



MERSİN GAZİANTEP HIGH STANDARD TRAIN PROJECT ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT



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MERSİN GAZİANTEP HIGH STANDARD TRAIN PROJECT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT (FINAL DRAFT)

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DICTIONARY AND ABBREVIATIONS

Word	Description
Access Road	Gravel or dirt road (rarely paved) that provides overland access to the transmission line and pipeline rights-of-way (ROWs) and facilities for inspection, maintenance, and decommissioning
AD	Anno Domini
Aspect	The positioning of a building or thing in a specified direction; the direction that something (such as a building) faces or points toward. The aspect combined with the bearing determines which side of a facility is in the view from a viewpoint, as well as the angle of the object's vertical surfaces with respect to the viewer
AYGM	General Directorate of Infrastructure Investments
BC	Before Christ
CDM/JI	Clean Development Mechanism/Joint Implementation
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLC	Corine Land Cover
Contrast	Opposition or unlikeness of different forms, lines, colours, or textures in a landscape.
Cumulative Impacts	The impacts assessed in an environmental impact statement that could potentially result from incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency, private industry, or individual undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period.
Digital Elevation Model (DEM)	A 3D representation of the surface terrain of an area. A DEM does not consider trees, buildings, or other screening structures.
Direct Impacts	Impacts occurring at or near the place of origin and at the time of a proposed activity and occurring as a direct result of the activity. An effect that results solely from the siting, construction, operation, or decommissioning of a proposed action without intermediate steps or processes.
Distance	The distance between the viewer and the viewed object, which affects the apparent size and degree of contrast between an object and its surroundings
DTM	Digital Terrain Model. A 3D model of the topography within the study area
EBRD	European Bank for Reconstruction and Development
ED50	European Datum 1950
Effects	Environmental consequences that occur as a result of a proposed action. Effects may be direct (caused by the action and occurring at the same time and place), indirect (caused by the action but occurring later in time or farther removed in distance but still reasonably foreseeable), or cumulative (incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions)
Energy Transmission Line	A set of electrical current conductors, insulators, supporting structures, and associated equipment used to move large quantities of power at high voltage, usually over long distances (e.g., between a power plant and the communities that it serves).
Environmental Impact Assessment (EIA)	The evaluation of likely significant effects on the environment of development proposals

Word	Description
EP	Equator Principles
EPFI	Equator Principles Financial Institutions
ESIA	Environmental and Social Impact Assessment
ESMS	Environmental and Social Management System
ESP	Environmental and Social Policy
EST	Electrification, Signaling and Telecommunication System
EU	European Union
GATT	General Agreement on Tariffs and Trade
GEF	Global Environmental Facility
GHG	Greenhouse Gas
GIID	Good International Industrial Practice
GWP	Global Warming Potential
Horizon Line	The apparent line in the landscape formed by the meeting of the visible land surface and the sky, or any line of a structure or landform feature that is parallel to that line.
ICOMOS	International Council on Monuments and Sites
IFC	International Finance Corporation
ILO	International Labor Organization
Impact	The effect, influence, alteration, or imprint caused by an action.
IUCN	International Union for Conservation of Nature
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
Land Use	Characterization of land in terms of its potential utility for various activities, or the activities carried out on a given piece of land.
Landscape	The expanse of visible scenery, including landforms, water forms, vegetation, and man-made elements such as roads and structures. Also, the traits, patterns, and structure of a specific geographic area, including its physical environment, its biological composition, and its anthropogenic or social patterns
Line	The path, real or imagined, that the eye follows when perceiving abrupt differences in form, colour, or texture. Within landscapes, lines may be found as ridges, skylines, the edges of structures, the edges of water bodies, changes in vegetative types, or individual trees and branches.
LUCC	Land Use Capability Class
Mitigation	A method or process by which impacts from actions can be made less injurious to the environment through appropriate protective measures.
Mitigation measures	Methods or actions that will reduce adverse impacts from facility development. Mitigation measures can include best management practices, stipulations in the Bureau of Land Management (BLM) ROW agreements, siting criteria, and technology controls.
Monitoring	Observation of construction, operation, and decommissioning activities to ensure proper mitigation measures or other resource protection protocols are being followed. Long-term monitoring observes the progress or quality of mitigation measures over a period.

Word	Description
NATM	New Austrian Tunneling Method
OHSAS	Occupational Health and Safety Standard
Other Contractors	Main contractors (companies) that directly serve TCDD in the Mersin-Gaziantep High Standard Line Project other than Rönesans
PM ₁₀	Particulate Matter Smaller than 10 microns
PM _{2.5}	Particulate Matter Smaller than 2.5 microns
PR	Performance Requirements
PS	Performance Standards
RAMEN	Regulation on Assessment and Management of Environmental Noise
SCADA	Supervisory Control and Data Acquisition monitoring system.
Sensitive Receptor	These are the spots or areas where any living things such as houses, hospitals, sports fields, recreation areas are constantly present and may be affected by the effects of the project.
Station	The area or building at a station that is used by passengers leaving or arriving by train in the Districts
TCDD	Turkish State Railways
TEEMP	Transport Emission Assessment Models for Projects or Transport Emissions Assessment Models
Terminal	A building and the surrounding area where trains stop for people to get on or off in the Provinces
Topography	The shape of the earth's surface; the relative position and elevations of natural and man-made features of an area.
TURKSTAT	Turkish Statistical Institute
UNFCCC	United Nations Framework Convention on Climate Change
UTM	Universal Transfer Mercator (Universal Latitude Mercator)
Viewer Characteristics	Traits of the individual viewer, such as visual acuity, visual engagement, experience, and viewer motion that affect the viewer's perception of contrast and the ability to discern objects in the landscape.
Viewpoint (VP)	A point from which a landscape is viewed. Also, a point from which a landscape view is analyzed and/or evaluated.
Viewshed	The total landscape has seen or potentially seen from a point, or from all or a logical part of a travel route, use area, or water body.
Viewshed Analysis	A spatial analysis that uses elevation data such as a DEM or SEM to determine which parts of the surrounding landscape are likely to be visible from a designated point or points.
Viewshed Map	The outcome of a viewshed analysis that shows which areas of the surrounding landscape would theoretically be visible from the viewshed origin (the viewpoint).
Visibility	The ability to visually discern an object in the landscape; also, the distance an individual can see as determined by light and weather conditions.
Visibility Factors	Variables that determine and affect the visibility and apparent visual characteristics of an object in a landscape setting. Visibility factors include viewshed-limiting factors that define the potentially visible area, viewer characteristics, distance, viewing geometry,

Word	Description
	background/backdrop, lighting, atmospheric conditions, and the object's visual characteristics.
Visual Contrast	Opposition or unlikeness of different forms, lines, colours, or textures in a landscape.
Visual Contrast Rating	An assessment of the visual contrast between a project and the surrounding landscape.
Visual Engagement/ Experience	How closely the viewer looks at an object or objects in the landscape.
Visual Experience	The degree of familiarity with the visual characteristics of an object in the landscape based on having seen it previously.
Visual Impact Assessment (VIA)	The professional and methodological process used to identify and assess the visual effects, and their likely significance, of a proposed development. Visual effects are effects on specific views and on the general visual amenity experienced by people
Visual Impact	Any modification in landforms, water bodies, or vegetation, or any introduction of structures or other human-made visual elements, that negatively or positively affect the visual character or quality of a landscape and the visual experience of persons viewing the landscape through the introduction of visual contrasts in the basic elements of form, line, color, and texture.
Visual Mitigation	Actions were taken to avoid, eliminate, or reduce potential adverse impacts on scenic resources.
Visual Resource	Any objects (man-made and natural, moving, and stationary) and features, such as landforms and water bodies that are visible on a landscape.
Visual Sensitivity	Public concern for the maintenance of scenic quality in a landscape setting.
Visual Simulation	A pictorial representation of a proposed project in its landscape setting, as it would be seen from a specified viewpoint, and used to visualize the project before it is built, typically in order to determine its potential visual contrasts and associated visual impacts.
Visualization	A computer simulation, photomontage, or other technique to illustrate the predicted appearance of a development.
WB	World Bank
WRI	World Resources Institute
Zone of Theoretical Visibility (ZTV)	Previously known as Zone of Visual Influence (ZVI). This represents the area over which development could theoretically be seen, based on a DTM. The ZTV usually presents a 'bare ground' scenario –i.e., a landscape without screening structures or vegetation.

Wind Directions		
N	North	North
NNE	North Northeast	North-Northeaster
NE	North East	Northeaster
ENE	East Northeast	Easterly Wind-Northeaster
E	East	Easterly Wind
ESE	East Southeast	Easterly Wind Southeaster
SE	Southeast	Southeaster
SSE	South Southeast	South Wind-Southeaster
S	South	South Wind
SSW	South Southwest	South Wind-Southwester

Wind Directions		
SW	South West	Southwester
WSW	West Southwest	West-Southwester
W	West	West
WNW	West Northwest	West-Northwester
NW	North West	Northwester
NNW	North Northwest	North-Northwester

1 INTRODUCTION

1.1 Project Information

The agreement signed between The Republic of Turkey State Railways (TCDD) and REC International Construction Investment Industry and Trade Inc. under Rönesans Holding (Rönesans Holding will be named as Rönesans in rest of the report) within the scope of the High Standard Railway Line Construction and Electromechanical Systems Installation Project, an Environmental and Social Impact Assessment Report was prepared for the Environmental and Social Evaluation of the High Standard Train Project.

Railway construction and mining activities require a full impact assessment study. Therefore, this Environmental and Social Impact Assessment (ESIA) is prepared to define environmental and social impacts. In this context, the timing chart for the ESIA report is given below (see Figure 1.1).

Two high standard railways have been planned between Mersin and Gaziantep provinces and the construction has started but could not be completed. Rönesans will complete the remaining works for the rail system and continuous transportation will be provided between Mersin and Gaziantep. In this context, 2 new railways will be constructed between Mersin and Adana in addition to the current railway. In following part of the line, current line will be extended with high standard railway line. The detailed explanation of the works to be performed by Rönesans is given in the project description section. General view of the Project and responsibilities of the Rönesans are shown in Figure 1.2.

The High Standard Train Project is between Mersin-Gaziantep provinces and passes through Mersin-Adana-Osmaniye-Gaziantep (Başpınar). The route proceeds as Mersin-Adana-Toprakkale-Bahçe-Nurdağ-Başpınar, respectively.

Mersin-Adana route is approximately 76 km long and passes through Mersin, Tarsus, Çukurova Airport and Adana. The main stations planned on the route are: Tırmıl Station, Karacailyas Station, Taşkent Station, Huzurkent Station, Tarsus Station, Çukurova Airport Connection, Yenice Station, Zeytinli Stop, Küçükdilli Station, Terminal Stop, Şakirpaşa Stop, Adana Station. Infrastructure, superstructure, electrification, signaling and telecommunication works are included on the Mersin-Adana route. Information about this route is given below;

- Existing 2 convectional lines will be rehabilitated,
- The third and fourth high standard railway lines will be constructed,
- The river crossing bridge constructed of 20 steel structures will be removed and a concrete bridge will be built instead,
- Length of existing 46 culverts in the first and second line will be extended to the third and fourth line,
- 12 stations will be built,
- Incomplete infrastructures and superstructures on Çukurova airport connection line, which is 9.5 km double line, will be built, Electrification, Signaling and Telecommunication (EST) Systems will be installed, and a 1113 m long viaduct will be built on this connecting line,
- Turkish State Railways (TCDD) will construct subways, overpasses, and surrounding walls and these are not included in the scope of this project.

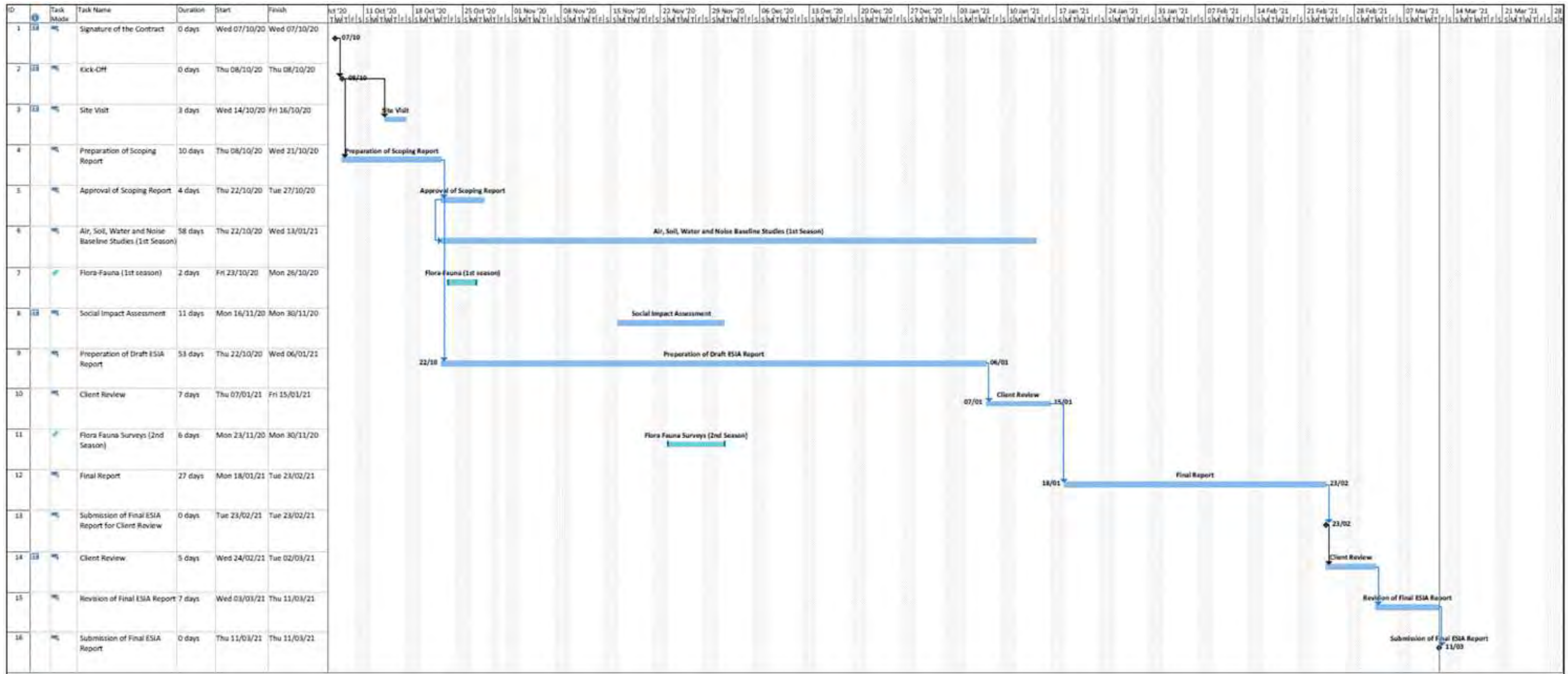


Figure 1.1: Schedule of the ESIA

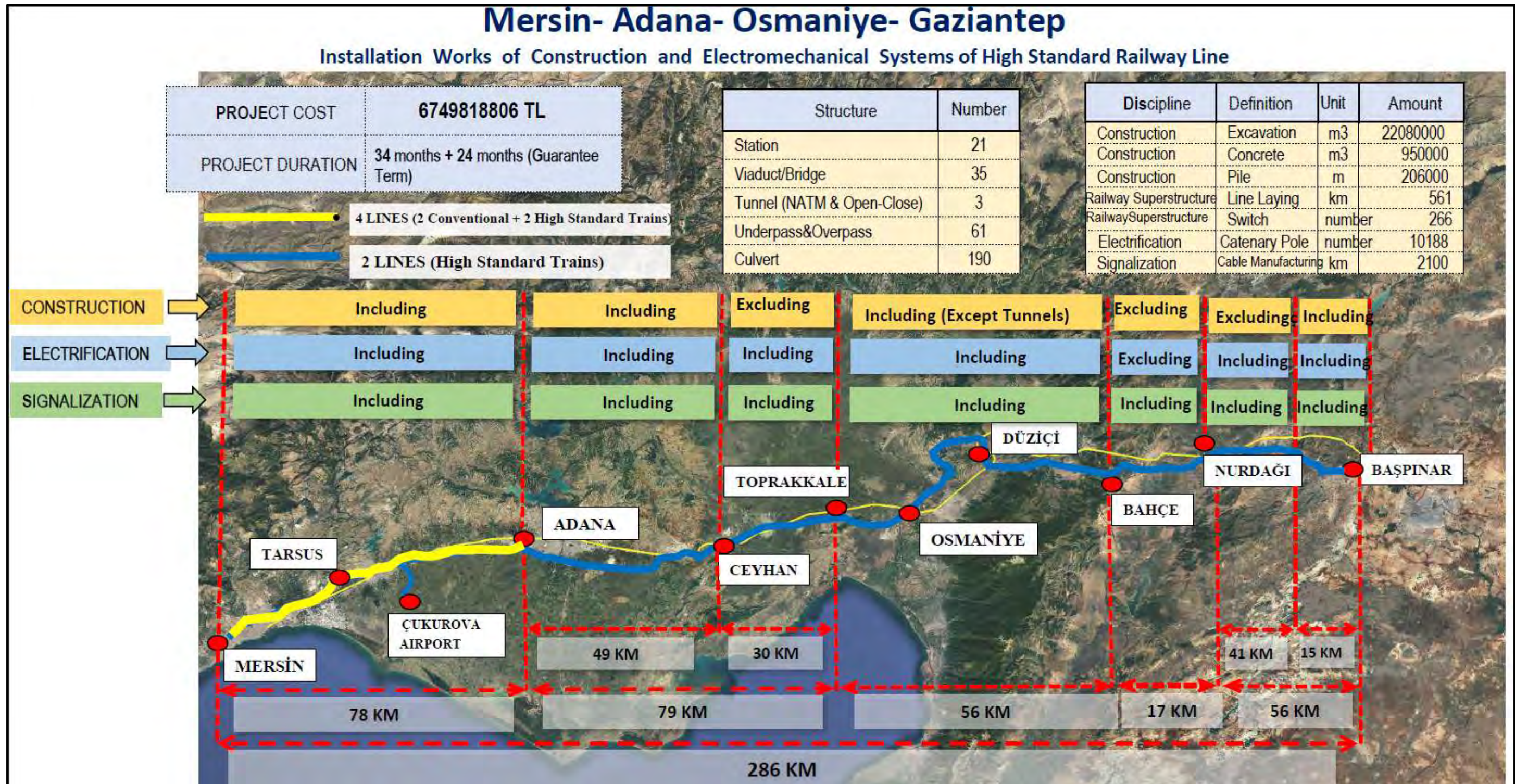


Figure 1.2: Project Scope Map

Adana-Toprakkale route is planned as a double line of approximately 79 km and passes through Adana, İncirlik, Ceyhan and Toprakkale. Main stations planned on the route; İncirlik Station, Yakapınar Station and Ceyhan Station. Another contractor carries out the infrastructure, superstructure, electrification, signaling and telecommunication works of the first 49 km line on the Adana-Toprakkale route and the infrastructure and superstructure works of the 30 km section and electrification and signaling works are within the scope of this project. Other information about the route is given below;

- 3 hydraulic bridges, 12 overpasses, 8 underpasses, 54 culverts and 2 tunnels will be constructed,
- A viaduct will be built on a 4 km section due to the inability to fit into the existing line in İncirlik region,
- 5 stations in the line will be reconstructed (the first 3 stations are in the 49 km section and the other 2 stations are in the 30 km section).

Toprakkale-Bahçe route is approximately 58 km double line and passes through Toprakkale, Osmaniye, Düziçi and Bahçe. Stations located between Toprakkale-Bahçe routes are Osmaniye Station, Düziçi Station and Bahçe Station. Including infrastructure, superstructure, electrification, signaling and telecommunication works in the tunnels on the route. Other information about the route is given below;

- Another contractor will carry out the construction of 11 cut, cover tunnels (2,387 m), 5 tunnels (9,785 m), 9 single tube escape tunnels (3,687 m) and 7 cut, and cover escape tunnels (449 m). These are not in the scope of the project,
- 5 viaducts, 15 overpasses, 23 underpasses and 83 culverts will be built,
- 3 stations will be constructed.

Bahçe-Nurdağ route has been planned as approximately 17 km, and the infrastructure, superstructure, and electrification operations between Bahçe and Nurdağ are not within the scope, only the signaling process at 17 km is within the scope.

Nurdağ-Başpınar route has been planned as approximately 56 km double lines, and in the first 41 km, electrification and signaling operations will be completed, except for infrastructure and superstructure construction works, and infrastructure, superstructure, electrification and signaling processes will be completed in the last 15 km. Other information about the route is given below;

- 3 viaducts, 2 overpasses, 1 underpass, 8 culverts and 1 tunnel will be constructed,
- 1 station will be built.

The construction of the railway system is scheduled to be completed in 34 months, and it is followed by period of 24-month guarantee. There may be shifts in the work schedule due to the site delivery of the companies currently working in the field and the place delivery dates to Rönesans by TCDD and AYGM. Within the scope of this work, the project cost has been determined as 6,749,818,806 TL. The construction period work schedule of Rönesans is given below (see Figure 1.3).

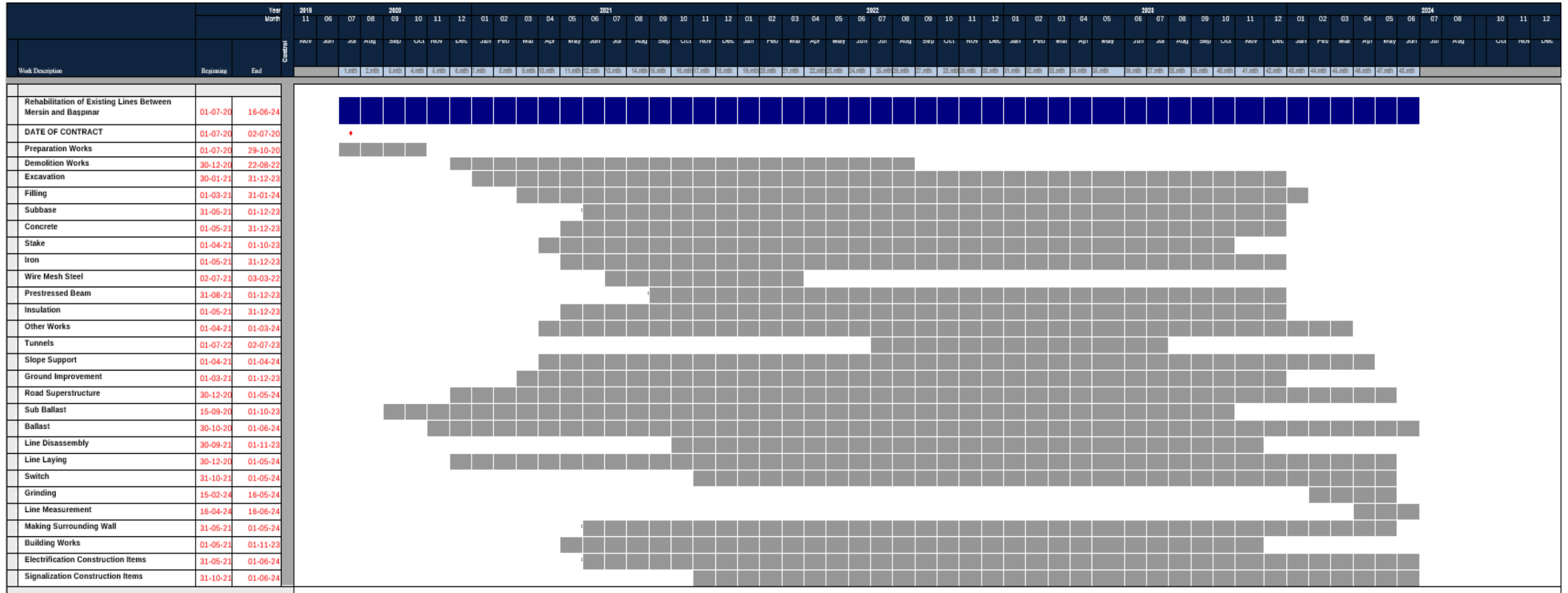


Figure 1.3: Construction Period Work Program

During the construction period, when infrastructure, superstructure and excavation operations were carried out, the maximum number of employees in March-April is 385 personnel. During the operation period, there will be 20 employees working at stations in each city and 10 employees working at stations in each district.

Within the scope of the Project, 21 stations with a length of 19,010 m, 35 viaducts/bridges with a length of 4528 m, 3 tunnels (NATM & cut and cover) with a length of 1520 m, 61 subways and overpasses with a length of 2740 m, 190 culverts with a length of 5350 m are constructed. In addition, 22,080,000 m³ excavation, 950,000 m³ concrete, 206,000 m piles, 561 km of line laying, 266 switches, 10,188 catenary poles for electrification and 2100 km of cables for signaling operations are produced.

For the air quality, water quality, noise and other environmental/social impact assessments evaluated within the scope of ESIA, where Environmental and Social Assessment will be made, field studies and measurements and analyzes were made and impact assessments were made in line with these measurements and analyzes. The impact assessment studies created are presented in section 4. Necessary mitigation methods and measures to be taken because of impact assessment studies are given in the relevant section.

Solid wastes, hazardous and non-hazardous wastes and wastewater that will be generated during the construction and operation phases such as project infrastructure, superstructure, electrification, and signalization will be recovered and/or disposed of in accordance with the relevant regulations.

Necessary field studies were carried out in December 2020 to determine the positive or negative social effects that may arise from the railway.

The travel time between Adana-Gaziantep will be shortened by 1.5 hours with the High Standard Train Project and it will increase the passenger comfort. In addition, it provides an important economic effect. Especially for Mersin, which is a port city, the port will contribute to the development of local and intercity transportation and the development of the economy. In addition, it is expected to provide employment in the cities where the stations and stops of the high standard train pass. In addition, with the shortening of the travel time and the increase in comfort, it is expected that the number of tourists coming to the region will increase and accordingly, the region around the project area will be improved economically.

The ESIA report, which will ensure that all impacts are duly defined, and the negative impacts are mitigated as best as practical, is developed in accordance with local legislations, the requirements of International Finance Corporation (IFC) and European Bank for Reconstruction and Development (EBRD).

1.2 Scope of works

A contract was signed between Rönesans and Assystem ENVY for the Mersin-Gaziantep High Standard Railway Line within the scope of the ESIA study. The scope of work includes:

- To identify, predict, evaluate and mitigate the significant environmental impacts (positive and negative);
- To identify key social issues relevant to the Project objectives, and specify the Project's social development outcomes;
- To determine magnitude of adverse environmental and social impacts and identify the safeguards instruments as per IFC guidelines, Country laws and regulations;
- To predict and assess in quantitative terms as far as possible, the impacts from changes brought about by the Project on the baseline environmental conditions;
- To establish the mitigation measures that are necessary to avoid, minimize or offset predicted adverse impacts and, where appropriate incorporate these into Environmental and Social Management and Monitoring Plan (ESMMP);
- To identify stakeholders who are directly affected and carry out stakeholder analysis to determine their role in achieving social development outcomes;

- To inform, consult and carry out dialogues with stakeholders on matters regarding project design alternatives, implementation of environmental and social mitigation measures and to provide recommendations on Project design that may require adjustments in project design;
- To provide an environmental and socio economic profile of the population and available infrastructure facilities for services and community resources; and
- To develop monitoring and evaluation mechanism to assess effectiveness of mitigation measures during and after Project completion.

1.3 Methodology

1.3.1 Baseline Data Collection

A contract was signed between Rönesans and Assystem ENVY for the Mersin-Gaziantep High Standard Railway Line within the scope of the ESIA study. The works and processes carried out within the scope of the contract were carried out with EIA regulations, IFC Performance Standards (2020), EBRD Policy and Performance Requirements (2019), National (Turkish) environmental, social, employment, health & safety, laws and regulations, best practices, engineering studies, and the work done is given below;

- Project documents were examined.
- Baseline measurements were carried out together with field studies in November 2020.
 - o PM₁₀ and PM_{2.5} measurements were made at 10 points during a month. Additionally, settled dust measurements were carried out at 15 points for 2 months. Within these measurements, air quality assessment has been carried out and is given in the impact assessment section.
 - o At 20 points, water samples were taken and analyzed according to the Table 2 in Annex-5 of the Surface Water Quality Regulation. Along with these analyzes, the evaluation of water resources is given in the impact assessment section.
 - o Day, evening, and night noise measurements of 15 minutes were made for 3 days at 20 points. As a result of the noise measurements, the noise impact assessment study was prepared and given in the impact assessment section.
- The visual impacts of project were determined with 3D visualization method.
- In December 2020, Social Impact Assessment and Stakeholder Engagement management assessment was carried out.
- Environmental and Social Management System was prepared.
- Environmental and Social Action Plan was prepared
- Non-Technical Summary Report has been created.

Summary information about Project area are given below (see Table 1.1).

Table 1.1: Baseline, Impact Assessment and Mitigation Measures

ESIA Topic	Baseline Data	Impact Assessment (IA) and Mitigation Measures
Physical Environmental		
Climate actual and projections. Climate change	<p>According to the data provided by EPA, the effect of GHGs to climate change depends upon three factors, which are;</p> <ul style="list-style-type: none"> • The concentration in the atmosphere, • Duration of stay in the atmosphere and • The power to affect the atmosphere. <p>The World Resources Institute (WRI) is a global research organization that turns big ideas into action at the junction of the environment, economic opportunities and human well-being, and the World Business Council for Sustainable Development (WBCSD) is an organization that works to accelerate the transition to a sustainable world. They prepared a Greenhouse Gas Protocol where greenhouse gas scopes are examined in three groups. The definitions adopted by the WBCSD/WRI Greenhouse Gas Protocol, the first group is "Scope 1" that emits greenhouse gases directly to the atmosphere from the facility or works under the responsibility of the facility, the second group is "Scope 2" that 'indirect' greenhouse gas emissions from sources owned or controlled by another company, as well as emissions from the grid electricity used and last group is other greenhouse gas emissions occurring in a wider area in a chain is called "Scope 3".</p> <p>In line with the information given about greenhouse gas and climate change, the use of the high standard railway in this project, instead of using vehicles, will have a positive effect in terms of the damage to the atmosphere caused by greenhouse gas emissions. The use of high</p>	<p>The emission amount has an advantage of being lower than the emission amount generated by the existing highway, mitigation measures are taken in order not to pose a risk in the future;</p> <ul style="list-style-type: none"> • Minimizing the transport distances for materials in excavation works during the construction period, • Programming vehicle and equipment movements to minimize the waiting time and the distances traveled, • Minimization of land clearance works during the construction phase as much as possible, • Regular maintenance of used vehicles and equipment, • Restricting the use of extra tools by well organizing excavation and filling works, • Keeping regular greenhouse gas emission calculation records for greenhouse gas emissions resulting from electricity use for the operating period, • Providing training to employees both during the construction and operation period, when necessary. <p>The mitigation measures planned to be implemented within the scope of the project are given in the ESMMP prepared for the project.</p>

ESIA Topic	Baseline Data	Impact Assessment (IA) and Mitigation Measures
	<p>standard trains has a very low potential as a negative impact on greenhouse gas emissions released into the atmosphere.</p> <p>The 286 km long route line between Mersin-Gaziantep is likely to create effect on GHG emissions due to the fuel consumption of vehicles and equipment to be used for excavation operations during the construction period.</p> <p>The evaluation of the greenhouse gas emissions that may occur during phases of the planned High Standard Train Project with the positive and negative aspects and determining the impacts to minimize the possible risks.</p> <p>GHG emissions are expected along the Mersin-Gaziantep (Başpınar) High Standart Railway route, arising from the construction and operation periods. The amount of CO₂ that will be released into the air because of the fuel consumption of vehicles and vehicles planned to be used for construction works along the 286 km line will affect the greenhouse gas emission.</p> <p>Along the High Standard train project route, there is an existing highway parallel to the right and left of the railway. For the High Standard Train Project, which is surrounded by both intercity and inner-city roads, vehicle intensity reduction is planned by means of reducing the vehicle use for the passengers who would like to travel.</p> <p>The amount of emissions that will be caused by the fuel consumption of these vehicles is 195663.345 metric tCO₂-e .</p>	
Topography and Agro-Ecological Zones	The existing topography was analyzed using 1/25000 scaled topographic maps and EU DEM 1.1 obtained from the General Directorate of Maps.	-
Soil	Necessary information was obtained from the geological and geotechnical studies conducted in the Project area before.	<ul style="list-style-type: none"> • Site planning should be prepared by related experts, • Physical characteristics of the soil will be investigated,

ESIA Topic	Baseline Data	Impact Assessment (IA) and Mitigation Measures
		<ul style="list-style-type: none"> • Proper excavation method to relocate the soil will be determined, • Correct depth for stripping topsoil and subsoil will be determined, • Topsoil will be stripped in the driest condition possible, • Movement of trucks or dumpers will be limited with designated temporary routes, • Soil storage periods will be kept as short as possible, • Salt crusting signs on the surface will be monitored. Material transfer should not be accepted if there is evidence of salt deposits unless the soil has been tested for salinity, • Topsoil will be recovered using appropriate equipment. Depending on compaction and recovery rates, deep ripping may be required to maximize topsoil recovery with care taken not to mix topsoil with sodic subsoil, • The vegetative topsoil to be stripped will be stored in the designated plant soil stock areas for use in rehabilitation and landscaping in the later stages of the project • The slope of vegetative topsoil storage area will not be more than 5%. • The requisite measures will be taken to prevent any loss in the vegetative topsoil during storage and the soil quality will be maintained. • With the intention to prevent the precipitation and wind erosion, the surface of the vegetative topsoil will be cover with fast growing plants and the perimeter of the storage area will be enclosed with ditch. • In the event of a spillage on land, contaminated soil will be cleaned in accordance with the provisions of the Regulation on Control of Soil Contamination and Point Source Contaminated Lands (Official Gazette dated 08.06.2010 and numbered 27605) or will be disposed of by licensed companies.

ESIA Topic	Baseline Data	Impact Assessment (IA) and Mitigation Measures
		<ul style="list-style-type: none"> • Within scope of the project, provisions of the Law on Soil Protection and Land Use No. 5403 and Regulation on Control of Soil Contamination and Point Source Contaminated Lands will be adhered to. • The samplings and analyses will be performed by laboratories accredited by the Ministry of Environment and Urbanization and the analyses reports will be kept on-site and upon request and/or when required, they will be submitted to the relevant authorities • Upon the termination of the construction activities, the vegetable topsoil stripped and stored separately will be spread on the landscaping areas in accordance with the "Landscape Repair Plan" for the purposes of arrangement the project site, and the provisions of the plan will be respected accordingly. • Landscape repair plan will be applied.
Surface water	Surface water measurements made at 20 points (10 input and 10 output to surface water) throughout the project area.	<ul style="list-style-type: none"> • Sampling studies will be conducted at a total of 10 stations in the scope of seawater quality monitoring activities. • The monitoring will be performed four times a year seasonally at each station throughout the construction phase. In addition, the samplings at Akliman and the beach will be continued throughout the operation phase • The sampling and analyses will be performed by laboratories accredited by the Ministry of Environment and Urbanization • the analyses reports will be kept on-site and upon request and/or when required, they will be submitted to the relevant authorities. • Lateral drainage systems will be established for all groundwater and surface water discharges with seasonal flow within the site.
Groundwater	Baseline groundwater measurements were not performed in the scope of the Project.	<ul style="list-style-type: none"> • Samples will be taken, during the construction period, from groundwater sources analyzed as part of the baseline studies within

ESIA Topic	Baseline Data	Impact Assessment (IA) and Mitigation Measures
		<p>scope of the project, and the groundwater quality will be constantly monitored</p> <ul style="list-style-type: none"> • The monitoring of the groundwater will be performed at these six boreholes throughout the construction and operation phases once every six months, in other words twice a year • The sampling and analyses will be performed by laboratories accredited by the Ministry of Environment and Urbanization • On roads and temporary access road in the site, care will be taken that there will be no spillage in order to prevent the penetration of silt, grease or other substances into drains. On roads and temporary access road in the site, care will be taken that there will be no spillage in order to prevent the penetration of silt, grease or other substances into drains • Within the scope of the project, actions will be taken so that the groundwater and surface water sources are never damaged and water sources that may be negatively affected will be determined and their coordinates and current flow rates will be measured and recorded. • Within the scope of the project, the legislation in force related to groundwater will be respected, and in case any negative impact on the groundwater's quality and quantity caused by the project is determined, all damages will be indemnified, and the respective activity will be stopped and actions will be taken accordingly in line with the directives of SHW. • Lateral drainage systems will be established for all groundwater and surface water with seasonal flow within the site.
Air Quality	PM ₁₀ and PM _{2.5} measurements were conducted by laboratory in 10 measurement points on a monthly basis and dust deposit measurements were conducted in 15 measurement points along the Railway Line.	<ul style="list-style-type: none"> • Dust generating areas will be controlled by water spraying, particularly under dry weather conditions.

ESIA Topic	Baseline Data	Impact Assessment (IA) and Mitigation Measures
		<ul style="list-style-type: none"> • Stockpiles will be planned and sited to minimize the potential for dust generation taking into account prevailing wind directions and the locations of sensitive receptors. They will be protected against wind erosion (e.g. by wind shield, water spraying in dry periods). • The drop height of potentially dust generating materials will be kept as low as possible. • Where practicable, stockpiles will be located away from sensitive receptors. • If crushing of construction materials is required, crushers will be located away from sensitive receptors. • On-site speed limits will be applied and enforced for trucks travelling on unpaved surfaces (10 km/h). • Trucks transporting spoil or other dusty materials off-site will be covered before leaving the sites. • Construction vehicles will not be permitted to keep engines running while waiting to enter the sites or waiting on-sites. • Wheel washing facilities will be available and used so that trucks leaving the site do not spread dust onto neighboring roads. • Public roads used by site traffic will be swept regularly to prevent accumulation of dust. • Construction machines will not be left running in periods between work, or will be throttled down to a minimum. • Movements of construction vehicles should be restricted with onsite only. • Successful implementation of the above measures will be supported by provision of training for the operators of equipment and truck drivers regarding the air pollution potential of their activities. • Dust levels around construction sites will be monitored using dust deposit gauges. The Contractor will adopt the value of 0.39 grams per

ESIA Topic	Baseline Data	Impact Assessment (IA) and Mitigation Measures
		<p>square meter per month as stipulated by the Turkish Industrial Air Pollution Control Regulation for the protection against dust nuisance. If this level is exceeded at sensitive areas near the construction sites, the Contractor will take additional measures for dust control including preventing recurrence during further stages of construction work.</p> <ul style="list-style-type: none"> • Reduction of PM₁₀ emissions will be implemented with the similar manner; by reducing the vehicle intensity and smoke and supplying pollution abatement equipment. • Allowable emission rates will be determined according to the permissible levels. • Emissions will be monitored to ensure that the air quality is maintained. • Renewable and eco-friendly energy sources and fuels will be preferred instead of sources with high air pollution potential. • Maintenance procedures will be implemented in order to keep equipment in good working condition to minimize exhaust emissions caused by poor performance. • Construction machines will not be left running or will be throttled down to a minimum. • Maintenance procedures will be implemented in order to keep equipment in good working condition to minimize exhaust emissions caused by poor performance. • Successful implementation of the above measures will be supported by provision of training for the operators of equipment and truck drivers regarding the air pollution potential of their activities. • PPE will also be supplied to be protected from adverse health effects of air pollutants for prevention of respiratory disorders.

ESIA Topic	Baseline Data	Impact Assessment (IA) and Mitigation Measures
Noise and vibrations	Background noise measurement points were determined as 20 points on the planned railway route, in front of the houses close to the railway. Vibration measures will be performed in the case of any complaint.	<ul style="list-style-type: none"> • Periodic machine maintenance, • Covering the source causing the noise with absorbent materials (rubber, melamine, etc.) that can absorb sound and provide sound insulation, • It is to make material and design changes by turning the noise source off. • Equipment with lower sound power levels should be selected, • Silencers should be installed for fans and mufflers should be installed on engine exhausts and compressor components, • Traffic noise should be reduced by effective traffic routing, • Local residents should be informed in advanced of the scheduled activities with noise generating potential, a mechanism to complaint recording and responding mechanism should be developed, • Operation hours of equipment with extra noise generating potential should be limited, • Re-locating noise sources to less sensitive areas to take advantage of distance and shielding, • Equipment causing excessive levels of noise due to malfunction should be identified and taken out of service. Corrective actions such as repair or replacement should be taken. • Covering with a material such as rubber to dampen the vibration at the points where vibration occurs, • Equipment with lower vibration levels should be selected and vibration,
Visual	Visual impact can be defined as any alteration in landforms, water bodies, or vegetation, or any introduction of structures or other man-made visual elements, that negatively or positively affect the visual characteristics or quality of a landscape and the visual experience of	The visual impact of the proposed Project will be permanent for people living in the nearest settlements and other living beings in the immediate vicinity of the Project region. Proximity of the project region to 2 highways and 1 state road will change the visual status

ESIA Topic	Baseline Data	Impact Assessment (IA) and Mitigation Measures
	<p>people viewing the landscape through the introduction of visual contrasts (opposition of different forms, lines, colors, textures in a landscape) in the basic elements of form, line, color, and texture. They cover the impacts on specific views and on the general visual amenity experienced by people and the potential visual impact is primarily originated from changes in visual characteristics in the view field. Any aesthetic disturbance to the human eye or any hindrance of a landscape can be regarded as visual impact and they should be evaluated thoroughly with a comprehensive VIA study.</p> <p>To be able to conduct an appropriate VIA study, baseline landscape characteristics must be comprehended.</p> <p>Landscape is the most frequently encountered concept in the scope of VIA studies. Landscape can be defined as the extent to which the scenery is visible including land and water forms, vegetation, and man-made structures such as roads and concrete structures of the geographical region that will be subjected to an examination, including its physical and biological environment and psychosocial patterns.</p> <p>VIA study area entails the determination of a 5 km circular area drawn from the center of the Project area. The detected 5 km study area is based upon the Project description, site visits and good practice guidance. High Standard Railway Line and its components (signaling, electrification, train etc.) were evaluated together.</p> <p>This is the generic impact area that should be determined for all VIA studies according to the well-recognized guidelines (e.g., GLVIA).</p> <p>Baseline conditions represent the existing scenic conditions of the Project area independent from the Project. The first step in any landscape or visual impact assessment is to identify the existing landscape and visual source in the vicinity of the Project that is the baseline visual conditions. Site visits and field studies were carried out by Assystem ENVY on September 19 and 20, 2020 in order to assess</p>	<p>substantially, once the construction is completed and operation starts. As the project region is covered by dense vegetation and forests, it is inevitable that visual sensitivity will be affected negatively during construction works.</p> <p>On the other hand, rehabilitation of the existing railway route will compensate the visual impacts arising from construction. As a result, the magnitude of the visual change after the rehabilitation for operation phase can be assumed as either high or medium.</p> <p>Mitigation measures were identified based both on the Best Practice Guide Documentations in theory and the Project only. These documentations clarify many issues for the clients on addressing project-specific impacts and their applicable mitigation measures. The impacts are categorized into four categories.</p> <p>As the electrification infrastructure will exist in long term and it is impossible and non-feasible to disassemble the structure and avoid or eliminate the visual changes. Therefore, there will be residual/net effects due to the long-term nature of the Project. Independent from this, mitigation measures are recommended where feasible to reduce the visual impacts of the electrification infrastructure as much as possible.</p> <p>As a part of the Project development, the following efforts will be made to minimize visual impacts to the extent possible;</p> <p><u>OCS (Overhead Contact System)/Overhead Line Catenary System</u></p> <ul style="list-style-type: none"> The installation of OCS infrastructure will influence the viewshed along the rail corridors, particularly in areas covered with vegetation. Visual impact mitigation strategies for OCS will be

ESIA Topic	Baseline Data	Impact Assessment (IA) and Mitigation Measures
	<p>the baseline conditions. In the evaluation of baseline conditions, similar projects, structures, vegetation, distribution of settlement areas, dwellings, land use, topography, and viewpoints, view angles and view directions. Also, in order to evaluate the current situation, many desk studies were conducted before the field studies.</p> <p>Baseline conditions are useful for forecasting the possible visual amenity after the completion of the Project. The changes will depend on the landscape/vegetation of the area in baseline view and the level of visual contrast of the objects within the scope of the project. In this section, high resolution photographs were addressed by section/VPs and visual characteristics were explained in detail.</p> <p>Visual or aesthetic sources are deemed as natural characteristics of an environment in the view field. These sources should be appealing to people as they reflect the long-term characteristics of the region. Appealing visual sources have high visual sensitivity (e.g. recreational areas, national parks, preserved areas with high biodiversity and high visual quality). In other words, those areas should be maintained in scenic quality as they highly concern the local inhabitants. Visual sources are referred to as any objects or features (either man-made, natural, stationary and mobile) such as landforms or water resources that are visible and valuable within a landscape.</p> <p>Within the scope of baseline studies, Assystem Envy carried out field studies and took photographs in September 2020, from the 1.6 m height on average above ground and with a high camera resolution of 1440p x 960p with a focal length of 4 mm. Focal length is the length of the lens used to take photographs. Even though the main parameters of human vision when the viewer's position is stationary and falls in the range between 45-60°, we generally move our eyes, head or our body for an accurate view. On the photographs taken by Assystem ENVY, VP codes and locations, view angles, view directions, latitude,</p>	<p>determined and incorporated into the detailed design processes. These measures will address the visual baseline conditions, area allocations and mitigation needs found along the rail corridor. This mitigation measure can be evaluated within the impact category of "high".</p> <ul style="list-style-type: none"> The Metrolinx Tree Compensation Protocol requirements will oblige compensating the tree loss to the extent possible through planting trees to the other vulnerable areas, which will also help reduce visual negative impacts due to tree cutting. <p><u>Bridges/Rail Overpasses</u></p> <ul style="list-style-type: none"> All overhead and pedestrian bridges will require safety barriers, which affect the view across the bridge. Therefore, Metrolinx Guideline will determine the "bridge barrier" designs instead that will maintain existing scenery to avoid substantial visual impacts. Treatment for the aesthetics of bridge barriers can also be carried out in consultation with the affected municipalities and dwellings. During the Project, OCS structures can be placed far away from the existing bridges/rail overpasses not to limit the visibility. Instead, OCS support structures can be placed symmetrically on each sides on bridges and viaducts for the least disturbing view. <p><u>Traction Power Facilities</u></p> <ul style="list-style-type: none"> The traction power facilities can be designed in a way that making site planning more innovative if feasible and ensuring external yard and transformers are hidden as much as possible. <p>Apart from these, dust emissions during construction activities can create loss of visibility and landscape viewing. Dust emissions should</p>

ESIA Topic	Baseline Data	Impact Assessment (IA) and Mitigation Measures
	<p>longitude, height above ground and date/time of the photographs are given.</p> <p>The desk studies are crucial elements before site visits and evenly important as site visits. The desk studies involve establishment of the visibility characteristics of the proposed Project region through visualization studies. Visualization studies cover computer simulations such as GIS software, photomontage or other illustration techniques to predict the potential appearance characteristics of the Project.</p> <p>Photomontage studies involve the process of creating imagery of a realistic 3D model of a proposed project overlaid onto a photograph of the existing landscape.</p> <p>The “Zone of Theoretical Visibility” (ZTV) is used to depict the area in which the proposed development can be seen theoretically, formerly named as “Zone of Visual Influence” (ZVI). ZTV is based on a Digital Terrain Model (DTM) which is the most widely used digital topography model to incorporate into a GIS software and it is overlapped with a map. Before site visits, the ZTV studies must be carried out to determine the reasonable VPs.</p> <p>The main reason behind defining such a zone is that the effective borders of the zone could affect the people’s visual aesthetic within the broader area neighboring the Project. Within this context, ZTV maps are prepared using the GIS software. The aim of the software is to assist the VP selection and simulate the potential impacts arising from the developments in the broader landscape. The visibility map facilitates the selection of areas where the proposed development can be seen by people and local inhabitants. However, the use of these maps should be improved due to the following constraints that impede the model accuracy;</p>	<p>be avoided for visual amenity. Dust emission reduction can be accomplished through paving and/or irrigation of the roads.</p> <p>The mitigation measures planned to be implemented within the scope of the project are given in the ESMP prepared for the project.</p>

ESIA Topic	Baseline Data	Impact Assessment (IA) and Mitigation Measures
	<ul style="list-style-type: none"> The ZTV map is based on a bare-earth model (ASTER DEM v2 data with a 30 m grid terrain model) which is limited by the detail of the DTM data and does not consider the spatial variations in topography or blocking features such as vegetation and so on (i.e., landscape without any structure, objects or vegetation). The ZTV map does not consider the exact location and orientation of the viewer such as the travel direction and there is no information upon the loss of visibility with physical environmental and meteorological conditions (distance, weather, light, etc.) <p>These limitations probably mean that the ZTV maps have a tendency to overvalue the extent of the visibility, both from the proposed development perspective and the range of the visible proposed development. As a result, ZTV studies are helpful for assessment of the theoretical visibility. In contrast, it is not a measure of the visual impacts. Visibility is defined as the ability to visually notice any object in a landscape; also the distance that an individual can see. Visibility factors are the variables that affect the visibility and distinct visual characteristics of an object in a landscape. They consist of “viewshed-limiting factors” that determine the potentially visible area, viewer characteristics (features of an individual’s viewer such as how closely the viewer looks at an object and viewer’s motion that affect the visual contrast perception and ability of distinguishing the objects in the landscape), distance, viewing geometry, background/backdrop, lighting, atmospheric conditions (stability/instability) and object’s visual characteristics.</p> <p><u>Viewshed Analysis</u></p> <p>Viewshed refers to the area/landscape that can be potentially seen from a specified point. Viewshed analysis can be defined as a spatial analysis that uses elevation data such as DEM and DTM to identify the</p>	

ESIA Topic	Baseline Data	Impact Assessment (IA) and Mitigation Measures
	parts from where the landscape surrounding the project area is likely to be visible from the certain points.	
Biological environment		
Flora and Fauna	<p>Ecology enriches the world and is crucial for human wellbeing and prosperity. It provides new knowledge of the interdependence between people and nature that is vital for food production, maintaining clean air and water, and sustaining biodiversity in a changing climate.</p> <p>The ecological studies before the project is an early element in the monitoring and evaluation plan and provide a reference point against which any future changes associated with the project activities can be assessed and offer information for subsequent monitoring.</p> <p>In that manner, the comprehensive baseline study identifies the habitats, the range and status of the main flora and fauna species groups that live in the project area and its potential radius impact area, the potential presence and status of protected areas or other important areas for biodiversity. Therefore, collecting biodiversity information is rather significant in the process. The data should be at a satisfactory level so as to compare the initial conditions and changes due to the project in an impact evaluation approach, to set future targets of the project and to estimate the changes as the project proceeds.</p> <p>The first step of the terrestrial ecological surveys was the desktop studies. In the scope of the desktop studies, a thorough search of the available literature on the distribution, population and ecology of the species likely to occur within the project area and areas of ecological value was conducted. Research on biological diversity of provinces where Project routes passes through, were analyzed before the field surveys for global insight of the region. Moreover, Davis's "Flora of the Turkey and Aegean Islands" was also considered for flora species characterization during the desktop studies. Besides, the area was</p>	<ul style="list-style-type: none"> • Arrange "Induction Meeting" for new comers in order to provide information about environmental & social policies, responsibilities, and management system as in line with the Environmental & Social Management System, • Hold regular trainings in order to raise awareness associated with the natural assets & importance of the site and protection of the natural structure including legislative framework, related conventions and their requirements as in line with the Environmental & Social Management System. • Limit the working area in order to keep the clearing area in minimum and avoid unnecessary clearing, • Limit access to non-working areas, • Engage a qualified ecologist to attend the site on a regular basis to monitor the activities, • Develop a monitoring program to be applied during construction works as in line with the Environmental & Social Management System. • Allocate a storage area to store chemicals and hazardous wastes at site with concrete basin and sheltering against wind, dust and sun, • Supply necessary and appropriate absorbents at the at site, • Do not allow debris dumping at site, • Remove waste regularly from the site and dispose properly, • Develop a "Waste Management Plan" as in line with the Environmental & Social Management System.

ESIA Topic	Baseline Data	Impact Assessment (IA) and Mitigation Measures
	<p>evaluated by the use of 1/25,000 scaled topographical maps and satellite images (Google Earth) to detect and validate the different habitat types. During reporting period, plant samples photographed during field observations were identified using by "Flora of Turkey and the East Aegean Islands" and plant terminology guides (Davis, 1965-1985; Davis et al., 1988; Stearn, 1995; Baytop, 1998; Güner et al., 2000). Scientific (in Latin), Turkish and English names of the identified species, their preferred habitat, phytogeographic regions, general distributions in Turkey, situations according to the Bern and CITES Convention, endemism and IUCN Red List categories with relative abundance given in the species list.</p> <p>Transect and grid method were implemented during terrestrial flora surveys. Transects are useful for measuring vegetative cover, determining composition and species dominance within a vegetation unit, or measuring vegetation changes across vegetation unit boundaries and species distribution. Quadrats are used to record floristic presence and characterize vegetation units. The Grid (Quadrature) method was also used during the field surveys. As quadrats have a defined boundary, they provide repeatable and verifiable location and abundance information. By this method comprehensive species list and abundance of the species were determined.</p> <p>In the scope of the project, 2 field surveys were conducted in 19-21 September 2020 and 21-23 November 2020. In order to determine the flora of the project route, site surveys, floristic research conducted in the areas close to the project route and literature data such as Flora of Turkey and the East Aegean Islands were used. If some exceptions are not regarded, the part of the route from Mersin to Nurdağı is in the Mediterranean phytogeographical region, and the part from the eastern of Nurdağı to Gaziantep is Iran-Turan phytogeographic region (Akman, 1993). Especially in Sof Mountain, located to the east of the route, the</p>	<ul style="list-style-type: none"> • Develop a "Landscape Repair Plan" to restore the vegetation of the area including landscape analyses, methodology to be applied for repairing, assessment and determination of landscape characteristics, management, control and monitoring of the plan as in line with the Environmental & Social Management System., • Start landscape repairing following completion of the construction, • Develop a monitoring program to be applied during post construction works. • Engage a qualified ecologist to attend the site on a regular basis to monitor the activities. • Construction and operational activities should be limited to the project area. No activity should be carried out within the project route. • The project area should be surrounded by wire mesh if possible, and wild animal entry into the area should be limited. • In order to prevent animals from using domestic waste for feeding, garbage containers will be covered and domestic solid waste should be stored in controlled areas. • Such activities cutting, rubble, etc. could be harmful to this habitat, should not be carried out in parts outside of the project area. • Within the scope of the project, existing roads should be used as much as possible and new roads should not be opened unless it is necessary. • Although not directly in the field of activity, nearby water resources and streams with seasonal flows, biotopes are the most advantageous habitat for many amphibians and reptiles. In addition, these areas in the region are very important in the

ESIA Topic	Baseline Data	Impact Assessment (IA) and Mitigation Measures
	<p>Iran-Turan phytogeographic region effect can be observed more clearly. The streams, canals and ponds of various sizes are a shelter for plants that are elements of the European-Siberian phytogeographical region.</p> <p>The site observations of the fauna were commenced in the mornings following the time/hour coordination of the GPSs and cameras of all fauna teams; thereby the observation points and tracks of the experts were recorded as of the commencement of the observation. Additionally, each survey point recorded as way points in GPSs and some animals were also recorded when seen between two survey points.</p> <p>The line transect method was used for field surveys. Transect methodology - a common and traditional method - is practical and efficient. Surveys comprise line transects to be walked. Transect route is selected so as to cover a walking line along which various fauna species are expected to be either observed or their signs of existence to be detected such as feces, feather, footprints or calls, etc. The surveyor walks, watches and listens around to determine the species till the end of the transect.</p> <p>Furthermore, the fauna experts photographed the burrow, hair, trace, feces, voice, bone, teeth and skins of the vertebrates and invertebrates species observed during the site surveys to be used in the identification of the species living at the area.</p> <p>At the end of the observation day, the tracks were saved in computer and archived as "kmz" files. All taken photos of all fauna experts were saved and archived. During site survey, Nikon 8x2 binocular, Canon Mark II camera with several lens 100 x 400 telephoto lens were used.</p> <p>Conversations were made with the local residents and workers to gather more data on the vertebrates at the project route.</p>	<p>thermoregulation of nocturnal wild animals. Therefore, it is essential to protect these resources and areas at every stage of the activity. Whatever the reason, intervention in these resources and areas should be avoided.</p> <ul style="list-style-type: none"> According to the air quality modelling studies carried out within the scope of the project, it is determined that dust and exhaust emissions that will occur during the land preparation and construction phase provide the limit values of ground level concentration given in the Regulation on Control of Air Pollution from Industrial Sources (Official Gazette dated 03.07.2009 and numbered 27277). In this context, to reduce dust emission, <ul style="list-style-type: none"> Unloading and loading operations will be carried out without scattering, Material will be covered with a nylon tarp or with other materials with a grain size no less than 10 mm, Upper layers will be stored with a humidity level of 10%, Roads should be wide enough and asphalt covered, Vehicles that can cause dust emission should be covered. Noise that will arise during the land preparation and construction period of the project will be produced by heavy construction machinery and other necessary plants (concrete batch plants and crushing and screening plant/s). Acoustic Report assessing noise impact in construction and operation phases, including background noise measurements daytime, in the evening and at night at the nearest settlement areas, is prepared by accredited laboratory. As demonstrated in the report, the

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	<p>In the scope of the project, 2 field surveys were conducted in 19-21 September 2020 and 21-23 November 2020. In order to determine the flora of the project route, site surveys, floristic research conducted in the areas close to the project route were used. The findings of these surveys are given according to species groups.</p>	<p>calculated noise levels are below the legal limits provided in Annex VII Table 4 of the Regulation on Assessment and Management of Environmental Noise (Official Gazette dated 04.06.2010 and numbered 27601) and the noise will only be detectable within the plant area.</p> <ul style="list-style-type: none"> • Training on "culture of living in peace with the nature" must be given to employees and operators at every stage of the project, • When any vertebrate species is seen while on a vehicle or on foot, it will not be interfered with, • When any vertebrate is encountered by car after the sunset, the car must be stopped and lights must be turned off sufficient time should be given in order to allow it to move away safely, • When a nest or youngster is encountered in the work area, it must not be touched or approached. If a nest, egg or youngster is encountered, it must be removed from the activity field by receiving help from experts, • No living species will be intentionally hunt, killed or caught, • No interference, in any manner, with wild species that are feeding, • During the spring and autumn migration periods, especially the Eastern Black Sea section is used by many bird species during the transition. During transitions in group or in case of accommodation, birds will not be disturbed to the extent possible, and any disruptive and noisy activities will be minimized until the transition ends, • Sand and gravel should not be taken from beach, dune and streambeds for use in buildings and for material supply. • A lighting system should be planned in a way to give minimum artificial light to

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		<ul style="list-style-type: none"> Especially heavy vehicle drivers should drive slowly when driving around the area and avoid unnecessary horn use. During the project activities, devices or applications producing smell, light, heat and sound that wild animals will perceive as a threat should be minimized. During stripping fauna expert will be employed to take necessary measures to move Birds which are widespread in agricultural areas are expected to be directly affected by the activities to be carried out in the project route. It has also been observed that bird of prey species that feed on rodents in the field also use this area. However, it is considered that there are alternative environments where these species can survive and there will be no significant impact provided that the activity starts outside the breeding period. In the observations made in December (2020), it was observed that the activity started after the breeding period and a process was followed by which the species could easily adapt. Turkey is one of important routes used by migratory species. It is determined that some of the main routes pass near the project site. For this reason, the area is used during the migration period. It is expected that bird species may pass through the area during migration periods. Accordingly, the project route should be monitored for the project route should be monitored for 2 years for construction period and 2 years for operation period in terms of birds and migration to find out possible impacts on bird species.
Natural Protected Areas	The ecological studies before the project is an early element in the monitoring and evaluation plan and provide a reference point against which any future changes associated with the project activities can be assessed and offer information for subsequent monitoring.	There is no any Natural Protected Areas on the Project route and because of this there is no need to take special mitigation measures. In addition to this, mitigation measures which are

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	<p>In that manner, the comprehensive baseline study identifies the habitats, the range and status of the main flora and fauna species groups that live in the project area and its potential radius impact area, the potential presence and status of protected areas or other important areas for biodiversity. Therefore, collecting biodiversity information is rather significant in the process. The data should be at a satisfactory level so as to compare the initial conditions and changes due to the project in an impact evaluation approach, to set future targets of the project and to estimate the changes as the project proceeds.</p> <p>The 286 km-long High Standard Train Project will start from Mersin, pass through Tarsus, Adana, Incirlik, Toprakkale, Bahçe, Nurdağı, Başpınar stations, and last at Mustafa Yavuz Station. 78 km of this 286 km line is between Mersin and Adana, 79 km between Adana and Toprakkale, 56 km between Toprakkale and Bahçe, 17 km between Bahçe and Nurdağı and the last 56 km between Nurdağı and Başpınar is planned to be. The route of the Project is passing through mostly agricultural areas and natural areas such as Nurdağı and Sof Mountain, which shows main vegetation characteristics of the route.</p> <p>The closest Natural Protected Areas are;</p> <ul style="list-style-type: none"> • Tarsus Dalyanı Natural Protected Area • Göksu Deltası Natural Protected Area • Taşocağı Cave • Tatarlı Köyü Natural Protected Area 	<p>specified for flora and fauna should be taken for all phases of the Project.</p>
Critical Habitats	<p>The habitats along project route were evaluated based on “EUNIS - European Nature Information System” and 6 different habitat types were defined.</p> <p>Among 6 habitats, Pinus brutia forests and maquis are widespread not only in Turkey but also in Mediterranean Phytogeographic Region.</p>	<p>As a result of the evaluation, it is concluded that all determined habitats are widespread in the area. Accordingly, no major impacts are foreseen considering the project route.</p>

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	<p>Another common habitat type along project route is "Oak Forests" which can be observed higher elevations of Sof Mountain and Nurdağı. The dominant species of this habitat type which are <i>Quercus cerris</i> and <i>Quercus infectoria</i> subsp. <i>veneris</i> are common species in Turkey. In addition to Turkey, these species also grow in Central and Southeast Europe, Cyprus, Palestine, Iraq, Iran and Transcaucasia. Besides, <i>Quercus brantii</i> is also found in Syria, Iraq and Iran, as well as <i>Quercus ithaburensis</i> subsp. <i>macrolepis</i> also grows in Central Anatolia, Aegean and Mediterranean regions, the Balkans and Southeastern Italy. In the light of these data, "Oak (<i>Quercus</i> sp.) Forests" and the species consisting these forests are not widespread in Turkey.</p> <p>"Anthropogenic habitats", which are frequently observed in the project area, occupy areas where Maquis habitats were dominant in the past. This habitat type has already lost its natural structure. On the other hand, the least common habitat type of the project site is "Riparian (wetland) areas". Except for Nurdağı and Sof Dağı, the "Riparian (wetlands) areas" can be observed within anthropogenic areas. These areas are not natural as a result of agricultural activities such as irrigation, fertilization, pesticides and the negative effects of wastes. The project route will pass through tunnels along Nurdağı and Sof Dağı. Therefore, "Riparian (wetland) areas" in these parts are will not be affected by the activity.</p> <p>The "Steppe habitat" in Sof Mountain and its close vicinity was formed by the destruction of the <i>Quercus brantii</i> habitat due to anthropogenic effects. Since it is secondary habitat, it contains many taxa belonging to the forest habitat. The secondary steppe habitats can be observed in wide area in Southeastern Anatolia region, Syria and Iraq.</p>	
Cultural Heritage		
Cultural Heritage	For the Project, cultural heritage studies were conducted by Archelologist Dr. İrfan Tuğcu as both desktop and field surveys.	This section shows the impacts of the construction and operation phases of the project on cultural heritage and archeology in the

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	<p>According to the EBRD PR8, the term cultural heritage defines it as a resource group that does not belong to people (that is not their own property), and that is accepted as a reflection of their developing values, beliefs, knowledge, and traditions from the past to the present. It covers all tangible (physical) and intangible cultural heritage recognized locally, regionally, or nationally or in the international community.</p> <p>Physical cultural heritage refers to mobile or immovable objects, sites, groups of buildings and associated cultural or sacred sites, and natural features and landscapes of archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Intangible cultural heritage refers to practices, representations, expressions, knowledge, and skills that communities, groups, and in some cases, individuals consider to be part of their cultural heritage and are passed down from generation to generation.</p> <p>It was determined whether there are cultural heritage and archeological findings in the region with the studies carried out on the routes followed for the High Standard Train Project covering Mersin-Adana-Osmaniye-Gaziantep provinces.</p> <p>The protected areas that are mentioned are not near the train project area. Cultural Heritage and Archaeological area near the project area are given below.</p> <p>Between Mersin – Adana</p> <ul style="list-style-type: none"> • There are no cultural heritage and natural heritage sites in and close to project area. • There is no sensitive area <p>Between Adana - Toprakkale</p> <ul style="list-style-type: none"> • It will pass just north of the Old Misis settlement at the 25th km of the Adana-Ceyhan line; The Misis Antique City of 	<p>region. Mersin - Gaziantep High Standard Train project includes four provinces and two cultural regions. It includes the provinces of Mersin, Adana and Osmaniye, which form the lowland Cilicia cultural region, and the provinces of Gaziantep in the Islahiye Cultural Region.</p> <p>Within the scope of the project, an examination was made in terms of immovable cultural assets (archaeological cultural heritage), based on the line passing through the borders of these four provinces. The study, conducted as a literature review, was completed in two stages as digital data scanning and printed publication review. Digital data evaluation: It was in the form of scanning the database of the Ministry of Culture and Tourism General Directorate of Cultural Heritage and Museums and the databases of the Provincial Directorate of Culture of four provinces on the project line. The print publication was searched on books, articles, journals, periodicals, and academic studies containing information about the region. In total, over 150 printed sources were scanned. During this study, 450 sites were examined, 76 of them were evaluated in detail considering their proximity to the project implementation site and their contribution to Anatolian archeology. Of these 76 sites, six regions have been identified as sensitive areas (These sensitive receptors may change during the project construction process and will be updated with any changes).</p> <p>Sensitive area detection has been tried to be done on the line of the project as a literature review (desk). This study was carried out by considering two criteria. The first of these is the registered areas existing in the project implementation line and the physical proximity of the line with these areas. It is the area with a zero point on the line known to be registered. This area, whose locations are marked in KMZ satellite images, is Sirkeli Höyük, which has a great importance</p>

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	<p>Yüreğir District of Adana Province passes through the 1st and 3rd degree archaeological site,</p> <ul style="list-style-type: none"> Sirkeli Mound and its Vicinity, located at the starting point of the Yukarı Ovalı within the borders of Çeyhan district at approximately 38th km of the Adana - Ceyhan line, Kamışlı/ Yarma Höyük, located at the 21st km of Ceyhan-Mustafabeyli line, It is the most sensitive point of the project, <p>Between Toprakkale - Bahçe</p> <ul style="list-style-type: none"> Neronias Ancient City located in the area between Düziçi Station and T4 tunnel entrance <p>Between Bahçe - Gaziantep</p> <ul style="list-style-type: none"> Islahiye (Sakçagözü) Plain is one of the sensitive points in the region 	<p>in the archaeological literature. Another of the other five sites is Kamışlı/Yarma Höyük, which was identified by scientific studies in the region. The line passes through the zero point in this placement. The other four areas are defined by their proximity to the registered archaeological data in their surroundings and the prediction that these archaeological data can be found within the spreading areas. It is anticipated that the risks and negativity in these areas will be zero or minimized by negotiating with the necessary institutions/organizations and the execution of the Chance Find Procedure.</p> <p>There is a The Misis Antique City around Adana-Toprakkale Railway line in Yüreğir Adana in the planned project area. The Misis Antique City is approximately 2 km away from the railway. The High Standard Train will pass just north of the Old Misis settlement at the 25th km of the Adana-Ceyhan line. During the application, the manufacturing process in this area will be a much more controlled and sensitive work.</p> <p>Also, around 38th km of Adana - Ceyhan line, within the borders of Ceyhan district, there are archaeological sites in Sirkeli Höyük and its surrounding at the starting point of the Yukarı Ova.</p> <p>Höyük at the western end of the Ceyhan River and the Hittite King II on the rock block next to the Ceyhan River. This area is extremely important for both Anatolian and World archeology because of the ski relief of Muwattali. The manufacturing process of the line that will pass through the southern skirt of the mound constitutes the second most sensitive time period in the project. The line passes through the zero point of the mound</p> <p>Kamışlı/ Yarma Mound, located at the 21st km of the Ceyhan-Mustafabeyli line, is the most sensitive point of the project. It is seen that the project line passes right in the middle of the mound. The</p>

ESIA Topic	Baseline Data	Impact Assessment (IA) and Mitigation Measures
		<p>area was visited and the presence of ceramics that could be dated to the Roman and later periods were observed. The line passes through the zero point of the mound. Suggested working methodology is given below;</p> <ul style="list-style-type: none"> • before to start excavation works, detailed site survey and if needed archeological excavation should be conducted by archeologist/s, • Results of detailed site survey and/or archeological excavation should be submitted to related Directorate of Cultural Heritage Preservation Regional Board, • Commision of Directorate of Cultural Heritage Preservation Regional Board will decide to how construction works will be held. Three options which will be implemented to contuninue construction works of the Project are given below, <ul style="list-style-type: none"> o Start rescue excavation and archelological finds should be moved by archelogists from the costruction site or, o Replace the railway route to out of the archelological site or, o No need any action and the construction works of the Project can continue under the supervision of an archaeologist. <p>The ancient city of Neronias, located in the district of Düziçi, has shown that there are densely settlements in the region and a spread towards the plain with the archaeological studies carried out recently. Roman cities, which were established in the lowland Kilikya since the 1st century BC, had wide spreading areas. Neronias-Eirenopolis / Düziçi city is also known to have a wide distribution area. Therefore, the area between Düziçi Station and T4 tunnel entrance has been</p>

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		<p>defined as another sensitive point during the project's implementation process in the field.</p> <p>Islahiye cultural region is one of the important points of Anatolian Archeology. Especially Zincirli Höyük, Coba (Sakçagözü) Höyük, Gedikli Karahöyük on the plain, especially in the early periods BC. The most important settlements of the Late Hittite Principalities in the 1st millennium years. The project line passes the Nurdağı tunnels from Osmaniye province Bahçe district and enters the Nurdağı district of Gaziantep. The line that starts with the T1 exit at the exit of Nurdağı District and continues along the Sakçagözü plain leaves the plain with the T2 entrance. The plain between T1 and T2 is another sensitive point of the project. This line of 19km has the potential to provide important data in terms of chance finds.</p> <p>The sixth and last sensitive point in the project line is Dülük Plain. In the plain located within the borders of Şehitkamil district, there is intense data especially regarding the Paleolithic Period. For this reason, the T7 tunnel exit and the Başpınar Organized Industrial Zone have been defined as a sensitive point.</p> <p>Mentioned archaeological sites are a moderately sensitive archaeological structure according to the ICOMOS scale. It is a cultural heritage property recognized by national authorities, where excavations are exhibited in museums, but not defined as a world heritage property.</p> <p>The project route and the works in the project preparation/operation phases are not expected to cause a visual and/or physical change/impact on the Mentioned archaeological sites. The project is carried out without damaging the rock tombs in the area and is monitored under the supervision of the Museum Directorate. In this context, the impact magnitude of the project is insignificant and is not expected to cause any changes.</p>

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		<p>The EIA studies have been examined, and most of cultural heritage asset are far away from Train Project. There are six sensitive area, and the railway route passes through the zero point of two of these sensitive areas. These two areas are Sirkeli Mound and Kamışlı Mound. If any movable or immovable cultural property is encountered during the project time, the works will be stopped and the nearest local administrative authority and/or the Museum Directorate will be informed.</p> <p>Sensitive areas were determined on the investigated railway route by evaluating the cultural heritage and archaeological findings on the project route and surrounding the project area. No possible impact is expected on these sensitive are of the project.</p> <p>As stated in the Archaeological Evaluation Report (EK), starting from the planning phase, the creation of the Chance Findings Procedure with the "Scientific Committee/Advisory" committee that will take charge in all and all areas of the production process will minimize the risks. The scientific committee/advisory board will make field visits daily, if necessary, but more weekly or monthly, during field studies and will share these visits with all relevant or requesting authorities and institutions by making a study report and They will take the responsibility of the scientific publications to be made during or at the end of the archaeological studies carried out within the scope of the project. The chance find procedure prepared is valid for all activity areas of the project in the field (railway line, connection roads, road opened for production purposes, quarries, tunnels, entrances, exits, etc.) or similar activities that develop or will develop as a main activity connection.</p> <p>According to the Chance Find Procedure, "Field Monitoring Experts" will be present at every point of the field applications. These will share their daily observations, which will take part in the construction</p>

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		<p>process of the project, with the units they are affiliated with. In a possible determination, they will ensure that production activities in that area are stopped, and they will take the area under control. They will ensure that production continues outside that specified area. Although the application process of the Chance Find Procedure is a production schedule, the existence of this procedure provides the opportunity for effective inspection, control and implementation throughout the project.</p> <p>The second unit of the Archaeological-Cultural Heritage unit are field monitoring experts. Field monitoring experts will be obliged to monitor the construction works daily from the moment the activity starts on the field. In this process, if any archaeological find is encountered, it will inform the upper units and the scientific committee that it will ensure that the construction activities in that area are stopped within the scope of the interviews and 2863 law. From this moment on, the Museum Directorate of the province where the production activity is located will be informed. They will prepare reports on daily work and share the reports they have prepared with the units they are affiliated with.</p> <p>The complete operation of the process in the field will ensure that the Chance Find Procedure is operated, and the production activities are interrupted in this process. They will be responsible for the surface research and/or archaeological excavations deemed necessary to be carried out within the scope of the project.</p> <p>The Museum Directorate and the Conservation Board of the province affiliated with the General Directorate of Cultural Heritage and Museums decide on what steps should be taken in the field. In the progress of the project, the Museum Directorate will be informed when a possible cultural heritage and archaeological find is encountered during the construction and operation phases.</p>

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		<p>Before starting the construction works, meetings will be held with the work area that covers the Chance Find Procedure and the General Directorate of Cultural Heritage and Museums of the Ministry of Culture and Tourism. With this meeting to be arranged, all kinds of archaeological studies to be carried out within the scope of Mersin-Gaziantep High Standard Train Project will be defined by the relevant institution. In addition, this contact to be made will pave the way for many bureaucratic processes between the company and the institution and will ensure that there are no possible disruptions in terms of schedule.</p> <p>The mitigation measures planned to be implemented within the scope of the project are given in the ESMMP prepared for the project.</p>
Socioeconomic		
Geography and Administrative Structure	According to this classification, there are 4 provinces. Mersin, Adana and Osmaniye provinces locate in within TR6 Mediterranean Region, Gaziantep Provinces locate in TRC Southeast Anatolia Region. In addition to this classification, below the NUTS levels there are two Local Administrative Unit (LAU). The first of these units (LAU-1) is districts and the second (LAU-2) is municipalities. According to this classification, there are 12 districts and 14 municipalities.	There is no mitigation measures to be needed due to the not available impacts on administrative structure.
Ethnicity, Religion and Language	According to the mukhtar interview, accurate information on the distribution of ethnic groups has not been obtained. However, it has been obtained that the majority consists of Turkish and Muslim groups.	<p>Impact Assessment:</p> <ul style="list-style-type: none"> EBRD PR 8: Cultural Heritage IFC PS 8: Cultural Heritage <p>There is no mitigation measures to be needed due to the not available impacts on ethnic and religious structure.</p>
Population and Demographics including Migration	In 2019, populations of Turkey, Mediterranean Region and Southeast Anatolia are 83,154,997, 10,627,530 and 8,975,618, respectively. The share of the populations of the Mediterranean Region (12.78%) and the Southeast Anatolia Region (10.79%) in the Turkish population is	<p>Impact Assessment:</p> <ul style="list-style-type: none"> EBRD PR 1: Assessment and Management of Environmental and Social Risks and Impacts

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	<p>similar. When the populations of the provinces on the route are sorted from large to small, Adana Province (2,237,940 people) ranks first, Gaziantep Province (2,069,364 people) is second, Mersin Province (1,840,425 people) is third and Osmaniye Province (538,759 people) comes in fourth place. Seyhan District is the most populated settlement (796,286 people), while Bahçe District has the lowest population on the route (22,155 people). The total population of Şehitkamil District (794,931) comes second in the district's population ranking, but only 3.54% of this district's population is on the route.</p> <p>According to the findings of household surveys, the average household size in the Project Social Impact Area (PSIA) is 3.7</p> <p>In the ten-year period of 2010-2019, the population change in the region was realized as an increase. This process of population change is parallel to the change in Turkey. The average annual population growth rate compared to the previous year is 0.79% in Adana, 1.24% in Mersin, 1.24% in Gaziantep and 1.31% in Osmaniye.</p>	<ul style="list-style-type: none"> • IFC PS 1: Social and Environmental Assessment and Management System <p>The goal is to make a social impact assessment on different aspects of the Project in a way, which allows a comprehensive analysis work to be done. The information produced by this study will focus on construction phase of the Project. The key objective of this study is; to assess and understand the impact of construction and operation of the High Standard Train Line and its infrastructure to both the regional economy and population.</p> <p>To evaluate the socio-economic impacts of a High Standard Train Project, it is necessary to consider the relations of different issues affecting each other together. It is an actual situation to say that the population will increase due to the arrival of workers to work in the region during the construction and operation phases of the High Standard Train Project. Still, this alone is not an adequate assessment. In short, it is necessary to consider the indirect impacts of the High Standard Train Line Project. On society, especially population growth, employment, and built environment.</p> <p>The direct impact of the project on the population and the indirect impact on the population's age and gender structure should be evaluated within the context of social +construction and operation. The most critical impact of the Project on demography is the increase in the region's population. The reason for the population growth is the workers who will work during the construction and operation phases.</p> <p>One of the significant and unavoidable impacts of macro projects is population growth. The local population growth also means population growth for the Mediterranean Region</p> <p>One of the most critical direct impacts of population growth caused by megaprojects on the current population structure is the youthening of the population. The population growth is due to workers who will work during the Project's construction and operation phases.</p> <p>The most critical consequence of expats' arrival in the area is interaction with the indigenous people. This interaction will be bilateral.</p> <p>The most important result of the interaction process due to workers migrating to the region is the social conflicts between foreign workers and the region's local people.</p>

ESIA Topic	Baseline Data	Impact Assessment (IA) and Mitigation Measures
		<p>Mitigations:</p> <p>The most important impact of the Project on the society is the increase in the population of the region due to expats. This increase will cause the young population to gain weight in the population structure. These effects of population growth can be monitored primarily in the region close to the project area. Population growth is overall definite, and its effects are positive for both local people and for the Mediterranean Region. The stated positive effects of population growth are more pronounced during the construction phase but will also apply to the operation phase. Neither a mitigation measure is required for the construction phase nor for the operation phase about population growth.</p> <p>Social conflicts, seen as a short-term impact, would be heavily related to the construction phase. The expected impact of social conflict will be short-term and will not be strong enough to change the social structure of the region. These social conflicts, which were raised during the construction phase, would have almost disappeared for the operation phase as a result of the cultural interaction. Induction trainings for new comers related with relationship/communication with locals, code of conduct, and the social dynamics of the country will be beneficial for mitigating the social conflicts.</p> <p>The most important effect of population growth in cultural life is the change in the daily life of the local people. These changes are more evident during the construction phase because the population growth was greater. As well as social conflicts, there will be cultural conflicts in this phase. The fact that employed workers during the construction phase are foreign nationals forms the basis of cultural conflicts. Differences in language, beliefs, and lifestyle can create cultural conflict. Local people are particularly affected by this issue.</p> <p>As of the initiation of the construction phase, measures can be taken by establishing an effective communication and training network for newcomers. It is important to provide training where newly arrived workers can learn the social and cultural structure of the region.</p>
Indigenous People	According to the mukhtar interview, accurate information on the distribution of ethnic groups has not been obtained. However, it has been obtained that the majority consists of Turkish and Muslim groups.	<p>Impact Assessment:</p> <ul style="list-style-type: none"> EBRD PR 7: Indigenous Peoples

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	As a result, it was not considered the Indigenous People in the context of Social Impact Assessment in ESIA Report.	<ul style="list-style-type: none"> • IFC PS 7: Indigenous Peoples <p>There is no mitigation measures to be needed.</p>
Gender Context	<p>The general structure of the population in terms of gender is more or less equally distributed, as 50.2% males and 49.8 % females, with no distorting figures.</p> <p>PSIA has a total of 679 inhabitants. Approximately, 54% of the total population of PSIA is male and 46% is female. Most of the population is in the 15-24 age group. The distribution of male and female by age groups is similar</p>	<p>Impact Assessment:</p> <ul style="list-style-type: none"> • EBRD PR 1: Assessment and Management of Environmental and Social Risks and Impacts • IFC PS 1: Social and Environmental Assessment and Management System <p>There is no mitigation measures to be needed due to the not available impacts on gender structure.</p>
Vulnerability	According to the mukhtar interview no precise or detailed information was available about the vulnerable groups.	<p>Impact Assessment:</p> <ul style="list-style-type: none"> • EBRD PR 1: Assessment and Management of Environmental and Social Risks and Impacts • IFC PS 1: Social and Environmental Assessment and Management System <p>The impact of the Project on the construction and operation period was examined on the low-income people and disabled people, who are minorities in the local population. How the expected impacts for the construction and operation phase will affect these sensitive groups has been studied in detail.</p> <p>Mitigations:</p> <p>Vulnerable groups will be a part of the stakeholder identification plan. Vulnerable groups/people in the Project area will be identified through the socio-economic study conducted as part of the ESIA studies. The Project will identify and consult specifically with potentially vulnerable groups such as women headed households, women, poor, disabled and elderly people. Special meetings for vulnerable groups; e.g. women meetings will be held on village level to make sure that their concerns are addressed as well. It is important to note that a special effort will be made to identify who</p>

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		are the most vulnerable among the potentially affected and are special engagement efforts necessary.
Economy	<p>The unemployment rate in Adana-Mersin Sub-region (11.9%) is lower than in Turkey (13.7%). In the sub-regions (TR63 Sub-region and TRC1 Sub-region) where Osmaniye and Gaziantep provinces are located respectively, these rates are (18.1% and 15.2%) significantly higher than Turkey. This situation is related to the low number of employment and employment participation rates in the relevant regions.</p> <p>The economic activities are industry, tourism and agriculture in TR62 Adana-Mersin Sub-region. When the spatial distribution of economic activities in the region is examined.</p> <p>Agriculture, industry and tourism in Adana-Tarsus-Mersin metropolitan area;</p> <p>Agriculture and industry in Adana's Kozan and Ceyhan districts; Agriculture and tourism are concentrated in Erdemli, Silifke and Anamur districts of Mersin</p> <p>The northern and western parts of the region show relatively underdeveloped features, and mostly agricultural and services sector activities stand out. Apart from the metropolitan centre of the region consisting of Adana and Mersin centres and Tarsus district, the two districts that have sub-centers in the region are Ceyhan and Silifke.</p> <p>Osmaniye is suitable for agricultural production, animal husbandry and forestry with its geographical location and natural structure, but economic mobility is observed in many industrial sectors in the province with the influence of expanding industries in the surrounding provinces and the expansion of incentive measures in the recent period.</p> <p>As Osmaniye province became one of the priority provinces in development, investments were made in various sectors with the incentives given. At the beginning of these investments is the iron and steel sector.</p> <p>According to the "socio-economic development ranking survey of Provinces and Regions" announced by the State Planning Organization in May 2011, the Gaziantep Province ranks 30. among 81 provinces</p>	<p>Impact Assessment:</p> <ul style="list-style-type: none"> EBRD PR 1: Assessment and Management of Environmental and Social Risks and Impacts EBRD PR 2: Labor and Working Conditions IFC PS 1: Social and Environmental Assessment and Management System IFC PS 2: Labor and Working Conditions <p>The most significant local impact of the macro projects is on jobs and incomes. There are findings that facilities generate substantial economic and employment benefits to the surrounding communities and are economic mainstays.</p> <p>Starting the construction of the Project, needed employment will raise and job seekers may come to the project area. Jobseekers may migrate to the Region from various places. It is possible to say that significance of the impact as a result of an influx of construction workers is largely dependent on the number of people. When the construction activities of the project, will be a significant impact on the regional economy especially in Mediterranean Region.</p> <p>Mitigations:</p> <p>The most important effect of the Project is the economic benefit. This economic benefit can be felt both locally, in the region and across the country. There is a significant economic benefit, especially in the local area. The significant reason for the economic growth of the macro projects is employment opportunities. This employment affects jobseekers in the local area. Thus, unemployment in the local area is reduced. Direct employment refers to personnel employed during the construction and operation phase of the Project. Indirect employment covers the services that will be created to meet the demands of these personnel. The only negative point here will be the competition between the unemployed</p>

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	<p>Gaziantep has been under the influence of many surrounding provinces in economic terms, and has made serious investments in tourism in recent years. It is one of the provinces leading the Turkish economy with its production and export volume</p> <p>Of the total population in PSIA, 53% (362 people) have no job or source of income. Of the remaining 317 people, 75% are active. 39.4% of active workers work in the private sector. 75% of those who have an income, even though they are not actively working, are retired</p>	<p>in the local area and the workers from outside. The prevention of this economic conflict depends on the good determination of the number of local employments.</p>
Education and Literacy	<p>Primary school graduates (28.9%) have the highest rate in the grouping made according to the last graduated education level</p>	<p>During both operation and construction phases arrival of the well-trained staff to the region is considered as a positive impact on the increase in the level of education. It is quite possible that this effect will occur.</p> <p>The low-educated labor force does not have a changing effect on the level of education in the region.</p> <p>Conversely, the labor force needed during the operation period is mostly well-trained, qualified personnel.</p> <p>The qualified labor force will increase the number of people who have trained university and post-university level education in the distribution of the population according to the level of education. This situation could be observed more at the local level.</p> <p>An increase impact in the level of education could be seen due to the migration of expats. However, the construction phase has no significant impact on education levels. Conversely, the arrival of qualified personnel needed during the operation phase may lead to an increase in the level of education. In both phases, the current education system will be forced to evolve, as the demands of workers who come to the region with their families on educational institutions will be intense.</p>
Livelihoods	<p>For the Project, land acquisition process is implemented by Ministry of Transportation and Infrastructure. It is declared by the Rönesans that, according to contract between Rönesans and the Ministry, The Ministry is responsible with the land acquisition process and any other permits</p>	N/A

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	which are related with land uses. As a result, Rönesans will not take any action for these issues.	
Labour and Working Conditions	<p>Labour and Working Conditions , It is the planning studies carried out in a systematic manner in order to protect from conditions that may harm human health and take precautions during the performance of business activities in the workplace. According to the mixed commission of WHO and International Labor Organization (ILO); "Occupational health is to protect and develop the physical, mental and social well-being of workers in all professions at the highest level; prevent workers from losing their health due to working conditions; protecting workers from risks arising from unhealthy factors in the workplace; It aims to ensure that the worker works in a job suitable for his physical and psychological equipment and, in short, to adapt the work to the human and to adapt each person to his job ".</p> <p>Labour and Working Conditions is very wide and diverse in scope. In addition, it has some basic principles for its implementation and planning. These principles;</p> <ul style="list-style-type: none"> • The right to work in a health and safety job is the right of all employees. • Creating a policy at a level that all interested parties can implement, • Creating a management system that can be developed and examined periodically, • Occupational Health and safety policies and programs should be focused on prevention and protection, • Created policies and programming should cover all workers. <p>In 2016, the International Labor Organization (ILO) published Turkey's Occupational Health and safety profile. According to this publication, although work accidents in Turkey have fallen steadily since the last two</p>	<p>Construction Phase</p> <p>Workers' rights including occupational health and safety need to be considered to avoid accidents and injuries, loss of man-hours, labour abuses and to ensure fair treatment, remuneration and working and living conditions. These issues should be considered not only for those who are directly employed by the Project, but also their sub-contractors and those within the supply chain. Rönesans engages with fair labour and working conditions in its policies and procedures.</p> <p>Worker Health and Safety</p> <p>Bearing in mind the nature of the activities being undertaken during construction, worker health and safety is a key risk area with the potential for accidents that may result in injuries and potentially fatalities as well as lost man- hours. Many national companies may currently not meet international safety requirements and standards. Employees working informally and those with limited or without awareness of their rights (for example, migrant workers, or those newly entering the labour market) are likely to be most at risk.</p> <p>Worker Rights</p> <p>The labour laws in Turkey are in line with international labour laws and Turkey has ratified the core International Labour Organisation (ILO) conventions:</p> <ul style="list-style-type: none"> • Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87); • Right to Organise and Collective Bargaining Convention, 1949 (No. 98) ;

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	<p>decades, with the change of the notification system in 2013, work accidents figures have been almost three times higher than the previous year.</p> <p>In Turkey, which was enacted on 22 April 2005, No. 155 Occupational Safety and health and the working environment in relation to the contract with occupational health and safety risk identification and assessment, and Prevention and protection requirements, both national and occupational health and safety system to ensure compliance at international standards and guidelines that are reengineered.</p> <p>Mersin-Gaziantep (Başpınar) High Standard Railway Line is a 286 km line and is divided into certain segments.</p> <p>In this 286 km line, all construction, electrification and signalization operations on the Mersin-Ceyhan route, other operations except construction between Ceyhan and Toprakkale, construction, electrification, and signalization operations except tunnel construction between Toprakkale and Bahçe, only signaling operations between Nurdağı and Bahçe, the first 41 km between Nurdağı and Başpınar, except construction operations for the remaining 15 km will be carried out. As most of the construction activities within the scope of the project, Labour and Working Conditions measures must be taken and implemented in all of these stages.</p> <p>There are both national legislation and international standards and guidelines to be based as guidelines for Labour and Working Conditions practices and management. Labour and Working Conditions applications will be implemented in accordance with both national legislation and international standards and guidelines.</p>	<ul style="list-style-type: none"> Forced Labour Convention, 1930 (No. 29); Abolition of Forced Labour Convention, 1957 (No. 105); Minimum Age Convention, 1973 (No. 138); Worst Forms of Child Labour Convention, 1999 (No. 182); Equal Remuneration Convention, 1951 (No. 100) ; and Discrimination (Employment and Occupation) Convention, 1958 (No. 111). <p>Discrimination is likely to occur as women are generally not employed in construction activities and may not be selected by contractors. However, Rönesans Human Resources Policies and Procedures seeks to apply gender diversity principles in all the phases of recruitment, selection, training, development and promotion of all employees</p> <p>Employment and Procurement</p> <p>The Project shall develop a Human Resources Policy, Labour and Employment Plan as well as specific recruitment policies and procedures, specifically:</p> <ul style="list-style-type: none"> The Project should develop a fair and transparent employment and procurement policy and processes to avoid any potential for nepotism or favouritism. The policy should be shared with the local community members and leadership. Rönesans will notify identified representatives of the local agencies of the specific jobs and the skills required for the Project, prior to the commencement of construction phase. This will give the local population time to prepare and apply for the available job opportunities on time. This is mainly

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		<p>applicable to unskilled and semi-skilled workers who will be locally sourced.</p> <ul style="list-style-type: none"> • There will be no requirement for applicants to make payments for applying for, or securing, employment on the proposed Project. • The Project will ensure that recruitment procedures are transparent and monitored to ensure that those recruited present their actual experience, geographical location, health status, and age and that requirements for local employment are being met. • The Project will develop and implement a program of up-skilling, training and development for workers to assist them in accessing opportunities associated with the Project and in finding work following completion of their contracts. • The Project will provide training on health and safety and quality standards required by the Project for provision of goods and services to the Project to ensure that local businesses have the opportunity to benefit. • The Project will develop a Workers Grievance Mechanism. <p>Management System</p> <p>The Project should develop a Human Resources Policy, Labour and Employment Plan. These requirements should also be passed on to any sub-contractors. Key issues with the Human Resource (HR) management will include, but not be limited to the following:</p> <ul style="list-style-type: none"> • Provision of clear and understandable information regarding rights under national labour and employment law, and any

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		<p>applicable collective agreements, including those related to hours of work, wages, overtime, compensation, etc.</p> <ul style="list-style-type: none"> • Provision of reasonable working conditions and terms of employment. • Provision of adequate accommodation (where relevant). • Provision of employment, compensation/remuneration and working conditions, including working hours, based on equal opportunity and fair treatment, avoiding discrimination on any aspects. • Provision of adequate welfare facilities on site. • Implementation of a grievance mechanism for the Project workers. • Adoption and implementation of a sexual harassment policy. • Adoption of open attitude towards freedom of association. <p>The Project will develop a H&S programme which will include risk assessments (such as working at heights, confined space machine guarding), work permit systems and a H&S management system, in line with industry best practice, including worker performance safety tracking (safety observations) to assure worker safety. All workers will receive induction and continuous training regarding this system (See Implementation of Social Monitoring in ESMMP)</p> <p>Sub-Contractor and Supplier Management</p> <ul style="list-style-type: none"> • Subcontractor and Supplier Contracts should make explicit reference to the need to abide by Turkish law, international standards (in particular IFC PS 2) and the ratified ILO conventions and the Project policies relating to health and safety, labour and welfare standards.

