAFAOĞLU
Yönetim Kurulu Üyesi

Yander Elektrik Müh. Müş. İnş. Turz. ve Tic. A.Ş.

Bilgi İçin Telefon:
0533 331 57 03
0533 426 38 53

Elden Teslim Aldım. 25/09/2017
Ömer ÇELİK
V.H.K.İ.

Büyükdere Caddesi, No:185, Kanyon Ofis Binası, Kat:6, Levent, İstanbul 34394

H.3 Kemalpasa District Governorate

YANDER ELEKTRİK

YANDER ELEKTRİK MÜHENDİSLİK MÜŞAVİRLİK İNŞAAT TURZ. VE TİC. AŞ.

Sayı : MERS-2017-010
Konu : Mersinli RES Bilgilendirme toplantısı hakkında

Tarih: 25/09/2017

T.C.
KEMALPAŞA KAYMAKAMLIĞI
KEMALPAŞA/İZMİR

İzmir İli, Bayındır İlçesinde kurulacak olan Mersinli RES projemiz ile ilgili izinlerin tamamlanması ile yapım süreci başlayacaktır. Söz konusu proje ile ilgili halkı önceden bilgilendirmek, görüş ve önerilerini almak için çevre köylerde toplantı yapılacaktır.

Toplantı 4 Ekim 2017 tarihinde yapılacak olup, katılımınız durumunda aşağıdaki telefon numarasından toplantı yeri ve saati ile ilgili bilgi alabilirsiniz.

Bilgilerinize arz ederiz.

YANDER ELEKTRİK MÜHENDİSLİK
MÜŞ. İNŞ. TURZ. VE TİC. A.Ş.
Esentepe Mah. Büyükdere Cad. No:185 K:6
Kanyon Ofis Binası Şişli/İSTANBUL
Zincirlikuyu V.D. 936 065 0606 Tic.Sic.No:639200

25-9-2017
Hikmet Ayn

Onur MUSTAFAOĞLU
Yönetim Kurulu Üyesi

Yander Elektrik Müh. Müş. İnş. Turz. ve Tic. A.Ş.

Bilgi İçin Telefon:
0533 331 57 03
0533 426 38 53

Büyükdere Caddesi, No:185, Kanyon Ofis Binası, Kat:6, Levent, İstanbul 34394

H.4 Kemalpasa Municipality

YANDER ELEKTRİK

YANDER ELEKTRİK MÜHENDİSLİK MÜŞAVİRLİK İNŞAAT TURZ. VE TİC. AŞ.

Sayı : MERS-2017-007
Konu : Mersinli RES Bilgilendirme toplantısı hakkında

Tarih: 25/09/2017

T.C.
KEMALPAŞA BELEDİYE BAŞKANLIĞI
KEMALPAŞA/İZMİR

İzmir İli, Bayındır İlçesinde kurulacak olan Mersinli RES projemiz ile ilgili izinlerin tamamlanması ile yapım süreci başlayacaktır. Söz konusu proje ile ilgili halkı önceden bilgilendirmek, görüş ve önerilerini almak için çevre köylerde toplantı yapılacaktır.

Toplantı 4 Ekim 2017 tarihinde yapılacak olup, katılımınız durumunda aşağıdaki telefon numarasından toplantı yeri ve saati ile ilgili bilgi alabilirsiniz.

Bilgilerinize arz ederiz.

25.08.2017
14351
İmar Md.

YANDER ELEKTRİK MÜHENDİSLİK MÜŞ. İNŞ. TURZ. VE TİC. A.Ş.
Esentepe Mah. Büyükdere Cad. No:185 K:6 Kanyon Ofis Binası Şişli / İSTANBUL
Zincirlikuyu V.D. 936 055 0606 Tic.Sic.No:639200

Onur MUSTAFAOĞLU
Yönetim Kurulu Üyesi

Yander Elektrik Müh. Müş. İnş. Turz. ve Tic. A.Ş.

Bilgi İçin Telefon:
0533 331 57 03
0533 426 38 53

Büyükdere Caddesi, No:185, Kanyon Ofis Binası, Kat:6, Levent, İstanbul 34394

H.5 Cumali Neighbourhood Administration

YANDER ELEKTRİK MÜHENDİSLİK MÜŞAVİRLİK İNŞAAT TURZ. VE TİC. AŞ.

YANDER ELEKTRİK

Sayı : **MERS-2017-007**
Konu : Mersinli RES Bilgilendirme toplantısı hakkında **Tarih:** 25/09/2017

T.C.
CUMALI KÖYÜ MUHTARLIĞINA

İzmir İli, Bayındır İlçesinde kurulacak olan Mersinli RES projemiz ile ilgili izinlerin tamamlanması ile yapım süreci başlayacaktır. Söz konusu proje ile ilgili halkı önceden bilgilendirmek, görüş ve önerilerini almak için çevre köylerde toplantı yapılacaktır.

Toplantı 4 Ekim 2017 tarihinde yapılacak olup, katılımınız durumunda aşağıdaki telefon numarasından toplantı yeri ve saati ile ilgili bilgi alabilirsiniz.

Bilgilerinize arz ederiz.

YANDER ELEKTRİK MÜHENDİSLİK
MÜŞ. İNŞ. TURZ. VE TİC. A.Ş.
Esentepe Mah. Büyükdere Cad. No:185 K:6
Kanyon Ofis Binası Şişli / İSTANBUL
Zincirlikuyu V.D. 936 065 0606 Tic.Sic.No:639200

Onur MUSTAFAOĞLU
Yönetim Kurulu Üyesi

Yander Elektrik Müh. Müş. İnş. Turz. ve Tic. A.Ş.

Bilgi İçin Telefon:
0533 331 57 03
0533 426 38 53

elden teslim aldım Mecit duman

Büyükdere Caddesi, No:185, Kanyon Ofis Binası, Kat:6, Levent, İstanbul 34394

H.6 Karakizlar Neighbourhood Administration

YANDER ELEKTRİK

YANDER ELEKTRİK MÜHENDİSLİK MÜŞAVİRLİK İNŞAAT TURZ. VE TİC. AŞ.

Sayı : **MERS-2017-007**
Konu : Mersinli RES Bilgilendirme toplantısı hakkında

Tarih: 25/09/2017

T.C.
KARAKIZLAR KÖYÜ MUHTARLIĞINA

İzmir İli, Bayındır İlçesinde kurulacak olan Mersinli RES projemiz ile ilgili izinlerin tamamlanması ile yapım süreci başlayacaktır. Söz konusu proje ile ilgili halkı önceden bilgilendirmek, görüş ve önerilerini almak için çevre köylerde toplantı yapılacaktır.

Toplantı 4 Ekim 2017 tarihinde yapılacak olup, katılımınız durumunda aşağıdaki telefon numarasından toplantı yeri ve saati ile ilgili bilgi alabilirsiniz.

Bilgilerinize arz ederiz.

Elden teslim aldım

YANDER ELEKTRİK MÜHENDİSLİK
MÜŞ. İNŞ. TURZ. VE TİC. A.Ş.
Esentepe Mah. Büyükdere Cad. No:185 K:6
Kanyon Ofis Binası Şişli / İSTANBUL
Zincirlikuyu V.D. 936 065 0606 Tic.Sic.No:639200

Onur MUSTAFAOĞLU
Yönetim Kurulu Üyesi

Yander Elektrik Müh. Müş. İnş. Turz. ve Tic. A.Ş.

Bilgi İçin Telefon:
0533 331 57 03
0533 426 38 53

Büyükdere Caddesi, No:185, Kanyon Ofis Binası, Kat:6, Levent, İstanbul 34394

H.7 Karaot Neighbourhood Administration

YANDER ELEKTRİK

YANDER ELEKTRİK MÜHENDİSLİK MÜŞAVİRLİK İNŞAAT TURZ. VE TİC. AŞ.

Sayı : **MERS-2017-007**
Konu : Mersinli RES Bilgilendirme toplantısı hakkında **Tarih:** 25/09/2017

T.C.
KARAOT KÖYÜ MUHTARLIĞINA

İzmir İli, Bayındır İlçesinde kurulacak olan Mersinli RES projemiz ile ilgili izinlerin tamamlanması ile yapım süreci başlayacaktır. Söz konusu proje ile ilgili halkı önceden bilgilendirmek, görüş ve önerilerini almak için çevre köylerde toplantı yapılacaktır.

Toplantı 4 Ekim 2017 tarihinde yapılacak olup, katılımınız durumunda aşağıdaki telefon numarasından toplantı yeri ve saati ile ilgili bilgi alabilirsiniz.

Bilgilerinize arz ederiz.

YANDER ELEKTRİK MÜHENDİSLİK
MÜŞ. İNŞ. TURZ. VE TİC. A.Ş.
Esentepe Mah. Büyükdere Cad. No:185 K:6
Kanyon Ofis Binası Şişli/İSTANBUL
Zincirlikuyu V.D. 936 065 0606 Tic.Sic.No:639200

Onur MUSTAFAOĞLU
Yönetim Kurulu Üyesi

Yander Elektrik Müh. Müş. İnş. Turz. ve Tic. A.Ş.

Bilgi İçin Telefon:
0533 331 57 03
0533 426 38 53

Elden Teslim Aldım
Ertan UÇAR

Büyükdere Caddesi, No:185, Kanyon Ofis Binası, Kat:6, Levent, İstanbul 34394

H.8 Yesilkoy Neighbourhood Administration

YANDER ELEKTRİK

YANDER ELEKTRİK MÜHENDİSLİK MÜŞAVİRLİK İNŞAAT TURZ. VE TİC. AŞ.

Sayı : **MERS-2017-007**
Konu : Mersinli RES Bilgilendirme toplantısı hakkında

Tarih: 25/09/2017

T.C.
YEŞİLKÖY KÖYÜ MUHTARLIĞINA

İzmir İli, Bayındır İlçesinde kurulacak olan Mersinli RES projemiz ile ilgili izinlerin tamamlanması ile yapım süreci başlayacaktır. Söz konusu proje ile ilgili halkı önceden bilgilendirmek, görüş ve önerilerini almak için çevre köylerde toplantı yapılacaktır.

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Bilgilerinize arz ederiz.

YANDER ELEKTRİK MÜHENDİSLİK MÜŞ. İNŞ. TURZ. VE TİC. A.Ş.
Esentepe Mah. Büyükdere Cad. No:185 K:6
Kanyon Ofis Binası Şişli / İSTANBUL
Zincirlikuyu V.D. 936 065 0806 Tic.Sic.No:639200

Onur MUSTAFAOĞLU
Yönetim Kurulu Üyesi

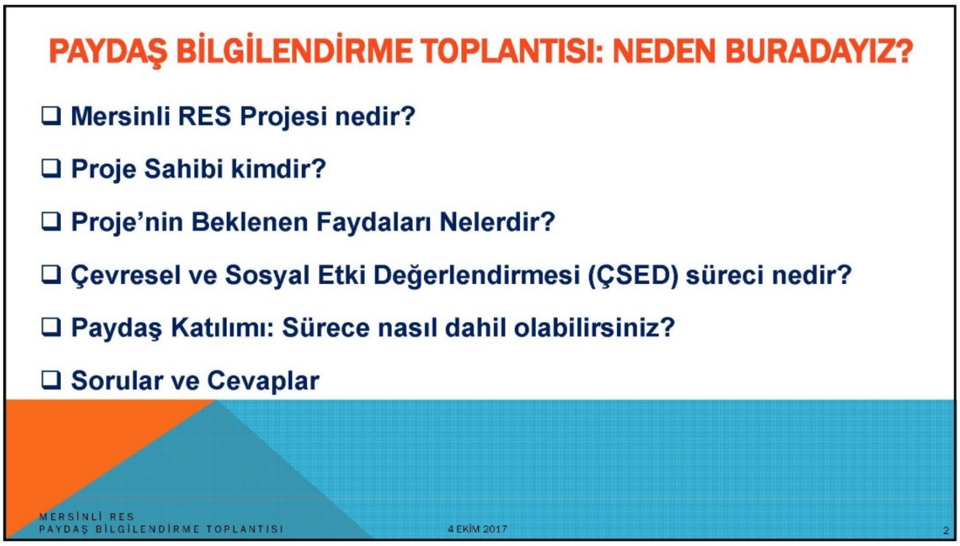
Yander Elektrik Müh. Müş. İnş. Turz. ve Tic. A.Ş.

Bilgi İçin Telefon:
0533 331 57 03
0533 426 38 53

Elden teslim aldım Mecit Duman

Büyükdere Caddesi, No:185, Kanyon Ofis Binası, Kat:6, Levent, İstanbul 34394

Appendix I Presentation Template used during the Public Consultation Meetings



MERSİNLİ RES PROJESİ

- Yenilenebilir enerji kaynağına dayalı lisanslı elektrik enerjisi üretimi
- Proje yeri : Kemalpaşa, Torbalı ve Bayındır ilçeleri
- Enerji üretimi : 202 GWh/yıl
- Toplam kurulu güç : 58.7 MWm
- Türbin sayısı : 17
- İnşaat süresi : 15 ay
- İşletme süresi : 49 yıl
- Yatırım bedeli : 90 milyon $
- İstihdam : İnşaat Aşaması 150 kişi; İşletme Aşaması 12 kişi

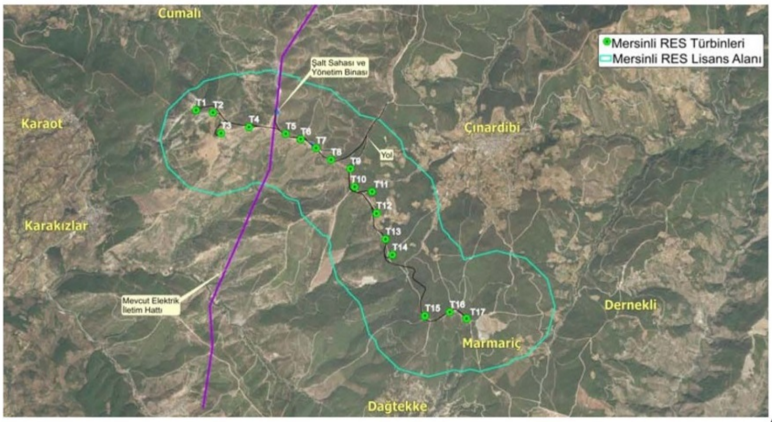
MERSİNLİ RES
PAYDAŞ BİLGİLENDİRME TOPLANTISI
4 EKİM 2017
AECOM
3

İŞLETME FAALİYETLERİ AKIM ŞEMASI

- 3,45 MW'lık türbinler
- Toprak altı kablo ağı
- Mevcut Enerji Nakil Hattı'na bağlantı (40 m)
- İdari bina (kontrol odası, idari ve sosyal tesisler)
- Saha içi ulaşım yolları
- Bakım ve onarım faaliyetleri

MERSİNLİ RES
PAYDAŞ BİLGİLENDİRME TOPLANTISI
4 EKİM 2017
AECOM
4

PROJE ÜNİTELERİNİN KONUMU



MERSİNLİ RES
PAYDAŞ BİLGİLENDİRME TOPLANTISI 4 EKİM 2017 AECOM 5

PROJE'NİN GEÇMİŞİ

2007
- TEİAŞ tarafından RES yarışmalarının açılması
- Yander Elektrik A.Ş'nin 55 MW kapasiteli Mersinli RES için bağlantı hakkı kazanması

2012
- EPDK'dan Elektrik Üretim Lisansı alınması (49 yıl)

2016
- T.C. Çevre ve Şehircilik Bakanlığı'ndan «ÇED Olumlu Belgesi» alınması

2017
- Yander Elektrik A.Ş.'nin hisselerinin **%100** oranında **Alcazar Energy** tarafından satın alınması

MERSİNLİ RES
PAYDAŞ BİLGİLENDİRME TOPLANTISI 4 EKİM 2017 AECOM 6

PROJE SAHİBİ: ALCAZAR ENERGY

ALCAZAR ENERGY

- ❑ Merkez: Dubai; Ofisler: İstanbul , Amman (Ürdün) ve Kahire (Mısır)
- ❑ Dünya Bankası (IFC) ortaklığı : 2015
- ❑ Türkiye, Ürdün ve Mısır'da rüzgar ve güneş enerjisi yatırımları
- ❑ Yander Elektrik A.Ş.'nin %100 sahibi

Shobak RES, Ürdün
44.6 MW

Al Rajef RES, Ürdün
86.1 MW

FIT RES, Mısır
50.0 MW

MERSİNLİ RES
PAYDAŞ BİLGİLENDİRME TOPLANTISI 4 EKİM 2017 AECOM 7

PROJE'NİN BEKLENEN FAYDALARI

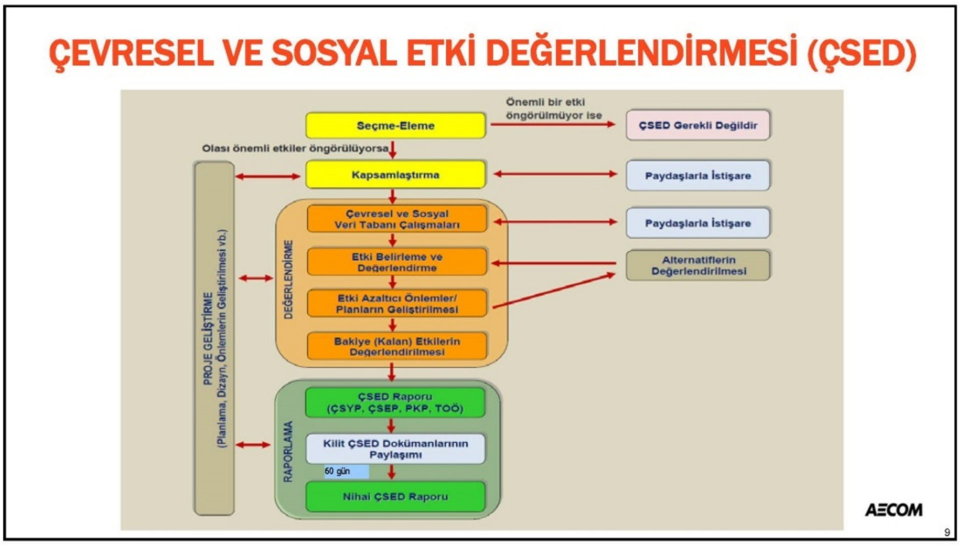
Ulusal Düzeyde

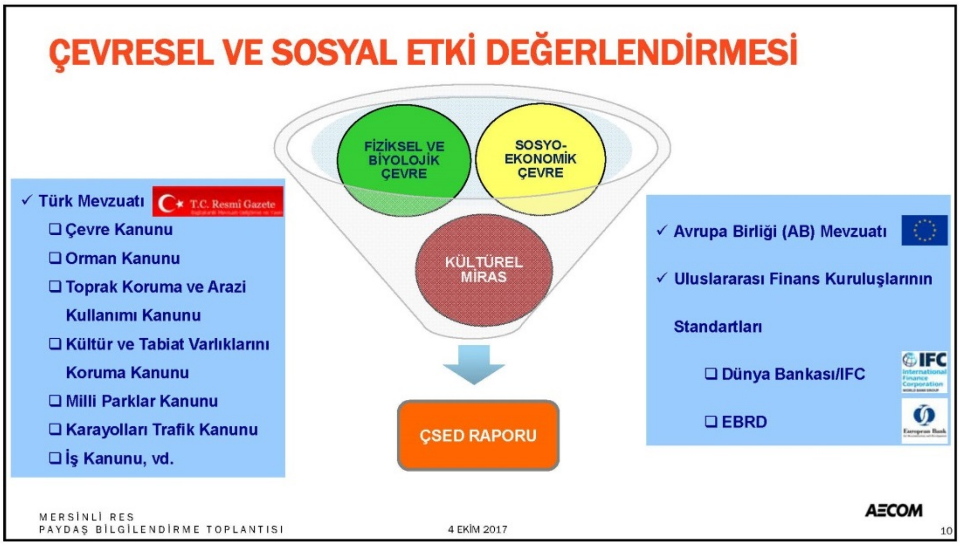
- ❑ Yenilenebilir kaynağa (rüzgara) dayalı temiz elektrik enerjisi üretimi
- ❑ Enerji üretimi kaynaklı çevre kirliliğinin azalmasına katkı
- ❑ Enerjide dışa bağımlılığın azalması
- ❑ Proje Sahibi tarafından devlete ödenecek vergiler, ücretler, vb.