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		<ul style="list-style-type: none"> As part of the subcontractor and supplier selection process, Rönesans should take into consideration performance with regard to worker management, worker rights, health and safety as outlined in Turkish law and international standards. Rönesans should provide support to sub-contractors and suppliers to ensure that labour and working conditions are in line with Turkish legislation and IFC PS 2 through gap analysis, awareness raising and information provision, as necessary. Regular checks / audits by Rönesans should be undertaken to ensure the relevant labour laws are adhered to at all times. <p>Workers' Rights</p> <ul style="list-style-type: none"> Rönesans should ensure no employee or job applicant is discriminated against on the basis of his or her gender, marital status, nationality, ethnicity, age, religion or sexual orientation. All workers (including those of subcontractors) should, as part of their induction, receive training on worker rights in line with Turkish legislation to ensure that positive benefits around understanding labour rights are enhanced. This process should be formalised within the Code of Conduct that would be provided by Rönesans (as in ESMMP). All workers (including those of subcontractors and suppliers) should have contracts, which clearly state the terms and conditions of their employment and their legal rights. These contracts should be aligned with Turkish labour law, the ILO core conventions and the requirements of IFC PS2. Contracts should be verbally explained to all workers where this is necessary to ensure that workers understand their

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		<p>rights. Contracts should be in place prior to workers leaving their home location if applicable.</p> <ul style="list-style-type: none"> The Project should put in place a worker grievance mechanism that should be accessible to all workers, whether permanent or temporary, directly or indirectly employed. The worker grievance mechanism should be open to Rönesans and the subcontractor workforce in the event that their grievance is not adequately resolved by their direct employer. Rönesans would then have the authority to act to resolve this grievance. All workers should have access to training on communicable diseases and STDs and community interactions in general. Accommodation should be provided to workers in accordance with international good practice on workers' accommodation, including IFC standards to prevent transmission of diseases associated with poor living conditions. <p>Rönesans should undertake surveillance and assurance that no children or forced labour is employed directly, and to the extent possible by third parties related to the Project and primary suppliers where such risk may exist.</p>
Community Health, Safety and Security	<p>Impacts on the health and safety of the community may arise during construction as a result of noise, vibration, dust and other emissions from earth moving activities, and operation of equipment and vehicles which have already been addressed in different chapters of the ESIA Section 4.7 "Impacts on Noise and Vibration from Construction Activities" and Section 4.3 "Impacts on Air Quality Related to Construction Equipment Emissions".</p> <p>Other risks involving the public associated with construction could include physical accidents on sites, impacts from construction</p>	<p>Rönesans has a "Manual for Health Safety & Environment" management plan, which has been created within the scope of Occupational Health and Safety. In the activities carried out in line with this plan, responsible people are appointed, and management is ensured by taking necessary OHS measures:</p> <ul style="list-style-type: none"> Adopting best transport safety practices across all aspects of the project and the adoption of a Traffic Safety Management Plan, including for sub-contractors, to

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	<p>traffic, and accidents involving the handling of hazardous materials during construction. Children and youths are amongst those vulnerable to the physical hazards associated with construction activities, including falls from unguarded areas at height, and construction traffic, especially in the event of unauthorised entry.</p> <p>The EPC Contractor's ongoing stakeholder engagement activities in accordance with Project "Stakeholder Engagement Plan" will serve to inform the local communities regarding potential health and safety issues during the construction period. Stakeholder engagement activities will include ongoing community meetings with the vulnerable and marginalized groups such as children and young persons (including visits to schools) and press releases and local postings to inform the public regarding the relevant hazards associated with construction activities that will be relevant to their particular locations. These stakeholder engagement requirements are detailed in the project SEP, provided in Appendix 6.</p> <p>IFC PS 4 recognizes that project activities, equipment and infrastructure can increase community exposure to risks and impacts. The objective of community health and safety measures is to anticipate and avoid health impacts during the project lifetime and to ensure that the safety of personnel and property is carried out in line with the human rights and in a way that avoid or at least minimize risks to the vulnerable communities. Community Health and Safety impacts during construction, rehabilitation, operation, and maintenance of railways are common for large construction projects, which are also discussed in the IFC General EHS Guidelines. These impacts include dust and noise emissions, vibration from construction vehicles and machinery, hazardous substance formation, transport and storage and communicable diseases associated with the biological impacts associated with the temporary labor in construction. General EHS Guidelines provide community health</p>	<p>prevent, minimize and control risks and adverse impacts from traffic accidents. Measures will include:</p> <ul style="list-style-type: none"> o Obligation that all drivers are appropriately licensed; o Obligation that all vehicles are safe and have current inspection certificates; o The rush hours of the access roads will be considered and usage of the access roads will be avoided during rush hours (especially during hours that children are travelling to and from school). o Minimizing pedestrian interactions with the construction vehicles through fencing, flagmen, warning signs, etc.; o Improving local traffic signage by collaboration with the responsible local authorities and communities; o Coordinating with emergency responders to ensure that appropriate first aid is provided in the event of accidents; <p>Developing and implementing a series of security measures including the installation of sufficient and adequate site boundary and access controls near settlements to prevent unauthorized entry to construction sites, especially by children.</p> <p>Hazardous Material Safety during Construction</p> <p>Hazardous materials, such as fuels, oil, paints, and solvents are likely to be used during construction. The storage, handling, transport and disposal of all hazardous materials should comply with Project requirements, and with adoption of good construction site practices</p>

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	<p>and safety issues specific to earthwork extraction projects including land instability, water, explosion risks and decommissioning. Additional potential risks to community health and safety are uncontrolled access to construction sites, exposure to waterborne diseases associated with the small impoundment formations and exposure to increased traffic of materials transport vehicles.</p> <p>However, no relevant Turkish national legislation has been published specific to community health and safety and involving the mitigation measures.</p> <ul style="list-style-type: none"> • Health and safety issues concerning the community include those subtopics; • General rail operational safety, • Transport of dangerous/hazardous goods, • Level crossings safety, • Pedestrian safety, <p>Occupational health and safety monitoring.</p>	<p>(e.g., appropriate locked storage and sign-posting of hazardous materials).</p> <p>Access control/restrictions to the construction site should be provided, and thus the risks to the community through exposure to any such hazardous materials during construction of the railway, are expected to be very limited.</p> <p>Details with respect to the anticipated quantities of hazardous materials to be used on site and the locations of where such materials are stored should be elaborated in the detailed site layout and management plans, to be produced by the EPC Contractor.</p> <p>The large majority of construction waste and spoil will be inert and suitable for disposal in normal disposal areas. Only a limited amount of waste (e.g. oily waste, containers with hazardous residues etc.) is expected to be disposed of as hazardous waste. Again, adoption of good construction waste management practices (e.g., placement in appropriate containers and sign-posted temporary hazardous waste storage sites, with restricted access, regular removal of waste) will ensure that risks to the public are very low.</p> <p>Security</p> <p>Security personnel will be employed at the site to protect assets and prevent community members entering restricted areas. In the event of protests, trespass or other actions by community members or other stakeholders there is the potential for unlawful or abusive interaction between security guards and community members especially if site security are not adequately trained.</p> <p>Community safety and security risks have the potential to impact Project workforce and communities on the direct footprint of the</p>

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		<p>proposed project. In order to minimise negative impacts from security, the following mitigation measures should be applied:</p> <ul style="list-style-type: none"> • A Grievance Mechanism should be developed, whereby affected people can raise issues and concerns associated with vehicle movements, driver behaviors and report accidents or damage to property they feel are caused by Project vehicles. Raise awareness to communities regarding the Grievance Mechanism to deal with community concerns and issues in a timely manner to avoid issues escalating. This will include the use of the Community Liaison Officers (CLOs) who will be present around the Project Site pre and during construction. • The Project should develop a Traffic Safety Management Plan to prevent, minimize and control risks and adverse impacts from traffic accidents. • Project security should comply with Turkish laws and regulations as well as the requirements of the Voluntary Principles for Security and Human Rights. The security should include, among other things, selection or personnel based on a careful background screening, training with regards to human rights requirements, and monitoring of performance. • The Project should implement a Community Health and Safety Management Plan and a Security Management Plan for construction phase containing measures to protect the Project facilities and personnel against potential violent protest or social unrest and to train security personnel in safeguarding of community human rights. • High-risk or value elements of construction sites should be fenced to minimise the risk of trespass and robbery. In

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		<p>addition, clear and visible signage should be put in place where appropriate to advise community members of the risk of site trespass.</p> <ul style="list-style-type: none"> • Sensitise local community members prior to the commencement of the construction phase so that they are aware of presence and role of security guards, the risk of site trespass and how to interact with the Project in the event of any concerns or issues. • The Project should consult with local leaders such as mukhtars. As part of the SEP, the consultations should be aimed at finding ways of ensuring site trespass and robbery are minimised either through punitive or rehabilitative measures (See Implementation of Social Monitoring in ESMMP) <p>Rönesans, from the above-mentioned national legislation, Occupational Health and Safety Law, Labor Law, Regulation on Duties, Authorities, Responsibilities and Training of Occupational Safety Specialists, Communique on Workplace Hazard Classes Regarding Occupational Health and Safety, EBRD (2019), IFC Standards and Guidelines and EU Directives will properly carry out business activities.</p> <p><u>General Rail Operational Safety</u></p> <p>General rail operational safety is a concept that potentially affects both crew members and passengers due to such problems such as train collisions with other trains or road vehicles in transition points as well as operational problems such as power cuts and loss of signals. Following mitigation measures will be implemented for those risks in the scope of the Project;</p>

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		<ul style="list-style-type: none"> Implementation of rail operational safety processes aims reducing the collisions such as positive train control (PTC) system. If a full PTC system is not applicable, installation of automatic rail switches is required. They are distinct from the manual switches due to the interchangeable replacements of the switches between main track and siding to compensate loss of signals. This information should be announced to all passengers and crew, Implementation of hazardous material security plan and relevant trainings, prohibition of unauthorized access as well as establishment procedures for storage and transport of hazardous materials are required. <p><u>Level Crossings Safety</u></p> <p>Level crossings at grade road and rail junctions represent high-risk accident locations for railways. On railways with congestion, a flagman (person who is in charge of protecting all personnel employed in the railway operation) can be charged to prevent traffic at the crossing and clear the tracks before the train comes. Automatic warning lights, belts, and beams or automatically closing gates are commonly used for this objective. The gates also function as barriers against intrusion of any highway or road traffic onto the railway. Crossings with no gate present inevitable risks. Following mitigation measures will be implemented for those risks in the scope of the Project;</p> <ul style="list-style-type: none"> Use of bridges or tunnels in place of level crossings. Level crossings may be beneficial as it may improve train performance. Because the limitation of train speed may not be an effective measure to reduce accidents.

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		<ul style="list-style-type: none"> Installation of automatic gates to all level crossings and proper and regular maintenance should be provided for safer operation. <p><u>Pedestrian Safety</u></p> <p>Trespassers on rail lines and facilities can expose risks caused by moving trains, electrical equipment and hazardous materials, substances. Following mitigation measures will be implemented for those risks in the scope of the Project;</p> <ul style="list-style-type: none"> Installation of a clear and attentive warning signalization system at crossing points of the track such as stations and level crossings, Installation of fences or barriers at station ends to prevent access to the track without any permission, Raising public awareness especially to elderly people and children, Designing stations in a way that the permitted route is safe and clearly indicated, Use of closed-circuit television to monitor the stations and other areas where trespassing occurs often and/or voice alarms to prevent trespassers to access the track. <p><u>Accident and Fatality Rates</u></p> <p>In all railway projects, number of accidents should be reduced to zero or at least minimized among the project personnel and contractors/subcontractors. It should be paid particular attention to the reduction of accident and fatality rates as it may result in a waste of time in workplace, disability and even death. Facility rates should</p>

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		<p>be graded in accordance with the performance of facilities in terms of their performance against accident and fatality rates in this sector in consultation with legal bodies (e.g., US Bureau of Labor Statistics and UK Health and Safety Executive).</p> <p><u>Occupational Health and Safety Monitoring</u></p> <p>Monitoring of the OHS should be carried out by accredited professionals. Facilities also should keep records and keep track of occupational accidents and/or occupational-vocational diseases that possibly occur in the workplace arising from physical, chemical, or biological hazards. For detailed information upon this, IFC General EHS Guidelines can be used as a guide.</p> <p>Across the world, train accidents have a decreasing trend as well as the death rates originating from the trains. The lowest statistical values belong to European Union and Australia.</p> <p>Apart from the IFC Requirements, all construction areas and access routes should be investigated, and restrictive measures should be applied prior to construction works. Speed limits should be implemented and checked as well as periodic vehicle maintenance. Investigation of grievances from local inhabitants and stakeholders due to the construction activities are also incredibly important. For biochemical risks mitigation, air conditioning and ventilation should be supplied, and periodic medical checks of staff should be implemented as well as carrying out health awareness raisings on emergency preparedness and response in railway tracks.</p>
<p>Land Ownership and Tenure System.</p> <p>Land use / Forest</p>	<p>Type of a land use depend on land what it is used for. Forestry and farming can be given as example for the land use in rural areas while housing and industry are land use example in urban areas which consist of town and cities. The main zones which represent the function of land</p>	<p>There will be no soil pollution around the Project during the construction and operation phases caused by the Project. Materials that will cause pollution will not be discharged to the soil. If necessary, the Emergency Action Plan prepared by Rönesans will be</p>

ESIA Topic	Baseline Data	Impact Assessment (IA) and Mitigation Measures
	<p>use are Central Business District, Inner City, Suburbs and Rural Urban Fringe.</p> <p>Studies on earth's surface is described as topography which includes changes on the surface of mountains and valleys, features of rivers and roads and surface of other planets, the moon, asteroids and meteors. Topography is used for determination of the relation between points with recording the data.</p> <p>Soil which covers the land is the surface material. Organic and inorganic matters form the soil. Existence of soil is significant for humanity because of the food chain and so on.</p> <p>In the scope of Mersin-Gaziantep Train Project, expropriation throughout the line is performed and ownership of the line is belonging to TCDD.</p> <p>High Standard Train Project pass through the land on Mersin, Adana, Osmaniye and Gaziantep Province. Length of the railway in each Province borders are 76 m km in Mersin, 79 km in Adana, 58 km in Osmaniye and 56 km in Gaziantep. The exact footprint of the Project could not be obtained from the activity owner. When the center of Railway Line is taken as a reference, 30 m buffer (15 m to the right and 15 m to the left) in the Mersin-Gaziantep Railway Line and 70 m (35 m to the right and 35 m to the left) buffer for the airport connection has been determined.</p> <p>Calculations have been made with this acceptance by using CORINE Land Cover.</p> <p>Major land use depending on the Project will be on 669.50 ha of permanently irrigated land, 252.13 ha of industrial/ commercial, 150.26 ha of complex cultivation patterns and 114.65 ha of discontinuous urban fabric. The land use type in the Project footprint will change.</p> <p>Studies about main soil types in the project area is according to the database of the General Directorate of Rural Services.</p>	<p>implemented. Topsoil and Subsoil Management Procedures of Rönesans will be implemented during the construction period.</p> <p>Mitigation measures to be taken for the topsoil;</p> <ul style="list-style-type: none"> • Site planning should be prepared by related experts, • Physical characteristics of the soil will be investigated, • Proper excavation method to relocate the soil will be determined, • Correct depth for stripping topsoil and subsoil will be determined, • Topsoil will be stripped in the driest condition possible, • Movement of trucks or dumpers will be limited with designated temporary routes, • Soil storage periods will be kept as short as possible, • Salt crusting signs on the surface will be monitored. Material transfer should not be accepted if there is evidence of salt deposits unless the soil has been tested for salinity, • Topsoil will be recovered using appropriate equipment. Depending on compaction and recovery rates, deep ripping may be required to maximize topsoil recovery with care taken not to mix topsoil with sodic subsoil, • The vegetative topsoil to be stripped will be stored in the designated plant soil stock areas for use in rehabilitation and landscaping in the later stages of the project, • The slope of vegetative topsoil storage area will not be more than 5%, • The requisite measures will be taken to prevent any loss in the vegetative topsoil during storage and the soil quality will be maintained,

ESIA Topic	Baseline Data	Impact Assessment (IA) and Mitigation Measures
		<ul style="list-style-type: none"> With the intention to prevent the precipitation and wind erosion, the surface of the vegetative topsoil will be cover with fast growing plants and the perimeter of the storage area will be enclosed with ditch, In the event of a spillage on land, contaminated soil will be cleaned in accordance with the provisions of the Regulation on Control of Soil Contamination and Point Source Contaminated Lands (Official Gazette dated 08.06.2010 and numbered 27605) or will be disposed of by licensed companies, Within scope of the project, provisions of the Law on Soil Protection and Land Use No. 5403 and Regulation on Control of Soil Contamination and Point Source Contaminated Lands will be adhered to, The samplings and analyses will be performed by laboratories accredited by the Ministry of Environment and Urbanization and the analyses reports will be kept on-site and upon request and/or when required, they will be submitted to the relevant authorities, Upon the termination of the construction activities, the vegetable topsoil stripped and stored separately will be spread on the landscaping areas in accordance with the "Landscaping Repair Plan" for the purposes of arrangement the project site, and the provisions of the plan will be respected accordingly. Landscape repair plan will be applied, <p>Mitigation measures to be taken for the erosion;</p> <ul style="list-style-type: none"> In order to interrupt the surface flow and prevent the bottom from being carved, material deposits will be released. When the slopes are to be cut, mini sluices will be formed, and discharge of the stream will be ensured along the slope.

ESIA Topic	Baseline Data	Impact Assessment (IA) and Mitigation Measures
		<ul style="list-style-type: none"> Continuous monitoring will be carried out to prevent problems such as collapses, soil losses Afforestation and planting will be done. Plant species that can be planted during the afforestation and landscaping should be used from the trees in the vegetation of the region. Landscape repair plan will be applied. Drainage channels and settlement structures will be built before the land preparation and construction of the Project. At the end of the excavation work, slopes will be strengthened. For the prevention of soil loss, embankments will be built around the excavation material which will be stored in the designated storage areas After the stripping and excavation of sites, all degraded part of the Project area will be rehabilitated. Geotextile filters, drainage channels and settlement structures will be built before the land preparation and construction of the Project for the reduction of sediment transportation to the outside from the project area. In the case of extreme climate conditions occurs, land preparation and construction works will be changed to decrease the erosion risk. <p>Mitigation measures to be taken for the forest lands;</p> <ul style="list-style-type: none"> Roads to be built at the construction phase of the project will be built by excavators in a way not causing any landslide from slopes and any harm to the environment, and materials to be extracted from the road building will be moved to authorized areas without causing any harm to the forest, and, furthermore, forest roads to be used will be repaired and maintained.

ESIA Topic	Baseline Data	Impact Assessment (IA) and Mitigation Measures
		<ul style="list-style-type: none"> All facilities and units to be built will be placed in line with provisions of the Regulation on Protection of Buildings against Fire (the Official Gazette dated 19.12.2007 and numbered 26735) A fire team will be established according to the Emergency Response Plan to be prepared and information will be provided in writing and verbally about how all personnel will act in case of emergency, and drills will be conducted at certain intervals. Forest fire extinguishing tools and equipment will be kept available for use, employees will be trained on how to use the tools and equipment to be used in this regard, and such tools and equipment will always be well-kept. In this respect, the nearest Provincial Directorate of Agriculture and Forest will be contacted and forest fires that may start both in the facility and around it will be immediately notified to the Provincial Directorate of Agriculture and Forest. <p>The mitigation measures planned to be implemented within the scope of the project are given in the ESMP prepared for the project.</p>
Traffic and Transportation	<p>The High Standard Train Project planned to be built on the Mersin-Gaziantep (Başpınar) route will be carried out by rehabilitating the existing railway in some sections and building additional lines in some places. The current railway proceeds in parallel with the highway from Mersin to Gaziantep, which also separates other settlements located between these two provinces. The High Standard Railway Route is surrounded by both the highway(O-51/52) and the state road (D400/825).</p>	<p>Although a negative impact on traffic and transport is not expected in the High Standard Train Project, the prevention and reduction methods given below are applied when a possible risk is not encountered and/or encountered;</p> <ul style="list-style-type: none"> All activities related to traffic and transportation within the scope of the High Standard Train Project will be carried out in accordance with the provisions of the Road Traffic Law.

ESIA Topic	Baseline Data	Impact Assessment (IA) and Mitigation Measures
	<p>With the High Standard Railway Route that passes through Mersin, Adana, Osmaniye and Gaziantep provincial borders and covers a total of 286 km, it will ensure that the transportation to the mentioned 4 provinces and districts is in a shorter time than the highway. High Standard Railway passes through 4 provinces and 14 districts. It will also reduce the load on road transport, as it will reduce the number of vehicles passing through the highway and state road.</p> <p>On the route from Mersin to Gaziantep Başıpınar, Mersin-Adana D400 Road, Adana-Erdemli Highway (O-51), Adana Ring Road (O-51), Adana-Şanlıurfa Highway (O-52), Adana-Osmaniye D400 the road runs in parallel with the Osmaniye-Gaziantep D400 Road, the Gaziantep-Antakya D825 Road, and intersects in some areas with the Adana-Şanlıurfa Highway (O-52), the Adana-Osmaniye D400 Road, the Osmaniye-Gaziantep D400 Road, and the Gaziantep-Antakya D825 roads. In addition, within the scope of this project, a single connection road will be built under Rönesans responsibility, and this road is the 9.5 km double-line connection road to Çukurova Airport.</p> <p><u>Mersin-Tarsus</u></p> <p>According to the 2019 State Roads Load Map published by the General Directorate of Highways, located between Mersin and Tarsus, the number of vehicles passing through the state road is estimated by counting 56,521 vehicles per day and a total of 25,697 vehicles per day with continuous vehicle counting and classification station. According to the 2019 Highway Volume Map published by the General Directorate of Highways, a total of 82,218 vehicles pass through this road daily.</p> <p><u>Tarsus-Adana</u></p> <p>According to the 2019 State Roads Volume Map published by the General Directorate of Highways, the number of vehicles passing</p>	<ul style="list-style-type: none"> Activities related to the transport of dangerous goods shall comply with the provisions of the regulation on the transport of dangerous goods by road No. 15742 of 22 October 1976. In the current situation, additional connecting roads will not be opened except for the Çukurova airport connection, and in cases where it is necessary to open, the necessary permits will be obtained from the relevant Regional Directorate of Highways and other authorities. Existing roads will be used for transport as much as possible during both the construction and operation stages, and all impact mitigating measures will be taken to avoid any damage to the roads. Existing asphalt roads will be used as necessary without damage. In cases of damage, such as removal of asphalt, repair work will be carried out. Stabilized roads used will be watered against dust formation. Vehicles carrying long, heavy, and dangerous loads will depart at certain hours in a way that does not disrupt traffic. Regular planning of the traffic hours will be made, and these hours will be enforced to be applied, Carrying out monitoring within the scope of traffic and transportation. <p>The mitigation measures planned to be implemented within the scope of the project are given in the ESMMP prepared for the project.</p>

ESIA Topic	Baseline Data	Impact Assessment (IA) and Mitigation Measures
	<p>through the state road between Tarsus and Adana Center is estimated and counted with a total of 53,707 vehicles per day and continuous vehicle counting and classification stations, and a total of 20,152 vehicles per day. According to the 2019 Highway Volume Map published by the General Directorate of Highways, a total of 73,859 vehicles pass through the state roads daily.</p> <p><u>Adana-Osmaniye</u></p> <p>According to the 2019 State Roads Volume Map published by the General Directorate of Highways between Adana and Osmaniye, the estimated number of vehicles passing through the state road is counted and a total of 61,416 vehicles per day.</p> <p>A total of 16,551 vehicles and portable vehicle counting, and classification stations are counted per day, and 14,420 vehicles are counted per day. According to the 2019 Highway Volume Map published by the General Directorate of Highways, a total of 92,387 vehicles pass through the Adana-Osmaniye highway per day.</p> <p><u>Osmaniye-Gaziantep</u></p> <p>According to the 2019 State Roads Volume Map published by the General Directorate of Highways, between Osmaniye and Gaziantep, the number of vehicles passing through the state road is estimated and counted with a total of 239,343 vehicles per day and continuous vehicle counting and classification stations, and a total of 34,741 vehicles per day. According to the 2019 Highway Volume Map published by the General Directorate of Highways, 274,084 vehicles pass through the Osmaniye-Gaziantep state roads in total daily.</p> <p>In the traffic and transportation section, the intersection points of the High Standard Train Project with the existing highway and the traffic</p>	

ESIA Topic	Baseline Data	Impact Assessment (IA) and Mitigation Measures
	<p>density are given and the effects on traffic and transportation have been examined.</p> <p>With a total of 56,521 vehicles including 38,712 automobiles, 8483 medium-loaded commercial vehicles, 591 buses, 2829 trucks and 5906 trucks+trailers, which were measured by estimating the state road between Mersin and Tarsus; A total of 25,697 vehicles, including 15,621 automobiles, 3134 medium-loaded commercial vehicles, 318 buses, 2047 trucks, and 4577 trucks+trailers, were counted through the continuous vehicle counting and classification station. The total number of vehicles between the Mersin-Tarsus state road, where both the estimated and continuous vehicle counting and classification station are being counted, is 82,218.</p> <p>A total of 52,575 vehicles, with 41,387 light vehicles and 11,188 heavy vehicles, passed through the highway between Mersin and Tarsus.</p> <p>With a total of 53,707 vehicles, including 41,700 automobiles, 6745 medium-loaded commercial vehicles, 512 buses, 3157 trucks and 1593 trucks + trailers, which were measured by making an estimate of the state road between Tarsus and Adana Center; A total of 20,152 vehicles, including 14,875 automobiles, 2490 medium-loaded commercial vehicles, 230 buses, 1122 trucks, 1432 trucks + trailers, were counted with the continuous vehicle counting and classification station. The total number of vehicles between Tarsus-Adana state road, where both the estimated and continuous vehicle counting and classification station and the counting is made, is 73,859.</p> <p>A total of 104,790 vehicles have passed between Tarsus-Adana Central highway, with 71,170 light vehicles and 33,620 heavy vehicles.</p> <p>With 39,435 automobiles, 5923 medium-loaded commercial vehicles, 281 buses, 11,857 trucks and 9920 trucks + trailers in total, 61,416 vehicles, which were measured by making an estimated count between Adana and Osmaniye; A total of 16,551 vehicles, including 10,904</p>	

ESIA Topic	Baseline Data	Impact Assessment (IA) and Mitigation Measures
	<p>automobiles, 2938 medium-loaded commercial vehicles, 266 buses, 1285 trucks, 1158 trucks + trailers, counted by the continuous vehicle counting and classification station; A total of 14,420 vehicles, including 8324 automobiles, 1244 medium-loaded commercial vehicles, 26 buses, 1501 trucks, 3325 trucks + trailers, were counted with the portable vehicle counting and classification station. The total number of vehicles between the estimated and continuous vehicle counting and classification station and the portable vehicle counting and classification station and the Adana-Osmaniye state road where the count is made is 92,387.</p> <p>A total of 368,984 vehicles passed between Adana and Osmaniye, with 274,916 light vehicles and 94,068 heavy vehicles.</p> <p>With a total of 239,343 vehicles, including 183,434 automobiles, 25,434 medium-loaded commercial vehicles, 1843 buses, 17,942 trucks and 11,918 trucks + trailers, which were measured by making an estimated count between Osmaniye and Gaziantep; A total of 34,741 vehicles, consisting of 28,054 automobiles, 3248 medium-loaded commercial vehicles, 122 buses, 1134 trucks, 2183 trucks + trailers, were counted with the continuous vehicle counting and classification station. The total number of vehicles between the Adana-Osmaniye state road, where both the estimated and continuous vehicle counting and classification station are being counted, is 274,084.</p> <p>There were 58,343 light vehicles and 111,886 heavy vehicles and a total of 170,229 vehicles between the Osmaniye-Gaziantep highway.</p> <p>The average total number of vehicles given in line with the volume maps published by the General Directorate of Highways and the total traffic load increase are given below.</p> <p>Average total number of vehicles crossing the state road between Mersin and Gaziantep: 522,548 vehicles.</p>	

ESIA Topic	Baseline Data	Impact Assessment (IA) and Mitigation Measures
	<p>Average total number of vehicles on the highway between Mersin and Gaziantep: 696,578 vehicles.</p> <p>During the construction phase, 315 vehicles for excavation, 91 for filling, 17 for foundation excavation, 29 for Plenti production, 87 for granular fillings, 11 for asphalt paving, 35 for basalt paving, 61 for basalt line paving, 15 for non-basalt line paving, scissors paving It is planned to use 13 vehicles for line dismantling, 5 for scissor removal, 14 for sleeper production, 8 for basalt quarry, 8 for panel production and 58 for the support team. A total of 758 vehicles will be used for all operations.</p>	

1.3.2 Stakeholder Consultations

A Stakeholder Engagement Plan (SEP) has been prepared for the purpose of ensuring that a consistent, comprehensive, coordinated and culturally appropriate approach is taken to stakeholder engagement and Project disclosure throughout the ESIA. The SEP was also used as a tool to enable Rönesans to align with international best practice for engaging stakeholders. Moreover, Rönesans is committed to full compliance with all Turkish EIA Regulations, as well as aligning to the international standards namely the IFC Performance Standards and any other directly relevant policies of the IFC and World Bank. To achieve this goal, a well-planned procedure for stakeholders in the entire ESIA study was thus imperative.

In line with current international best practice, the SEP aims to ensure engagement that is free of manipulation, interference, coercion and intimidation. It also aims to ensure that stakeholder engagement is conducted on the basis of timely, relevant, understandable and accessible information, in a culturally appropriate format. In this way, the SEP seeks to ensure that stakeholder groups are given sufficient opportunity to voice their opinions and concerns, and that these concerns influence Project decisions. The SEP:

Outlines the approach to be adopted to engagement, showing how this will be integrated into the rest of the ESIA process;

- Identifies stakeholders and mechanisms through which they will be included in the ESIA process; and
- Serves as a way to document engagement undertaken throughout the ESIA.

The SEP was developed after the Scoping exercise, and was continually updated throughout the course of conducting this ESIA study. The SEP was used in the course of engaging stakeholders during the detailed ESIA study. The SEP shall continue to be used during Project implementation and post-construction monitoring, and is presented in this ESIA. As described in the SEP, consultation was undertaken.

In December 2020, field survey of Stakeholder Engagement Plan and Social Impact Assessment were carried out. The summary of field surveys are given below:

- 183 household questionnaires were completed in the field survey conducted as part of the social impact assessment in 4 provinces, 15 districts and 120 settlements (village, neighborhoods) designated as the project's impact area. 33.3% of questionnaire forms belong to Mersin, 42.1% to Adana, 18.6% to Osmaniye, and 6.0% to Gaziantep,
- 19 mukhtar interviewed was conducted as of December 2020. 9 of the interviews were conducted in Osmaniye, 5 in Adana and 5 in Gaziantep,
- 30 institutions were interviewed. 11 of the meetings of this institution were conducted in Mersin, 9 in Adana, 6 in Osmaniye and 4 in Gaziantep. The majority of the interviews (11) were conducted with representatives of metropolitan municipalities and district municipalities. 9 interviews were conducted in other public institutions, and 6 of them are institutions related to the Ministry of Transport (see Table 1.2).
- It was considered sufficient to organize a focus group meeting to represent each province, and 2 focus group meetings and 2 in-depth interviews were realized (see Table 1.3),

Table 1.2: Consultations with Institution

No	Date	Province	District	Institution
1	02.12.2020	Mersin	Akdeniz	Mersin Chamber of Commerce and Industry
2	02.12.2020	Mersin	Akdeniz	Mersin Metropolitan Municipality Transportation Department
3	02.12.2020	Mersin	Akdeniz	Mersin Governorate
4	03.12.2020	Mersin	Tarsus	Tarsus Branch of Turkish Disabled Association
5	03.12.2020	Mersin	Tarsus	Tarsus Branch of the Autism Association
6	03.12.2020	Mersin	Tarsus	Tarsus Visually Impaired Association
7	03.12.2020	Mersin	Tarsus	Tarsus Municipality
8	04.12.2020	Mersin	Akdeniz	TCDD Gar Directorate
9	04.12.2020	Mersin	Akdeniz	Güney Newspaper
10	04.12.2020	Mersin	Akdeniz	Mersin Provincial Directorate of Environment and Urbanization, Branch of Zoning Planning
11	04.12.2020	Mersin	Akdeniz	Directorate of TCDD Mersin Port Authority
12	07.12.2020	Adana	Seyhan	Adana Metropolitan Municipality Head of Projects Department
13	07.12.2020	Adana	Seyhan	Çukurova Development Agency, Investment Support Office
14	07.12.2020	Adana	Seyhan	Seyhan District Municipality
15	07.12.2020	Adana	Çukurova	Adana Metropolitan Municipality, Head of Transportation Department-Directorate of Rail Systems
16	08.12.2020	Adana	Seyhan	Adana Chamber of Industry
17	08.12.2020	Adana	Seyhan	Adana Regional Directorate of TCDD Transportation Incorporated Company, Directorate of Services

No	Date	Province	District	Institution
18	08.12.2020	Adana	Seyhan	Adana 6 th Regional Directorate of TCDD, Railway Maintenance Service, Branch of Superstructure
19	08.12.2020	Adana	Seyhan	Adana 6 th Regional Directorate of TCDD, Railway Maintenance Service
20	09.12.2020	Adana	Ceyhan	Ceyhan District Municipality, Directorate of Mukhtar Affairs
21	10.12.2020	Osmaniye	Central District	Osmaniye Municipality
22	10.12.2020	Osmaniye	Central District	Osmaniye Provincial Directorate of Environment and Urbanisation
23	10.12.2020	Osmaniye	Central District	Osmaniye Provincial Directorate of Environment and Urbanisation, Directorate of Planning and Settlement
24	10.12.2020	Osmaniye	Düziçi	Düziçi District Municipality
25	10.12.2020	Osmaniye	Bahçe	Bahçe District Municipality
26	10.12.2020	Osmaniye	Nurdağı	Nurdağı District Municipality, Branch of Zoning and Urbanisation
27	11.12.2020	Gaziantep	Şehitkamil	Gaziantep Metropolitan Municipality,
28	11.12.2020	Gaziantep	Şehitkamil	Silk Road Development Agency
29	11.12.2020	Gaziantep	Şehitkamil	Gaziantep Governorate
30	11.12.2020	Gaziantep	Şehitkamil	TCDD General Directorate of Infrastructure

Table 1.3: Focus Group Discussions and In-Depth Interviews

Province	Date	Type of interview	Representatives / Members
Mersin	03.12.2020	In depth interview	<ul style="list-style-type: none"> - Tarsus Branch of Turkish Disabled Association - Tarsus Branch of the Autism Association - Tarsus Visually Impaired Association
Adana	29.12.2020	In depth interview	- Adana "Kadın Eli" Women's Development, Production and Business Cooperative
Osmaniye	27.12.2020	Focus group discussion	<ul style="list-style-type: none"> - Osmaniye Branch Office of Science Dissemination Society - Osmaniye Scientific Art And Culture Association (İLSANDER) - Osmaniye Branch Office of Anatolian Artisan Industrialists ' and Businessmen's Association (ANESİAD) - Osmaniye Branch Office of Beyazay Association of Turkey - Osmaniye Branch Office of Chamber of Agricultural Engineers
Gaziantep	20.12.2020	Focus group discussion	Graduate students of the department of sociology of Gaziantep University

1.3.3 Fieldwork and Observations

Fieldwork was carried out in the Project area by related experts (biologist, sociologist, measurement laboratories and environmental engineers). Result of fieldwork were given in this Report. Fieldwork depending on each impact is detail explained in related sections in Section 4.

1.3.4 Impact Assessment

Impacts of Mersin-Gaziantep High Standard Train Project on baseline of the Project area was analyzed and observed. Necessary measurement was carried out. Policy and legal framework, extend of study area, identification of baseline conditions, impact magnitude and sensitivity criteria, impact assessment, cumulative impact assessment, summary of residual impacts, significance criteria and overall impact significance, mitigation measures, assumptions and limitation of each environmental and social impact are given in the Section 4

1.3.5 Public Disclosure of Draft ESIA

- 1st Draft: 13.01.2021 (Presented to Rönesans by Assystem Envy)
- 2nd Draft: 15.03.2021 (Presented to Rönesans by Assystem Envy)
- Final Draft: 29.03.2021 (Presented to Rönesans by Assystem Envy)

1.4 Study Limitations

This Environmental and Social Impact Assessment Report (ESIA) is prepared in the pursuance of the agreement mutually signed between Rönesans and Assystem ENVY Energy and Environmental Investments Inc. (Assystem ENVY).

Assystem ENVY is appointed to undertake an Environmental and Social Impact Assessment Report (ESIA) in compliance with Finance Corporation (IFC), and European Bank for Reconstruction and Development (EBRD).

ESIA report for the High Standard Train Project has been independently prepared by Assystem ENVY as a result of the analysis made using the most up-to-date engineering studies and best practices on 29th March, 2021 in line with the information and documents from Rönesans and the measurement dates (field work).

1.5 Project Phase

The Project was developed by TCDD in the early year 2010 and at the some locations of the project construction works have been started. In the scope of this ESIA Reports, the Project was designed by TCDD and some engineering information have been provided by The Ministry of Transport and Infrastructure to Rönesans. Construction works, signaling and any other defined works will be done by Rönesans at the scope of signed contract between Rönesans and The Ministry of Transport and Infrastructure. Responsibilities of Rönesans are detailed in Section 3. After completion of construction and other necessary works, Mersin – Gaziantep High Standard Train project will be operated by TCDD.

1.5.1 Design Criteria & Technical Specification

Design criteria and technical specifications of the Project are given below (see Table 1.4).

Table 1.4: Design Criteria and Technical Specifications

Design Parameter	Design Specification
Rail	Rail 60 E1 in 900A quality
Axle load	22.5 tons/axle
Design speed	120 -160 km/hour
Minimum curve radius	200 m
Maximum deviation	130 mm
Maximum slope	16 per thousand
Ballast	30-60 mm
Span between sleepers	60 cm
Rail connection	Welded
Sleeper type	Concrete sleeper

1.6 Construction Phase

1.6.1 Water Supply for The Project

The water requirement for the construction and operation period will depend on the use of personnel and drinking water. For the construction period, drinking water needs of the staff at the construction sites and in the field will be supplied from the market. The utility water need at the construction sites will be met from the city network. For the operating period, drinking water of the personnel at the route stations will be supplied from the market and the domestic water from the city network.

1.6.2 Machinery and Equipment required for Construction

During the construction phase, 315 vehicles for excavation, 91 for filling, 17 for foundation excavation, 29 for Plenty production, 87 for granular fillings, 11 for asphalt paving, 35 for basalt paving, 61 for basalt line paving, 15 for non-basalt line paving, scissors paving It is planned to use 13 vehicles for line dismantling, 5 for scissor removal, 14 for sleeper production, 8 for basalt quarry, 8 for panel production and 58 for the support team. 758 vehicles will be used for all operations.

1.6.3 Access Routes to Site Locations

For the construction on the route, 3 construction sites will be installed and the structures in these sites are planned to be prefabricated.

As a result of preliminary studies, Merkez Tarsus construction site is positioned as the central construction site and Ceyhan as the second construction site. Nurdağı construction site is located as the third construction site.

Construction sites locations are shown in Map 3.11 and there are connections roads to construction sites. As a result, there is no need to built new connection roads for construction sites.

1.6.4 Labour, Facilities and Accommodation for Construction Phase

For the construction on the route, 3 construction sites will be installed and the structures in these sites are planned to be prefabricated.

As a result of preliminary studies, Merkez Tarsus construction site is positioned as the central construction site and Ceyhan as the second construction site. Nurdağı construction site is located as the third construction site.

During the construction period of the High Standard Train Project such as excavation, filling, and coating, works will be carried out along the line. In the areas where Rönesans is responsible for the construction operations, temporary construction sites are established where the construction works are carried out. These construction sites are units with a certain number of employees and equipment used for construction operations.

1.6.5 Fuel

In the scope of the project, diesel fuel will be used to provide energy for construction machinery. Usage of total diesel fuel for each section are listed below;

- between Mersin and Adana; ~23,827,889.52 Lt/year
- between Adana and Toprakkale; ~13,301,417.80 Lt/year
- between Toprakkale and Bahçe; ~27,602,092.36 Lt/year
- between Bahçe and Nurdağı; ~2,726,681.94 Lt/year
- between Nurdağı and Gaziantep; ~5,650,824.96 Lt/year

Fuel to be used within the scope of the project will be supplied from licensed facilities in the region.

1.6.6 Waste Management

During the construction phase of the High Standard Train Project, construction wastes originating from earthworks, ground improvement, engineering structures, superstructure works, electrification and signaling processes, household and packaging wastes from the staff to work on the site, waste oils from vehicles and equipment to be used, medical wastes, end-of-life tires hazardous wastes and wastes from waste batteries and accumulators are generated.

In the operational phase, it is likely that wastes arising from the personnel working at the stations and the use of the train and the passengers will occur.

As mentioned above, domestic solid wastes, packaging wastes and construction wastes will be generated during the construction phase of the project.

The domestic solid waste load that will arise during the construction phase is 1459 kg/day, and the packaging waste load is 0.2918 kg/day. Domestic solid wastes and packaging wastes, which will occur during the construction phase of the project, will be kept in the construction site in a way that will not pose a risk to water, air, soil, plants, animals, and people, prevent adverse effects on the natural environment and thus not harm the environment and human health. Then, they will be sent to the nearest landfill and removed from the field.

In the management of domestic solid wastes to be generated within the scope of the Project, provisions of the Waste Management Regulation dated 02.04.2015 and numbered 29314, international standards, IFC Standards and EU Directives will be followed. Recyclable and non-recyclable packaging wastes such as glass, plastic and metal will be collected separately from the others and managed in accordance with the Packaging Waste Control Regulation dated 27.12.2017 and numbered 30283, IFC Standards and EU Directives. Negotiations will be made with the relevant municipalities to ensure collection, storage, and disposal.

Construction/excavation wastes will be used as filling and wastes that are not suitable for filling will be kept in the designated area in the construction site and sent to the relevant municipal solid waste site. In this context, the relevant provisions of the "Regulation on the Control of Excavation Soil, Construction and Demolition Wastes" will be complied with regarding the reuse and disposal of excavation phases materials within the scope of the project.

First aid equipment will be available to respond to an emergency that may occur during the construction phase of the High Standard Train Project, and medical wastes from this equipment (bandages, bandages, contaminated cotton, etc.) will be generated. These medical wastes will be collected separately from other wastes such as domestic, packaging, hazardous and non-hazardous wastes and sent to the disposal facility of the relevant municipality. By preventing from harming to the environment and human health directly or indirectly, the Medical Waste Control Regulation, the relevant IFC standard/guideline and EU directives will be complied with for the management in this regard.

In case of any malfunction of the construction equipment to be used for the works in the construction phase, it is possible that waste oils will occur during the maintenance and repair of the machines in cases where this failure is made in the construction site. The waste oils generated will be stored in sealed bags/containers placed on an impermeable ground within the project. Tanks and/or containers shall be easily filled and emptied. In case that oil filters are removed from the vehicles, waste engine oil will be collected in, a separate lidded container located next to the temporary storage tanks. Apart from waste oils from the same construction machinery and equipment, it is likely to occur in hazardous wastes from absorbers, filter materials, protective clothing, and waste drums and cartridges contaminated with pollutants. It will be managed in accordance with the Waste Oil Management Regulation dated 21.12.2019 and numbered 30985, Waste Management Regulation dated 02.04.2015 and numbered 20814 and the relevant IFC standard/guideline and EU directives, by ensuring ground impermeability to prevent the passage of these waste oils and hazardous wastes to the soil and water.

In case that the replacement of the tires that have completed their life is in the field, they will be given to the conversion companies that have "Temporary Storage Permit or Environmental License" from the Ministry of Environment and Urbanization and evaluated. Within the scope of the project, the management will be carried out in accordance with the Regulation on Control of End of Life Tires, IFC standard/guideline and EU directives.

In cases where it is necessary to change the batteries of construction machinery and equipment, it will be replaced with a battery full and waste batteries will be generated. Apart from batteries, it will also generate waste from batteries that have reached the end of their life. These wastes will be collected and given to licensed companies. The provisions of Waste Batteries and Accumulators Control Regulation, IFC standard/guideline and EU directives will be complied in the collection and disposal of waste batteries and accumulators.

The solid wastes, which are calculated and mentioned above, do not cause any risk or negative impact on the environment and people during and after the construction period of the High Standard Train Project.

Management of wastes and wastewater are detailed in Section 4.10.

2 POLICIES AND LEGAL FRAMEWORK

2.1 Turkish Environmental and Social Policies and Legislations

In Turkey, there are numerous directives and laws, which are oriented towards prevention of environmental pollution and protection of human health and natural resources and arranging social life in a clean environment with a peaceful and confident way. The legal arrangements ensure the preservation of environmental quality by preventing environmental pollution. The purpose of legal arrangements in environmental area is to determine necessary standards and behavioral patterns of authorized agencies and citizens in order to live in a healthy and a balanced environment. Directives, circulars, notifications that were issued based on these laws include the details related to procedures and methods to be complied with.

Projects are subject to various inspections by local authorities and regulatory institutions during their construction, operation, and decommissioning periods. The Environmental Law No. 2872, which was revised with the decision numbered 2014/116 dated July 3, 2014, was the first to be applied from the national legislation in the examination of facilities and projects. The Environmental Law is a legal framework that ensures the regulation and implementation of the environmental impacts of the projects that are carried out and/or planned. It enabled the enactment of many other regulations.

Turkish legislation on the environmental protection largely overlaps with the European Union (EU) legislation in line with the harmonization studies carried out in the scope of pre-accession efforts of Turkey to the EU. The majority part of the national environmental legislation related to the Project is presented below under the headings; general, nature protection, soil quality, climate change, air quality, water quality, waste management, management of chemicals, and noise. Additionally, the requirements of the applicable national legislation related to workers' health and safety shall be fulfilled to provide suitable working environment and to minimize the impact and risks on employees both during the construction and operation phases of the project (see Table 2.1).

For the planned High Standard Train Project, both national regulations and relevant provisions given in international standards and conventions are provided.

The national regulations listed below are updated and changed over time. Updates and revisions in the relevant regulations and changes that will take place during the Project will be followed and implemented by Rönesans.

In all evaluations made in the report, current national and international regulations have been taken into consideration and implemented as of the date of the report's preparation.

Table 2.1: National Regulations

Environmental Issues	Turkish Legislations
General	<ul style="list-style-type: none"> • Municipality Law No. 5393 (Official Gazette dated 13.07.2005 and numbered 25874) • Environmental Impact Assessment Regulation (Official Gazette dated 25.11.2014 and numbered 29186), • Environmental Permit and License Regulation (Official Gazette dated 10.09.2014 and numbered 29115), • Regulation on Environmental Audit (Official Gazette dated 21.11.2008 and numbered 27061).
Nature Protection	<ul style="list-style-type: none"> • Regulation on the Procedures and Principles Regarding the Protection of Game and Wild Animals and Their Lives; Pest Control (Official Gazette dated 24.10.2005 and numbered 25976),

Environmental Issues	Turkish Legislations
	<ul style="list-style-type: none"> Regulation on the Conservation of Wetlands (Official Gazette dated 04.04.2014 and numbered 28962), Regulation on Pasture (Official Gazette dated 31.07.1998 and numbered 23419), Land Hunting Law No. 4915 (Official Gazette dated 11.07.2003 and numbered 25165), National Parks Law No. 2873 (Official Gazette dated 11.08.1983 and numbered 18132), Environment Law No. 2872 (Official Gazette dated 11.08.1983 and numbered 18132) and all relevant Regulations, Law No. 2863 on Conservation of Cultural and Natural Entities (Official Gazette dated 23.07.1983 and numbered 18113), Red Data Book for Turkish Bird Species (Kiziroglu, 2008).
Soil Quality	<ul style="list-style-type: none"> Soil Protection and Land Use Law No. 5403 (Official Gazette dated 19.07.2005 and numbered 25880) Expropriation Law No. 2942 (Official Gazette dated 08.11.1983 and numbered 18215) Regulation on Soil Pollution Control and Contaminated Sites by Point Source (Official Gazette dated 08.06.2010 and numbered 27605).
Climate Change	<ul style="list-style-type: none"> Regulation on Substances that Deploy Ozone Layer (Official Gazette dated 07.04.2017 and numbered 30031), Regulation on Monitoring of Greenhouse Gas Emissions (Official Gazette dated 17.05.2014 and numbered 29003).
Air Quality	<ul style="list-style-type: none"> Regulation on Control of Industrial Air Pollution (Official Gazette dated 03.07.2009 and numbered 27277), Regulation on Exhaust Gas Emission Control (Official Gazette dated 11.03.2017 and numbered 30004), Regulation on Assessment and Management of Air Quality (Official Gazette dated 06.06.2008 and numbered 26898), Regulation on Control of Exhaust Gas Emission and Diesel Fuel and Gasoline Quality (Official Gazette dated 30.11.2013 and numbered 28837), Regulation of Control of Air Pollution Originated from Heating (Official Gazette dated 13.01.2005 and numbered 25699).
Water Quality	<ul style="list-style-type: none"> Groundwater Law No. 167 ((Official Gazette dated 23.12.1960 and numbered 10688) Regulation of Urban Wastewater Treatment (Official Gazette dated 08.01.2006 and numbered 26047), Regulation on Control of Pollution Caused by Hazardous Substances in the Aquatic Environment and Its Surroundings (Official Gazette dated 26.11.2005 and numbered 26005),

Environmental Issues	Turkish Legislations
	<ul style="list-style-type: none"> Regulation Concerning Water Intended for Human Consumption (Official Gazette dated 17.02.2005 and numbered 25730), Water Pollution Control Regulation (Official Gazette dated 31.12.2004 and numbered 25687), Regulation on Fishery Products (Official Gazette dated 10.03.1995 and numbered 22223), Regulation on Quality of Surface Water (Official Gazette dated 30.11.2012 and numbered 28483), Regulation on Protection of Groundwater Against Pollution and Deterioration (Official Gazette dated 07.04.2012 and numbered 28257), Monitoring of Surface and Groundwater Regulation (Official Gazette dated 11.02.2014 and numbered 28910), Regulation on Water Intended for Human Consumption (Official Gazette dated 17.02.2005 and numbered 25730).
Waste Management	<ul style="list-style-type: none"> Regulation on the Control of Packaging Waste (Official Gazette dated 27.12.2017 and numbered 30283), Regulation on Waste Management (Official Gazette dated 02.04.2015 and numbered 29314), Regulation on the Control of Waste Tires (Official Gazette dated 25.11.2006 and numbered 26357), Regulation on Control of Medical Wastes (Official Gazette dated 25.01.2017 and numbered 29959), Regulation on Control of Waste Batteries and Accumulators (Official Gazette dated 31.08.2004 and numbered 25569), Regulation on Waste Oil Control (Official Gazette dated 21.12.2019 and numbered 30985), Regulation on Control of Waste Vegetable Oil (Official Gazette dated 06.06.2015 and numbered 29378), Regulation on Control of Excavated Soil, Construction and Demolition Wastes (Official Gazette dated 18.03.2004 and numbered 25406), Regulation on Control of Waste Electrical and Electronic Appliances (Official Gazette dated 22.05.2012 and numbered 28300), Regulation on Safety Data Sheets Regarding Hazardous Substances and Mixtures (Official Gazette dated 13.12.2014 and numbered 29204) Regulation on the Preparation and Distribution of Safety Data Sheets Regarding Dangerous Substances and Preparations (Official Gazette dated 26.12.2008 and numbered 27092) Regulation on Classification, Labeling and Packaging of Substances and Mixtures (Official Gazette dated 11.12.2013 and numbered 28848)
Management of Chemicals	<ul style="list-style-type: none"> Regulation on Safety Information Forms on Hazardous Substances and Mixtures (Official Gazette dated 13.12.2014 and numbered 29204).

Environmental Issues	Turkish Legislations
Noise	<ul style="list-style-type: none"> Regulation on Assessment and Management of Environmental Noise (Official Gazette dated 04.06.2010 and numbered 27601), Regulation on Control of Ambient Noise Emissions Originating from Equipment used Outdoor (Official Gazette dated 30.12.2006 and numbered 26392), Regulation Related to Noise Emissions by Equipment for Outdoor Use (Official Gazette dated 30.12.2006 and numbered 26392).
Health and Safety	<ul style="list-style-type: none"> Labor Law No. 4857 (Official Gazette dated 10/6/2003 and numbered 25134), Occupational Health and Safety Law No. 6331 (Official Gazette dated 30.6.2012 and numbered 28339), Public Health Law No. 1593 (Official Gazette dated 06.05.1930 and numbered 1489) Regulation on Health and Safety Requirements for Temporary or Fixed Term Works (Official Gazette dated 23.08.2013 and numbered 28744), Charter on the Measures to Be Taken at the Works and Businesses Which Utilize Flammable, Explosive, Hazardous and Detrimental Materials (Official Gazette dated 24.12.1973 and numbered 14752), Regulation on Transportation of Explosives via Highways (Official Gazette dated 24.04.2019 and numbered 30754), Regulation on Personal Protective Equipment (Official Gazette dated 01.05.2019 and numbered 30761), Regulation on Usage of Personal Protective Equipment in Workplaces (Official Gazette dated 02.07.2013 and numbered 28695), Act on the Procedures and Principles on Manufacture, Import, Transportation, Storing, Sales, Usage, Disposal and Control of Explosive Materials, Hunting Equipment and Similar Exempted from Monopoly (Official Gazette dated 29.09.1987 and numbered 19589)
Traffic and Transport	<ul style="list-style-type: none"> Traffic Law No. 2918 (Official Gazette dated 18.10.1983 and numbered 18195) Highways Traffic Law (Official Gazette dated 8.10.1983 and numbered 18195) Turkey Law on the Liberalization of Railway Transport (Official Gazette dated 01.05.2013 and numbered 28634) Regulation on Transportation of Hazardous Substances via Highways (Official Gazette dated 24.04.2019 and numbered 30754) Communique on Dangerous Goods Safety Consultancy (Official Gazette dated 22.05.2014 and numbered 29007) Highways Traffic Regulation (Official Gazette dated 18.07.1997 and numbered 23053) Regulation on Road Infrastructure Safety Management (Official Gazette dated 21.10.2018 and numbered 30572)

2.2 National Legislations for Labour and Working Conditions

2.2.1 Occupational Health and Safety Law

The Occupational Health and Safety Law dated 30.06.2012 and numbered 6331 regulates the duties, powers, responsibilities, rights and obligations of employers and employees in order to ensure occupational health and safety at workplaces and to improve existing health and safety conditions.

The OHS Law No. 6331 is applied to all businesses and workplaces belonging to the public and private sector, employers and employer representatives of these workplaces, all employees, including apprentices and interns, regardless of their field of activity. Activities outside of this scope are;

- Activities of the Turkish Armed Forces, general law enforcement forces and the Undersecretaries of the National Intelligence Organization, excluding those in factories, maintenance centers, sewing shops and similar workplaces,
- Intervention activities of disaster and emergency units,
- Household services,
- Those who produce goods and services on their own behalf and account without employing employees,
- During the execution services for convicts and detainees, the workplace, education, security, and vocational training activities performed within the scope of improvement.

The general obligation of the employer, protection from risks, occupational health and safety services, workplace physicians and occupational safety experts, determination of the hazard class, emergency plans, occupational accidents and occupational diseases, employee training are mentioned and precautions to be taken about these issues. Except for the business lines outlined above, it is obligatory for both employers and employees to comply and enforce in all workplaces and working areas.

Employer representatives who act on behalf of the employer and take part in the management of the work and the workplace are considered as employers for the implementation of this Law.

The employer is obliged to ensure the work-related health and safety of the employees and within this framework;

- It works to prevent occupational risks, to take all kinds of measures, including training and information, to organize, to provide the necessary tools and equipment, to adapt health and safety measures to changing conditions and to improve the current situation.
- Monitors and controls whether occupational health and safety measures taken in the workplace are followed and ensures that non-conformities are eliminated.
- Makes or has a risk assessment done.
- While assigning tasks to the employee, it considers the employee's suitability for the job in terms of health and safety.
- Takes necessary measures to prevent employees other than those given adequate information and instructions from entering places with life and special danger.

Receiving services from experts outside the workplace does not remove the employer's responsibilities. Employees' obligations in the field of occupational health and safety do not affect the employer's responsibilities and the employer cannot reflect the cost of occupational health and safety measures to the employees.

2.2.2 Labor Law

The Labor Law No. 4857 and dated 10.6.2003 in the Official Gazette is to regulate the rights and responsibilities of workers employed on the basis of an employment contract with employers regarding the working conditions and the working environment.

Sea and air transportation business, fewer than 50 workers (50) including the business or businesses of agriculture and forestry is carried out in workplaces where the family remaining within the boundaries of the economy related to agriculture in all kinds of building work, members of a family and 3rd Degree (3rd Degree included) to disagree with someone else among the relatives of handicrafts are made from the outside in where homes and jobs, in home services, apprentices, about athletes, about those who rehabilitate, it applies to all workplaces other than workplaces where three people work in accordance with the description of Article 2 of the law on Merchants and Craftsmen 507, employers of these workplaces, as well as employers' representatives and employees, regardless of their activity issues.

All kinds of responsibilities and obligations provided for by the employer in this law also apply to the employer's proxies. The title of employer's attorney does not eliminate the rights and obligations granted to employees. The principal employer is jointly responsible with the sub-employer for the obligations of the sub-employer to its employees arising from this law, the employment contract, or the collective bargaining agreement to which the sub-employer is a party in relation to that workplace.

2.2.3 Regulation on Duties, Authorities, Responsibilities and Training of Occupational Safety Specialists

Regulation on Duties, Authorities, Responsibilities and Training of Occupational Safety Specialists, dated 29.12.2012 and numbered 28512, regulates the qualifications, training and certification, duties, powers and responsibilities, and working procedures and principles of occupational safety specialists working in occupational health and safety services. It covers workplaces and educational institutions within the scope of the Occupational Health and Safety Law No. 6331.

2.2.4 Communique on Workplace Hazard Classes Regarding Occupational Health and Safety

In accordance with the Article 9 of the Occupational Health and Safety Law numbered 6331, the hazard classes of the workplaces in terms of occupational health and safety are specified in the Workplace Hazard Classes List in Annex-1 of this communique. In determining the hazard class, the hazard class of the actual work carried out in a workplace is taken into consideration.

2.2.5 Occupational Health and Safety Risk Assessment Regulation

The Occupational Health and Safety Risk Assessment Regulation, dated 29.12.2012 and numbered 28512, regulates the procedures and principles of risk assessment to be made in terms of occupational health and safety at workplaces. It covers workplaces under the Occupational Health and Safety Law numbered 6331.

According to this regulation, the employer makes risk assessment in terms of occupational health and safety with the aim of ensuring, maintaining, and improving the working environment and the health and safety of the employees. Carrying out a risk assessment does not eliminate the employer's obligation to ensure occupational health and safety at the workplace. The employer provides all kinds of information and documents related to risk assessment to the person or persons assigned in risk assessment studies.

2.2.6 Regulation on Occupational Health and Safety in Construction Works

The Regulation on Occupational Health and Safety in Construction Works dated 05.10.2013 and numbered 28786 determines the minimum occupational health and safety conditions to be taken in construction works. It is applied in workplaces under the Occupational Health and Safety Law numbered 6331.

The employer, in addition to the obligations specified in Article 4 of the Law, also provides the following issues in construction works;

- Keeping the construction area tidy and clean enough,
- In the selection of working places in the building area; determination of how transportation will be provided and areas or roads for equipment, movement, and passages,
- Arranging the usage and transportation conditions of the material,
- Technical maintenance and controls of the facility and equipment before starting to be used and periodically,
- Separating suitable storage areas for various materials and especially dangerous materials and substances and determining the boundaries of these areas,
- Regulating the conditions for the use of dangerous materials and their removal,
- Storage, disposal or removal of wastes and residues with appropriate methods and equipment,
- The periods foreseen for various jobs or work stages are re-determined according to the state of the work in the construction area,
- Cooperation between subcontractors and employees on their behalf,
- Consideration of interaction with industrial activities in or near the building site.

Having personal protective equipment in accordance with the Regulation on the Use of Personal Protective Equipment at Workplaces and harmonized national standards published in the Official Gazette dated 2.7.2013 and numbered 28695, and their use by employees.

2.3 International Environmental and Social Standards

In order to manage the project in environmental and social issues and to obtain credit from the credit institution, there are also national legal provisions and international obligations that must be implemented and carried out. The environment outside as Turkey signed contracts and agreements and other assets that are created to maintain the standards and guidelines are available.

2.3.1 International Conventions and Treaties

The international conventions related to the Project are listed below;

- Stockholm Convention on Persistent Organic Pollutants, 2001 (Turkey 2001),
- European Landscape Convention, Florence 2000 (Turkey 2003),
- Convention on Biological Diversity, Rio de Janeiro 1992 (Turkey 1996),
- United Nations Framework Convention on Climate Change, 1992 (Turkey 2004),
- Kyoto Protocol to the United Nations Framework Convention on Climate Change, 1992 (Turkey 2009),
- Montreal Protocol on Substances that Deplete the Ozone Layer, 1987 (Turkey 1990),
- Vienna Convention for the Protection of the Ozone Layer, 1985 (Turkey 1990),
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES Convention, Turkey 2001),
- Convention on the Conservation of European Wildlife and Natural Habitats, Bern 1979 (Turkey 1984),
- Convention concerning the Protection of the World Cultural and Natural Heritage, Paris 1972 (Turkey 1983),
- International Convention for the Protection of Birds, Paris 1959 (Turkey 1966),

- 1983 Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) and Agreement (bird and mammals and their habitats, 1994),
- 1971 International Convention on Wetlands of International Importance especially as Waterfowl Habitat (RAMSAR Convention) and the as amended by 1982 Protocol,
- 1951 International Plant Protection Convention,
- 1950 International Convention for the Protection of Birds,
- 1979 Convention on Long-range Transboundary Air Pollution and its protocols,
- 1998 Aarhus Convention on the Access to Information, Public Participation in Decision-Making, and Access to Justice in Environmental Matters,
- 1989 ILO Convention Concerning Indigenous and Tribal Peoples in Independent Countries.
- ILO Convention: C182 Worst Forms of Child Labour Convention, 1999
- ILO C148, Working Environment (Air Pollution, Noise and Vibrations) Convention, 1977)

International Union for Conservation of Nature (IUCN)

IUCN “Red List of Threatened Species” is widely recognized as the most comprehensive, objective global approach for evaluating the conservation status of plant and animal species.

The IUCN Red List Categories and Criteria are intended to be an easily and widely understood system for classifying species at high risk of global extinction. The general aim of the system is to provide an explicit, objective framework for the classification of the broadest range of species according to their extinction risk. However, while the Red List may focus attention on those taxa at the highest risk, it is not the sole means of setting priorities for conservation measures for their protection.

Extensive consultation and testing in the development of the system strongly suggest that it is robust across most organisms. However, it should be noted that although the system places species into the threatened categories with a high degree of consistency, the criteria do not consider the life histories of every species. Hence, in certain individual cases, the risk of extinction may be under or over estimated. The IUCN Council adopted the new Red List system in 1994. The IUCN Red List Categories and Criteria have several specific aims;

- To provide a system that can be applied consistently by different people,
- To improve objectivity by providing users with clear guidance on how to evaluate different factors which affect the risk of extinction,
- To provide a system which will facilitate comparisons across widely different taxa,
- To give people using threatened species lists for a better understanding of how individual species were classified.

9 categories are defined for the Red List considering extinction rate, population size, geographical distribution areas and population and distribution degree (see Figure 2.1). The red list categories are as follows;

- Extinct, EX
- Extinct in the Wild, EW
- Critically Endangered, CR
- Endangered, EN
- Vulnerable, VU
- Near Threatened, NT
- Least Concern, LC
- Data Deficient, DD
- Not Evaluated, NE

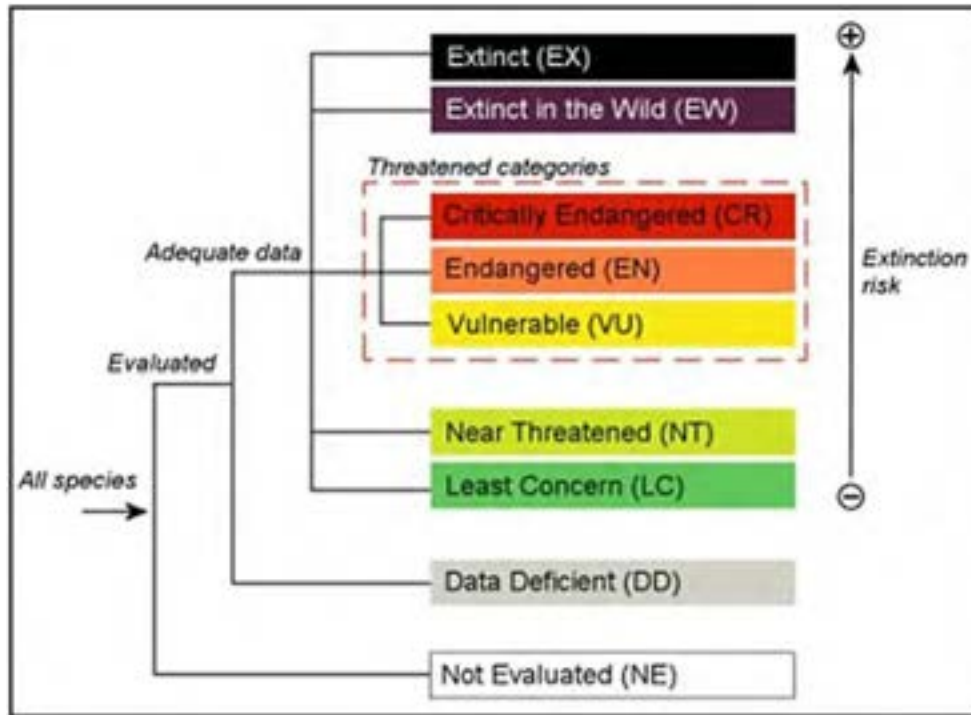


Figure 2.1: Structure of the Red List Categories of IUCN

Bern Convention

The Convention on the Conservation of European Wildlife and Natural Habitats was signed on October 19, 1979 in Bern. In Turkey, this convention was approved by the Decree of Council of Ministers numbered 84-7601 and became effective by publishing in the Official Gazette dated February 20, 1984 and numbered 18318.

The aim of this convention is to ensure the conservation of European Wildlife and Natural Habitats by means of cooperation between the States who signed this convention.

All countries that have signed the Bern Convention must act to;

- Promote national policies for the conservation of wild flora and fauna, and their natural habitats,
- Have regard to the conservation of wild flora and fauna in their planning and development policies, and in their measures against pollution,
- Promote education and disseminate general information on the need to conserve species of wild flora and fauna and their habitats,
- Encourage and co-ordinate research related to the purposes of this Convention.

Also, co-operate to enhance the effectiveness of these measures through;

- Co-ordination of efforts to protect migratory species, and the exchange of information and the sharing of experience and expertise.

Appendices of the Bern Convention give the species list needing to be protected. The list of appendices and content of each appendix is given below;

- Annex I: Strictly protected flora species (may not be taken from the wild or harmed)

- Annex II: Strictly protected fauna species (may be neither disturbed nor captured, killed, or traded)
- Annex III: Protected fauna species (species that need protection but may be hunted or otherwise exploited in exceptional instances)
- Annex IV: Prohibited means and methods of killing, capture and other forms of exploitation

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

CITES is a multilateral treaty to protect endangered plants and animals. It was drafted because of a resolution adopted in 1963 at a meeting of members of the IUCN (International Union for Conservation of Nature). The convention was opened for signature in 1973 and CITES entered into force on 1st of July 1975. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species in the wild, and it accords varying degrees of protection to more than 35,000 species of animals and plants. In order to ensure that the GATT (General Agreement on Tariffs and Trade) was not violated, the Secretariat of GATT was consulted during the drafting process. Turkey was partied CITES on 22nd of December 1996. Appendices I, II and III to the Convention are lists of species afforded different levels or types of protection from over-exploitation. Content of each appendix is given below;

Appendix I: lists species that are the most endangered among CITES-listed animals and plants. They are threatened with extinction and CITES prohibits international trade in specimens of these species except when the purpose of the import is for instance for scientific research.

Appendix II: lists species that are now not necessarily threatened with extinction but that may become so unless trade is controlled. International trade in specimens of Appendix-II species may be authorized by the granting of an export permit or re-export certificate.

Appendix III: is a list of species included at the request of a Party that already regulates trade in the species and that needs the cooperation of other countries to prevent unsustainable or illegal exploitation. International trade in specimens of species listed in this Appendix is allowed only on presentation of the appropriate permits or certificates.

International Council on Monuments and Sites (ICOMOS)

Its main purpose is to develop principles, techniques and policies for the conservation and evaluation of historical monuments and sites, and to support and direct all relevant research. The international statute of ICOMOS, which is still valid today, took its final form and entered into force at the fifth general assembly held in Moscow on 22 May 1978.

The aims of ICOMOS are;

- To create a forum for professional dialogue and exchange by bringing together conservation experts from around the world,
- Gathering, evaluating and disseminating information on conservation principles, techniques and policies,
- Cooperating with national and international authorities in order to establish certification centers specialized in the field of conservation,
- To work for the acceptance and enforcement of international conventions aimed at the protection and development of architectural heritage,
- Contributing to the organization of training programs for conservation professionals all over the world,
- To put the knowledge and experience of high-level professionals and experts at the service of the international community.

Turkey National Committee for this purpose in the statute, to ensure the introduction of immovable cultural property in Turkey at the international level and help shape the development of international relations with two more substances were added culture channel.

2.3.2 International Standards

Among the potential creditor corporations for the Project, the Environmental and Social Standards, and Guiding Documents of International Finance Corporation (IFC) and European Bank for Reconstruction and Development (EBRD) shall be taken as basis for every phase of the Project. Furthermore, in compliance to the Equator Principles (July 2020), the conditions of Equator Principles Financial Institutions (EPFI) shall also be provided. All these standards serve for the improvement of the project's performance through its evaluation in environmental and social aspect by minimizing of negative impacts and increasing in contributions.

The processes of ESIA adopted by finance foundations, which are conformable with the EIA methodology, are explained in the following paragraphs.

2.3.3 IFC Performance Standards

As the financial department of the World Bank, IFC, has constituted its environmental and social policy with the intention to provide the implementation of the projects that it provides finance in line with the sustainability principle and in that regard, has established Performance Standards (PS) as the basis of environmental and social evaluation.