Yerel Düzeyde

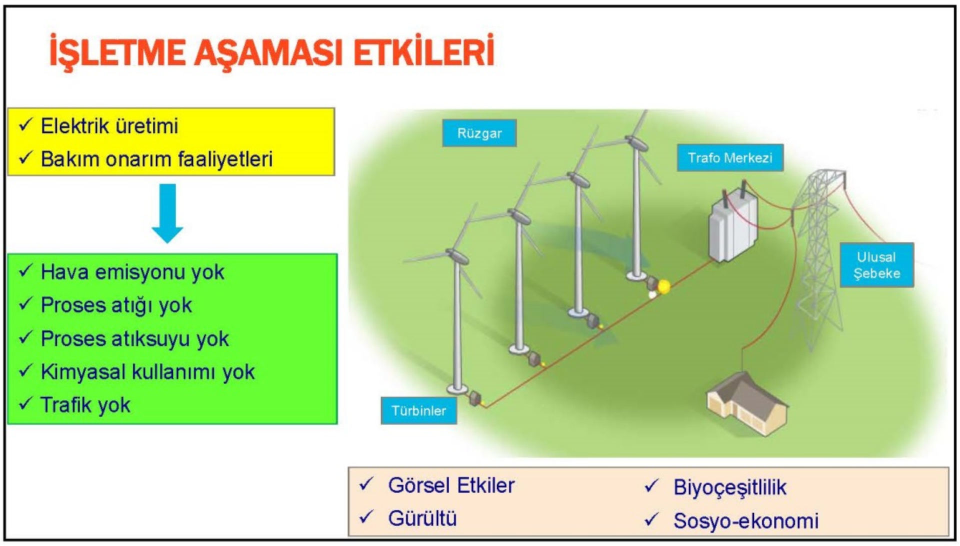
- ❑ Yerel istihdam olanakları
- ❑ Mal ve hizmet alımına bağlı olarak yerel ölçekte ekonomik faydalar
- ❑ Yerel altyapının gelişmesi
- ❑ Çevre, iş sağlığı ve güvenliği alanlarında örnek uygulama
- ❑ Sosyal projeler sayesinde, toplumsal kalkınmaya katkı

MERSİNLİ RES
PAYDAŞ BİLGİLENDİRME TOPLANTISI 4 EKİM 2017 AECOM 8


ÇEVRESEL VE SOSYAL ETKİ DEĞERLENDİRMESİ (ÇSED)
Seçme-Eleme
Önemli bir etki öngörülmüyor ise
ÇSED Gerekli Değildir
Olası önemli etkiler öngörülüyorsa
Kapsamlaştırma
Paydaşlarla İstişare
Çevresel ve Sosyal Veri Tabanı Çalışmaları
Paydaşlarla İstişare
Etki Belirleme ve Değerlendirme
Alternatiflerin Değerlendirilmesi
Etki Azaltıcı Önlemler/ Planların Geliştirilmesi
Bakiye (Kalan) Etkilerin Değerlendirilmesi
DEĞERLENDİRME
PROJE GELİŞTİRME
(Planlama, Dizayn, Önlemlerin Geliştirilmesi vb.)
ÇSED Raporu (ÇSYP, ÇSEP, PKP, TOÖ)
Kilit ÇSED Dokümanlarının Paylaşımı
60 gün
Nihai ÇSED Raporu
RAPORLAMA
AECOM
9


ÇEVRESEL VE SOSYAL ETKİ DEĞERLENDİRMESİ
FİZİKSEL VE BİYOLOJİK ÇEVRE
SOSYO-EKONOMİK ÇEVRE
KÜLTÜREL MİRAS
ÇSED RAPORU
✓ Türk Mevzuatı
T.C. Resmi Gazete
❑ Çevre Kanunu
❑ Orman Kanunu
❑ Toprak Koruma ve Arazi Kullanımı Kanunu
❑ Kültür ve Tabiat Varlıklarını Koruma Kanunu
❑ Milli Parklar Kanunu
❑ Karayolları Trafik Kanunu
❑ İş Kanunu, vd.
✓ Avrupa Birliği (AB) Mevzuatı
✓ Uluslararası Finans Kuruluşlarının Standartları
❑ Dünya Bankası/IFC
❑ EBRD
MERSİNLİ RES
PAYDAŞ BİLGİLENDİRME TOPLANTISI
4 EKİM 2017
AECOM
10


İNŞAAT AŞAMASI ETKİLERİ
✓ Bitkisel örtü temizliği
✓ Yapım faaliyetleri
✓ Mal ve hizmet temini
Arazi kullanımı değişimi
Toz oluşumu
Gürültü
Trafik
İstihdam (150 kişi)
Geçici etkiler
(15 ay)
MERSİNLİ RES
PAYDAŞ BİLGİLENDİRME TOPLANTISI
4 EKİM 2017
AECOM
11


İŞLETME AŞAMASI ETKİLERİ
✓ Elektrik üretimi
✓ Bakım onarım faaliyetleri
✓ Hava emisyonu yok
✓ Proses atığı yok
✓ Proses atıksuyu yok
✓ Kimyasal kullanımı yok
✓ Trafik yok
Rüzgar
Trafo Merkezi
Ulusal Şebeke
Türbinler
✓ Görsel Etkiler
✓ Gürültü
✓ Biyoçeşitlilik
✓ Sosyo-ekonomi

İŞLETME AŞAMASI ETKİLERİ

Görsel Etkiler	Gürültü
Üç boyutlu görselleştirme	48 saat gürültü ölçümü
Gölge etkisi analizi	Gürültü modellemesi

MERSİNLİ RES
PAYDAŞ BİLGİLENDİRME TOPLANTISI

4 EKİM 2017

AECOM

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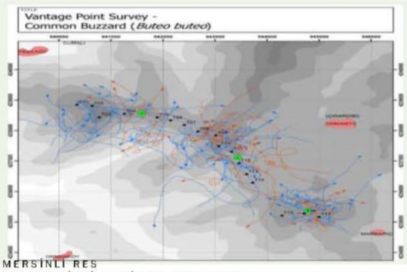
İŞLETME AŞAMASI ETKİLERİ

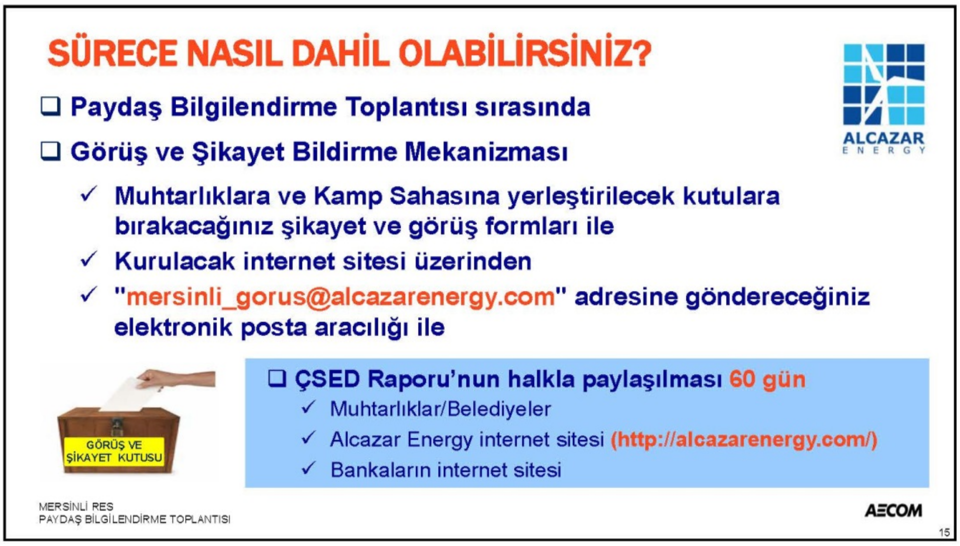
Biyoçeşitlilik	Sosyo-ekonomik
Habitat, kuş ve yarasa araştırmaları	Muhtar anketleri
Kritik habitat değerlendirmesi	Odak grup görüşmeleri
Kuş ve yarasa çarpışma analizleri	Projeden etkilenen kişiler ile görüşmeler



MERSİNLİ RES
PAYDAŞ BİLGİLENDİRME TOPLANTISI

4 EKİM 2017

14


SÜRECE NASIL DAHİL OLABİLİRSİNİZ?
ALCAZAR ENERGY
❑ Paydaş Bilgilendirme Toplantısı sırasında
❑ Görüş ve Şikayet Bildirme Mekanizması
✓ Muhtarlıklara ve Kamp Sahasına yerleştirilecek kutulara bırakacağınız şikayet ve görüş formları ile
✓ Kurulacak internet sitesi üzerinden
✓ "mersinli_gorus@alcazarenergy.com" adresine göndereceğiniz elektronik posta aracılığı ile
GÖRÜŞ VE ŞİKAYET KUTUSU
❑ ÇSED Raporu'nun halkla paylaşılması 60 gün
✓ Muhtarlıklar/Belediyeler
✓ Alcazar Energy internet sitesi (http://alcazarenergy.com/)
✓ Bankaların internet sitesi
MERSİNLİ RES
PAYDAŞ BİLGİLENDİRME TOPLANTISI
AECOM
15


ALCAZAR ENERGY
Mersinli Rüzgar Enerjisi Santrali
Paydaş Bilgilendirme Toplantısı
Çevresel ve Sosyal Etki Değerlendirmesi Süreci
Katılımınız ve İlginiz İçin Teşekkür Ederiz!
Sorular, Yorumlar ve Görüşler
Cumalı Köyü, 4 Ekim 2017
AECOM

Appendix J Comment/ Suggestion Form (in English)

<table>
<tr><td colspan="2">MERSINLI WIND POWER PLANT PROJECT

Environmental and Social Impact Assessment (ESIA) Process

Comment/Suggestion Form</td></tr>
<tr><td>Name-Surname

(if you do not prefer to identify yourself, please write “ANONYMOUS” in the box)</td><td></td></tr>
<tr><td>How you would like to be contacted?

Please specify the method you prefer and provide the relevant contact information (mail, telephone, e-mail)</td><td>☐ Mail: (please enter your mail address)
____
____
____

☐ Telephone: (please enter your phone number)
____

☐ E-mail: (please enter your e-mail address)
______________________________</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td colspan="2">Please write your comments and suggestions in the following box in details.</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td colspan="2"></td></tr>
</table>

Appendix K List of Participants

Yander Elektrik Müh. Müş. İnş. Tur. Ve Tic. A.Ş.
Mersinli RES Kapsam Toplantısı Katılım Listesi

Yer: Cumalı Köyü Köy Kahvesi

Tarih: 04.Ekim.2017

Katılımcı

Adı Soyadı	Köy/Kurum	Telefon	İmza
Nail Serin	Cumalı köyü	05366537884	[signature]
Barış Kollik	Cumalı Köyü	05468497306	[signature]
Mustafa Topuz	Cumalı Köyü		
M. Yaşar Sevim			[signature]
Mehmet Önen	Yeşilköy	0537892532	[signature]
Ali Taşkın	Cumalı	05379399054	[signature]
Mehmet Turhan	Cumalı	0536828 [illegible]	[signature]
Lütfi Dönmez	Cumalı	05353695683	[signature]
Ahmet Öz	Cumalı	05369817634	[signature]
AHMET BAYSAL	CUMALI	0507 358 24 40	[signature]
MEHMET ÖZDEMİR	CUMALI	05365157007	[signature]
Selahattin [illegible]	CUMALI		[signature]
Muharrem Yarımkol	CUMALI	05368944382	[signature]
Adem Yarımkol	CUMALI	05375538841	[signature]
Adem Serin	CUMALI	05373868186	[signature]
Mustafa Korkut	Cumalı	0538 081 14 90	[signature]
Erhan Önen	Yeşilköy	05347881813	[signature]
Hilmi Çetin	Cumalı		[signature]
Numan Özkan	yeşil köy		[signature]
Ahmet Nazır	yeşil köy		[signature]
Ahmet Konya	yeşil köy		[signature]
Fikret Tunay	Yeşilköy		[signature]

YANDER ELEKTRİK

Yander Elektrik Müh. Müş. İnş. Tur. Ve Tic. A.Ş.
Mersinli RES Kapsam Toplantısı Katılım Listesi

Yer: Cumalı Köyü Köy Kahvesi

Tarih: 04.Ekim.2017

Katılımcı

Adı Soyadı	Köy/Kurum	Telefon	İmza
Mustafa İŞLEK	Sosyal Uzman	0533 3464749	
Deniz Sofular	hukuk müşaviri	0553 3390016	
Burak Aksoyer	İş Geliştirme	05552241236	
Ahmet Ersayar	Cumalı Köyü		
Onur Mustafaoğlu	Alcazar Energy		
Hande Yürüsçeler	AECOM		
Susan Konukhanği	Alcazar Energy		
Galzka Uliarte	Alcazar Energy		
Burcu Yazgan Kayabalı	AECOM		

Appendix L Environmental and Social Management and Monitoring Plan

The Environmental and Social Management and Monitoring Plan (“ESMMP”) for the Mersinli Wind Power Plant Project (“Mersinli WPP” Project”, “the Project”), is prepared as part of the Environmental and Social Impact Assessment (ESIA) Disclosure Package. The ESMMP is developed to supplement the national EIA studies in line with EBRD’s Environmental and Social Policy (2014) and its associated Performance Requirements (PRs).

The main aim of the ESMMP is implementing environmentally and socially sound practices that are required to avoid and where not possible, minimise the Project’s potential impacts on the environment, the workforce and the local communities. The ESMMP reflects and measures the implementation performance of mitigation measures addressing the identified environmental and social impacts and outlines an overall approach to monitoring. It will be implemented jointly with subject specific environmental and social management plans.

Implementation effectiveness of the environmental and social mitigation measures and compliance with Project standards will be identified by using the monitoring parameters and Key Performance Indicators (KPIs) defined in the ESMMP.

Impact Description	Proposed Mitigation Measures	Stage of Project	Responsibility	Monitoring/ KPIs	Implementation Plan
Land Use, Soils and Geology					
Top soil stripping and management	• Implement top soil management measures. • Remove top soil from the footprint of Project units at suitable depths (20 cm at forest lands; 30 cm at lands used for agriculture; 10 cm at open spaces) before the start of construction activities and store it separately separate from the sub soil at designated top soil storage areas. • Minimise soil loss by employing suitable equipment, procedure and an accurate work schedule (windy and rainy seasons should be eliminated for activities that involve soil disturbance). • Identify sufficiently capable top soil storage areas, these must be placed in relatively low slope areas with sparse or no forest vegetation based on the results of final soil surveys. • Ensure that the height of the top soil stockpiles does not exceed 2 m. • Ensure that no excavation waste (except soil) such as waste rock, domestic waste, medical waste, construction waste and debris will be dumped in top soil storage areas. • Ensure that a maximum slope of 1/3 and a minimum bench width of 10 m are achieved in excavations, in order to maintain slope stability and a safe working environment for heavy construction vehicles. • To avoid soil compaction, ensure that surface grading is performed with lightweight tracked vehicles or wheeled vehicles. • Enclose the top soil storage areas with wire back silt fences and place an adequate number of explanatory signboards at visible points; fix the signboards strongly to ground. • Provide drainage of the temporary top soil sites throughout the storage period. • At sites where construction activities have been completed, reuse stored top soil for rehabilitation of sites • Ensure that top soil stripping and excavation activities will be performed in compliance with the Regulation on Control of Excavated Soil, Construction and Demolition Wastes. • Ensure that unnecessary soil stripping will not be carried out during construction activities to minimise disturbance to vegetation and soils. • Ensure that vegetative soil will not be used as fill material under any circumstances. • Implement the Erosion Control, Soil and Spoil Management Plan.	• Land preparation and construction	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)	• Amount of topsoil stripped and stored • Topsoil storage integrity and proper storage conditions ensured (stability, vegetation, moisture) • Amount of topsoil reinstated to original areas (keep to maximum) • Amount of topsoil reinstated to selected new areas	• Erosion Control, Soil and Spoil Management Plan • Contractor Management Framework Plan • Reforestation Programme
Loss of forests	• Implement the Biodiversity Action Plan. • Sign Reforestation Protocol with the Forestry Authorities. • Implement Reforestation Programme.	• Land preparation and construction • Operation	• Project Company	• Reforestation Programme developed in cooperation with the related forestry authority and implemented • Number of trees planted (or area reforested)	• Erosion Control, Soil and Spoil Management Plan • Reforestation Programme
Loss of forest lands used for agricultural purpose	• Implement the Livelihood Restoration and Compensation Framework	• Land preparation and construction	• Project Company • External Consultants/ Experts	• Livelihood Restoration and Compensation Framework developed and implemented • Grievance records • Compensation provided to affected PAPs • Area reinstated after construction phase	• Erosion Control, Soil and Spoil Management Plan • Stakeholder Engagement Plan • Livelihood Restoration and Compensation Framework
	• Implement top soil management measures. • Ensure that vehicle movements are restricted to designated roads to avoid disturbance of lands adjacent to the roads.		• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)		
Soil Disturbance and Erosion	• Implement top soil management measures. • Implement Erosion Control, Soil and Spoil Management Plan. • Conduct final soil surveys prior to construction; based on the survey results plan using excavated soils in fill operations to the extent possible. • Ensure that natural vegetation will be preserved in non-exposed ground areas for effective sediment and erosion control. • Ensure that disturbance to existing areas of site vegetation will be limited. • Consider limiting activities during adverse weather conditions to reduce potential wind and water erosion.	• Land preparation and construction • Operation • Closure	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)	• Water spraying on roads during dry season conducted to ensure minimum erosion • Interception and drainage channels constructed and maintained • Successful vegetative growth achieved at revegetated sites	• Erosion Control, Soil and Spoil Management Plan • Air Quality Management Plan • Contractor Management Framework Plan
	• Implement the Biodiversity Action Plan. • Implement the Reforestation Programme to be developed in consultation with the related forestry authorities.		• Project Company		
Soil Contamination	• Identify the baseline soil conditions prior to the construction activities by sampling and laboratory analysis. • Develop and implement a Project-specific Emergency Preparedness and Response Plan. • Implement the Waste Management Plan. • Develop and implement Training Programme covering aspects related with management of hazardous substances. • Ensure that hazardous waste will be temporarily stored on-site in an area designated just for this purpose, appropriately enclosed and with concrete paved surface. • Prohibit waste storage out of the designated storage areas. • Ensure that oil changes, refuelling, or lubrication of vehicles will be conducted in a dedicated area. Storage	• Land preparation and construction • Operation • Closure	• Contractors (development and implementation of measures/actions) • Project Company (ensuring measures/actions are developed and implemented by the Contractors)	• Spillage/leakage sites and records • Hazardous materials and hazardous and non-hazardous waste storage areas properly built and maintained	• Waste Management Plan • Contractor Management Framework Plan