General Environment, Health and Safety (EHS) Guidelines of IFC is among the guiding documents to be based on during implementation. It contains information on environmental issues, occupational health and safety, community health and safety. The important aspects for the construction and decommissioning phases are given in a separate section in this guideline. Furthermore, Industry Specific EHS Guidelines defines the environmental impacts and health and safety risks about the sector to which the project is related to and it leads the way for the measures to be taken. Apart from these guidelines, there are IFC performance standards. The project is expected to comply with both the IFC general Environmental and Health Guidelines and performance standards.

The IFC performance standards (PSs) are given brief as follows;

- PS 1: Social and Environmental Assessment and Management System; it underscores the importance of managing environmental and social performance throughout the life of a project.
- PS 2: Labor and Working Conditions; it comprises the issues on the protection of basic worker rights under the headings of Working Conditions and Management of Worker Relationship, Protecting the Workforce, Occupational Health and Safety, Non-Employee Workers.
- PS 3: Pollution Prevention and Abatement; it outlines a project approach to pollution prevention and abatement.
- PS 4: Community Health, Safety and Security; it covers the assessment of the potential risks and impacts to the health and safety of the affected community from project activities.
- PS 5: Land Acquisition and Involuntary Resettlement; it highlights that in addition to physical displacement, economical displacement (loss of income, etc.) should be considered during the land allocation for the project.
- PS 6: Biodiversity Conservation and Sustainable Natural Resource Management; it recognizes the protection and conservation of biodiversity - the variety of life in all its forms - and its ability to change and evolve and that this is fundamental to sustainable development. IFC Performance Standard 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. The requirements set out in this Performance Standard have been guided by the Convention on

Biological Diversity, which defines biodiversity as “the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species, and of ecosystems. The objectives of Standard 6 are to protect and preserve biodiversity, to sustain the benefits from ecosystem services and to promote the sustainable management of living natural resources.

- PS 7: Indigenous Peoples; it includes the assessments of the indigenous peoples among the social groups at the project area.
- PS 8: Cultural Heritage; it includes the protection of the cultural heritage in the project design and implementation and the usage of the cultural heritage by the project.

For each impact, IFC General EHS Guidelines and IFC Performance Standards are given under the titles.

2.3.3.1 European Bank for Reconstruction and Development (EBRD) Environmental and Social Standards (April 2019)

Another international standard is the European Bank for Reconstruction and Development (EBRD) Standard. The European Bank for Reconstruction and Development (EBRD or the Bank) is committed to promoting “environmentally sound and sustainable development” in the full range of its activities pursuant to the Agreement Establishing the EBRD. The Bank recognizes that environmental and social sustainability is a fundamental aspect of achieving outcomes consistent with its transition mandate. Therefore, the projects that foster environmental and social sustainability are within the highest priorities of the Bank’s activities.

EBRD Performance Conditions aims to ensure that projects are implemented under appropriate policies and conditions, to support projects with high environmental and social benefits, and to integrate the environmental sustainability of the project with the Bank activities. Through the Performance Requirements (PR) adopted in line with these objectives, the bank defines the key areas of environmental and social impacts and issues and requires monitoring the applications. The Bank Performance Requirements are parallel to the IFC Performance Standards and they are listed below;

- EBRD PR1: Assessment and Management of Environmental and Social Risks and Impacts
- EBRD PR2: Labour and Working Conditions
- EBRD PR3: Resource Efficiency and Pollution Prevention and Control
- EBRD PR4: Health, Safety and Security
- EBRD PR5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement
- EBRD PR6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
- EBRD PR7: Indigenous Peoples
- EBRD PR8: Cultural Heritage
- EBRD PR9: Financial Intermediaries
- EBRD PR10: Information Disclosure and Stakeholder Engagement

PRs 1 through 8 coincide entirely with the eight performance standards of IFC. As for PR 9, it requires the Bank to evaluate the environmental and social policy and practices of the intermediaries in case if the intermediaries finance the project. PR 10 points out the requirements regarding determination of the potential stakeholders of the project, information disclosure and collection of comments via convenient tools.

The Bank evaluates whether the project is beneficial or not and considers its socio-economic contributions in particular. Additionally, climate change, biodiversity, stakeholder engagement and information disclosure are emphasized.

The EBRD is committed to the adoption of EU environmental principles, practices, and fundamental standards in the projects it finances. When the regulations in the country of the project are different from the EU basic environmental standards, the projects to be made are expected to comply with that regulation, whichever regulation is stricter.

2.3.3.1 Equator Principles (July 2020)

The Equator Principles consist of principles that aim to establish a common basis for financial institutions to identify, assess and manage environmental and social risks while financing the Projects. Equator Principles Financial Institutions (EPFI) are the institutions that decide to carry out their project finance transactions in accordance with the Equator Principles and require that the activities they finance are carried out in accordance with these principles. No funding is provided for Projects that do not comply with the relevant Equator Principles requirements. EPFIs also state that they have broader responsibilities to identify and manage adverse environmental and social risks and impacts, and to respect Human Rights for financial products that are outside the Scope of the Equator Principles and managed through the corporate environmental and social risks of EPFIs. Equator principles are briefly explained below;

EP 1: Review and Categorization; Following the assessment of the project in terms of its social and environmental impacts, it categorizes the project as per the magnitude of impacts as Category A, B or C.

Category A: Projects with potential significant adverse environmental and social risks and/or impacts that are diverse, irreversible or unprecedented;

Category B: Projects with potential limited adverse environmental and social risks and/or impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures; and

Category C: Projects with minimal or no adverse environmental and social risks and/or impacts.

EP 2: Environmental and Social Assessment; The EPFI will require the client to conduct an appropriate Assessment process to address, to the EPFI's satisfaction, the relevant environmental and social risks and scale of impacts of the proposed Project (which may include the illustrative list of issues found in Exhibit II). The Assessment Documentation should propose measures to minimize, mitigate, and where residual impacts remain, to compensate/offset/remedy for risks and impacts to Workers, Affected Communities, and the environment, in a manner relevant and appropriate to the nature and scale of the proposed Project.

EP 3: Applicable Environmental and Social Standards; The Assessment process should, in the first instance, address compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues. EPFIs operate in diverse markets: some with robust environmental and social governance, legislation systems and institutional capacity designed to protect their people and the environment; and some with evolving technical and institutional capacity to manage environmental and social issues. The EPFI's due diligence will include, for all Category A and Category B Projects globally, review and confirmation by the EPFI of how the Project and transaction meet each of the Principles.

EP 4: Environmental and Social Management System and Equator Principles Action Plan; For all Category A and Category B Projects the EPFI will require the client to develop and / or maintain an Environmental and Social Management System (ESMS). Further, an Environmental and Social Management Plan (ESMP) will be prepared by the client to address issues raised in the Assessment process and incorporate actions required to comply with the applicable standards. Where the applicable standards are not met to the EPFI's satisfaction, the client and the EPFI will agree to an Equator Principles Action Plan (EPAP). The EPAP is intended to outline gaps and commitments to meet EPFI requirements in line with the applicable standards.

EP 5: Stakeholder Engagement For all Category A and Category B Projects the EPFI will require the client to demonstrate effective Stakeholder Engagement, as an ongoing process in a structured and culturally appropriate manner, with Affected Communities, Workers and, where relevant, Other Stakeholders. For Projects with potentially significant adverse impacts on Affected Communities, the client will conduct an Informed Consultation and Participation process. The client will tailor its consultation process to: the risks and impacts of the Project; the Project's phase of development; the language preferences of the Affected Communities; their decision-making processes; and the needs of disadvantaged and vulnerable groups. This process should be free from external manipulation, interference, coercion and intimidation.

EP 6: Grievance Mechanism; For all Category A and, as appropriate, Category B Projects, the EPFI will require the client, as part of the ESMS, to establish effective grievance mechanisms which are designed for use by Affected Communities and Workers, as appropriate, to receive and facilitate resolution of concerns and grievances about the Project's environmental and social performance.

EP 7: For all Category A and, as appropriate, Category B Projects, an Independent Environmental and Social Consultant, will carry out an Independent Review of the Assessment process including the ESMPs, the ESMS, and the Stakeholder Engagement process documentation in order to assist the EPFI's due diligence and determination of Equator Principles compliance. The Independent Environmental and Social Consultant will also propose or opine on a suitable EPAP capable of bringing the Project into compliance with the Equator Principles, or indicate where there is a justified deviation from the applicable standards. The Independent Environmental and Social Consultant must be able to demonstrate expertise in evaluating the types of environmental and social risks and impacts relevant to the Project.

EP 8: Covenants; An important strength of the Equator Principles is the incorporation of covenants linked to compliance. For all Projects, where a client is not in compliance with its environmental and social covenants, the EPFI will work with the client on remedial actions to bring the Project back into compliance. If the client fails to re-establish compliance within an agreed grace period, the EPFI reserves the right to exercise remedies, including calling an event of default, as considered appropriate..

EP 9: Independent Monitoring and Reporting; For all Category A and, as appropriate, Category B Projects, in order to assess Project compliance with the Equator Principles after Financial Close and over the life of the loan, the EPFI will require independent monitoring and reporting

EP 10: Reporting and Transparency; as a minimum, the project owner should ensure that a summary of the ESIA is accessible and available online and includes a summary of human rights and climate change risks and impacts, where relevant.

2.3.4 International Agreement and Guidelines for Labour and Working Conditions

2.3.4.1 International Labor Organization

The International Labor Organization, which was established with the aim of developing and advancing the standards in the labor laws and practices in this field in countries, aims to realize rights in working life, to encourage decent employment opportunities, to strengthen social protection and to strengthen dialogue on working life issues. The ILO has four strategic goals;

- The dissemination and implementation of standards, basic principles and rights in working life,
- Increasing the opportunities required for women and men to work in decent jobs and earn decent income,
- Expanding the scope of social protection for all and increasing its effectiveness,
- Strengthening tripartite and social dialogue.

There are 59 contracts from ILO Conventions, which are approved by Turkey, and 55 of them are in force. Some of Turkey's approved contracts are as follows;

Table 2.2: Turkey's Approved Contracts

Convention Name	ILO Admission Date	The date that Convention entered into force in Turkey
Unemployment Convention numbered 2	29. 10. 1919	14. 07. 1950
Freedom of Association (Agriculture) Convention numbered 11	25. 10. 1921	29. 03. 1961

Convention Name	ILO Admission Date	The date that Convention entered into force in Turkey
Weekly Rest (Industry) Convention numbered 14	25. 10. 1921	27. 12. 1946
Weekly Rest (Industry) Convention numbered 14	25. 10. 1921	27. 12. 1946
Minimum Age (Trimmers and Attendants) Convention* numbered 15	29.10. 1921	29. 09. 1959
Minimum Wage Determination Method Convention numbered 26	30. 05. 1928	29. 01. 1975
Forced Labor Convention numbered 29	06. 06. 1930	30. 10. 1998
Paid Employment Offices Convention numbered 34	08. 06. 1933	27. 12. 1946
Worker Compensation Convention (Occupational Diseases) numbered 42 (Revised)	04. 06. 1934	27. 12. 1946
On the Underground Works Convention numbered 45 (Women)	04. 06. 1935	21. 04. 1938
Minimum Age (Sea) Convention numbered 58 (Revised)	22. 10. 1936	29. 09. 1959
Minimum Age (Industry) Convention numbered 59 (Revised)	03. 06. 1937	12. 07. 1993
Young People's Medical Examination (Industry) Convention numbered 77	19. 06. 1947	05. 03. 1951
Labor Inspection Convention numbered 81	17. 06. 1948	12. 07. 1993
Freedom of Association and Protection of the Right to Union Convention numbered 87	17. 06. 1948	14. 07. 1950
The Establishment of the Job and Employment Service Convention numbered 88	08. 06. 1949	29. 03. 1961
Working Conditions Convention (Public Conventions) numbered 94	08. 06. 1949	29. 03. 1961
Protection of Wages Convention numbered 95	18. 06. 1949	23. 01. 1952

2.3.4.2 EU Directive 89/391/EEC

The European Union Directive 89/391/EEC of 12.06.1989 was created to promote improvements in safety and health of workers. Therefore, it contains information on occupational risk prevention, safety and health protection, elimination of risk and accident factors, information, consultation, national laws and/or practices, and principles, guidelines, and training principles for employee implementation.

This Directive applies to all sectors of activity, both public and private (industrial, agricultural, commercial, administrative, service, education, culture, entertainment, etc.). However, It cannot be applied to certain specific public service activities, such as the armed forces of the police, or certain specific activities in the civil protection service. The Member State will take the necessary steps to ensure that employers, workers and representatives of workers are subject to the legal provisions necessary for the implementation of this Regulation.

The directive, consisting of 19 articles, includes main headings for the health and safety of employers and workers.

2.3.4.3 IFC Environmental, Health, and Safety (EHS) Guidelines Occupational Health and Safety

The IFC Occupational Health and Safety section provides guidance and examples of reasonable measures to be implemented in managing key risks to occupational health and safety. Most of the guidance also applies to construction and decommissioning activities, although the focus is placed on the operational phase of projects. According to the IFC Occupational Health and Safety guidelines, employers should hire technically qualified contractors to manage the occupational health and safety issues of their employees and carry out hazard management activities through formal procurement Conventions.

According to IFC, preventive and protective measures should be taken in the following order of priority;

- Eliminating the hazard by removing the activity from the work process. Examples include substitution with less hazardous chemicals, using different manufacturing processes, etc.
- Controlling the hazard at its source through use of engineering controls. Examples include local exhaust ventilation, isolation rooms, machine guarding, acoustic insulating, etc.;
- Minimizing the hazard through design of safe work systems and administrative or institutional control measures. Examples include job rotation, training safe work procedures, lock-out and tag-out, workplace monitoring, limiting exposure or work duration, etc.
- Providing appropriate personal protective equipment (PPE) in conjunction with training, use, and maintenance of the PPE.

The application of prevention and control measures to occupational hazards should be based on comprehensive occupational safety or occupational hazard analysis. The results of these analyzes should be prioritized as part of an action plan based on the likelihood and severity of the consequence of exposure to the hazards identified. An example of a qualitative risk ranking/analysis matrix has been provided by IFC OHS to help set priorities (see Table 2.3).

Table 2.3: Risk Ranking Table to Classify Worker Scenarios Based on Likelihood and Consequence

Likelihood	Consequences				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain	L	M	E	E	E
Likely	L	M	H	E	E
Moderate	L	M	H	E	E
Unlikely	L	L	M	H	E
Rare	L	L	M	H	H
Legend E: extreme risk; immediate action required H: high risk; senior management attention needed M: moderate risk; management responsibility should be specified L: low risk; manage by routine procedures					

2.3.4.4 IFC Performance Standards

The Labor and Working Conditions standard, which is the IFC Performance Standard 2, is another IFC guide that will set an example for occupational health and safety. IFC Performance Standard 2 recognizes that the pursuit of economic growth through job creation and income generation must be balanced with the protection of fundamental rights of the employees.

Failure to establish and develop a sound worker-management relationship can weaken employee engagement and jeopardize a project. Conversely, through a constructive worker-management relationship and by treating workers fairly and providing them with safe and healthy working conditions, tangible benefits such as increasing the efficiency and productivity of operations of the customers improve the project.

The requirements set out in this Performance Standard are partly guided by international Conventions negotiated through the International Labor Organization (ILO) and the United Nations (UN). The purpose of the IFC PS 2 is;

- Establishing, maintaining, and improving the worker-management relationship,
- Promoting fair treatment, non-discrimination and equal opportunity of employees and compliance with national labor and employment laws,
- Protecting the workforce by addressing child labor and forced labor,
- Promoting safe and healthy working conditions and to protect and improve the health of employees.

While the applicability of this Performance Standard is determined in the Social and Environmental Assessment process, the implementation of the necessary actions to meet the requirements of this Performance Standard is managed through the Social and Environmental Management System of the client. The assessment and management system requirements are outlined in Performance Standard 1.

2.3.4.5 European Bank for Reconstruction and Development (EBRD) Requirements

The European Bank for Reconstruction and Development (EBRD) Requirement 2: Labor and Working Conditions states that the workforce is a valuable asset for employers and their business activities, and that good human resources management and a sound worker based on respect for rights of workers, including

freedom of association and the right to work. acknowledges that there is a management relationship. EBRD PR2 objectives are given below;

- To respect and protect the basic principles and rights of employees,
- To promote a decent work agenda, including fair treatment, non-discrimination, and equal opportunities for employees,
- To establish, maintain and improve a solid worker-management relationship,
- To encourage compliance with collective Conventions, national labor and employment laws,
- To protect and improve the safety and health of employees, especially by promoting safe and healthy working conditions,
- To prevent forced labor and child labor (as defined by ILO).

Rönesans has a "Manual for Health Safety & Environment" management plan, which has been created within the scope of Occupational Health and Safety. In the activities carried out in line with this plan, responsible people are appointed, and management is ensured by taking necessary OHS measures.

Rönesans, from the above-mentioned national legislation, Occupational Health and Safety Law, Labor Law, Regulation on Duties, Authorities, Responsibilities and Training of Occupational Safety Specialists, Communique on Workplace Hazard Classes Regarding Occupational Health and Safety, IFC Standards and Guidelines and EU Directives will properly carry out business activities.

Table 2.4: Permitting Plan for the Project

Permit	Authority	Responsibility	Timing	Date Received	Status/Permit No
Environmental					
Mersin-Adana EIA Decision*	Ministry of Environment and Urbanization	TCDD	10.07.2015	10.07.2015	E-2015531
İncirlik-Toprakkale EIA Decision*	Ministry of Environment and Urbanization	TCDD	19.06.2012	19.06.2012	2577
Toprakkale- Bahçe EIA Decision*	Ministry of Environment and Urbanization	TCDD	05.05.2014	05.05.2014	E-201464
Bahçe - Nurdağı EIA Decision*	Ministry of Environment and Urbanization	TCDD	05.10.2011	05.10.2011	2309
Nurdağ – Başpınar EIA Decision*	Ministry of Environment and Urbanization	TCDD	25.03.2013	25.03.2013	2834
Waste Management					
Environmental Permit for Camp Sites	Ministry of Environment and Urbanization	Rönesans	Before Activities	-	-

Permit	Authority	Responsibility	Timing	Date Received	Status/Permit No
Other					
Construction Permit	Ministry of Environment and Urbanization	Rönesans	Before Construction	-	-
Forest Permit	Ministry of Agriculture and Forest	Rönesans	Before Construction	-	-
Non-Agricultural Usage Permit	Ministry of Agriculture and Forest	Rönesans	Before Construction	-	-
Protocol for cultural heritage (especially for Kamışlı/Yarma Mound)	Directorate of Cultural Heritage Preservation Regional Board	Rönesans	Before construction activities near the Kamışlı/Yarma Mound and anywhere else where recommended by Directorate of Cultural Heritage Preservation Regional Board	-	-

3 PROJECT DESCRIPTION

3.1 Project Overview

The Project awarded to Rönesans through a tender by TCDD is a High Standard Train Project where construction, electrification and signaling processes will be carried out. The High Standard Train Project will be built between Mersin-Adana-Osmaniye-Gaziantep (Başpınar) routes and a railway of 286 km in total will be created. The unfinished parts of the railway between Mersin and Gaziantep are planned to be completed in 34 months by Rönesans, followed by 24 months warranty period.

The 286 km long High Standard Train Project will start from Mersin, pass through Tarsus, Adana, Incirlik, Toprakkale, Bahçe, Nurdağ, Başpınar stations, and last at Mustafa Yavuz Station. 78 km of this 286 km line is between Mersin and Adana, 79 km between Adana and Toprakkale, 56 km between Toprakkale and Bahçe, 17 km between Bahçe and Nurdağ and the last 56 km between Nurdağ and Başpınar is planned to be.

All construction, electrification and signaling operations on the route between Mersin and Ceyhan, other operations excluding construction between Ceyhan and Toprakkale, construction, electrification and signaling operations excluding tunnel construction between Toprakkale and Bahçe, signaling operations only between Bahçe and Nurdağ, the first 41 km between Nurdağ and Başpınar excluding construction works and all operations on the remaining 15 km will be carried on Rönesans.

With the High Standard Train Project, it is aimed to shorten the travel time and increase passenger comfort by reducing Adana-Gaziantep travel time by 1.5 hours. In addition to shortening the travel time, it will be a great investment for Gaziantep with a population of approximately 2 million and Mersin with an international port. Other stations between Mersin-Gaziantep route and passing through certain provinces/districts will provide passenger comfort and economic benefits.

In 2023, it is aimed to increase the passenger capacity in railway transportation from 1.3% to 3.8% with the High Standard Train Project planned.

3.2 Project Categorization

According to Equator Principles, categorization scale is in 3 different categories. These categories are A, B and C. The Category A is large projects that can cause significant adverse environmental and social risks and/or impacts that are diverse, irreversible, or unprecedented such as projects that take 15 years or more.

In general, according to IFC and EBRD standards, train projects can be categorized as Category A Project. Category A Projects are defined by EBRD as projects which are likely to have significant environmental and/or social impacts and which require a more formalized process of assessment than other projects. The planned Train Project can be considered as Category A since it passes through especially important natural areas, water bodies and may have an impact on number of employees and geographical size. In addition, since the ESIA process is currently underway, it has been deemed appropriate to be considered Category A.

In summary, since the train project is a stable and long-term project and its impact will remain for a long time, it is also likely to be Category A according to reasons which are the described above in the category descriptions.

3.3 Project Scope and Extend

The main scope of the Project is high standard railway construction and rehabilitation between Mersin and Gaziantep Provinces of Turkey.

Turkey aims to improve intermodal and multimodal applications by using the geographic advantage of Turkey to;

- Increase the share of railway and seaway in transportation,
- Establish a fast, flexible, safe, reliable, and integrated transportation system and so reduce logistic costs and trade facilitation,

- Increase growing competitiveness for logistics and transportation within the scope of 11th Development Plan covering the period 2019-2023.

For this purpose;

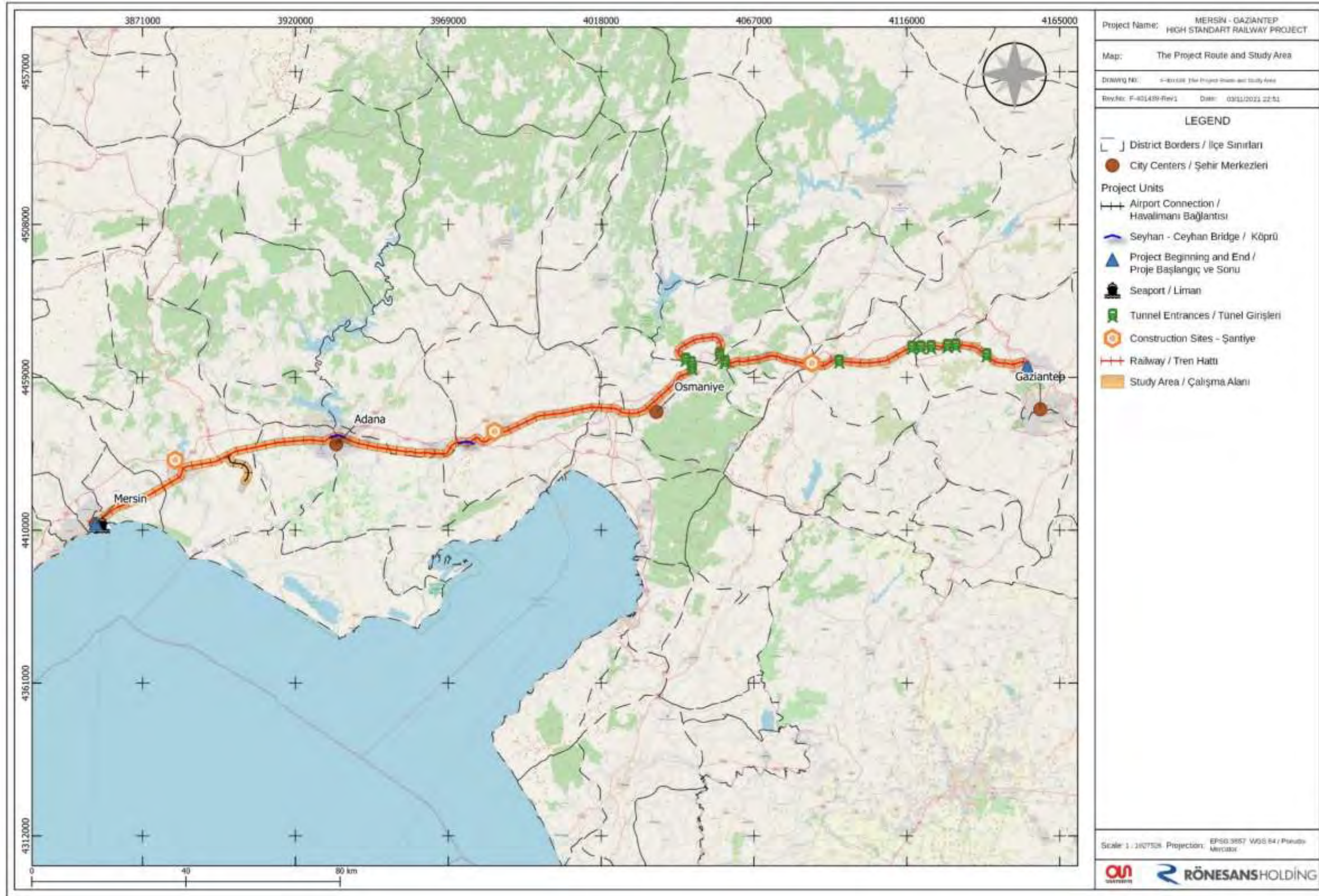
- Ongoing high standard railways will be completed,
- Planning for high standard railway will be made by considering the balance of supply and demand,
- Express services will be increased, and
- Travel times will be shortened.

In this context, it is planned that the total length of high standard railway, which were 1,213 km in 2018, will be increased to 5,595 km, and the share of railway passenger transportation is increased in total (on land) from 1.3% to 3.8% in 2023.

The studies for the completion of Mersin-Adana-Osmaniye-Gaziantep High Standard Railway System have been started in accordance with 11th Development Plan, and the Project was awarded to Rönesans. Rönesans has vast experience in superstructure projects, and it is one of the largest contracting companies in the world.

The Train Project, which is the subject of this report and 286 km in length, starts from Mersin, passes through Adana, İncirlik, Toprakkale, Bahçe, Nurdağ, Başpınar Stations respectively and ends at the Mustafa Yavuz Station. Following the completion of the railway, the travel time between Adana and Gaziantep will be reduced to 1.5 hours. As a result, while the transportation cost to Mersin where there exists an international port reduces, the competition opportunities of producers, especially located in Gaziantep will increase because, Gaziantep is an industrial city with a population of around 2 million.

Project route and study area are shown as a map below (see Map 3.1).



Map 3.1: The Project Route and Study Area

Currently, there are 2 lines between Mersin and Gaziantep Provinces. Rehabilitation of the available lines, construction of 2 new lines, electrification, signaling, and telecommunications and the connection of the line with Çukurova Airport and Tarsus are taken into consideration in the scope of the Project.

By implementing the Project, the following benefits will be achieved;

- Expansion and development of the national railway network,
- Increasing the share of railways in intercity transportation,
- Providing fast, secure, continuous and economical transportation,
- Reducing intercity logistic costs,
- Ensuring safe traffic and station management with an effective capacity of the national railway network.

Within the scope of the project, 21 stations, 35 viaducts/bridges, 3 tunnels (NATM & cut-and-cover), 61 subway & overpasses, 190 culverts and also 22,080,000 m³ excavation, 950,000 m³ concrete, 206,000 m piles, 561 km line laying, 266 switches, 10,188 catenary poles for electrification operations and 2100 km cable production for signaling processes.

Construction, electrification and signaling operations on the 79 km Mersin-Adana route of the 286 km Mersin-Gaziantep (Başpınar) high standard railway, construction, electrification and signaling operations on the 49 km section of the 79 km Adana-Toprakkale route and other 30 km of the route electrification and signaling processes; construction, electrification and signaling operations excluding tunnels on the 56 km Toprakkale-Bahçe route, 17 km Bahçe-Nurdağ route only signaling process, the first 41 km of the 56 km Nurdağ-Başpınar route electrification and signaling operations and the construction, electrification and signaling operations in the remaining 15 km will be carried out by Rönesans.

The scope of the study is as given in Section 1.2. A study area of 2 km in total was created by taking 1 km from the right and left of the line along the line related to the impact assessment studies carried out within the scope of the project.

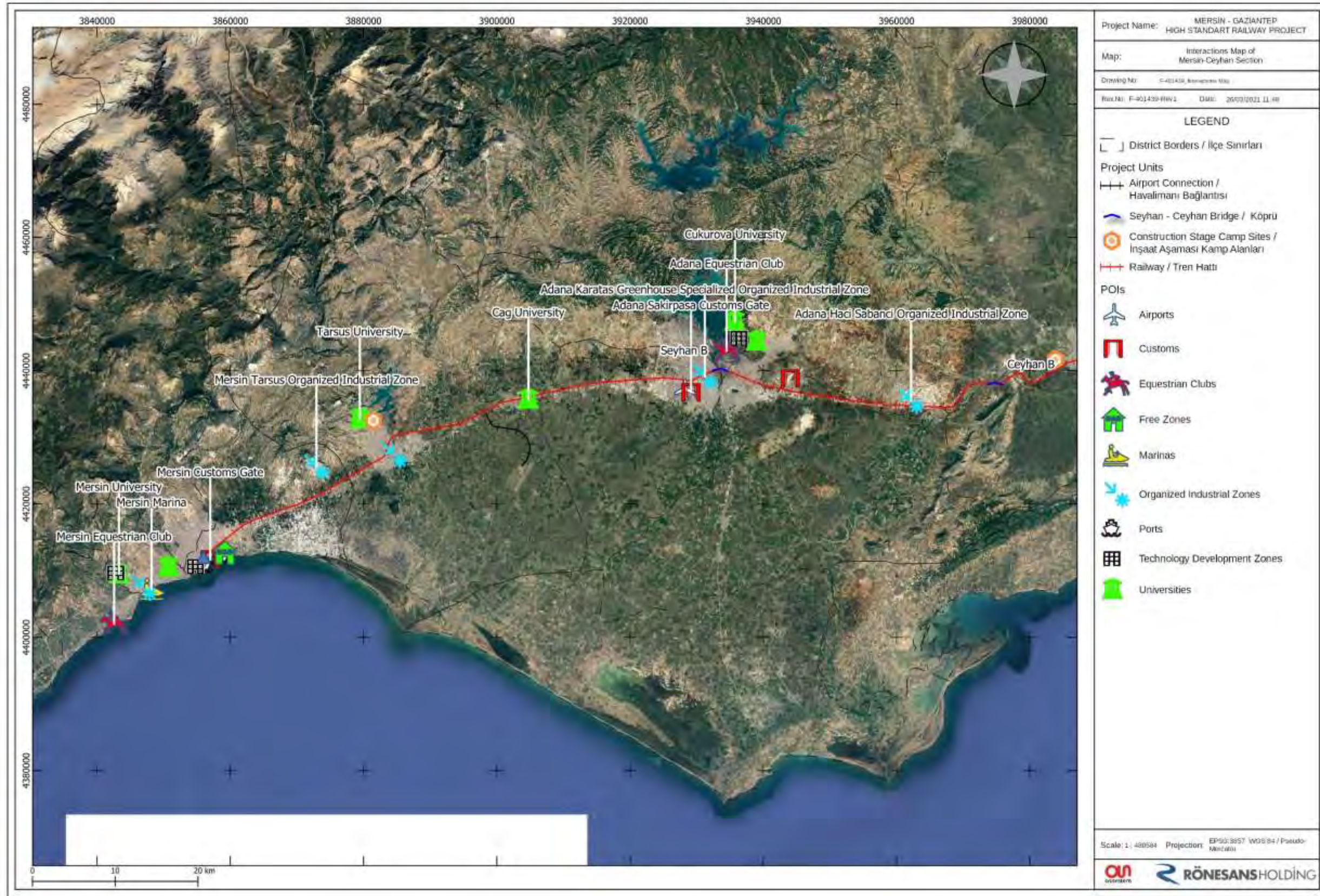
3.4 Major Facilities in the Project Vicinity

Major facilities in the Project vicinity are listed below (see Table 3.1) and Interaction map of the major facilities with the Project is given in the maps below (see Map 3.2 and Map 3.3).

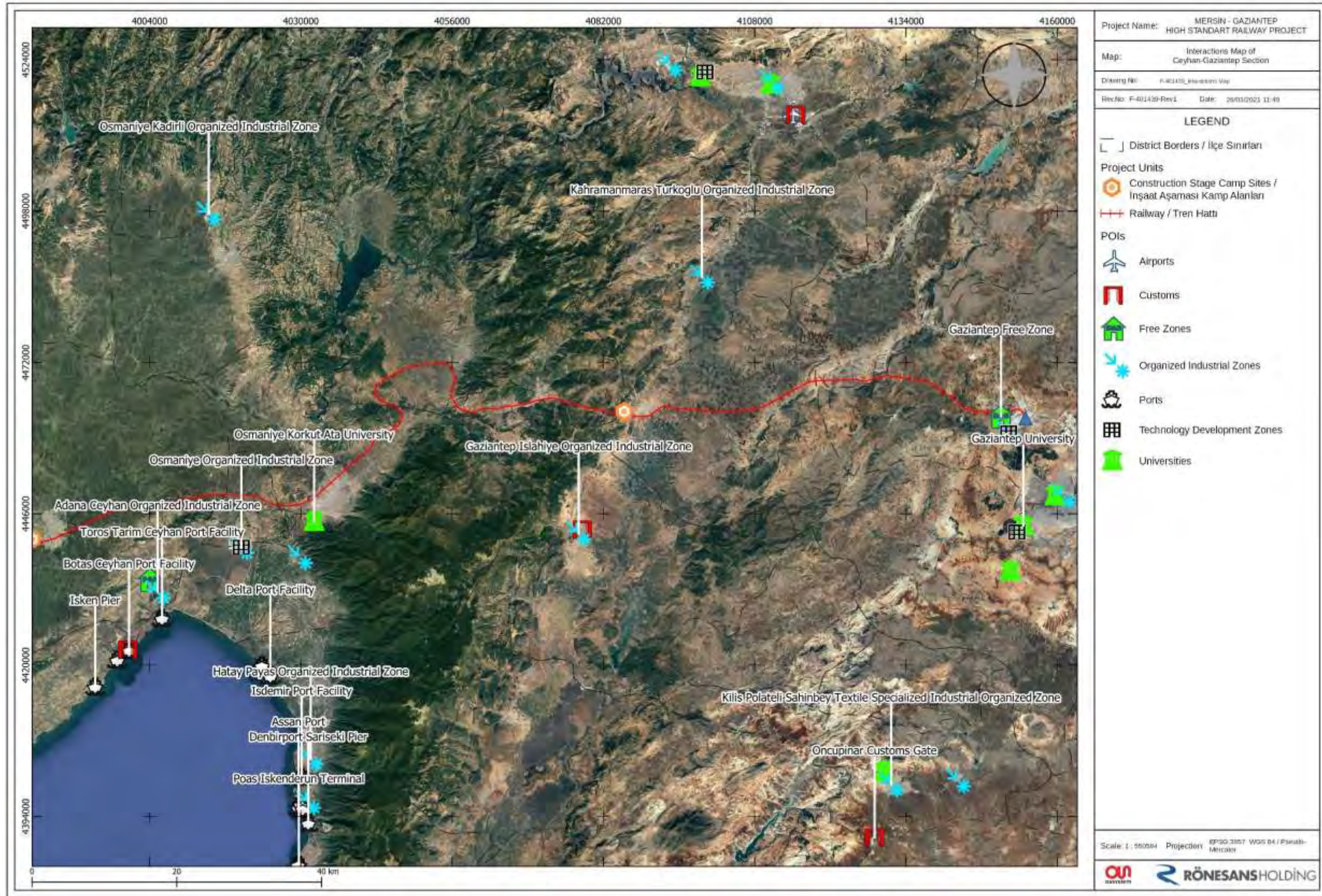
Table 3.1: Major Facilities in the Project Vicinity

City	Facilities in the Project Vicinity
Mersin	Mersin Food and Agriculture Specialized Technology Development Zone
	Mip Mersin Port
	Mersin Customs Gate
	Mesbas Port Facility
	Mersin Mut Organized Industrial Zone
	Mersin Technology Development Zone
	Mersin Free Zone
	Mersin Tarsus Organized Industrial Zone

City	Facilities in the Project Vicinity
	Mersin Tarsus Agricultural Product Processing Organized Industrial Zone
Adana	Adana Airport
	Adana Sakirpasa Customs Gate
	Adana Karatas Greenhouse Specialized Organized Industrial Zone
	Cukurova Technology Development Zone
	Adana Incirlik Customs Gate
	Adana Haci Sabanci Organized Industrial Zone
	Adana Yumurtalik Free Zone
	Adana Ceyhan Organized Industrial Zone
	Toros Tarım Ceyhan Port Facility
	Botaş Ceyhan Port Facility
	Isken Pier
Osmaniye	Osmaniye Technology Development Zone
Gaziantep	Gaziantep Free Zone
	Gaziantep Organized Industrial Zone



Map 3.2: Interaction Map of the Major Facilities with the Project Between Mersin-Ceyhan



Map 3.3: Interaction Map of the Major Facilities with the Project Between Ceyhan - Gaziantep

3.5 Estimated Benefits of the Projects

Estimated benefits of the Projects,

- The travel time between Adana-Gaziantep will be shortened by 1.5 hours with the High Standard Train Project,
- It will increase the passenger comfort,
- It provides an important economic effect,
- Especially for Mersin, which is a port city, the port will contribute to the development of local and intercity transportation and the development of the economy,
- It is expected to provide employment in the cities where the stations and stops of the high standard train pass,
- With the shortening of the travel time and the increase in comfort, it is expected that the number of tourists coming to the region will increase and accordingly, the region around the project area will be improved economically.

3.6 Utilities to be Relocated

Necessary expropriation procedures have been carried out and there is no infrastructure components to be relocated.

3.7 Temporary Construction Facilities

For the construction on the route, 3 construction sites will be installed and the structures in these sites are planned to be prefabricated.

During the construction period of the High Standard Train Project such as excavation, filling, and coating, works will be carried out along the line. In the areas where Rönesans is responsible for the construction operations, temporary construction sites are established where the construction works are carried out. These construction sites are units with a certain number of employees and equipment used for construction operations.

As a result of preliminary studies, Merkez Tarsus construction site is positioned as the central construction site and Ceyhan as the second construction site. Nurdağı construction site is located as the third construction site.

There is no stockyards planned to be built within the scope of the Project.

3.8 Project Units

3.8.1 Earthworks

Information about the soil work in construction period given in the table below (see Table 3.2). The extracted vegetable soil is expected to be stored on site temporally.

During the excavations to be carried out along the route, the topsoil to be taken at the first stage will be temporarily stored along the route at certain intervals. It will be used in landscaping after the general excavation works are completed. Topsoil remaining after this use will be transferred to the area determined by the relevant municipality.

For the management of excavation wastes, the provisions of the Regulation on Control of Excavated Soil, Construction and Demolition Wastes Official Gazette dated 18.03.2004 and numbered 25406 will be provided.

Table 3.2: Excavation and Filling Amounts

Section	km	Distance (km)	Excavation (m³)	Filling (m³)	Rock Fill (m³)
Mersin Adana	0+000				
	10+000	10	235,877	65,789	186,000
	20+000	10	249,194	65,789	312,000
	30+000	10	269,360	65,789	196,800
	40+000	10	256,450	65,789	150,000
	352+869	10	255,965	65,789	136,000
	362+869	10	268,263	65,789	208,000
	370+091	7	200,114	46,052	172,000
Airport Connection	09+400	9.4	461,700	59,210	140,000
	Total		2,196,922	499,996	1,500,800
Adana Toprakkale	370+091	0			
	382+869	13	176,000	246,835	200,772
	392+869	10	169,180	189,873	154,440
	402+869	10	364,370	189,873	154,440
	412+869	10	434,610	189,873	154,440
	422+869	10	130,000	189,873	154,440
	432+869	10	135,000	189,873	154,440
	442+869	10	135,000	189,873	154,440
	00+385	6	66,000	113,924	92,664
	Total		1,610,160	1,499,997	1,220,076
Toprakkale Nurdağ	00+385	0			
	10+385	10	533,660	467,600	39,473
	20+386	10	500,000	2,904,000	39,473
	30+385	10	2,985,511	1,048,000	39,473
	40+385	10	3,200,000	2,470,000	39,473
	50+385	10	2,105,858	1,045,000	39,473
	60+385	10	2,110,000	902,500	39,473
	76+400	16	1,923,548	600,000	63,158
	Total		13,358,577	9,437,100	299,996
Nurdağ Başpınar	86+400	10	351,000	302,000	
	96+400	10	1,169,000	454,000	10,000
	106+400	10			
	116+400	10	40,000		
	126+400	10	212,300	245,000	
		5	620,000		
	Total		2,392,300	1,001,000	10,000

3.8.2 Stations, Buildings and Engineering Structures

The station information of the High Standard Train Project on the Mersin-Gaziantep (Başpınar) route is written in the following items. For the construction on the route, 3 construction sites will be installed and the structures in these sites are planned to be prefabricated.

In order to determine the existing conditions of the project area, Assystem ENVY carried out a field exploration study between 4-16 October 2020.

Mersin - Adana Section (76 km)

- Existing 2 convectional lines will be rehabilitated,
- The third and fourth high standard railway lines will be constructed,
- The river crossing bridge constructed of 20 steel structures will be removed and a concrete bridge will be built instead,
- Length of existing 46 culverts in the first and second line will be extended to the third and fourth line,
- 12 stations will be built,
- EST systems of 4 lines will be installed,
- Incomplete infrastructures and superstructures on Çukurova airport connection line, which is 9.5 km double line, will be built. In addition, EST systems and a 1113 m long viaduct will be built on this connecting line,
- Turkish State Railways (TCDD) will construct subways, overpasses, and surrounding walls and these are not included in the scope of this project.

The images of the railway between Mersin-Adana and the route of Mersin-Adana information map is given below (see Figure 3.1, Figure 3.2, Figure 3.3, Figure 3.4, Figure 3.5, Figure 3.6, Figure 3.7 and Map 3.4).



Figure 3.1: Mersin Province



Figure 3.2: Between Mersin and Taşkent



Figure 3.3: Taşkent Station-1



Figure 3.4: Between Taşkent and Tarsus



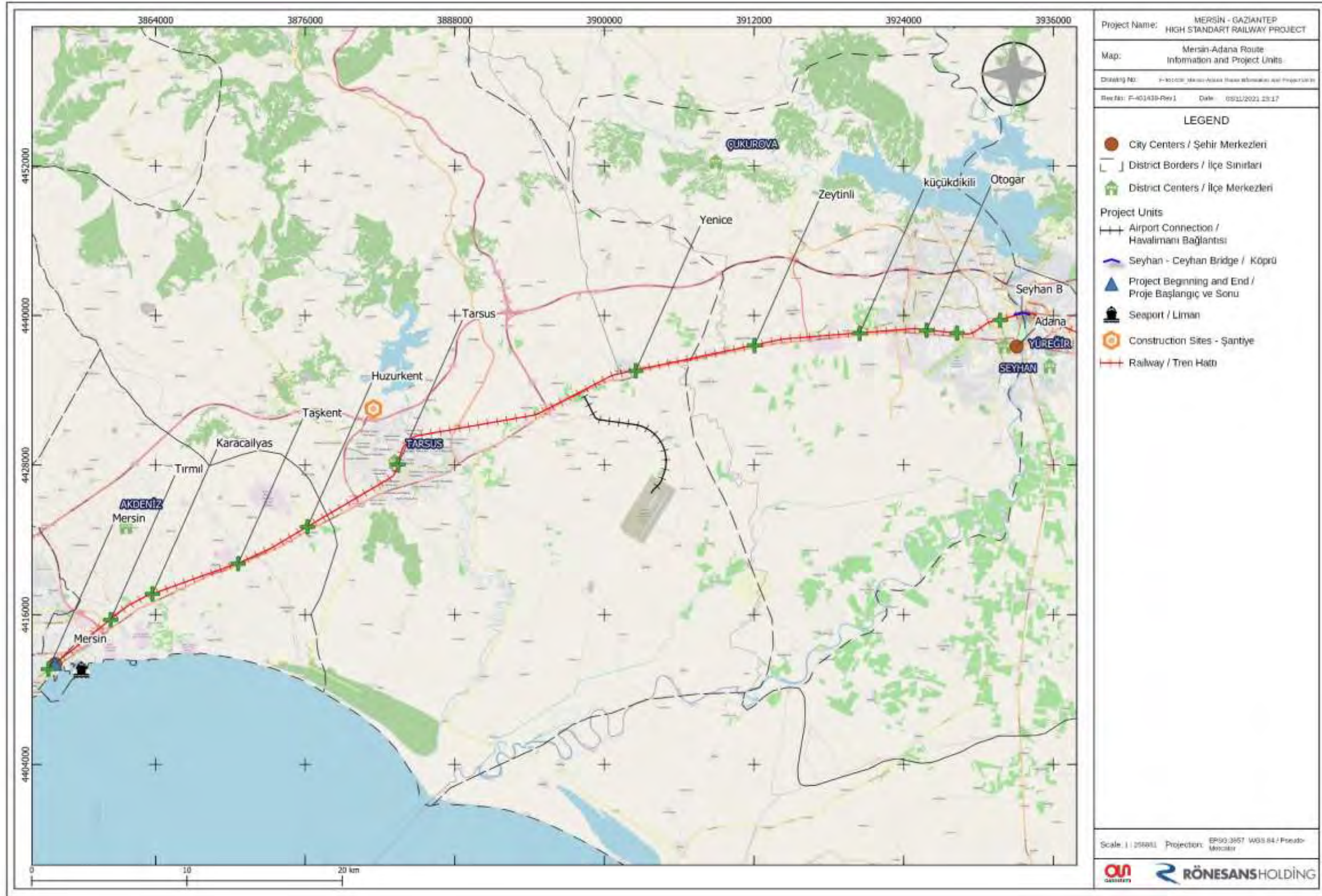
Figure 3.5: Entrance to Tarsus



Figure 3.6: Between Tarsus and Adana-1



Figure 3.7: Between Tarsus and Adana-2



Map 3.4: Mersin-Adana Route Information and Project Units

Adana - İncirlik - Ceyhan - Toprakkale Section (79 km)

- The first 49 km section of the 79 km double rail line will be constructed, infrastructures and superstructures will be built, and EST will be installed,
- Infrastructure and superstructure work of the last 30 kilometers of the line will be completed by another contractor, but electrification and signaling works of this part will be carried out,
- 3 hydraulic bridges, 12 overpasses, 8 underpasses, 54 culverts and 1 tunnels will be constructed,
- A viaduct will be built on a 4 km section due to the inability to fit into the existing line in İncirlik region,
- 5 stations in the line will be reconstructed.

The images of the railway between Adana and Toprakkale and the route of Mersin-Adana information map is given below (see Figure 3.8, Figure 3.9, Figure 3.10, Figure 3.11, Figure 3.12, Figure 3.13 and Map 3.5).



Figure 3.8: Adana-1



Figure 3.9: Adana-2



Figure 3.10: Adana-3



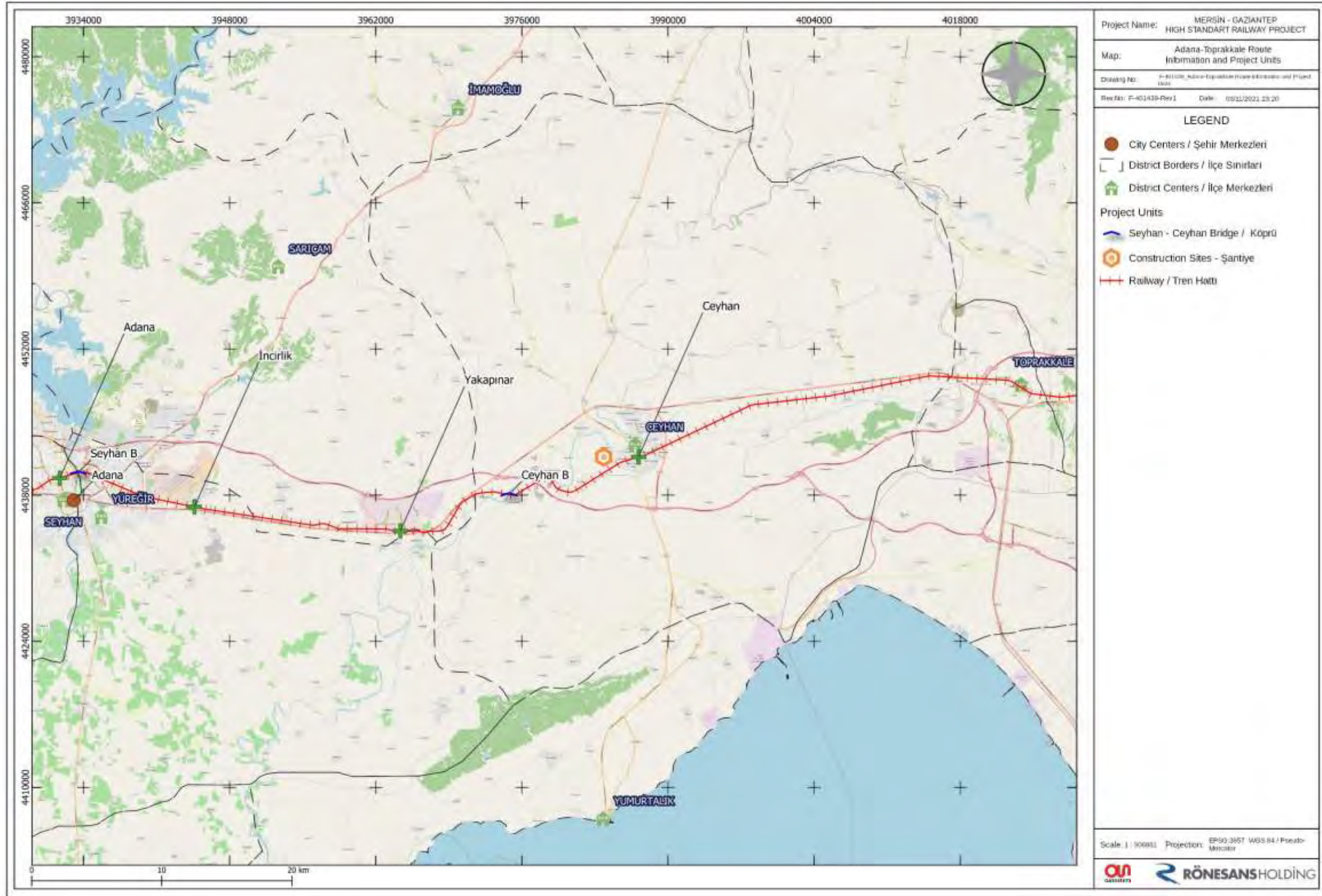
Figure 3.11: Between Adana and Ceyhan



Figure 3.12: Yılkaya Quarry



Figure 3.13: Between Ceyhan and Toprakkale



Map 3.5: Adana-Toprakkale Route Information and Project Units

Toprakkale - Osmaniye - Bahçe Section (58 km)

- 8 km double railway line will be constructed between Toprakkale - Osmaniye - Bahçe, all infrastructures and superstructures in line will be completed,
- The construction of 11 cut and cover tunnels (2,387 m), 5 tunnels (9,785 m), 9 single tube escape tunnels (3,687 m) and 7 cut and cover escape tunnels (449 m) will be carried out by another contractor. These are not in the scope of the Project,
- 5 viaducts, 15 overpasses, 23 underpasses and 83 culverts will be built,
- 3 stations will be constructed.

The images of the railway between Toprakkale-Bahçe and the route of Toprakkale-Bahçe information map is given below (see Figure 3.14, Figure 3.15, Figure 3.16, Figure 3.17 and Map 3.6).



Figure 3.14: Entrance to Osmaniye



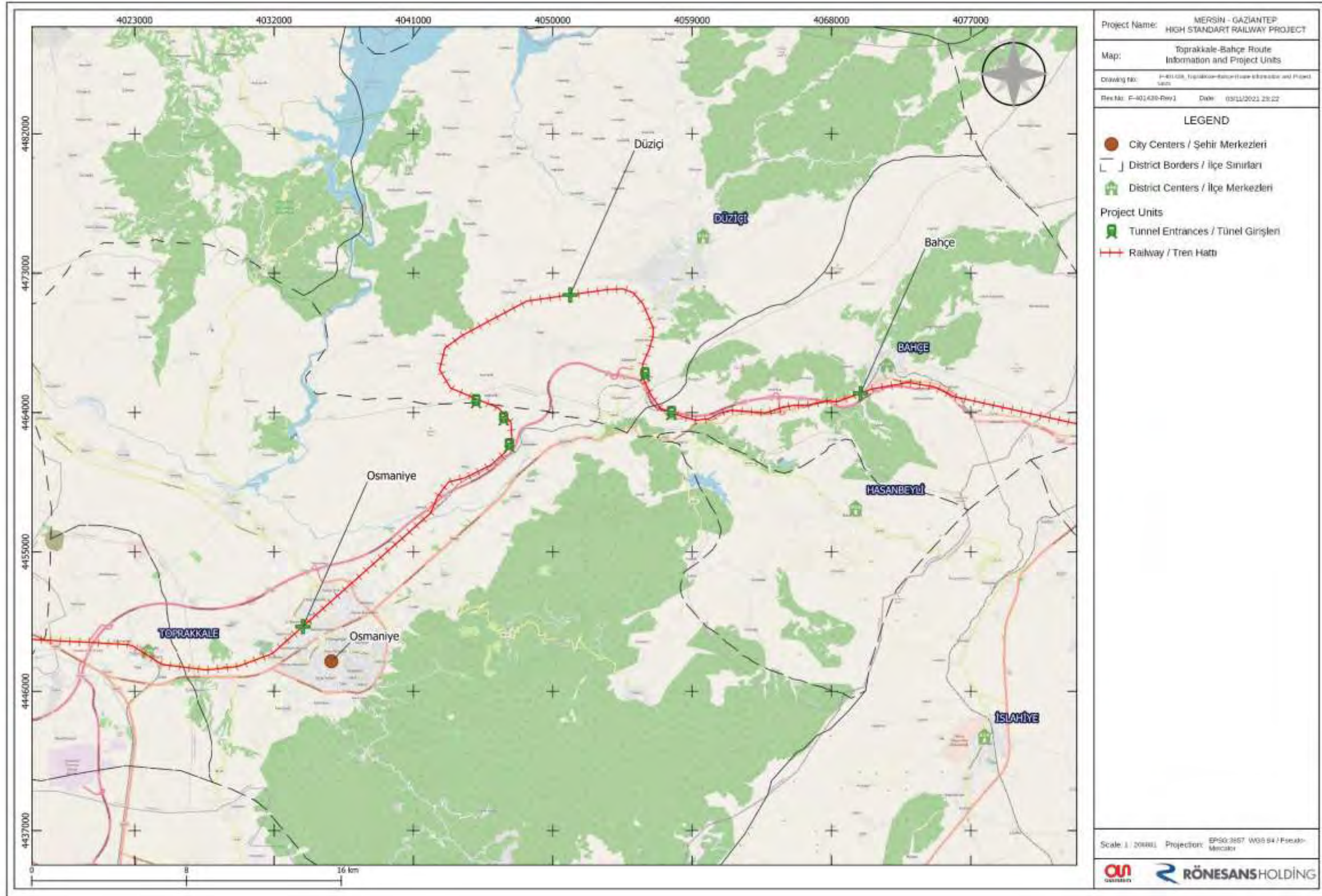
Figure 3.15: Osmaniye Train Station



Figure 3.16: Between Osmaniye and Şekerdere



Figure 3.17: Between Düziçi and Bahçe



Map 3.6: Toprakkale-Bahçe Route Information and Project Units

Bahçe - Nurdağ Section (approx. 19 km)

- Only signalization works for the 19 km dual railway line will be carried out. Another contractor will carry out all other necessary works.

The images of the railway between Bahçe-Nurdağ and the route of Bahçe-Nurdağ information map is given below (see Figure 3.18, Figure 3.19, Figure 3.20 and Map 3.7).



Figure 3.18: Entrance to Bahçe



Figure 3.19: Railway in Bahçe



Figure 3.20: Works Between Bahçe and Nurdağ



Nurdağ–Başpınar Section (56 km)

- The final 16 km section of the 56 km dual rail line will be constructed. Infrastructures and superstructures of this line and EST systems will be built,
- Another contractor will carry out infrastructure and superstructure work of the first 40km section. However, electrification and signaling works of this part will be carried out,
- 3 viaducts, 2 overpasses, 1 underpass, 8 culverts and 1 tunnel will be constructed,
- 1 station will be built.

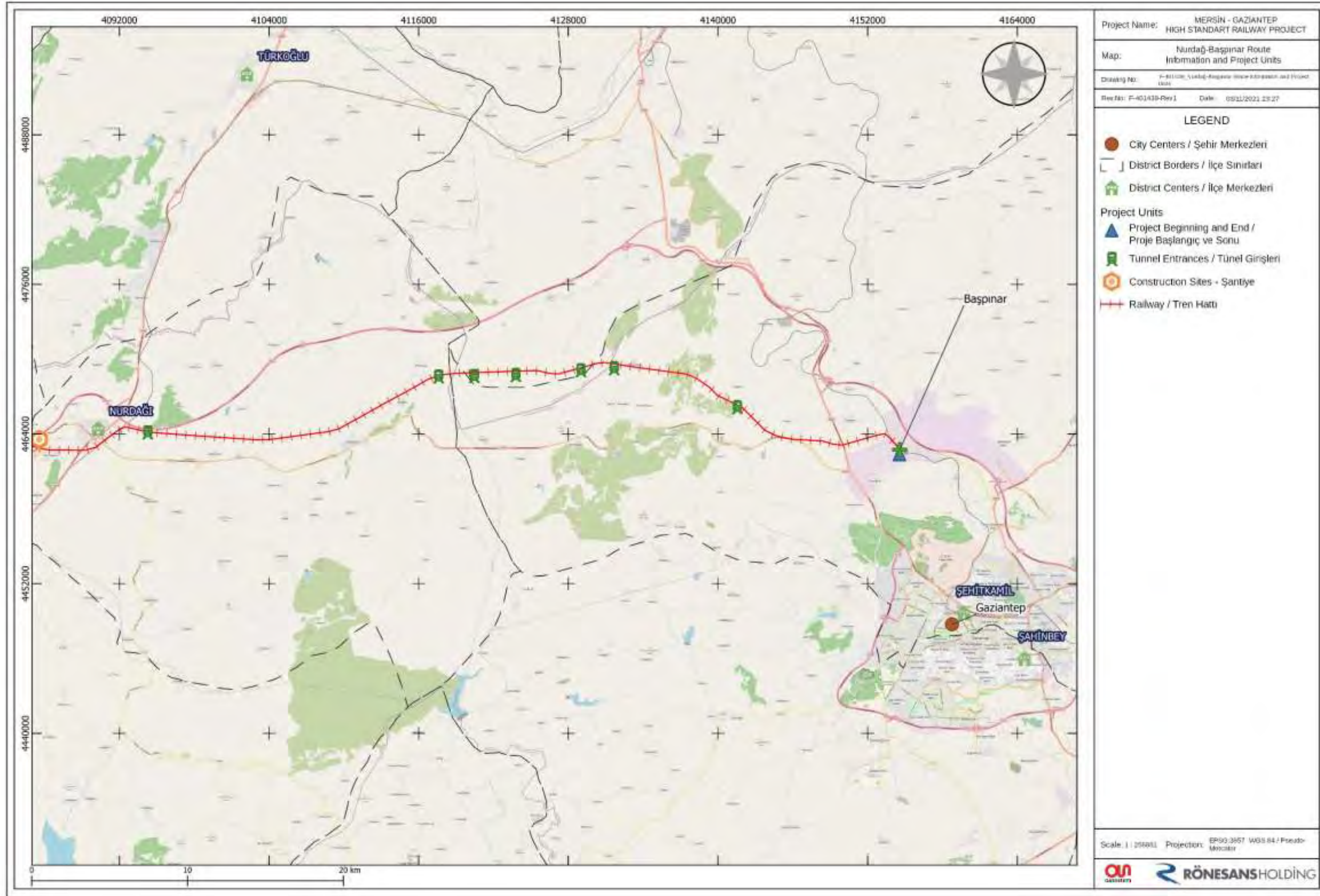
The images of the railway between Nurdağ-Başpınar and the route of Nurdağ-Başpınar information map is given below (see Figure 3.21, Figure 3.22 and Map 3.8).



Figure 3.21: Entrance to Nurdağ



Figure 3.22: Başpınar Quarry



Map 3.8: Nurdağ-Başpınar Route Information and Project Units

The tunnel pictures that will take place between the routes are given below (see Figure 3.23, Figure 3.24, Figure 3.25, Figure 3.26 and Figure 3.27).



Figure 3.23: Tunnel-5 Location



Figure 3.24: Exit of Tunnel-5



Figure 3.25: Ongoing Activities in Tunnel-6 Location



Figure 3.26: Exit of Tunnel-6

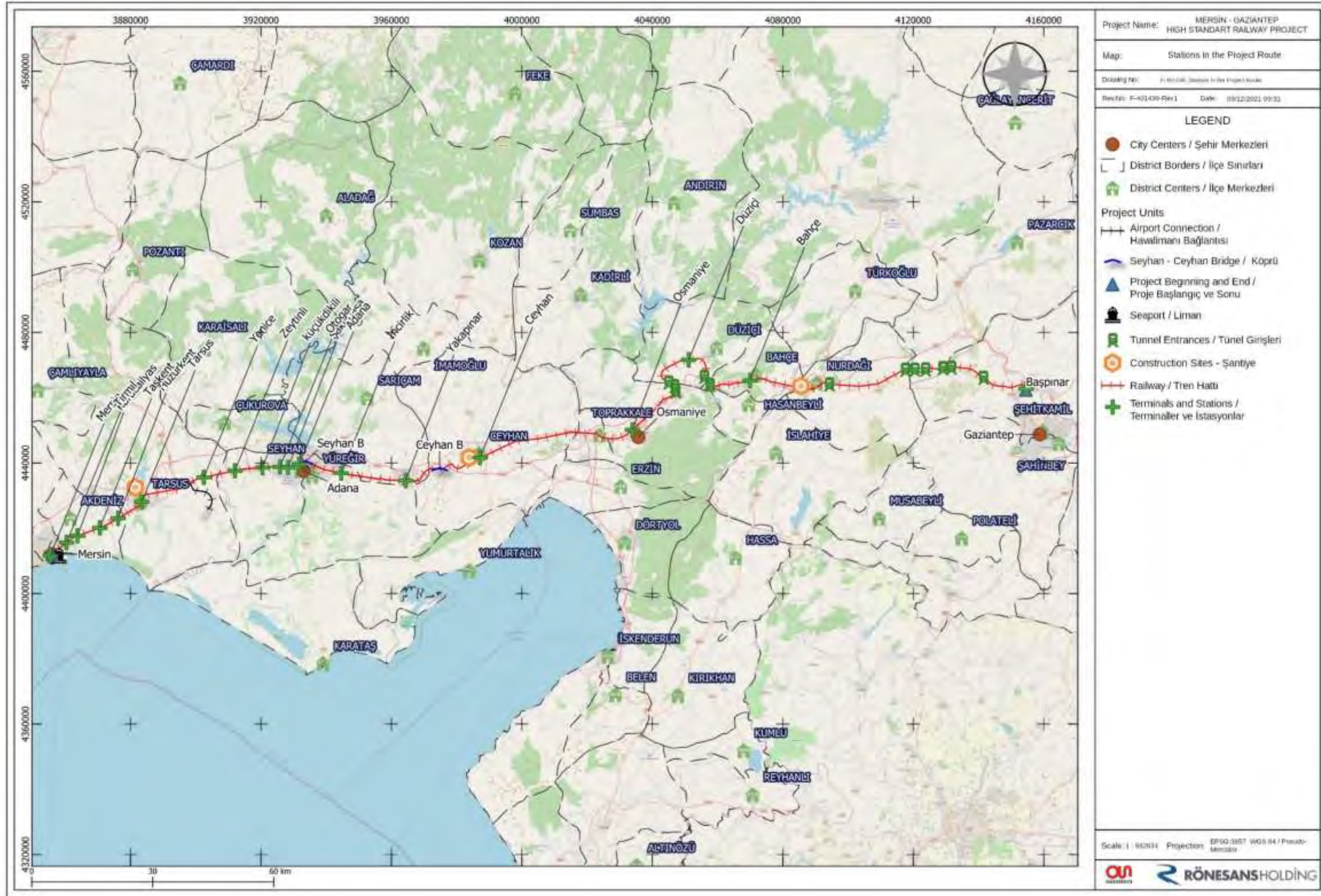


Figure 3.27: Filling Material Stock Area

Except the Düziçi Station, all other terminals and stations were built before the High Standard Train Project because there was already an existing railway line. Station names throughout the project route and their coordinates were given table and map below (see Table 3.3 and Map 3.9).

Table 3.3: Stations and Their Coordinates

Station Name	Longitude (E)	Latitude (N)
Mersin Terminal	34.63372687°	36.80266792°
Tırmıl Station	34.67857793°	36.83112110°
Karacailyas Station	34.70865818°	36.84606961°
Taşkent Station	34.77042144°	36.86346425°
Huzurkent Station	34.82041041°	36.88472373°
Tarsus Station	34.88565582°	36.92063497°
Yenice Station	35.05683163°	36.97456608°
Zeytinli Station	35.14237438°	36.98921613°
Küçükdikili Station	35.21817930°	36.99611349°
Terminal	35.26638707°	36.99787877°
Şakirpaşa Station	35.28835984°	36.99629617°
Adana Terminal	35.31929676°	37.00371655°
İncirlik Station	35.43523620°	36.98407618°
Yakapınar Station	35.61246865°	36.96755389°
Ceyhan Station	35.81746669°	37.01826115°
Osmaniye Terminal	36.23682167°	37.07934956°
Düziçi Station	36.39188895°	37.23272965°
Bahçe Station	36.56036932°	37.18725021°
Başpınar Terminal	37.32118198°	37.16936906°



Map 3.9: Stations in the Project Route

A ballasted railway line is structurally divided into two main parts as infrastructure and superstructure. The superstructure consists of rails, sleepers, connection materials, ballast layer and sub-ballast layer, while the infrastructure consists of compacted base floor and formation layer. A typical railways structure and components were given in the figure below (see Figure 3.28).

- **The ballast layer:** transmit all the effects transmitted by the sleepers to the platform by spreading without permanent collapses and with the friction between the grains and forms an elastic bed to the road frame. It is a layer consisting of crushed stone between 15-80 mm.
- **The sub-ballast:** a transitional layer between the upper good quality chunky ballast layer and the lower well graded subgrade.
- **The base ground:** the layer of ballast and the material under the sub-ballast layer. This layer is one of the most important layers as it can cause road breakdowns and poor road quality.
- **Formation layer:** the layer laid between the ground and the superstructure in cases where the base ground is insufficient.
- **The sleepers:** are the elements that are placed at certain intervals perpendicular to the rails, which meet the forces acting on the rail on a wider surface and transfer them to the ballast layer, detect and protect the opening of the road and keep the road on its axis against side effects. They are in accordance with the railway freight transfer model.
- **Connection materials:** materials that form a frame with high stability by connecting the rails to other rails and sleepers provide force transfer between the rails and the rail and the sleeper, prevent the shape and displacement of the rails, and reduce the effects on the superstructure with elastic deformations (Tacıroğlu, 2016).

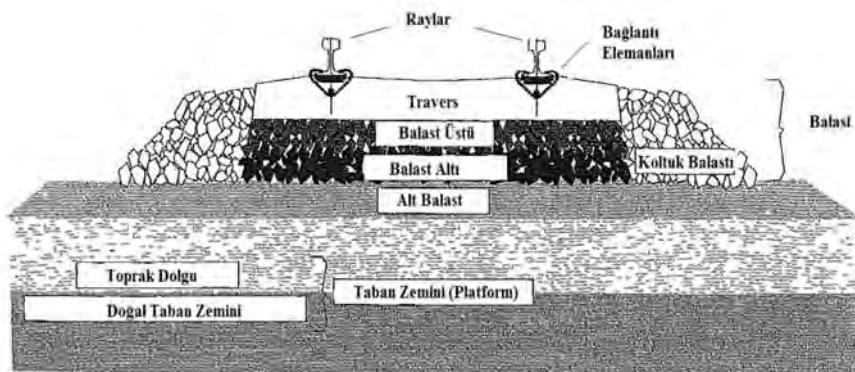


Figure 3.28: A Typical Railway Structure and Components

Cross section given below is a typical cross section of a railway line and it can change depending on the application area along the line (see Figure 3.29).

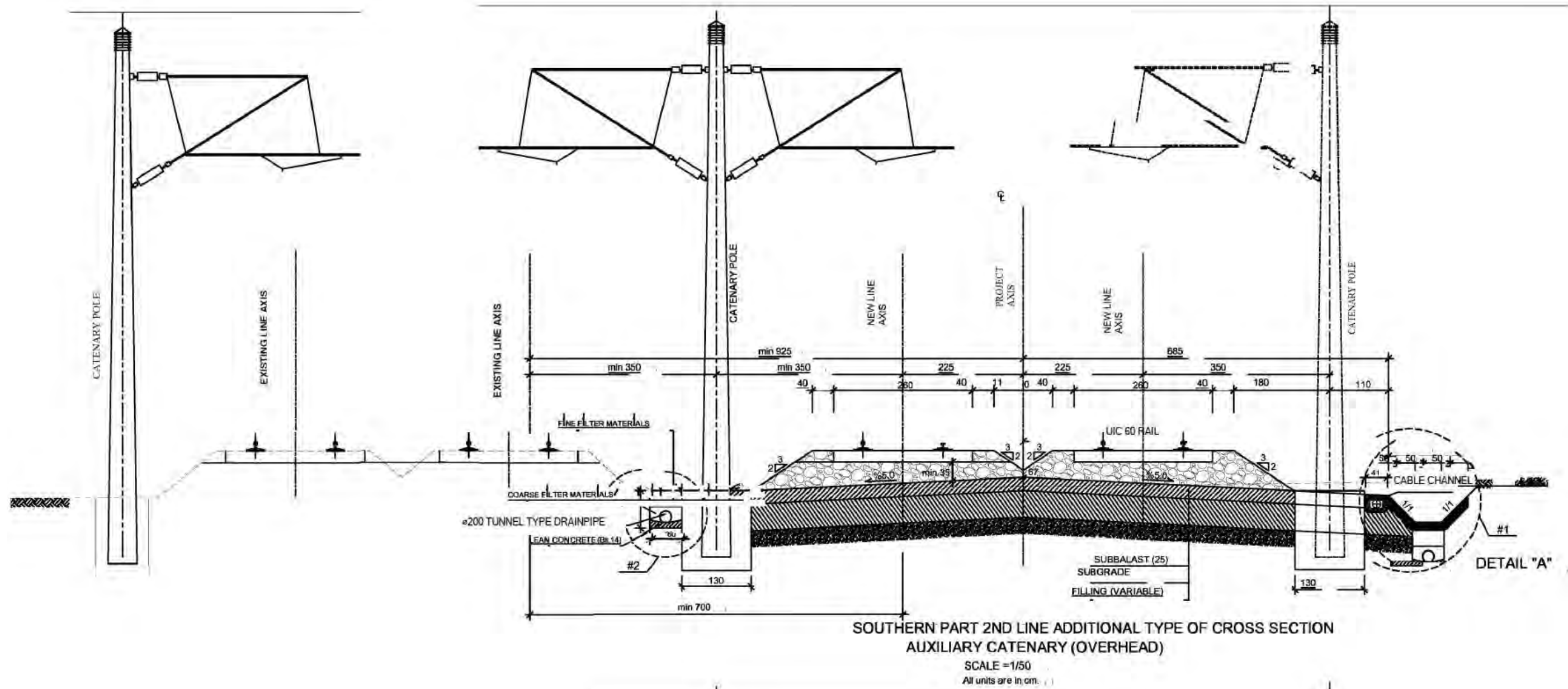


Figure 3.29: A Typical Cross Section of the Railway Line

Engineering structures used in the Mersin-Gaziantep High Standard Train Project and typical cross section of engineering structures are given in the following table with their definitions and figures (see Table 3.4, Figure 3.30, Figure 3.31, Figure 3.32, Figure 3.33 and Figure 3.34).

Table 3.4: Stations and Their Coordinates

Engineering Structure	Definition
Bridge	The structure having a gap greater than 10 m (including 10 m) used for passing obstacles such as stream, valley, highway, and rail.
Culvert	The engineering structure having a gap about 10 m and that is built under the road body for removing the water coming from the municipal adjacent area and built to ensure that the road will function properly during the operation period.
Overpass	The main structure that allows the highway to cross over the railway or another highway.
Tunnel	The underground structure that is built with creation and supporting of a gap in a desired cross-section with the excavation works underground.
Underpass	The main structure that allows the highway to cross under the railway or another highway.
Viaduct	The bridge that is built to remove road and junction intersections and that enables the railway and highway passage from the valley that has a huge gap and elevation.

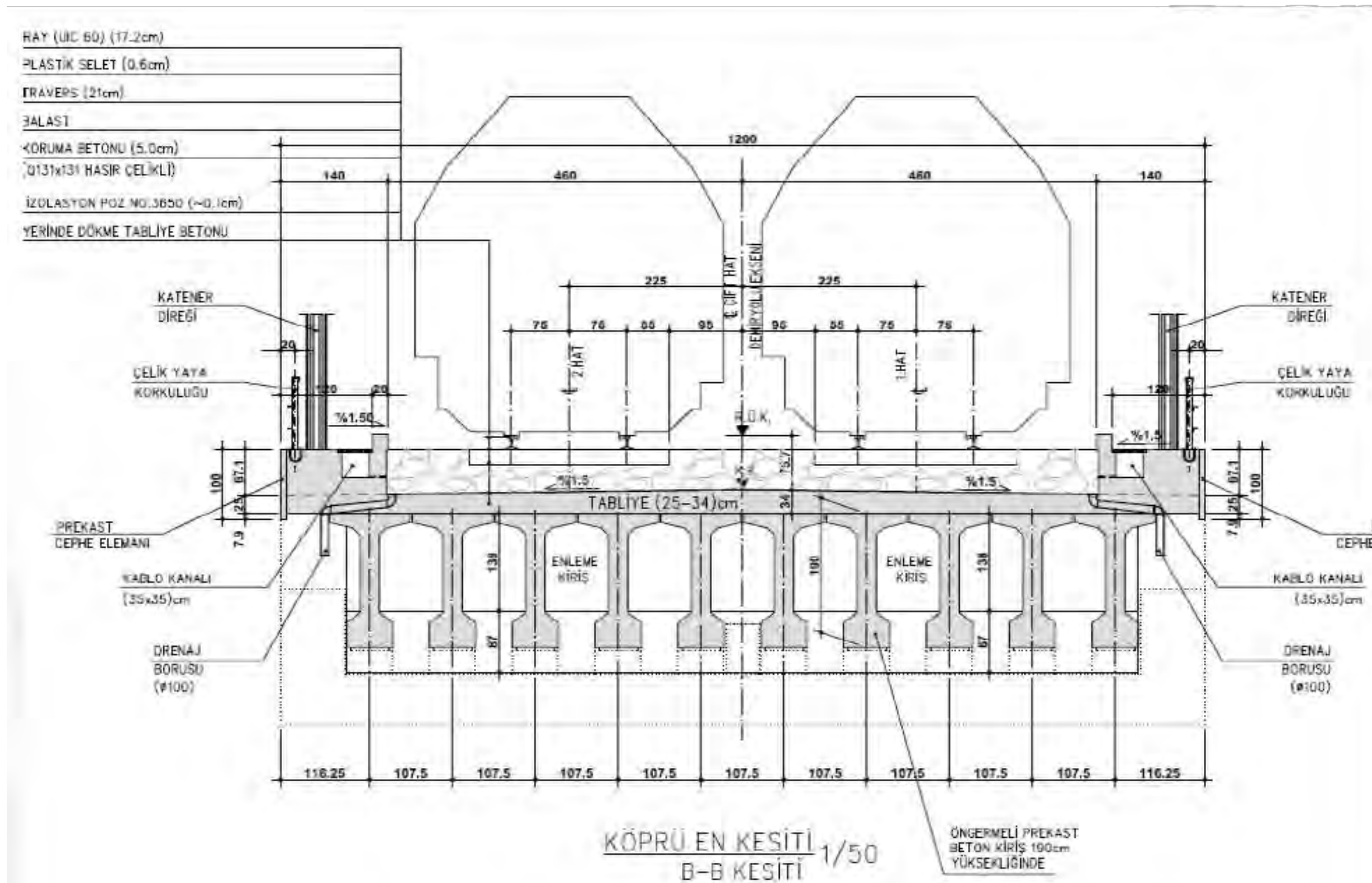


Figure 3.30: Example of a Typical Cross-Section – Bridge – Viaduct 1

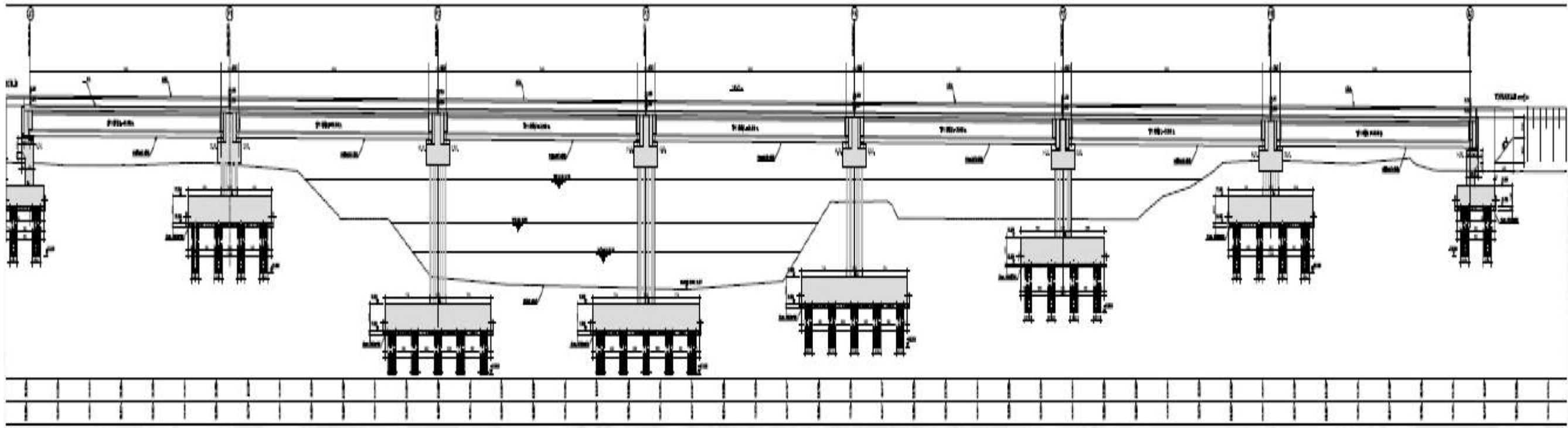


Figure 3.31: Example of a Typical Cross-Section – Bridge – Viaduct 2

Box Section Underpass

Wide Spacious (Precast) Underpass

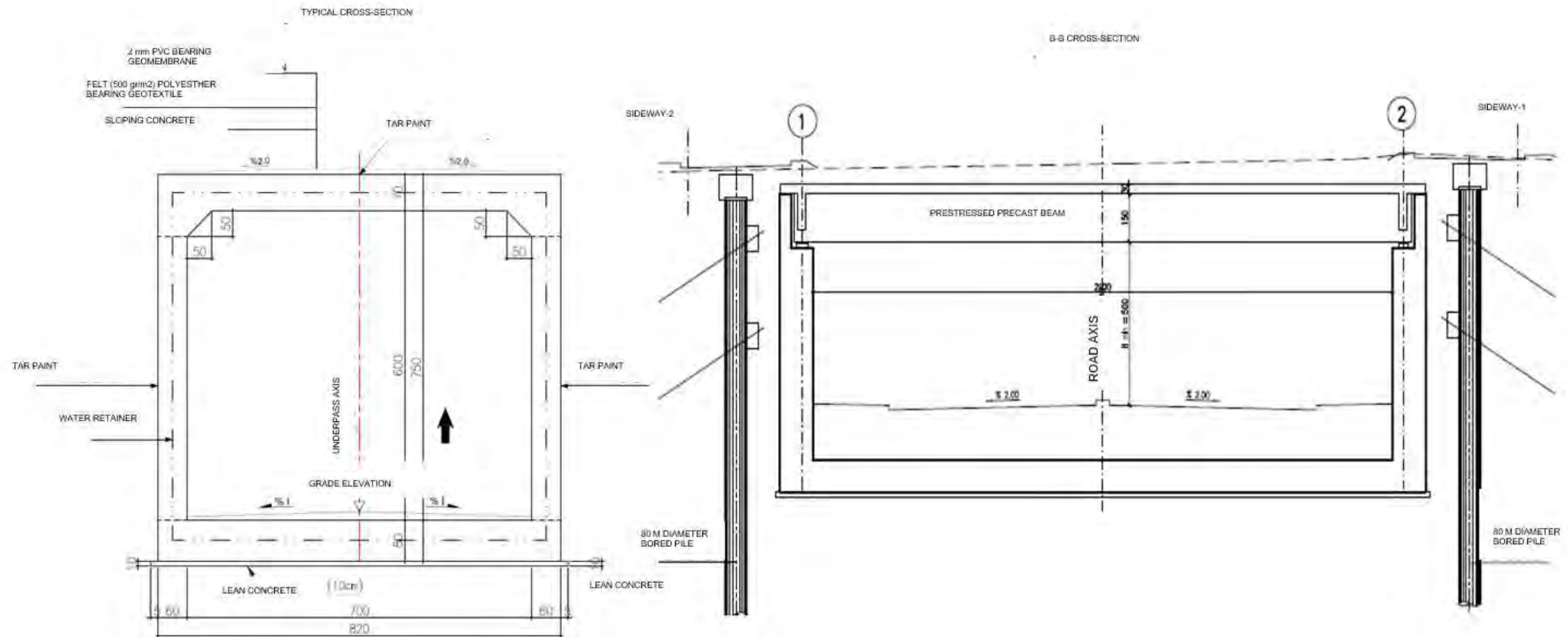


Figure 3.32: Example of a Typical Cross-Section - Underpass



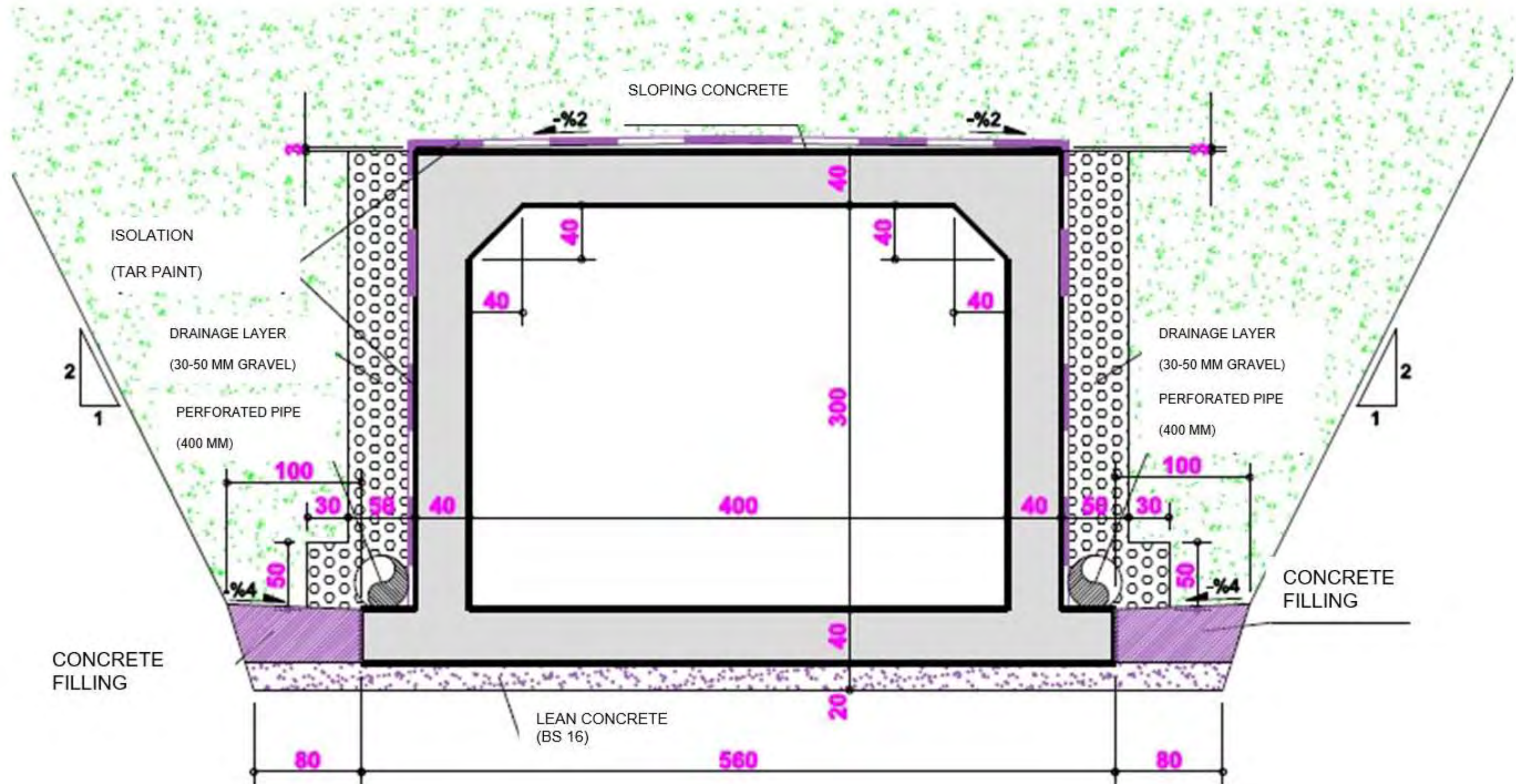


Figure 3.34: Example of a Typical Cross-Section - Culvert

3.8.3 Rail and Loop/Siding Development

A rail loops which is also called as rail siding places on the main railway line. The rail loop provides the passage of the trains that are coming from the opposite directions. As can be seen in the figure below, a rail loop has double end with the connection to the main at both ends (see Figure 3.35). To be able to provide a safe passage to the trains, rail loop should be longer than the length of the train [36].

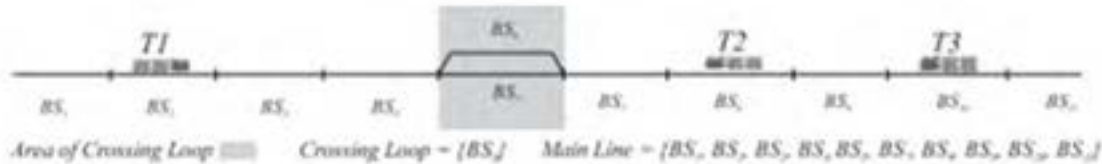


Figure 3.35: A Typical Rail Loop/Siding

There is no rail loop/siding throughout the Mersin-Gaziantep Railway Route.

3.8.4 Station Access Roads

Suppling of the access to the stations for the community is an important subject. For most of the stations, existing roads will be rehabilitated and used. For the new stations to be built, connection roads will be built close to the existing highways.

3.8.5 Bridges, Tunnels and Engineering Structures

5 different consultancy/contracting companies are involved in the construction of the High Standard Train Project. These companies are companies that have been contracted by TCDD with different tenders. Each of these companies has different business scopes. As can be seen from the tables below, even structures like the engineering structures, bridges, tunnels and so on will be constructed by these 5 companies. The list of structures under the responsibility of Rönesans is given in Table 3.5 and the list of structures under the responsibility of other contractors (4 companies) is given in Table 3.6.

Table 3.5: Structures under the Responsibility of the Rönesans

Section	Beginning (km+m)	Finish	Length (m)	Class	Status
Mersin-Adana	000+000			Project Start	Information
Mersin-Adana	001+700			Overpass	Available
Mersin-Adana	001+862	001+882	20.00	Railway Crossing Bridge	Structure Renewal
Mersin-Adana	002+999		14.00	Culvert	Structure
Mersin-Adana	003+344		11.00	Culvert	Structure
Mersin-Adana	004+926	006+221	1,295.00	Station	Information
Mersin-Adana	007+558	007+621	63.00	Railway Crossing Bridge	Structure Renewal
Mersin-Adana	008+150	008+676	526.00	Station	Information
Mersin-Adana	008+508		19.00	Culvert	Structure
Mersin-Adana	008+614		18.50	Culvert	Structure

Section	Beginning (km+m)	Finish	Length (m)	Class	Status
Mersin-Adana	008+875		14.00	Culvert	Structure
Mersin-Adana	009+467		14.00	Culvert	Structure
Mersin-Adana	009+800			Overpass	Available
Mersin-Adana	010+554	010+584	30.00	Railway Crossing Bridge	Structure Renewal
Mersin-Adana	012+035		14.00	Culvert	Structure
Mersin-Adana	012+052		14.00	Culvert	Structure
Mersin-Adana	013+357		14.00	Culvert	Structure
Mersin-Adana	013+460	015+294	1,834.00	Station	Information
Mersin-Adana	014+461		7.00	Culvert	Structure
Mersin-Adana	015+062		14.50	Culvert	Structure
Mersin-Adana	015+610		14.00	Culvert	Structure
Mersin-Adana	016+497		18.00	Culvert	Structure
Mersin-Adana	016+517		15.00	Culvert	Structure
Mersin-Adana	016+979		13.50	Culvert	Structure
Mersin-Adana	017+671	017+691	20.00	Railway Crossing Bridge	Structure Renewal
Mersin-Adana	018+830	019+340	510.00	Station	Information
Mersin-Adana	019+020		67.00	Overpass	Available
Mersin-Adana	019+482	019+502	20.00	Railway Crossing Bridge	Structure Renewal
Mersin-Adana	019+684	019+721	37.00	Railway Crossing Bridge	Structure Renewal
Mersin-Adana	020+921		89.00	Overpass	Available
Mersin-Adana	021+136		12.00	Culvert	Structure
Mersin-Adana	021+722		14.00	Culvert	Structure
Mersin-Adana	021+963		14.00	Culvert	Structure
Mersin-Adana	022+505		17.00	Culvert	Structure
Mersin-Adana	023+301		13.00	Culvert	Structure
Mersin-Adana	023+375		14.00	Culvert	Structure
Mersin-Adana	023+987		14.00	Culvert	Structure
Mersin-Adana	024+294		13.00	Culvert	Structure
Mersin-Adana	024+517		14.00	Culvert	Structure
Mersin-Adana	024+533	024+553	20.00	Railway Crossing Bridge	Structure Renewal
Mersin-Adana	025+977	027+199	1,222.00	Station	Information
Mersin-Adana	027+940			Overpass	Available
Mersin-Adana	028+051	028+130	79.00	Railway Crossing Bridge	Structure Renewal
Mersin-Adana	028+740		14.00	Culvert	Structure
Mersin-Adana	029+244		14.00	Culvert	Structure
Mersin-Adana	029+548		14.00	Culvert	Structure
Mersin-Adana	029+836	029+848	12.00	Railway	Structure Renewal

Section	Beginning (km+m)	Finish	Length (m)	Class	Status
				Crossing Bridge	
Mersin-Adana	030+340		13.50	Culvert	Structure
Mersin-Adana	030+945		13.70	Culvert	Structure
Mersin-Adana	031+701		14.50	Culvert	Structure
Mersin-Adana	031+932		14.82	Culvert	Structure
Mersin-Adana	032+259		15.00	Culvert	Structure
Mersin-Adana	033+218		14.00	Culvert	Structure
Mersin-Adana	034+160	034+202	42.50	Railway Crossing Bridge	Structure Renewal
Mersin-Adana	034+598		14.00	Culvert	Structure
Mersin-Adana	034+723	034+735	12.00	Railway Crossing Bridge	Structure Renewal
Mersin-Adana	035+860		74.00	Overpass	Available
Mersin-Adana	036+088		22.00	Culvert	Structure
Mersin-Adana	036+693	036+703	10.00	Railway Crossing Bridge	Structure Renewal
Mersin-Adana	037+071		21.70	Culvert	Structure
Mersin-Adana	037+164		22.00	Culvert	Structure
Mersin-Adana	038+009		13.60	Culvert	Structure
Mersin-Adana	038+994	040+663	1,669.00	Station	Information
Mersin-Adana	040+074		14.20	Culvert	Structure
Mersin-Adana	040+240		13.90	Culvert	Structure
Mersin-Adana	041+025	041+037	12.00	Railway Crossing Bridge	Structure Renewal
Mersin-Adana	043+330			KM Conjugate	Information
Mersin-Adana	346+000			KM Conjugate	Information
Mersin-Adana	346+000	348+917	2,917.00	Station	Information
Mersin-Adana	347+348		19.00	Culvert	Structure
Mersin-Adana	348+535		16.00	Culvert	Structure
Mersin-Adana	350+341		14.80	Culvert	Structure
Mersin-Adana	351+415		23.50	Culvert	Structure
Mersin-Adana	352+949	352+969	20.00	Railway Crossing Bridge	Structure Renewal
Mersin-Adana	353+608	353+970	362.00	Station	Information
Mersin-Adana	353+696		59.00	Overpass	Available
Mersin-Adana	354+336	354+348	12.00	Railway Crossing Bridge	Structure Renewal
Mersin-Adana	356+330	356+340	10.00	Railway Crossing Bridge	Structure Renewal
Mersin-Adana	356+734	356+746	12.00	Railway Crossing Bridge	Structure Renewal
Mersin-Adana	357+913		22.40	Culvert	Structure
Mersin-Adana	359+666	359+678	12.00	Railway Crossing Bridge	Structure Renewal

Section	Beginning (km+m)	Finish	Length (m)	Class	Status
Mersin-Adana	360+474	360+745	271.00	Station	Information
Mersin-Adana	361+156	361+166	10.00	Railway Crossing Bridge	Structure Renewal
Mersin-Adana	362+255	362+267	12.00	Railway Crossing Bridge	Structure Renewal
Mersin-Adana	364+048	364+060	12.00	Railway Crossing Bridge	Structure Renewal
Mersin-Adana	364+790	365+010	220.00	Station	Information
Mersin-Adana	366+980	367+200	220.00	Station	Information
Mersin-Adana	367+000		500.00	Şakirpaşa Junction	Structure
Mersin-Adana	369+343	369+448	105.00	Railway Crossing Bridge	Structure Renewal
Mersin-Adana	369+484	371+069	1,585.00	Station	Information
Mersin-Adana	370+091	000+000		Conventional Project End	Information
Mersin-Adana	371+226	000+000		High Standard Train Project End	Information
Adana- İncirlik - Toprakkale	370+484			Project Start	Information
Adana- İncirlik - Toprakkale	371+170			Subway	Available
Adana- İncirlik - Toprakkale	371+201	371+521	320.00	Hydraulic Bridge	Structure
Adana- İncirlik - Toprakkale	371+750			Overpass	Available
Adana- İncirlik - Toprakkale	373+800		30.00	Overpass	Structure
Adana- İncirlik - Toprakkale	374+170		30.00	Overpass	Structure
Adana- İncirlik - Toprakkale	374+170			Level Crossing	Information
Adana- İncirlik - Toprakkale	374+850		30.00	Overpass	Structure
Adana- İncirlik - Toprakkale	374+850			Level Crossing	Information
Adana- İncirlik - Toprakkale	376+060		30.00	Overpass	Structure
Adana- İncirlik - Toprakkale	376+060			Level Crossing	Information
Adana- İncirlik - Toprakkale	377+100			Culvert	Structure
Adana- İncirlik - Toprakkale	378+800			Culvert	Structure
Adana- İncirlik - Toprakkale	380+365			Culvert	Structure
Adana- İncirlik - Toprakkale	380+400		30.00	Overpass	Structure
Adana- İncirlik - Toprakkale	380+400			Level Crossing	Information
Adana- İncirlik - Toprakkale	380+778	381+798	1,020.00	Station	Information
Adana- İncirlik - Toprakkale	381+198		Ø120	Concrete Pipe	Available
Adana- İncirlik - Toprakkale	381+570			Culvert	Available
Adana- İncirlik - Toprakkale	381+600	382+000	400.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	382+000	382+040	40.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	382+358		13.80	Culvert	Structure

Section	Beginning (km+m)	Finish	Length (m)	Class	Status
Adana- İncirlik - Toprakkale	382+549		30.00	Overpass	Structure
Adana- İncirlik - Toprakkale	383+129		15.30	Culvert	Structure
Adana- İncirlik - Toprakkale	383+383		14.20	Culvert	Structure
Adana- İncirlik - Toprakkale	383+936		14.00	Culvert	Structure
Adana- İncirlik - Toprakkale	384+106		15.70	Culvert	Structure
Adana- İncirlik - Toprakkale	384+260	385+060	800.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	385+111		16.30	Culvert	Structure
Adana- İncirlik - Toprakkale	385+335		16.40	Culvert	Structure
Adana- İncirlik - Toprakkale	385+400	385+440	40.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	385+440	386+040	640.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	386+420	386+540	120.00	Heel Ditch	Structure
Adana- İncirlik - Toprakkale	386+588		16.58	Culvert	Structure
Adana- İncirlik - Toprakkale	386+680	387+280	600.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	387+280	388+000	720.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	387+441		68.00	Subway	Structure
Adana- İncirlik - Toprakkale	387+568		15.00	Culvert	Structure
Adana- İncirlik - Toprakkale	388+072		21.00	Culvert	Structure
Adana- İncirlik - Toprakkale	388+100	388+500	400.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	388+518		21.00	Culvert	Structure
Adana- İncirlik - Toprakkale	388+540	388+820	280.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	388+696		68.00	Subway	Structure
Adana- İncirlik - Toprakkale	388+989		21.50	Culvert	Structure
Adana- İncirlik - Toprakkale	389+040	389+760	720.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	389+776		16.30	Culvert	Structure
Adana- İncirlik - Toprakkale	389+780	389+980	200.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	389+900	390+454	554.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	390+030	390+454	424.00	Intercepting Ditch	Structure
Adana- İncirlik - Toprakkale	390+511	390+537	26.00	Heel Ditch	Structure
Adana- İncirlik - Toprakkale	390+543		23.00	Culvert	Structure
Adana- İncirlik - Toprakkale	390+547	391+010	463.00	Topuk Hendeği	Structure
Adana- İncirlik - Toprakkale	390+980	391+460	480.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	391+192		68.00	Subway	Structure
Adana- İncirlik - Toprakkale	391+532		16.90	Culvert	Structure

Section	Beginning (km+m)	Finish	Length (m)	Class	Status
Adana- İncirlik - Toprakkale	391+560	391+840	280.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	391+840	392+020	180.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	391+959		16.30	Culvert	Structure
Adana- İncirlik - Toprakkale	392+020	392+420	400.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	392+048	392+360	312.00	Intercepting Ditch	Structure
Adana- İncirlik - Toprakkale	392+470		16.40	Culvert	Structure
Adana- İncirlik - Toprakkale	392+520	392+760	240.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	392+839		21.00	Culvert	Structure
Adana- İncirlik - Toprakkale	392+953		16.30	Culvert	Structure
Adana- İncirlik - Toprakkale	392+980	393+400	420.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	393+120	393+220	100.00	Intercepting Ditch	Structure
Adana- İncirlik - Toprakkale	393+240	393+380	140.00	Intercepting Ditch	Structure
Adana- İncirlik - Toprakkale	393+657		24.00	Culvert	Structure
Adana- İncirlik - Toprakkale	393+760	393+820	60.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	393+820	394+180	360.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	394+312		16.90	Culvert	Structure
Adana- İncirlik - Toprakkale	394+300	394+620	320.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	394+620	394+820	200.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	394+860	395+060	200.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	394+866		17.50	Culvert	Structure
Adana- İncirlik - Toprakkale	394+912		68.00	Subway	Structure
Adana- İncirlik - Toprakkale	395+060	395+100	40.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	395+120	395+160	40.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	395+125		15.20	Culvert	Structure
Adana- İncirlik - Toprakkale	395+140	395+140	0.00	Heel Ditch	Structure
Adana- İncirlik - Toprakkale	395+160	395+520	360.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	395+300	395+480	180.00	Intercepting Ditch	Structure
Adana- İncirlik - Toprakkale	395+545		146.00	Culvert	Structure
Adana- İncirlik - Toprakkale	395+560	395+600	40.00	Trench Lining System	Structure

Section	Beginning (km+m)	Finish	Length (m)	Class	Status
Adana- İncirlik - Toprakkale	395+600	395+760	160.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	395+760	395+800	40.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	395+800	395+900	100.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	395+913		14.70	Culvert	Structure
Adana- İncirlik - Toprakkale	395+920	396+020	100.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	396+025	397+442	1,417.00	Station	Information
Adana- İncirlik - Toprakkale	396+360		15.00	Culvert	Available
Adana- İncirlik - Toprakkale	397+123		15.00	Culvert	Available
Adana- İncirlik - Toprakkale	397+300	397+860	560.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	397+370		14.70	Culvert	Structure
Adana- İncirlik - Toprakkale	397+451	397+843	392.00	Heel Ditch	Structure
Adana- İncirlik - Toprakkale	397+860	397+940	80.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	397+850		33.60	Culvert	Structure
Adana- İncirlik - Toprakkale	397+851	397+998	147.00	Heel Ditch	Structure
Adana- İncirlik - Toprakkale	397+940	398+120	180.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	398+120	398+480	360.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	398+158		16.90	Culvert	Structure
Adana- İncirlik - Toprakkale	398+170	398+228	58.00	Heel Ditch	Structure
Adana- İncirlik - Toprakkale	398+322		60.40	Tunnel Open-Close	Structure
Adana- İncirlik - Toprakkale	398+511		15.00	Culvert	Structure
Adana- İncirlik - Toprakkale	395+513	398+876	3,363.00	Heel Ditch	Structure
Adana- İncirlik - Toprakkale	399+034		45.30	Culvert	Structure
Adana- İncirlik - Toprakkale	399+435		26.60	Culvert	Structure
Adana- İncirlik - Toprakkale	399+689		26.50	Culvert	Structure
Adana- İncirlik - Toprakkale	399+820	399+910	90.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	399+888	400+615	727.00	Intercepting Ditch	Structure
Adana- İncirlik - Toprakkale	399+910	402+240	2,330.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	401+100		15.00	Culvert	Structure
Adana- İncirlik - Toprakkale	401+713		68.00	Subway	Structure
Adana- İncirlik - Toprakkale	402+320	402+450	130.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	402+324		26.00	Culvert	Structure
Adana- İncirlik - Toprakkale	402+450	402+740	290.00	Trench Lining	Structure

Section	Beginning (km+m)	Finish	Length (m)	Class	Status
				System	
Adana- İncirlik - Toprakkale	402+840	402+940	100.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	402+876		27.00	Culvert	Structure
Adana- İncirlik - Toprakkale	402+940	403+000	60.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	403+000	403+860	860.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	403+712		22.00	Culvert	Structure
Adana- İncirlik - Toprakkale	404+039		32.00	Culvert	Structure
Adana- İncirlik - Toprakkale	404+205		68.00	Subway	Structure
Adana- İncirlik - Toprakkale	404+205	404+950	745.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	404+837		16.50	Culvert	Structure
Adana- İncirlik - Toprakkale	405+143		16.20	Culvert	Structure
Adana- İncirlik - Toprakkale	405+160	405+380	220.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	405+474		13.35	Culvert	Structure
Adana- İncirlik - Toprakkale	405+881		30.00	Overpass	Structure
Adana- İncirlik - Toprakkale	406+133		24.96	Culvert	Structure
Adana- İncirlik - Toprakkale	406+355	406+583	228.00	Hydraulic Bridge	Structure
Adana- İncirlik - Toprakkale	406+794		17.90	Culvert	Structure
Adana- İncirlik - Toprakkale	406+916		30.00	Overpass	Structure
Adana- İncirlik - Toprakkale	407+318			Oil Pipeline Crossing	Available
Adana- İncirlik - Toprakkale	407+481		15.70	Culvert	Structure
Adana- İncirlik - Toprakkale	407+482	408+510	1,028.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	408+382		16.35	Culvert	Structure
Adana- İncirlik - Toprakkale	408+510	408+610	100.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	408+610	410+550	1,940.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	408+732		14.98	Culvert	Structure
Adana- İncirlik - Toprakkale	408+820			Highway Bridge	Available
Adana- İncirlik - Toprakkale	409+239		15.13	Culvert	Structure
Adana- İncirlik - Toprakkale	409+483		30.00	Overpass	Structure
Adana- İncirlik - Toprakkale	409+965		14.30	Culvert	Structure
Adana- İncirlik - Toprakkale	410+596	410+626	30.00	Hydraulic Bridge	Structure
Adana- İncirlik - Toprakkale	410+720	417+400	6,680.00	Trench Lining System	Structure
Adana- İncirlik - Toprakkale	411+619		30.00	Overpass	Structure
Adana- İncirlik - Toprakkale	411+894		18.60	Culvert	Structure

Section	Beginning (km+m)	Finish	Length (m)	Class	Status
Adana- İncirlik - Toprakkale	413+364		30.00	Overpass	Structure
Adana- İncirlik - Toprakkale	414+720		18.00	Culvert	Structure
Adana- İncirlik - Toprakkale	415+061		15.00	Culvert	Available
Adana- İncirlik - Toprakkale	415+094		16.65	Culvert	Structure
Adana- İncirlik - Toprakkale	416+913		30.00	Overpass	Structure
Adana- İncirlik - Toprakkale	417+408	418+471	1,063.00	Station	Information
Adana- İncirlik - Toprakkale	417+914		68.00	Subway	Structure
Adana- İncirlik - Toprakkale	418+202		68.00	Subway	Structure
Adana- İncirlik - Toprakkale	418+471			Scope End	Information
Toprakkale - Bahçe	000+000			Project Start	Information
Toprakkale - Bahçe	000+385		26.00	Culvert	Structure
Toprakkale - Bahçe	000+529		61.10	Overpass	Structure
Toprakkale - Bahçe	000+779		30.00	Culvert	Structure
Toprakkale - Bahçe	001+218		24.00	Culvert	Structure
Toprakkale - Bahçe	001+520		24.00	Culvert	Structure
Toprakkale - Bahçe	002+200		32.00	Subway	Structure
Toprakkale - Bahçe	002+450		22.00	Culvert	Structure
Toprakkale - Bahçe	003+257		26.00	Culvert	Structure
Toprakkale - Bahçe	003+320		32.00	Subway	Structure
Toprakkale - Bahçe	003+643		26.00	Culvert	Structure
Toprakkale - Bahçe	003+963		26.00	Culvert	Structure
Toprakkale - Bahçe	004+527		26.00	Culvert	Structure
Toprakkale - Bahçe	004+562		26.00	Subway	Structure
Toprakkale - Bahçe	004+741		30.00	Culvert	Structure
Toprakkale - Bahçe	005+035		22.00	Culvert	Structure
Toprakkale - Bahçe	005+209		28.00	Culvert	Structure
Toprakkale - Bahçe	005+685		30.00	Overpass	Structure
Toprakkale - Bahçe	005+700		625.00	Reinforced Earth Wall	Structure
Toprakkale - Bahçe	005+913		22.00	Culvert	Structure
Toprakkale - Bahçe	006+491		22.00	Culvert	Structure
Toprakkale - Bahçe	006+800		332.00	Reinforced Concrete Wall	Structure
Toprakkale - Bahçe	007+145		30.00	Overpass	Structure
Toprakkale - Bahçe	007+145		36.30	Subway	Structure
Toprakkale - Bahçe	007+158		742.00	Reinforced Concrete Wall	Structure
Toprakkale - Bahçe	007+411		22.00	Culvert	Structure
Toprakkale - Bahçe	008+034		118.00	Subway	Structure
Toprakkale - Bahçe	008+249	008+649	400.00	Station	Information
Toprakkale - Bahçe	008+780		2,810.00	Reinforced Concrete Wall	Structure

Section	Beginning (km+m)	Finish	Length (m)	Class	Status
Toprakkale - Bahçe	008+874		30.00	Overpass	Structure
Toprakkale - Bahçe	008+874		27.00	Subway	Structure
Toprakkale - Bahçe	008+900		597.00	Reinforced Earth Wall	Structure
Toprakkale - Bahçe	009+508		412.00	Reinforced Earth Wall	Structure
Toprakkale - Bahçe	009+508		30.00	Overpass	Structure
Toprakkale - Bahçe	000+095	000+350	412.00	Reinforced Earth Wall	Structure
Toprakkale - Bahçe	009+769		22.00	Culvert	Structure
Toprakkale - Bahçe	010+097		528.00	Reinforced Earth Wall	Structure
Toprakkale - Bahçe	010+097		30.00	Overpass	Structure
Toprakkale - Bahçe	010+650		515.00	Reinforced Earth Wall	Structure
Toprakkale - Bahçe	010+650		30.00	Overpass	Structure
Toprakkale - Bahçe	010+955		14.00	Culvert	Structure
Toprakkale - Bahçe	011+340		18.00	Culvert	Structure
Toprakkale - Bahçe	011+730		105.00	Highway Bridge	Available
Toprakkale - Bahçe	011+829		22.00	Culvert	Structure
Toprakkale - Bahçe	011+951		22.00	Culvert	Structure
Toprakkale - Bahçe	012+059		538.00	Reinforced Earth Wall	Structure
Toprakkale - Bahçe	012+059		30.00	Overpass	Structure
Toprakkale - Bahçe	012+667		24.00	Culvert	Structure
Toprakkale - Bahçe	012+808		30.00	Culvert	Structure
Toprakkale - Bahçe	013+108		30.00	Culvert	Structure
Toprakkale - Bahçe	013+340		30.00	Overpass	Structure
Toprakkale - Bahçe	013+954		26.00	Culvert	Structure
Toprakkale - Bahçe	014+850		26.00	Culvert	Structure
Toprakkale - Bahçe	015+080		30.00	Overpass	Structure
Toprakkale - Bahçe	016+024		156.00	Reinforced Concrete Wall	Structure
Toprakkale - Bahçe	016+184	016+274	89.70	Viaduct	Structure
Toprakkale - Bahçe	016+280		333.00	Reinforced Concrete Wall	Structure
Toprakkale - Bahçe	016+617	016+707	89.70	Viaduct	Structure
Toprakkale - Bahçe	016+957		54.00	Culvert	Structure
Toprakkale - Bahçe	017+050		46.00	Subway	Structure
Toprakkale - Bahçe	017+110		60.49	Culvert	Structure
Toprakkale - Bahçe	017+050		12.00	Culvert	Structure
Toprakkale - Bahçe	017+051		18.00	Culvert	Structure
Toprakkale - Bahçe	017+200		256.00	Reinforced Concrete Wall	Structure

Section	Beginning (km+m)	Finish	Length (m)	Class	Status
Toprakkale - Bahçe	017+669		74.61	Culvert	Structure
Toprakkale - Bahçe	017+737	017+889	151.70	Viaduct	Structure
Toprakkale - Bahçe	017+924	017+963	133.10	Subway	Structure
Toprakkale - Bahçe	017+982	018+020	157.30	Subway	Structure
Toprakkale - Bahçe	018+112		117.00	Culvert	Structure
Toprakkale - Bahçe	018+342		115.00	Subway	Structure
Toprakkale - Bahçe	018+570		36.00	Culvert	Structure
Toprakkale - Bahçe	018+734		46.00	Culvert	Structure
Toprakkale - Bahçe	018+799		34.00	Subway	Structure
Toprakkale - Bahçe	019+120		34.00	Culvert	Structure
Toprakkale - Bahçe	019+280		130.00	Retaining Wall	Structure
Toprakkale - Bahçe	019+346		42.00	Culvert	Structure
Toprakkale - Bahçe	019+641		66.00	Culvert	Structure
Toprakkale - Bahçe	020+174		66.00	Culvert	Structure
Toprakkale - Bahçe	020+550		43.00	Subway	Structure
Toprakkale - Bahçe	020+550		14.00	Culvert	Structure
Toprakkale - Bahçe	020+708		62.40	Culvert	Structure
Toprakkale - Bahçe	020+826		58.36	Culvert	Structure
Toprakkale - Bahçe	020+946		76.50	Culvert	Structure
Toprakkale - Bahçe	021+141		74.48	Culvert	Structure
Toprakkale - Bahçe	021+317		60.35	Culvert	Structure
Toprakkale - Bahçe	021+560			Scope End	Information
Toprakkale - Bahçe	028+200			Scope Start	Information
Toprakkale - Bahçe	028+300		446.00	Diversion Canal	Structure
Toprakkale - Bahçe	028+720		40.25	Culvert	Structure
Toprakkale - Bahçe	029+055		71.00	Subway	Structure
Toprakkale - Bahçe	029+337		82.50	Culvert	Structure
Toprakkale - Bahçe	029+600		41.00	Subway	Structure
Toprakkale - Bahçe	029+600		14.00	Culvert	Structure
Toprakkale - Bahçe	029+610		16.00	Culvert	Structure
Toprakkale - Bahçe	029+745		72.60	Culvert	Structure
Toprakkale - Bahçe	030+130		26.00	Subway	Structure
Toprakkale - Bahçe	030+130		22.00	Culvert	Structure
Toprakkale - Bahçe	030+200		34.00	Culvert	Structure
Toprakkale - Bahçe	030+565		44.40	Culvert	Structure
Toprakkale - Bahçe	031+130		32.21	Culvert	Structure
Toprakkale - Bahçe	031+364		34.23	Culvert	Structure
Toprakkale - Bahçe	031+580		34.00	Culvert	Structure
Toprakkale - Bahçe	031+783		24.00	Subway	Structure
Toprakkale - Bahçe	032+104		24.00	Culvert	Structure
Toprakkale - Bahçe	032+467		22.00	Subway	Structure

Section	Beginning (km+m)	Finish	Length (m)	Class	Status
Toprakkale - Bahçe	033+100		30.00	Overpass	Structure
Toprakkale - Bahçe	033+335		46.38	Culvert	Structure
Toprakkale - Bahçe	033+100		24.00	Culvert	Structure
Toprakkale - Bahçe	033+786		93.00	Culvert	Structure
Toprakkale - Bahçe	034+363		43.00	Subway	Structure
Toprakkale - Bahçe	034+578	034+606	27.70	Viaduct	Structure
Toprakkale - Bahçe	035+435		74.61	Culvert	Structure
Toprakkale - Bahçe	036+630	037+030	400.00	Station	Information
Toprakkale - Bahçe	037+750		30.00	Overpass	Structure
Toprakkale - Bahçe	038+200		452.00	Diversion Canal	Structure
Toprakkale - Bahçe	038+562		42.38	Culvert	Structure
Toprakkale - Bahçe	039+419		41.00	Subway	Structure
Toprakkale - Bahçe	039+459		50.38	Culvert	Structure
Toprakkale - Bahçe	039+789		49.00	Subway	Structure
Toprakkale - Bahçe	040+659		45.00	Subway	Structure
Toprakkale - Bahçe	040+789		58.48	Culvert	Structure
Toprakkale - Bahçe	040+660		14.00	Culvert	Structure
Toprakkale - Bahçe	041+409		36.20	Subway	Structure
Toprakkale - Bahçe	041+409		16.00	Culvert	Structure
Toprakkale - Bahçe	041+694		129.00	Culvert	Structure
Toprakkale - Bahçe	042+202			Scope End	Information
Toprakkale - Bahçe	044+424			Scope Start	Information
Toprakkale - Bahçe	044+645		46.00	Culvert	Structure
Toprakkale - Bahçe	044+775		80.00	Retaining Wall	Structure
Toprakkale - Bahçe	044+872		46.00	Culvert	Structure
Toprakkale - Bahçe	044+920		18.00	Culvert	Structure
Toprakkale - Bahçe	044+920		30.20	Subway	Structure
Toprakkale - Bahçe	045+060		60.38	Culvert	Structure
Toprakkale - Bahçe	045+295		76.34	Culvert	Structure
Toprakkale - Bahçe	045+668	045+788	120.70	Viaduct	Structure
Toprakkale - Bahçe	045+821			Scope End	Information
Toprakkale - Bahçe	050+853			Scope Start	Information
Toprakkale - Bahçe	051+198		50.00	Culvert	Structure
Toprakkale - Bahçe	051+716		28.00	Culvert	Structure
Toprakkale - Bahçe	051+950		62.00	Culvert	Structure
Toprakkale - Bahçe	052+200		18.00	Culvert	Structure
Toprakkale - Bahçe	052+201		20.00	Culvert	Structure
Toprakkale - Bahçe	052+200		509.00	Reinforced Earth Wall	Structure
Toprakkale - Bahçe	052+200		30.00	Overpass	Structure
Toprakkale - Bahçe	052+400		30.00	Overpass	Structure

Section	Beginning (km+m)	Finish	Length (m)	Class	Status
Toprakkale - Bahçe	052+400		318.00	Reinforced Earth Wall	Structure
Toprakkale - Bahçe	052+852		22.16	Culvert	Structure
Toprakkale - Bahçe	053+290		30.00	Highway Bridge	Available
Toprakkale - Bahçe	053+600		214.00	Diversion Canal	Structure
Toprakkale - Bahçe	053+752		20.00	Culvert	Structure
Toprakkale - Bahçe	054+100		902.00	Reinforced Earth Wall	Structure
Toprakkale - Bahçe	054+100		30.00	Overpass	Structure
Toprakkale - Bahçe	054+300		115.00	Retaining Wall	Structure
Toprakkale - Bahçe	054+871		26.00	Culvert	Structure
Toprakkale - Bahçe	054+880		75.00	Retaining Wall	Structure
Toprakkale - Bahçe	055+210		20.00	Culvert	Structure
Toprakkale - Bahçe	055+466		20.00	Culvert	Structure
Toprakkale - Bahçe	055+634		95.00	Highway Bridge	Available
Toprakkale - Bahçe	056+020		28.00	Culvert	Structure
Toprakkale - Bahçe	056+274		18.16	Culvert	Structure
Toprakkale - Bahçe	056+429		596.00	Shoring Wall	Structure
Toprakkale - Bahçe	057+150		321.00	Shoring Wall	Structure
Toprakkale - Bahçe	057+091		44.25	Culvert	Structure
Toprakkale - Bahçe	057+183	057+583	400.00	Station	Information
Toprakkale - Bahçe	057+685			Project End	Information
Nurdağ-Başpınar	116+237			Scope Start	Information
Nurdağ-Başpınar	116+303		27.50	Culvert	Structure
Nurdağ-Başpınar	116+633		41.00	Culvert	Structure
Nurdağ-Başpınar	116+975	117+335	360.00	Viaduct	Structure
Nurdağ-Başpınar	117+141		97.00	Culvert	Structure
Nurdağ-Başpınar	118+098	118+392	294.00	Viaduct	Structure
Nurdağ-Başpınar	118+570		28.00	Subway	Structure
Nurdağ-Başpınar	118+693		76.00	Culvert	Structure
Nurdağ-Başpınar	120+099		36.00	Culvert	Structure
Nurdağ-Başpınar	120+228		36.00	Culvert	Structure
Nurdağ-Başpınar	120+439			Scope End	Information
Nurdağ-Başpınar	121+712			Scope Start	Information
Nurdağ-Başpınar	121+952		36.30	Culvert	Structure
Nurdağ-Başpınar	122+197		24.00	Culvert	Structure
Nurdağ-Başpınar	125+680		33.00	Overpass	Structure
Nurdağ-Başpınar	127+268	127+694	426.00	Viaduct	Structure
Nurdağ-Başpınar	127+800	128+810	1,010.00	Tunnel	Structure
Nurdağ-Başpınar	131+279		66.00	Overpass	Structure
Nurdağ-Başpınar	131+518			Project End	Information

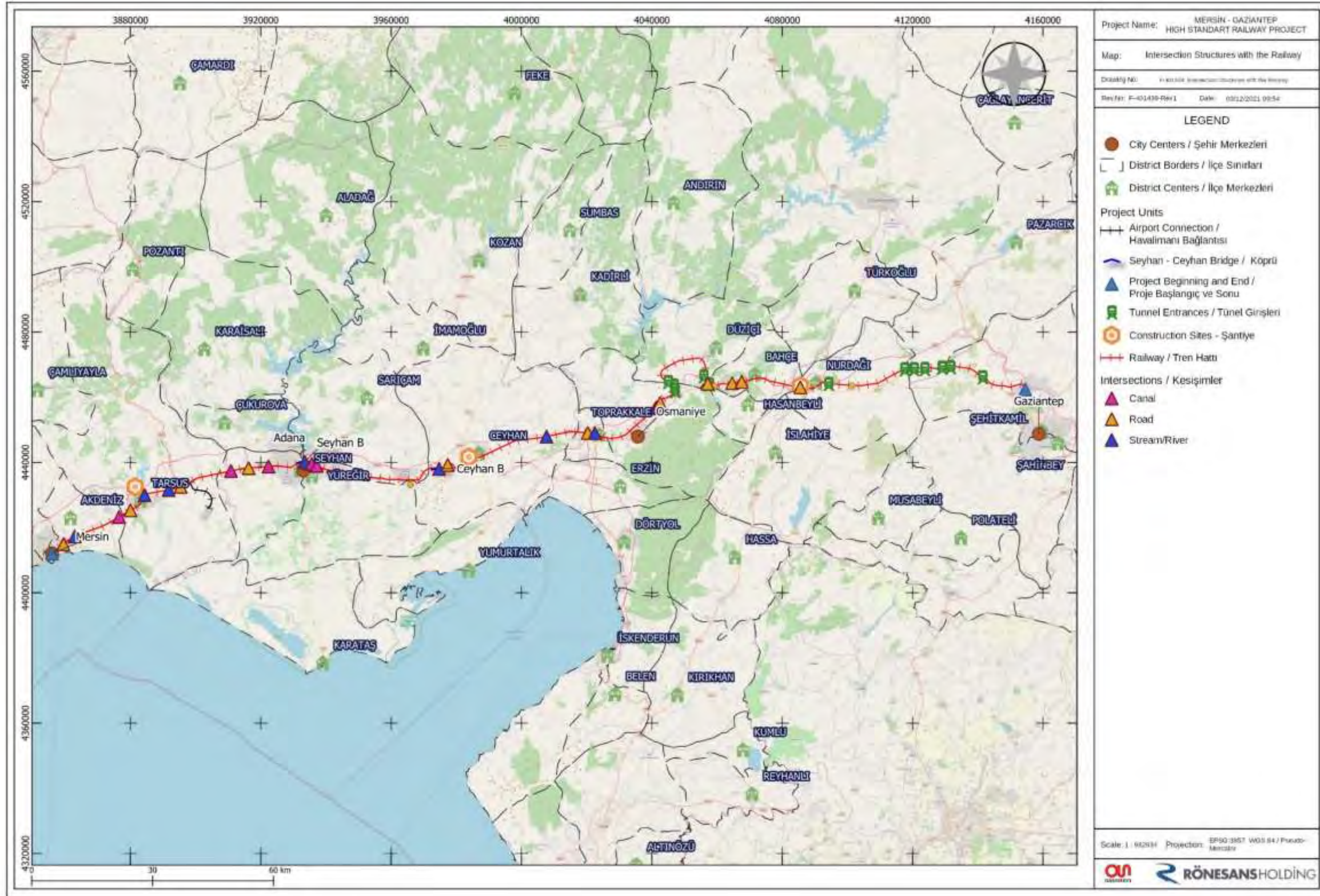
Table 3.6: Structures under the Responsibility of Other Contractors

Section	Mersin - Adana	Adana - Incirlik - Toprakkale	Toprakkale - Bahçe	Bahçe - Nurdağ Variant		Nurdağ - Başpınar	Başpınar - Gaziantep - M.Yavuz
Scope of the Work	Addition of 3 rd and 4 th lines between Adana and Mersin Stations	Addition of 2 nd line and rehabilitation of current line between Adana - Incirlik and Toprakkale Stations	Construction of Tunnel Works Between Toprakkale and Bahçe Stations	Infrastructure works of between Bahçe -Nurdağ Variant	Infrastructure, superstructure and electrification works between Bahçe and Nurdağ Variant	Construction of new lines between Nurdağ and Başpınar Stations	Infrastructure and superstructure work and reconstruction of railway lines between Başpınar – Gaziantep and Mustafa Yavuz Stations
Contractor	Dalgıçlar & Nuhoğlu	Çelikler	Demce & Bestaş	Intekar	Bestaş - Intekar	Fernas & Öztaş	Kolin & Gülermak & Kalyon
Distances	78.0 km	79.0 km	58.0 km	-	16.9 km	56.0 km	25.0 km
Completion Percentage	100.0%	22.0%	7.5%	100.0%	-	49.1%	100.0%

Intersection points of the railway route with the structures are given in the table and map below by divided into the sections (see Table 3.7).

Table 3.7: Coordinates of the Intersection Structures with the Railway

Structure	Coordinates of the Intersection	
	Latitude	Longitude
Mersin-Adana		
Road	36.90099345	34.85497194
Stream/River	36.84354749	34.70147485
Road	36.82607310	34.67025750
Canal	36.88624358	34.82361049
Stream/River	36.93430276	34.89387113
Stream/River	36.94560014	34.96027849
Road	36.95270420	34.99343393
Canal	36.98746531	35.13187222
Road	36.99379475	35.18069257
Canal	36.99746623	35.23545839
Adana-Toprakkale		
Stream/River	37.00744831	35.33541475
Canal	37.00313726	35.35508573
Canal	36.99893854	35.36793071
Stream/River	36.99235533	35.70541761
Road	37.00079825	35.72938997
Stream/River	37.06321988	36.00153937
Toprakkale-Bahçe		
Road	37.07135696	36.11546815
Stream/River	37.07084074	36.13478042
Stream/River	37.12555109	36.30203894
Stream/River	37.12822887	36.30585650
Road	37.13700081	36.31471122
Road	37.17943195	36.44586518
Road	37.18064947	36.51328776
Road	37.18370297	36.53961089
Bahçe-Nurdağ		
Road	37.17146474	36.7009282



Map 3.10: Intersection Structures with the Railway

3.8.6 Signaling and Electrical Infrastructure

The flow of train traffic is managed through a position and motion signal control system, which is mechanical or electronic and includes the use of timesheets, signs, colored lights, and railway track switching equipment. This system informs train operators about the state of the railway line and serves to prevent collisions.

Figure representing the signaling system is given below (see Figure 3.36).



Figure 3.36: Signaling System [37]

Railways are primarily set up with signaling to ensure that there is always enough space between trains to allow the next train to stop before it hits the train in front of it. This is done by dividing each train track into sections or blocks. A signal is placed at each section/block entrance, and if a train occupies the block, the signal will display the color red to tell the train to stop. If the section is empty, the signal will show green color. Below is a schematic description of how the signaling is progressing (see Figure 3.37).

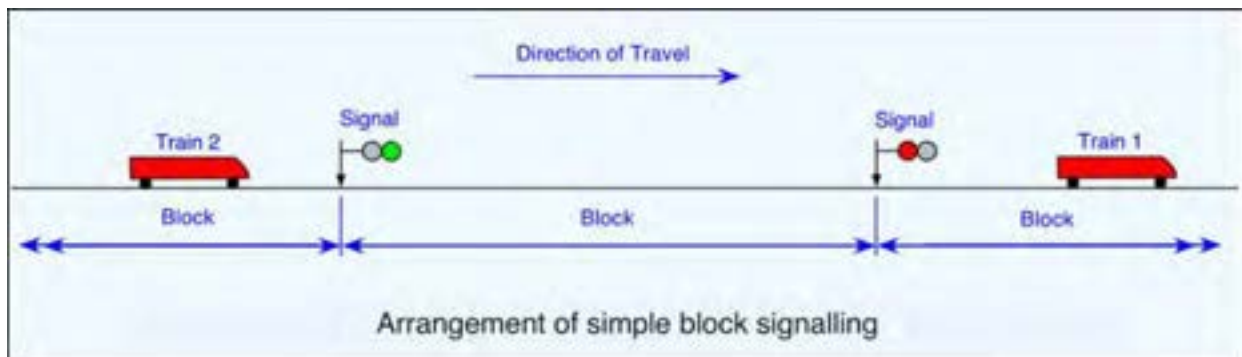


Figure 3.37: Schematic Explanation of Signaling

As you can see in the above figure, there is no train in a block, so if the block is empty, the signal to the train coming from behind will appear green. If there is a train in a block, the signal light for the train coming from behind will appear red.

During the operation phase of the high standard train project, a signaling system is technically made in accordance with national legislation and international standards in order to maintain the railway lines in a safe

manner and to prevent these accidents in any emergency (for example, accidents and rollover). The safety of signaling systems is achieved by allowing transportation especially in meteorological conditions (adverse weather conditions such as snow and fog).

In addition, train signaling is carried out not only for the trains to navigate safely, but also to ensure that the railway is used at maximum capacity with a little cost, that is operated in the most efficient way. The quality of the systems and equipment used in its construction is important in order to fulfill this function of the signaling process for the safety and efficient use of the train.

The signaling system ensures the separation of the train speed by regular speed control and the safe travel of the train, providing the most appropriate security and safety systems for the traffic on the railway, providing speed restriction equipment for the highest possible speed travel, safe operation on the catenary voltage line on the train route. It is a system designed for remote monitoring in buildings where signaling equipment is located, communication between the telecommunication system and signaling systems and external energy is provided for the operation of the system.

Equipment used for signaling;

- Externally provided energy supply systems,
- Central Traffic Control remote control rooms,
- Signaling systems equipment rooms,
- Equipment such as interlocking, switch motor, engine, heater, track circuit, detector used along the line,
- Centers providing local control,
- Double sided line length signals,
- Automatic signaling systems for train safety.

For the signaling infrastructure, which consist of 43 main interlocks and auxiliary interlocks, 2100 km long cable manufacturing (fiber optic, energy, signaling) are used.

Several different types of rail electrical power system configurations are used around the world. The choice of electric power system depends on train service requirements such as commuter train, freight rail, light rail, train loads, and power grid power supply.

The voltage levels used for world electrification are in a certain value range and are defined according to the EN 50163 standard. In the intercity main line railways, the electricity supply system generally used in our country is a single-phase, 25 kV AC system with a 50 Hz network frequency. DC supply system is used in railway lines where urban transportation is provided. The stress levels defined according to EN 50163 are given in the table below (see Table 3.8).

Table 3.8: EN 50163 Voltage Levels

	U_n	U_{min1}	U_{min2}	U_{max1}	U_{max2}	U_{max3}
DC 600 V	600		400	720	770	1,015
DC 750 V	750		500	900	950	1,269
DC 1.5 kV	1,500		1,000	1,800	1,950	2,538
DC 3 kV	3,000		2,000	3,600	3,900	5,075
AC 15 kV 16.7 Hz	15,000	11,000	12,000	17,250	18,000	24,311
AC 25 kV 50Hz	25,000	17,500	19,000	27,500	29,000	38,746

U_n : Nominal voltage
 U_{min1} : Lowest permanent voltage
 U_{min2} : Lowest transient voltage, max. 10 min
 U_{max1} : Highest residual voltage
 U_{max2} : Lowest transient voltage, max. 5 min
 U_{max3} : Over voltage, longer than 20 ms

Electrification systems include energy supply from the network to transformer centers, installation of substations and overhead line catenary systems in accordance with the project and operational requirements. The determination of location and capacity in substation installations is determined because of traction simulations based on parameters such as the parameters of the railway vehicles planned to be used within the scope of the project, the voyage interval, the geographical features of the railway line and the line topology. Overhead line designs and installations are determined on the basis of project and operational requirements [15].

The following operations are required for the electrification system;

- Providing the most economical and reliable electrical contact system to continuously power moving electric railway vehicles,
- Planning for power supply,
- Providing switches to regulate the flow of power together with electrical protective equipment,
- Monitoring and control of the power supply,
- 5 kV, 50 Hz, single phase traction power supply's electromagnetic and electrostatic induction effects against the effects of signaling and roadside telecommunication circuits,
- Providing maintenance and operating facilities for electric traction.

Railway electrification, a multidisciplinary project work, needs close coordination between the electrical, signaling and telecommunications and civil engineering disciplines.

Below is the form of electrification system that an electric train should have (see Figure 3.38).

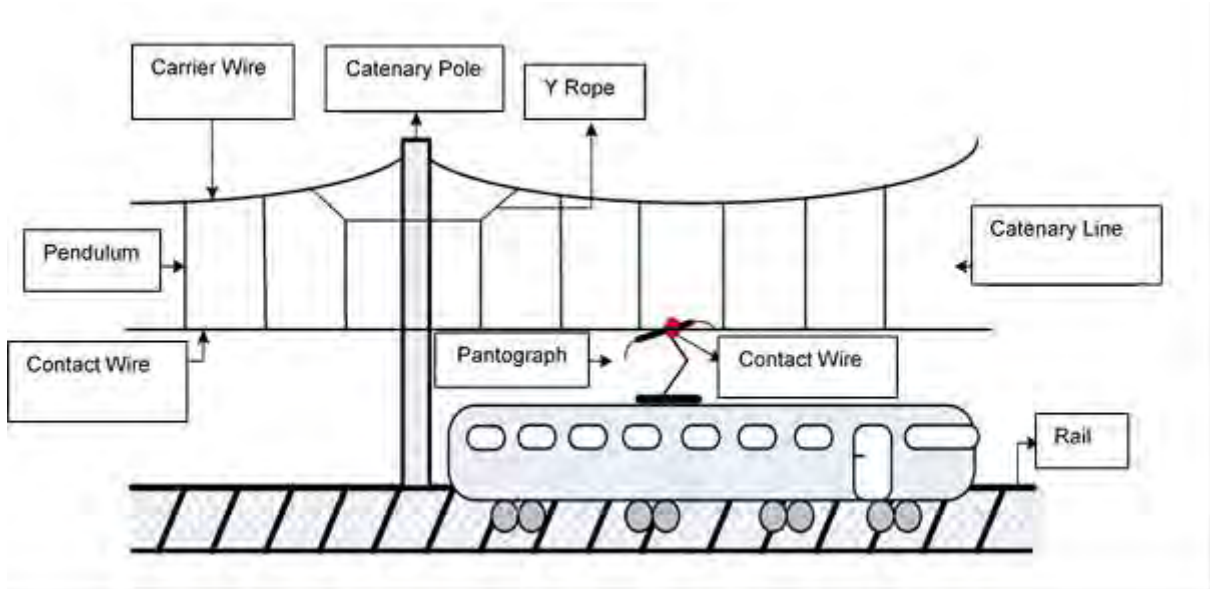


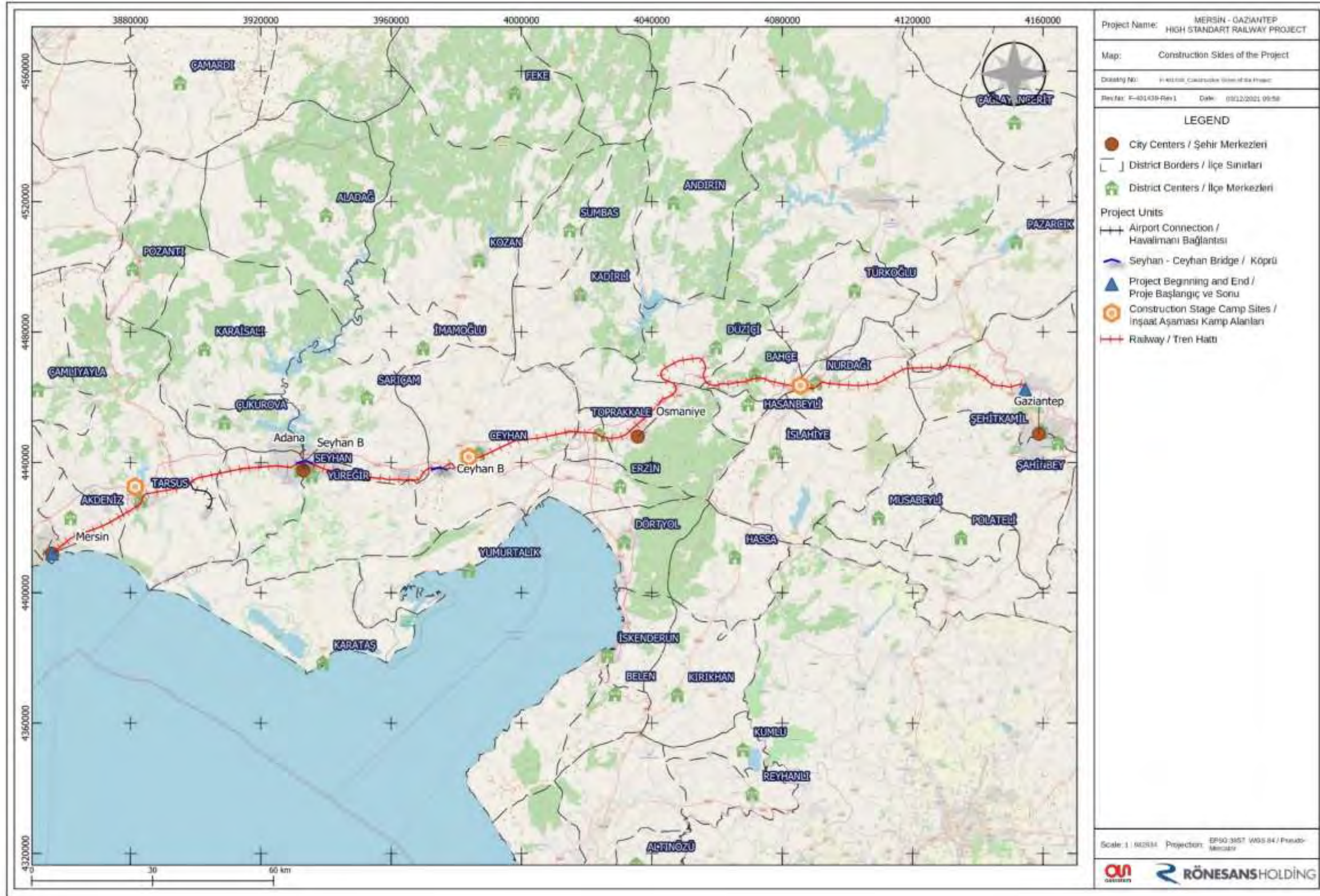
Figure 3.38: Railway Electrification System [13]

For the electrical infrastructure, 10,188 poles (concrete, steel) and 332 units of transformers (power, voltage) are installed.

3.8.7 Temporary (Construction Phase) Units

During the construction period of the High Standard Train Project such as excavation, filling, and coating, works will be carried out along the line. In the areas where Rönesans is responsible for the construction operations, temporary construction sites are established where the construction works are carried out. These construction sites are units with a certain number of employees and equipment used for construction operations.

Because of preliminary studies, Merkez Tarsus construction site is positioned as the central construction site and Ceyhan as the second construction site. Nurdağ construction site is located as the third construction site.



Map 3.11: Construction Sides of the Project

3.9 Project Background/History

The railway between Mersin and Gaziantep is the railway currently in use and whose construction was completed 36 month. There is a conventional multi-railway between Mersin-Adana route and a conventional single railway between Adana Başıpınar route. With the high standard train project, it is planned to add 2 high standard railways to the conventional multi-railway on the route between Mersin and Adana and 2 high standard railways to the route between Adana and Başıpınar (revision of the existing line in some parts and a new line in some parts).

Turkey aims to improve intermodal and multimodal applications by using the geographic advantage of Turkey to;

- Increase the share of railway and seaway in transportation,
- Establish a fast, flexible, safe, reliable, and integrated transportation system and so reduce logistic costs and trade facilitation,
- Increase growing competitiveness for logistics and transportation within the scope of 11th Development Plan covering the period 2019-2023.

For this purpose;

- Ongoing high standard railways will be completed,
- Planning for high standard railway will be made by considering the balance of supply and demand,
- Express services will be increased, and
- Travel times will be shortened.

In this context, it is planned that the total length of high standard railway, which were 1,213 km in 2018, will be increased to 5,595 km, and the share of railway passenger transportation is increased in total (on land) from 1.3 % to 3.8 % in 2023.

The studies for the completion of Mersin-Adana-Osmaniye-Gaziantep High Standard Railway System has been started in accordance with 11th Development Plan, and the Project was awarded to Rönesans. Rönesans has vast experience in superstructure projects, and it is one of the largest contracting companies in the world.

The Train Project, which is 286 km in length, is the subject of this report starts from Mersin, passes through Adana, İncirlik, Toprakkale, Bahçe, Nurdağ, Başıpınar Stations respectively and ends at Mustafa Yavuz Station. Following the completion of the railway, the travel time between Adana and Gaziantep will be reduced to 1.5 hours. As a result, while the transportation cost to Mersin where there exists an international port reduces, the competition opportunities of producers, especially located in Gaziantep will increase since Gaziantep is an industrial city with a population of around 2 million.

Current Situation Map of Turkey are given below (see Map 3.12).



Map 3.12: Turkey Current Railway Situation Map

3.10 Project Alternatives (If investigated by TCDD)

3.10.1 No Project Alternative

The project alternatives determined before the project construction are used to determine the most suitable scenario in the region without changing the purpose and benefits of the Project. Project alternatives, which their impacts are not reasonably defined, may cause problems in terms of implementation and the project objectives cannot be achieved, are not considered.

Since the Mersin-Gaziantep Railway Route is an existing railway, its route and technologies used are certain. In determining the alternative of the High Standard Train Project, contacting many institutions and organizations and examining the plans to be made with areas such as the planned road and water resources played a role. For the determined alternative of the Project, the geology of the line, the environmental features in the region, the services and engineering structures that may be affected, and the cost analysis and examination have been made.

There are no project alternatives as it is an existing line, and it is aimed to add lines where necessary and rehabilitate the existing one.

4 ASSESSMENT and MANAGEMENT of ENVIRONMENTAL and SOCIAL RISKS and IMPACTS (EBRD PR 1)

4.1 Impact Assessment Methodology (Impact Magnitude and Sensitivity Criteria may be re-define in each section)

4.1.1 Describing the Sensitivity, Value, or Importance of Receptors

General criteria for defining the importance or sensitivity of receptors are set out in Table 4.1. Key factors influencing this include;

The value of the receptor or resource based upon empirical and/or intrinsic factors, for example, taking into account any legal or policy protection afforded which is indicative of the receptor or resources' value internationally, nationally or locally.

The sensitivity of the receptor or resource to change, for example, is the receptor likely to acclimatize to the change. This will consider legal and policy thresholds, which are indicative of the ability of the resource to absorb change.

Table 4.1: Sensitivity or Value Criteria

Sensitivity or Value	Description
Very high	The receptor has little or no capacity to absorb change without fundamentally altering its present character, is of very high environmental value, or of international importance.
High	The receptor has low capacity to absorb change without fundamentally altering its present character, is of high environmental value, or of national importance.
Medium	The receptor has moderate capacity to absorb change without significantly altering its present character, has some environmental value, or is of regional importance.
Low	The receptor is tolerant of change without detriment to its character, is low environmental value, or local importance.
Negligible	The receptor is resistant to change and is of little environmental value.

4.1.2 Magnitude of Impacts

General criteria for defining the magnitude of an impact are set out in Table 4.2. Key factors influencing this include;

- The physical or geographical scale of the impact (note that this will be relative to the scale of the receptor or resource affected),
- The duration of the impact - it will be short term, lasting for a few days or weeks, or long term, lasting for a number of years,
- The frequency of the impact - it will occur hourly, daily, monthly or will it be permanent lasting for the duration of the development,
- The reversibility of the effect - it can be reversed following completion of construction or decommissioning of the development.

Table 4.2: Impact Magnitude Criteria

Magnitude	Description
Very high	Total loss or major alteration to key elements/features of the baseline conditions such that post development character/composition of baseline condition will be fundamentally changed.
High	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/composition of the baseline condition will be materially changed.
Medium	Minor shift away from baseline conditions. Changes arising from the alteration will be detectable but not material; the underlying character/composition of the baseline condition will be similar to the pre-development situation.
Low	Little change from baseline conditions. Change is barely distinguishable, approximating to a "no change" situation.
Negligible	Total loss or major alteration to key elements/features of the baseline conditions such that post development character/composition of baseline condition will be fundamentally changed.

4.1.3 Describing the Significance of Effects

The general approach adopted for evaluating the significance of effects considering the sensitivity of the receptor and the magnitude of impact is outlined in Table 4.3. The ESIA Regulations require the likely significant effects to be identified. The classification of significance is explained in Table 4.4, however, in simple terms effects predicted to be 'major' or 'moderate' are considered to be 'significant' whilst effects predicted to be 'minor' or 'neutral' are considered to be 'not significant'.

Table 4.3: Impact Magnitude Criteria

Magnitude of Impact	Sensitivity or Value of Receptor				
	Very High	High	Medium	Low	Negligible
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

Table 4.4: Explanation of Significance Classifications

Classification	General Description	Significant
Major (adverse or beneficial)	<p>A large and/or detrimental change to a valuable/sensitive receptor; likely or apparent exceeding of accepted (often legal) threshold or a major departure from national targets.</p> <p>A large and beneficial change, resulting in improvements to baseline conditions whereby previously poor conditions are replaced by compliance with accepted (often legal) thresholds or a major contribution is made to national targets.</p> <p>These are effects, which may represent key factors in the decision-making process. Potentially associated with sites and features of national importance or likely to be important considerations at a regional or district scale. Major effects may relate to impacts on</p>	Yes

Classification	General Description	Significant
	resources or features, which are rare and cannot be relocated, or if lost, cannot be replaced.	
Moderate (adverse or beneficial)	<p>A medium scale change, which, although not beyond an accepted (often legal) threshold, is still considered generally unacceptable, unless balanced out by other significant positive benefits of the development. Likely to relate to departure from relevant planning policy, rather than legal compliance.</p> <p>A positive moderate effect is a medium scale change that is significant in that the baseline conditions are improved to the extent that guideline targets are contributed to.</p> <p>These effects, if adverse, are likely to be important at a local or district scale and on their own could have a material influence on decision making.</p>	Yes
Minor (adverse or beneficial)	<p>A small change that, whilst adverse, does not exceed accepted thresholds, legal or guideline standards. Unlikely to be a departure from planning policy.</p> <p>A small positive change, but not one that is likely to be a key factor in the overall balance of issues.</p> <p>These effects may be raised as local issues but are typically unlikely to be critical in the decision-making process.</p>	No
Negligible	<p>A very small change that is so small and unimportant that it is considered acceptable to disregard.</p> <p>Effects, which are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error, these effects, are unlikely to influence decision making, irrespective of other effects.</p>	No

In subsequent chapters of this report, the general criteria described above have been made more specific for each environmental topic based on relevant standards or guidelines. A detailed explanation of the approach to assessing impacts and the specific criteria to be used for each topic is set out in later chapters.

4.1.4 Residual Effects

The residual effects are those generated by considering the mitigation methods. The results of the EIA will be reported with and without mitigation in order to allow the effectiveness of mitigation to be fully understood.

4.1.5 Approach to Mitigation

A standard hierarchical approach to the development of mitigation measures will be followed with aim of 'designing out' adverse effects as much as possible (avoiding, preventing or reducing effects). With the EIA being undertaken in parallel with the development of the Railway this provides opportunities to incorporate mitigation into its design or how it will be constructed.

The following approach will be used for developing and categorizing mitigation:

Design Mitigation: These are measures incorporated into the design of the Railway and could include measures such as the design of the cable route, the layout of the converter station or the use of acoustic enclosures.

Construction Mitigation: These are measures incorporated into how the Railway will be constructed and could include measures in relation to silt control or dust suppression.

Other Measures: These are other measures which have been identified which are neither design nor construction mitigation.

Compensation Measures: These are measures to be implemented in the event that an effect cannot be mitigated and could include measures to offset the loss of an important feature or resource.

4.1.6 Types of Effects

4.1.6.1 Construction Effects

For the purposes of this ESIA construction effects are typically temporary or short-term occurring during the construction phase only. This would include effects resulting from construction of the Railway such as construction traffic, noise and vibration from construction plant and machinery, dust generation and site runoff as well as effects resulting from the temporary loss of agricultural land or other temporary effects such as exposure to compounds.

4.1.6.2 Operational, Longer Term & Permanent Effects

For the purposes of this ESIA operational, longer term and permanent effects are those, which would occur because of the Railway such as its land take or its operation. This would include effects, which may begin during construction and endure for the lifetime of the Railway (such as the loss of agricultural land for the construction of the converter station) or effects, which occur during operation only (such as noise imissions associated with operation of the converter station).

4.2 Land Acquisition, Restrictions on Land Use and Involuntary Resettlement (EBRD PR5)

4.2.1 Introduction

Type of a land use depend on land what it is used for. Forestry and farming can be given as example for the land use in rural areas while housing and industry are land use example in urban areas which consist of town and cities. The main zones, which represent the function of land use, are Central Business District, Inner City, Suburbs and Rural Urban Fringe [32].

Studies on earth's surface is described as topography which includes changes on the surface of mountains and valleys, features of rivers and roads and surface of other planets, the moon, asteroids and meteors. Topography is used for determination of the relation between points with recording the data [9].

Soil, which covers the land, is the surface material. Organic and inorganic matters form the soil. Existence of soil is significant for humanity because of the food chain and so on [33].

In the scope of Mersin-Gaziantep Train Project, expropriation throughout the line is performed and ownership of the line is belonging to TCDD.

4.2.2 Policies, Legal Framework and Guidelines

4.2.2.1 National Legislation

Expropriation Law

Expropriation Law dated 08.11.1983 and numbered 18215 regulates transactions to be carried out in the expropriation of immovable properties owned by real and private law legal entities by the State and public legal entities in cases required by the public interest, calculation of the expropriation value, registration of the immovable property and the right of easement in the name of the administration, taking back unused immovable property, transfer of immovable properties between administrations, the mutual rights and obligations and the procedures and methods for the resolution of disputes based on them.

Provisions of this Law are also applied in expropriations to be made on behalf of real and private law legal persons based on private laws. Expropriation Law and all legislative provisions of this law will be strictly complied with.

Soil Protection and Land Use Law

The purpose of this Soil Protection and Land Use Law dated 08.06.2010 and as numbered 27605 is to determine the principles and procedures that will ensure the conservation and development of the soil, the classification of agricultural lands, the determination of the minimum agricultural land and the agricultural land with sufficient income and the prevention of their division, the planned use of agricultural land and sufficient income agricultural lands in accordance with the environmental priority sustainable development principle.

This Law covers the classification of land and soil resources in accordance with scientific principles, determining the minimum size of agricultural land and agricultural lands with sufficient income and preventing their division, preparing land use plans, evaluating the social, economic and environmental dimensions of the conservation and development process with participatory methods, preventing misuse, procedures and principles regarding the creation of methods to ensure protection and duties, powers and responsibilities. Soil Protection and Land Use Law and all legislative provisions of this law will be strictly complied with.

Pasture Law

The purpose of Pasture Law is to determine pastures, highlands, winter pastures and public pastures and meadows that were previously allocated by various laws or have been used since ancient times, allocation on behalf of village or municipality legal entities, to be used in accordance with the rules to be determined, increasing and maintaining their productivity by performing their maintenance and improvement, to ensure that their use is constantly monitored, protected and the purpose of use changed when necessary. Pasture law and all legislative provisions of this law will be strictly complied with.

Forest Law

Forest law requirements will be fulfilled and Articles 16 and 17 will especially be complied with. Forest Law and all legislative provisions of this law will be strictly complied with.

Agriculture Law

The purpose of Agriculture Law is the determination of policies and making arrangements for the development and support of the agricultural sector and rural areas in line with development plans and strategies. Agriculture Law and all legislative provisions of this law will be strictly complied with.

Regulation on Control of Soil Pollution and Point Source Contaminated Sites

The purpose of this Regulation dated 08.06.2010 and numbered as 27605 is to prevent of soil pollution as a receiving environment, identify the areas and sectors where pollution is present or likely to be, determine the principles of cleaning and monitoring contaminated soils and fields in line with sustainable development goals.

This Regulation covers the technical and administrative procedures and principles regarding the prevention of soil pollution, determination of areas and sectors where pollution is present or likely to occur, recording, cleaning and monitoring contaminated soils and fields.

Regulation on Building in Disaster Areas

The purpose of this Regulation on Building in Disaster Areas dated 14.07.2007 and as numbered 26582 is to determine the technical conditions of all official and private buildings and building-type structures to be reconstructed, changed, repaired or strengthened in the disaster areas determined and declared in

accordance with Article 2 of the Law numbered 7269 on Measures to be Taken for Disasters Affecting Public Life.

Regulation on Building Earthquake in Turkey

The purpose of this Regulation on Building Earthquake in Turkey dated 18.03.2018 and as numbered 30364 is the design and construction of all official and private buildings and building-type structures to be reconstructed, changed, enlarged under the effect of earthquake and the necessary rules and minimum conditions for the evaluation and strengthening of the performance of existing buildings under the effect of earthquake.

Regulation on the Conservation, Use and Planning of Agricultural Lands

The purpose of Regulation on The Conservation, Use and Planning of Agricultural Lands dated 09.12.2017 and as numbered 30265 is to determine the procedures and principles for the determination of land assets foreseen on Soil Conservation and Land Use Law numbered 5403 and dated 3/7/2005, classification and development of agricultural lands, allowing unintended use in necessary cases, determining and protecting the soil and large plains with high agricultural production power, soil conservation and the preparation and implementation of projects, determination of areas susceptible to erosion, providing planned use of lands in accordance with the environmental priority sustainable development principle with the establishment of the soil conservation board, its duties and studies.

Regulation on Control of Excavated Soil, Construction and Demolition Wastes

The purpose of Regulation on Control of Excavated Soil, Construction and Demolition Wastes is to regulate the technical and administrative issues and general rules regarding the reduction, collection, temporary accumulation, transportation, recovery, evaluation and disposal of excavation soil and construction and demolition wastes at the source in a way that does not harm the environment.

Regulation on Protection of Buildings against Fire

The purpose of Regulation on Protection of Buildings against Fire dated 19.12.2007 and numbered 26735 is minimizing the fires that may occur during the design, construction, operation, maintenance and use phases of all kinds of buildings, buildings, facilities and enterprises used by public institutions and organizations, private organizations and real persons, and minimizing the loss of life and property of any fire that may occur and to determine the procedures and principles of the measures to be taken before and during the fire, the organization, training and inspection.

4.2.3 Extend of Study Area

4.2.3.1 Spatial Extend

High Standard Train Project pass through the land on Mersin, Adana, Osmaniye and Gaziantep Province. Length of the railway in each Province borders are 76 m km in Mersin, 79 km in Adana, 58 km in Osmaniye and 56 km in Gaziantep. The exact footprint of the Project could not be obtained from the activity owner. When the center of Railway Line is taken as a reference, 30 m buffer (15 m to the right and 15 m to the left) in the Mersin-Gaziantep Railway Line and 70 m (35 m to the right and 35 m to the left) buffer for the airport connection has been determined. Information about the type of the land use on the construction site of the Project is given table below (see Table 4.5).

Table 4.5: Type of the Land Use on the Construction Site

CLC Level 1	CLC Level 2	CLC Level 3	CLC CODE	Unit-1 (Hectare)
Agricultural areas	Arable land	Non-irrigated arable land	211	57.13
		Permanently irrigated land	212	669.50
		Rice fields	213	-
	Heterogeneous agricultural areas	Agro-forestry areas	244	-
		Annual crops associated with permanent crops	241	-
		Complex cultivation patterns	242	150.26
		Land principally occupied by agriculture, with significant areas of natural vegetation	243	38.40
	Pastures	Pastures	231	4.79
	Permanent crops	Fruit trees and berry plantations	222	54.16
		Olive groves	223	-
		Vineyards	221	-
Artificial surfaces	Artificial, non-agricultural vegetated areas	Green urban areas	141	9.87
		Sport and leisure facilities	142	2.93
	Industrial, commercial and transport units	Airports	124	15.85
		Industrial or commercial units	121	252.13
		Port areas	123	1.17
		Road and rail networks and associated land	122	40.86
	Mine, dump and construction sites	Construction sites	133	-
		Dump sites	132	-
		Mineral extraction sites	131	3.90
	Urban fabric	Continuous urban fabric	111	97.25
		Discontinuous urban fabric	112	114.65
Forest and semi natural areas	Forests	Broad-leaved forest	311	3.30
		Coniferous forest	312	3.78
		Mixed forest	313	10.09
	Open spaces with little or no vegetation	Bare rocks	332	-
		Beaches, dunes, sands	331	-
		Burnt areas	334	-
		Glaciers and perpetual snow	335	-
		Sparsely vegetated areas	333	-
	Scrub and/or herbaceous vegetation associations	Moors and heathland	322	-
		Natural grasslands	321	0.50
		Sclerophyllous vegetation	323	-
		Transitional woodland-shrub	324	42.90
Water bodies	Inland waters	Water bodies	512	-
		Water courses	511	1.70
	Marine waters	Coastal lagoons	521	-

CLC Level 1	CLC Level 2	CLC Level 3	CLC CODE	Unit-1 (Hectare)
		Estuaries	522	-
		Sea and ocean	523	-
Wetlands	Inland wetlands	Inland marshes	411	-
		Peat bogs	412	-
	Maritime wetlands	Intertidal flats	423	-
		Salines	422	-
		Salt marshes	421	-

Calculations have been made with this acceptance by using CORINE Land Cover.

Major land use depending on the Project will be on 669.50 ha of permanently irrigated land, 252.13 ha of industrial/ commercial, 150.26 ha of complex cultivation patterns and 114.65 ha of discontinuous urban fabric. The land use type in the Project footprint will change.

Studies about main soil types in the project area is according to the database of the General Directorate of Rural Services. Detail information about soil is given in the table below (see Table 4.6, Table 4.7, Table 4.8, Table 4.9 and Table 4.10).

Table 4.6: Major Soil Group Distribution in the Project Area

Great Soil Groups	Area (m ²)	Area (ha)
Non-Soil Areas	2,364,965.07	236.50
Red Yellow Podzolic Soils	0.00	0.00
Gray Brown Podzolic Soils	0.00	0.00
Brown Forest Soils	534,146.31	53.41
Limeless Brown Forest Soils	507,903.60	50.79
Chestnut Soils	0.00	0.00
Reddish Chestnut Soils	0.00	0.00
Red Mediterranean Soils	1,000,961.53	100.10
Red Brown Mediterranean Soils	1,559,952.23	156.00
Brown Soils	0.00	0.00
Calc Free Brown Soils	0.00	0.00
Reddish Brown Soils	0.00	0.00
Rendzinas	0.00	0.00
Vertisols	189,877.40	18.99
Sierozems	0.00	0.00
Regosols	0.00	0.00
Basaltic Soils	0.00	0.00
High Mountain Meadow Lands	0.00	0.00
Alluvial Soils	5,546,382.42	554.64
Hydromorphic Soils	0.00	0.00
Alluvial Coastal Soils	0.00	0.00
Colluvial Soils	3,544,526.39	354.45
Salty-Alkali and Salty-Alkali Mixture Soils	0.00	0.00
Organic Soils	0.00	0.00
River Flood Beds	274,539.00	27.45
Residential area	221,319.70	22.13
Total	1,5744,574	1574.5

Table 4.7: Soil Depth Classes

Code	Depth Class	Area (m ²)	Area (ha)
	Barren Rocks - Settlements - River Beds	2,860,824	286.1
A	Deep (> 90 cm)	7,921,474	792.1
B	Moderate (50 - 90 cm)	2,436,479	243.6
C	Shallow (20 - 50 cm)	1,731,897	173.2
D	Very Shallow (0 - 20 cm)	556,621	55.7
E	Litozolik	237,279	23.7
	Total	15,744,574	1574.5

Table 4.8: Land Use Capability Class (LUCC)

Class	Area (m ²)	Area (ha)	%
Non-Soil Areas	2,581,066.37	258.11	16.39
I	6,504,238.01	650.42	61.11
II	2,520,784.12	252.08	16.01
III	1,905,539.02	190.55	17.90
IV	528,672.70	52.87	4.97
VI	499,232.70	49.92	4.69
VII	925,283.33	92.53	8.69
VIII	279,757.40	27.98	2.63
Total	15,744,574	1574.5	

Table 4.9: Problematic Areas

Code	Others	Area (m ²)	Area (ha)
	Stone Free & Rocky Areas	12,839,907.9	1,283.99
h	Slightly salty	0	0.00
s	Salty	0	0.00
a	Alkali	0	0.00
k	Lightly salted - Alkali	0	0.00
v	Salty - Alkali	0	0.00
t	Stony	1,667,795	166.78
r	Rocky	146,810.7	14.68
y	Insufficiently drained	413,600	41.36
f	Poorly drained	0	0.00
hy	Slightly salty / Insufficiently drained	504,538	50.45
ky	Lightly salted - Alkali / Insufficiently drained	171,922	17.19
	Total	15,744,573.6	1,574.5

Table 4.10: Soil Erosion Classes

Code	Erosion Class	Area (m ²)	Area (ha)
-	Non-Soil Areas	2,860,823.8	286.1
1	No Erosion or Slight	7,892,173.2	789.2
2	Moderate	3,314,582.6	331.5
3	Severe	1,239,834.6	124.0
4	Very Severe	437,159.4	43.7
	Total	15,744,573.6	1,574.5

Erosion classes of the Project footprint are given in the table and map above (see Table 4.10). After the construction works, the soil structure will change and the vegetative soil will be re-laid in the Project area and the soil will be tightened. Because of these processes, the Project is not expected to have a negative impact on soil erosion risk classes, except for the Project footprint.

4.2.3.2 Temporal Extend

The construction of the railway system is scheduled to be completed in 34 months, and it is followed by period of 24-month guarantee. The period when the impacts can be reversible is described as temporal boundaries. When the construction is completed, impact of the Project on land use and soil will not be reversible. After the construction of the Project, land will be used for transportation until the end of operational period of the Project.

4.2.4 Identification of Baseline Conditions

Existing situation related to land use, topography and soil is given in this section of the report. Results of the baseline studies are used to define the impacts of the proposed project in the project area.

4.2.4.1 Desk Studies

In the context of Mersin-Gaziantep High Standard Railway Project, baseline conditions of the Project area are analyzed with the purpose of defining land use. The database of the General Directorate of Rural Services and CORINE Land Cover were used. Results of the desk studies are given in the Section 4.2.3.

Mersin-Adana

There are settlements belonging to Mersin Province Tarsus District and Adana Provinces along the route. TCDD. The project of adding 3rd and 4th line railways between Adana-Mersin stations planned to be realized by the 6th Regional Directorate will pass through the lands owned by TCDD. In addition, the vegetable soil to be stripped on the route will be stripped and the excavation soil to be removed will be temporarily stored on the route 5 meters on the side for later use.

General Geology

The study area covers different tectonostratigraphic units with tectonic contact with each other in the Taurus belt, with distinctive distinctions between Adana and Mersin provinces in terms of their surroundings, distinctive stratigraphy, structure and rock type characteristics. Bolkar Mountain unit includes the rocks with olistostrom feature together with carbonate and clastic rocks deposited from the Devonian-Lower Tertiary interval. The steppe unit includes acidic tuff, basic and ultrabasic rocks and serpentinites, with sequences representing different facies and environments ranging from continental slope and ocean-type rocks to shelf-type rocks deposited in the Triassic-Cenozoic range. Aladağ unit includes shelf type carbonate and clastic rocks representing the Devonian-Cretaceous range.

The Geyik Mountain unit includes carbonate and clastic rocks belonging to the Cambrian-Early Tertiary range. The Görbiyes Mountain unit includes the carbonate sequence, which probably represents the Jurassic-Late Cretaceous interval, and the olistolith and olistostromal formations. Görbiyes Mountain Unit shows low grade metamorphism. The Keban-Malatya unit is represented by the Upper Paleozoic-Lower Cretaceous age range, metamorphism, mainly platform type metaclastics and metacarbonates. The Misis-Andırın union presents features of mélangé and volcanoes, which were deposited in the Cretaceous-Tertiary time interval. Cover units consist of shallow marine sediments deposited in the Tertiary-Quaternary range and pelagic (deep sea, > 1,000m) sediments.