Impact Description	Proposed Mitigation Measures	Stage of Project	Responsibility	Monitoring/ KPIs	Implementation Plan
	tanks and refuelling stations will be equipped with drip trays and spill control equipment. • Ensure that when spills or leakages of any type of hazardous materials occur, the contamination will be controlled by using absorbents. The contaminated soil (if any) will be stripped to the adequate depth and disposed in compliance with the applicable legislation and international best practice.				
Seismic risk	• Conduct seismic design of the Project taking the results of the final soil surveys to be conducted prior to construction. • Ensure that the Project units are designed in full compliance with related natural hazards legislation and legislative technical specification documents, in addition to the specific natural hazard resistant design studies conducted for each Project unit.	• Land preparation and construction • Operation • Closure	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)	• Visual check of all project components following large seismic events conducted • Number of related OHS accidents/ incidents recorded	-
Noise					
Noise generation due to operation of construction machinery and equipment and nuisance of local communities	• Conduct construction activities at the work sites located closest to the noise sensitive receptors only during day time. • Limit potentially noisier activities to day time. • Inform noise sensitive receptors about the schedule of activities ahead of start of construction in their proximity. • Keep the main access road in well-maintained condition throughout the construction phase; based on results of the further surveys to be conducted prior to the start of construction phase improve the road conditions if deemed necessary. • Ensure that the mobile vehicles use only designated access roads to reduce traffic routing through community areas. • Select equipment with lower sound power levels. • Optimise the internal-traffic routing, particularly to minimise vehicle reversing needs (reducing noise from reversing alarm) and to maximise distances to the closest sensitive receptors. • Ensure that equipment is regularly maintained. • Implement the Stakeholder Engagement Plan to collect complaints and suggestions through the grievance mechanism to be established. • Conduct noise monitoring programme to verify compliance with regulatory limits and Project standards.	• Land preparation and construction • Closure	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors) • External Consultants/ Experts	• Noise measurement results • Non-compliance with Project Standards • Number of noise related grievances (internal and external)	• Noise Management Plan • Occupational Health and Safety Plan • Contractor Management Framework Plan
Noise generation due to operation of wind turbines and nuisance of local communities	• Optimise turbine operation in consideration of wind speed to avoid noise becoming unacceptable. • Keep turbines in good running order throughout the operational life of the Project through routine maintenance. • Limit the cutting/clearing of vegetation. • Implement the Stakeholder Engagement Plan to collect, investigate and resolve the complaints and suggestions through the grievance mechanism to be established. • Conduct noise monitoring in the first year of operation and later in case of complaints to verify the compliance with regulatory limits and Project standards; take corrective actions in case of any impact.	• Operation	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors) • External Consultants/ Experts	• Noise measurement results • Non-compliance with Project Standards • Number of noise related grievances	• Noise Management Plan • Stakeholder Engagement Plan • Contractor Management Framework Plan
Air Quality and GHG Emissions					
PM_{10} emissions due to construction of WPP and nuisance of local communities PM_{10} emissions due to construction of WPP and impacts on productivity of beekeeping and agricultural activities as a result of dust Exhaust and dust emissions as a result of transportation of project material to the Project Area via main	• Implement the Air Quality Management Plan • Carry out loading and unloading of material without scattering. • During their transportation, cover excavated materials with nylon canvas. • Apply dust suppression methods such as watering with water trucks at access roads and internal roads. • Cover access roads and internal roads with plant mix. • Speed limitations will be applied for vehicles. • Upper layers of the excavated material stored will be kept at a humidity level of about 10%. • Construction vehicles will not be permitted to keep engines running while waiting to enter to the site or waiting on-site. • Construction vehicles leaving the site will be washed to prevent the transmission of soil from the site to the public roads. • Drop height of materials that have potential to generate dust will be kept as minimum as possible. • Well and adequate maintained vehicles will be used and regular maintenance of these vehicles will be ensured. • In order to minimise air emissions sourced from construction machinery and trucks; relevant provisions of the Industrial Air Pollution Control Regulation and the Regulation on Assessment and Management of Air Quality will be complied with. • Monitoring of project related emissions will be carried out in accordance with the Environmental and Social	• Land preparation and construction • Closure	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)	• Results of PM10 measurements • Non-compliance with Project Standards • Number of air quality (particularly dust) related grievances (internal and external)	• Air Quality Management Plan • Stakeholder Engagement Plan • Traffic and Transport Management Plan • Occupational Health and Safety Plan • Contractor Management Framework Plan

Impact Description	Proposed Mitigation Measures	Stage of Project	Responsibility	Monitoring/ KPIs	Implementation Plan
access road. Exhaust emissions due to operation of construction machinery and equipment	Management and Monitoring Plan prepared for Mersinli WPP. • Stakeholder Engagement Plan will be implemented to collect complaints and suggestions through the grievance mechanism to be established.				
Water and Wastewater					
Impacts on water quality due to transport of uncontrolled sediments to downstream surface waters	• Erosion Control Soil and Spoil Management Plan will be implemented. • All required and effective drainage and construction procedures will be applied in order to minimise the impacts on soil hydrology and to benefit soil infiltration. Interception channels around the crane pads will be built to divert runoff waters and to prevent/minimise erosion caused by water. • It will be ensured that exposed ground that will be disturbed during the construction phase activities will be minimised (unnecessary soil stripping will not be carried out). • Vehicle movements will be restricted to designated roads to avoid disturbance of soils adjacent to the roads. • Construction activities will be limited during adverse weather conditions to reduce potential wind and water erosion. • Water sprinkling will be implemented on access roads (initially, based on the air quality model results, water sprinkling will be conducted for at least 3 times a day during dry season and the frequency will be increased if the monitoring results require so).	• Land Preparation and Construction	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)	• Water spraying on roads during dry season visually checked to ensure minimum erosion • Interception and drainage channels constructed and maintained • Successful vegetative growth achieved at revegetated sites	• Erosion Control, Soil and Spoil Management Plan • Air Quality Management Plan • Contractor Management Framework Plan
Impacts on the quality of nearby water resources due to improper management of wastewater, hazardous materials/wastes, construction machinery and vehicles	• Waste Management Plan will be implemented. • Hazardous materials management will be included as a subject in EHS and OHS trainings to be provided to personnel. • Routine control of hazardous waste containers will be carried out and it will be ensured that they are not damaged and no spill exists. • All maintenance activities will be performed on suitable impermeable ground that prevents potential transport of contaminants to surface waters and groundwater. • A designated area for refuelling of the mobile vehicles and machinery will be constructed (ir fequired). • Construction machinery and vehicles will be checked regularly in order to prevent spills and leakages of fuel and other hazardous materials. • Spill kits, absorbent pads and absorbent sands will be available on site at all times. • Vehicle parking will be restricted to designated areas to minimise the potential for any oil or fuel leaks. • In order to prevent surface water contact with the construction area around the turbine foundations, interception channels will be constructed to divert the runoff. Diverted runoff waters will be discharged to the receiving environment to maintain the natural flow regime in the License Area. • In order to prevent / minimise potential impacts on surface waters, no earthworks material will be dumped into the intermittent streams and their banks located within the License Area (Gavuramoğlu, Kulvarkavağı, Kılıboz, Kızıl, Keseroğlu, Karakaya, Çiftepınar, Zeybekmezarı, Sarısu, İzmiryolu, Cimbaz and Musluk streams) and in the near vicinity of the license area (Yayala, Kestane, Kiraz, Akalan, Soğukdere, Karadere, Çeşmebaşı and Akkaya streams). • In the case of need for construction of water structures (such as bridge, culvert, concrete tubes, etc.) on the stream beds, required approvals from the relevant governmental authorities with regard to the type, characteristic and potential impacts on stream flows, will be obtained before construction. • Impermeable septic tank(s)/mobile toilets will be built/provided within the Project Area for collection of wastewaters during operation phase. • During operation phase, routine control and maintenance of domestic waste storage area(s) (septic tank(s)) will be carried out. • Septic tanks will be emptied regularly by vacuum trucks of related Municipalities for discharge to municipal sewage systems during the operation phase.	• Land Preparation and Construction • Operation • Closure	• Contractors (development and implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)	• Spillage/leakage sites and records • Hazardous materials and hazardous and non-hazardous waste storage areas properly built and maintained	• Waste Management Plan • Contractor Management Framework Plan
Waste					
Additional load on region's waste management facilities (e.g. landfills, excavation storage areas, etc.)	• Ensure related waste disposal agreements with the Municipality and licensed recovery/disposal firms are in place. • Implement the Waste Management Plan.	• Land Preparation and Construction • Operation • Closure	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)	• Waste disposal records (volume of waste sent for disposal) • Amount of excavated material generated, stored, reused and sent for disposal • Ratio of waste sent for recycling to waste sent for final disposal	• Waste Management Plan • Erosion Control, Soil and Spoil Management Plan • Contractor Management Framework Plan
Improper waste management causing environmental pollution or nuisance	• Provide adequate and appropriate storage areas. • Ensure container types, labelling, classifying, etc. in the storage areas are in in line with Project standards. • Segregate hazardous and non-hazardous wastes at source. • Separate recyclable and non-recyclable solid waste and store separately until the related Municipality/	• Land Preparation and Construction • Operation • Closure	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are	• Waste storage areas properly built and maintained • Waste records • Training records	• Waste Management Plan • Contractor Management Framework Plan