Stratigraphy

Bolkar Mountain Union

The union takes its name from the Bolkar Mountain in the Central Taurus Mountains. Mostly, green schist facies cover limetamorphites. The oldest unit of the union containing fossils (coral and brachiopods) is the Devonian aged schist and marbles. Carboniferous schist, quartzite and limestone; Permian is represented by recrystallized limestone with intercalations of quartzite. Triassic shale, quartzite, limestone and dolomite, in the region showing metamorphism, it covers schists with marble intercalations, green chlorite and sericite.

Liass begins with the floor pebble. It consists of Jurassic and Cretaceous carbonate rocks. Upper Cretaceous (Cenomanian-Turonian) ruddiest limestone is represented by Maastrichtian pelagic limestone. Rocks in the Maastrichtian and/or Paleocene olistostromfacies form the uppermost unit of the unit. Epirogenic movements were effective during the Upper Paleozoic and Mesozoic.

Steppe Union

It consists of acidic tuff, basic and ultrabasic rocks and serpentinites, with sequences representing different environments in facies ranging from ocean-type rocks to shelf-type rocks deposited in the Triassic-Senonian range. It is a mixed (Melange) in a broad sense. In the region, the carbonate and clastic rock assemblage mixed with the antophiolite and ophiolite belonging to the Bozkır unit, which forms allochthonous coverings on the Aladağ and Geyik Mountain units, is the "Karsanthiophiolite complex". The karsanthiophiolite mix is mainly composed of ultramafic rocks such as dunite, harzburgite, pyroxenite, gabbro and blocks of carbonate, clastic, mafic and ultramafic rocks.

Aladağ Union

This union, which generally includes rock units representing the Devonian-Upper Cretaceous interval; The shelf is represented by flysch-like clastic rocks containing carbonate and clastic rocks, olistolite and olistostromal formations. Traces of the terrestrial phase are seen in Upper Tiryas. Consequently, red conglomerate and sandstone units with a thickness of 500 meters are observed in the Taurus belt. It includes lead-zinc ore deposits controlled by Permian and Triassic rocks.

Geyikdağı Union

The Geyik Mountain unit, which covers a wide area around Kozan, Feke, Saimbeyli and Tufanbeyli districts in the north of Adana province in the Eastern Taurus Mountains, includes mainly shelf type carbonate and clastic rocks deposited in the time interval from Cambrian to Tertiary.

Emirgazi Formation

The formation consists of subarkose, siltstone and claystone with lateral and vertical transition between them. It contains limestone, dolomite and quartzite layers and lenses of different sizes. The Emirgazi formation, which is thin, partly thick bedded, some levels are graded and cross-bedded, laminated and jointed, is purple, gray, green and brown in color. The material of the formation, which was deposited in a shallow and high energy environment, was derived from a granitic or gneissic basement. It contains 70-80% quartz, 10-20% feldspar and less biotite, muscovite, tourmaline, zircon grains and clay. Specularite plastering observed on cracks and joint layer surfaces is a distinctive feature for the formation. Base relationship is not observed. The age of the formation for which no fossil has been found is the Lower Cambrian, according to its stratigraphic position.

Değirmentaş Formation

Değirmentaş formation is located on Emirgazi formation gradually. It is represented by limestone, dolomite and nodular limestone, which show lateral transition between them and replace each other in different locations. It is medium-thick bedded, gray, and black in color. It was generally formed in a calm environment. Its thickness gives different values at short distances laterally. Age is given as Middle Cambrian according to its stratigraphic location.

Armutludere Formation

This formation, which is gradually transitive over the Değirmenteş formation, consists of an alternation of nodular limestone, shale and siltstone. The formation is thin to medium bedded, laminated, gray, purple, green, brown in color, and is characterized by its worm traces and cone in cone structures. It shows the transition to the Halıyaylası formation with a thin arctic level and is of Upper Cambrian-Upper Ordovician age.

Halıyaylası Formation

The unit consists of conglomerate and sandstone. Conglomerate pebbles with angular, semi-angular, poorly sorted and thick layer at the base are mostly quartz. It passes to the middle bedded, jointed, laminated, graded and cross bedded sandstones as the grain size gets thinner towards the top. The purple and gray Halıyaylası formation is a shallow and high-energy.

It precipitated in the environment. Since there are no fossils, it has been accepted as Lower Silurian, considering the age of the formations above and below it.

Puşutepe Formation

It is represented by gray, black colored, thin bedded, laminated and abundant graptolite fossils shale. It is compatible with the Halıyaylası formation at the bottom and passes to the Yukarıyayla formation represented by the lumpy limestone at the top. The age of the Puşutepe formation, which was deposited in a low energy environment close to the coast, is Lower Silurian.

Yukarıyayla Formation

This formation, which shows regular limestone-shales and includes layers of nodular limestone with abundant orthoceras, especially in the lower levels, reflects shallow and unstable shelf environment conditions. The Upper Silurian is old.

Ayitepesi Formation

It consists of alternation of sandstone-limestone-shale. It is thin-medium bedded, green, purple and brown in color. There are worm marks on the layer surfaces. It should be cross layered in places. It precipitated in a shallow environment. The age of the formation is Lower Devonian.

Şafaktepe Formation

It is represented by sandstone at the bottom and dolomite at the top. It sits harmoniously on the Ayitepesi formation. The sandstone level is medium-thick bedded, white, brown colored and consists of more than 80% quartz and a little feldspar fragment. It gradually passes into dolomites at the top. Dolomite is medium-thick bedded, white-black colored and combined. Amphiporamosa (phillips) in the lower levels and Mesophyllum sp. Şafaktepe formation containing fossils was deposited in a shallow environment with a depth not exceeding 50-60 m. Its age is Lower Devonian.

Gümüşali Formation

It begins with limestone-shale intercalation, continues with shale-limestone-sandstone alternation, and passes into the Ziyarettepe formation with ferrous and sandstone. The unit, which is medium-thick at the base and thin-layered at the middle and upper levels, is gray, black and brown in color. Worm marks and rip markers are observed on layer surfaces. The limestones at the bottom contain abundant coral fossils. The age of the unit that collapsed in an environment where hot, shallow and wave energy is effective is Upper Devonian.

Ziyarettepe Formation

The unit starts with thin bituminous shale, sandstone, limestone, marls at the base, and continues with the alternation of sandstone, limestone and marl layers towards the top. This member, which is thin to medium bedded, jointed, dirty yellow, brown colored, gradually passes into limestones in its upper levels. Limestones are represented by a medium-thick bedded, jointed, fractured, gray, black limestone sequence. The Ziyarettepe formation is of Lower Carboniferous age. It is gradually transitive with the Gümüşali formation at the bottom and is incompatible with the Yığıltepe formation at the top.

Yığıltepe Formation

A thick limestone represents it. Limestone is thin-medium, partly thick-bedded, jointed, gray, and black in color. Some of the levels are oolitic and contain dolomite and quartzite layers and lenses. At the top, the Yığıltepe formation, which shows a gradual transition to the Katarası formation with a thin bedded limestone level, overlies the Ziyarettepe and older formations unconformably. It was deposited in a shallow, warm and low-energy environment with abundant algae. He is of Permian age.

Katarası Formation

It is represented by a thin-bedded, laminated sequence of yellow, gray, purple and green marble containing thin limestone and sandstone layers. Limestone, which increases towards the upper levels in the formation, is partly lamellar and gastropodaceous. The Katarası formation, which is compatible with the Yığıltepe formation at the bottom, is incompatible with the Köroğlutepe formation at the top. Its age is given as Lower Triassic.

Köroğlutepe Formation

It is represented by a thick carbonate sequence. This unit, which consists of dolomite, limestone and dolomite-limestone alternation, is generally gray, black colored, jointed, medium-thick bedded. It also includes oolitic limestone levels. It takes place unconformably over the Katarası formation and the older formations. It is Jura-Cretaceous in age.

Güzelimköy Formation

The unit consists of marl, limestone and sandstone. The unit, which is thin to medium bedded, gray, light gray, dirty yellow and red, is characterized by marl, rod-like disintegration. The Güzelimköy formation, which also contains ground geoglomerate layers, is gradually transitional with the Köroğlutepe formation. Its age is Upper Cretaceous.

Gerbiyes Mountain Union

The Gerbiyes Mountain Unit covers Mesozoic age metamorphic carbonate and clastic rocks. It consists of flysch-like formations with dolomite, neritic limestone, flint limestone and pelagic micrites from the bottom. This rock unit shows metamorphism in green schist facies.

Sağkaya Formation

It includes levels of dolomite, neritic limestone and flintstone intercalated limestone. The 400 m thick unit has undergone a low degree of metamorphism. It is Jurassic-Cretaceous in age.

Kızılarsakisi Formation

The unit consists of metaclastics including olistolith and olistostromal formations. Green schist facies shows metamorphism at the beginning. It must be of Upper Cretaceous and younger age.

Keban - Malatya Union

Keban-Malatya unit has Upper Paleozoic-Lower Cretaceous age range. The lower part has at least metamorphism at the level of amphibolite or green schistfacies. The degree of metamorphism decreases towards the upper levels. Predominantly platform type is represented by metaclastic and metacarbonates.

Yoncayolu Formation

The unit, which is composed of mainly gneiss, amphibolite, schist and calcschist sequence, is partly doped with medium thickness marble, crystallized limestone, phyllite, quartzite and metavolcanite. It shows moderately and probably metamorphism in the amphibolit facies. The unit with a thickness of 600 m is in the Carboniferous-Permian age range.

Çayderesi Formation

In the unit, which consists mainly of marble, crystallized limestone and locally dolomites, additions of calcschists and greenschists are also observed. It shows metamorphism in the green schistfaci. With a thickness of more than 500 meters, the unit is Permian in age. The formation consists of a non-uniform rock type assemblage of crystallized Alıçlı limestone, calcschist, greenschist, and phyllite and metaseyl type. It shows low degree metamorphism properties. The age of the unit with a thickness of around 250 m must be Triassic.

Kaletepe Formation

The unit represented by recrystallized platform type carbonates should be in the Jurassic-Cretaceous age range.

Misis-Andırın Union

Misis-Andırın union; Karataş in the south, Adana-Yakapınar (Misis) in the west, and Ceyhan and Yumurtalık in the east. The Misis group, which has no relationship with the Eastern Taurus autochthonous rocks and lies between the Adana basin and the Amanos, has been divided into Dokuztekne, Andırın and Karataş formations.

Dokuztekne Formation

In the region, this unit is represented by a volcano sedimentary sequence. The unit starts with tuffs with manganese limestone levels at the bottom, and continues with spiliticagglomerate, volcanic element stones and clayey limestone intermediate level agglomerates. The lower contact of this unit, whose thickness varies between 1,500 - 2,000 m, is tectonic and the Andırın formation unconformably comes on top. The age of the formation is Meastrichtian-Lower Eocene.

Andırın Formation

The Andırın formation, which is mostly composed of serpentinites, has the characteristic of flowing debris, from gravel to very large olistoliths, possibly Paleozoic aged, recrystallized limestone, Mesozoic and Eocene limestones, volcanic and ophiolite blocks. It is thought to occur with rapid storage. This unit, which overlies the Dokuztekne formation with an angular unconformity, is overlain by the Karataş formation with an angular unconformity. The age of the unit is Upper Lutetian-Lower Miocene.

Karataş Formation

Karataş formation is generally a turbiditic sequence represented by alternation of sandstone-marl-sandy limestone-mudstone. It includes blocks in velitology of various ages, most common at olitostromal levels. It also contains rocks belonging to the Andırın formation that came to the basin as nappes and blocks during sedimentation. The unit overlying the Andırın formation with unconformity is unconformably covered by young sediments. The diposis in samples taken from different levels in the Karataş formation with a thickness of 2,500 m or more gave the age of Lower-Upper Miocene.

Kızıldere Formation

The formation starts at the bottom with conglomerate and reef limestones. It transitions into thick layers of sandstone and marls towards the top. Marls are dark gray in color. Rare clayey limestones are light cream colored, brittle, laminated and abundantly clayey. In the intermediate levels basalts behave. The upper contact of the unit unconformably overlying the lower units is a fault along the Yumurtalık fault. Although the upper boundary of the formation is uncertain, it has a thickness of approximately 1,500 m. The age of the unit is given as Upper Miocene.

Hamış Formation

The main component of the formation is conglomerate. Sometimes limestone cement and sometimes almost too little cement are seen in the conglomerate. In rare cases, coarse-grained sandstone, light gray, brown and sometimes red-colored milite or pebbly marl, mudstone additives are present. The elements of the conglomerates are all ancient rocks in the region. Cross stratifications are observed on a very large scale. The formation covers units older than itself. It contains Delihalil basalts.

Delihalil Basalt

Quaternary-aged basalts that yield outcrops in Yumurtalık, Ceyhan, Osmaniye and Haruniye regions are named as Delihalil formation. Basalticvolcanism presents very different macro examples. The unattached pyroclastics in the cones of Delihalil Tepe and Üç Tepe consist of elements such as volcanic bombs, lapilli and pumice stone. Underneath the lava flows there are yellow-colored loose-textured tuffs. The lava flows on the top are very durable and carry traces of fluxes. The age of Delihalil basalts is considered to be Quaternary.

Caliche

Caliche is similar to the formation of travertine. In the dry seasons, CaCO_3 transported water was formed by the evaporation of the waters when they came to the surface and the calcareous substances they carried were deposited. They were deposited in the wider areas in accordance with the slope of the slope in the Misis hills region. Its thickness reaches from a few centimeters to several meters. Its age is Quaternary-Holocene.

Dunes

The dunes that cover large areas in the coastal area from Yumurtalık Bay in the east to Tuzla in the west, from time to time spread up to a few km inland. In recent history, coastal dunes have been formed in the region as a result of the removal of the sands on the shore up to tens of meters with the effect of the strong winds blowing on the shore. These are in the form of hills or strips at a height of 1-10 meters that spread along the coast. Areas devoid of vegetation move under the influence of the wind and move frequently. These dunes have partially or completely covered some ancient settlements belonging to the Venetian, Byzantine, and Roman periods established in the areas near the shore, in the vicinity of Yumurtalık and Karataş.

Alluvium

In the Adana - Mersin basin, there are old alluviums forming the Adana plain and young alluviums developed along the stream. Old alluvium is generally covered with vegetative soil. New alluviums have developed along streams and generally consist of poorly sorted unattached gravel, sand and spindle material.

Hydrogeology

The unit forming the project area is a semi-permeable unit. It changes as clay-silt-sand and gravel laterally within itself. It consists of materials coming from high mountains and slopes and the unit that carries water in it features an aquifer. In the plains where Seyhan River stores alluvial material in places, the ground level is close to the surface.

İncirlik-Toprakkale

Within the scope of the construction of II Line between İncirlik and Toprakkale stations, the 6th Regional Directorate of TCCD made the Survey and Project tender. The length of the project is approximately 68 km. The project start is taken as the İncirlik Station exit Km: 380 + 778, and the end of the project as the Toprakkale Station entrance Km: 448 + 669.

The İncirlik-Toprakkale Railway Project will proceed in parallel with the existing line. As there is an existing line, the most important effects of the II. Line will be socio-economic changes. The socio-economic changes expected within the scope of the project will be due to the newly planned bridge projects and expropriation. Therefore, environmental impact of II. Line Railway Project is considered as at negligible levels. Construction works will generally be carried out on this line only.

General Geology

In order to reveal the geodynamic evolution of the study area, the litho-stratigraphic units of Adana and Osmaniye provinces and their surroundings were investigated. While preparing the general geology data of the İncirlik-Toprakkale railway route and its immediate surroundings, literature research was carried out together with the land survey studies. The Cemiş Fault Zone in the west, the Orogenic Taurus Mountain belt in the north, and the Amanos Mountains in the east (Yetiş and Demirkol, 1986) limit the Adana Basin, in which the study area is located.

Adana Basin Tertiary sequence is unconformable on the Paleozoic and Mesozoic aged rock stratigraphic units forming the Taurus orogenic belt and consists of 11 interlocking rock stratigraphic units. There are units consisting of Güvenç formation, Kuzgun formation, Handere formation, caliche - terrace and alluvium in the study area and its close vicinity;

Güvenç formation, named by Schmidt (1961), consists of dark gray, greenish gray-gray shale. In addition, there are few fine sandstone-siltstone-clayey limestone and carbonaceous shale levels in places.

The Kuzgun formation, which was first named by Schmidt (1961), outcrops widely in the north and northwest of Adana. The unit deposited in the Upper-Middle Miocene period starts with fluvial-shallow marine sediments at the base and it consists of alternation of conglomerate, pebbly sandstone, sandstone and amestone. Yetiş and others (1991) named this level as the member of Kuzgun. Yetiş and others (1991) defined another member of the Kuzgun formulation as a member of Salbaş tuffite. This member overlies the Kuzgun member and begins with light gray volcanoclastic sandstone-conglomerate at the base. The main tuffite mass, which forms the basis of the member, is light gray-off-white colored, containing clay and spindle, partly made of biotite and mafic mineral tuffite or volcanoclastic mudstone. Yetiş and the others (1991) name another level overlying the Kuzgun formation as Memişli sandstone by Schmidt (1961) and Memişli member. The fluvial sediments of the unit, which consists mainly of river, lake and shallow sea sediments, begin with mottled, cross-layered, pebbly sandstone and coarse sandstone. Thin to medium bedded, low angle trough-shaped cross bedded sandstone and above it red-brown, mottled colored siltstone-mudstone. Shallow marine sediments are made up of thin medium sandstone with thin pebbles, siltstone - mudstone.

Schmidt (1961) first named Handere formation, which was deposited in the Upper Miocene - Pliocene period. The unit crops out especially in the north of Adana - Misis. Gray-colored conglomerate, pebbly sandstone, sandstone, siltstone and mudstone are made of marl and form gypsum lenses in places. The unit, which has a transitional ocean on the Kuzgun formation at the bottom, is covered with common terrace formations of the Adana basin, caliches and locally young alluvium at the top.

Another unit that is widely exposed in relatively small areas in Adana and its vicinity is the caliche. In general, the formation of this unit, whose upper levels are hard (hard pan) and the lower levels are soft (soft pan), is explained by two different approaches. The first of these is the evaporation of groundwater as it rises to the surface and the precipitation of carbonate in it. In the second approach, caliches can be formed with the precipitation of carbonate in the waters leaking from the surface. In the north of Adana, common calcic formations are observed especially on the terrace materials. In the south of Adana, there are caliche on the parts of Ceyhan River towards Karataş.

In the Adana basin, there are old alluviums forming the Adana plain and young alluviums developed along the stream. Old alluviums are generally covered with vegetable soil. New alluviums are developed along the streams and generally consist of poorly sorted unattached gravel, sand, silt and clay material. The meandering structures of the Seyhan and Ceyhan rivers allow the precipitation of fine-grained (sand-silt-clay) materials rather than very coarse-grained material.

Stratigraphy

There are sedimentary deposits and Quaternary deposits in the study area.

In order to facilitate the explanation, in order to explain the geochronological order and stratigraphic relations of the rock units defined with unofficial geography names in accordance with the stratigraphic naming rules, the basement and cover rocks in the region are described in order from old to young.

Karataş Formation (Tmk)

Karataş formation is generally a turbiditic sequence represented by alternation of sandstone-marl-sandy limestone-mudstone. It contains blocks of various ages and lithology, mostly widespread at olitostromal levels. It also contains rocks belonging to the Andırın formation that came to the basin as nappes and blocks during sedimentation. Unconformably overlying the Andırın formation, the unit is unconformably covered by young sediments. Fossils in samples taken from different levels in the Karataş formation with a thickness of 2,500 m or more have given the Lower-Upper Miocene age. Unit is exposed around the Yakapınar exit and Yılankale.

Caliche (Qk)

The formation of caliche is similar to the classical travertine formation. They were formed when waters carrying CaCO_3 evaporate when they came to the surface in dry seasons and precipitated calcareous substances they carried. They were deposited in large areas in the Misis hills region in a position suitable for the slope of the slope. Its thickness reaches from a few centimeters to several meters. Its age is Quaternary-Holocene. The unit is exposed in large areas especially around Yakapınar.

Alluvium (Qal)

In the Adana basin, there are old alluviums forming the Adana plain and young alluviums developed along the stream. It is also possible to consider old alluviums as delta formations.

This unit, where the Seyhan and Ceyhan Rivers are deposited in the places where they flow into the sea and currently have organic soil cover, constitutes the fertile Çukurova. Young alluviums developed along streams and generally consist of poorly sorted, unattached gravel, sand and silt material. Gravel, sand and spindle material are mainly derived from ophiolite, various limestone types, radiolarite, chert, quartzite etc. depending on the basic lithology of the Taurus orogenic belt. The gravel, sand and silt rates in these alluviums vary

according to the type of stream. Alluvium is exposed in all flat areas from the beginning to the end of the Project.

Geomorphology

Within the borders of Adana province, different stream shapes and the valley cuts created by them, steep slopes, small islets formed by changing the bed of streams and alluvial fans formed in the plain section are remarkable morphological forms. Adana province is examined in two parts, the center of which is north and south. Post Miocene erosions, rock falls, rock falls that occur in rock variations on the slopes and the post Miocene erosional surfaces that have become smaller due to erosion in the northern part due to erosion, bedlands topography around the dam lake is formed by abrasion and accumulation glaciers, ridges and steep slopes. They are split by streams. In the southern part, the alluvium formed by delta sediments and the large flood area formed by the change of bedding of the Seyhan river in time consists of detached meanders, lagoons, terrestrial lagoons, temporary and permanent lakes, cape set reservoirs, craveses and river terraces (Yaşar et al., 1999).

Hydrogeology

Seyhan and Ceyhan rivers are seen as the most important surface water resources along the investigated project route.

These two rivers and sediments brought by the arms of the Taurus Mountains of Turkey's most efficient. They have created Çukurova, one of its plains. Seyhan River rises as Zamantı River in the north of Kayseri-Pınarbaşı in the Central Anatolia Region. When it enters the borders of Adana province, it forms the Seyhan River by joining the Göksu River that originates from Sarız from the northeast. Other important branches of Seyhan River are Çakıt Stream, which originates from Ulukışla, Körkün Creek and Entertainment Teas that originate from the north of Karaisalı. Seyhan River, which forms the Seyhan and Çatalan Dams, passes through Adana and enters the plain. After establishing the Adana-İçel border, it flows into the Mediterranean in Deli Cape. Its total length is 569 km. The Ceyhan River, which is another important stream, springs from Kahramanmaraş-Elbistan. The river, which is 509 km long, grows by joining various streams and streams within the borders of Kahramanmaraş province. After passing through Aslantaş Dam located on the border of Adana Kahramanmaraş, it merges with Sumbas and Savrun streams around Osmaniye-Kadirli. After forming the Osmaniye-Adana border for a while, it enters the province of Adana. It passes through Ceyhan district and comes to Misis. From there, it turns south, passes the Hurma Strait and pours into the Mediterranean. The precipitation area is approximately 20,000 km and the average flow rate is 180 m³/sec. The highest flow is in April.

Apart from this, there are many irrigation and drying channels of DSI except Karaçay in the section from Km: 410 + 000, where the route passes the Ceyhan plain, to the end of the project. There are underground waters in alluvial units in the region. While groundwater is close to the surface in Ceyhan plain, groundwater is deeper in alluvial plains on the Incirlik side.

In addition, it can be mentioned that the existing spring waters and the existence of leaking waters that vary according to the seasons.

Toprakkale-Bahçe

Geological-geotechnical research studies conducted for the Km: 0+000-57+685 section of the project route within the scope of Engineering Services for the Double Line Railway Survey-Project between Toprakkale - Bahçe Stations consists of Engineering geology survey basic survey drilling, in-situ and laboratory experiments.

General Geology

Turkey's geological structure, as part of the Alpine-Himalayan orogenic belt in the late Tertiary period to form a monolithic land mass formed by the combination of different continental plates come together.

These continental plates were formerly separated by oceans; ophiolites and accretion prisms, which are the remnants of this ocean, are exposed throughout the Anatolian peninsula. During the late Paleozoic-early Paleogene period, the sea called Tethys lies between the Eurasian continental border in the north and the continental border of Gondwana (Africa) in the south. North Turkey, which is the region of the Tethys Sea, which is part of the Eurasian continental margin Pontian and an array of European-Asian relations with geological geology, is characterized item. The Anatolia-Tauride region, the southern geological region associated with Gondwana, separated from the mainland of Gondwana in the Triassic period and formed a widespread, independent carbonatic plateau that persisted throughout the mesozoic period.

All these elements clustered in the mid-Cretaceous period with the closure of the ancient Tethyan Sea and the beginning of the Alpine orogenic cycle. As a result, two main orogenic belts have developed. Pontide in the north and Anatolia-Tauride in the south. Between these two belts, there is a large Central Anatolian Complex Crystalline area (Kırşehir Massif), which is composed of supercretase metamorphic and Plutonic rocks, of which connection is not clear. These three areas constitute the main mass of Anatolia today. These areas are separated from each other by suture belts formed by the continuous accretion of tectonic layers from previously existing sea and continental areas.

While the Pontide Belt was relatively less affected by the Alpine orogeny, it mostly preserves the remnants of the old orogenic events (e.g. Variscan and Chimerid orogenesis). On the other hand, the Anatolian-Tauride Belt was severely deformed and partially metamorphosed during the Alpine orogenesis.

From a stratigraphic point of view, the Anatolian-Taurid Belt shows similarities with the northernmost extension of the Arabian plate, whose features are today in Southeast Anatolia. In both regions, clastic-carbonate-dominated Paleozoic and carbonate-dominated Mesozoic successions were observed.

Following the complete closure of the oceanic field, the tectonic phase started in the Oligo-Miocene period. This has led to the initiation of continental type sedimentation in many inter-mountain basins associated with widespread calcalkaline magmatism, dipping and strike-slip fault.

The neotectonic activity of Anatolia, which continues today, originating from the western direction of the Anatolian block and causing some of the most severe earthquakes recorded throughout history, has been characterized by a tectonic regime from slope to strike.

Stratigraphy of the project route listed as Clastic Rocks (Upper Ordovician), Undifferentiated Harzburgite, Dunite and Serpentinite (Mesozoic), Neritic Limestones (Upper Jurassic-Lower Cretaceous), Clasticites and Carbonates (Middle Miocene), Undifferentiated Terrestrial Basalt (Pliocene), Quaternary Basalt Listed in unseparated Quaternary.

The study area is located in the Taurus belt, between the Yumurtalık Fault and the Amanos Mountains. The stratigraphy of the province of Osmaniye and its surroundings within these boundaries presents a sequence starting from the Lower Paleozoic and continuing to the Upper Cretaceous, Eocene, Miocene and Plio-Quaternary. It presents a continuous sequence starting from Amanos Mountains in the east, from Lower Paleozoic to Upper Cretaceous in the west. In the study area, there is an ophiolite obduction, albeit Upper Cretaceous, and in places Eocene outcrops are observed. Above all these are the Helvetic-Tortonian sediments (Kızıldereli Formation) with shallow sea facies characteristics (BİLGİN et al. 1981). Reef lenses are observed in places in these deposits. Young sediments of Plio-Quaternary age overlie these formations with the effect of grabenization as one goes southwest in the study area. Among the two Miocene sequences with different characteristics mentioned earlier, there is the Lower-Middle Miocene aged Karataş Formation with lateral and vertical variations, containing blocks of various ages and lithology or nappe slices belonging to the Andırın Formation. This highly folded unit exhibits change in fauna from other formations. The rock units defined as the Misis-Andırın basin were deposited in the Cretaceous-Tertiary time interval. It offers melange and volcano sedimentary facies features.

Stratigraphy

Kızıldağ Ophiolite

The Kızıldağ ophiolite, an allochthonous body, is the last unit in the southwest of the Amanos Mountains. The unit, which consists of ultrabasic-basic rocks, spreads in an area of approximately 720 km² between İskenderun-Belen-Bedirge-Antakya-Çevlik, and first named the unit Selçuk (1985) Kızıldağ ophiolite. Tekeli and Erendil (1986) into Tectonite Peridotite, Polyclitic Zone, Layered Gabbro, Isotropic Gabbro, Dike Complex and Volcanic Complex have divided the Kızıldağ ophiolite. Again, Selçuk (1985) divided the Kızıldağ Ophiolite into five rock units: Tectonite-Cumulate-Diabase dyke complex-Pillow lava-volcano sedimentary. The base relationship of the Kızıldağ ophiolite occurs in mid-ocean ridges according to plate tectonics. The relationship between this ocean material and a continental crust is undoubtedly faulty. We can explain this movement with overlay. We can see this relationship in the Kazankaya tectonic window. Kızıldağ ophiolite was pushed together with volcano sediments consisting of deep-sea sediments and settled on the carbonate platform of Denizgören Group (Arabian plate). During the thrust, the Kızıldağ ophiolite was also pushed onto each other by additional faults formed within it. The ceiling relationship of the Kızıldağ ophiolite; Young autochthonous units unconformably overlie the autochthonous units and Allochthonous units (Kızıldağ ophiolites). Young autochthonous units start with Upper Maestrichtian conglomerates and continue with Paleocene, Eocene, Middle-Upper Miocene, Pliocene sediments. The thickness of the Kızıldağ ophiolite is thought to be more than 8,500 meters.

Karataş Formation

Karataş formation is generally a turbiditic sequence represented by alternation of sandstone-marl-sandy limestone-mudstone. It contains blocks of various ages and lithology, most common at olitostromal levels. It also contains rocks belonging to the Andırın formation that came to the basin in the form of nappes and blocks during sedimentation. Unconformably overlying the Andırın formation, the unit is unconformably covered by young sediments. Fossils in samples taken from different levels in the Karataş formation with a thickness of 2,500 m or more have given the Lower-Upper Miocene age (see Figure 4.1).



Figure 4.1: Images of the Karataş Formation in the field

Undifferentiated Terrestrial Clastics (Pliocene)

Pliocene units show a wide distribution in the region where the project route passes. Typically, the Pliocene units, consisting of less consolidated, consolidated sand-gravel units, are conglomeratic in places. The clays in the Pliocene units are light brown-beige colored, medium hard, more or less sandy and occasionally contain mica flakes. At the bottom of the clayey layers, there is ophiolite pebbly, irregularly sized, loosely cemented basal conglomerate.

Quaternary

This formation consists of young deposits. It contains materials ranging from coarse gravel to sand, silt, and clay size. They are generally seen on the valley floor. It is located in thick layers in the plains. As can be seen from the borehole logs and the geological and geotechnical profile, the thickness of the alluvial deposits on the route varies. Alluviums on the route generally consist of coarse-grained units. Typically, silt-clay, sand, gravel and clayey-silty sand consisting of mixtures of these units, clayey-silty gravel, sandy clay-silt, pebbly clay-silt alternation. There are transitions between these units.

The project route, as explained in detail above its geological structure;

- Km: 0+000-15+900 Quaternary Alluvial Units (Qa)
- Km: 15+900-32+800 Pliocene Units (consolidated, slightly consolidated Pliocene pebbles) (PI)
- Km: 32+800 - 41+800 Quaternary Alluvial Units (Qa)
- Km: 41+800 – 46+600 Karataş Formation (Kr)
- Km: 46+600 – 50+200 Ophiolite Units, Carbonate Clastic (Kızıldağ Ophiolites), Karataş Formation
- Km: 50+200 - 57+685 Alluvial Deposits pass over the Karataş Formation units.

Hydrogeology

As mentioned above, most of the project route passes over gravel units and slope deposits. The groundwater level in alluvial areas is around 5-6 meters in the measurements made in the drillings.

Chemical properties and quality of groundwater are directly related to the chemical and mineralogical structure of the geological units in the regions where they are fed. Units consisting of pliocene pebbles have a very wide distribution in the project area in question.

Ceyhan River, one of the important water resources of the Çukurova Region, is one of the most important rivers of our country, flowing from north to south and having a series of dams on it. It rises from the Upper Ceyhan Basin to the north of the Elbistan Plain and reaches the Menzelet Dam by taking the Söğütlü Stream, Hurman Stream, Göksun Stream and Güredin Stream. After that, the national park passes in the north-south direction through the Aslantaş Dam Lake over the Sır and Berke Dams. The Ceyhan River, which draws about 11 km of the eastern border of the national park, and Kaplan, Korucu, Barracks, Hililik, Cistern, Kırğılı, Kepir and Yiğit streams drain to Aslantaş Dam Lake. These are seasonal streams and form important indentations on the shores of the reservoir. Some of the streams that are located in the national park or pass through it and do not show a regular flow can be listed as Harlı, Gücükburun, Köprücek, Babaoğlu, Oklubel, Çullu, Kapız, Taşlıburun, Kırmacıyolu, Akyol, Göz, Kırallı and Çoraklı Rivers.

DSİ regularly takes water samples from two regions in the lower basin of the Ceyhan River for water quality observations. The evaluations made by taking into account the main parameters (BOD, COD, TDS, DO, NH₃N, NO₂N, Fe ++, Mn ++, F-, Br) for the years 1989-99. The quality of the water falls within the 1st Class water quality determined by the regulations, except for nitrogenous compounds. In terms of nitrogenous compounds, water quality falls within Class 2 water quality. From this point of view, it would be more correct to accept water quality as Class 2, since other nutrients are also at maximum level. Because of the evaluation of samples taken from two different regions between 1988-99, it is understood that the limit of nitrogenous compounds is above the limits specified for Class 1 water quality. This shows that the agricultural activities carried out on the Ceyhan River upstream have a negative impact on water quality. In the period of 1988-99 taken as an example, BOD values are within the 1st Class water quality limits. However, an increase in these values that started in 1990 and reached the maximum in 1998 is noteworthy. Although the BOD values are

within the limits, this increase may indicate that, the water is contaminated with sewage wastes. As a result of the evaluation of the above-mentioned parameters, it reveals that the water quality is suitable for fishing other than trout and that after adequate technological applications, the water needs of settlements can be used (WCD, 1999). Especially in summer, the decrease in the river flow rate and the changes in the riverbed affect the organisms that live in the river ecosystem and adapt to the water flow.

Bahçe-Nurdağı

Various large soil groups have been formed in Gaziantep due to the differences in climate topography and main material. Alluvial soils, colluvial soils, organic soils, brown forest soils, lime-free brown forest soils, red Mediterranean soils, red brown Mediterranean soils, brown soils, lime-free brown soils, red brown soils, basaltic soils are the soil types within the borders of Gaziantep province. In the article of Bahçe District Directorate of Agriculture, it was determined that the land of the Bahçe side was loamy-sandy.

General Geology

The region where the project is located is the region where the Middle Amanos Mountains (Gavurdağı or Nurdağı) are located, which separate the Mediterranean region and Southeast Anatolia from each other. Just east of it is the Hatay-Adıyaman front pit, which is an important fracture of the Eastern Mediterranean.

The basic lithology in the region consists of Paleozoic aged methacrete rocks, dolomitic limestones and silicified dolomitic limestones. The ophiolite unit is located to the west of the study area.

Structurally, Amanos Mountains are located at the intersection or impact areas of tectonic zones, which are most widely known in the literature. Thrust, reverse and stratification faults are commonly observed. In Nurdağı, advanced tectonic thrust caused overturned folds, schistosity and reverse faults (Duman, 1993).

In the middle Amanos, the Kızlaç formation is dominant where the route passes.

Kızlaç Formation

It gives a widespread outcropping in middle Amanos. It takes its name from this village because it gives the typical section in the village of Kızlaç.

The Kızlaç formation is clearly visible on the Fevzipaşa-Hasanbeyli road and the Bahçe-Nurdağı road.

The intermediate layers of quartzite and sandstone, which are mainly green-brownish, green-gray colored, micaceous pyritized, fine sandstone layered shale and seen in the lower parts, gradually increase towards the top.

Kızlaç formation shows traces of low grade metamorphism with cleavage development. It is compatible with the underlying Kardere formation. The upper age of the unit is orthodox.

In the eastern parts of Kızlaç village, the unit starts with brownish-green-gray, fine-grained, dispersible, laminated, fine-bedded, sandy clay shales over the Kardere Formation, while the relatively sparse quartzite and quartzitic sandstone layers in the lower parts gradually increase towards the top. Many investigators agree that the top touch of the unit is normal.

Hydrogeology

In the middle Amanos, the groundwater was formed in the rock cracks due to the cracked and permeable layers. Hydrogeologically, springs and leaks are concentrated on the west side and are observed in discontinuity zones depending on the structural geology (Yilmazer, 1995). Due to the topographic structure of the land and the permeability of the rocks and the fact that the rocks are permeable and fractured, the waters descending to the lower elevations drain from the rock cracks to the Ba pit of Amanos Mountain and in the parts close to the İslahiye plain.

These springs and leaks caused significant weathering in the bedrock. There is no ground water in İslahiye plain.

Nurdağ-Başpınar

Project area is located within the borders of Gaziantep Province, Nurdağı and Şehitkâmil Districts and Kahramanmaraş Province Pazarcık District.

Regional Geology, Gaziantep

The region is located on the border between the great Asian-European folds and the African plateau and includes the Antitaurus mountain range in the north-west direction and the northern part of the Syrian plain in the south-east direction. The main characteristic of this region's tectonics is that the outer ranges of the Taurus Mountains are crushed by hitting the Syrian plateau (secondary folds and many faults) and the facies belonging to the same floor are different in the Taurus and Syria, making it difficult to examine this area in terms of geology.

The allochthonous rock units outcropping in the region are represented by rock assemblages that settled in the region during the Maastrichtian and show a complex sequence. These units generally consist of Karadut and Koçali complexes consisting of serpentinite, volcanic rock, sandstone, siliceous shale, clayey limestone, radiolarite and foreign blocks and ophiolite nappe tectonically overlying them. Autochthonous units are represented by a sequence of Maastrichtian-Lower Miocene age and approximately 1,800 m thick. The sequence begins at the base with the Besni Formation consisting of Maastrichtian-Lower Paleocene aged conglomerate, sandstone and sandy limestone. This unit is harmoniously followed by the Germav Formation, which consists of sandstone and clayey limestone intercalated marl. The Beşenli Formation, which consists of an alternation of two units with lateral and vertical transitions, pebbly limestone and marl of Middle Paleocene-Lower Eocene age, overlies the previous units with a local unconformity. From bottom to top; Gercüş Formation consisting of the Lower Eocene aged conglomerate, sandstone and pebbly marl - limestone; Ardıçlıtepe Formation consisting of Eocene aged, clayey pebbly marl and pebbly limestone and the Hoya Formation consisting of dolomitic-cherty limestone; Upper Eocene - Oligocene aged Gaziantep Formation consisting of limestone and chalky limestone and Fırat Formation consisting of Oligocene - Lower Miocene aged reef limestone with a local unconformity, the Şelmo Formation consisting of Middle - Upper Miocene stream - lake sediments, Upper Miocene Yavuzeli Basalt and Pliocene The Harabe Formation, which consists of river-lake sediments, unconformably overlies the older units.

Regional Geology, Kahramanmaraş

The height of the sea (average height of the entire area) is 850 m. It starts from the south of Ahır Mountain, which forms the outer belt of the Taurus Mountains, and is a lower plain of the Maraş Plain, which expands towards the south. It was established in the south of Aksu Stream, which is a branch of Turkey. This plain on which the city is located; Amanos Mountain towards the south is the last part of the large depressions on the eastern edge like a groove in the north. This depression area forms the continuation of the Jordan graben system starting from the African Lakes Region and extending along the Red Sea, Lake Lut and Amik Plain. Therefore, the fact that Pazarcık is located on this graben system indicates that the geology of the district and its surrounding formations was formed in "IV. However, the most important of these formations are Cretaceous and Eocene aged sediments and IV. It forms the alluvial cover of the time. This land descends from east to west and continues until Narlı Plain.

Stratigrafi

In the study area, the bottom allochthonous Karadut Complex, Koçali Complex and ophiolite nappe; above them are the autochthonous Cretaceous Besni and Germav Formations, Tertiary Belveren, Beşenli, Aslansuyu and Ardıçlıtepe Formations, Midyat group (Gercüş, Hoya, Gaziantep and Fırat Formations), Şelmo Formation, Yavuzeli Basalt and Harabe Formation.

The study area is located along the belt covering the marginal folds with the Arab autochthonous in Southeast Anatolia.

Allochthonous Units

The rock units outcropping in the southwest and northwest of Gaziantep K24 and having tectonic relations with each other and with autochthonous units are collected under the name of allochthonous units.

Cretaceous

Karadut Complex (Kka): The unit, which consists of silicified limestone, radiolarite, siliceous shale, cherty limestone, clayey limestone, bedded cherts, sandstone and volcanites, and limestone and serpentinite blocks of different ages, present a complex structure. It was named for the first time by the Turkish Gulf Oil (Tuna, from 1973). The unit generally presents a reddish color and a soft topography. The unit, which is generally olistostromal in character and contains serpentinite and limestone blocks, has gained an extremely folded and fractured structure due to shifts and compression tectonics.

The rock types forming the Karadut Complex are silicified limestones, greenish in color, thin to medium bedded, silicified and intercalated with lots of cherries and green colored marl. Siliceous things are red brick red in color, laminated and siliceous, with hard thin layers of silicified marl interlayers between them. Clayey limestones are reddish brown, greenish in color, thin to medium bedded and cherty. Apart from these, there are locally layered and white light yellow colored limestones, yellowish-greenish sandstones, gray-dirty white thick bedded chert and ultrabasic pebbles and macro fossil shelled conglomeratic limestones, sandy limestones and volcanites. Among these pasty rock types, there are gray-white colored, thick to very thick bedded limestone blocks and green-bluish colored, highly weathered serpentinite blocks of various sizes.

In the Gaziantep K24 sheet, the Karadut Complex is located with a tectonic contact on a part of the Bozova Formation and Germav Formation. The upper levels of the Germav Formation come with angular unconformity. No data were found to determine the sedimentation age of the unit. However, Yoldemir (1987) states those fossils were found outside the study area indicating that the depositional age of this unit is Cenomanian-Lower Turonian. In addition, Senonian and Upper Jurassic ages were obtained from limestones located as blocks in the complex. The unit probably settled in the region in the Lower-Middle (?) Maastrichtian.

Koçali Complex (Kk): The unit consisting of ultrabasic rocks, volcanics, serpentinite, radiolarite, cherty limestone and limestone blocks of different ages shows an irregular internal structure. Sungurlu (1972) first named it.

The dominant rock type are ultrabasics and serpentinites. These are dark brown-dark green colored, highly fragmented, with a shiny surface, and generally serpentinitized.

In addition, dark brown-gray agglomerate and lava flows, red-colored, highly folded, locally manganese radiolarite and siliceous shales, red-colored, thin-bedded, cherty limestones are rarely observed. These rock types present a complex structure juxtaposed with each other in a tectonic contact. The complex includes large and small beige-gray, locally red colored, very thick bedded or massive crystallized limestone blocks.

Koçali Complex is located on the Karadut Complex in the study area. The Germav Formation of Upper Maastrichtian-Lower Paleocene age unconformably overlies it. Data that will determine the age of formation of the complex could not be obtained in the map area. However, according to Tuna (1973), the age of the unit is Upper Jurassic-Lower Cretaceous, according to fossils obtained from limestones found together with radiolaritic levels in the Complex.

Ophiolite Naph (Kof): The allochthonous unit consisting of peridotite, gabbro and diabase is named Ophiolite Naph. Peridotites constitute a large part of the ophiolite nappe. Peridotites are dark brown colored and generally serpentinitized. Peridotites are composed of harzburgite and dunite and contain chromite occurrences in places. In some places in the unit, gabbro dykes, layered gabbros and diabase dykes are also observed.

The Ophiolite Nappe comes in tectonic contact over the Koçali Complex. On the top of it, the units deposited after the settlement of the unit in the region and in the Upper Maastrichtian-Miocene age range are unconformably located.

There is not enough data available on the formation mechanism and age of the Ophiolite Nappe, which is represented by the upper parts of the mantle and the part of the oceanic crust. However, it can be said that the unit reached its current position in pre-Middle (?) - Upper Maastrichtian.

Autochthonous Units: The rock units, which cover a large part of the Gaziantep K24 sheet and have a total thickness of approximately 1800 meters and present a regular and continuous sequence in the Maastrichtian-Pliocene age range, are gathered under the name of 'Autochthon Units'.

Cretaceous

Besni Formation (Kbe): The unit is composed of pebble and sandstone at the bottom and sandy, fossil clastic limestones at the top. The unit was deposited in a turbulent shallow water environment. The thickness of the formation varies between 0-100 m and unconformably overlies the ophiolite nappe. On the other hand, Germav Formation is congruent and Hoya Formation is located with an incompatible contact.

Germav Formation (Ktşg): It consists of marl and clayey limestones at the bottom and marls at the top.

The formation is gray-gray colored at the bottom, with or without a thin layer and 3-5 m. thick marl and 100-200 m. between the clayey limestone intercalated marl. Limestone levels are generally yellowish gray in color, thin medium bedded, clayey, in places sandy, brittle, pyritized, worm-traced, bituminous in places, and pelagic. Marl levels, on the other hand, are bluish-gray colored, without layers, with carbonates, fragile plant fragments and living life traces. In the upper levels of the unit, its thickness is 10-20 cm. The unit, in which turbiditic sandstone, conglomerate and turbiditic limestone are observed, varying between and having little lateral continuity, deposited in the open shelf-basin edge or deep shelf edge microfacies environment. The thickness of the formation is 100-500 m. and comes with a harmonious contact on the Bozova Formation. On the other hand, the Karadut Complex is located with a tectonic contact, Beşenli Formation and Cengin Formation with a harmonious and transitional contact.

As a result of fossil studies of samples taken from the lower and middle parts of the formation, the age of the unit was determined as Lower Paleocene.

Tertiary

Belveren Formation (tba): Wilson and Krummenacher (1957) first used the name Belveren Formation for the unit, whose dominant rock type is limestone and is represented by clayey limestones with intercalations of claystone.

The formation starts with reddish pink colored, thin bedded, abundant algae, foraminiferous, crinoid, pebbly, clastic limestone, and the algae ratio decreases in the upper parts, foraminifera ratio and layer thickness increase, and pinkish-dark cream, cream colored limestone dominates. The unit ends with cream-gray, medium-thick bedded limestones at the top. Limestones, which are the dominant rock types of the unit, were deposited in front of the slope, and the rock types in the further west were deposited in the environment of the basin edge microfacies. The Ophiolite Nappe unconformably overlies the Besni Formation and the Germav Formation. On it, Hoya Formation is harmoniously located in some places and unconformably in some places.

Beşenli Formation (Tbş): The first description of the unit consisting of marl, clayey-cherty limestone alternation at the bottom and cherty limestone at the top is performed.

The formation consists of claystone with marl intercalations, chert nodular, clastic limestones at the bottom and cherty, clayey limestones towards the top. Where the unit is defined, its approximate thickness is 50 m. The alternation of marl, claystone-siltstone and clayey-cherty limestone forms the bottom of the sequence.

Limestones are light gray-yellowish colored, medium-thick bedded; the claystone-siltstone levels are gray-light gray colored and unstratified.

Light rust-colored, commonal-bedded cherty limestones overlie this marl-claystone alternation of limestone. The rock types that make up the unit were deposited in the basin edge or deep shelf edge microfacies environment. The unit, which is generally 10-60 meters thick, is located on the Germav Formation with a harmonious and transitional contact. It also shows a compatible contact relationship with the Aslansuyu Formation on it. According to Terlemez et al. (1992), age of the Upper Monsian (Middle Paleocene) is determined and in samples collected from marls in the lower levels of the formation and age of the Middle-Upper Paleocene is determined in samples collected from limestones.

Aslansuyu Formation (Ta): Güvenç (1973) made the description of this unit consisting of clayey-pebbly limestone and chalk.

The formation starts with clayey-pebbly limestone. These limestones are gray-beige colored, medium thick bedded, cherty and pebbly, followed by chalky limestones. Chalky limestones contain beige-whitish gray colored, medium-thick bedded, abundant micro fauna and yellow-black colored chert bands. The unit, whose top level consists of white colored, thick and poorly bedded, loose textured chalk, deposited in the "basin edge and deep shelf edge" micro-facies environment. The thickness of the formation is 500 meters in the region where the definition is made, and it is generally 100-500 m. and overlies the Beşenli Formation and the Cengin Formation with a harmonious contact. Ardıçlıtepe Formation is located in a harmonious contact on it. Based on the fossils determined in the samples collected from the rock types forming the formation, Terlemez et al. determined the age of the 1992 formation as Lower-Middle Eocene.

Ardıçlıtepe Formation (Tar): Terlemez et al. (1992) made the definition and naming of the unit, which is generally composed of limestone. The place where the definition was made is Ardıçlıtepe, which is 4.5-5 km west of Kürüm village, 25-30 km north of Kilis province.

The unit starts with an alternation of clastic limestone and chalky limestone at the bottom. Limestone is thick, very thick bedded, chalky limestone, whitish-light yellow-beige colored, and medium-thick bedded, loose dispersive, rare fauna. Unit consisting of completely light yellow-gray-beige colored, thick-very thick bedded, partly unstratified, hard solid, porous, with melting gaps, micro and macro fauna, yellow-brownish colored lenses and lumps of chert limestone " Carbonate plain with "Open platform" deposited in microfacies environment. The thickness of the formation generally varies between 50-200 meters and it comes over the Aslansuyu Formation with a gradual contact. Gaziantep Formation is located in a harmonious contact on it. According to the fossils obtained from the limestones forming the formation, the formation is of Middle Eocene (Lutetian) - Upper Eocene (Priabonian) age.

Midyat Group (Tm)

Gercüş Formation (Tmg): Maxon and Tromp (Tuna, 1973) named the unit consisting of pebble stone, sandstone, pebbly marl and pebbly limestone for the first time.

The unit starts with 2-3 m thick conglomerate at the bottom where it overlies the Germav Formation. White-reddish white colored claystone with fine-grained sandstone levels in between, lies on the conglomerate. Gray-reddish colored, medium-thick bedded conglomerate-sandstone alternation comes on claystone.

The alternation is overlain by red colored, thick bedded, cement-consolidated silt, pebbles of radiolarite, ophiolite and conglomerate with less limestone. Towards the top, it passes into off-white-pinkish-red colored, lime-cemented, usually attached conglomerate and pebbly marls. In the upper part of the unit, the carbonate ratio increases and there are pebbly limestone and pebbly marls.

Gercüş Formation is of terrestrial origin and, considering its relationship with overlying carbonates, it is probably the lowest level of the transgressive sequence deposited on the basin margin. Ophiolite Nappe and Germav Formation overlie the Germav Formation with an angular unconformity and Hoya Formation is observed with a harmonious contact on it.

Hoya Formation (Tmh): Sungurlu (1974) named the unit consisting of carbonates. The dominant rock type of the formation is limestone. It starts with pebbly limestone at the bottom. Gray, beige, red colored, thick to very thick bedded limestones pass into limestone towards the top. These limestones are cream-off-white-light gray colored, medium-thick bedded, partly unstratified, some levels with abundant fossils, with abundant fractures and macro fossil shells. In the upper levels of the unit, chert lumps are observed. Limestones were deposited in carbonate plain microfacies environment and open platform microfacies environment. The unit comes on the Gercüş Formation with an angular discordant contact over the ophiolite nappe, the Germav Formation, the Besni Formation and the Belveren Formation, and is followed by the harmoniously. Terlemez et al. determined the age of the unit as Middle (Upper Lutetian) - Upper (Priabonian) Eocene.

Gaziantep Formation (Tmga): This unit, which consists of clayey limestone, limestone and chalk, was first described and named by Wilson and Krummenacher (1957).

The formation outcrops in the form of clayey limestone and chalky limestone showing a soft topography. In some places, instead of these clayey and chalky limestones, there are thick bedded limestones. Clayey limestones are whitish gray-cream-dirty yellow colored, thin to medium bedded, with little chert nodules. Limestones, on the other hand, are gray-beige-yellowish gray in color, medium-thick in places, very thick bedded, granular, abundant benthic fossils, algae and coral in places. Clayey limestones, chalky limestones were deposited in the "basin edge or deep shelf edge" microfacies environment and limestones in the "turbulent shallow water" microfacies environment.

The thickness of the formation is 100-250 m. and comes in a harmonious contact on the Ardiçlıtepe Formation. On it, Fırat Formation lies in harmonious contact and Yavuzeli Basalt is located with an incompatible contact. In the samples collected from the formation discovered in 1992 by Terlemez et al. It was, and according to these fossils, the formation is of Upper Eocene (Priabonian) - Lower Oligocene (Stampian) age.

Fırat Formation (Tmf): The unit, which consists of limestones with reefal character in places, was named for the first time as a member of the Midyat Formation (Fırat Member), Maxon and Tromp (from Tuna, 1973).

The formation starts with cream-whitish-dirty yellow colored, medium-thick bedded limestones with no layers at the bottom, and above these limestones with dirty yellow color, medium-thick bedding, plenty of chert nodules and abundant fossil shells. The uppermost part is composed of whitish cream-dirty yellow, thick-very thick bedded, little chert nodules, abundant echinids, ostrea, gastropods and lamella bioclastic cleats. The limestones that make up the unit have been deposited in the "turbulent shallow water" microfacies environment. The thickness of the formation is 0-150 m. and comes with a harmonious contact on the Gaziantep Formation. On it, the Shelmo Formation and Yavuzeli Basalt are located with an unconformable contact with an angle. According to fossils collected from limestones, the formation is of Lower Oligocene (Stampian) - Lower Miocene (Burdigalian) age.

Şelmo Formation (Tş): Yoldemir (1987) named this unit, which consists of fluvial sediments with alternating pebblestone, sandstone, shale and mudstone, and lakes with sandstone, pebbly marl, shale and tuffite.

The formation consists of sandstone, claystone, mudstone, siltstone and conglomerates between them, and some parts of it are sandstone, pebbly marl and shale, tuffite and clayey limestone. While the outcrops of these two parts can be viewed together, it is possible to see them independently in the map area. Where these two parts are together, they are laterally and vertically transitive with each other. The thickness of the unit is not much and it is 0-75 m. and comes on the Fırat Formation with an angular unconformity. On it, Yavuzeli Basalt is located with an angular unconformity. No fossils were found to determine the age of the unit. According to its stratigraphic location, the age of the formation is most likely Middle-Upper Miocene, as the top level comes over the Lower Miocene (Burdigalian) Euphrates Formation with an angular unconformity and is covered by the Upper Miocene Yavuzeli Basalt.

Yavuzeli Basalt (Ty): Yoldemir (1987) named this unit consisting of Basalt Lava. The definition and naming is done outside the map area, around Yavuzeli district. Tuna (1973) named the unit as Karacadağ Basalt.

Yavuzeli Basalt consists of generally reddish-dark brown-dark gray and blackish colored, non-layered, partly very thick bedded, porous, porous lava flow with pores filled with calcite. In addition, under this lava flow there are agglomerate and tuff outcrops. These pyroclastics are observed especially in the parts of Gaziantep-Kilis road close to Kilis. We to determine the mechanism by which basalts are formed and their exit areas have carried out no study. Researchers who have worked in the region before having various opinions on this issue. Some attribute the formation of these basalts to the fault system associated with the Eastern Anatolian Fault, and some to the expansions formed due to compression that started in the Middle Miocene in the region. The thickness of the basalts varies between 0 and 50 m, and they come with an angular unconformity over the Shelmo Formation and other older units. The formation age of Yavuzeli basalt is 12.1 ± 0.4 million years (Middle Miocene) according to Yoldemir (1987) and 7-8 million years (Upper Miocene) according to Ulu et al. (1991). According to its stratigraphic position in the map area, the age of basalt is Upper Miocene.

Harabe Formation (Th): The name and description of this unit consisting of pebble stone, sandstone, claystone and mud is performed. The formation starts with conglomerate at the bottom.

The conglomerates are gray to light gray in color, without layers, limestone, ophiolite and radiolarite pebbles are loosely and predominantly bonded with carbonate cement. Pebbles passes into sandstones towards the top. Sandstones are grayish colored, thin to medium cross bedded, graded. The sandstones pass on top of yellow-colored claystone and red-colored mudstones. The rock types that make up the unit are generally stream, and very few of them are lake sediments. The age of the unit is accepted as Pliocene based on its stratigraphic position.

Quaternary

Old Alluvium (Qe): It consists of loosely attached gravel, sand and mudstone, usually in the old beds of rivers and in the plains surrounded by high hills. These deposits are used in agriculture or in construction as sand and gravel storage.

Alluvium (Qa): They are unattached gravel, sand and mud deposits in the valleys and plains of large streams.

Tectonic Characteristics

Tectonic features in Gaziantep and its region generally reflect the tectonic features in the Southeastern Anatolia Region. Generally, it can be examined in three stages.

Upper Cretaceous (Pre-Upper Maestrichtian) Tectonics: This tectonic is not seen much in the Gaziantep region. It is the first tectonic regime that can be observed regionally, and generally reverse faults and strike-slip faults have occurred in places.

Middle Miocene Tectonics: Compression tectonics that developed in the Middle Miocene formed large faults (especially reverse faults and strike-slip faults, locally normal-slip faults) and folds in rocks deposited between the Upper Maestrichtian-Lower Miocene. The strikes of these tectonic lines are East-West, Northeast-Southwest.

Today Tectonics: Turkey's one of the most important lines passing through the Northwest and Gaziantep East Anatolian Fault (EAF) to the west of the last Ölüdeniz split up today continues its activities from time to time. The effects of this fault system (earthquake), which continues its activity, are less felt in Gaziantep.

Table 4.11: Information about Stratigraphy throughout the Project Route

Section	Stratigraphy
Mersin-Adana	Bolkar Mountain Union
	Steppe Union
	Aladağ Union
	Geyikdağı Union
	Emirgazi Formation
	Değirmentaş Formation
	Armutludere Formation
	Halityaylası Formation
	Puşçutepe Formation
	Yukarıyayla Formation
	Ayıtepesi Formation
	Şafaktepe Formation
	Gümüşali Formation
	Ziyarettepe Formation
	Yığılıtepe Formation
	Katarası Formation
	Köroğlutepesi Formation
	Güzelinköy Formation
	Gerbiyes Mountain Union
	Sağkaya Formation
	Kızlarsekisi Formation
	Keban - Malatya Union
	Yoncayolu Formation
	Çayderesi Formation
	Kaletepe Formation
	Misis-Andırın Union
	Dokuztekne Formation
	Andırın Formation
	Karataş Formation
	Kızıldere Formation
	Hamış Formation
	Delihalil Basalt
	Kailiçi
	Dunes
	Alluvium
İncirlik-Toprakkale	Karataş Formation (Tmk)
	Caliche (Qk)
	Alluvium (Qal)
Toprakkale-Bahçe	Kızıldağ Ophiolite
	Karataş Formation

Section	Stratigraphy
	Undifferentiated Terrestrial Clastics (Pliocene)
	Quaternary
Bahçe-Nurdağ	Kızlaç Formation
Nurdağ-Başpınar	Allochthonous Units
	Karadut Complex (Kka):
	Koçali Complex (Kk):
	Autochthonous Units
	Besni Formation (Kbe)
	Germav Formation (Ktşg)
	Belveren Formation (tba)
	Beşenli Formation (Tbş)
	Aslansuyu Formation (Ta)
	Ardıçlıtepe Formation (Tar)
	Gercüş Formation (Tmg)
	Hoya Formation (Tmh)
	Gaziantep Formation (Tmga)
	Fırat Formation (Tmf)
	Şelmo Formation (Tş)
	Yavuzeli Basalt (Ty)
	Harabe Formation (Th)
	Quaternary

Natural Disaster Risks

The Project area and its immediate surroundings do not carry the risk of natural disasters such as landslides, rocks and avalanches between Mersin-Adana.

On the part of the route between Ceyhan and Toprakkale districts, Yumurtalık Fault passes from the far right parallel of the Railway line. In addition, although the Kozan Fault Zone is also far from the line, earthquakes that occur from time to time also affect Adana.

There are Osmaniye Fault, Toprakkale Fault, Misis-Ceyhan Fault and Göksu Faults within the region close to the Project route between Toprakkale-Bahçe. The most important fracture in the region is the Karataş-Osmaniye Fault Zone (Saroğlu et al., 1992). It is the fault observed between the Misis Group and the Kızıldere formation. This highly active fault passes from the southeast of the Karatepe-Aslantaş National Park area.

There is no risk of landslide disaster since the land is steep and loose between Bahçe and Nurdağ. Since the highway passes on the south side of the Bahçe entrance of the Tunnel, the line is protected from landslides and rockfalls since the slopes in the south start after the highway. This situation may occur in the form of rockfall due to the presence of places where the land is steep and rocky at the Nurdağ exit of the tunnel.

In the construction and operation phase of the project, there may be flood risk as a natural disaster risk in the entrance of Bahçe tunnel and a tunnel under the Koca (Horu) stream. For this, the slope of the line will be reinforced with pere stone or concrete wall in order to prevent the deterioration of the line infrastructure in these places by flood water. In addition, the project will be designed to prevent water ingress from outside to the route, and to ensure that water flow at the entrance and in the tunnel is easily thrown out. DSI for this. The opinion and approval of the 6th Regional Directorate will be obtained.

In the project subject to the project, the provisions of the "Regulation on Buildings to be Built in Disaster Areas" published in the Official Gazette dated 14/07/2007 and numbered 26582 in order to protect against flood, fire

and earthquake disasters will be complied with. The provisions of the "Regulation on Building Earthquake in Turkey " published in the Official Gazette dated 18.03.2018 and numbered 30364 will be complied with.

Turkey Earthquake Risk Map is given below (see Figure 4.2).

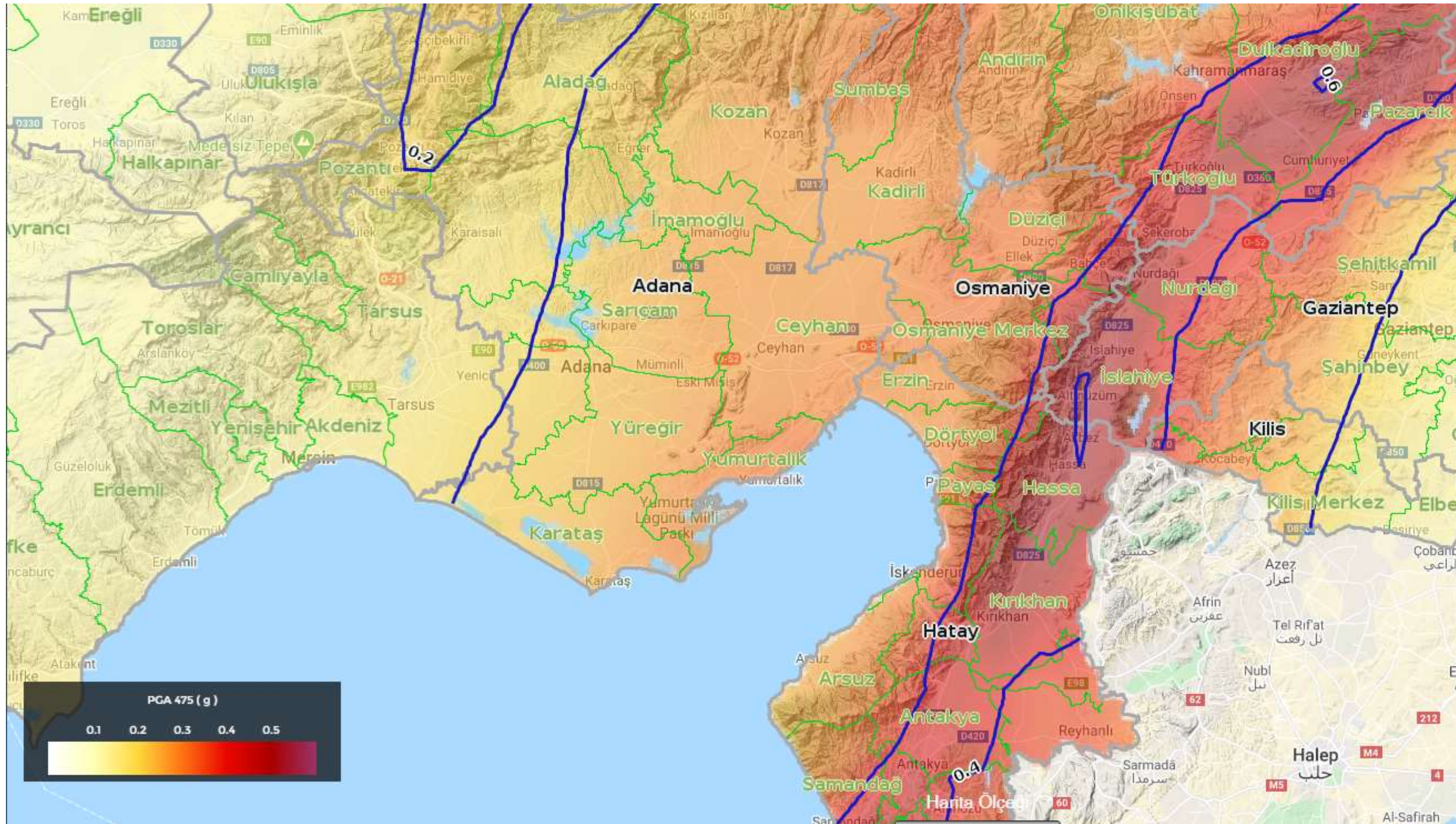


Figure 4.2: The Turkey Earthquake Risk Map between Mersin-Gaziantep [45]

4.2.4.2 Field Studies

Mersin-Adana

The Project will be carried out by the 6th Regional Directorate of TCDD. Within the scope of the project, the vegetable soil on the route determined for the 2 lines to be added to the existing railway line will be stripped first. These operations will be carried out in station areas, outside the crossings on the route (bridge, water, level) and in areas where vegetal soil can be found.

After the vegetative soil is stripped, the excavation soil in the Project area will be removed. A large part of this excavation soil to be removed will be used for land arrangement along the route and filling.

After the infrastructure and land preparation processes are completed, the Engineering Structures (culvert, passage) will be carried out. Then, rails will be laid on the platform. In the future, depending on the situation of electrification and signaling, the 3rd and 4th line route infrastructure works will be designed in accordance with these operations.

After laying the rail, trial operations will start on the line and the new line will be put into operation.

İncirlik-Toprakkale

Work will be carried out such as preparing the land, stripping the topsoil, excavation operations, filling operations, construction of engineering structures, lower and upper foundation construction, laying of railway tracks, signalization works, laying of safety wire fences and testing operations.

Drilling Works

Along the route line, 46 drillings were carried out with depths varying between 10.00-19.95 m to determine the geological and geotechnical characteristics of the foundation ground. The works were carried out between 22.02.2011-01.04.2011 and the total length was 1126.15 m. For the 2nd Line, which is envisaged to be built right next to the İncirlik-Toprakkale Railway, 46 drilling works were carried out at the locations foreseen according to the kilometers on the existing line.

7 drillings were made for the Seyhan River Bridge crossing outside the line included in the Project. Drilling depths made to determine the geological and geotechnical characteristics of the foundation soil ranged from 10.58 m to 40.95 m, and the total length for 53 drillings was 1100.16 m. The studies were carried out in two separate periods, 43 drillings were carried out between 19.01.2011-19.02.2012 and 10 drillings were carried out between 28.05.2011-17.06.2011. Studies were carried out with the help of 2 drilling machines.

Research Pit Studies

Along the route, research pits were dug with a tractor bucket (JCB) to determine the geological and geotechnical characteristics of the foundation ground and to correlate the geological structure determined with the help of drillings. Depths of the pit vary between 0.70 and 4.00 m depending on the soil structure. The ground structure was observed in the pits, and sack samples were taken from some of the pits showing the same type of ground features to classify the ground and constitute the superstructure. The total number of pits opened is 73, and sample pits are 45.

The sections with low carrying capacity and high settlement potential are not crossed along the route.

Toprakkale-Bahçe

Mobilization, mobile construction sites, land preparation, topsoil stripping, excavation and filling works, route construction, railway sleepers and rails laying, ballast material laying, electrification and signaling processes and finally testing were carried out.

A total of 2,967 meters of foundation drilling was carried out at 97 locations between Toprakkale-Bahçe Stations in order to determine the geological and geotechnical characteristics of the grounds on the route and

to reveal the ground profile. Foundation drilling and in-situ tests were carried out in accordance with the "Research Engineering Services Technical Specification" of the General Directorate of Highways. Disturbed (SPT), undisturbed (UD) and core samples were taken from the drillings in order to determine the engineering properties of the soils. After the drilling into the wells was completed, $\Phi 50$ PVC pipes were lowered and groundwater level measurements were made.

The related tests have been carried out in accordance with the relevant technical specification in order to determine the on-site properties of the units that make up the soil profile during the drilling works.

In order to determine the strength of soils in place, disturbed samples were taken by performing Standard Penetration Test (SPT) at 1.50 meters intervals in soil units and in very weathered levels of rocks.

Bahçe-Nurdağ

Excavation and Filling Works in the Project, Construction of Engineering Structures in the Project (Culvert, Bridge, Underpass, Viaduct), Installation of Lines (Traverse + Rail + Connection Elements), and Control and Trial Works were carried out. The structure of the ground was illuminated by drilling 1,121 m with 22 drillings for geological and geotechnical studies.

Nurdağ-Başpınar

Railway construction starts with the application of the horizontal axis specified in accordance with the project to the field. Splitting and filling works are carried out to create the road platform at the elevations specified in the project profile. Railway line pass over the highway and railway with under and overpasses, and obstacles such as high hills with a tunnel structure. In addition, land preparation and stripping of topsoil, railway infrastructure and works were carried out.

4.2.5 Impact Magnitude and Sensitivity Criteria

The criteria listed in the table below have been used when assessing the magnitude of the potential effects of the Project.

- High
 - o Land-take to the extent that it precludes existing or intended use.
 - o Activity to the extent that it permanently precludes use.
 - o Loss of amenity to an extent that deters use.
- Medium
 - o Land-take to the extent that it compromises but does not preclude use.
 - o Activity to the extent that it precludes use for an extended period.
 - o Loss of amenity to an extent that it compromises but does not deter use.
- Low
 - o Land-take peripheral to use.
 - o Activity to the extent that it temporarily precludes use.
 - o Loss of amenity that does not compromise use.
- Negligible
 - o No land-take. Existing or intended land use can continue.
 - o No discernible loss of amenity

4.2.6 Impact Assessment

4.2.6.1 Construction Phase

Impacts related to the Project on the existing land use, topography and soil characteristics might occur mostly during the preparation of land and construction period depending on the earthworks and construction activities to be carried out. The impacts on land use, topography and soil will continue during the operational period of the Project.

Topsoil, vegetation and trees located in the project area are removed during the land preparation and construction period. Topsoil will be used after construction of the railway line is completed for the rehabilitation of the land around the Project area. Necessary permits were taken from the Republic of Turkey Ministry of Agriculture and Forestry. The relevant provisions and laws will be accorded during the all period of construction. Affected area due to the Project was determined by using the GIS analysis, which is based on CORINE database.

Topsoil losses, soil disturbance and soil contamination are the possible impacts of the Project on soil. The excavated soil will be stored permanently storage areas near to the project area until the end of construction period and saving the vegetative properties of excavated soil will be ensured. Works carried out during the construction period such as clearing the area, earthworks and excavation of the soil can make the soil risky to the erosion. Soil contamination may be caused by accidentally release of hazardous materials like oil used by machines. Occurrence of this kind of accidents cannot be foreseen but Emergency Management Procedure of Rönesans will be complied in the case of any hazardous leakage (see Appendix 5). All work on soil will also be carried out in accordance with the Topsoil and Subsoil Management Procedure of Rönesans (see Appendix 6).

4.2.6.2 Operation, Longer Term and Permanent Effects

Impacts related to the Project on land use, topography, and soil occur in the preparation period of land and construction period. Any impact is not expected on land use, topography, and soil during the operational period. Related changes in the land use type, which occurred in the construction period, will continue until the end of Project life.

4.2.7 Cumulative Impact Assessment

In the Project area, there was impact of the existing railway on land use, soil and topography. After the construction and rehabilitation of railway line, this impact will be extended in some section of the Railway route. Increase in the impact is expected because of the Project.

4.2.8 Summary of Residual Impacts, Significance Criteria and Overall Impact Significance

Flood refers to the event that a river overflows from its bed for various reasons, damaging the surrounding lands, settlements, infrastructure facilities and living creatures, creating a flow size that interrupts normal socioeconomic life in the impact area. Causes of flood are as following;

- Excessive and heavy rains
- Sudden snow melts
- Earthquakes, landslides
- Dam failures
- Climate change
- Human-induced factors
- Interventions to the stream bed
- Wrong land use in the basin (Kirmencioğlu)

Most of the project route has an existing infrastructure system to provide drainage. Arrangements will be made in this existing infrastructure system. A drainage system will be made for the new line to be established. The Ceyhan Flood Management Plan of DSI prepared in 2018 will be followed. In case of flood risk during the construction phase, Emergency Action Plan of Rönesans will be implemented which is given in Appendix 5. During the operation phase, flood risk will be under the responsibility of TCDD.

Considering the flood risk in Mersin-Antep Highspeed Railway project, there are three subjects that need to be discussed; first is the irrigation structures, the second one is the rivers and the last one is the dry basins.

In Adana region there are irrigational structures (channels) and with some of the the existing railline is crossing. Since irrigation channels are designed and constructed for a maximum flow, which is controlled from the dam via gates, there is no risk of flooding from irrigational structures. For your general understanding and knowledge flow data is given in the attachements.

There are two main rivers that the Project is crossing and they are Seyhan and Ceyhan Rivers. There are existing railroad bridges over these rivers and they will be demolished and re-constructed by Ronesans. During bridge design process, State Water Works' (DSI) stream gauging data will be used. DSI is very professional with those stations, in many stations data observations has started nearly 50 years ago. For each big and small rivers data will be used by design consultant, and the geometric, structural and ground improvement design will be made accordingly. The data observed after 2015 will be bought officially via DSI (see Table 4.12).

Table 4.12: Amount of Released Water (m³)

Year/Month	2015	2016	2017	2018	2019	2020	2021
Seyhan River							
January	432,278	161,068	243,434	0	274,752	527,242	67,731
February	462,967	346,291	306,177	0	341,348	504,727	200,066
March	555,811	172,628	191,635	0	425,910	546,487	41,901
April	708,394	68,027	469,666	295,675	712,969	520,322	214,486
May	409,666	52,675	149,505	159,746	590,062	150,682	14,076
June	89,018	56,650	99,959	58,986	103,950	29,549	
July	97,185	40,285	97,362	34,121	51,029	38,275	
August	29,874	33,314	35,597	29,588	42,516	38,189	
September	56,557	25,520	37,325	39,830	50,903	17,449	
October	25,340	32,807	40,241	39,945	58,444	5,260	
November	27,695	29,409	13,507	51,752	49,589	5,821	
December	39,468	65,815	20,628		44,237	16,486	
Canal (YS0)							
January	0	0	0	0	77,846	0	16,243
February	0	0	0	0	102,643	0	36,288
March	146,621	51,926	0	0	51,667	0	81,389
April	214,445	119,578	51,840	88,992	127,872	0	157,334
May	75,168	180,144	218,074	147,658	62,208	233,280	238,896

Year/Month	2015	2016	2017	2018	2019	2020	2021
June	233,280	221,962	226,886	246,240	234,144	262,829	
July	252,893	242,093	230,256	269,741	269,741	258,163	
August	193,104	176,256	207,965	211,766	242,525	236,736	
September	110,333	95,299	123,206	128,304	137,808	168,048	
October	115,344	83,462	73,267	73,526	66,787	111,456	
November	88,301	49,334	0	16,848	70,848	69,725	
December	89,338	0	0	0	8,294	0	
Canal (YS1)							
January	0	0	0	0	0	0	0
February	0	0	1,555	0	0	0	0
March	0	2,160	2,419	0	0	0	2,592
April	0	4,493	4,147	2,592	0	0	5,184
May	8,554	7,085	7,258	6,394	2,678	14,947	10,195
June	7,776	7,776	6,566	8,813	10,368	18,317	
July	10,714	10,714	10,714	13,306	13,392	13,046	
August	9,158	10,714	7,128	11,146	10,714	10,973	
September	7,258	6,998	5,184	7,949	9,763	9,763	
October	2,678	5,357	2,074	3,413	5,357	8,036	
November	2,246	4,234	346	1,944	2,851	3,154	
December	2,419	0	0	0	0	0	

On the project site there are some dry basins which only collect rain flow. During the design process, the design of culvert boxes will be done with the rainfall data and the topographical survey data. The design of culverts will be started after the completion of the topographical survey. By using the flow and survey data, with a good implementation of the projects on site, the flood risk will be eliminated.

4.2.9 Mitigation Measures

There will be no soil pollution around the Project during the construction and operation phases caused by the Project. Materials that will cause pollution will not be discharged to the soil. If necessary, the Emergency Action Plan prepared by Rönesans will be implemented (see Appendix 5). Topsoil and Subsoil Management Procedures of Rönesans will be implemented during the construction period.

Mitigation measures to be taken for the topsoil;

- Site planning should be prepared by related experts,
- Physical characteristics of the soil will be investigated,
- Proper excavation method to relocate the soil will be determined,
- Correct depth for stripping topsoil and subsoil will be determined,
- Topsoil will be stripped in the driest condition possible,

- Movement of trucks or dumpers will be limited with designated temporary routes,
- Soil storage periods will be kept as short as possible,
- Salt crusting signs on the surface will be monitored. Material transfer should not be accepted if there is evidence of salt deposits unless the soil has been tested for salinity,
- Topsoil will be recovered using appropriate equipment. Depending on compaction and recovery rates, deep ripping may be required to maximize topsoil recovery with care taken not to mix topsoil with sodic subsoil,
- The vegetative topsoil to be stripped will be stored in the designated plant soil stock areas for use in rehabilitation and landscaping in the later stages of the project,
- The slope of vegetative topsoil storage area will not be more than 5%,
- The requisite measures will be taken to prevent any loss in the vegetative topsoil during storage and the soil quality will be maintained,
- With the intention to prevent the precipitation and wind erosion, the surface of the vegetative topsoil will be cover with fast growing plants and the perimeter of the storage area will be enclosed with ditch,
- In the event of a spillage on land, contaminated soil will be cleaned in accordance with the provisions of the Regulation on Control of Soil Contamination and Point Source Contaminated Lands (Official Gazette dated 08.06.2010 and numbered 27605) or will be disposed of by licensed companies,
- Within scope of the project, provisions of the Law on Soil Protection and Land Use No. 5403 and Regulation on Control of Soil Contamination and Point Source Contaminated Lands will be adhered to,
- The samplings and analyses will be performed by laboratories accredited by the Ministry of Environment and Urbanization and the analyses reports will be kept on-site and upon request and/or when required, they will be submitted to the relevant authorities,
- Upon the termination of the construction activities, the vegetable topsoil stripped and stored separately will be spread on the landscaping areas in accordance with the "Landscaping Repair Plan" for the purposes of arrangement the project site, and the provisions of the plan will be respected accordingly.
- Landscape repair plan will be applied,

Mitigation measures to be taken for the erosion;

- In order to interrupt the surface flow and prevent the bottom from being carved, material deposits will be released.
- When the slopes are to be cut, mini sluices will be formed, and discharge of the stream will be ensured along the slope.
- Continuous monitoring will be carried out to prevent problems such as collapses, soil losses
- Afforestation and planting will be done.
- Plant species that can be planted during the afforestation and landscaping should be used from the trees in the vegetation of the region.
- Landscape repair plan will be applied.
- Drainage channels and settlement structures will be built before the land preparation and construction of the Project.
- At the end of the excavation work, slopes will be strengthened.
- For the prevention of soil loss, embankments will be built around the excavation material which will be stored in the designated storage areas
- After the stripping and excavation of sites, all degraded part of the Project area will be rehabilitated.

- Geotextile filters, drainage channels and settlement structures will be built before the land preparation and construction of the Project for the reduction of sediment transportation to the outside from the project area.
- In the case of extreme climate conditions occurs, land preparation and construction works will be changed to decrease the erosion risk.

Mitigation measures to be taken for the forest lands;

- Roads to be built at the construction phase of the project will be built by excavators in a way not causing any landslide from slopes and any harm to the environment, and materials to be extracted from the road building will be moved to authorized areas without causing any harm to the forest, and, furthermore, forest roads to be used will be repaired and maintained.
- All facilities and units to be built will be placed in line with provisions of the Regulation on Protection of Buildings against Fire (the Official Gazette dated 19.12.2007 and numbered 26735)
- A fire team will be established according to the Emergency Response Plan to be prepared and information will be provided in writing and verbally about how all personnel will act in case of emergency, and drills will be conducted at certain intervals.
- Forest fire extinguishing tools and equipment will be kept available for use, employees will be trained on how to use the tools and equipment to be used in this regard, and such tools and equipment will always be well-kept. In this respect, the nearest Provincial Directorate of Agriculture and Forest will be contacted and forest fires that may start both in the facility and around it will be immediately notified to the Provincial Directorate of Agriculture and Forest.

The mitigation measures planned to be implemented within the scope of the project are given in the ESMP prepared for the project.

4.2.10 Assumptions and/or Limitations

- Necessary calculation made by using Corine Land Cover European seamless vector database (2018).
- Footprint of the Project could not be provided from TCDD. Thus, 30 m (15 m to the left and 15 m to the right) buffer is used for the Mersin-Gaziantep Railway Line while 70 m (35 m to the left and 35 m to the right) buffer is used for the airport connection.
- Earthquake Risk Map was taken on the website of AFAD [6].

4.3 Air Quality

This section considers the existing air quality and potential impacts of the region where the planned activity is located and the air quality around the project. Railway construction activities require a comprehensive air quality impact assessment study. Therefore, Air Quality section is prepared to define environmental impacts of air quality within the Project area.

4.3.1 Introduction

Air pollution is the existence of substances that are harmful to the atmosphere when their concentration is above certain limits that can cause damage to the climate, living beings and materials and increase mortality. In addition, air pollution is a substantial risk factor for many diseases such as cardiovascular diseases,

respiratory problems, and psychological disorders. Air pollution results from the industrial activities, domestic heating, transportation, construction activities etc.[34]

Air quality is of paramount importance for the projects to be implemented since the area of concern can be affected in a negative manner due to increased air pollution, leading to various health problems. Air pollution affects the quality of life directly or indirectly. Local, regional, and global problems are common today due to the air pollution.

Air quality is dramatically lowered with the increase in industrialization, poor quality fuel use, intensive urbanization, misplacement of cities, the number of motor vehicles, reasons such as topographic and meteorological conditions. In the big, metropolitan cities, air pollution can be experienced very clearly, especially in wintertime.

The quite common air pollutants are designated as “criteria pollutants”, spread all over the atmosphere due to the mentioned activities above, harm the health and environment and cause reversible or irreversible material damage depending on the magnitude of the pollution and/or pollutant concentrations. The criteria pollutants are;

- Dust Deposit: A sedimentary deposit produced from the finest (silt-sized) fraction of planetary regolith that is carried in suspension and distributed by atmospheric activity [46]
- Particulate Matter 10 (PM₁₀): Inhalable particles with diameters having 10 µm and smaller.
- Particulate Matter 2.5 (PM_{2.5}): Fine inhalable particles with diameters having 2.5 µm and smaller.
- Nitrogen Dioxide (NO₂): The gas used as the indicator of NO_x, gets in the air by fossil fuel combustion and vehicle exhausts.
- Sulfur Dioxide (SO₂): The gas used as the indicator of SO_x, gets in the air by fossil fuel combustion at power plants and other industrial facilities.
- Carbon Monoxide (CO): A colorless, odorless, and harmful gas released because of incomplete combustion.
- Lead (Pb): Metal pollutant that is released into the atmosphere because of motor vehicle gasolines and waste incineration.
- Ground Level/Tropospheric Ozone (O₃): Pollutant that is not emitted directly but formed by chemical reactions of oxides of nitrogen (NO_x) and VOC (Volatile Organic Compounds)[31]

Within the scope of air quality, during the operation, highway emissions are expected to decline significantly as the public and environmentally friendly transport will be promoted with the High Standard Train, which uses electricity. Consequently, the Project will contribute to the reduction of vehicle intensity and congestion, leading to a higher air quality. The only emissions are likely to be vehicle exhaust emissions due to the transportation of staff to the stations and maintenance operations (i.e., NO₂ and PM₁₀).

In Turkey, the air pollution generally stems from heating, industry, and motor vehicles. These activities bring about emissions. Emissions can be defined as average release amount of a certain pollutant originating from any activity or equipment for a unit raw material, unit fuel, unit volume, unit time, unit space; and emission sources are the stack or non-stack sources giving off emission to the atmosphere, either mobile or stationary sources [34].

Air quality measurement stations have been established in 81 provinces by the Ministry of Environment and Urbanization to measure air pollution accurately, to establish air pollution control strategies in all our provinces and to bring the air quality of the provinces to a better situation than the previous year's values within the framework of these strategies.

There is a legal framework and regulatory bodies of air quality in both national and international scale. The strictest values are always taken to be target values for all the projects. For the High Standard Train Project, Industrial Air Pollution Control Regulation in Turkey and Environmental Health and Safety Guidelines established by International Finance Corporation/World Bank ambient air quality limit values are taken as reference documents.

In the scope of the project, air quality measurements were carried out to determine the present pollution load of the region before air quality modelling studies. The pollutants of interest for this project are determined as

PM₁₀, PM_{2.5} and dust deposit for the construction phase. PM₁₀ and PM_{2.5} measurements were made at 10 points during a month while deposit measurements were carried out at 15 points for 2 months. Air quality assessment has been carried out by using these measurements.

4.3.2 Policies, Legal Framework and Guidelines

The legal framework is applied for all the projects for the evaluation of air quality for a better examination of air quality measurement results. The legal framework examined is given below;

- The Regulation on Industrial Air Pollution Control,
- The Regulation on Management and Assessment of Air Quality,
- The Regulation of Control of Air Pollution Originated from Heating,
- The Regulation on Control of Odor Causing Emissions,
- International Finance Corporation/World Bank (IFC/WB) General Environmental Health and Safety Guidelines,
- European Bank for Reconstruction and Development (EBRD),
- Directive 2015/1480/EC on Ambient Air Quality and Cleaner Air for Europe

Both national and international legislations consist of limit values for PMs on air and dust deposit. The limit values are compared for both regulations and the strictest values among these regulations are selected as target values for the project.

4.3.2.1 National Legislation

Activity owners are obliged to comply with the national legislations for the facilities operating in Turkey. Detailed Information on national legislation on air pollution is given in this section.

Regulation on Control of Industrial Air Pollution

The purpose of the “Regulation on Control of Industrial Air Pollution” published on the volume of the official gazette dated 03.07.2009 and numbered 27277 is that the protection of human health and its environment from the potential hazards of pollutions in air-receiving environments and aims control of soot, fume, dust, gas, vapor, and aerosol emissions released into the atmosphere from the industrial processes and energy production processes.

Regulation on Control of Industrial Air Pollution regulates the emission limits of industrial facilities in a broad scope. As the major pollutants of concern are the dust and PM emissions during both construction and operation phase, the measured values within the railway site must met the limit values stated in this regulation. The pollutants of concern and their limit values within the project site are highlighted in the table below (see Table 4.13).

Table 4.13: Air Quality Limit Values on Regulation on Control of Industrial Air Pollution [26]

Parameter	Duration	Unit	2019-2023	2024 and after
SO ₂	Hourly (cannot be exceeded more than 24 times in a year)	µg/m ³	350	350
	24 hours		125	125
	LTL		60	60
	**Annual and winter period (October 1-March 31)		20	20
NO ₂	Annual (cannot be exceeded more than 18 times in a year)	µg/m ³	250	200*
	Annual		40*	40
Suspended Particulate Matter (PM ₁₀)	24 hours (cannot be exceeded more than 35 times in a year)	µg/m ³	50	50
	Annual		40	40
Pb	Annual	µg/m ³	0.5	0.5
CO	Maximum daily 8 hours mean value	mg/m ³	10	10
Cd	LTL	µg/m ³	0.02	0.02
HCl	STL	µg/m ³	150	150
	LTL		60	60
HF	Hourly	µg/m ³	30	30
	STL		5	5
H ₂ S	Hourly	µg/m ³	100	100
	STL		20	20
Total Organic Carbon	Hourly	µg/m ³	280	280
	STL		70	70

Parameter		Duration	Unit	2019-2023	2024 and after
Dust Deposit		STL	mg/m ² -day	390	390
		LTL		210	210
In Dust Deposit	Pb and compounds	LTL	mg/m ² -day	250	
	Cd and compounds	LTL		3.75	
	Tl and compounds	LTL		5	

* The limit value will be reduced evenly annually until the targets for 2024 are reached.

** Protection of the eco system

The Regulation on Management and Assessment of Air Quality

The purpose of "Regulation on Assessment and Management of Air Quality" published on the volume of the official gazette dated 06.06.2008 and numbered 26898 is defining and creating air quality targets in a way that preventing or mitigating effects of the air pollution on the environment and human health, evaluating the air quality by considering the defined methods and criteria as fundamentals, protecting the baseline conditions in locations where the air quality is good. Otherwise, gathering the adequate Information about the air quality and ensuring that the people is informed upon thresholds.

The Regulation of Control of Air Pollution Originated from Heating

The purpose of "Regulation of Control of Air Pollution Originated from Heating" published on the volume of the official gazette dated 13.01.2005 and numbered 25699 reduces and foresees the adverse impacts of pollutants released to the atmosphere in the form of soot, smoke, dust, gas, steam and aerosol on air quality, which originates from residences, mass housing, cooperatives, housing complexes, schools, universities, hospitals, governmental agencies, workplaces, social facilities, industry and similar places.

The Regulation on Control of Odor Causing Emissions

The purpose of "Regulation on Control of Odor Causing Emissions" published on the volume of the official gazette dated 19.07.2013 and numbered 28712 is regulating administrative and technical procedures and principles regarding control and reduction of emissions causing odor.

The Regulation on Control of Exhaust Gas Emissions

The purpose of "Regulation on Control of Exhaust Gas Emissions" published on the volume of the official gazette dated 11.03.2017 and numbered 30004 is regulating the necessary steps taken to reduce the exhaust gas pollutants to protect the living beings and the environment from the effects of air pollution caused by the exhaust pipes of the motor vehicles navigating in traffic. This Regulation covers the measurement stations and searches, operation, and authorization of natural or legal people who will carry out exhaust gas emission measurements of gasoline, diesel and gaseous fuel (LPG, CNG, LNG and similar) in traffic, and the inspection procedures and principles of the devices, tools/equipment, operation and work and covers the personal and qualifications in the measurement stations.

4.3.2.2 International Legislation

International Finance Corporation/World Bank (IFC/WB)

International Finance Corporation/World Bank (IFC/WB) has a comprehensive set of Environmental Health and Safety Guidelines that aim to provide Information for projects during assessment activities. If the limit values of the IFC/WB standards diverge from the relevant regulations of the project country, the regulation with the stricter standard value must be followed.

The IFC EHS guide provides an approach to the management of principal emission sources, including specific guidance for impact assessment and monitoring. It also aims to provide additional Information on strategies for emission management in projects in low air quality region.

IFC/WB has General EHS Guidelines in variety of topics such as Environment, Community Health and Safety, Construction, Operation, and Decommissioning, as well as different Sector Guidelines.

IFC EHS Guideline for Air Emissions and Air Quality aims to attain the limit values recommended by the World Health Organization (WHO) Ambient Air Quality Guidelines, presented in Table 4.14.

Table 4.14: WHO Ambient Air Quality Standards

Parameter	Duration	($\mu\text{g}/\text{m}^3$)
SO ₂	10-minute mean	500
	24-hour mean	20
NO ₂	1-hour mean	200
	Annual mean	40
Particulate Matter (PM ₁₀)	24-hour mean	50
	Annual mean	20
Particulate Matter (PM _{2.5})	24-hour mean	25
	Annual mean	10
O ₃	8-hour mean	100

European Bank for Reconstruction and Development (EBRD)

One of the other international standards used to evaluate the effects of the planned High Standard Train Project on air quality assessment is the EBRD performance standards. In this context, EBRD Performance Standard 1: Assessment and Management of Environmental and Social Impacts and Issues and Performance Requirements 3: Resource Efficiency and Pollution Prevention and Control Guidelines are applied. Information on EBRD Performance Standards (PR) is also stated in some of the following sections of the report where the abatement is needed.

EBRD performance standards are mostly like IFC performance standards. For the protection and management of air quality as specified in EBRD PR 3;

- To avoid or at least minimize the adverse impacts of air pollution directly arising from the projects.
- Projects will be carried out commensurate with the requirements of this PR to promote pollution prevention as a part of the air quality management plan. The plan is also in compliance with the other Good International Industry Practices (GIIPs). GIIPs have emerged as a fundamental for the management of air quality, using the Best Available Techniques (BAT).

In relation to the abovementioned topics, projects will be designed in a way that to comply with the relevant EU environmental requirements applicable to the national legislation and project operations must be in line with these legislations. It is very well-known that EU environmental requirements are based upon BATs. BAT does not cover the implementation of any specific technology but considering the technical traits of the project installation, geographical and local baseline conditions to ensure that the most effective abatement for environmental disturbances.

During the design, construction, operation, and decommissioning stages; in other words, during the lifecycle of a project, the client must consider the requirements above such that applying the BAT for pollution prevention by avoidance or at least minimizing the pollution and/or releases where avoidance is difficult in a financially feasible, cost-effective, and energy-efficient manner for a sustainable conservation of resources.

EU Directive 2015/1480/EC

The European Union has developed a legislation through the authorized bodies, which establishes health standards and objectives for several air pollutants. These standards and objectives are summarized in the table below (see Table 4.15). These apply for varying periods because the observed health impacts related with various pollutants occur at different exposure times.

To protect human health and the environment, it is particularly important to avert emissions at the source of pollutants and to identify and implement the most effective emission reduction measures at local, national and community scale. For this reason, emissions of hazardous air pollutants should be prevented, or at least reduced, and appropriate targets should be set for ambient air quality, amending the relevant World Health Organization standards, guidelines, and programs. The latest Directive 2015/1480/EC of the European Parliament and of the Council of 28 August 2015 on Ambient Air Quality and Cleaner Air for Europe has been found appropriate for the assessment of the emissions arising from the activities in this project.

Table 4.15: EU Directive Emission Standards for Criteria Pollutants

Pollutant	Concentration	Averaging period	Permitted exceedances each year
Fine particles (PM _{2.5})	25 µg/m ³ ***	1 year	N/A
Sulphur dioxide (SO ₂)	350 µg/m ³	1 hour	24
	125 µg/m ³	24 hours	3
Nitrogen dioxide (NO ₂)	200 µg/m ³	1 hour	18
	40 µg/m ³	1 year	N/A
PM ₁₀	50 µg/m ³	24 hours	35
	40 µg/m ³	1 year	N/A
Lead (Pb)	0.5 µg/m ³	1 year	N/A
Carbon monoxide (CO)	10 mg/m ³	Maximum daily 8 hour mean	N/A
Benzene	5 µg/m ³	1 year	N/A
Ozone	120 µg/m ³	Maximum daily 8 hour mean	25 days averaged over 3 years
Arsenic (As)	6 ng/m ³	1 year	N/A
Cadmium (Cd)	5 ng/m ³	1 year	N/A
Nickel (Ni)	20 ng/m ³	1 year	N/A
Polycyclic Aromatic Hydrocarbons	1 ng/m ³ (expressed as concentration of Benzo(a)pyrene)	1 year	N/A

***Standard introduced by Directive.

Dust Emissions

Filling, separating, sieving, conveying, crushing and grinding of particles larger than 5 millimeters in diameter; is conducted in fixed facilities and open areas; Independent of the values in ANNEX-2 Table 2.1 of the Regulation, for the facilities where dust emissions originate from outside of the stacks, the amount of dust deposit measured in the operation site according to the principles are specified in ANNEX-2 (g) of the Regulation, considering the prevailing wind direction, 450 mg/m².day as a monthly average value should not be exceeded for dust emissions.

4.3.2.3 Project Targets

The emission limit values applied in Turkey comply with the limit values (excluding dust deposit) applied in the IFC/WB General EHS Guide. It has been determined that the PM₁₀ limit values in the IFC/WB General EHS Guide have lower limit values compared with the national legislation and there are no limit values for dust deposit. For this reason, while IFC/WB limit values are taken as PM₁₀ targets of the project, The Regulation on Industrial Air Pollution Control limit values are taken for dust deposit. For PM₁₀, limit values targeted within the scope of the project activity is given in the table below (see Table 4.16).

Both national and international legislations consist of limit values for PM and dust emissions. The limit values are compared for both regulations and the strictest values among these regulations are selected as target values for the project.

Table 4.16: Targeted National and International Limit Values Pertaining to the Activity

Parameter	Average Time	Unit	Regulation on Control of Industrial Air Pollution	The Regulation on Management and Assessment of Air Quality	IFC/WHO	EU 2015/1480/EC	Project Targets
			Target Values (1 January 2019) ($\mu\text{g}/\text{m}^3$)	Target Values (1 January 2019) ($\mu\text{g}/\text{m}^3$)			
PM₁₀	Daily (24 hours)	$\mu\text{g}/\text{m}^3$	50 (Not exceeded more than 35 times a year)	50 (Not exceeded more than 35 times a year)	40 (a value of 99%)	50	40
	Annual	$\mu\text{g}/\text{m}^3$	40	40	20	40	20
PM_{2.5}	Daily (24 hours)	$\mu\text{g}/\text{m}^3$	-	-	25	-	25
	Annual	$\mu\text{g}/\text{m}^3$	-	-	10	25	10
Dust Deposit (mg/Nm³-day)	Monthly	mg/Nm ³ -day	390	390	-	-	390
	Annual	mg/Nm ³ -day	210	210	-	-	210
NO₂	Hourly (Not exceeded more than 18 times in a year)	$\mu\text{g}/\text{m}^3$	250	250	200		200
	Annual		40	40	40		40
CO	Daily (8 hours)	mg/m ³	10	10	-		
SO₂	10-minute	$\mu\text{g}/\text{m}^3$	-	-	500	-	
	1-hour	$\mu\text{g}/\text{m}^3$	350	350	-	350	
	24-hour	$\mu\text{g}/\text{m}^3$	125	125	20	125	

4.3.3 Extend of Study Area

4.3.3.1 Spatial Extend

Along the project area, the route was splatted into 5 different model domains due to AERMOD modelling limitations. Considering the railway line as the center, it was incorporated into the model to run the air quality dispersion model. The spatial distribution for sources of air pollutants along the proposed railway covers a narrow area (see Map 4.1).

The buffer zone, which is determined as 10 km (5 km to the left and 5 km to the right) as nested receptors and gridded receptors used for the determination of spatial extend, expresses the impact areas that are likely to affect the nearby communities to the project area. The quantity of buffer length is determined considering the effects that are potentially to be observed from which the distance is maximum.



Map 4.1: Air Quality Impact Assessment Area and Receptors

4.3.3.2 Temporal Extend

Temporal changes express the change in a property with respect to time. Air quality samplings were carried out within the scope of the Train project to identify the temporal change in air quality and to understand the overall baseline quality and potential cumulative impacts of the project's existing activities (i.e., whether and/or how they will contribute to the air quality of the proposed project area). In the model study, 2020 meteorological data was used.

It is expected that construction phase air pollutants and GHG emissions will significantly be reduced during the operation phase, as the train will use electricity only and no fuel will be consumed. The only possible releases during the operation are dust carryover during the train passage and transport of staff to the stations by vehicles whose air quality impact will be minor.

4.3.4 Identification of Baseline Conditions

Baseline conditions expresses the present conditions of the region in the absence of any activity. Herein, the detailed description of the air quality status of the Project area is provided. Baseline concentrations of PM₁₀, PM_{2.5} and dust deposit are measured by the contracted laboratory, which is called as Febas Environmental Laboratory.

Baseline conditions relate to the properties of the area already present where the railway is going to be placed. The air quality is analyzed to evaluate the baseline of the project area and its vicinity. The baseline studies are key elements in the monitoring and assessment plan and provide a reference for which any future changes associated with the project activities can be assessed together with their degree of effectiveness and offer information for consecutive monitoring. In this context, environmental baseline conditions are described to form a basis for the impacts of the Project and the relevant mitigation measures. The baseline conditions also offer a set of comparison criteria for the status of the area before and after the implementation of the Project.

Detailed Information about baseline air quality studies is given in Section 4.3.4.2.

4.3.4.1 Desk Studies

Desk studies of the Project were carried out with the following order;

- Execution of a preliminary model and determination of nearest sensitive receptors to the project area,
- Satellite imagery and obtaining of the Open Street Map views of the Project area,
- Route evaluation,
- Literature studies upon the possible impacts which are examined thoroughly as well as the research and reliable selection of emission factors (EFs) of the construction phase pollutants of concern (PM and dust) with the help of Best Available Techniques (BAT),
- Model selection,
- Model results.

Air Quality Dispersion model results are explained in detail in Section 4.3.6 as well as listed in Appendix 7.

4.3.4.2 Field Studies

Measuring the baseline air quality in a region is a way of analyzing the air quality of the area where people live in. Measuring the baseline conditions will give change to see the impact of the Project in the environment.

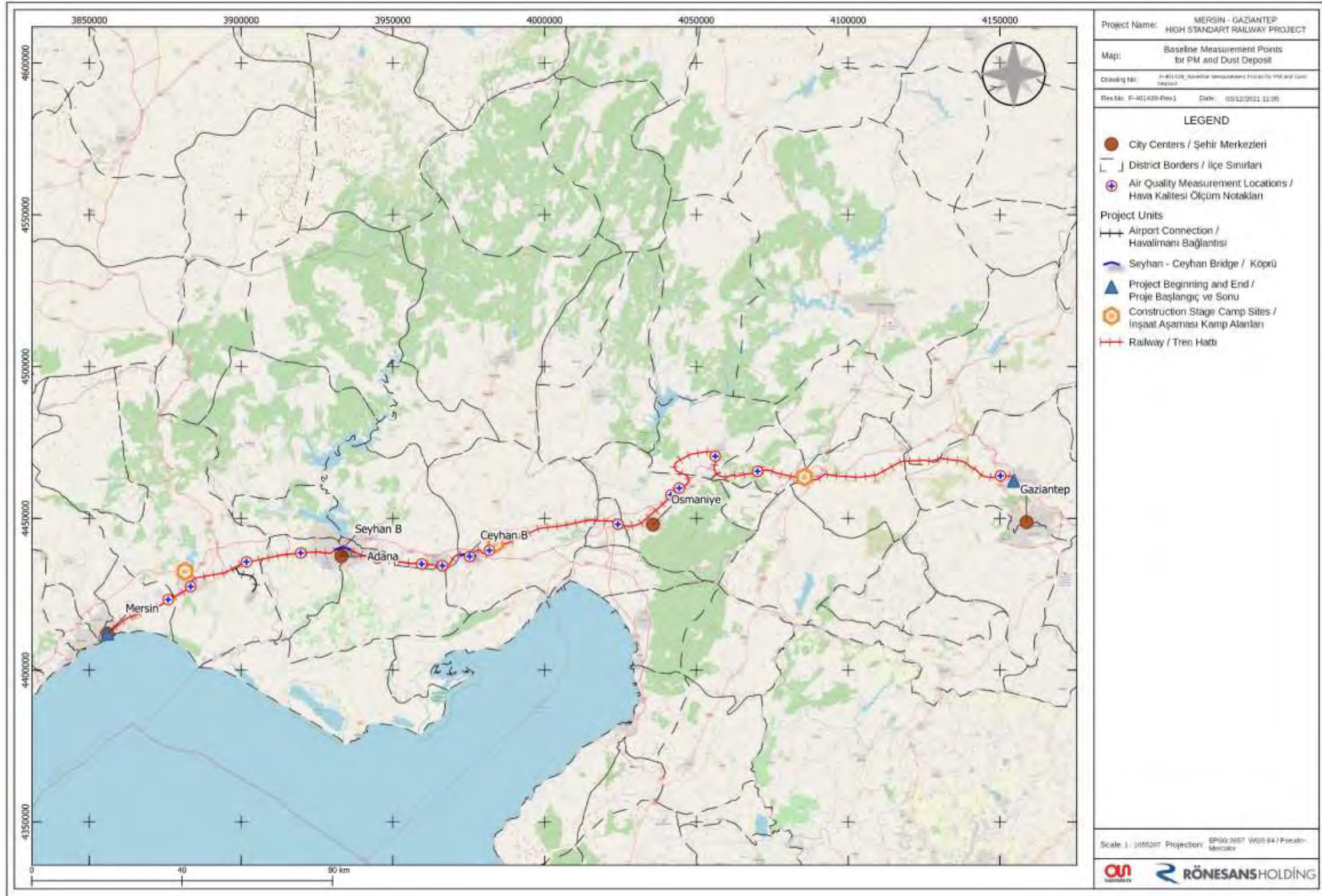
To determine the baseline air quality in the project area, air quality monitoring was carried out at the project field and its vicinity. PM₁₀ and PM_{2.5} measurements were conducted by laboratory in 10 measurement points on a monthly basis and dust deposit measurements were conducted in 15 measurement points along the

Railway Line. PM measurement points are marked as yellow, while settled dust measurement points are marked as red in the map given below (see Map 4.2).

To determine the Air Quality around the facility, Emission Measurements were carried out around the facility in the date mentioned below.

- 17.10.2020-17.11.2020 / 29.11.2020-29.12.2020 for settled dust measurements,
- 17.10.2020-17.11.2020 / 29.11.2020-29.12.2020 for PM₁₀ measurements,
- 17.10.2020-17.11.2020 / 29.11.2020-29.12.2020 for PM_{2.5} measurements.

Emission measurement locations were selected according to the standards approved by the Ministry, technically flawless and allowing making the necessary connections for the measurement. Information about the devices used in analysis and measurements are given in Appendix 8.



Map 4.2: Baseline Measurement Points for PM and Dust Deposit

4.3.4.3 Ambient Air Quality

Settled Dust Emissions

The settled dust emissions are carried out for 2 periods each of them is 1 month and in total 2 months according to the Regulation on Industrial Air Pollution Control. In 15 points settled dust measurements were performed. Particulate pollutants that have a diameter above 30 µm settles due to the gravity, classified as dust.

The roads in the Project area are covered with asphalt. For this reason, dust formation occurs merely within the site. The material that will be transported for the construction works will require significant number of vehicles, which also emit dust during the movement.

The filling material used for soil works is stored in a stock area. Dust formation is expected due to the storage of the excess filling material unless the stock area is not covered with vegetable soil. It is also expected during the discharge of the filling material to the stock area.

Long-term limit value is 210 mg/m².day and short-term value is 390 mg/m².day, which are the strictest value in both national and international legislations. Settled dust measurement results in each point in the field are given in the tables below with the limit value in legislations. The results are established by the laboratory (see Table 4.17 to Table 4.31).

Table 4.17: Settled Dust Measurement at Point 1

Project Name and Number								GPS	
ENVY 20/İM00489-1								Easting:	662034
Sampling Place: Point 1 (Equipment no:107)								Northing:	4083758
Measurement Information									
Settled Dust Concentration (mg/m ² -day)									
17.10.2020 – 17.11.2020				29.11.2020 – 29.12.2020				Average Value	
Period 1				Period 2				Period 1	Period 2
214	193	151	84	210	176	161	80	160	157
Long Term Value								158.6	210
Short Term Value								214	390

Table 4.18: Settled Dust Measurement at Point 2

Project Name and Number								GPS	
ENVY 20/İM00489-1								Easting:	667915
Sampling Place: Point 2 (Equipment No:109)								Northing:	4087309
Measurement Information									
Settled Dust Concentration (mg/m ² -day)									
17.10.2020 – 17.11.2020				29.11.2020 – 29.12.2020				Average Value	
Period 1				Period 2				Period 1	Period 2
248	217	154	81	315	196	137	97	175	186
Long Term Value								180,5	210
Short Term Value								315	390

Table 4.19: Settled Dust Measurement at Point 3

Project Name and Number								GPS	
ENVY 20/İM00489-1								Easting:	696718
Sampling Place: Point 3 (Equipment No:110)								Northing:	4094079
Measurement Information									
Settled Dust Concentration (mg/m ² -day)									
17.10.2020 – 17.11.2020				29.11.2020 – 29.12.2020				Average Value	
Period 1				Period 2				Period 1	Period 2
302	152	114	84	244	220	139	107	163	177
Long Term Value								170.2	210
Short Term Value								302	390

Table 4.20: Settled Dust Measurement at Point 4

Project Name and Number								GPS	
ENVY 20/İM00489-1								Easting:	696718
Sampling Place: Point 4 (Equipment No:111)								Northing:	4096728
Measurement Information									
Settled Dust Concentration (mg/m ² -day)									
17.10.2020 – 17.11.2020				29.11.2020 – 29.12.2020				Average Value	
Period 1				Period 2				Period 1	Period 2
196	161	150	88	179	168	123	103	149	143
Long Term Value								146	210
Short Term Value								196	390

Table 4.21: Settled Dust Measurement at Point 5

Project Name and Number								GPS		
ENVY 20/İM00489-1								Easting:	716900	
Sampling Place: Point 5 (Equipment No:112)								Northing:	4095887	
Measurement Information										
Settled Dust Concentration (mg/m²-day)										
17.10.2020 – 17.11.2020				29.11.2020 – 29.12.2020				Average Value		Limit Value
Period 1				Period 2				Period 1	Period 2	
187	152	79	51	219	116	79	42	117	114	
Long Term Value								115.6		210
Short Term Value								219		390

Table 4.22: Settled Dust Measurement at Point 6

Project Name and Number								GPS					
ENVY 20/İM00489-1								Easting:		728660			
Sampling Place: Point 6 (Equipment No:113)								Northing:		4094638			
Measurement Information													
Settled Dust Concentration (mg/m²-day)													
17.10.2020 – 17.11.2020				29.11.2020 – 29.12.2020				Average Value		Limit Value			
Period 1				Period 2				Period 1	Period 2				
342	192	146	44	223	147	95	51	181	129				
Long Term Value								154.9				210	
Short Term Value								342				390	

Table 4.23: Settled Dust Measurement at Point 7

Project Name and Number								GPS	
ENVY 20/İM00489-1								Easting:	734148
Sampling Place: Point 7 Equipment No:118)								Northing:	4094344
Measurement Information									
Settled Dust Concentration (mg/m ² -day)									
17.10.2020 – 17.11.2020				29.11.2020 – 29.12.2020				Average Value	
Period 1				Period 2				Period 1	Period 2
155	124	126	59	153	137	112	75	116	119
Long Term Value								117.7	
Short Term Value								155	

Table 4.25: Settled Dust Measurement at Point 9

Project Name and Number								GPS	
ENVY 20/İM00489-1								Easting:	746400
Sampling Place: Point 9 (Equipment No:120)								Northing:	4098702
Measurement Information									
Settled Dust Concentration (mg/m ² -day)									
17.10.2020 – 17.11.2020				29.11.2020 – 29.12.2020				Average Value	
Period 1				Period 2				Period 1	Period 2
164	125	122	65	166	131	125	66	119	122
Long Term Value								120.5	
Short Term Value								166	

Table 4.27: Settled Dust Measurement at Point 11

Project Name and Number								GPS		
ENVY 20/iM00489-1								Easting:	260709	
Sampling Place: Point 11 Equipment No:155)								Northing:	4113060	
Measurement Information										
Settled Dust Concentration (mg/m²-day)										
17.10.2020 – 17.11.2020				29.11.2020 – 29.12.2020				Average Value		Limit Value
Period 1				Period 2				Period 1	Period 2	
162	125	113	69	169	128	115	75	118	122	
Long Term Value								119.8		210
Short Term Value								169		390

Table 4.29: Settled Dust Measurement at Point 13

Project Name and Number								GPS	
ENVY 20/İM00489-1								Easting:	272655
Sampling Place: Point 13 (Equipment No:157)								Northing:	4122845
Measurement Information									
Settled Dust Concentration (mg/m ² -day)									
17.10.2020 – 17.11.2020				29.11.2020 – 29.12.2020				Average Value	
Period 1				Period 2				Period 1	Period 2
286	142	127	68	195	140	129	80	156	136
Long Term Value								146	210
Short Term Value								286	390

Table 4.30: Settled Dust Measurement at Point 14

Project Name and Number								GPS	
ENVY 20/İM00489-1								Easting:	283657
Sampling Place: Point 14 (Equipment No:158)								Northing:	4118629
Measurement Information									
Settled Dust Concentration (mg/m ² -day)									
17.10.2020 – 17.11.2020				29.11.2020 – 29.12.2020				Average Value	
Period 1				Period 2				Period 1	Period 2
168	131	126	63	138	115	99	56	122	102
Long Term Value								112.1	210
Short Term Value								168	390

Table 4.31: Settled Dust Measurement at Point 15

Project Name and Number								GPS	
ENVY 20/İM00489-1								Easting:	347473
Sampling Place: Point 15 (Equipment No:187)								Northing:	4116050
Measurement Information									
Settled Dust Concentration (mg/m ² -day)									
17.10.2020 – 17.11.2020				29.11.2020 – 29.12.2020				Average Value	
Period 1				Period 2				Period 1	Period 2
192	190	122	44	165	133	121	58	137	119
Long Term Value								128.1	210
Short Term Value								192	390

Gravimetric Method with Four-Way Ambient Air Sampling Device did settled dust determination. The determination of settled dust in the environment is measured in accordance with the TS 2342 standards. The sampling system consists of 1 base plate, 1 tripod and 4 dust collectors. In this way, the sampling system can collect the dust that may form from 4 main directions (North, South, East, and West). Through this way, the source of the dust at a certain point can be understood.

According to measurement results, there is no exceedance for settled dust concentration in the baseline conditions. Both annual and monthly dust emissions that will arise from the activities during the construction period comply with the limit values on the Regulation on Industrial Air Pollution Control. There is no Information in the international legislation on dust limit values.

PM Emissions

Result of PM_{10} and $PM_{2.5}$ emission measurement, which are performed at 10 points, are also given in tables below (see Table 4.32 to Table 4.41). As given in the tables of PM_{10} measurement, limit value for daily base is $50 \mu g/m^3$ in both national and international legislations and long-term limit for average value is $40 \mu g/m^3$ in national legislations and $20 \mu g/m^3$ and international legislations. As given in the tables of $PM_{2.5}$ measurement, limit value for daily base is $25 \mu g/m^3$ in both international legislations and long-term limit for average value is $10 \mu g/m^3$ and international legislations. Evaluation of baseline measurement when compared to limit value is given below the measurement result tables of PM_{10} and $PM_{2.5}$.

Note that the superscript 1 denotes The Regulation on Industrial Air Pollution Control limit value while superscript 2 denotes IFC/WB limit value. The dates when the exceedance occurred are highlighted with red color.

Table 4.32: PM₁₀ and PM_{2.5} Measurement Results at Location 1

Location Name	PM ₁₀ -1 (Particulate Matter10-1)		West	662034	
Measurement Location	ADNAN MENDERES Location		North	4083758	
DATE	Ambient Pressure (hPa,mbar)	Temperature (°C)	Sampling Time (Hours)	Standard Concentration (µg/m³)	Limit Value (µg/m³)
25.10.2020	1012	28.3	24	31.39	50 ¹ 50 ²
26.10.2020	1012	29.7	24	31.03	
27.10.2020	1012	28.9	24	30.35	
28.10.2020	1012	30.3	24	30.09	
29.10.2020	1012	29.7	24	31.23	
30.10.2020	1012	28.6	24	29.92	
31.10.2020	1012	30.1	24	32.07	
1.11.2020	1012	29.3	24	31.19	
2.11.2020	1012	28.9	24	29.25	
3.11.2020	1012	30.7	24	39.67	
4.11.2020	1012	30.5	24	32.12	
5.11.2020	1012	29.3	24	28.19	
6.11.2020	1012	28.1	24	29.77	
7.11.2020	1012	29.9	24	27.75	
8.11.2020	1012	30.4	24	30.90	
9.11.2020	1012	31.0	24	27.14	
10.11.2020	1012	28.9	24	32.35	
11.11.2020	1012	28.6	24	28.13	
12.11.2020	1012	29.1	24	27.77	
13.11.2020	1012	28.4	24	22.82	
14.11.2020	1012	29.8	24	28.24	
15.11.2020	1012	30.5	24	27.30	
16.11.2020	1012	30.3	24	25.68	
17.11.2020	1012	29.6	24	30.72	
18.11.2020	1012	30.7	24	32.64	
19.11.2020	1012	29.5	24	31.41	
20.11.2020	1012	29.9	24	27.14	
21.11.2020	1012	28.3	24	31.48	
22.11.2020	1012	28.7	24	30.23	
23.11.2020	1012	29.1	24	30.37	
Average				29.94	40 ¹ 20 ²

Location Name	PM _{2.5} -1 (Particulate Matter _{2,5} -1)		West	662034	
Measurement Location	ADNAN MENDERES Location		North	4083758	
DATE	Ambient Pressure (hPa, mbar)	Temperature (°C)	Sampling Time (Hours)	Standard Concentration (µg/m³)	Limit Value (µg/m³)
25.10.2020	1012	28.3	24	28.20	25 ²
26.10.2020	1012	29.7	24	25.52	
27.10.2020	1012	28.9	24	27.05	
28.10.2020	1012	30.3	24	22.57	
29.10.2020	1012	29.7	24	25.22	
30.10.2020	1012	28.6	24	25.13	
31.10.2020	1012	30.1	24	25.16	
1.11.2020	1012	29.3	24	24.09	
2.11.2020	1012	28.9	24	25.76	
3.11.2020	1012	30.7	24	27.82	
4.11.2020	1012	30.5	24	24.29	
5.11.2020	1012	29.3	24	21.79	
6.11.2020	1012	28.1	24	30.87	
7.11.2020	1012	29.9	24	26.24	
8.11.2020	1012	30.4	24	26.89	
9.11.2020	1012	31.0	24	25.43	
10.11.2020	1012	28.9	24	24.86	
11.11.2020	1012	28.6	24	23.34	
12.11.2020	1012	29.1	24	24.08	
13.11.2020	1012	28.4	24	23.62	
14.11.2020	1012	29.8	24	23.13	
15.11.2020	1012	30.5	24	17.46	
16.11.2020	1012	30.3	24	24.47	
17.11.2020	1012	29.6	24	24.52	
18.11.2020	1012	30.7	24	24.81	
19.11.2020	1012	29.5	24	25.31	
20.11.2020	1012	29.9	24	23.14	
21.11.2020	1012	28.3	24	25.71	
22.11.2020	1012	28.7	24	25.94	
23.11.2020	1012	29.1	24	25.57	
Average				24.93	10 ²

Table 4.33: PM₁₀ and PM_{2.5} Measurement Results at Location 2

Location Name	PM ₁₀ -2 (Particulate Matter10-2)		West	682491	
Measurement Location	ATALAR Location		North	4094079	
DATE	Ambient Pressure (hPa,mbar)	Temperature (°C)	Sampling Time (Hours)	Standard Concentration (µg/m³)	Limit Value (µg/m³)
25.10.2020	1010.3	26.5	24	29.56	50 ¹ 50 ²
26.10.2020	1010.3	27.8	24	35.57	
27.10.2020	1010.3	25.0	24	31.98	
28.10.2020	1010.3	26.1	24	33.49	
29.10.2020	1010.3	27.3	24	38.00	
30.10.2020	1010.3	25.2	24	16.20	
31.10.2020	1010.3	26.0	24	30.60	
1.11.2020	1010.3	27.6	24	35.45	
2.11.2020	1010.3	25.1	24	34.66	
3.11.2020	1010.3	26.0	24	33.28	
4.11.2020	1010.3	25.5	24	26.40	
5.11.2020	1010.3	26.7	24	34.05	
6.11.2020	1010.3	25.3	24	27.37	
7.11.2020	1010.3	26.9	24	34.17	
8.11.2020	1010.3	27.5	24	30.06	
9.11.2020	1010.3	27.0	24	32.30	
10.11.2020	1010.3	27.6	24	29.87	
11.11.2020	1010.3	26.5	24	29.76	
12.11.2020	1010.3	25.4	24	26.00	
13.11.2020	1010.3	26.8	24	30.49	
14.11.2020	1010.3	25.2	24	28.25	
15.11.2020	1010.3	26.4	24	32.53	
16.11.2020	1010.3	27.3	24	27.95	
17.11.2020	1010.3	25.2	24	31.81	
18.11.2020	1010.3	26.5	24	31.65	
19.11.2020	1010.3	27.1	24	30.52	
20.11.2020	1010.3	26.9	24	31.89	
21.11.2020	1010.3	25.3	24	29.25	
22.11.2020	1010.3	26.1	24	34.68	
23.11.2020	1010.3	27.8	24	29.49	
Average				30.91	40 ¹ 20 ²

Location Name	PM _{2.5} -2 (Particulate Matter2,5-2)		West	682491	
Measurement Location	ATALAR Location		North	4094079	
DATE	Ambient Pressure (hPa,mbar)	Temperature (°C)	Sampling Time (Hours)	Standard Concentration (µg/m³)	Limit Value (µg/m³)
25.10.2020	1010.3	26.5	24	26.19	25 ²
26.10.2020	1010.3	27.8	24	23.71	
27.10.2020	1010.3	25.0	24	27.05	
28.10.2020	1010.3	26.1	24	28.34	
29.10.2020	1010.3	27.3	24	29.74	
30.10.2020	1010.3	25.2	24	26.77	
31.10.2020	1010.3	26.0	24	22.78	
1.11.2020	1010.3	27.6	24	29.97	
2.11.2020	1010.3	25.1	24	29.43	
3.11.2020	1010.3	26.0	24	26.15	
4.11.2020	1010.3	25.5	24	21.55	
5.11.2020	1010.3	26.7	24	25.81	
6.11.2020	1010.3	25.3	24	25.79	
7.11.2020	1010.3	26.9	24	27.32	
8.11.2020	1010.3	27.5	24	30.66	
9.11.2020	1010.3	27.0	24	28.52	
10.11.2020	1010.3	27.6	24	26.19	
11.11.2020	1010.3	26.5	24	24.70	
12.11.2020	1010.3	25.4	24	26.89	
13.11.2020	1010.3	26.8	24	24.23	
14.11.2020	1010.3	25.2	24	26.47	
15.11.2020	1010.3	26.4	24	24.89	
16.11.2020	1010.3	27.3	24	22.08	
17.11.2020	1010.3	25.2	24	29.83	
18.11.2020	1010.3	26.5	24	34.42	
19.11.2020	1010.3	27.1	24	23.66	
20.11.2020	1010.3	26.9	24	24.54	
21.11.2020	1010.3	25.3	24	26.09	
22.11.2020	1010.3	26.1	24	26.45	
23.11.2020	1010.3	27.8	24	28.50	
Average				26.62	10 ²

Table 4.34: PM₁₀ and PM_{2.5} Measurement Results at Location 3

Location Name	PM ₁₀ -3 (Particulate Matter10-3)		West	696718	
Measurement Location	ADANA BATI Location		North	4096728	
DATE	Ambient Pressure (hPa,mbar)	Temperature (°C)	Sampling Time (Hours)	Standard Concentration (µg/m³)	Limit Value (µg/m³)
25.10.2020	1010.8	27.3	24	32.71	50 ¹ 50 ²
26.10.2020	1010.8	27.9	24	34.77	
27.10.2020	1010.8	27.5	24	33.03	
28.10.2020	1010.8	27.6	24	31.45	
29.10.2020	1010.8	27.8	24	36.35	
30.10.2020	1010.8	27.9	24	35.37	
31.10.2020	1010.8	27.1	24	32.99	
1.11.2020	1010.8	27.5	24	30.44	
2.11.2020	1010.8	27.9	24	32.38	
3.11.2020	1010.8	27.8	24	33.46	
4.11.2020	1010.8	27.6	24	31.65	
5.11.2020	1010.8	27.1	24	33.78	
6.11.2020	1010.8	27.2	24	32.20	
7.11.2020	1010.8	27.7	24	37.43	
8.11.2020	1010.8	27.9	24	36.46	
9.11.2020	1010.8	27.3	24	33.70	
10.11.2020	1010.8	27.6	24	33.24	
11.11.2020	1010.8	27.8	24	38.14	
12.11.2020	1010.8	27.0	24	36.75	
13.11.2020	1010.8	27.9	24	35.27	
14.11.2020	1010.8	28.0	24	36.57	
15.11.2020	1010.8	28.1	24	37.88	
16.11.2020	1010.8	27.6	24	35.83	
17.11.2020	1010.8	27.4	24	34.01	
18.11.2020	1010.8	27.3	24	34.10	
19.11.2020	1010.8	27.9	24	31.08	
20.11.2020	1010.8	27.0	24	34.37	
21.11.2020	1010.8	27.8	24	33.06	
22.11.2020	1010.8	27.6	24	30.25	
23.11.2020	1010.8	27.8	24	34.56	
Average				34.11	40 ¹ 20 ²

Location Name	PM _{2.5} -3 (Particulate Matter2,5-3)		West	696718	
Measurement Location	ADANA BATI Location		North	4096728	
DATE	Ambient Pressure (hPa,mbar)	Temperature (°C)	Sampling Time (Hours)	Standard Concentration (µg/m³)	Limit Value (µg/m³)
25.10.2020	1010.8	27.3	24	27.84	25 ²
26.10.2020	1010.8	27.9	24	24.91	
27.10.2020	1010.8	27.5	24	25.77	
28.10.2020	1010.8	27.6	24	23.98	
29.10.2020	1010.8	27.8	24	26.69	
30.10.2020	1010.8	27.9	24	25.60	
31.10.2020	1010.8	27.1	24	24.14	
1.11.2020	1010.8	27.5	24	32.04	
2.11.2020	1010.8	27.9	24	28.49	
3.11.2020	1010.8	27.8	24	31.47	
4.11.2020	1010.8	27.6	24	28.46	
5.11.2020	1010.8	27.1	24	29.81	
6.11.2020	1010.8	27.2	24	26.54	
7.11.2020	1010.8	27.7	24	30.17	
8.11.2020	1010.8	27.9	24	33.37	
9.11.2020	1010.8	27.3	24	28.93	
10.11.2020	1010.8	27.6	24	33.34	
11.11.2020	1010.8	27.8	24	32.27	
12.11.2020	1010.8	27.0	24	30.09	
13.11.2020	1010.8	27.9	24	29.59	
14.11.2020	1010.8	28.0	24	31.59	
15.11.2020	1010.8	28.1	24	26.72	
16.11.2020	1010.8	27.6	24	29.86	
17.11.2020	1010.8	27.4	24	26.06	
18.11.2020	1010.8	27.3	24	28.24	
19.11.2020	1010.8	27.9	24	24.11	
20.11.2020	1010.8	27.0	24	26.62	
21.11.2020	1010.8	27.8	24	27.29	
22.11.2020	1010.8	27.6	24	21.50	
23.11.2020	1010.8	27.8	24	29.08	
Average				28.15	10 ²

Table 4.35: PM₁₀ and PM_{2.5} Measurement Results at Location 4

Location Name	PM ₁₀ -4 (Particulate Matter10-4)		West	716900	
Measurement Location	ADANA DOĞU Location		North	4095887	
DATE	Ambient Pressure (hPa,mbar)	Temperature (°C)	Sampling Time (Hours)	Standard Concentration (µg/m³)	Limit Value (µg/m³)
25.10.2020	1011.3	28.9	24	28.17	50 ¹ 50 ²
26.10.2020	1011.3	28.4	24	36.20	
27.10.2020	1011.3	28.0	24	27.09	
28.10.2020	1011.3	28.1	24	32.68	
29.10.2020	1011.3	28.7	24	35.74	
30.10.2020	1011.3	28.6	24	33.73	
31.10.2020	1011.3	28.1	24	28.60	
1.11.2020	1011.3	28.9	24	31.77	
2.11.2020	1011.3	28.3	24	35.10	
3.11.2020	1011.3	28.7	24	36.74	
4.11.2020	1011.3	29.0	24	36.58	
5.11.2020	1011.3	28.2	24	34.09	
6.11.2020	1011.3	28.5	24	34.62	
7.11.2020	1011.3	28.8	24	33.46	
8.11.2020	1011.3	28.4	24	30.92	
9.11.2020	1011.3	28.3	24	29.11	
10.11.2020	1011.3	28.9	24	28.37	
11.11.2020	1011.3	28.0	24	33.67	
12.11.2020	1011.3	28.7	24	34.44	
13.11.2020	1011.3	28.9	24	32.37	
14.11.2020	1011.3	28.4	24	31.32	
15.11.2020	1011.3	28.1	24	30.49	
16.11.2020	1011.3	28.6	24	37.53	
17.11.2020	1011.3	28.9	24	34.17	
18.11.2020	1011.3	28.4	24	36.50	
19.11.2020	1011.3	29.0	24	30.98	
20.11.2020	1011.3	28.1	24	34.28	
21.11.2020	1011.3	28.6	24	37.33	
22.11.2020	1011.3	28.4	24	32.31	
23.11.2020	1011.3	28.3	24	30.91	
Average				32.98	40 ¹ 20 ²

Location Name	PM _{2.5} -4 (Particulate Matter2,5-4)		West	716900	
Measurement Location	ADANA DOĞU Location		North	4095887	
DATE	Ambient Pressure (hPa,mbar)	Temperature (°C)	Sampling Time (Hours)	Standard Concentration (µg/m³)	Limit Value (µg/m³)
25.10.2020	1011.3	28.9	24	22.48	25 ²
26.10.2020	1011.3	28.4	24	29.72	
27.10.2020	1011.3	28.0	24	17.63	
28.10.2020	1011.3	28.1	24	27.40	
29.10.2020	1011.3	28.7	24	29.95	
30.10.2020	1011.3	28.6	24	27.75	
31.10.2020	1011.3	28.1	24	22.62	
1.11.2020	1011.3	28.9	24	26.27	
2.11.2020	1011.3	28.3	24	26.12	
3.11.2020	1011.3	28.7	24	28.95	
4.11.2020	1011.3	29.0	24	29.18	
5.11.2020	1011.3	28.2	24	30.70	
6.11.2020	1011.3	28.5	24	29.63	
7.11.2020	1011.3	28.8	24	32.06	
8.11.2020	1011.3	28.4	24	24.34	
9.11.2020	1011.3	28.3	24	23.03	
10.11.2020	1011.3	28.9	24	19.68	
11.11.2020	1011.3	28.0	24	26.89	
12.11.2020	1011.3	28.7	24	28.15	
13.11.2020	1011.3	28.9	24	26.17	
14.11.2020	1011.3	28.4	24	30.12	
15.11.2020	1011.3	28.1	24	31.09	
16.11.2020	1011.3	28.6	24	29.94	
17.11.2020	1011.3	28.9	24	29.17	
18.11.2020	1011.3	28.4	24	28.52	
19.11.2020	1011.3	29.0	24	22.09	
20.11.2020	1011.3	28.1	24	28.00	
21.11.2020	1011.3	28.6	24	29.14	
22.11.2020	1011.3	28.4	24	27.13	
23.11.2020	1011.3	28.3	24	23.03	
Average				26.90	10 ²

Table 4.36: PM₁₀ and PM_{2.5} Measurement Results at Location 5

Location Name	PM ₁₀ -5 (Particulate Matter10-5)		West	728660	
Measurement Location	SULUCA Location		North	4094638	
DATE	Ambient Pressure (hPa,mbar)	Temperature (°C)	Sampling Time (Hours)	Standard Concentration (µg/m³)	Limit Value (µg/m³)
25.10.2020	1011.5	27.2	24	33.37	50 ¹ 50 ²
26.10.2020	1011.5	27.9	24	31.56	
27.10.2020	1011.5	28.0	24	30.87	
28.10.2020	1011.5	27.6	24	32.12	
29.10.2020	1011.5	27.8	24	35.73	
30.10.2020	1011.5	27.4	24	30.81	
31.10.2020	1011.5	27.8	24	26.77	
1.11.2020	1011.5	27.1	24	27.90	
2.11.2020	1011.5	27.9	24	28.07	
3.11.2020	1011.5	27.0	24	24.22	
4.11.2020	1011.5	27.6	24	28.34	
5.11.2020	1011.5	27.3	24	23.45	
6.11.2020	1011.5	27.2	24	20.06	
7.11.2020	1011.5	27.7	24	27.56	
8.11.2020	1011.5	27.1	24	29.98	
9.11.2020	1011.5	27.5	24	24.16	
10.11.2020	1011.5	27.3	24	34.97	
11.11.2020	1011.5	27.9	24	35.24	
12.11.2020	1011.5	27.4	24	31.21	
13.11.2020	1011.5	27.7	24	33.92	
14.11.2020	1011.5	27.9	24	25.49	
15.11.2020	1011.5	27.4	24	28.23	
16.11.2020	1011.5	27.6	24	26.45	
17.11.2020	1011.5	27.3	24	34.48	
18.11.2020	1011.5	27.1	24	34.25	
19.11.2020	1011.5	28.0	24	34.06	
20.11.2020	1011.5	27.9	24	33.35	
21.11.2020	1011.5	27.5	24	33.90	
22.11.2020	1011.5	27.6	24	27.85	
23.11.2020	1011.5	27.0	24	29.78	
Average				29.94	40 ¹ 20 ²

Location Name	PM _{2.5} -5 (Particulate Matter2,5-5)		West	728660	
Measurement Location	SULUCA Location		North	4094638	
DATE	Ambient Pressure (hPa,mbar)	Temperature (°C)	Sampling Time (Hours)	Standard Concentration (µg/m³)	Limit Value (µg/m³)
25.10.2020	1011.5	27.2	24	31.98	25 ²
26.10.2020	1011.5	27.9	24	25.68	
27.10.2020	1011.5	28.0	24	31.57	
28.10.2020	1011.5	27.6	24	28.54	
29.10.2020	1011.5	27.8	24	29.86	
30.10.2020	1011.5	27.4	24	27.03	
31.10.2020	1011.5	27.8	24	25.18	
1.11.2020	1011.5	27.1	24	28.79	
2.11.2020	1011.5	27.9	24	25.58	
3.11.2020	1011.5	27.0	24	21.44	
4.11.2020	1011.5	27.6	24	23.07	
5.11.2020	1011.5	27.3	24	16.49	
6.11.2020	1011.5	27.2	24	14.30	
7.11.2020	1011.5	27.7	24	21.79	
8.11.2020	1011.5	27.1	24	24.82	
9.11.2020	1011.5	27.5	24	22.77	
10.11.2020	1011.5	27.3	24	27.22	
11.11.2020	1011.5	27.9	24	25.68	
12.11.2020	1011.5	27.4	24	28.52	
13.11.2020	1011.5	27.7	24	28.45	
14.11.2020	1011.5	27.9	24	26.18	
15.11.2020	1011.5	27.4	24	26.93	
16.11.2020	1011.5	27.6	24	29.64	
17.11.2020	1011.5	27.3	24	28.22	
18.11.2020	1011.5	27.1	24	27.20	
19.11.2020	1011.5	28.0	24	28.38	
20.11.2020	1011.5	27.9	24	31.86	
21.11.2020	1011.5	27.5	24	24.16	
22.11.2020	1011.5	27.6	24	22.38	
23.11.2020	1011.5	27.0	24	21.74	
Average				25.85	10 ²

Table 4.37: PM₁₀ and PM_{2.5} Measurement Results at Location 6

Location Name	PM ₁₀ -6 (Particulate Matter10-6)		West	741248	
Measurement Location	ÇOKÇAPINAR Location		North	4096955	
DATE	Ambient Pressure (hPa,mbar)	Temperature (°C)	Sampling Time (Hours)	Standard Concentration (µg/m³)	Limit Value (µg/m³)
29.11.2020	1011.5	28.9	24	26.77	50 ¹ 50 ²
30.11.2020	1011.5	29.3	24	30.40	
1.12.2020	1011.5	28.1	24	30.08	
2.12.2020	1011.5	28.6	24	24.55	
3.12.2020	1011.5	28.4	24	26.23	
4.12.2020	1011.5	29.3	24	28.40	
5.12.2020	1011.5	29.9	24	24.85	
6.12.2020	1011.5	28.0	24	28.58	
7.12.2020	1011.5	28.7	24	33.84	
8.12.2020	1011.5	28.6	24	26.04	
9.12.2020	1011.5	29.4	24	24.71	
10.12.2020	1011.5	29.7	24	27.94	
11.12.2020	1011.5	29.3	24	25.20	
12.12.2020	1011.5	28.1	24	25.50	
13.12.2020	1011.5	29.0	24	23.18	
14.12.2020	1011.5	28.6	24	24.95	
15.12.2020	1011.5	28.4	24	33.90	
16.12.2020	1011.5	28.9	24	28.67	
17.12.2020	1011.5	29.1	24	28.09	
18.12.2020	1011.5	29.3	24	27.60	
19.12.2020	1011.5	29.7	24	26.24	
20.12.2020	1011.5	29.5	24	24.12	
21.12.2020	1011.5	28.8	24	23.26	
22.12.2020	1011.5	29.2	24	24.10	
23.12.2020	1011.5	28.1	24	30.38	
24.12.2020	1011.5	29.6	24	24.43	
25.12.2020	1011.5	29.9	24	24.95	
26.12.2020	1011.5	28.5	24	26.73	
27.12.2020	1011.5	29.4	24	27.21	
28.12.2020	1011.5	29.7	24	26.04	
Average				26.90	40 ¹ 20 ²

Location Name	PM _{2.5} -6 (Particulate Matter2,5-6)		West	741248	
Measurement Location	ÇOKÇAPINAR Location		North	4096955	
DATE	Ambient Pressure (hPa,mbar)	Temperature (°C)	Sampling Time (Hours)	Standard Concentration (µg/m³)	Limit Value (µg/m³)
29.11.2020	1011.5	28.9	24	20.88	25 ²
30.11.2020	1011.5	29.3	24	21.50	
1.12.2020	1011.5	28.1	24	22.71	
2.12.2020	1011.5	28.6	24	22.55	
3.12.2020	1011.5	28.4	24	27.02	
4.12.2020	1011.5	29.3	24	20.20	
5.12.2020	1011.5	29.9	24	23.35	
6.12.2020	1011.5	28.0	24	21.31	
7.12.2020	1011.5	28.7	24	27.35	
8.12.2020	1011.5	28.6	24	25.44	
9.12.2020	1011.5	29.4	24	26.81	
10.12.2020	1011.5	29.7	24	23.43	
11.12.2020	1011.5	29.3	24	25.40	
12.12.2020	1011.5	28.1	24	23.51	
13.12.2020	1011.5	29.0	24	27.08	
14.12.2020	1011.5	28.6	24	23.25	
15.12.2020	1011.5	28.4	24	28.22	
16.12.2020	1011.5	28.9	24	23.57	
17.12.2020	1011.5	29.1	24	21.39	
18.12.2020	1011.5	29.3	24	20.20	
19.12.2020	1011.5	29.7	24	17.13	
20.12.2020	1011.5	29.5	24	21.52	
21.12.2020	1011.5	28.8	24	27.76	
22.12.2020	1011.5	29.2	24	24.20	
23.12.2020	1011.5	28.1	24	26.50	
24.12.2020	1011.5	29.6	24	26.43	
25.12.2020	1011.5	29.9	24	25.55	
26.12.2020	1011.5	28.5	24	25.84	
27.12.2020	1011.5	29.4	24	25.71	
28.12.2020	1011.5	29.7	24	26.64	
Average				24.08	10 ²

Table 4.38: PM₁₀ and PM_{2.5} Measurement Results at Location 7

Location Name	PM _{2.5} -7 (Particulate Matter _{2.5} -7)		West	246541	
Measurement Location	TOPRAKKALE Location		North	4105782	
DATE	Ambient Pressure (hPa,mbar)	Temperature (°C)	Sampling Time (Hours)	Standard Concentration (µg/m ³)	Limit Value (µg/m ³)
29.11.2020	1008.2	18.5	24	18.38	25 ²
30.11.2020	1008.2	17.9	24	15.84	
1.12.2020	1008.2	18.9	24	13.08	
2.12.2020	1008.2	19.1	24	16.09	
3.12.2020	1008.2	19.5	24	20.10	
4.12.2020	1008.2	19.7	24	21.28	
5.12.2020	1008.2	18.6	24	23.52	
6.12.2020	1008.2	19.1	24	18.71	
7.12.2020	1008.2	17.9	24	18.35	
8.12.2020	1008.2	18.2	24	17.40	
9.12.2020	1008.2	17.3	24	15.61	
10.12.2020	1008.2	19.8	24	14.48	
11.12.2020	1008.2	20.0	24	11.48	
12.12.2020	1008.2	19.5	24	19.90	
13.12.2020	1008.2	17.2	24	23.89	
14.12.2020	1008.2	18.0	24	21.93	
15.12.2020	1008.2	19.2	24	19.98	
16.12.2020	1008.2	19.1	24	15.32	
17.12.2020	1008.2	17.9	24	22.11	
18.12.2020	1008.2	18.8	24	23.92	
19.12.2020	1008.2	18.0	24	20.19	
20.12.2020	1008.2	17.4	24	23.81	
21.12.2020	1008.2	19.3	24	15.33	
22.12.2020	1008.2	18.6	24	19.36	
23.12.2020	1008.2	17.2	24	16.18	
24.12.2020	1008.2	19.9	24	22.85	
25.12.2020	1008.2	17.0	24	18.96	
26.12.2020	1008.2	18.5	24	19.84	
27.12.2020	1008.2	19.7	24	22.05	
28.12.2020	1008.2	17.6	24	16.98	
Average				18.90	10 ²

Location Name	PM ₁₀ -7 (Particulate Matter ₁₀ -7)		West	246541	
Measurement Location	TOPRAKKALE Location		North	4105782	
DATE	Ambient Pressure (hPa,mbar)	Temperature (°C)	Sampling Time (Hours)	Standard Concentration (µg/m ³)	Limit Value (µg/m ³)
29.11.2020	1008.2	18.5	24	27.87	50 ¹ 50 ²
30.11.2020	1008.2	17.9	24	25.78	
1.12.2020	1008.2	18.9	24	21.80	
2.12.2020	1008.2	19.1	24	25.98	
3.12.2020	1008.2	19.5	24	29.81	
4.12.2020	1008.2	19.7	24	31.28	
5.12.2020	1008.2	18.6	24	33.59	
6.12.2020	1008.2	19.1	24	29.57	
7.12.2020	1008.2	17.9	24	29.35	
8.12.2020	1008.2	18.2	24	26.68	
9.12.2020	1008.2	17.3	24	25.34	
10.12.2020	1008.2	19.8	24	24.10	
11.12.2020	1008.2	20.0	24	21.59	
12.12.2020	1008.2	19.5	24	29.71	
13.12.2020	1008.2	17.2	24	32.75	
14.12.2020	1008.2	18.0	24	31.59	
15.12.2020	1008.2	19.2	24	29.87	
16.12.2020	1008.2	19.1	24	26.57	
17.12.2020	1008.2	17.9	24	31.86	
18.12.2020	1008.2	18.8	24	33.80	
19.12.2020	1008.2	18.0	24	30.14	
20.12.2020	1008.2	17.4	24	32.87	
21.12.2020	1008.2	19.3	24	26.97	
22.12.2020	1008.2	18.6	24	28.75	
23.12.2020	1008.2	17.2	24	26.49	
24.12.2020	1008.2	19.9	24	32.67	
25.12.2020	1008.2	17.0	24	27.15	
26.12.2020	1008.2	18.5	24	29.41	
27.12.2020	1008.2	19.7	24	31.67	
28.12.2020	1008.2	17.6	24	28.17	
Average				28.77	40 ¹ 20 ²

Table 4.39: PM₁₀ and PM_{2.5} Measurement Results at Location 8

Location Name	PM ₁₀ -8 (Particulate Matter10-8)		West	262963	
Measurement Location	TEHÇİ Location		North	4114771	
DATE	Ambient Pressure (hPa,mbar)	Temperature (°C)	Sampling Time (Hours)	Standard Concentration (µg/m³)	Limit Value (µg/m³)
29.11.2020	1018.5	12.6	24	27.87	50 ¹ 50 ²
30.11.2020	1018.5	14.1	24	28.21	
1.12.2020	1018.5	13.8	24	26.48	
2.12.2020	1018.5	14.2	24	26.42	
3.12.2020	1018.5	14.8	24	27.99	
4.12.2020	1018.5	13.1	24	29.14	
5.12.2020	1018.5	12.8	24	29.96	
6.12.2020	1018.5	14.0	24	27.82	
7.12.2020	1018.5	12.5	24	26.64	
8.12.2020	1018.5	13.4	24	28.70	
9.12.2020	1018.5	14.9	24	28.57	
10.12.2020	1018.5	15.2	24	27.84	
11.12.2020	1018.5	13.7	24	29.11	
12.12.2020	1018.5	12.6	24	27.21	
13.12.2020	1018.5	15.4	24	28.62	
14.12.2020	1018.5	14.3	24	29.07	
15.12.2020	1018.5	14.6	24	27.69	
16.12.2020	1018.5	13.8	24	29.59	
17.12.2020	1018.5	14.1	24	28.87	
18.12.2020	1018.5	13.2	24	29.72	
19.12.2020	1018.5	15.0	24	28.20	
20.12.2020	1018.5	13.9	24	29.22	
21.12.2020	1018.5	12.7	24	27.50	
22.12.2020	1018.5	13.8	24	27.42	
23.12.2020	1018.5	13.8	24	28.84	
24.12.2020	1018.5	14.5	24	28.25	
25.12.2020	1018.5	13.9	24	27.05	
26.12.2020	1018.5	14.5	24	27.58	
27.12.2020	1018.5	13.6	24	28.72	
28.12.2020	1018.5	12.9	24	30.15	
Average				28.28	40 ¹ 20 ²

Location Name	PM _{2.5} -8 (Particulate Matter2,5-8)		West	262963	
Measurement Location	TEHÇİ Location		North	4114771	
DATE	Ambient Pressure (hPa,mbar)	Temperature (°C)	Sampling Time (Hours)	Standard Concentration (µg/m³)	Limit Value (µg/m³)
29.11.2020	1018.5	12.6	24	19.24	25 ²
30.11.2020	1018.5	14.1	24	20.47	
1.12.2020	1018.5	13.8	24	20.35	
2.12.2020	1018.5	14.2	24	19.63	
3.12.2020	1018.5	14.8	24	18.91	
4.12.2020	1018.5	13.1	24	18.52	
5.12.2020	1018.5	12.8	24	18.78	
6.12.2020	1018.5	14.0	24	19.24	
7.12.2020	1018.5	12.5	24	18.39	
8.12.2020	1018.5	13.4	24	19.86	
9.12.2020	1018.5	14.9	24	18.26	
10.12.2020	1018.5	15.2	24	19.79	
11.12.2020	1018.5	13.7	24	19.97	
12.12.2020	1018.5	12.6	24	18.58	
13.12.2020	1018.5	15.4	24	19.33	
14.12.2020	1018.5	14.3	24	20.11	
15.12.2020	1018.5	14.6	24	19.66	
16.12.2020	1018.5	13.8	24	18.38	
17.12.2020	1018.5	14.1	24	19.81	
18.12.2020	1018.5	13.2	24	20.41	
19.12.2020	1018.5	15.0	24	19.78	
20.12.2020	1018.5	13.9	24	19.61	
21.12.2020	1018.5	12.7	24	19.06	
22.12.2020	1018.5	13.8	24	20.26	
23.12.2020	1018.5	13.8	24	19.70	
24.12.2020	1018.5	14.5	24	19.18	
25.12.2020	1018.5	13.9	24	19.61	
26.12.2020	1018.5	14.5	24	20.03	
27.12.2020	1018.5	13.6	24	19.30	
28.12.2020	1018.5	12.9	24	19.35	
Average				19.45	10 ²

Table 4.40: PM₁₀ and PM_{2.5} Measurement Results at Location 9

Location Name	PM ₁₀ -9 (Particulate Matter10-9)		West	272655	
Measurement Location	DÜZİÇİ Location		North	4122845	
DATE	Ambient Pressure (hPa,mbar)	Temperature (°C)	Sampling Time (Hours)	Standard Concentration (µg/m³)	Limit Value (µg/m³)
29.11.2020	966.5	13.5	24	26.78	50 ¹ 50 ²
30.11.2020	966.5	12.9	24	28.41	
1.12.2020	966.5	14.0	24	29.12	
2.12.2020	966.5	12.1	24	28.73	
3.12.2020	966.5	12.9	24	30.19	
4.12.2020	966.5	13.1	24	28.03	
5.12.2020	966.5	13.8	24	28.10	
6.12.2020	966.5	13.1	24	27.04	
7.12.2020	966.5	12.4	24	26.58	
8.12.2020	966.5	11.9	24	27.82	
9.12.2020	966.5	11.4	24	26.88	
10.12.2020	966.5	12.3	24	27.46	
11.12.2020	966.5	11.5	24	29.06	
12.12.2020	966.5	12.6	24	27.69	
13.12.2020	966.5	13.4	24	28.86	
14.12.2020	966.5	12.6	24	27.79	
15.12.2020	966.5	13.8	24	27.51	
16.12.2020	966.5	13.2	24	28.34	
17.12.2020	966.5	12.1	24	27.34	
18.12.2020	966.5	12.7	24	28.09	
19.12.2020	966.5	13.4	24	29.06	
20.12.2020	966.5	12.9	24	28.41	
21.12.2020	966.5	13.5	24	28.97	
22.12.2020	966.5	13.0	24	29.61	
23.12.2020	966.5	12.7	24	28.00	
24.12.2020	966.5	13.6	24	27.19	
25.12.2020	966.5	13.2	24	28.74	
26.12.2020	966.5	13.5	24	28.17	
27.12.2020	966.5	12.6	24	29.07	
28.12.2020	966.5	12.1	24	27.54	
Average				28.15	40 ¹ 20 ²

Location Name	PM _{2.5} -9 (Particulate Matter2,5-9)		West	272655	
Measurement Location	DÜZİÇİ Location		North	4122845	
DATE	Ambient Pressure (hPa,mbar)	Temperature (°C)	Sampling Time (Hours)	Standard Concentration (µg/m³)	Limit Value (µg/m³)
29.11.2020	966.5	13.5	24	19.34	25 ²
30.11.2020	966.5	12.9	24	18.61	
1.12.2020	966.5	14.0	24	19.68	
2.12.2020	966.5	12.1	24	20.04	
3.12.2020	966.5	12.9	24	19.20	
4.12.2020	966.5	13.1	24	20.51	
5.12.2020	966.5	13.8	24	19.07	
6.12.2020	966.5	13.1	24	20.31	
7.12.2020	966.5	12.4	24	18.58	
8.12.2020	966.5	11.9	24	19.33	
9.12.2020	966.5	11.4	24	19.99	
10.12.2020	966.5	12.3	24	19.66	
11.12.2020	966.5	11.5	24	20.79	
12.12.2020	966.5	12.6	24	21.26	
13.12.2020	966.5	13.4	24	19.04	
14.12.2020	966.5	12.6	24	19.09	
15.12.2020	966.5	13.8	24	20.26	
16.12.2020	966.5	13.2	24	18.93	
17.12.2020	966.5	12.1	24	19.64	
18.12.2020	966.5	12.7	24	19.78	
19.12.2020	966.5	13.4	24	19.34	
20.12.2020	966.5	12.9	24	20.10	
21.12.2020	966.5	13.5	24	18.95	
22.12.2020	966.5	13.0	24	19.61	
23.12.2020	966.5	12.7	24	20.28	
24.12.2020	966.5	13.6	24	20.54	
25.12.2020	966.5	13.2	24	20.91	
26.12.2020	966.5	13.5	24	19.15	
27.12.2020	966.5	12.6	24	19.38	
28.12.2020	966.5	12.1	24	19.05	
Average				19.68	10 ²

Table 4.41: PM₁₀ and PM_{2.5} Measurement Results at Location 10

Location Name	PM ₁₀ -10 (Particulate Matter10-10)		West	283657	
Measurement Location	BAHÇE Location		North	4118629	
DATE	Ambient Pressure (hPa,mbar)	Temperature (°C)	Sampling Time (Hours)	Standard Concentration (µg/m³)	Limit Value (µg/m³)
29.11.2020	952	17.2	24	27.95	50 ¹ 50 ²
30.11.2020	952	17.5	24	27.27	
1.12.2020	952	17.3	24	28.06	
2.12.2020	952	17.9	24	27.20	
3.12.2020	952	17.0	24	26.40	
4.12.2020	952	17.4	24	26.64	
5.12.2020	952	17.9	24	27.20	
6.12.2020	952	17.6	24	28.09	
7.12.2020	952	17.2	24	27.95	
8.12.2020	952	17.8	24	28.11	
9.12.2020	952	17.5	24	27.88	
10.12.2020	952	17.3	24	28.78	
11.12.2020	952	17.8	24	28.52	
12.12.2020	952	17.7	24	29.43	
13.12.2020	952	17.2	24	29.18	
14.12.2020	952	17.1	24	27.43	
15.12.2020	952	17.6	24	28.60	
16.12.2020	952	17.5	24	28.59	
17.12.2020	952	17.9	24	28.73	
18.12.2020	952	17.4	24	27.66	
19.12.2020	952	17.2	24	27.75	
20.12.2020	952	17.6	24	27.99	
21.12.2020	952	17.8	24	26.58	
22.12.2020	952	17.2	24	27.14	
23.12.2020	952	17.6	24	28.09	
24.12.2020	952	17.4	24	27.15	
25.12.2020	952	17.2	24	28.16	
26.12.2020	952	17.8	24	27.19	
27.12.2020	952	17.4	24	27.97	
28.12.2020	952	17.7	24	26.98	
Average				27.82	40 ¹ 20 ²

Location Name	PM _{2.5} -10 (Particulate Matter2,5-10)		West	283657	
Measurement Location	BAHÇE Location		North	4118629	
DATE	Ambient Pressure (hPa,mbar)	Temperature (°C)	Sampling Time (Hours)	Standard Concentration (µg/m³)	Limit Value (µg/m³)
29.11.2020	952	17.2	24	21.01	25 ²
30.11.2020	952	17.5	24	21.44	
1.12.2020	952	17.3	24	20.72	
2.12.2020	952	17.9	24	20.96	
3.12.2020	952	17.0	24	21.41	
4.12.2020	952	17.4	24	21.54	
5.12.2020	952	17.9	24	19.94	
6.12.2020	952	17.6	24	21.45	
7.12.2020	952	17.2	24	20.81	
8.12.2020	952	17.8	24	20.75	
9.12.2020	952	17.5	24	20.32	
10.12.2020	952	17.3	24	21.53	
11.12.2020	952	17.8	24	21.26	
12.12.2020	952	17.7	24	20.74	
13.12.2020	952	17.2	24	21.22	
14.12.2020	952	17.1	24	22.03	
15.12.2020	952	17.6	24	21.55	
16.12.2020	952	17.5	24	20.42	
17.12.2020	952	17.9	24	20.66	
18.12.2020	952	17.4	24	20.82	
19.12.2020	952	17.2	24	21.93	
20.12.2020	952	17.6	24	22.17	
21.12.2020	952	17.8	24	21.98	
22.12.2020	952	17.2	24	22.34	
23.12.2020	952	17.6	24	21.86	
24.12.2020	952	17.4	24	21.54	
25.12.2020	952	17.2	24	22.14	
26.12.2020	952	17.8	24	21.88	
27.12.2020	952	17.4	24	21.54	
28.12.2020	952	17.7	24	21.15	
Average				21.30	10 ²

PM sampling and calculation was done in accordance with TS EN 12341 standards. By using a PM sampling device. Particles smaller than 10 microns in diameter and 2.5 microns in diameter are kept on filter paper in accordance with TS EN 12341 standard. On the other hand, the sampling device is a pump-controlled, time and volume adjustable device used for dust sampling in an electrically operated environment.

Information about the exceedance of PM₁₀ and PM_{2.5} are given in the table below (see Table 4.42 and Table 4.43).

Table 4.42: Exceeded Number of PM₁₀ and PM_{2.5} in the Daily Base for a Month

Measurement Location	Number of Limit Exceeded	
	PM ₁₀	PM _{2.5}
Adnan Menderes Neighboring	0	16
Atalar Neighboring	0	21
Adana West Zone	0	25
Adana East Zone	0	22
Suluca Neighboring	0	20
Çokçapınar Neighboring	0	14
Toprakkale District	0	0
Tehçi Village	0	0
Düziçi District	0	0
Bahçe District	0	0

Table 4.43: Limit Value Exceedance of PM₁₀ and PM_{2.5} in the Long-term Base

Measurement Location	Limit Value (µg/m³)		Average Value (µg/m³)		Is the Limit Exceeded?	
	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Adnan Menderes Neighboring	20	10	29.94	24.93	Yes	Yes
Atalar Neighboring			30.91	26.62	Yes	Yes
Adana West Zone			34.11	28.15	Yes	Yes
Adana East Zone			32.98	26.90	Yes	Yes
Suluca Neighboring			29.94	25.85	Yes	Yes
Çokçapınar Neighboring			26.90	24.08	Yes	Yes
Toprakkale District			28.77	18.90	Yes	Yes
Tehçi Village			28.28	19.45	Yes	Yes
Düziçi District			28.15	19.68	Yes	Yes
Bahçe District			27.82	21.30	Yes	Yes

4.3.5 Impact Magnitude and Sensitivity Criteria

This section discusses about the impact magnitude by grading the effects of the construction, operation, and decommissioning phases of the Project on air quality in the region. The magnitude and significance of the impact of the project on air quality in the region are shaped by the impact on the receptor. Air quality sensitive receptors have been assessed for their sensitivity, providing a definition of receptor sensitivity and in accordance with relevant applicable legal regulations and standards (see Table 4.44 and Table 4.45).

Table 4.44: Criteria for the Impact Magnitude of Air Quality

Excedance of Project Standards (%)	Criteria
0-25	Negligible
25-50	Low
50-75	Medium
75-100	High

Table 4.45: Sensitivity of Receptor Criteria of Air Quality

Excedance of Project Standards (%)	Criteria
0-20	Negligible
20-40	Low
50-60	Medium
60-80	High
80-100	Very High

In the scope of air quality assessment, only human and ecological receptors were evaluated.

4.3.6 Impact Assessment

In the impact assessment section, the model study, model selection and outputs/results are given and evaluated in detail. In addition, model results are given in Appendix 7 in details.

The methodology is presented in the following subsections. It should be noted that the severity criteria of the adverse impacts include duration, likelihood, extent and reversibility of an impact within the scope of risk assessment and EBRD PR 3.

4.3.6.1 Construction Phase

The following works will be conducted within the scope of construction works of the project;

- Soil Works
 - o Excavation (including poor bearing soil excavations)
 - o Filling
- Soil Improvement
 - o Formation of a Solimix Column
- Engineering Structures
 - o Concrete
 - o Fitting
 - o Prestressing Steel

- o Precast Prestressing Beam
- o Pile
- Road Superstructure
 - o Asphalt Coating Road
 - o Chip Seal
- Superstructure Works
 - o Line Laying
 - o Switch
 - o Line Detachment
 - o Ballast
 - o Sub ballast
 - o Railroad Ballast and Subbase
 - o Surrounding Wall
- Road Infrastructure
- Infrastructure Works
- Electrification
 - o Pole (Concrete, Steel)
 - o Transformator (Power, Voltage)
- Signalization
 - o Main Interlocking + Auxiliary Interlocking Region
 - o Cable Manufacturing (FO, Energy, Signalization)
- Telecommunication

Air pollution caused by the construction period of the Project is predicted not to have a significant impact on sensitive receptors near the project area as the baseline measurements and other emissions from the pollution sources in the provinces already exceed the limit values.

In terms of air pollution arising from the project, all of the impact significances according to The Regulation on Industrial Air Pollution Control and IFC guidelines are found out to be high, and limit value exceedances are detected in baseline PM₁₀, PM_{2.5} and dust concentrations. Since all the impacts (i.e., negligible, minor, moderate, and high) are found out during modeling and the severity of the impact was selected according to the results, calculation, and analysis, it is likely that residual impacts are expected from the project unless there will be some notable change happened in the project area or working circumstance.

4.3.6.2 Operation, Permanent and Long-Term Effects

As the proposed project will not utilize fuel during operation, no pollutants of concern will be emitted. The only emission during the operation phase can be for maintenance purposes (i.e., transportation of the station employees with vehicles and/or transportation of the authorized personnel in case of an emergency/a maintenance situation). The exhaust emissions from vehicles are NO_x and PM₁₀ and their limit values set by Regulation on Control of Industrial Air Pollution is tabulated in Section 4.3.2.1. The number of vehicles had their exhaust measurements are shown in Section 4.3.6.2.4, Table 4.61 and Table 4.65. There are 4, 6, 2 and 4 certified exhaust measurement stations in Adana, Mersin, Osmaniye and Gaziantep provinces, respectively [28]. However, relevant measurement data is available for Adana and Gaziantep provinces only (see Table 4.61 and Table 4.65). The aim of the exhaust gas measurements is that to protect living beings and the environment from the effects of air pollution caused by exhaust gases of motor vehicles navigating in traffic, and to reduce exhaust gas pollutants (see Section 4.3.2.1.). According to the Table 4.61 and Table 4.65, motor vehicle exhausts are periodically maintained, thus no abnormal amount of air pollution is expected near the Project area in the long run [26]

4.3.6.3 Methodology

4.3.6.3.1 Objective of Models and Model Selection

There are many air quality distribution models developed and developed by various institutions/organizations around the world. Factors such as the physical location of the emission sources and receptors, regional conditions, the characteristics of the emissions to be determined, chemical reactions play an important role in the selection of the Air Quality Distribution Model.

Air dispersion models uses mathematical formulas to form the infrastructure of the distribution, probability of impact, and atmospheric phenomenon that affect a particular area. The use of these models may result in uncertainties in some cases. Dispersion models calculate the emissions using the following Information: emission rates, physical properties of emissions, location of sources, sensitive receptor locations, land effects, meteorology, and atmospheric dispersion.

There are two basic models proposed by the Ministry of Environment and Urbanization and US-EPA. Although these are AERMOD and CALPUFF, they have different advantages.

AERMOD (American Meteorological Society (AMS)/EPA Regulatory Model): A steady state plume model that includes atmospheric distribution based on the planetary boundary layer (PBL) turbulence structure and scaling, including the processing of both surface and elevated resources and both simple and complex terrains [31]. US-EPA recommends that the distance between the source and the receiver should be less than 50 km. Model studies up to now has shown that the AERMOD model gives healthy results up to 20 km.

CALPUFF: It is a non-fixed puff dispersion model that simulates the effects of spatiotemporal meteorological conditions on pollution transport, alterations in chemical composition of pollutants, and pollutant removal from the atmosphere. CALPUFF is suitable for long distance transport of pollutants and complex terrains. It does not apply for the simple terrains unlike the AERMOD, which makes AERMOD more functional.

Within the scope of desk studies, AERMOD program was used for air quality dispersion modeling, as it is the proposed one by the Ministry of Environment and Urbanization. This model is a Gauss dispersion model, and it is used for calculation of three-dimensional gas or dust type pollutant dispersion. Through this model, it is possible to model the contaminant dispersions within the area, point, linear or volumetric sources.

It is important to recall that the AERMOD is used for modeling of atmospheric dispersions within the impact area of 50 km in length, on the simple or complex terrains. Within the scope of the project, both complex and simple terrains are present, which makes AERMOD suitable to use.

AERMOD modeling is ran in a user-defined network system and calculations are made for every corner points of every receiving environment units, which is a constituted network. The network used by AERMOD can be defined as polar or cartesian networks and apart of the network system, separate receiver points can be determined, and calculations that are more detailed can be made at these points. Model uses topographical maps to determine the effects of the terrain and surfaces on the dispersion.

4.3.6.3.2 Model Scenario

In the model study, scenarios of PM₁₀ and PM_{2.5} emissions were assessed for constructions phase. There is no emissions expected on operation period of project.

4.3.6.3.3 Model Inputs

Determination of model inputs and incorporation of them into the AERMOD is important for accurate outputs. In this section, each input used in the model is evaluated separately. Since AERMOD is an open-source model and has many options, it can calculate different values for the same receiver point. AERMOD source codes can be re-organized specific to projects and recompiled with a Fortran compiler. Within the scope of this report, AERMOD Model has been run with the following main model options and acceptances (see Table 4.46 and Table 4.47).