Impact Description	Proposed Mitigation Measures	Stage of Project	Responsibility	Monitoring/ KPIs	Implementation Plan
	licensed firm collects it. • Ensure the firms that will conduct transport/ recovery/ disposal of non-hazardous waste are licensed. • Ensure that all excavation activities are implemented in line with the cut and fill program to minimise excavation waste. • Provide trainings to personnel on waste reduction, general waste management and housekeeping. • Under no circumstances, dispose of or bury waste on site. • Implement the Waste Management Plan.		implemented by the Contractors)		
Personnel and community health and safety (incl. odour)	• Provide adequate and appropriate storage areas for all types of wastes. • Provide trainings to personnel on general waste management and housekeeping. • Under no circumstances, dispose of or bury waste on site. • Conduct visual checks on site to ensure proper housekeeping. • Implement the Grievance Mechanism. • Implement the Waste Management Plan.	• Land Preparation and Construction • Operation • Closure	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)	• Grievance records	• Contractor Management Framework Plan • Stakeholder Engagement Plan
Loss of valuable material through improper waste management practices (losing recycling and reusing opportunities)	• Ensure container types, labelling, classifying, etc. in the storage areas are in in line with Project standards. • Ensure the firms that will conduct transport/recovery/disposal of waste are licensed. • Separate recyclable and non-recyclable solid waste and store separately until the related Municipality collects it. • Provide trainings to personnel on waste reduction and general waste management. • Implement the Waste Management Plan.	• Land Preparation and Construction • Operation	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors) •	• Separate waste collection systems based on waste types installed on site • Ratio of waste sent for recycling to waste sent for final disposal • Training records • Management plan including detailed measures on reuse/ recycling of plant components during decommissioning prepared prior to closure phase	• Waste Management Plan • Contractor Management Framework Plan
	• Ensure the decommissioning contractor has in place a detailed plan for handling of reusable, recyclable, recoverable turbine, substation and other plant components. • Ensure other mitigation proposed above for land preparation and construction phase and operation phase are in place for closure phase too.	• Closure	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)		
Biodiversity					
Land clearing and deforestation	• Keep land clearance of natural vegetation at minimum and restricted to designated sites. • Avoid destruction of trees and other vegetation for purposes other than planned Project activities. • Avoid dumping excavated soils on natural habitats. • Stabilise all destructed habitats and rehabilitate as early as possible. • Clear vegetation before nesting seasons of animals identified in the area. • Train on-site employees to be aware of nests, avoid any displacement without an expert opinion on the status of the nests. • Conserve all-natural habitats that are outside the Project footprint. • Monitor species' estimated populations and statuses in the area to propose further mitigation measures if needed. • Implement the Biodiversity Action Plan that will specify the bio restoration measures. • Sign Reforestation Protocol with the Forestry Authorities. • Implement Reforestation Programme.	• Land preparation and construction	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)	• No net loss of habitats and species' populations • See Mersinli BAP for habitat and species specific indicators	• Biodiversity Action Plan
Destruction of breeding habitats/roost sites	• Avoid all identified nests. • Remove habitat features before nesting season. • Ensure proper waste disposal avoiding natural habitats. • Avoid cutting trees and other vegetation independent of Project activities. • Avoid any destruction to habitats other than those at designated construction sites. • Monitor identified nests to verify whether they are active. • Allow for adaptive management and take additional measures if needed.	• Land preparation and construction	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)		
Movement and operation of machinery	• Limit on-site vehicle speed to avoid potential road kill. • Maintain all related equipment to avoid introduction of invasive species. • Minimise noise to in accordance with the Project standards. • Use designated roads for on-site traffic.	• Land preparation and construction	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)		
Dust	• To minimise dust impacts, clear vegetation only at designated sites and rehabilitate all sites after construction. • Limit on-site vehicle speed, also to avoid direct mortality of animals. • Implement all necessary dust suppression measures to avoid further impacts on biodiversity features.	• Land preparation and construction	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)		
Collision with turbines	• Monitor activity and conduct carcass searches to assess the level of impact.	• Operation	• Project Company /Project		

Impact Description	Proposed Mitigation Measures	Stage of Project	Responsibility	Monitoring/ KPIs	Implementation Plan
	• Identify which species are more prone to collision. • Ensure there is no net loss of populations. • Avoid any lights, coloured equipment and acoustic effects that may attract birds and bats into the risk zone. • If mortality rates are higher than initially estimated, take measures like increasing cut-in-wind speed, shutting off some of the turbines during critical times like migration, using UV lights, where necessary.		Ornithologist		
Displacement	• Maintain pre-existing land uses. • Conserve and restore natural habitats to allow species re-inhabit the area. • Avoid any vegetation clearance. • Manage public access to avoid further disturbances. • Manage land for priority species. • Monitor species' populations to ensure there is no net loss. • Ban illegal hunting, poaching, or other activities involving biodiversity features. • Raise awareness to conserve species on-site and around.	• Operation	• Project Company /Project Ornithologist /Fauna Expert		
Visual					
Visual impact due to earthworks, cooperation of construction machinery, temporary construction compounds	• Implement dust suppression measures to avoid dust cloud. • Implement topsoil management measures provided in Land Use, Soils and Geology section of this Plan. • Keep lightning to a minimum, insofar as is consistent with maintaining activities and health and safety requirements. • Use of materials that will not result in light reflection will be required, for all project components. • The obstacle lighting fixtures will include shielding such that no light is visible below 10 degrees below horizontal. • Minimize the amount of excess excavated materials to minimize the footprint of storage areas and height of the stockpiles.	• Land preparation and construction • Closure	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)	• Amount of topsoil generated/stored • Amount of excavated material generated/stored/reused • Number of grievances related to dust	• Stakeholder Engagement Plan • Air Quality Management Plan • Erosion Control, Soil and Spoil Management Plan • Contractor Management Framework Plan
Visual impact due to visibility of turbines	• Implement the Project with the 17 turbines-layout, which includes reduced number of turbines (reduced from 22 turbines with almost same tip height). • Connect to the existing 154 kV ETL line of the Fuat WPP to avoid additional ETL pylons in line with the agreement to be done with the related authority (TEİAŞ). • Use underground cable system. • At sites where construction activities are completed, reuse stored top soil for rehabilitation of sites • Implement heBiodiversity Action Plan. • Develop and implement a Reforestation Program in line with the Reforestation Protocol to be signed with the Forestry authorities. • Implement Grievance Mechanism in line with the Stakeholder Engagement Plan (prepared as a stand-alone document as part of the ESIA Disclosure Package) and take possible corrective actions in consultation with the local communities and authorities. • Use materials that will not result in light reflection. • Paint the turbine blades and tower with non-reflective materials.	• Operation	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)	• Amount of topsoil reused • Number of grievances related with visibility of turbines	• Stakeholder Engagement Plan • Biodiversity Action Plan (BAP) • Erosion Control, Soil and Spoil Management Plan • Contractor Management Framework Plan
Socio-economy					
Land Use	• Minimise the amount of land occupied during construction. • After the completion of construction activities, fully reinstate all land not permanently occupied. • Develop and implement a Traffic and Transport Management Plan. • Provide timely information to land users when access to the lands might be more difficult (e.g. during scheduled transportation activities). • Establish and implement public grievance mechanism.	• Land Preparation and Construction	• Contractors (development and implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)	• Grievance records • Area reinstated after construction phase	• Erosion Control, Soil and Spoil Management Plan • Stakeholder Engagement Plan
Employment and Procurement Opportunities	• To the extent possible, use local workforce during construction phase. • Implement transparent and fair recruitment procedures. • Advertise employment opportunities through settlement headmen (muhtar) offices and available public buildings (e.g. Municipality billboards, settlement coffeehouses). • Seek to promote gender equality and employment of women where possible during the recruitment selection process.	• Land Preparation and Construction • Operation • Closure	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)	• KPIs provided in Livelihood Restoration and Compensation Framework	• Livelihood Restoration and Compensation Framework
Livelihoods	• Minimise the amount of land occupied during construction. • Implement the Livelihood Restoration and Compensation Framework (LRCF). • Compensate all users of land whose crops or livelihood will be affected at full replacement cost, in	• Land Preparation and Construction • Closure	• Contractors (development and implementation of measures/actions)	• KPIs provided in Livelihood Restoration and Compensation Framework	• Livelihood Restoration and Compensation Framework