Table 4.46: Assumptions

Acceptance
In the model, the surface areas of the emission sources are calculated in 2 dimensions.
The width of the buffer project area from center line has assumed to be 30 m (15m left and 15m right)
Aspect ratio for Linear Field Sources (Path) 1: 100
Assuming that the project transport roads will be irrigated 5 times, the emission calculation of the transportation roads (EPA (2006) Unpaved Roads-Chapter 13.2.2, AP-42, Compilation of Air Pollutant Emission Factors, Volume 1, Stationary Point and Area Sources, USEPA, USA.) Calculated with reference to the document. The calculation steps are given in the figure below.

Table 4.47: AERMOD Model Options

Option	Default	Used
Editor Options	Default Options	Default Options
Output Type	Concentration	Concentration, Total Precipitation
Deposition Options (Wet-Dry Deposition)	-Not selected-	-Not selected-
Topography	Terrain and Flat	and Flat
Adjusted Friction Speed	-Not selected-	-Not selected-
Average Times	Hourly, 24 Hours and Annual (Period)	Hourly, 24 Hours and Annual (Period)

4.3.6.3.4 Emission Sources

The calculations regarding the emissions to be caused by the activity are given in the below section. Each emission activity is not defined as a separate emission source in the AERMOD Model. Emissions that are in the same physical location and operating simultaneously are entered into the model as a single source and by collecting emission values. In the model studies, all emissions from the operation are included and cumulative impacts have been identified. Information on emission sources used in the AERMOD model is given below (see Table 4.48 and Table 4.49)

Table 4.48: Information on Emission Sources from Construction Activities

Emission Source									Emission Duration	
No	Name	AERMOD Source Name	Description	Source Type	Stage	Process	Material Quantity (ton/year)	Material Quantity (ton/hour)	Day of Year	Hour of Day
1	ADNMRSNSOKME	ADANAMERSIN	Stripping the Pasa from the Karatepe Pit Area	Line	Construction	Disassembly	2776355.8	964.0	360	8
2	ADNMRSNYUKLE	ADANAMERSIN	Loading the Pasa from the Karatepe Pit Area	Line	Construction	Loading	2776355.8	964.0	365	8
3	ADNMRSNDOLGU	ADANAMERSIN	Transport of Pasa from Karatepe Pit Area to Pasa Storage Area	Line	Construction	Unloading	705257.6	244.9	365	8
4	HAALANIKAZI	HAVVALANI	Unloading of Pasa from Karatepe Pit Area into Pasa Storage Area	Line	Construction	Disassembly	738720.0	256.5	365	8
5	HAVVALANIYUKLE	HAVVALANI	Storage of Pasa from Two Pit in the Temporary Pasa Storage Area	Line	Construction	Loading	738720.0	256.5	365	8
6	HAVAALANIDOLGU	HAVVALANI	Stripping Pasa from Kestanelik Pit Area	Line	Construction	Unloading	94736.0	32.9	365	8
7	ADNTPRKKAZI	ADNTPRK	Loading the Pasa in the Kestanelik Pit Area to the Trucks	Line	Construction	Disassembly	2576256.0	894.5	365	8
8	ADNTPRKYUKLE	ADNTPRK	Transport of Pasa from Kestanelik Pit Area to Pasa Storage Area	Line	Construction	Loading	2576256.0	894.5	365	8
9	ADNTPRK	ADNTPRK	Unloading the Pasa from the Kestanelik Pit Area to the Pasa Storage Area	Line	Construction	Unloading	2399995.2	833.3	365	8
10	TPRNRDKAZI	TPRNURDAG	Stripping Ore from Karatepe Pit Area	Line	Construction	Disassembly	21373723.2	7421.4	365	8

Emission Source									Emission Duration	
No	Name	AERMOD Source Name	Description	Source Type	Stage	Process	Material Quantity (ton/year)	Material Quantity (ton/hour)	Day of Year	Hour of Day
11	TPRNRDYUKLEME	TPRNURDAG	Loading the Ore in the Karatepe Pit Area to the Trucks	Line	Construction	Loading	21373723.2	7421.4	365	8
12	TPRNRDDOLGU	TPRNURDAG	Transport of Ore Mined from Karatepe Pit Area to Ore Stock Area	Line	Construction	Unloading	15099360.0	5242.8	365	8
13	NRDANTEPKAZI	NRDBSP	Unloading the Ore from the Karatepe Pit Area into the Ore Stock Area	Line	Construction	Disassembly	3827680.0	1329.1	365	8
14	NRDANTEPYUK	NRDBSP	Storage of Ore from Two Pit in the Temporary Ore Storage Area	Line	Construction	Loading	3827680.0	1329.1	365	8
15	NRDANTEPDOLGU	NRDBSP	Stripping Ore from Kestanelik Pit Area	Line	Construction	Unloading	1601600.0	556.1	365	8

It is stated in Annex-2 of the Regulation on Control of Industrial Air Pollution dated 03.07.2009 and numbered 27277: are determined using emission factors for Emission Calculations have been made by using the Emission Factors in "Table 12.6" in the same regulation

Table 4.49: Emission Calculations from Construction Activities

Emission Source			Emission Factor (EF)				Formulation	Controlled Emission Amount (EA)	
Code	Name	AERMOD Source Name	EF Reference	Unit	EF	EF (Un-controlled)	AERMOD Source Name	EF Calculation (kg/hr)	EF Calculation (gr/hr)
1	ADNMRSNSOKME	ADANAMERSIN	SKHKKY EK-12 Tablo 12.6 - Sökme	kg/ton	0.0125	0.025	EF x Amount of material (t/hr)	$0.0125 \times 964.0 = 12.050$	$12.050 / 3.6 = 3.34727$
2	ADNMRSNYUKLE	ADANAMERSIN	SKHKKY EK-12 Tablo 12.6 - Yükleme	kg/ton	0.005	0.01	EF x Amount of material (t/hr)	$0.005 \times 964.0 = 4.820$	$4.820 / 3.6 = 1.33891$
3	ADNMRSNDOLGU	ADANAMERSIN	SKHKKY EK-12 Tablo 12.6 - Boşaltma	kg/ton	0.005	0.01	EF x Amount of material (t/hr)	$0.005 \times 244.9 = 1.224$	$1.224 / 3.6 = 0.34011$
4	HAALANIKAZI	HAVVALANI	SKHKKY EK-12 Tablo 12.6 - Sökme	kg toz/ha day	0.0125	0.025	EF x Amount of material (t/hr)	$0.0125 \times 256.5 = 3.206$	$3.206 / 3.6 = 0.89063$
5	HAVVALANIYUKLE	HAVVALANI	SKHKKY EK-12 Tablo 12.6 - Yükleme	kg/ton	0.005	0.01	EF x Amount of material (t/hr)	$0.005 \times 256.5 = 1.283$	$1.283 / 3.6 = 0.35625$
6	HAVAALANIDOLGU	HAVVALANI	SKHKKY EK-12 Tablo 12.6 - Boşaltma	kg/ton	0.005	0.01	EF x Amount of material (t/hr)	$0.005 \times 32.9 = 0.164$	$0.164 / 3.6 = 0.04569$
7	ADNTPRKKAZI	ADNTPRK	SKHKKY EK-12 Tablo 12.6 - Sökme	kg/ton	0.0125	0.025	EF x Amount of material (t/hr)	$0.0125 \times 894.5 = 11.182$	$11.182 / 3.6 = 3.10602$
8	ADNTPRKYUKLE	ADNTPRK	SKHKKY EK-12 Tablo 12.6 - Yükleme	kg/ton	0.005	0.01	EF x Amount of material (t/hr)	$0.005 \times 894.5 = 4.473$	$4.473 / 3.6 = 1.24241$
9	ADNTPRK	ADNTPRK	SKHKKY EK-12 Tablo 12.6 - Boşaltma	kg/ton	0.005	0.01	EF x Amount of material (t/hr)	$0.005 \times 833.3 = 4.167$	$4.167 / 3.6 = 1.15741$
10	NRDANTEPYUK	TPRNURDAG	SKHKKY EK-12 Tablo 12.6 - Sökme	kg/ton	0.0125	0.025	EF x Amount of material (t/hr)	$0.0125 \times 7,421.4 = 92.768$	$92.768 / 3.6 = 25.76886$

Emission Source			Emission Factor (EF)				Formulation	Controlled Emission Amount (EA)	
Code	Name	AERMOD Source Name	EF Reference	Unit	EF	EF (Un-controlled)	AERMOD Source Name	EF Calculation (kg/hr)	EF Calculation (gr/hr)
11	NRDANTEPDOLGU	TPRNURDAG	SKHKKY EK-12 Tablo 12.6 - Yükleme	kg toz/ha day	0.005	0.01	EF x Amount of material (t/hr)	$0.005 \times 7,421.4 = 37.107$	$37.107 / 3.6 = 10.30754$
12	-	TPRNURDAG	SKHKKY EK-12 Tablo 12.6 - Boşaltma	kg/ton	0.005	0.01	EF x Amount of material (t/hr)	$0.005 \times 5,242.8 = 26.214$	$26.214 / 3.6 = 7.28171$
13	NRDANTEPKAZI	NRDBSP	SKHKKY EK-12 Tablo 12.6 - Sökme	kg/ton	0.0125	0.025	EF x Amount of material (t/hr)	$0.0125 \times 1,329.1 = 16.613$	$16.613 / 3.6 = 4.61478$
14	-	NRDBSP	SKHKKY EK-12 Tablo 12.6 - Yükleme	kg/ton	0.005	0.01	EF x Amount of material (t/hr)	$0.005 \times 1,329.1 = 6.645$	$6.645 / 3.6 = 1.84591$
15	NRDANTEPDOLGU	NRDBSP	SKHKKY EK-12 Tablo 12.6 - Boşaltma	kg/m ³	0.005	0.01	EF x Amount of material (t/hr)	$0.005 \times 556.1 = 2.781$	$2.781 / 3.6 = 0.77238$

4.3.6.3.5 Precipitated Dust Parameters

AERMOD and CALPUFF can model particulate accumulation for a range of user-specified particle sizes, mass fractions, and particle densities. In order for the settled dust to be evaluated, these parameters must be entered and evaluated correctly in the model. Information and parameters related to particulate matter are taken from the “Air Quality Distribution Model Competence Firms Application Guide” published by the Ministry of Environment and Urbanization (see Table 4.50).

Table 4.50: Distributions of PM Granulometry for PM Types

Particle Diameter (Micron)	Mass Fraction	Particle Density (gr/cm ³)
0.35	0.128	1
0.7	0.105	1
1.1	0.104	1
2.0	0.073	1
3.6	0.103	1
5.5	0.105	1
8.1	0.082	1
12.5	0.076	1
15.0	0.224	1

4.3.6.3.6 Change of Emission Generation Rates Over Time from the Sources

The change of emissions over time is an important element in the model study. In order to evaluate the worst-case conditions, it has been assumed that they work at full capacity during working hours. Different time scenarios have been created since the emission sources are active at different times. * Variable emission rate factors are a multiplier of the emission rate determined for Emission Sources. For example:

- A factor of 0 (zero) means that the source is not spread for the specified hour / time.
- A factor of 0.5 means that the source emits 50% of the stated emission rate.
- A factor of 1 means that the source emits 100% of the stated emission rate during the specified hour / time.

[illegible]

Figure 4.3: Change of Emission Generation Rates Over Time During the Year - Emissions from Pit Activities - (360 days a year, 8 hours a day)

4.3.6.3.7 Determination of Impact (Model) Area and Resolution

RIAPC projects impact areas; "The area with a radius of 50 (fifty) times the chimney heights determined according to the principles given in the RIAPC Annex-4 from the center of the emissions is the project impact area. In facilities with an effective height of emissions ($h + h$) less than 30 m from the ground, the project impact area is a square-shaped area with a side length of 2 km. If the surface distribution of non-flue emission sources (area source) is greater than 0.04 km², the facility impact area is a square shaped area with a side length of 2 km, the area being in the middle of the source square. In determining the distribution of emission sources on the surface, the impact area of the project is taken as basis. " defines as.

The area of influence can be increased in order to evaluate the project requirements and sensitive receptors in the environment. Within the scope of this study, the area of influence has been expanded to 10 km in all directions starting from the center railway line.

In order to increase the resolution of the domain and to make a more detailed evaluation, the distance between the examination areas has been taken as 100, 250, 500 and 1,000 meter nested receptors meters.

It may be desirable to estimate concentrations (maxima or a few percentages) in sensitive receptors such as individual residences, residential areas, schools, hospitals, commercial day care and centers, campsites, parks, recreation areas and sensitive ecosystems. AERMOD and CALPUFF are capable of outputting concentrations at designated receptors in addition to a receptor grid, and AERSCREEN is able to extract concentrations at specific distances in addition to the grid designated distances.

The receiving points are introduced in two different ways in the model as grid and sensitive receptors. The grid receivers are evaluated as the Peak Points determined within the scope of RIAPC and their distribution is presented in the map below (see Map 4.3).



Map 4.3: Receptors Distributions and Model Domains

4.3.6.3.8 Meteorological Data

Meteorological data is one of the most important parameters of model study. If there is a meteorology station around the project area, it is recommended to use the station data. In the absence of a meteorological station, the data representing the region should be produced with Meteorological Models. Meteorological data related to the region where the activity is located was provided hourly due to the presence of a station in the region. Meteorological data provided as Excel has been made suitable for use in the AERMOD model by using an internet service that offers "Meteorological Data Conversion Service for Air Quality Modeling Study".

The Meteorology Stations, which are given below table, has been determined as the most suitable meteorology stations in terms of representing the field of activity (see Table 4.51). Meteorological data of the last 10 years and meteorological statistics for many years, which were measured by the Meteorology Stations, were examined. As a result of these evaluations, it was determined that the wind distribution in 2020 was similar to the wind distribution for many years and most up to date, and it was decided to select 2020 in consultation with the Expert of the General Directorate of Meteorology. In this direction, hourly data for 2020 was used in the model study.

Table 4.51: Explanation of Significance Classifications

Station Code	Station Name	Year Of Dataset
173400	Mersin	2020
173520	Adana	2020
173550	Osmaniye	2020
172600	Gaziantep Oğuzeli	2020

In order to determine the high atmospheric conditions, the "Hourly Upper Air Data" data of 17351-Adana Meteorology station, which is the closest high atmosphere (ravinsonde) station to the region, was used.

4.3.6.3.9 Determination of Hourly Meteorological Data Year

The data received from ground level meteorology stations are listed below and entered into the model program in hourly values:

- Hourly Actual Pressure (hPa)
- Hourly Cloud Base Height (m)
- Hourly Cloudiness (8 Okta)
- Hourly Relative Humidity (%)
- Hourly Wind Direction and Speed (m ÷ sec)
- Hourly Temperature (° C)
- Hourly Total Precipitation (mm = kg ÷ m²) OMGI
- Hourly Upper Air Data

Hourly meteorological data were processed with AERMET meteorology preprocessor and compiled as SFC and PFL files suitable for use in AERMOD model. AERMET can cause differences between input values and output values (temperature, wind, pressure, etc.) with its calculations using surface conditions and hourly drilling data. The meteorological data calculated by AERMET in the SFC file.

4.3.6.3.11 Completing Missing Meteorological Data

AERMOD (AERMET) requires a sequential time series meteorological input data per hour. AERMET skips the periods of incomplete meteorological data. If there is more than 10% deficiency in meteorological data, the model loses its healthy working and evaluation conditions. Missing data can be filled with statistical analysis. The filled data should be plotted to assist in the interpretation of the model output and uncertainty regarding the estimated concentrations during the substituted data periods. Within the scope of this study, the rate of missing data does not exceed 10%.

4.3.6.3.12 Slightly Windy or Still (Windless) Weather Conditions

It is important to check hourly data to understand what the lowest recorded wind speed (low wind speed cutoff) and the frequency of the inhabitants. AERMOD does not make calculations at wind speeds below 0.28 m / s. Because the highest 24-hour average concentrations are common in light wind conditions, the highest 24-hour averages may be completely overlooked because of the calm winds. This issue was taken into consideration when evaluating model studies.

4.3.7 Model Results

The emission distributions obtained because of the air quality distribution model study are presented in the maps, details Appendix 7. In addition, Peak Point Results on impact area is given below table (see Table 4.52).

Table 4.52: Explanation of Significance Classifications

Model Domain Code	Parameter	Averaging Period	Rank	Result	Units	X (m) (UTM WGS84)	Y (m) (UTM WGS84)	UTM Zone	Peak Date, start Hour
1	PM ₁₀	24-hr	1st	15.38	ug/m ³	668381.47	4089362.55	36	31.12.2020, 24
1	PM ₁₀	Annual	-	1.54	ug/m ³	648961.18	4076910.93	36	
1	PM _{2.5}	24-hr	1st	2.31	ug/m ³	668381.47	4089362.55	36	31.12.2020, 24
1	PM _{2.5}	Annual	-	0.23	ug/m ³	648961.18	4076910.93	36	
2	PM ₁₀	24-hr	1st	7.99	ug/m ³	735990.35	4095120.21	36	18.09.2020, 24
2	PM ₁₀	Annual	-	2.28	ug/m ³	735990.35	4095120.21	36	
2	PM _{2.5}	24-hr	1st	1.20	ug/m ³	735990.35	4095120.21	36	18.09.2020, 24
2	PM _{2.5}	Annual	-	0.34	ug/m ³	735990.35	4095120.21	36	
3	PM ₁₀	24-hr	1st	245.28	ug/m ³	780304.91	4106239.83	36	22.12.2020, 24
3	PM ₁₀	24-hr	36th	6.13	ug/m ³	784617.81	4106751.64	36	15.02.2020, 24
3	PM ₁₀	Annual	-	7.08	ug/m ³	784383.12	4106667.27	36	
3	PM ₁₀	24	-	8	COUNT	783393.88	4106518.58	36	
3	PM _{2.5}	24-hr	1st	36.80	ug/m ³	780304.91	4106239.83	36	22.12.2020, 24
3	PM _{2.5}	24-hr	36th	0.92	ug/m ³	784617.81	4106751.64	36	15.02.2020, 24
3	PM _{2.5}	Annual	-	1.07	ug/m ³	784383.12	4106667.27	36	15.02.2020, 24
4	PM ₁₀	24-hr	1st	164.85	ug/m ³	287267.35	4118376.64	37	11.12.2020, 24
4	PM ₁₀	24-hr	36th	15.82	ug/m ³	254703.01	4107503.57	37	12.10.2020, 24
4	PM ₁₀	Annual	-	19.29	ug/m ³	254703.01	4107503.57	37	
4	PM ₁₀	24-hr	1st	164.85	ug/m ³	287267.35	4118376.64	37	11.12.2020, 24
4	PM ₁₀	24	-	9	COUNT	266717.91	4123911.45	37	

Model Domain Code	Parameter	Averaging Period	Rank	Result	Units	X (m) (UTM WGS84)	Y (m) (UTM WGS84)	UTM Zone	Peak Date, start Hour
4	PM _{2.5}	24-hr	1st	22.41	ug/m ³	266966.37	4123939.81	37	7.12.2020, 24
4	PM _{2.5}	24-hr	36th	2.43	ug/m ³	254703.01	4107503.57	37	24.01.2020, 24
4	PM _{2.5}	Annual	-	2.92	ug/m ³	254703.01	4107503.57	37	
5	PM ₁₀	24-hr	1st	34.99488	ug/m ³	343761.73	4115595.68	37	22.02.2020, 24
5	PM ₁₀	24-hr	36th	7.76389	ug/m ³	343761.73	4115595.68	37	25.11.2020, 24
5	PM ₁₀	Annual	-	7.04099	ug/m ³	343517.58	4115649.29	37	
5	PM _{2.5}	24-hr	1st	5.24938	ug/m ³	343761.73	4115595.68	37	22.02.2020, 24
5	PM _{2.5}	24-hr	36th	1.16462	ug/m ³	343761.73	4115595.68	37	25.11.2020, 24
5	PM _{2.5}	Annual	-	1.05618	ug/m ³	343517.58	4115649.29	37	

4.3.8 Cumulative Impact Assessment

There are many industrial facilities around the project area, which should be evaluated as a stationary point source. In addition, effects of emissions stemming from the facility on the cumulative load must be evaluated since there are settlement units nearby. The emissions stemming from the other sources are called background measurements. As a rule of thumb, background field measurements form the basis of cumulative impact assessment studies for a better comprehension of project's overall impact to the communities.

Information on provinces that comprise borders of the planned project railway is given in the following sections. Information consists of the number and type activities going on in the region, meteorological conditions, and geographical information is given in the following sections. Pertaining data is retrieved from the Ministry of Environment and Urbanization, Provincial Environmental Status Reports 2019 for Adana, Osmaniye and Gaziantep provinces and 2018 for Mersin, because the 2019 report for Mersin province is not available in the official website [20].

Results pertaining to such measurements have been used for calculation of Total Contribution Value (TCV) and the contribution of the project has been determined in addition to cumulative emission load of the region.

It is important to note that there is also an existing highway near the project area, which is likely to affect air quality (GHGs and air pollutants) during vehicle passage due to the fuel consumption. For detailed information, see Section 4.6.

The annual recordings of PM₁₀ and PM_{2.5} are also given in each section for each province. Data is retrieved from Ministry of Environment and Urbanization Continuous Monitoring Center Data Bank between selected dates of 01.01.2020-01.01.2021. PM_{2.5} records are very few in stations throughout Turkey. For project provinces, PM_{2.5} recording was only done for Adana in Adana-Çatalan Measurement Station, even though some of the data is missing until the date 10.10.2020. For Mersin Province, 2019 and 2020 data were missing; therefore, 2018 data is used to access the PM₁₀ record. For the settled dust parameter, it was not measured in any station. Straight lines in graphs shows that no measurement data is available for that date (see Table 4.62 and Table 4.66).

4.3.8.1.1 Mersin

Mersin province is located over the Çukurova territory, surrounded by Taurus Mountains from its north and west. Because it is a port city due to Mersin, Silifke, Taşucu Ports (third greatest port of Turkey) and Mersin Free Trade Zone, it has gained an economic significance. The dominant sectors in the province are industry due to ports, agriculture, and trade. Furthermore, Mersin province is partially dry, warm in wintertime, hot in summertime and under the influence of sea breeze [19].

To conduct a cumulative air quality impact assessment, number of facilities and their stacks, the types and amounts fuels used in residences and industry are provided in the tables below, respectively (see Table 4.53 to Table 4.57).

Table 4.53: Continuous Emission Measurement Systems in Mersin Province as of 2018

Sector	Number of Facilities	Number of Stacks
Wood-Working Facilities	0	0
Acid Production Facilities	0	0
Waste Recovery and Disposal Facilities	0	0
Glass Production Industries	2	5
Cement	2	5
Iron-Steel and Metallurgical Industry	0	0
Natural Gas and Coal Power Plants	1	1
Food Industries	0	0
Paper Industry	0	0
Fertilizer Industry	1	3
Chemical Industries	1	1
Lime Plants	0	0
Tire Production Facilities	0	0
Automotive	0	0
Petroleum and Petrochemical Industry	0	0
Sugar Industry	0	0
Textile Industry	0	0
Sum	7	15

Table 4.54: The Type of Solid Fuels Used in Domestic Heating in Mersin in 2018, With Their Characteristics and Their Supply Locations

Type of Fuel (*)	Supply Place	Consumption Amount (ton)	Low Heating Value (kcal/kg)	Fuel Properties			
				Volatile Matter (%)	Total Sulfur (%)	Total Humidity (%)	Ash (%)
Imported Coal	Russia, Africa	53,500	6,668	24.01	0.39	9.45	12.85
Domestic Coal (Social Foundation)	TKİ	35,807	5,905	-	1.84	13.39	11.52

(*) Such as domestic coal, imported coal, briquette, biomass, Social Aid Foundation coal, wood.

Table 4.55: The Type of Solid Fuels Used in Industry in Mersin Province in 2018, With Their Characteristics and Their Supply Locations

Type of Fuel (*)	Supply Place	Consumption Amount (ton)	Low Heating Value (kcal/kg)	Fuel Properties			
				Volatile Matter (%)	Total Sulfur (%)	Total Humidity (%)	Ash (%)
Non-calcinated petrocoke	ABD	332,569.183	8,202	-	5.43	-	-
Anthracite	Russia, Ukraine	13,946.926	-	3.45	-	96.55	-
Other Bitumunous Pit Coal	Russia, ABD	458,128.840	6,697	13.04	0.6	4.67	17.36

Table 4.56: The Amount of Natural Gas Used in Mersin Province in 2018

Use Location of Fuel	Consumption Amount (m ³)	Heating Value (kcal/kg)
Residence	56	L = 7.89 – 11.86 Kw/Nm ³ H = 6800 – 10200 kcal/Nm ³
Industry	706	L = 7.89 – 11.86 Kw/Nm ³ H = 6800 – 10200 kcal/Nm ³

Table 4.57: The Amount of Fuel-Oil Used in Mersin Province in 2018

Use Location of Fuel	Consumption Amount (m ³)	Heating Value (kcal/kg)	Total Sulfur (%)
Residence + Industry	644,240	9200-10300	-

According to the situation in tables, cumulative air pollution impact from Mersin province is expected on the project that can increase the concentrations our pollutants of concern (PM₁₀, PM_{2.5} and dust) as many industrial activities, industrial and residential fuel consumption goes on as well as the intensive port trade.

Looking at the results, it is likely that agricultural activities can particularly contribute PM_{2.5} formation, industrial activities can particularly contribute PM₁₀ formation and the construction activities within the Mersin provincial borders can contribute dust formation apart from the information given above.

The 01.01.2019-01.01.2020 PM₁₀ annual records are given in the graph below, as the 2020 data has not been published (see Figure 4.4). The 24 hours maximum, minimum values and annual average values are summarized in the summary table below (see Table 4.58).

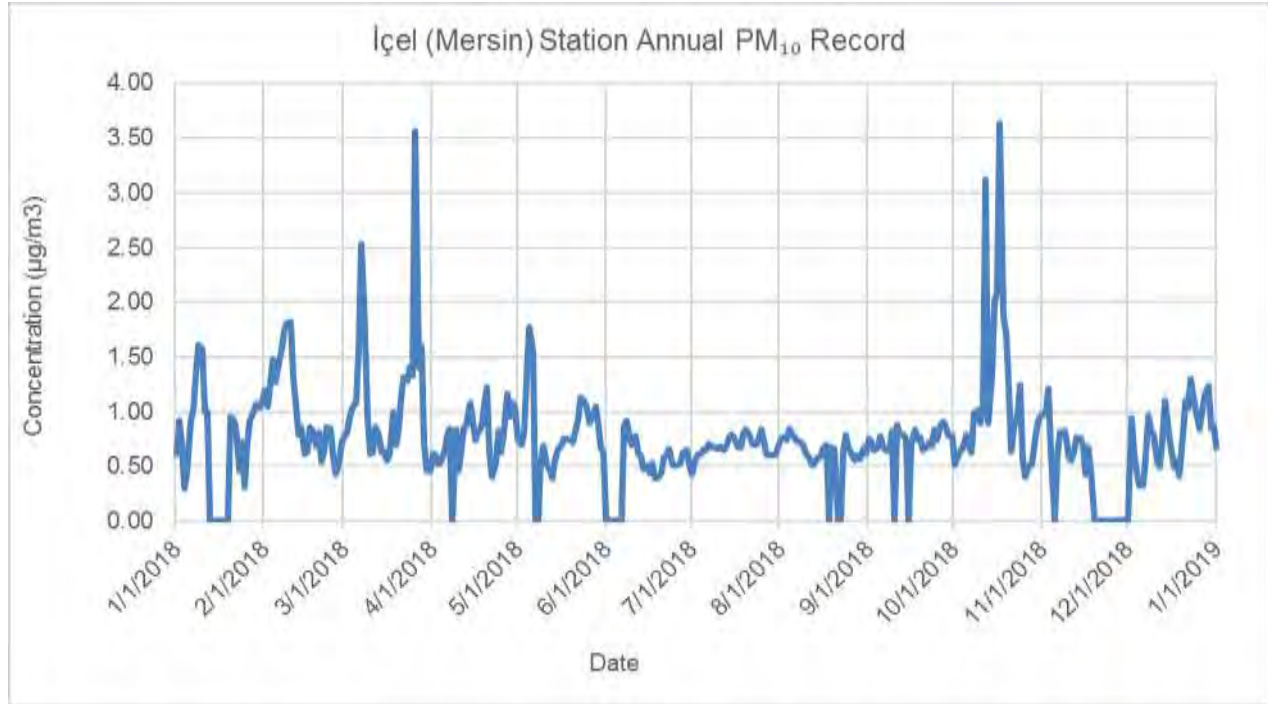


Figure 4.4: Mersin Province Annual PM₁₀ Record

Table 4.58: Mersin Province PM Measurements Summary Table

Parameter	PM ₁₀ (µg/m³)	PM _{2.5} (µg/m³)
24 Hours Minimum	29.72	-
24 Hours Maximum	363.26	-
Annual Average	84.05	-
The Month with the Highest Monthly Average Concentration	October	-
The Date with the Highest Concentration	17.10.2018	-
Number of Data	331	0
Number of Data Required	365	365

4.3.8.1.2 Adana

Adana is located at southern part of Turkey. Agricultural fields are dominant in the city and there are many industrial districts. To conduct a cumulative air quality impact assessment, number of facilities and their stacks, the types and amounts fuels used, and number of vehicles registered for traffic and had their exhaust measurements are provided in the tables below, respectively (see Table 4.59, Table 4.60 and Table 4.61)[17]

Table 4.59: Continuous Emission Measurement Systems in Adana Province as of 2019

Sector	Number of Facilities	Number of Stacks
Wood-Working Facilities	1	1
Acid Production Facilities	0	0
Waste Recovery and Disposal Facilities	0	0
Glass Production Industries	0	0
Cement	2	4
Iron-Steel and Metallurgical Industry	0	0
Natural Gas and Coal Power Plants	2	5
Food Industries	2	2
Paper Industry	0	0
Fertilizer Industry	0	0
Chemical Industries	1	5
Lime Plants	3	10
Tire Production Facilities	0	0
Automotive	0	0
Petroleum and Petrochemical Industry	0	0
Sugar Industry	0	0
Textile Industry	0	0
Sum	11	27

Table 4.60: Fuel Types and Amounts Used in Adana in 2019

	Solid Fuel			Natural Gas		Fuel Oil	
	Place of Use	Type	Consumption Amount (tons)	Place of Use	Consumption Amount (sm ³)	Place of Use	Consumption Amount (kg)
Industry	-	Domestic Coal	256,181	-	-	-	-
	-	Imported Coal	91,960	-	-	-	-
	-	Petroleum Coke	204,053	-	-	-	-
	-	Biomass	88,258	-	-	-	-
	Consumption Amount (tons)			Consumption Amount (sm³)		Consumption Amount (m³)	
Residence	213,062.34			96,510,537			

Distribution of fuels used in residences by type:

Domestic Coal: 36,702 tons/year

Imported coal: 39,874.28 tons/year

Briquette Coal: 36,486.06 tons/year

Wood: 100,000 tons/year

Table 4.61: The Number of Vehicles in Adana Province in 2019 and the Number of Vehicles Had Their Exhaust Measurements

Automobile	Minibus	Bus	Pick-up Truck	Truck	Other	Sum
135,044	7,946	3,219	75,735	7,333	5,515	234,792

According to the situation in tables, cumulative air pollution impact from Adana province is expected on the project that can increase the concentrations our pollutants of concern (PM_{10} , $PM_{2.5}$ and dust) as many industrial activities, industrial and residential fuel consumption goes on.

Looking at the results, it is likely that agricultural activities-which constitutes exceptionally high percent of the city economy-can particularly, contribute $PM_{2.5}$ formation, industrial activities can particularly contribute PM_{10} formation and the construction activities within the Adana provincial borders can contribute dust formation apart from the Information given above.

The 01.01.2020-01.01.2021 PM_{10} and $PM_{2.5}$ annual records are given in the graph below (see Figure 4.5). The 24 hours maximum, minimum values and annual average values are summarized in the summary table below (see Table 4.62).

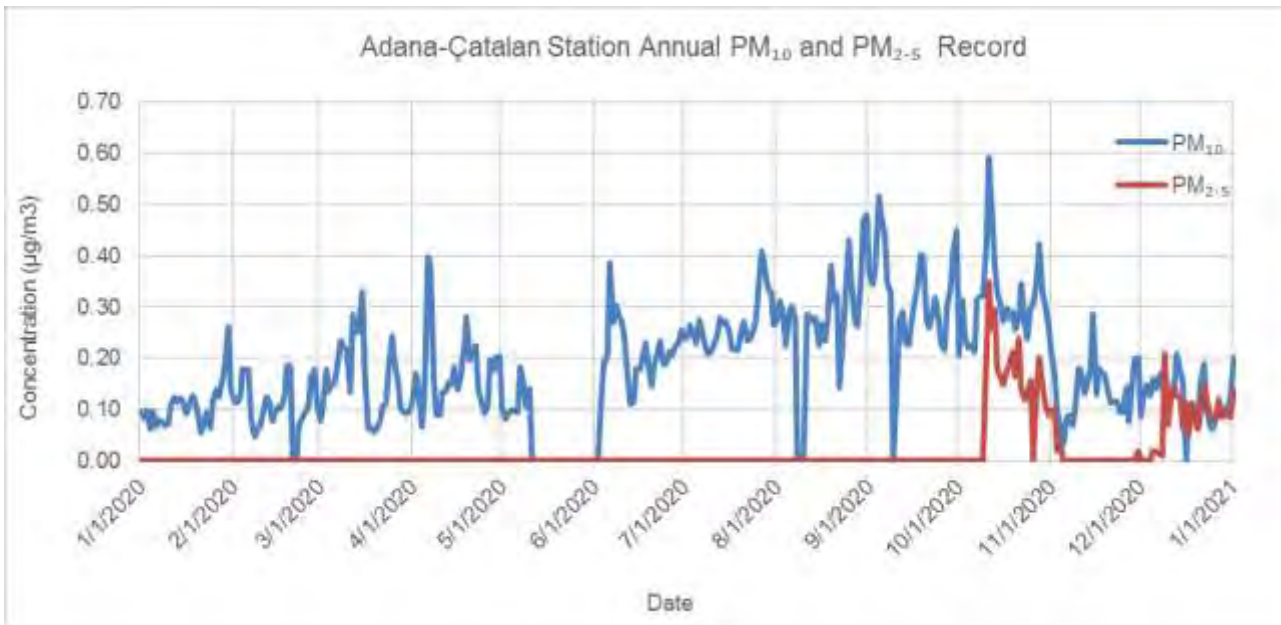


Figure 4.5: Adana Province Annual PM_{10} and $PM_{2.5}$ Record

Table 4.62: Adana Province PM Measurements Summary Table

Parameter	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)
24 Hours Minimum	3.15	1.08
24 Hours Maximum	59.18	34.85
Annual Average	19.96	12.33
The Month with the Highest Monthly Average Concentration	September	October

Parameter	PM ₁₀ (µg/m³)	PM _{2.5} (µg/m³)
The Date with the Highest Concentration	11.10.2020	11.10.2020
Number of Data	337	54
Number of Data Required	366	366

4.3.8.1.3 Osmaniye

Osmaniye province is located at the end of Çukurova territory, surrounded by Middle Taurus Mountains from west towards north and surrounded by Amanos Mountains at its eastern and southeastern part. The dominant activities in the province are agriculture and husbandry. Industrial activities are rare; there are few organized industrial zones (OSBs), and they are continuously developing and increasing in capacity [21].

In general, Osmaniye has a climate, which summers are hot and dry, winters are warm and rainy.

To conduct a cumulative air quality impact assessment, there is no information of facilities with stacked are found. No Information is available on types of fuel consumed and transportation pattern in the Ministry of Environment and Urbanization database.

There is no continuous emission measurement system in Osmaniye Province as of 2019.

According to the situation, no significant cumulative air pollution impact from Osmaniye is expected on the project, as the city has no industrial activity t that can increase the concentrations of our pollutants of concern (PM₁₀, PM_{2.5} and dust).

Looking at the results, it is likely that agricultural activities can particularly contribute PM_{2.5} formation, industrial activities can particularly contribute PM₁₀ formation and only the construction activities within the Osmaniye provincial borders can contribute dust formation.

The PM₁₀ annual records are given in the graph below (see Figure 4.6). The 24 hours maximum, minimum values and annual average values are summarized in the summary table below (see Table 4.63).

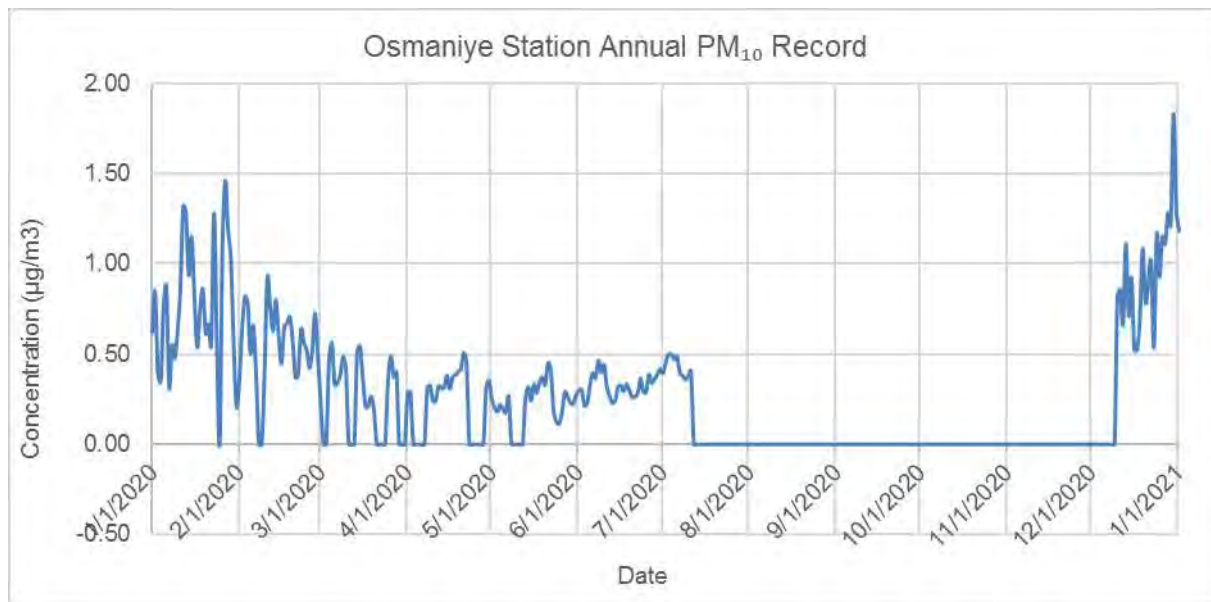


Figure 4.6: Osmaniye Province Annual PM₁₀ Record

Table 4.63: Osmaniye Province PM Measurements Summary Table

Parameter	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)
24 Hours Minimum	11.46	-
24 Hours Maximum	183.39	-
Annual Average	52.31	-
The Month with the Highest Monthly Average Concentration	December (96.14)	-
The Date with the Highest Concentration	30.12.2020	-
Number of Data	185	0
Number of Data Required	366	366

4.3.8.1.4 Gaziantep

Gaziantep province is located at the Southeastern Anatolia and eastern part of the Mediterranean, separated by the Amanos Mountains in Osmaniye at its west and Fırat River in Şanlıurfa. There are no natural forests near the province but artificial (human-made) forests.

Due to its location, Gaziantep has a climate both shows Mediterranean and continental climate properties. Temperature differences between day and night are remarkably high in Gaziantep due to the continental climate and the dominant activities in the province are agriculture, husbandry, industry, and trade. The transportation opportunities and proximity to ports makes Gaziantep a quite rich city.

Gaziantep is a city where all products of the Eastern and Southeastern Anatolia region are processed; it is the industrial and commercial center of the Southeastern Anatolia Region. The city ranks 5th in industry and trade nationwide and possesses Turkey's largest industrial sites [18].

To conduct a cumulative air quality impact assessment, the types and amounts of fuels used and vehicles had their exhaust emissions in the city are provided in the tables below, respectively (see Table 4.64).

Table 4.64: Fuel Types and Amounts Used in Gaziantep in 2019

	Solid Fuel			Natural Gas		Fuel Oil	
	Place of Use	Type	Consumption Amount (tons)	Place of Use	Consumption Amount (sm ³)	Place of Use	Consumption Amount (kg)
Industry	-	Imported Coal	43,831	-	274,479,660	-	-
	-	Imported Coal	126,608	-	-	-	-
	-	Domestic Lignite	105,000	-	-	-	-
	Consumption Amount (tons)			Consumption Amount (sm ³)		Consumption Amount (m ³)	
Residence	375,545.73			361,803,442		-	

Table 4.65: The Number of Vehicles in Gaziantep Province in 2019 and the Number of Vehicles Had Their Exhaust Measurements

Number of Companies That Organized Exhaust Gas Emission Measurement Authorization Certificate	Total Number of Vehicles in the City	The Number of Vehicles Had Their Exhaust Measurements
33	58415	186428

According to the situation in tables, a notable cumulative air pollution impact from Gaziantep province is expected on the project that can increase the concentrations our pollutants of concern (PM₁₀, PM_{2.5} and dust) as intensive industrial activities from the industrial zones, industrial and residential fuel consumption goes on.

Looking at the results, it is likely that agricultural activities can particularly contribute PM_{2.5} formation; industrial activities and construction activities for the project can particularly contribute PM₁₀ and dust formation respectively. Apart from the information given above.

The PM₁₀ annual records are given in the graph below (see Figure 4.7). The 24 hours maximum, minimum values and annual average values are summarized in the summary table below (see Table 4.66).

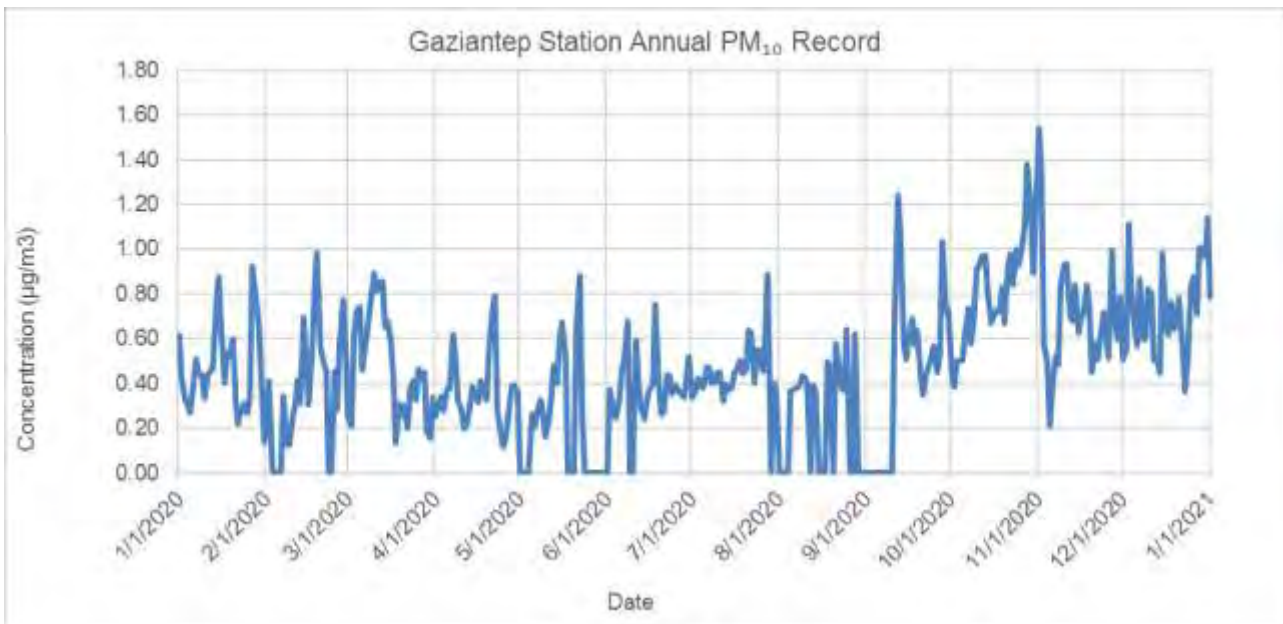


Figure 4.7: Gaziantep Province Annual PM₁₀ Record

Table 4.66: Gaziantep Province PM Measurements Summary Table

Parameter	PM ₁₀ (µg/m³)	PM _{2.5} (µg/m³)
24 Hours Minimum	11.65	-
24 Hours Maximum	153.78	-
Annual Average	54.08	-
The Month with the Highest Monthly Average Concentration	October	-

Parameter	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)
The Date with the Highest Concentration	1.11.2020	-
Number of Data	318	0
Number of Data Required	366	366

4.3.8.1.5 Results

Looking at the records, some PM₁₀ data is missing due to the lack of some station measurements. Straight lines in figures means that no published data on PM_{2.5} for the measurement stations. In summary and looking at the results in the tables (see Table 4.58, Table 4.62, Table 4.63 and Table 4.66, these results stipulates that a cumulative air quality impact assessment study is required as the exceedances occurred throughout a year, particularly for industry-intensive provinces: Mersin and Gaziantep. Although the construction phase emissions and their impacts are not persistent and operation phase emissions are not significant, it is inevitable that Project emissions will contribute to air quality of the vicinity, even the extent is small, due to the baseline/background measurement results. Maximum concentrations were observed mostly in October and some peaks were observed in spring season (March). For a detailed explanation and relevant data set, see Section 4.3.6.3.4.

The resultant concentrations can be attributed to the natural dust transport events from Great Sahara Desert, which is the greatest dust transporting desert towards Turkey. Section 4.3.11 explains this phenomenon in detail.

4.3.9 Summary of Residual Impacts, Significance Criteria and Overall Impact Significance

As shown in the table of Values of Contribution to Air Pollution and Total Pollution Values, background emissions exceed the "Targeted Limit Values" at some points. However, it is below national limit values as of the year 2018 for Mersin and 2019 for Adana, Osmaniye and Gaziantep when the measurements have been made and the report has been drawn up. In addition, the contribution of the project to existing air quality for PM₁₀ and PM_{2.5} parameters is mostly below 1 µg/m³.

An "Air Quality Management Plan" should be prepared for the operation stage within scope of the project, and, at the stage of operation, parameters such as NO₂, PM₁₀, PM_{2.5} must be monitored in the project area of influence according to the Regulation on Industrial Air Pollution Control and IFC criteria, due to the staff transportation to the stations through vehicles. Although the monitoring period is frequent for the first year, it can be rearranged according to the measurement results.

The project, which is planned for sustainable development according to the IFC General EHS Guidelines guide, is not intended to bring more than 25% additional burden on regional air quality within the same Airshed (which is an airshed boundary that can be determined by some variables in which geographic conditions are involved in determining air quality standards/limits). The project is not expected to have a negative impact on the existing ambient air quality since the project's VCAP is below 1% and incredibly low.

4.3.10 Mitigation Measures

Mitigation measures are required for items, which are expected to cause impact on the environment. All activities will be carried out in a controlled manner to prevent dust formation within the scope of the planned activity. By implementation of the mitigation measures below, Mersin-Gaziantep HST will be able to become an environmentally friendly type of transportation. Mitigation measures at construction stage are proposed below. In addition, the following measures can be applied if the activity continues.

- Place windbreaks on the land, build a wall or planting windproof trees,
- It is emptied and filled without t spinning,
- The material is covered with nylon canvas or equipment with a grain size of more than 10 mm,

- Top layers are preserved at 10% humidity. The necessary hardware is installed to ensure this situation,
- Unused surfaces of storage areas should be made compact to bring the particle size to a smaller diameter,
- Wind turbulence should be prevented by decreasing the slope on the windward side of the storage areas,
- Moisture content of the stored material should be increased with the help of irrigation,
- In cases where irrigation only is not sufficient, emissions should be reduced by applying equivalent binders and non-toxic chemicals,
- Wind turbulence should be prevented by loading/unloading operations in the downwind part of the material,
- If necessary, by applying barriers and wind curtains, dust formation can be prevented due to wind erosion,
- To prevent dust formation during transportation, stabilized roads will be irrigated in periods with the sprinkler to be found in the project,
- The acceleration and deceleration of the vehicles in the field will be limited and lowered as much as possible to prevent dust emissions and dust peaks.

In contrast, no exceedance is observed in settled dust measurements. Therefore, the above-mentioned mitigation measures are not considered obligatory for the Project.

It is also known that PM_{2.5} emissions in the region can simply be reduced by reducing of smoke and vehicle emissions, thus lowering the vehicle intensity and avoiding excessive burning during agricultural activities.

Reduction of PM₁₀ emissions is possible with the similar manner; by reducing the vehicle intensity and smoke and supplying pollution abatement equipment with high removal efficiencies for facilities (e.g., coal power plants).

As the train will possess electrically powered locomotives, general mitigation measures for the operational lifetime of the project can alone be the use of “regenerative braking systems” to recycle energy for use by other locomotives [10].

The mitigation measures planned to be implemented within the scope of the project are given in the ESMP prepared for the project.

4.3.11 Assumptions and/or Limitations

Air quality analysis was made using the and most appropriate standards and the emission measurement locations have been selected according to the standards approved by the Ministry, with technically flawless and allowing the necessary connections for measurement by the laboratory. Air quality impacts resulting from construction and operation phases of the Project has been analyzed based on the most used international standards and/or national standards due to its strictness. The most widely used document is IFC, which is a subsidiary of WB.

Air quality impacts herein were identified and interpreted for each measurement location within the development area qualitatively and quantitatively. The evaluation work is based on the AERMOD model and real-time field measurements by the contacted laboratory. The air quality modelling results were interpreted based on the combination of both incoming information and model/desk studies. The studies were conducted using the most modern engineering studies in line with the information and documents provided by Rönesans.

Based on the results, it is likely that the presence of industrial facilities in the vicinity and in the impact area of the railway site-that are spread around each of the 4 provinces: Mersin, Adana, Osmaniye and Gaziantep-caused an increase in the PM₁₀ emissions. The exceedances of the PM_{2.5} emissions is mostly due to the agricultural activities and natural factors such as Saharan dusts coming from southwestern part/Great Sahara

Desert of the Turkey by winds and circulated in Turkey's atmosphere, triggering the $PM_{2.5}$ emissions. Particulate matter concentration is deemed as directly proportional to the amount of Saharan Dust storm events, thus the mortality.

Saharan Dusts are circulated over the atmosphere due to the mid-latitude cyclones, winds, and North Atlantic Oscillation. They can either diffuse through the atmosphere or settle down depending on the particle size [25].

In addition to this Information, there is a notable difference in Mersin province PM_{10} concentrations, which is approximately 8-fold of the 24 hours limit value ($50 \mu g/m^3$) stated in the national and international legislation, reaching up to $400 \mu g/m^3$ on the date specified in Table 4.58. In addition, an exceedingly high peak value ($356.55 \mu g/m^3$) in March was also observed, which could be attributed to the high humidity.

PM_{10} pollution is generally encountered and raises to exceptionally high levels especially in low air temperatures, low vertical mixture of pollutants and intensive domestic heating period. High PM_{10} values are encountered also in spring season. Saharan dust transport is also one of the causes of PM peaks.

The maximum PM_{10} observation dates correspond to autumn and winter season for the measurement results. When the dust transport from the Sahara Desert is expected to propel more over the Turkey and can be assumed to trigger PM_{10} emissions when crosses paths with the high air pressure and high wind speed in autumn. The literature studies have so far exhibited that in transition periods (i.e., September, October, November and March, April, May) [7], Saharan Dusts increase their effects over Turkey. When PM_{10} increases, $PM_{2.5}$ always increases, results also prove this hypothesis. In Eastern Mediterranean Region-which is the region that the Project takes place-effect of dusts generally soar, resulting in higher PM concentration and loss of visibility. The explanatory column graph is given below (see Figure 4.8). It should be noted that the graph is independent from the development, just to give an idea.

For the Project, it should be recalled that the baseline measurement results show that the highest concentrations for PM of each size were observed in September, October, and December for all provinces as well as the peak concentrations in March, as mentioned in the above paragraphs.

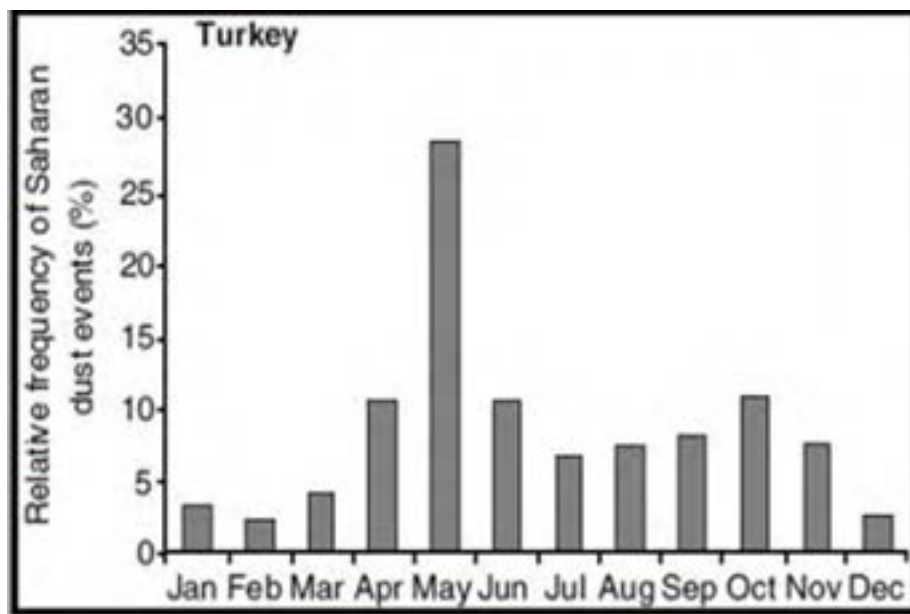


Figure 4.8: Monthly Percent Distribution Graph of Sahara Desert Originated Dust Transport to Turkey [24]

4.4 Visual

This section is about potential visual impacts originating from the Project during operational period. In addition, visual impact assessment of the construction period is given in Section 4.4.6. This section also consists of identification of potential visual impacts, proposed avoidance or at least mitigation measures if required, the resultant net and residual effects and monitoring/commitments.

The impact area based upon the existing information and impacts on sensitive receptors are addressed in the following sections. In this context, 3D visual impact assessment studies were carried out in the Report and in the area of analysis belonging to the Project, which is the geographic area to be included in the visual impact assessment.

4.4.1 Introduction

Visual impact can be defined as any alteration in landforms, water bodies, or vegetation, or any introduction of structures or other man-made visual elements, that negatively or positively affect the visual characteristics or quality of a landscape and the visual experience of people viewing the landscape through the introduction of visual contrasts (opposition of different forms, lines, colors, textures in a landscape) in the basic elements of form, line, color, and texture. They cover the impacts on specific views and on the general visual amenity experienced by people and the potential visual impact is primarily originated from changes in visual characteristics in the view field. Any aesthetic disturbance to the human eye or any hindrance of a landscape can be regarded as visual impact and they should be evaluated thoroughly with a comprehensive VIA study.

To be able to conduct an appropriate VIA study, baseline landscape characteristics must be comprehended (see Section 4.4.4).

Landscape is the most frequently encountered concept in the scope of VIA studies. Landscape can be defined as the extent to which the scenery is visible including land and water forms, vegetation, and man-made structures such as roads and concrete structures of the geographical region that will be subjected to an examination, including its physical and biological environment and psychosocial patterns.

4.4.2 Policies, Legal Framework and Guidelines

There are no well-recognized legislations on VIA studies across the world and Turkey, either. However, there are some guidelines established and widely used. One of which is and the most commonly used one is the “Scottish Natural Heritage Environmental Impact Assessment Handbook”. The visual impact assessment (VIA) work within the scope of this project was performed in parallel to and “Guidelines for Landscape and Visual Impact Assessment 3rd Edition”.

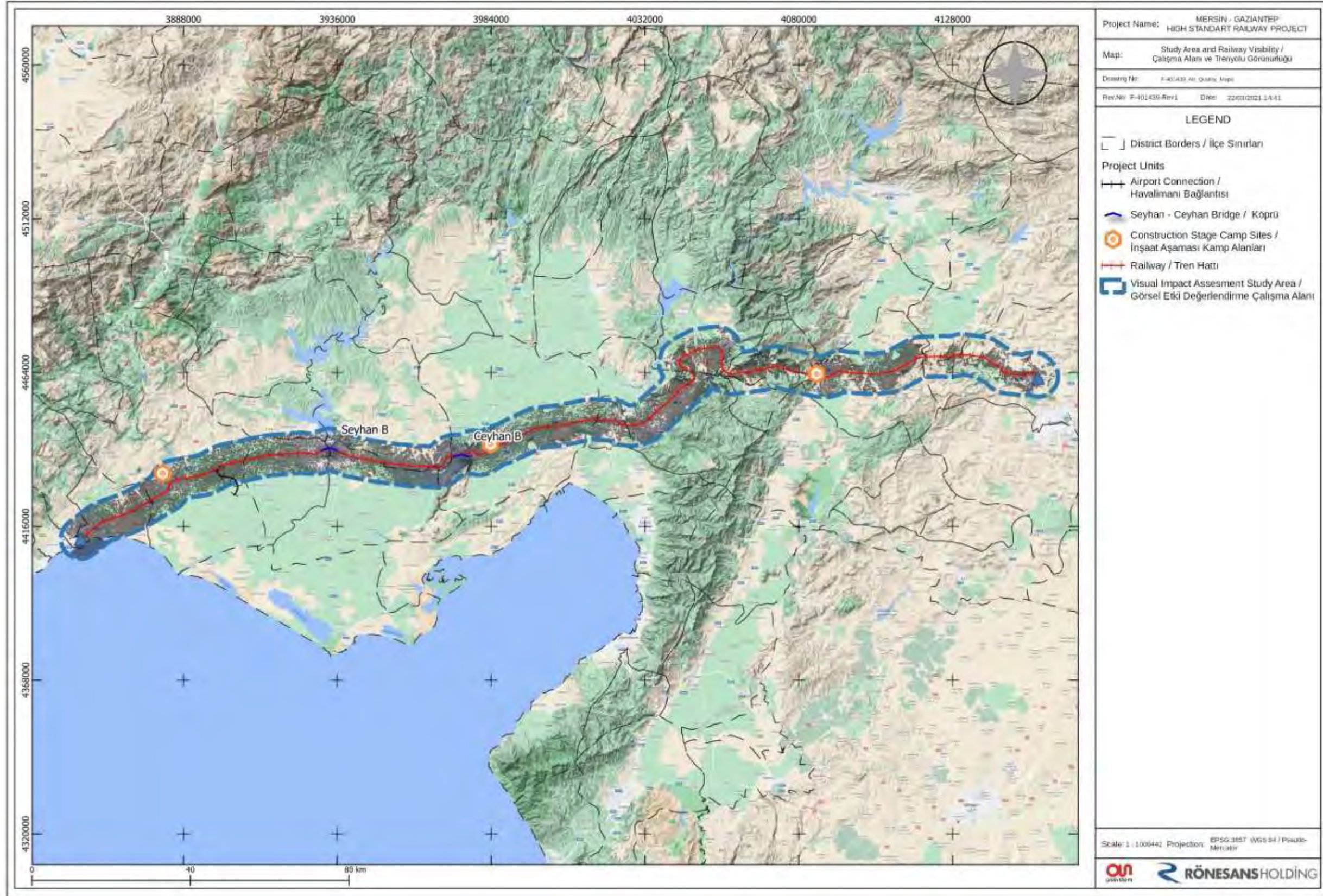
Apart from this guideline, there is a document established for vegetation removal and compensation relevant to railway projects for offsetting the tree loss due to installment: “Metrolinx Vegetation Removal and Compensation Program Document”. This guideline aims to manage the vegetation along the electrified corridor after the tree removal [47].

4.4.3 Extend of Study Area

4.4.3.1 Spatial Extend

VIA study, area entails the determination of a 5 km circular area drawn from the center of the Project area. The detected 5 km study area is based upon the Project description, site visits and good practice guidance. High Standard Railway Line and its components (signaling, electrification, train etc.) were evaluated together.

This generic impact area should be determined for all VIA studies according to the well-recognized guidelines (e.g., GLVIA). The map showing study area visibility of the railway is given in below (see Map 4.4).



Map 4.4: Study Area and Railway Visibility

4.4.3.1.1 Temporal Extend

Temporal changes express the change in a property with respect to time. Visual impact assessment studies were carried out within the scope of the Railway Project to identify the temporal change in visual quality/sensitivity/amenity and to understand the overall baseline quality and potential cumulative impacts of the project's existing activities (i.e., whether and/or how they will contribute to the visual quality of the Project area). In the construction period, no visual impact is expected. Possibility of any visual impact, it is evaluated in the Section 4.4.4. In the operation period, visual impact of the Project will last until the decommission of the Project.

4.4.4 Identification of Baseline Conditions

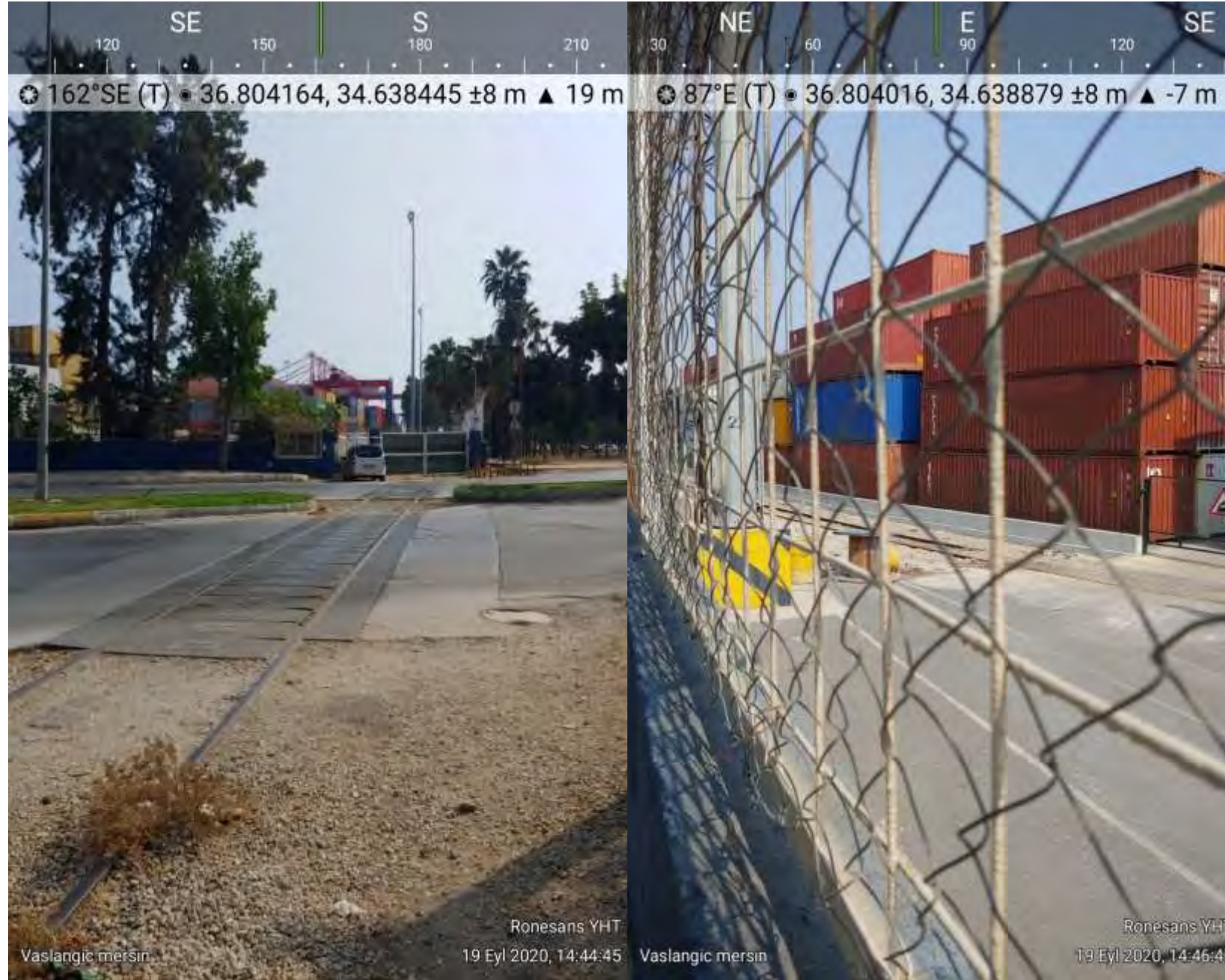
Baseline conditions represent the existing scenic conditions of the Project area independent from the Project. The first step in any landscape or visual impact assessment is to identify the existing landscape and visual source in the vicinity of the Project that is the baseline visual conditions. Assystem ENVY on September 19 and 20, 2020 carried out site visits and field studies in order to assess the baseline conditions. In the evaluation of baseline conditions, similar projects, structures, vegetation, distribution of settlement areas, dwellings, land use, topography, and viewpoints, view angles and view directions. In addition, in order to evaluate the current situation, many desk studies were conducted before the field studies.

Baseline conditions are useful for forecasting the possible visual amenity after the completion of the Project. The changes will depend on the landscape/vegetation of the area in baseline view and the level of visual contrast of the objects within the scope of the project. In this section, high resolution photographs were addressed by section/VPs and visual characteristics were explained in detail.

Visual or aesthetic sources are deemed as natural characteristics of an environment in the view field. These sources should be appealing to people as they reflect the long-term characteristics of the region. Appealing visual sources have high visual sensitivity (e.g. recreational areas, national parks, preserved areas with high biodiversity and high visual quality). In other words, those areas should be maintained in scenic quality as they highly concern the local inhabitants. Visual sources are referred to as any objects or features (either man-made, natural, stationary and mobile) such as landforms or water resources that are visible and valuable within a landscape.

Photographs

Within the scope of baseline studies, Assystem Envy carried out field studies and took photographs in September 2020, from the 1.6 m height on average above ground and with a high camera resolution of 1440p x 960p with a focal length of 4 mm (see for viewpoints and photographs of the sections Figure 4.9 to Figure 4.22). Focal length is the length of the lens used to take photographs. Even though the main parameters of human vision when the viewer's position is stationary and falls in the range between 45°-60°, we generally move our eyes, head or our body for an accurate view. On the photographs taken by Assystem ENVY, VP codes and locations, view angles, view directions, latitude, longitude, height above ground and date/time of the photographs is are given. Summary and technical info on VPs is given in Table 4.67.



VP-1

VP-2



VP-3



VP-4

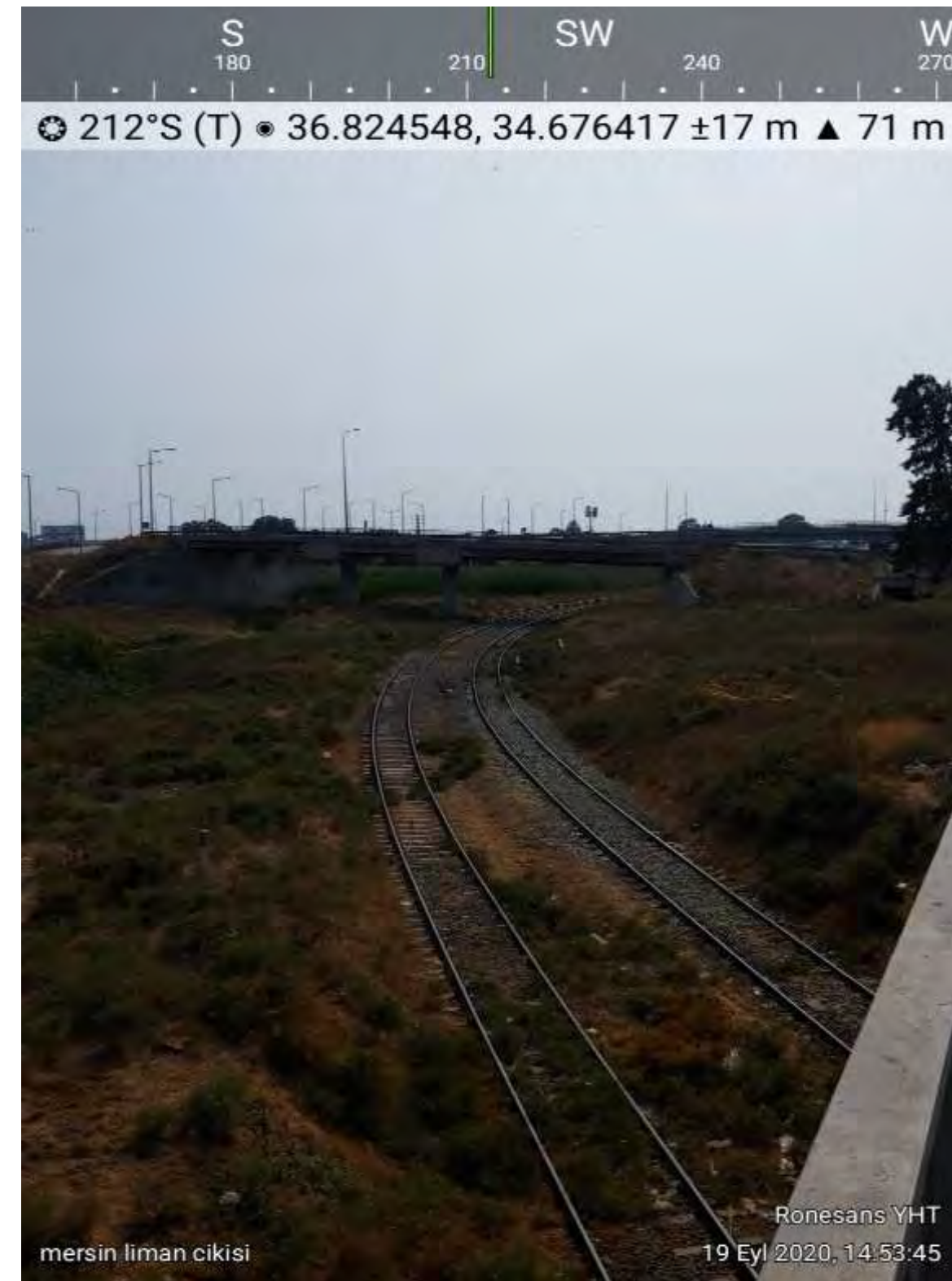
Figure 4.9: Viewpoints of Mersin Entrance



VP-5



VP-6



VP-7

Figure 4.10: Viewpoints of Mersin Port Exit



VP-8



VP-9

Figure 4.11: View Points of Mersin



VP-10



VP-11

Figure 4.12: Viewpoints of Kanberhöyüğü Neighborhood



VP-12



VP-13



VP-14

Figure 4.13: Viewpoints of Yılanlıkaya Road



VP-15



VP-16



VP-17

Figure 4.14: Viewpoints of Yilankale - 1



VP-18



VP-19

Figure 4.15: Viewpoints of Yilankale - 2



VP-20



VP-21



VP-22

Figure 4.16: Viewpoints of Hamdili



VP-26



VP-27



VP-28



VP-29

Figure 4.17: Viewpoints of Osmaniye Exit



VP-30



VP-31



VP-32



VP-33

Figure 4.18: Viewpoint of Tunnel 1-1



VP-34



VP-35



VP-36

Figure 4.19: Viewpoint of Tunnel 1-2



VP-37



VP-38



VP-39



VP-40

Figure 4.20: Viewpoints of Tunnel 2 Entrance



VP-41



VP-42



VP-43

Figure 4.21: Viewpoint of Tunnel 4 and Tunnel 5



VP-44



VP-45



VP-46

Figure 4.22: Viewpoint of Tunnel 6

Entrance of Mersin

Entrance of Mersin Province has a visual amenity with its vegetated areas, which enhances the quality of the view for the observer. Photographs were taken from 4 VPs in total. View directions are southeast at VP-1, east at VP-2, southeast from VP-3 and north from VP-4. These directions refer to the view direction of the person at which the railway corridor has partly vegetated areas as well as steppe covers A VP-1 and VP-2. Industrial estates are present when viewed from the railway corridor, at VP-3 and VP-4. No dwelling was detected in the region, in other words sensitive receptors (see Figure 4.9).

Exit of the Mersin Port

The port exit is a highly vegetated area with variety of endemic plants with active highways and bridges, overpasses in its surrounding at VP-5 and VP-6. VP-7 is a main road with variety of trees and dwellings, from which the inhabitants can see the railway (see Figure 4.10).

Mersin

The photos were taken at Mersin Province city center. From VP-8, a stream can be seen with dumped wastes around it, negatively affects the visual amenity. In contrast, vegetation is dominant from VP-9 and other visible sources small facilities, storage areas and a greenhouse. No sensitive receptor exist nearby (e.g. dwellings and/or institutional and commercial buildings) possibly vulnerable to severe visual impacts (see Figure 4.11).

Kanberhöyüğü Neighborhood

Kanberhöyüğü is a village in Tarsus district in Mersin province and it is a station on the conventional railway line. Both viewpoints of the location have ample amount of vegetation. View of the signalization beams thus may have negligible visual impact for those who can view the railway corridor. Number of settlements seems rare, as well as the facilities from both viewpoints (see Figure 4.12).

Yılanlıkaya Road

The viewpoints of the location have differing features. VP-12 has steppe cover, few trees and an arable land, in contrast with the VP-13 which is likely to be a highly fertile land. VP-14 shows the junction point, and it possesses a land cover of contrasts; including both green grasses and infertile steppe lands. It can also be inferred that the photograph was taken during the construction phase of the railway. The view covers a wide scenery including bridges, roads, electricity transmission beams and small facilities, which all can be classified as visual receptors due to the proximity to the development. Yılanlıkaya is a village within the borders of Sivas province (see Figure 4.13).

Yılankale

Yılankale is 13 km away from Adana, Ceyhan and o 3 km away from highway. Yılankale is located on a mountainous terrain, having many rocky areas and some vegetation. In each of the viewpoints, no settlement area was observed. All viewpoints are natural areas with no artificial structures except the electrification and signalization beams, and no life forms except the plants, grasses and scrubs (see Figure 4.14 and Figure 4.15).

Hamdilli

Hamdilli is a neighborhood in Ceyhan district in Adana province. When glancing at the photographs, it can be inferred that construction still goes on due to the earthwork soil and rocks that spread around the area, affects the visual amenity in a negative manner. Some bush vegetation can be seen as well as some dry grasses and under shrubs. Beams and electricity transmission lines can be seen very clearly from the VP-24. The area is

rather flat; it is likely that the visual impacts will not be negligible. No sensitive receptor was detected around the viewpoint (see Figure 4.16).

Exit of Osmaniye

The exit of Osmaniye province is a flat area and a dense and sprawled vegetation is dominant and has a notably wide landscape including mountainous terrains with settlements and plantation and a notably great yard in both sides of the railway line and beams. All viewpoints have visual amenity. As no stationary sensitive receptor exists nearby, no significant visual impact is expected whatsoever (see Figure 4.17).

Tunnel 1

The Tunnel-1 is located on a mountainous terrain and on the elevated areas, thick forest formation is dominant. Near the tunnel, newly planted trees (VP-33) and dense pine trees (VP-36) are present. Residuals of earthworks can also be seen from the VPs. In contrast, VP-34 and VP-35 shows incomplete construction, earthworks and machinery, which will have a negative visual impact for the observer as the dust emissions occur. No sensitive receptor was detected around the viewpoint (see Figure 4.18 and Figure 4.19).

Tunnel 2

The Tunnel-2 is located on a mountainous terrain and visually attractive for the observer as there are pine forests. The only source that negatively affects the visual quality is that the excavation earthworks and the excavator. No sensitive receptor was detected around the viewpoint (see Figure 4.20).

Tunnel 4 and Tunnel 5

As Tunnel-5 only shows the bushes, steppes, some pine trees and a beam, Tunnel-4 shows an area of high visual quality, with a variety of plantation and has a very wide scenery including mountains and distant settlements. No sensitive receptor was detected around the viewpoint (see Figure 4.21).

Tunnel 6

In contrast to other tunnels, Tunnel-6 is viewed from a VP where all the necessary machinery, vehicles and equipment and storage units are present with a lot of earthwork. Those with construction does not have a visual quality while the rocky areas over the tunnel have a thick forest formation when looking upward. No sensitive receptor was detected around the VP (see Figure 4.22).

Table 4.67: VPs Summary Table

VP Code	Elevation (m)	View Angle(°)	Date/Time	Location	Latitude	Longitude
VP-1	17	338.0°	2020:09:19 14:44:10	Entrance of Mersin	34.63843190	36.80418190
VP-2	19	160.0°	2020:09:19 14:44:45	Entrance of Mersin	34.63844470	36.80416390
VP-3	-7	85.0°	2020:09:19 14:46:47	Entrance of Mersin	34.63887890	36.80401580
VP-4	17	120.0°	2020:09:19 14:46:57	Entrance of Mersin	34.63886580	36.80396580
VP-5	42	156.0°	2020:09:19 14:53:45	Exit of the Mersin Port	34.67624690	36.82481190

VP Code	Elevation (m)	View Angle(°)	Date/Time	Location	Latitude	Longitude
VP-6	43	195.0°	2020:09:19 14:54:06	Exit of the Mersin Port	34.67621690	36.82471080
VP-7	41	32.0°	2020:09:19 14:54:16	Exit of the Mersin Port	34.67623080	36.82471580
VP-8	45	43.0°	2020:09:19 15:27:18	Mersin	34.83718280	36.89257580
VP-9	47	58.0°	2020:09:19 15:27:41	Mersin	34.83722890	36.89257500
VP-10	51	22.0°	2020:09:19 15:59:44	Kanberhöyüğü Neighborhood	35.02743890	36.96670080
VP-11	51	50.0°	2020:09:19 16:00:03	Kanberhöyüğü Neighborhood	35.02743890	36.96670190
VP-12	81	127.0°	2020:09:20 09:47:12	Yılanlıkaya Road	35.48866690	36.97706280
VP-13	83	8.0°	2020:09:20 09:47:35	Yılanlıkaya Road	35.48867690	36.97705280
VP-14	85	295.0°	2020:09:20 09:47:39	Yılanlıkaya Road	35.48868580	36.97704580
VP-15	69	102.0°	2020:09:20 10:10:39	Yılankale	35.74884970	37.02160780
VP-16	60	76.0°	2020:09:20 10:10:56	Yılankale	35.74878190	37.02163780
VP-17	59	176.0°	2020:09:20 10:11:00	Yılankale	35.74881080	37.02166190
VP-18	57	131.0°	2020:09:20 10:27:03	Yılankale	35.74995690	37.02204780
VP-19	62	114.0°	2020:09:20 10:27:09	Yılankale	35.74995690	37.02206580
VP-20	74	165.0°	2020:09:20 10:47:27	Hamdilli	35.92587000	37.05519000
VP-21	50	145.0°	2020:09:20 10:47:38	Hamdilli	35.92594780	37.05524580
VP-22	50	197.0°	2020:09:20 10:47:41	Hamdilli	35.92594780	37.05524580
VP-23	54	200.0°	2020:09:20 10:48:21	Hamdilli	35.92599890	37.05512690
VP-24	63	258.0°	2020:09:20 10:48:38	Hamdilli	35.92596970	37.05502390
VP-25	46	222.0°	2020:09:20 10:48:55	Hamdilli	35.92602390	37.05496500
VP-26	150	5.0°	2020:09:20 11:37:09	Exit of Osmaniye	36.27921280	37.10945970
VP-27	150	97.0°	2020:09:20 11:37:25	Exit of Osmaniye	36.27921280	37.10945890
VP-28	139	225.0°	2020:09:20 11:37:41	Exit of Osmaniye	36.27930390	37.10950890
VP-29	139	285.0°	2020:09:20 11:37:45	Exit of Osmaniye	36.27930390	37.10950890

VP Code	Elevation (m)	View Angle(°)	Date/Time	Location	Latitude	Longitude
VP-30	214	38.0°	2020:09:20 12:12:28	Tunnel 1	36.34643890	37.15430890
VP-31	214	329.0°	2020:09:20 12:12:40	Tunnel 1	36.34643890	37.15430890
VP-32	214	262.0°	2020:09:20 12:12:44	Tunnel 1	36.34643390	37.15429080
VP-33	213	48.0°	2020:09:20 12:13:08	Tunnel 1	36.34643390	37.15428500
VP-34	269	329.0°	2020:09:20 12:26:35	Tunnel 1	36.35710970	37.16388690
VP-35	269	68.0°	2020:09:20 12:26:44	Tunnel 1	36.35705580	37.16391970
VP-36	267	292.0°	2020:09:20 12:26:51	Tunnel 1	36.35705000	37.16392390
VP-37	255	271.0°	2020:09:20 12:52:13	Tunnel 2	36.35445500	37.17723390
VP-38	255	326.0°	2020:09:20 12:52:22	Tunnel 2	36.35445500	37.17723390
VP-39	255	328.0°	2020:09:20 12:52:25	Tunnel 2	36.35445500	37.17723390
VP-40	257	337.0°	2020:09:20 12:52:29	Tunnel 2	36.35446470	37.17723890
VP-41	409	232.0°	2020:09:20 14:26:23	Tunnel 4	36.43559690	37.19452280
VP-42	549	71.0°	2020:09:20 14:35:03	Tunnel 5	36.45299190	37.17816390
VP-43	549	125.0°	2020:09:20 14:35:17	Tunnel 5	36.45300080	37.17816280
VP-44	1011	313.0°	2020:09:20 15:59:07	Tunnel 6	37.22071580	37.18321690
VP-45	1005	359.0°	2020:09:20 15:59:14	Tunnel 6	37.22069390	37.18315190
VP-46	1005	31.0°	2020:09:20 15:59:19	Tunnel 6	37.22069390	37.18315190

4.4.4.1 Desk Studies

The desk studies are crucial elements before site visits and even more important as site visits. The desk studies involve establishment of the visibility characteristics of the proposed Project region through visualization studies. Visualization studies cover computer simulations such as GIS softwares, photomontage or other illustration techniques to predict the potential appearance characteristics of the Project.