Impact Description	Proposed Mitigation Measures	Stage of Project	Responsibility	Monitoring/ KPIs	Implementation Plan
	accordance with Turkish Laws and IFI's Requirements. • Fully reinstate the land after disruption. • Implement the Stakeholder Engagement Plan (SEP). • Develop and implement a Traffic and Transport Management Plan. • Provide timely information on transportation schedule to the land owners whose lands are located along the route. • Establish and implement a public grievance mechanism.		• Project Company (ensuring measures/actions are implemented by the Contractors)		
	• Implement the Livelihood Restoration and Compensation Framework (LRCF). • Compensate all users of land whose crops or livelihood will be affected at full replacement cost, in accordance with Turkish Laws and IFI requirements. • Inform the District Governorates of Agriculture on the location of upcoming transportation activities to ensure that beekeepers will be aware of the construction zones and avoid to place their hives nearby to the construction zones. • Provide timely information on transportation schedule to the land owners whose lands are located along the route. • Establish and implement a public grievance mechanism.	• Land Preparation and Construction • Closure	• Project Company		
	• Minimise the amount of land occupied during maintenance and repair. • Fully reinstate the land after disruption. • Compensate all users of land whose crops or livelihood will be affected at full replacement cost, in accordance with Turkish Laws and IFI's Requirements. • Implement the public grievance mechanism.	• Operation	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)		
Infrastructure	• Improve roads for heavy machinery transportation (e.g. asphalt coating on specific locations). • Restoration of roads to at least pre-construction level. • Compensated all damages on infrastructure by the Project Company in accordance with Turkish laws and IFI requirements.	• Land Preparation and Construction • Closure	• Contractors (development and implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)	• Traffic and Transport Management Plan developed and implemented • Grievance records	• Traffic and Transport Management Plan • Stakeholder Engagement Plan
	• Carry out regular maintenance of access roads during operation phase to contribute to improved access to agricultural lands.	• Operation			
Labor and Working Conditions					
OHS/ Risks Associated to General OHS Management	• Implement the OHS Plan. • Implement the Contractor Management Plan. • Implement the Construction Environmental Social Management Plan. • Implement the Emergency Prevention and Response Plan. • Develop and Implement a Construction Camp Management Plan. • Develop and implement a Local Employment and Training Management Plan. • Provide general OHS trainings and first aid trainings. • Conduct periodic medical checks. • Conduct regular labour audits to contractors' workforce (by independent labour auditors assigned by the Project Company). • Develop and Implement the Demobilisation Plan. • Obtain OHSAS 18001 certification. • Implement the worker Grievance Mechanism.	• Land Preparation and Construction • Operation • Closure	• Contractors (development and implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)External Consultants/ Experts	• OHS Plan developed and implemented • Emergency Preparedness and Response Plan developed and implemented • Traffic and Transport Management Plan developed and implemented • Contact information for emergency services distributed to site • Accident/incident statistics • Proper signage in place • Inventory of PPEs • Training records • Drill records • Medical records • Grievance records	• OHS Plan • Emergency Preparedness and Response Plan • Traffic and Transport Management Plan • Air Quality Management Plan • Noise Management Plan • Waste Management Plan • Stakeholder Engagement Plan • Contractor Management Framework Plan
OHS/ Hazards due to Accidents and Incidents (including ergonomic injuries, collision with moving machinery, being struck by heavy equipment, etc.)	• Ensure use of related PPEs and other protective means such as sun blockers. • Implement limits on manual lifting/handling. • Install guard rails, signs. • Ensure sufficient illumination.	• Land Preparation and Construction • Operation • Closure			
	• Conduct regular visual checks and maintenance/clean-up of excavation debris and other potential risk sources such as cables and ropes. • Restrict operation of heavy machinery to those that are trained and competent (licensed if required). • Provide regular OHS trainings, • Conduct regular labour audits to contractors' workforce (by independent labour auditors assigned by the Project Company).	• Land Preparation and Construction • Operation • Closure			
OHS/ Working at Height and Falling Objects (working at heights more than 2 m and objects falling on individuals working below)	• Provide specialised OHS trainings. • As possible to the extent and as considered feasible, assemble structures and carry out other suitable work at ground. • Allow only competent and trained personnel to conduct works at height. • Ensure fall protection systems are in place during works at height (e.g. guard rails, fall arrest equipment, etc.).	• Land Preparation and Construction • Operation • Closure			

Impact Description	Proposed Mitigation Measures	Stage of Project	Responsibility	Monitoring/ KPIs	Implementation Plan
	• Consider additional safety equipment such as safety nets and airbags. • Provide workers with a suitable work-positioning device. • Ensure crane and other hoisting equipment are checked and maintained regularly. • Do not conduct related activities during heavy rain/storm and other poor/extreme weather conditions. • Set and maintain appropriate exclusion zones below any working at height activities to the extent possible (measure for falling objects). • Ensure all tools and equipment are attached by appropriate means to the personnel that is working at height (measure for falling objects). • Use approved tool bags for raising and lowering equipment. • Implement the worker Grievance Mechanism. • Conduct regular labour audits to contractors' workforce (by independent labour auditors assigned by the Project Company).				
OHS/ Working in Remote Locations (difficulty in access to emergency services and communication)	• Ensure communications equipment are available for all personnel and maintained properly. • Keep a suitable patient transport vehicle on site.	• Land Preparation and Construction • Operation • Closure			
OHS/ Lifting Operations (risks associated with lifting objects to heights)	• Ensure personnel that conduct lifting operations receive special training and are competent. • Ensure all parties involved in the lifting operations hold a meeting prior to activities, to ensure the operation is well planned, risks discussed and communication methods provided. • Ensure all required information regarding the load is known (e.g. attachment points and weight). • Ensure lifting equipment is properly maintained and right for the material to be lifted (e.g. sufficient capacity to support the weight). • Set and maintain appropriate exclusion zones below any working at height activities (measure for falling objects). • Ensure weather condition limits set by the lifting equipment manufacturer are not exceeded, check prior to each lifting operation. • Implement the worker grievance mechanism. • Conduct regular labour audits to contractors' workforce (by independent labour auditors assigned by the Project Company).	• Land Preparation and Construction • Closure			
OHS/ Air Quality (PM_{10} and exhaust gas emissions)	• Implement dust suppression techniques identified in Air Quality and GHG Emissions section of this Plan.	• Land Preparation and Construction • Closure			
OHS/ Noise and Vibration (noise and vibration caused by construction activities)	• Ensure use of related PPEs as required. • Consider changing equipment or implementing time limits in case of a grievance regarding vibration.	• Land Preparation and Construction • Operation • Closure			
OHS/ Site Traffic (traffic management related risks)	• Implement the Traffic and Transport Management Plan. • Restrict operation of heavy vehicles to those that are trained and competent (licensed if required). • Provide traffic trainings for all personnel and provide specialised trainings to personnel that will operate industrial vehicles. • Include traffic issues in the scope of the trainings that site visitors will receive and limit site visitors' mobility on construction sites. • Install and maintain signage and other traffic regulating means. • Set speed limits and implement right of way practices. • Conduct periodic vehicle maintenance.	• Land Preparation and Construction • Closure			
OHS/ Live Power Lines and Components/ Electrocution (risks posed by contact with live power lines and electrical equipment)	• Ensure live power lines and components are shut down prior to conducting work. • Allow only trained and authorised personnel to conduct electrical works. • Ensure related PPEs are used. • Prohibit other workers from reaching the areas where live power lines or components exist and provide training to the ones that require to work in close proximity.	• Land Preparation and Construction • Operation • Closure			
OHS/ Diseases (potential increase in prevalence of communicable and vector borne diseases)	• Conduct periodic medical checks for personnel and provide vaccination and/or other mitigating measures when required. • Implement appropriate waste management practices and the Waste Management Plan. • Keep a suitable patient transport vehicle on site. • Conduct awareness raising activities on communicable diseases.	• Land Preparation and Construction • Closure			
OHS/ Hazardous Materials (risks associated with contact with hazardous materials)	• Ensure use of PPEs.	• Operation			
OHS/ Electric and Magnetic Fields	• Implement the workers grievance mechanism.	• Operation			

Impact Description	Proposed Mitigation Measures	Stage of Project	Responsibility	Monitoring/ KPIs	Implementation Plan
(risks associated with EMF emitted from high voltage equipment, including the Project ETL)	• Conduct additional assessments in case multiple worker grievances are received.				
Labour/ Worker's Accommodation (impacts related to inappropriate conditions that may result in illnesses and psychological impacts)	• Ensure compliance with Workers' accommodation: processes and standards (IFC and EBRD, 2009) for on-site facilities (canteen, sanitary facilities). • Survey accommodation facilities to be provided off-site and ensure they are in compliance with Workers' accommodation: processes and standards (IFC and EBRD, 2009). • Ensure potable water and domestic purpose water to be supplied on site meet the requirements of the Turkish Regulation on Water Intended for Human Consumption. • Provide trainings to personnel on general waste management, housekeeping and first aid. • Conduct visual checks on site to ensure proper housekeeping. • Ensure proper first aid equipment is kept on site, at various related locations. • Implement the Grievance Mechanism. • Implement the Waste Management Plan.	• Land Preparation and Construction • Closure	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)	• Facilities in compliance with Workers' accommodation: processes and standards (IFC and EBRD, 2009) in place and maintained • Training records • Medical records • Grievance records	• Stakeholder Engagement Plan
Labour/ Dismissal of workers on fixed term contracts at the end of construction phase	• Ensure a demobilisation plan is prepared and implemented. • Ensure construction and closure phase personnel's dismissal is conducted in compliance with all applicable legal requirements and EBRD PR 2. • Ensure contractual requirements are fulfilled during the process. • Ensure the personnel are aware of the process and dates (through appropriate and transparent information dissemination). • To the extent possible, ensure personnel that may also be employed during the operation phase (e.g. security personnel) are not included in the scope of retrenchment at the end of construction phase.	• Land Preparation and Construction • Closure	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)	• Workers informed through appropriate/ transparent mediums with regards to collective dismissal • Number of construction phase personnel employed also for the operation phase • Grievance records	• Stakeholder Engagement Plan
Community Health and Safety					
Abnormal Load Transportation	• Develop and implement a Traffic and Transport Management Plan. • Implement the Stakeholder Engagement Plan and the external grievance mechanism. • Ensure detailed road surveys are conducted and findings of the existing road surveys and detailed road surveys to be conducted are taken into consideration and implemented. • Based on the results of the detailed road surveys, schedule abnormal road transportation and if required, other construction materials transportation to coincide with off-peak hours. • Based on the results of the detailed road surveys, implement traffic management practices. • Ensure abnormal road transportation is conducted with escort vehicles. • Ensure coordination with local authorities during abnormal road transportation (especially for scheduling and road selection). • Implement working hour limits for drivers and inform drivers periodically on working schedule. • Restrict operation of heavy vehicles to those that are trained and competent (licensed if required). • Provide traffic and road safety trainings for all personnel and provide specialized trainings to personnel that will operate industrial vehicles (such as defensive driving, of road and anti-skid etc) • Include traffic issues in the scope of the trainings that site visitors will receive and limit site visitors' mobility on construction sites. • Install and maintain signage and other traffic regulating means. • Set speed limits and implement right of way practices. • Implement restrictions for night time driving • Conduct periodic vehicle maintenance. • Conduct periodic medical checks for drivers. • Conduct awareness raising activities for affected communities through the Project Community Liaison Officer.	• Land Preparation and Construction • Closure	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)External Consultant (transport roads' survey)	• Traffic and Transport Management Plan developed and implemented • Communities informed through appropriate mediums with regards to transport times • Appropriate signage in place • Accident/ incident statistics • Training records (driver trainings) • Grievance records	• Traffic and Transport Management Plan • Stakeholder Engagement Plan
Exposure to Disease	• Provide trainings to personnel on healthcare. • Conduct periodic medical checks for personnel and provide vaccination and/or other mitigating measures when required. • Implement appropriate waste management practices and the Waste Management Plan. • Provide health related awareness raising activities aimed at local communities. • Implement the Stakeholder Engagement Plan and the external grievance mechanism.	• Land Preparation and Construction • Closure	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)	• Grievance records	• Stakeholder Engagement Plan
Electromagnetic Interference	• Obtain relevant approvals from related authorities. • Conduct regular consultation and monitoring with communities	• Operation			

Impact Description	Proposed Mitigation Measures	Stage of Project	Responsibility	Monitoring/ KPIs	Implementation Plan
	• Ensure related grievances are investigated and responded to appropriately				
Emergency Preparedness and Response and Fire Risk	• Develop and implement an Emergency Prevention and Response Plan. • Ensure sufficient communication tools are always in place and distributed throughout the site, with backup systems. • In case local communities are at risk due to an emergency situation; notify the communities by means of alarms/sirens, contacting authorities and select community members by using formerly prepared, up to date contact lists, etc. • Ensure fire detection systems and turbine overheating systems are maintained properly. • Take the fire preparedness and response measures in line with the requirements of the related forestry authorities. • Ensure cooperation with related authorities is achieved (both for prevention of emergencies and during emergency situations. • Engage key community members and relevant local authorities into drilling exercises during operations phase • Implement the Stakeholder Engagement Plan and the external grievance mechanism.	• Land Preparation and Construction • Operation • Closure	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)	• Fire detection/ monitoring systems in place and maintained • Emergency Preparedness and Response Plan developed and implemented • Drill records • Grievance records	• Emergency Preparedness and Response Plan • Stakeholder Engagement Plan
Public Access	• Restrict access to construction/rehabilitation areas. • Ensure adequate signage are in place. • Ensure proper traffic management practices are in place and implement the Traffic and Transport Management Plan. • Provide awareness raising activities for local communities. • Implement the Stakeholder Engagement Plan and the external grievance mechanism. • Ensure monitoring of the third party access to site through use of security personnel • Conduct awareness raising activities for affected communities through the Project Community Liaison Officer.	• Land Preparation and Construction • Closure	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)	• Measures for prevention of public access to construction sites in place (fencing, proper signage, etc.) • Accident/ incident statistics • Grievance records • Training records (for security personnel)	• Traffic and Transport Management Plan • Stakeholder Engagement Plan
	• Ensure access to turbine sites is restricted during extreme weather conditions that may lead to blade/ice throw and communities are informed about risks.	• Operation	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)	• Proper signage in place (risk of ice throw, electrocution, etc.) • Grievance records • Training records (for security personnel)	• Stakeholder Engagement Plan
Hazardous Materials Management	• Implement related mitigation measures provided in Land Use, Soils and Geology, Water Resources and Waste sections of this Plan. • Include hazardous materials management as a subject in EHS and OHS trainings to be provided to personnel. • Implement the Waste Management Plan.	• Land Preparation and Construction • Operation • Closure	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)	• Records of leakage/ spillage incidents • Grievance records	• Stakeholder Engagement Plan
Security Personnel	• Develop and implement a security management plan in compliance with Voluntary Principles on Security and Human rights • Implement the Stakeholder Engagement Plan and the external grievance mechanism. • As also stipulated by the Project Company's Quality Health Safety and Environment Management System requirements, ensure legal inquiries are in place during the hiring process of security guards (or the company the security service is procured from) to check competency and existence of any former abuse incidents. • As also stipulated by the Project Company's Quality Health Safety and Environment Management System requirements, provide trainings to security personnel on code of conduct, gender sensitivities and local cultural sensitivities or ensure the company the security service is procured from provides its personnel with similar trainings.	• Land Preparation and Construction • Operation • Closure	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)	• Training records (for security personnel) • Grievance records	• Stakeholder Engagement Plan
Shadow Flicker	• Manage any complaint in relation to shadow flicker in accordance with the Project's Grievance Mechanism. • Verify line of sight from the receptors to respective turbines, since multiple long trees and strong vegetation are distributed between the turbines and these receptors. • Based on verification of line of sight, in case line of sight is determined to be not disrupted completely by vegetation (i.e. in case even a small partial line of sight exists), install a light sensor on the shadow receptor in order to monitor the shadow flicker impact during operation and shut down (based on shadow flicker hours) the turbine which causes the impact if the receptor receives more than 30 hrs. per year or more than 30 min per day shadow flicker. • In consultation with the affected communities and if required based on verification of sight and light sensor monitoring results, consider providing vegetation screening and other means of screening that may be considered appropriate by communities. • Implement the Stakeholder Engagement Plan and the external grievance mechanism.	• Operation	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)	• Grievance records • Monitoring records (monitoring to be conducted following grievances)	• Stakeholder Engagement Plan
Blade and Ice Throw	• Ensure that lightning protection systems are properly installed and maintained. • Carry out periodic blade inspections and repair any defects that could affect blade integrity. • Ensure vibration sensors that can react to any imbalance in the rotor blades and shut down the turbine are maintained properly.	• Operation	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are	• Operation adjusted to extreme weather conditions • Proper signage in place (risk of ice throw, blade throw, fire)	• Stakeholder Engagement Plan

Impact Description	Proposed Mitigation Measures	Stage of Project	Responsibility	Monitoring/ KPIs	Implementation Plan
	• Ensure heat control mechanism is maintained properly. • Ensure static and illuminated warning signs are used to inform/warn receptors. • Conduct awareness raising activities for affected communities through the Project Community Liaison Officer. • Implement the Stakeholder Engagement Plan and the external grievance mechanism.		implemented by the Contractors)	• Grievance records	
Infrastructure and Equipment Design and Safety and Electrocution	• Ensure the switchyard is fenced off and related cautionary signs are in place. • Ensure access to turbine ladders is closed off and related cautionary signs are in place. • Ground conducting objects installed near the ETL. • Ensure maintenance schedule for turbines is followed strictly. • Design the administrative building in consideration of universal access principles, as this unit will be used for communal purposes. • Conduct awareness raising activities for affected communities through the Project Community Liaison Officer. • Implement the Stakeholder Engagement Plan and the external grievance mechanism.	• Operation	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)	• Proper signage in place (risk of ice throw, blade throw, fire) • Grievance records	• Stakeholder Engagement Plan
Aviation	• Obtain relevant approvals from related authorities.	• Operation	• Project Company	• Approvals from related authorities in place	-
Cultural Heritage					
Damage risk to recognized cultural heritage due to earthworks, excavation activities, etc.	• Develop and implement a Cultural Heritage Management Plan • Evaluate the feasibility of alternatives for relocating the part of the access road (which is an existing forest road) that crosses the registered archaeological site boundaries to keep it outside if possible. • Evaluate the feasibility of alternatives for locating the crane pad for Turbine-9 to a site, which would be at uttermost possible distance to the boundary of the archaeological site • Limit earthworks and construction activities to designated areas and do not allow any work to be conducted on the cultural heritage area • Ensure all personnel are informed about the work restriction in the cultural heritage area • Install fencing between the access road and the cultural heritage site, with proper signage restricting access to the cultural heritage site during the construction phase. • In coordination with the authorities, it will be ensured that access to the 1st degree archaeological site is not prevented or restricted due to the Project during the operation phase. • Set strict speed limits at the main access road. • Implement the dust suppression and noise management measures identified in this ESIA	• Land preparation and construction • Closure	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)	• Chance find records • Training records • Grievance records	• Chance Finds Procedure • Stakeholder Engagement Plan
Restriction of access to recognized cultural heritage sites	• During the ESIA disclosure meetings to be conducted, ensure that the communities are informed with regards to the identified cultural heritage site and access restrictions during the land preparation and construction phase. • Coordinate with the authorities to ensure that access to the 1st degree archaeological site is not prevented or restricted due to the Project during operation phase	• Land preparation and construction • Closure • Operation			
Nuisance due to operation of turbines (noise and visual)	• Develop and implement a Cultural Heritage Management Plan • Implement noise management measures identified in this ESIA	• Operation			
Damage risk to chance finds to be encountered during Project works	• Comply with the relevant provisions (Article 4) of the Turkish Law on Conservation of Cultural and Natural Assets (Law No: 2863). • Train all Project personnel including contractors on the implementation of Chance Finds Procedure. • Implement Chance Finds Procedure. • Collaborate with the authorities for the investigation of site and taking relevant measures to avoid any further disturbance. • Ensure ongoing reporting to communities includes chance finds.	• Land preparation and construction • Closure			
Impact on intangible cultural heritage	• Implement the Stakeholder Engagement Plan (including grievance mechanism). • Inform and consult with the Gokyaka neighbourhood headman regarding the fountain located on the main access road, if the availability/accessibility of this resource is to be temporarily affected due to construction activities. • Take necessary measures to ensure that the availability/accessibility of this resource is not impacted by the Project during the operation phase.	• Land preparation and construction • Operation • Closure	• Contractors (implementation of measures/actions) • Project Company (ensuring measures/actions are implemented by the Contractors)	• Grievance records	• Stakeholder Engagement Plan

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