Photomontage studies involve the process of creating imagery of a realistic 3D model of a proposed project overlaid onto a photograph of the existing landscape (see also Section 4.4.6 for detailed explanation of the desk/computer studies).

Zone of Theoretical Visibility

The “Zone of Theoretical Visibility” (ZTV) is used to depict the area in which the proposed development can be seen theoretically, formerly named as “Zone of Visual Influence” (ZVI). ZTV is based on a Digital Terrain Model (DTM), which is the most widely used digital topography model to incorporate into a GIS software, and it is overlapped with a map. Before site visits, the ZTV studies must be carried out to determine the reasonable VPs.

The main reason behind defining such a zone is that the effective borders of the zone could affect the people’s visual aesthetic within the broader area neighboring the Project. Within this context, ZTV maps are prepared using the GIS softwares. The aim of the software is to assist the VP selection and simulate the potential impacts arising from the developments in the broader landscape. The visibility map facilitates the selection of areas where the proposed development can be seen by people and local inhabitants. However, the use of these maps should be improved due to the following constraints that impede the model accuracy;

- The ZTV map is based on a bare-earth model (ASTER DEM v2 data with a 30 m grid terrain model) which is limited by the detail of the DTM data and does not consider the spatial variations in topography or blocking features such as vegetation and so on (i.e., landscape without any structure, objects or vegetation).
- The ZTV map does not consider the exact location and orientation of the viewer such as the travel direction and there is no information upon the loss of visibility with physical environmental and meteorological conditions (distance, weather, light, etc.)

These limitations probably mean that the ZTV maps have a tendency to overvalue the extent of the visibility, both from the proposed development perspective and the range of the visible proposed development. As a result, ZTV studies are helpful for assessment of the theoretical visibility. In contrast, it is not a measure of the visual impacts.

The visibility factors and their spatial interactions in a landscape are illustrated conceptually in below (see Figure 4.23).

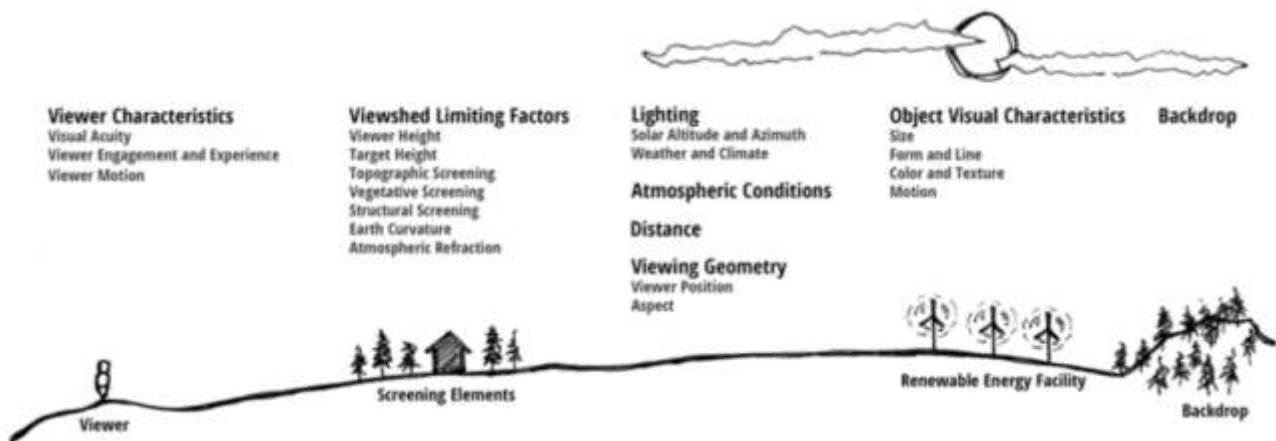


Figure 4.23: Conceptual Diagram of Visibility Factors

Visibility is defined as the ability to visually notice any object in a landscape; also the distance that an individual can see. Visibility factors are the variables that affect the visibility and distinct visual characteristics of an object in a landscape. They consist of “viewshed-limiting factors” that determine the potentially visible area, viewer characteristics (features of an individual’s viewer such as how closely the viewer looks at an object and

viewer's motion that affect the visual contrast preception and ability of distinguishing the objects in the landscape), distance, viewing geometry, background/backdrop, lighting, atmospheric conditions (stability/unstability) and object's visual characteristics.

Viewshed Analysis

Viewshed refers to the area/landscape that can be potentially seen from a specified point (see Section 4.4.1). Viewshed analysis can be defined as a spatial analysis that uses elevation data such as DEM and DTM to identify the parts from where the landscape surrounding the project area is likely to be visible from the certain points.

4.4.4.2 Field Studies

Within the scope of field studies, after the completion of construction, site visits were performed by Assystem Envy, photographs belonging to the railway line is given in Section 4.4.4 (see Figure 4.9 to Figure 4.22). Detailed 3D impact assessment studies were completed and these studies are given in detail and step-by-step in Section 0.

4.4.5 Impact Magnitude and Sensitivity Criteria

The classification for potential visual impacts can be either of negligible, low, moderate or high magnitude. The impacts are categorized in order to predict the potential effects along the railway line and its vicinity.

Visual impact by the construction period of the Project is predicted not to have a significant impact on sensitive receptors near the Project area as the rehabilitation works will compensate the visual impacts arising from the construction works. Visual changes will not remain persistent for a long time. As the magnitude of change will be high after remediation and visual sensitivity will be less prior to rehabilitation, it is likely that the impact magnitude and sensitivity will increase proportionally.

Assessment of impact magnitude and sensitivity criteria is given in the Section 4.4.6.

4.4.6 Impact Assessment

As the electrification infrastructure will exist in long term and it is impossible and non-feasible to disassemble the structure and avoid or eliminate the visual changes. In addition, the line within the railway line are electrified. The railway corridor mostly passes near the settlements; therefore it is definite that visual impacts with varying magnitudes occur.

Apart from the impact classifications; to distinguish between the various project-specific potential environmental impacts related to the Project lifetime, they were classified as follows (see Table 4.68).

Table 4.68: Potential Visual Impacts during Project Lifetime

Footprint Impacts	Loss of existing features, objects present in the Project area, land losses, soil degradation due to the implementation of the Project and installment of its components/structures.
Construction Impacts	Temporary or short term effects due to the vehicle movement (trucks, excavators, dozers) and resultant earthwork wastes associated with the works of the machinery.
Operation and Maintenance Impacts	Much longer term impacts than that of construction activities due to the stations, railroad, rolling stocks, art structures, electrification and signalization beams, etc.

Following the determination of potential impacts, mitigation measures were established (see Section 4.4.9).

Receptors

Visual receptors are those objects or dwellings that are susceptible to any alteration in landscape. They are assessed and described in terms of the views obtained from VPs determined. The settlements that lie within the Project area should also be subject to the VIA. Each VPs were assessed independently.

Each receptor was visited and surveyed considering the following factors;

- Receptor type and number (dwelling, road, school, hospital, workplace etc.),
- Date and Time that visit took place,
- Geographical Coordinates (latitude and longitude),
- Relative height to the proposed development,
- Baseline visual conditions/existing scenery (composition and quality),
- The distance and direction of the view,
- Potentially visible project elements and their visibility percentage,
- VP position (looking upwards or downwards),
- View angle (perpendicular, acute, average),
- The magnitude of change (negligible, slight, moderate, substantial),
- Impact significance (negligible, minor, moderate and major),
- Type of view (foreground/mid-ground, background) and position of the development in the view,
- View duration (stationary like house or mobile/transient such as a pedestrian)

VPs were selected as representative city centers of worst-case scenario of visual impacts. Within the scope of VIA study, “sensitive receptors” were identified and impact of the project on visual amenity was assessed.

4.4.6.1 Methodology

The most preferred method is the visualization of the field in three dimensions (3D) in computer environment. Visualization is technique for creating imagery, diagram or animation. This can be best accomplished through the visual imagination. Visualization facilitates the evaluation of visual impacts of the project via GIS and 3D Visualization software.

The VIA was and is generally undertaken in general in parallel with the requirements of Guidelines for Landscape and Visual Impact Assessment (GLVIA). GLVIA recommends that the visual impacts be assessed clearly for any mitigation measures to be implemented with minimum errors. To conduct the assessment, visual features of the existing landscape, its quality and its sensitivity to change against the proposed development and the magnitude of change. In this guideline, visual impacts are classified according to their visual disturbances on receptors (if present) or groups of viewers.

The extent of change in landscape elements are assessed considering the following factors;

- The proposed changes,
- Landscape elements having capability of affecting the proposed change permanently,
- Wider landscape and wider landscape elements having capability of affecting the proposed change permanently,

It is important to note that although the assessment may be affected by the landscape value. In general, highly values landscapes have high visual sensitivity; however, this is not always the case (see Section 4.4.4 for

areas of high visual sensitivity). The landscape sensitivity is evaluated relatively within the study area and is described by using the following 3 criteria in brief;

Low Sensitivity Areas

- Industrial and commercial areas,
- Rural farming areas,
- Rail overpasses in industrial areas or waterways,
- Tap locations and/or traction power facilities in industrial areas.
- Residential areas adjacent to settlements,
- Bridges,
- Some stations,
- Tap locations and/or traction power facilities where the existing landscapes are replaced by existing electricity facilities (e.g., transmission lines and power plants).

Medium Sensitivity Areas

- Residential areas with a distance to the railway line between 8 and 20 m,
- Areas where high rise buildings are present closer than 30 m to the railway line,
- Panoramic areas,
- Panoramic overpasses,
- Stations,
- Panoramic bridges,
- Pedestrian bridges,
- Tap locations and/or traction power facilities over 150 m from the development and have some present vegetation or other viewings.

High Sensitivity Areas

- Residential areas where settlements are within 8 meters of the railway line,
- Significant panoramic, cultural, and historical places nearby the railway line,
- Tap locations and/or traction power facilities within 30 m from the settlements and potentially have an adverse impact on the viewshed.

On behalf of the magnitude of change;

- High: Notable changes in landscape features over an extensive area, refers to the intensive changes over a small area,
- Medium: Moderate change in the localised area,
- Low: Small change in landscape elements,
- Negligible: No or extremely small changes in landscape elements.

Significance of Impacts

The magnitude of the effects are determined using the following matrix (see Table 4.69).

Table 4.69: Impact Significance Matrix

The sensitivity (nature of receptor) of the environmental receptor	Magnitude (Nature of Effect) of Change			
	Substantial	Moderate	Slight	Negligible/None
High	Major	Major	Moderate	Negligible/None
Medium	Major	Moderate	Minor	Negligible/None
Low	Moderate	Minor	Minor	Negligible/None

Visibility Level

Visibility level table is given below for a better understanding by observes to rate the visibility of developments (see Table 4.70).

Table 4.70: Visibility Levels from VPs

Visibility Rating	Description
VISIBILITY LEVEL 1: Visible only after extended, close viewing; otherwise invisible.	An object/phenomenon that is near the extreme limit of visibility. A person who was unaware of it in advance and looking for it could not see it. Even under those circumstances, the object can only be seen after looking at it closely for an extended period.
VISIBILITY LEVEL 2: Visible when scanning in general direction of study subject; otherwise likely to be missed by the casual observer.	An object/phenomenon that is very small and/or faint, but when the observer is scanning the horizon or looking more closely at an area, can be detected without extended viewing. A casual observer could sometimes notice it; however, most people would not notice it without some active looking.
VISIBILITY LEVEL 3: Visible after a brief glance in the general direction of the study subject and unlikely to be missed by casual observer.	An object/phenomenon that can be easily detected after a brief look and would be visible to most casual observers, but without sufficient size or contrast to compete with major landscape/seascape elements.
VISIBILITY LEVEL 4: Plainly visible, could not be missed by the casual observer but does not strongly attract visual attention, or dominate view because of apparent size, for views in general direction of study subject.	An object/phenomenon that is obvious and with sufficient size or contrast to compete with other landscape elements, but with insufficient visual contrast to strongly attract visual attention and insufficient size to occupy most of the observer's visual field.

The general assessment methodology is based upon the classification of magnitude of change. The changes will depend on the landscape/vegetation of the area in baseline view and the level of visual contrast of the objects within the scope of the project (see Section 4.4.4).

As the visual impacts of the Project will be determined by the 3D Visualization method, following steps are taken to execute this;

- The base databases/layers will be gathered from the open sources and/or project owner. These layers:
 - o Topography: the DEM. ASTER DEM v2 or General Directorate of Mapping Dataset or on T site/real T time topographical measurements grid terrain model will use to create ZTV determined the topographic structure of the region.

- o Land use: Land use is an especially important factor affecting the visibility of the Project. In the project area where the average viewing height is 1.6 meters (average person height) and assuming the area is flat, visibility can be hindered by vegetation. The Project area is in a slightly vegetated area.
- o OpenStreetMap Dataset including the following layers;
 - Buildings and man-made objects,
 - Roads and junctions,
 - Rivers,
 - Railways, etc.
 - o Project route and infrastructures to be added,
 - o 3D designs of the project route.
- A computer-based ZTV map will be prepared in line with the GIS Software. Global Mapper Software will be used. The other step will be the VP selection to predict the potential impacts of the Project in a broader extent within the landscape.
- 3D visualization model will be prepared by commercially available software and existing datasets.
- Existing and future conditions will be modelled/visualized through these software.

Visual impact assessment is the professional and methodological process used to identify and assess the visual impacts and their potential significance of the Project. Visual impact assessment involves potential impacts on the landscape due to the construction and operation phase of the Project. The Project area is visible from adjacent settlement areas and frequently used roads. The site is in a strategic location, near to the Çukurova Basin and Mersin ports (Silifke, Taşucu Ports) and Mersin Free Zone. The scope of studies for visual impact assessment studies are as follows;

- Evaluation of existing data,
- Evaluation of the baseline situation upon the Project region,
- Methodology and model selection,
- Determining the potential visibility of the Project region via viewshed (the total landscape has seen or potentially seen from a point, or from all or a logical part of a travel route, use area, or water body) analysis on Global Mapper software,
- Determination of the viewpoints (VP) (a point from which the landscape is viewed, and the resulting view is analyzed) and information on VP,
- Determination of the predicted visibility of the Railway Line from the adjacent settlements,
- Results and conclusion,
- Cumulative impact assessment,
- Mitigation measures for offsetting the cumulative impacts.

4.4.6.2 Construction Phase

The trucks, dozers etc doing the earthworks have short-term visual impacts on the environment. No significant visual impact is expected on the receptors since the work is temporary. In addition, the each sensitive receptor through the Railway Line experienced temporary visual changes. Based on sections but not the whole railway line, construction activities will be expected to have significant visual impacts on the receptors.

4.4.6.3 Operation, Longer Term and Permanent Effects

Operation phase will have permanent effects due to presence of art structures (culverts, bridges, overpasses, underpasses, viaducts, etc.) and electrical infrastructures such as catenary poles and electricity transmission lines will have permanent visual impacts on the receptors, ability to change the scenario. On the other hand, the persistency of the visual impacts are also dependent upon the VP of a viewer, either transient or stationary. However, the impact magnitude is not expected to be high, as the railway route will be rehabilitated for operation. The conventional worn out railway track rehabilitation enables the new railway to be more attentive including the repairmen of walls, wire fences, etc. as well as the construction of earthwork storage areas.

4.4.7 Cumulative Impact Assessment

The cumulative impacts were evaluated separately for each VP. The cumulative impacts were taken into consideration since the additional railway to be constructed within the scope of the project will be visible from main roads by the transient viewers and nearby settlement areas by stationary viewers (i.e., inhabitants) because it is approximately at the same level as the topography.

4.4.8 Summary of Residual Impacts, Significance Criteria and Overall Impact Significance

The visual impact of the proposed Project will be permanent for people living in the nearest settlements and other living beings in the immediate vicinity of the Project region. Proximity of the project region to 2 highways and 1 state road will change the visual status substantially, once the construction is completed and operation starts. As dense vegetation and forests cover the project region, it is inevitable that visual sensitivity will be affected negatively during construction works.

On the other hand, rehabilitation of the existing railway route will compensate the visual impacts arising from construction. As a result, the magnitude of the visual change after the rehabilitation for operation phase can be assumed as either high or medium.

4.4.9 Mitigation Measures

Mitigation measures were identified based on both the Best Practice Guide Documentations in theory and the Project only. These documentations clarify many issues for the clients on addressing project-specific impacts and their applicable mitigation measures. The impacts are categorized into four categories as mentioned earlier in Section 4.4.1.

As the electrification infrastructure will exist in long term and it is impossible and non-feasible to disassemble the structure and avoid or eliminate the visual changes. Therefore, there will be residual/net effects due to the long-term nature of the Project. Independent from this, mitigation measures are recommended where feasible to reduce the visual impacts of the electrification infrastructure as much as possible.

As a part of the Project development, the following efforts will be made to minimize visual impacts to the extent possible;

OCS (Overhead Contact System)/Overhead Line Catenary System

- The installation of OCS infrastructure will influence the viewshed along the rail corridors, particularly in areas covered with vegetation. Visual impact mitigation strategies for OCS will be determined and incorporated into the detailed design processes. These measures will address the visual baseline conditions, area allocations and mitigation needs found along the rail corridor. This mitigation measure can be evaluated within the impact category of “high”.
- The Metrolinx Tree Compensation Protocol requirements will oblige compensating the tree loss to the extent possible through planting trees to the other vulnerable areas, which will also help reduce visual negative impacts due to tree cutting.

Bridges/Rail Overpasses

- All overhead and pedestrian bridges will require safety barriers, which affect the view across the bridge. Therefore, Metrolinx Guideline will determine the “bridge barrier” designs instead that will maintain existing scenery to avoid substantial visual impacts. Treatment for the aesthetics of bridge barriers can also be carried out in consultation with the affected municipalities and dwellings.
- During the Project, OCS structures can be placed far away from the existing bridges/rail overpasses not to limit the visibility. Instead, OCS support structures can be placed symmetrically on each sides on bridges and viaducts for the least disturbing view.

Traction Power Facilities

- The traction power facilities can be designed in a way that making site planning more innovative if feasible and ensuring external yard and transformers are hidden as much as possible.

Apart from these, dust emissions during construction activities can create loss of visibility and landscape viewing. Dust emissions should be avoided for visual amenity. Dust emission reduction can be accomplished through paving and/or irrigation of the roads.

The mitigation measures planned to be implemented within the scope of the project are given in the ESMP prepared for the project.

4.4.10 Assumptions and/or Limitations

Visual impacts resulting from construction and operation phases of the Project has been analyzed based on the most used international standards. The most widely used document is GLVIA, which is emerged in Scotland. In this section, visual impacts were identified and interpreted for each viewpoint both from technical

and non-technical perspectives. The evaluation work is based on the 3D visualization model and view shed analysis results and other information provided about the Project such as photographs taken in the field. The visualization results were interpreted based on the combination of both desk and field studies. Rehabilitation of the existing line is estimated to avert the visual impacts observed in the construction due to the machinery and to bring back the former landscape quality. However, there remain gaps in the long-term visual impacts, as not all the necessary information have been gathered by TCDD

4.5 Water Resources

4.5.1 Introduction

The quality of the water resources that can be used, both underground and above ground, is related to the construction and operation period activities of the planned High Standard Train Project. The relationship of the Project with the water resources, whether there is an impact on these resources and the determination of the mitigation methods for the evaluated impact are given in this section.

Mersin, Adana, Osmaniye and Gaziantep are the provinces on the route where the Mersin-Gaziantep (Başpınar) High Standard Train passes. Water resources information related to these provinces are explained in the following paragraphs.

Irrigation channels were built by the traffic of the General Directorate of State Hydraulic Works (DSİ) to supply water to the agricultural land starting from Mersin to the provincial border exit to Adana. Since 2005, 85 irrigation facilities have been built to cover Mersin, Adana and Osmaniye provinces, and 73 irrigation channels have been under construction since 2012. For Gaziantep Province, 11 irrigation canals have been built since 1991, and there are 7 irrigation canals under construction since 2015. These facilities are of great importance for irrigation of agricultural lands between Mersin, Adana, Osmaniye and Gaziantep.

According to the data of DSİ 6th Regional Directorate, in the region where Mersin, Adana and Osmaniye provinces are located, annual 475 hm³ groundwater and 4,286 hm³ aboveground water irrigation water supply annually, 538 hm³ groundwater and 417 hm³ surface water drinking water supply annually. There is a potential of 246 hm³ of groundwater and 40 hm³ of surface water for industrial water supply. In this context, according to the 2018 Mersin Provincial Environmental Status Report, 5100 hm³ of surface water per year and 213 hm³ of groundwater per year in Mersin; according to the 2019 Adana Provincial Environmental Status Report, 4312 hm³ of surface water per year and 609 hm³ of groundwater annually in Adana; according to the 2018 Osmaniye Provincial Environmental Status Report, there is 159.69 hm³ of groundwater per year in Osmaniye and 718.68 hm³ of groundwater per year in Gaziantep according to the 2018 Gaziantep Provincial Environmental Status Report.

There are dams in the Provinces where the Railway Line passes. Dams' information are given in the table below (see Table 4.71).

Table 4.71: Dams throughout the Railway Line

Province	Number of the Dams	Name of the Dams
Mersin	7	Berdan, Merkez Arslanköy, Alaköprü, Silifke Kıca, Merkez Değirmendere, Merkez Cemilli Çevlik and Toroslar Gözne
Adana	19	Seyhan, Kesiksuyu, Kozan, Nergizlik, Çatalan, Yüreğir Kılıçlı, Yedigöze, Sarıçam Broad Bean, Pozantı Yağtaş, Kozan Postkabasakal, Kozan Bağtepe, Kozan Zerdali, Karaisalı Demirçit, Kozan Meletmez, Aladağ Dölekli, Menge, Bridge and Feka 2
Osmaniye	4	Mehmetli, Aslantaş, Kalecik, Düziçi Karacaören [23]
Gaziantep	5	Hanacak, Kayacık, Ardıl, Nurdağ Kuzuluk, İslahiye Bayraktepe [23]

The closest dams to the high standard railway line and their distances are given in the table below (see Table 4.72).

Table 4.72: Dams Closest to the Railway Line and Their Distances

City Name	Dam Name	Coordinates		Distance* (km)
		Latitude	Longitude	
Adana	Seyhan Dam	37.039873	35.331940	3.56
Mersin	Berdan Dam	36.960154	34.877341	3.17
Osmaniye	Kalecik Dam	37.150772	36.465821	2.65
Gaziantep	Nurdağ Kuzoluk Dam	37.061833	36.892472	12.73

* The closest train route from the nearest dam point

Apart from irrigation channels and dams, there are many lakes/ponds around the Mersin-Gaziantep route. In Adana, Sarıçam Hakkıbeyli Pond (Yağızlar Pond), Sarıçam Karlık Pond [23], Kılıçlı Pond, Hakkıbeyli Pond, Kasimli Pond, Demirçit Pond, Bağtepe Pond, Zerdali Pond, Postkabasakal Pond, Meletmez Pond, Karlık Pond, Ağıltaş Pond, Baklalı Pond, Dölekli Pond, and 3 lakes, namely Akyatan, Yapı, Tuz Lake, and 1 port.

There are 7 ponds in Mersin: Gülnar Köseçobanlı Bardat Pond, Gülnar Taşoluk Pond, Erdemli Güzeloluk Pond, Mut Hacınuhlu Kelce Pond, Gülnar Yassıbağ Pond, Erdemli Avgadı Aydınlar Pond, Aslanköy Pond.

There are 3 ponds in Osmaniye, namely the Central Köyleri Pond, Central Bahçeköy Pond and Arıklıkaş Pond [23].

In Gaziantep, there are 7 ponds, namely Şahinbey Alleben Pond, Şehitkamil Yamaçoba Pond, Zülfikar Pond, Hacıarslan Pond, İslahiye Balıkanlı Pond, İslahiye Çakmak Pond and İslahiye Nogaylar Pond [23].

The closest lakes/ponds to the project route and their distances are given in the table below (see Table 4.73).

Table 4.73: Ponds/Lake Closest to the Railway Route and Their Distances

City Name	Dam Name	Coordinates		Distance* (km)
		Latitude	Longitude	
Osmaniye	Arıklıkaş Pond	37.154842	36.515075	2.72
Gaziantep	Çakmak Pond	37.189487	36.836399	1.19

On the Mersin-Gaziantep project route, it passes over the Seyhan and Ceyhan River, which are two important water resources between Adana and Toprakkale.

The water requirement for the construction and operation period will depend on the use of personnel and drinking water. For the construction period, drinking water needs of the staff at the construction sites and in the field will be supplied from the market. The utility water need at the construction sites will be met from the city network. For the operating period, drinking water of the personnel at the route stations will be supplied from the market and the domestic water from the city network.

4.5.2 Policies, Legal Framework and Guidelines

Both national regulations and national standards are used to protect and use underground and surface water resources, prevent pollution, and eliminate the resulting pollution. Since limit values for surface waters are not determined in international standards and guidelines, an evaluation has been made within the scope of national legislation.

The determined regulations and standards are given below.

4.5.2.1 National Legislation

Regulation on Water Pollution Control

The Water Pollution Control Regulation, that is numbered 25687 and published on 31.12.2004, aims to determine the legal and technical principles required for the project owners to protect the potential of underground and surface water resources during the construction and operation phases of the projects, to use these resources in the best way and to prevent the pollution of water resources in harmony with the sustainable environment.

The scope of the regulation is the classification of water environments by evaluating the quality and the purpose of its use, the methods related to the protection of the water quality, its planning and dangers, the monitoring and inspection procedures and principles to be done to prevent water pollution. The table of Quality Criteria according to the In-Continental Water Resources Classes of The Water Pollution Control Regulation is given below (see Table 4.74).

Table 4.74: The Table of Quality Criteria According to the In-Continental Water Resources Classes of the Water Pollution Control Regulation

Water Quality Parameters	Water Quality Classes			
	I	II	III	IV
A) Physical and inorganic- chemical parameters				
1) Temperature (C)	25	25	30	> 30
2) pH	6.5-8.5	6.5-8.5	6.0-9.0	Higher than 6.0-9.0
3) Dissolved oxygen (mg O ₂ / L) a	8	6	3	< 3
4) Oxygen saturation (%) a	90	70	40	< 40
5) Chloride ion (mg Cl ⁻ / L)	25	200	400 ^b	> 400
6) Sulphate ion (mg SO ₄ = / L)	200	200	400	> 400
7) Ammonium nitrogen (mg NH ₄ + -N / L)	0.2 ^c	1 ^c	2 ^c	> 2
8) Nitrite nitrogen (mg NO ₂ ⁻ -N / L)	0.002	0.01	0.05	> 0.05
9) Nitrate nitrogen (mg NO ₃ ⁻ -N / L)	5	10	20	> 20
10) Total phosphorus (mg P / L)	0.02	0.16	0.65	> 0.65
11) Total dissolved matter (mg / L)	500	1500	5000	> 5000
12) Color (Pt-Co unit)	5	50	300	> 300
13) Sodium (mg Na + / L)	125	125	250	> 250
B) Organic parameters				
1) Chemical oxygen demand (COD) (mg / L)	25	50	70	> 70
2) Biological oxygen demand (BOD) (mg / L)	4	8	20	> 20

Water Quality Parameters	Water Quality Classes			
	I	II	III	IV
3) Total organic carbon (mg / L)	5	8	12	> 12
4) Total Kjeldahl-nitrogen (mg / L)	0.5	1.5	5	> 5
5) Oil and grease (mg / L)	0.02	0.3	0.5	> 0.5
6) Reacting with methylene blue	0.05	0.2	1	> 1.5
surfactants (MBAS) (mg / L)	0.002	0.01	0.1	> 0.1
7) Phenolic substances (volatile) (mg / L)	0.02	0.1	0.5	> 0.5
8) Mineral oils and derivatives (mg / L)	0.001	0.01	0.1	> 0.1
9) Total pesticide (mg / L)				
C) Inorganic contamination parameters				
1) Mercury (µg Hg / L)	0.1	0.5	2	> 2
2) Cadmium (µg Cd / L)	3	5	10	> 10
3) Lead (µg Pb / L)	10	20	50	> 50
4) Arsenic (µg As / L)	20	50	100	> 100
5) Copper (µg Cu / L)	20	50	200	> 200
6) Chromium (total) (µg Cr / L)	20	50	200	> 200
7) Chromium (µg Cr + 6 / L)	Too little to measure	20	50	> 50
8) Cobalt (µg Co / L)	10	20	200	> 200
9) Nickel (µg Ni / L)	20	50	200	> 200
10) Zinc (µg Zn / L)	200	500	2000	> 2000
11) Cyanide (total) (µg CN / L)	10	50	100	> 100
12) Fluoride (µg F ⁻ / L)	1000	1500	2000	> 2000
13) Free chlorine (µg Cl ₂ / L)	10	10	50	> 50
14) Sulfur (µg S = / L)	2	2	10	> 10
15) Iron (µg Fe / L)	300	1000	5000	> 5000
16) Manganese (µg Mn / L)	100	500	3000	> 3000
17) Boron (µg B / L)	1000 ^e	1000 ^e	1000 ^e	> 1000
18) Selenium (µg Se / L)	10	10	20	> 20
19) Barium (µg Ba / L)	1000	2000	2000	> 2000
20) Aluminum (mg Al / L)	0.3	0.3	1	> 1
21) Radioactivity (Bq / L)				
Alpha-activity	0,5	5	5	> 5
beta-activity	1	10	10	> 10
D) Bacteriological parameters				
1) Fecal coliform (EMS / 100 mL)	10	20	2000	>2000
2) Total coliform (EMS / 100 mL)	100	20000	100000	>100000

(a) It is sufficient to provide only one of the parameters of concentration or percentage of saturation.

(b) It may be necessary to lower this concentration limit when watering chloride sensitive plants.

(c) Depending on the pH value, the free ammonia nitrogen concentration should not exceed 0.02 mg NH₃-N / L.

(d) The criteria in this group give the total concentrations of the chemical species that make up the parameters.

(e) It may be necessary to reduce the criterion up to 300 µg / L for irrigating plants sensitive to bora.

In the water quality, which is ranged from I to IV, I represents the best quality water while IV represents the most polluted.

Regulation on Surface Water Quality

This regulation numbered 28483 and published on 30.11.2012, covering all surface waters except open sea, determining and classifying the biological, chemical, physio-chemical and hydro morphological qualities of surface waters and coastal and transitional waters, monitoring the quality and quantity of water. It aims to determine the procedures and principles for the measures to be taken for the protection and the achievement of good water status by observing the balance of protection and use of the purposes of using these waters in line with the sustainable development goals.

Regulation on Protection of Groundwater against Pollution and Deterioration

The Regulation on the Protection of Groundwater against Pollution and Degradation, numbered 28257, published on 07.04.2012 and amended on 22.05.2015, aims to preserve the current state of groundwater, prevent pollution and deterioration of groundwater and determine the necessary principles for the improvement of these waters.

It covers all groundwater except waters subject to the Law on Geothermal Resources and Natural Mineral Waters.

Regulation on Monitoring of Surface and Groundwater

The purpose of the regulation numbered 28910 and dated 11.02.2014 is to determine the current situation of all surface waters and groundwater in terms of quantity, quality and hydro morphological elements throughout the country, to monitor waters with an approach based on ecosystem integrity, to ensure standardization in monitoring and coordination between monitoring institutions and organizations.

The regulation covers inland surface, underground, transitional and natural mineral waters excluding other coastal waters, including coastal waters in the parts where water resources reach the sea, except geothermal resources and sea waters. The observations and measurements that are not included in the regulation, but the institutions have to do within the scope of their duties and powers are not covered by this regulation.

Regulation on Control of Pollution Caused by Hazardous Substances in the Aquatic Environment and Its Surroundings

The purpose of the Regulation on Control of Pollution Caused by Dangerous Substances in Water and Its Environment dated 26.11.2005 numbered 26005 is to detect, prevent and reduce the pollution caused by hazardous substances in water and its environment.

This regulation covers technical and administrative principles regarding determination of hazardous substances that cause pollution in surface waters, estuary waters and regional waters, establishment of pollution reduction programs, prevention and monitoring of pollution, inventory of hazardous substances discharged into water, determination of discharge standards and quality criteria.

Regulation on Water Intended for Human Consumption

This regulation numbered 25730 dated 17.02.2005 aims to ensure compliance of water for human consumption with technical and hygienic conditions and to ensure quality standards of water, extraction, packaging, labeling, sales and inspection of spring water and drinking water in accordance with the procedures. The Regulation on Water Intended for Human Consumption includes drinking water, spring water and utility water, but does not cover natural mineral waters, thermal and drinking water and medical water.

4.5.2.2 International Guidelines

The standards established for the efficient use and protection of underground and surface water resources are given below.

International Finance Corporation (IFC)

One of these standards is the IFC Performance Standard 3 applied to eliminate and/or minimize the potential risks that may occur in water resources due to the High Standard Train Project. Performance standard applied the IFC not only for water resources, but also for energy use and greenhouse gas risk. The Environmental and Social Risk Management System, which was established during the period of determining environmental and social risks, manage it.

Except for the IFC Standard, the IFC Environmental, Health, and Safety (EHS) Guidelines on the protection of water resources are implemented in the General EHS Guidelines: Environmental Water Conservation. According to the Water Conservation Guide, water conservation practices should be in direct proportion to the size and cost of water use. Cost-effective practices should be provided for minimizing water use and for treatment/disposal. Basic elements to ensure water management are;

- Identification of the water resources in and around the project,
- Potential effects that could affect water use,
- Regular measurements and analyzes that are made in order to make comparisons regarding the use and quality of water.

According to IFC Environmental, Health, and Safety (EHS) Guidelines General EHS Guidelines: According to Environmental Water Quality, all kinds of drinking water sources should always be protected to meet or not exceed applicable national regulations. In the absence of national restrictions, the current WHO Guidelines for Drinking-Water Quality should be consulted. The quality of the water should comply with national standards even when the project is transmitted to the community or to the users of the project infrastructure where water can be used for drinking, cooking, washing and bathing.

European Bank for Reconstruction and Development (EBRD)

One of the other international standards used to evaluate the effects of the planned High Standard Train Project on water resources is the EBRD performance standards. In this context, EBRD Performance Requirement 1: Assessment and Management of Environmental and Social Risks and Impacts Performance Requirements 3: Resource Efficiency and Pollution Prevention and Control Guidelines are applied.

EBRD performance standards are mostly similar to IFC performance standards. For the protection and management of water efficiency as specified in EBRD PR 3;

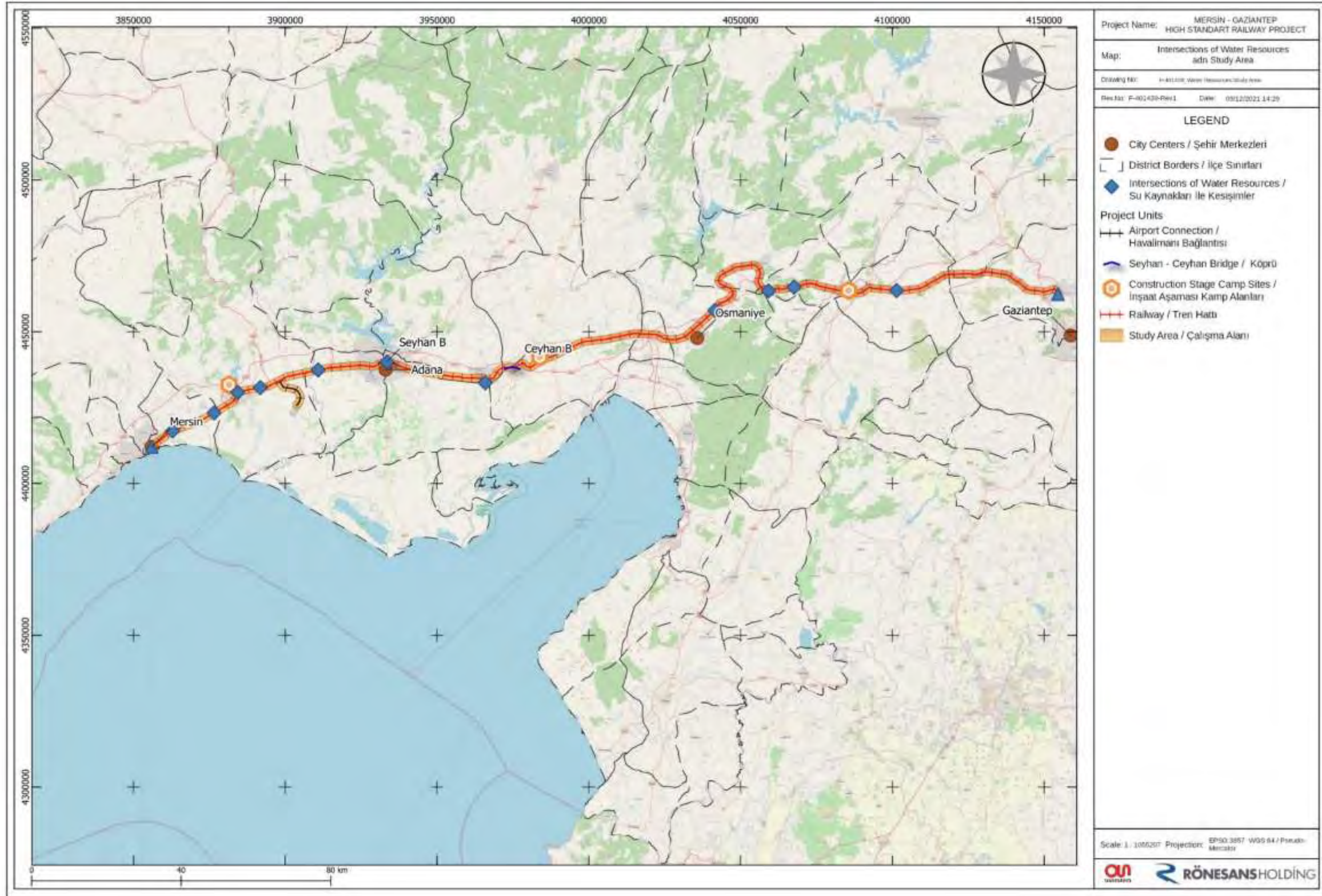
- Defining the project's water use and water efficiency importance for the project,
- Adaptation of reduction methods for the project.

4.5.3 Extend of Study Area

4.5.3.1 Spatial Extend

The water analysis for this ESIA covers the surface water and groundwater resources of the 4 provinces (Mersin, Adana, Osmaniye and Gaziantep) where the train sight passes, and more specifically the catchment basins of the Seyhan and Ceyhan rivers. In this section, the intersections with the main waterways, water quality and the railway line are described, provided a summary of the state of surface and groundwater in the

region. The main focus is on the intersections of trains and water sources and their branches. These water resources constitute the main water resources for the relevant municipalities. The spatial area where water resources are studied is shown in the map below (see Map 4.5).



Map 4.5: Intersections of Water Resources

4.5.3.2 Temporal Extend

In order to examine the effect of Mersin-Gaziantep High Standard Train Line on water resources, a study area of 1000 m in total was selected by choosing distances of 500 m from the right and left of the route. In this determined study area, the water resources that were or could be affected by the project were examined. Because of the investigation, surface water analysis was carried out to determine the effect on water resources, especially during the construction phase. Results of analysis are given in below (see Section 4.5.4).

4.5.4 Identification of Baseline Conditions

4.5.4.1 Desk Studies

The High Standard Train Line passes over the Seyhan and Ceyhan rivers, which are two important surface water resources, within the borders of Adana Province. Apart from these two large rivers, it completes the route by passing near small and medium-sized water sources. Most of the small and medium-sized water resources are used as irrigation channels and are of great importance for the lands given in Section 4.5.1.

4.5.4.2 Field Studies

There were drilling works performed by SWS Engineering in 2015 between Toprakkale-Bahçe sections on the Mersin - Gaziantep High Standard Railway Line. Drilling work carried out was conducted between Toprakkale - Bahçe Station Km: 0 km + 000-57 m + 685 cm, taking into account the "Research Engineering Services Technical Specification for the General Directorate of Highways", 2967 foundation drillings were carried out in 97 locations with depths varying between 12 m and 100 m. During the drillings, disturbed (SPT), undisturbed (UD) and core samples were taken to determine the properties of the project area ground. Natural water content, natural unit volume weight, specific weight, Atterberg limits (ll, pl, pi), grain size distribution, triaxial pressure test, free pressure test and consolidation tests were performed on the damaged and undisturbed samples. Uniaxial pressure test and natural unit weight test were applied on the rock samples obtained from the cores.

There are drilling works carried out by Yüksel Proje in 2012 in the Nurdağ-Başpınar section. A total of 2031.00 meters of foundation drilling was carried out at 68 locations, taking into account the "Research Engineering Services Technical Specification" of the General Directorate of Highways between Km: 76 + 400 - 132 + 300 along the route. Experiments were carried out by taking undisturbed (UD) and core samples. Information on drillings between Nurdağ-Başpınar is given in the table below (see Table 4.76).

Toprakkale-Bahçe Section:

Information on drillings between Toprakkale and Bahçe are given in the table below (see Table 4.75).

Table 4.75: Drilling Information between Toprakkale and Bahçe

Drilling Code	km	Depth (m)	Structure	Ground Water Level (m)
PSK-1	0+280	30	Overpass	5.30
PSK-2	0+735	15	Route	8.00
PSK-3	1+166	15	Route	5.00
PSK-4	1+542	15	Route	6.00
PSK-5	1+906	30	Route	5.50
PSK-6	2+455	15	Route	4.00
PSK-7	2+987	15	Route	6.00

Drilling Code	km	Depth (m)	Structure	Ground Water Level (m)
PSK-8	3+645	25	Route	4.00
PSK-9	3+960	25	Route	5.00
PSK-10	5+209	25	Route	6.00
PSK-11	8+025	20	Subway	9.00
PSK-12	8+030	20	Subway	9.00
PSK-17	8+876	30	Overpass	6.00
PSK-18	9+509	30	Overpass	6.80
PSK-19	0+100	0	Overpass	7.00
PSK-20	0+738	0	Overpass	5.00
PSK-21	2+061	0	Overpass	7.80
PSK-22	2+672	5	Route	4.50
PSK-23	2+799	5	Route	4.00
PSK-24	3+508	0	Route	4.80
PSK-25	3+960	0	Route	3.30
PSK-26	4+762	5	Route	5.00
PSK-27	5+089	0	Overpass	8.50
PSK-28	6+211	0	Viaduct-1	4.80
PSK-29	6+246	0	Viaduct--1	4.50
PSK-30	6+650	0	Viaduct--2	4.50
PSK-31	6+708	0	Viaduct--2	4.00
PSK-32	6+962	5	Filling	3.30
PSK-33	7+362	5	Filling	3.30
PSK-33A	7+502	0	Subway	4.50
PSK-34	17+613	30	Viaduct-3	6.00
PSK-34A	17+860	36	Viaduct-3	4.00
PSK-34B	18+075	32	Filling	4.50
PSK-35	18+159	50	Filling	5.00
PSK-36	18+350	20	Subway	5.00
PSK-36	18+378	25	Filling	5.50
PSK-37	18+799	20	Filling	4.00
PSK-38	19+980	12	Filling	9.00
PSK 39	20+380	20	Filling	6.50
PSK 40	20+550	20	Subway	8.50
PSK 41	21+130	20	Filling	7.50
PSK 43	21+625	45	Splitting	No Water
PSK 44	22+200	15	Filling	6.00
PSK 45	22+690	25	Tunnel-1	No Water
PSK 45	22+950	50	Tunnel -1	46.00
PSK 46	23+290	30	Tunnel -2	23.50
PSK 47	23+830	50	Splitting /Open-Close	40.50
PSK 48	24+270	35	Splitting	No Water

Drilling Code	km	Depth (m)	Structure	Ground Water Level (m)
PSK 50	24+590	15	Filling	5.00
PSK 52	25+152	55	Tunnel -3	45.50
PSK 52	25+270	60	Tunnel -3	51.50
PSK 53	25+865	75	Tunnel -3	69.00
PSK 54	26+490	80	Tunnel -3	78.00
PSK 55	26+800	60	Tunnel -3	57.50
PSK 56	27+210	55	Tunnel -3	54.00
PSK 59	29+050	20	Subway	4.500
PSK 60	29+600	20	Subway	8.00
PSK 60	30+130	20	Subway	18.00
PSK 61	31+125	15	Filling	No Water
PSK 63	31+780	15	Filling	9.00
PSK 65	33+100	15	Overpass	5.00
PSK 66	34+360	15	Subway	6.00
PSK 67	34+590	40	Viaduct-4	5.00
PSK 69	35+430	25	Filling	5.00
PSK 70	36+700	20	Filling/Station	5.50
PSK 71	37+000	20	Filling/Station	5.50
PSK71A	37+260	25	Splitting	24.00
PSK 72	38+930	15	Filling	4.50
PSK 73	39+420	15	Subway	5.00
PSK 74	39+790	15	Subway	5.50
PSK 75	40+660	15	Subway	5.00
PSK 76	41+410	15	Subway	5.50
PSK 77	41+700	20	Filling	5.50
PSK 78	42+280	20	Splitting	No Water
PSK 79	42+507	60	Tunnel -4	42.50
PSK 80	42+800	70	Tunnel -4	60.00
PSK 81	43+120	50	Tunnel -4	39.50
PSK 82	43+455	95	Tunnel -4	89.50
PSK 83	44+130	60	Tunnel -4	54.50
PSK 85	44+560	20	Filling	7.50
PSK 86	44+920	15	Subway	10.50
PSK87	45+360	20	Overpass	No Water
PSK 88	45+555	35	Splitting	No Water
PSK 89	45+680	25	Viaduct -5	5.00
PSK 90	45+780	25	Viaduct -5	5.50
PSK 92	46+620	80	Tunnel -5	67.50
PSK 98	47+400	99	Tunnel -5	19.00
PSK 96	49+800	50	Tunnel -5	No Water
PSK 97	50+360	40	Splitting - Tunnel -5	30.50

Drilling Code	km	Depth (m)	Structure	Ground Water Level (m)
PSK 99	51+715	15	Overpass	5.00
PSK 100	52+380	20	Overpass	5.50
PSK 102	53+725	30	Overpass	5.50
PSK 103	54+150	13	Filling	4.50
PSK 103A	54+870	15	Filling	6.50
PSK 104	56+000	20	Filling	5.00
PSK 106A	57+280	25	Splitting	No Water
PSK 107	57+630	20	Route	6.00

Nurdağ-Başpınar Section;

Table 4.76: Drilling Information between Nurdağ and Başpınar

Drilling Code	km	Depth (m)	Structure	Ground Water Level (m)
NB-1	77+050	15	Station	0.10
NB-2	77+720	15	Station	1.15
NB-3	78+000	15	Station	1.00
NB-4	79+210	15	Filling	1.60
NB-5	80+080	15	Subway	2.75
NB-6	80+340	30	Tunnel	1.45
NB-7	81+025	52	Tunnel	30.70
NB-8	81+310	34	Tunnel	1.00
NB-9	82+630	15	Subway	12.70
NB-10	84+200	15	Filling	4.60
NB-11	86+980	17	Splitting	14.80
NB-12	87+610	20	Overpass	14.85
NB-13	88+680	15	Filling	12.55
NB-14	89+835	15	Subway	1.70
NB-15	91+042	15	Filling	2.85
NB-16	91+700	15	Filling	12.50
NB-17	92+405	26	Splitting	10.00
NB-18	92+765	22	Splitting	12.50
NB-19	93+065	15	Splitting	5.30
NB-20	93+980	19	Overpass	18.25
NB-21	94+586	35	Splitting	5.00
NB-22	95+680	15	Filling	11.00
NB-23	96+920	15	Filling	10.40
NB-24	97+510	15	Filling	5.00
NB-25	97+970	15	Filling	10.25
NB-26	98+480	15	Filling	14.80
NB-27	98+860	27	Tunnel	7.40

Drilling Code	km	Depth (m)	Structure	Ground Water Level (m)
NB-28	101+330	15	Filling	2.40
NB-29	107+140	15	Filling	12.60
NB-30	107+749	15	Filling	9.50
NB-31	108+100	15	Filling	12.00
NB-32	108+310	15	Filling	No Water
NB-33	112+495	169	Tunnel	No Water
NB-34	113+910	106	Tunnel	No Water
NB-35	114+433	104	Tunnel	No Water
NB-36	114+795	139	Tunnel	No Water
NB-37	115+308	148	Tunnel	No Water
NB-38	115+750	75	Tunnel	No Water
NB-39	116+080	67	Tunnel	No Water
NB-40	117+170	15	Filling	No Water
NB-41	118+700	15	Filling	No Water
NB-42	119+315	20	Splitting	23.80
NB-43	119+650	33	Splitting	21.15
NB-44	120+410	23	Tunnel	37.60
NB-45	121+020	40	Tunnel	No Water
NB-46	121+745	29	Tunnel	9.35
NB-47	121+957	15	Filling	7.60
NB-48	122+640	15	Filling	1.60
NB-49	123+580	15	Filling	8.65
NB-50	124+327	15	Filling	6.55
NB-51	124+673	15	Filling	9.60
NB-52	125+680	15	Overpass	15.40
NB-53	126+480	16	Splitting	31.60
NB-54	126+825	43	Splitting	26.55
NB-55	126+890	32	Splitting	29.40
NB-56	127+321	25	Viaduct	19.35
NB-57	127+367	25	Viaduct	No Water
NB-58	127+425	25	Viaduct	No Water
NB-59	127+500	25	Viaduct	20.40
NB-60	127+575	25	Viaduct	16.30
NB-61	127+650	25	Viaduct	6.45
NB-62	128+340	15	Filling	3.65
NB-63	128+720	15	Filling	2.70
NB-64	129+420	15	Filling	4.70
NB-65	129+740	15	Splitting	2.65
NB-66	130+510	15	Station	8.00
NB-67	131+265	15	Station	-
NB-68	132+170	15	Overpass	-

Since geological/geotechnical information is not available on the routes between Mersin-Adana, Adana-Toprakkale, Bahçe-Nurdağ, the information between these routes could not be given.

Analysis was carried out to examine the water resources in the vicinity of the high standard railway route between Mersin and Gaziantep. Febas Environmental Laboratory took samples for analysis on 22.10.2020-24.10.2020 between 24.10.2020 and 30.10.2020. The results of the analysis studies and the places of coordination are given in the table below (see Table 4.77 and Table 4.78).

The photos of the sample points taken for analysis are shown below (see Figure 4.24 to Figure 4.33).

Table 4.77: Results of Surface Water Analyses Part 1

Points/ Coordinates	Point1		Point2		Point3		Point4		Point5		REGULATION ON QUALITY OF SURFACE WATER TABLE 2: Quality Criteria of Inland Surface Water Resources in Terms of General Chemical and Physicochemical Parameters According to their Classes			
	Output 1 X: 651852 Y: 4078586	Input 2 X:651684 Y:4079044	Output 3 X: 662503 Y: 4083690	Input 4 X: 662669 Y: 4084330	Output 5 X: 668717 Y:4089229	Input 6 X: 668630 Y:4089353	Output 7 X: 674553 Y:4090423	Input 8 X: 674493 Y:4090789	Output 9 X: 689750 Y:4095480	Input 10 X: 690114 Y: 4095975				
Sample Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Water Quality Degree			
Sample Taking Date/ Sample Name	22.10.2020 N-3670/20	22.10.2020 N-3671/20	22.10.2020 N-3672/20	22.10.2020 N-3673/20	22.10.2020 N-3674/20	22.10.2020 N-3675/20	22.10.2020 N-3676/20	22.10.2020 N-3677/20	23.10.2020 N- 3690/20	23.10.2020 N- 3691/20	1 (very well)	2 (good)	3 (medium)	4 (weak)
	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results				
Color	436nm: 0,0 525nm: 0,2 620nm: 0,4	436nm: 0,0 525nm: 0,2 620nm: 0,4	436nm: 0,0 525nm: 0,3 620nm: 0,4	436nm: 0,0 525nm: 0,3 620nm: 0,5	436nm: 0,0 525nm: 0,3 620nm: 0,5	436nm: 0,0 525nm: 0,3 620nm: 0,5	436nm: 0,1 525nm: 0,3 620nm: 0,5	436nm: 0,1 525nm: 0,3 620nm: 0,5	436nm: 0,0 525nm: 0,3 620nm: 0,5	436nm: 0,0 525nm: 0,3 620nm: 0,5	RES 436 nm: ≤ 1,5 RES 525 nm: ≤ 1,2 RES 620 nm: ≤ 0,8	RES 436 nm: 3 RES 525 nm: 2,4 RES 620 nm: 1,7	RES 436 nm: 4,3 RES 525 nm: 3,7 RES 620 nm: 2,5	RES 436 nm: > 4,3 RES 525 nm: >3,7 RES 620 nm: >2,5
pH	8.24	8.28	8.2	8.15	8.12	8.13	8.3	8.19	8.1	8.18	6-9	6-9	6-9	6-9
Conductivity (µS/cm)	955	956	325	316	325	327	809	810	335	336	< 400	1000	3000	> 3000
Oil-Grass (mg/L)	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 0,2	0.3	0.5	> 0,5
Dissolved Oxygen (mg/L)	7	7.11	7.14	7.2	6.9	7.03	6.45	6.1	6.7	6.58	> 8	6	3	< 3
COD (mg/L)	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 25	50	70	> 70
BOD (mg/L)	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	8	20	> 20
Ammonium Nitrogen (mg/L)	0.067	0.045	0.022	0.02	0.044	0.039	< 0,02	< 0,02	< 0,02	0.05	< 0,2	1	2	> 2
Nitrate Nitrogen (mg/L)	3.37	3.78	0.883	0.906	0.818	0.867	6.55	9.19	0.353	0.268	< 3	10	20	> 20
TKN (mg/L)	0.616	0.728	0.784	0.392	1.01	0.896	0.784	0.896	0.672	0.84	< 0,5	1.5	5	> 5
Total Nitrogen (mg/L)	4.03	4.54	1.68	1.31	1.84	1.77	7.36	10.1	1.04	1.13	< 3,5	11.5	25	> 25
Ortho Phosphate Phosphorus (mg/L)	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	0.026	0.022	0.024	0.02	< 0,05	0.16	0.65	> 0,65
Total Phosphorus (mg/L)	0.05	0.018	0.018	0.01	< 0,01	0.015	0.042	0.031	0.024	0.025	< 0,08	0.2	0.8	> 0,8
Fluoride(µg/L)	297	248	< 100	150	122	< 100	381	441	< 100	< 100	≤ 1000	1500	2000	> 2000
Mangan (µg/L)	1.41	1.18	2.14	1.48	2.88	1.73	1.93	2.18	2.27	2.32	≤ 100	500	3000	> 3000
*Selenium (µg/L)	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	≤ 10	15	20	> 20
Sulfur(µg/L)	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	≤ 2	5	10	> 10

Table 4.78: Results of Surface Water Analyses Part 2

Points/ Coordinates	Point 6		Point 7		Point 8		Point 9		Point 10		REGULATION ON QUALITY OF SURFACE WATER TABLE 2: Quality Criteria of Inland Surface Water Resources in Terms of General Chemical and Physicochemical Parameters According to their Classes			
	Output 11 X: 707829 Y: 4098237	Input 12 X: 707659 Y: 4098380	Output 13 X: 734975 Y: 4093265	Input 14 X: 7745702 Y: 4098926	Output 15 X: 260101 Y: 4112754	Input 16 X: 262150 Y: 41128497	Output 17 X: 276994 Y: 4117620	Input 18 X: 277790 Y: 4117489	Output 19 X: 309294 Y: 4116007	Input 20 X: 308480 Y: 4118151				
Sample Description	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Water Quality Degree			
Sample Taking Date/ Sample Name	23.10.2020 N-3692/20	23.10.2020 N-3693/20	23.10.2020 N-3694/20	23.10.2020 N-3695/20	24.10.2020 N-3708/20	24.10.2020 N-3709/20	24.10.2020 N-3710/20	24.10.2020 N-3711/20	24.10.2020 N-3712/20	24.10.2020 N-3713/20	1 (very well)	2 (good)	3 (medium)	4 (weak)
	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results				
Color	436nm: 0,1 525nm: 0,3 620nm: 0,5	436nm: 0,1 525nm: 0,3 620nm: 0,5	436nm: 0,1 525nm: 0,3 620nm: 0,5	436nm: 0,1 525nm: 0,3 620nm: 0,5	436nm: 0,1 525nm: 0,3 620nm: 0,5	436nm: 0,1 525nm: 0,3 620nm: 0,5	436nm: 0,1 525nm: 0,3 620nm: 0,5	436nm: 0,1 525nm: 0,3 620nm: 0,5	436nm: 0,1 525nm: 0,4 620nm: 0,5	436nm: 0,1 525nm: 0,4 620nm: 0,5	RES 436 nm: ≤ 1,5 RES 525 nm: ≤ 1,2 RES 620 nm: ≤ 0,8	RES 436 nm: 3 RES 525 nm: 2,4 RES 620 nm: 1,7	RES 436 nm: 4,3 RES 525 nm: 3,7 RES 620 nm: 2,5	RES 436 nm: > 4,3 RES 525 nm: >3,7 RES 620 nm: >2,5
pH	8.03	8.09	8.05	7.96	8.25	7.98	7.8	8.13	8.04	7.98	6-9	6-9	6-9	6-9
Conductivity (µS/cm)	338	335	454	450	627	608	536	498	625	642	< 400	1000	3000	> 3000
Oil-Grass (mg/L)	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 0,2	0.3	0.5	> 0,5
Dissolved Oxygen (mg/L)	7	7.1	6.4	6.34	6.12	6.05	6.2	6.28	6.5	6.41	> 8	6	3	< 3
COD (mg/L)	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	18.1	< 25	50	70	> 70
BOD (mg/L)	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	8	20	> 20
Ammonium Nitrogen (mg/L)	< 0,02	0.069	< 0,02	0.036	0.023	< 0,02	0.107	0.039	0.029	0.147	< 0,2	1	2	> 2
Nitrate Nitrogen (mg/L)	0.453	0.385	1.57	1.18	3.94	3.46	2.35	1.84	2.52	5.38	< 3	10	20	> 20
TKN (mg/L)	0.84	1.23	1.28	0.504	0.392	0.336	0.896	0.728	1.01	1.736	< 0,5	1.5	5	> 5
Total Nitrogen (mg/L)	1.31	1.65	2.91	1.74	4.34	3.8	3.25	2.58	3.57	7.19	< 3,5	11.5	25	> 25
Ortho Phosphate Phosphorus (mg/L)	0.009	0.005	0.037	0.046	0.024	0.044	0.037	0.026	0.069	0.045	< 0,05	0.16	0.65	> 0,65
Total Phosphorus (mg/L)	0.042	0.017	0.131	0.064	0.036	0.052	0.046	0.031	0.078	0.109	< 0,08	0.2	0.8	> 0,8
Fluoride(µg/L)	< 100	105	102	115	233	237	113	138	118	126	≤ 1000	1500	2000	> 2000
Mangan (µg/L)	1.85	2.29	2.03	1.92	1.67	2.43	2.58	1.89	1.87	2.28	≤ 100	500	3000	> 3000
*Selenium (µg/L)	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	≤ 10	15	20	> 20
Sulfur(µg/L)	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	≤ 2	5	10	> 10



Figure 4.24: Point No 1



Figure 4.25: Point No 2



Figure 4.26: Point No 3



Figure 4.27: Point No 4



Figure 4.28: Point No 5



Figure 4.29: Point No 6



Figure 4.30: Point No 7



Figure 4.31: Point No 8



Figure 4.32: Point No 9



Figure 4.33: Point No 10

4.5.5 Impact Magnitude and Sensitivity Criteria

Although Mersin-Gaziantep (Başpınar) High Standard Railway has no effect on water resources and is not expected to have an impact in the future, the short-term effects that may occur will be controlled by mitigation methods. Irrigation channels for the lands in and around the project area and the presence of Seyhan and Ceyhan rivers, which are two important rivers for the region; Water resources are of high importance because when groundwater and surface waters are polluted, it creates a mass effect, not a regional one, and the pollution cannot be removed for a long time. Although it is high magnitude, the impact is insignificant, as the project is not expected to affect water resources.

4.5.6 Impact Assessment

4.5.6.1 Construction Phase

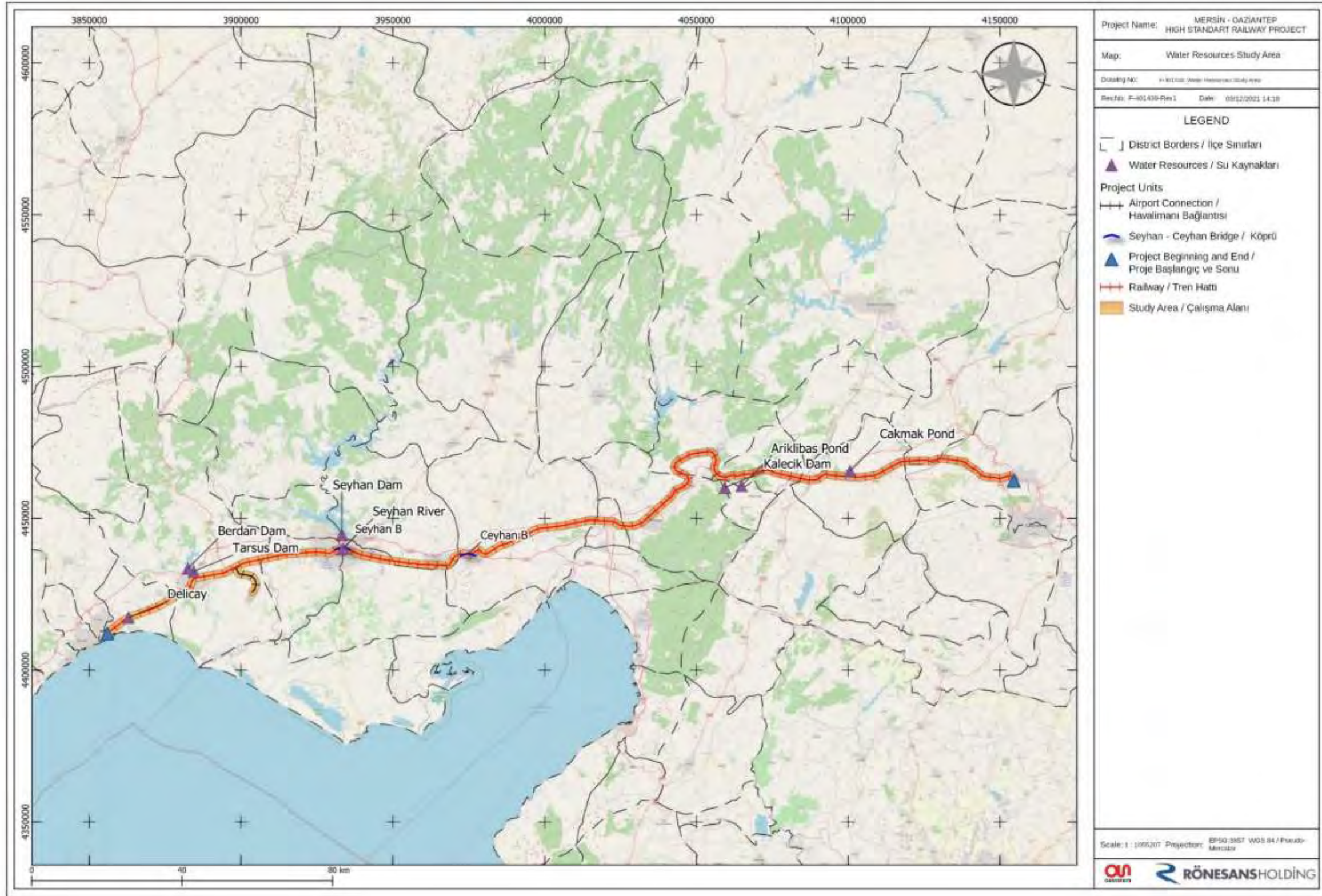
During the construction period when the existing route is rehabilitated and new lines are added in certain sections and excavation-filling operations are carried out, the water resources given in the above sections and its immediate surroundings are passed. In order to see whether the planned project will be affected by the works to be carried out during the construction period, it has been ensured that the impact is observed by drilling works and surface water analysis.

Water resources close to the project area are given in the table below (see Table 4.79). Apart from the water resources given in the table, the railway passes over the many land irrigation channel. The analyses of the water resources deemed necessary over the route of the railway and the results are given in the Table 4.77 and Table 4.78 is provided with the coordinates.

Table 4.79: Water Resources Close to the Project Area

City Name	Water Sources Name	Coordinates		Distance*(km)
		Latitude	Longitude	
Mersin	Deliçay	36.843679	34.701161	Passing Over
Mersin	Tarsus Dam	36.952751	34.894161	Passing Over
Adana	Seyhan River	37.006490	35.335496	Passing Over
Gaziantep	Çakmak Pond	37.189487	36.836399	1.19
Osmaniye	Kalecik Dam	37.150772	36.465821	2.65
Osmaniye	Arıklıkış Pond	37.154842	36.515075	2.72
Mersin	Berdan Dam	36.960154	34.877341	3.17
Adana	Seyhan Dam	37.039873	35.331940	3.56

* Distance between the city and water sources

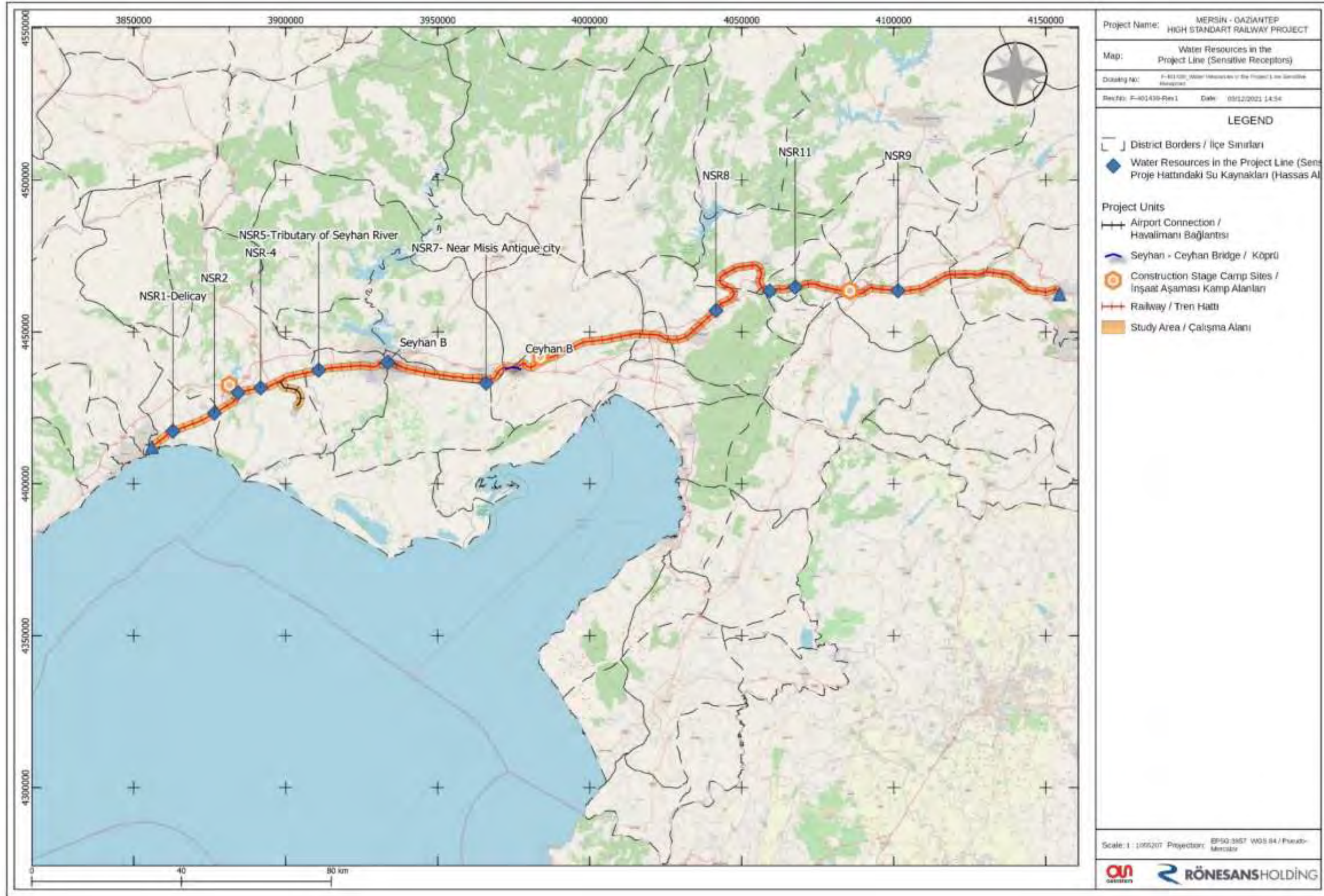


Map 4.6: Water Resources Close to the Project Area

The water resources that the project line passes through and which we can call sensitive receptors are given below (see Table 4.80 and Map 4.7).

Table 4.80: Water Resources in the Project Line (Sensitive Receptors)

City Name	Water Sources Name	Coordinates	
		Latitude	Longitude
Mersin	NSR1-Deliçay	36.843679	34.701161
Mersin	NSR2	36.886077	34.823643
Mersin	NSR3-Near Tarsus Fall	36.934622	34.893570
Adana	NSR-4	36.945900	34.960179
Adana	NSR5-Tributary of Seyhan River	36.987721	35.131715
Adana	NSR6-Seyhan River	37.006490	35.335496
Adana	NSR7- Near Misis Antique city	36.957346	35.626458
Osmaniye	NSR8	37.128418	36.305761
Osmaniye	NSR9	37.175164	36.843587
Osmaniye	NSR10	37.174403	36.464463
Osmaniye	NSR11	37.183569	36.539845



Map 4.7: Water Resources in the Project Line (Sensitive Receptors)

During the drilling works, there were places where groundwater at different depths was found and sections where groundwater was not available. In the drilling work between Toprakkale-Bahçe, groundwater at the closest level of 3.30 m to the surface and the closest 0.10 m level groundwater in the section between Nurdağ-Başpınar were found. The results of the drilling works are shown in Table 4.75 and Table 4.76.

It is not expected that any underground water resources will be damaged by paying attention to these depths in the construction works such as infrastructure, superstructure, and station other than tunnels to be made in both sections. Apart from this, no negative effects are expected since there will be no production or work with a hazardous substance that will pollute the groundwater and those working in temporarily established construction sites will not use the groundwater. The sewage system, which is a factor with low potential to contaminate groundwater, is not expected to affect it because it is an impermeable system.

As it can be seen from the analyzes determined by the inlet and outlet points of surface waters, it has been observed that the water quality values are mostly very good and good according to the National Regulation (Regulation on Quality of Surface Water) water quality value, scaled from very good to bad. It is not expected to affect surface waters by paying attention to the analysis values during the Project construction process. According to the analysis results, it is not expected to have a negative impact on irrigation channels and water resources specified in Table 4.80 during the construction period of the project.

4.5.6.2 Operation, Longer Term and Permanent Effects

In the construction and operation phases of the project, no surface water resource will be used. The high standard train will be operated once the construction period is over, providing that there will be no probability of hazardous and chemical substance transport. Along the route, no negative impact is expected on the given water resources as no water resource will be utilized except the stations.

4.5.7 Cumulative Impact Assessment

Municipal water needed by the personnel who works in the scope of the Project will be provided from city infrastructure. Necessary procedures and permissions will be obtained for connection to the infrastructure system. Drinking water will be met from the market. Information about the current water usage, including Mersin, Adana, Osmaniye and Gaziantep below, was obtained from TURKSTAT, and the water load and the water load due to the project were calculated and compared.

TURKSTAT 2018 (the most recent year given) daily water withdrawal per person (kg/person-day);

Mersin Province: 227 L/person-day

Adana Province: 222 L/person-day

Osmaniye Province: 173 L/person-day

Gaziantep Province: 224 L/person-day

TURKSTAT 2019-year Population Information;

Mersin Province: 1,840,425 people

Adana Province: 2,237,940 people

Osmaniye Province: 416,335 people

Gaziantep Province: 2,069,364 people

Mersin daily water consumption: L/day	1,840,425 person x 227 L/person-day: 417,776,475
Adana daily water consumption: L/day	2,237,940 person x 222 L/person-day: 496,822,680
Osmaniye daily water consumption:	416,335 person x 173 L/person-day: 72,025,955 L/day
Gaziantep daily water consumption: L/day	2,069,364 person x 224 L/person-day: 463,537,536
Total daily water consumption in 4 cities:	1,450,162,646 L/day

385 people will work for this project. Total water consumption for 4 cities according to TURKSTAT data 846 L/person-day.

Total daily water consumption for project: L/day	849 L/person-day X 385 person: 326,865
Water consumption load increase due to project:	$326,865 / 1,429,743,959 \times 100: 0.023\%$

According to the above calculated water load increase, the project will increase the current water load by 0.023%. An increase in this amount indicates that the cumulative effect of the project on the resource from which both drinking water and the water usage needed by the personnel will be provided is negligible.

The water to be used for irrigation of the wastes that will create dust and the roads that will cause dust during the construction process with the sprinkler will be supplied from the source indicated by the relevant municipality.

4.5.8 Summary of Residual Impacts, Significance Criteria and Overall Impact Significance

The impact of the High Standard Train Project that is planned to be constructed between Mersin-Gaziantep (Başpınar) on the water resources has been examined. The high standard train railway line has been separated into 5 lines: Mersin-Adana, Adana-Toprakkale, Toprakkale-Bahçe, Bahçe-Nurdağ and Nurdağ-Başpınar, respectively. Different operations are planned to be carried out in each line. However, in general, infrastructure, superstructure, electrification, and signalization processes are planned to be carried out excluding the tunnels.

In the line with the planning, field studies and analyzes have been carried out in order to examine the groundwaters and surface waters for monitoring objectives and as a result of the analysis of water resources which are of high importance, it has been seen that the project will not have a negative impact on the water resources. Mitigation measures will be applied in case of any negative impact.

4.5.9 Mitigation Measures

The project is not expected to have an impact on water resources, but the following measures will be taken in case of a risk;

- When deemed necessary, establishment of the Water Resources Management Plan thus, the reduction of the negative impacts on the water resources,
- Monitoring of the impact by having water resources analyzed periodically,

- Improving the sewage system at the stations.

The mitigation measures planned to be implemented within the scope of the project are given in the ESMMP prepared for the project.

4.5.9.1 Assumptions and/or Limitations

The studies in this section, which examines the effects on water resources, have been prepared in line with the information of the field visits, analyses and the geological/geotechnical reports prepared because of the drilling works carried out in 2012/20015.

4.6 Greenhouse Gases (GHG)

4.6.1 Introduction

Greenhouse gases trap heat into the atmosphere. Human activities are responsible for almost all of the greenhouse gas increase in the atmosphere in the last 150 years. The biggest source of greenhouse gas emissions is the burning of fossil fuels for heat and transport.

The global warming problem has emerged due to activities such as greenhouse gases, fossil fuel use, manufacturing sectors, and driving. Increase in greenhouse gas emissions is seen as an expected result by disrupting the global carbon balance with the increase in human activities. The gases causing greenhouse gas generation given in the Kyoto Protocol are as follows [29];

Carbon dioxide (CO₂): Carbon dioxide enters the atmosphere because of chemical reactions from the burning of fossil fuels (coal, natural gas and petroleum), solid wastes, trees and combustion of other biological materials and chemical reactions from specific production activities. Carbon dioxide is removed from the atmosphere when absorbed by the plants as a part of biological carbon cycle.

Methane (CH₄): Methane gas yields during the transport of coal, natural gas and petroleum production as well as farming and other agricultural applications, it also originates from the decay of organic wastes in municipal solid waste landfills.

Nitrous oxide (N₂O): Nitrous oxide forms during the combustion of solid wastes and fossil fuels and during the agricultural and industrial activities. Globally, 40% of the total nitrous oxide emissions are anthropogenic.

Fluorinated gases: Fluorinated gases: Hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and nitrogen trifluoride are synthetic, powerful greenhouse gases released from various industrial processes [29]

The figure below shows the percentage distribution of greenhouse gases released by the EPA and the interaction between the increase of greenhouse gases and climate change (see Figure 4.34 and Figure 4.35).

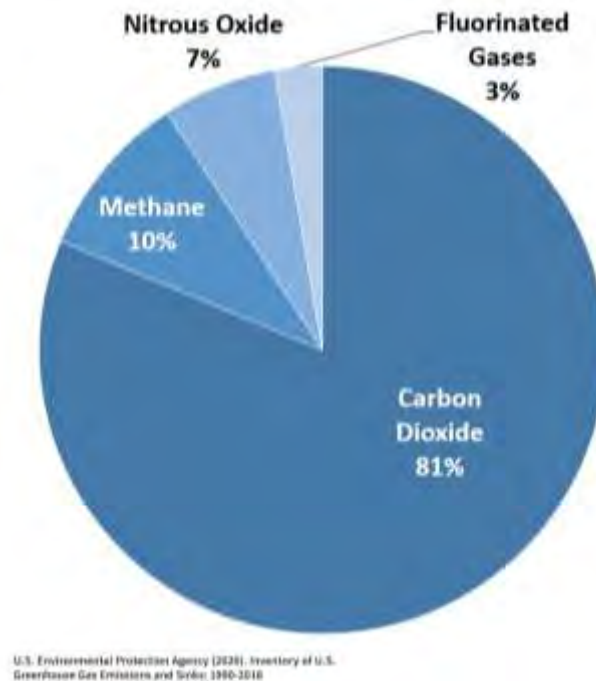
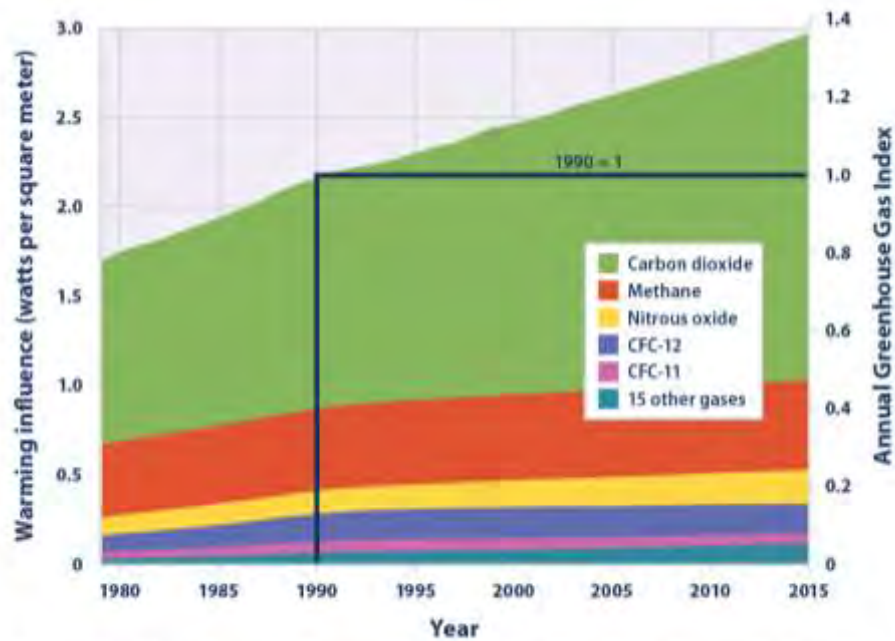


Figure 4.34: Percentage Distribution of Greenhouse Gases, 2018 [29]



Data source: NOAA (National Oceanic and Atmospheric Administration), 2016. The NOAA Annual Greenhouse Gas Index. Accessed June 2016: www.esrl.noaa.gov/gmd/aggi/

Figure 4.35: The Relationship between Greenhouse Gases and Climate Change [29]

According to the data provided by EPA, the effect of GHGs to climate change depends upon three factors, which are;

- The concentration in the atmosphere,
- Duration of stay in the atmosphere and
- The power to affect the atmosphere.

The World Resources Institute (WRI) is a global research organization that turns big ideas into action at the junction of the environment, economic opportunities and human well-being, and the World Business Council for Sustainable Development (WBCSD) is an organization that works to accelerate the transition to a sustainable world. They prepared a Greenhouse Gas Protocol where greenhouse gas scopes are examined in three groups. The definitions adopted by the WBCSD/WRI Greenhouse Gas Protocol, the first group is "Scope 1" that emits greenhouse gases directly to the atmosphere from the facility or works under the responsibility of the facility, the second group is "Scope 2" that 'indirect' greenhouse gas emissions from sources owned or controlled by another company, as well as emissions from the grid electricity used and last group is other greenhouse gas emissions occurring in a wider area in a chain is called "Scope 3".

In line with the information given about greenhouse gas and climate change, the use of the high standard railway in this project, instead of using vehicles, will have a positive effect in terms of the damage to the atmosphere caused by greenhouse gas emissions. The use of high standard trains has a very low potential as a negative impact on greenhouse gas emissions released into the atmosphere.

The 286 km long, route line between Mersin-Gaziantep is likely to create effect on GHG emissions due to the fuel consumption of vehicles and equipment to be used for excavation operations during the construction period.

This section includes the evaluation of the greenhouse gas emissions that may occur during the construction phase of the planned High Standard Train Project with the positive and negative aspects and determining the impacts to minimize the possible risks.

4.6.2 Policies, Legal Framework and Guidelines

4.6.2.1 National Legislation

Regulation on Monitoring of Greenhouse Gas Emissions

The Regulation on Tracking of Greenhouse Gas Emissions aims to regulate the procedures and principles for monitoring, reporting, and verifying greenhouse gas emissions arising from the activities in the list where the facilities are categorized according to their activities.

The procedure for monitoring, reporting and verifying the greenhouse gas emissions arising from the activities included in the above-mentioned list in terms of content given in Annex 1 of the Regulation on Tracking of Greenhouse Gas Emissions (generally production and combustion processes activities) and the procedure for determining the responsibilities of verifying institutions and enterprises and covers the essentials.

According to this regulation, greenhouse gas emission, which absorb and re-emit infrared radiation can be both natural and human-sourced and specified in the list in Annex-2 (Carbon Dioxide (CO₂), Methane (CH₄), Nitrous Oxide (N₂O), Hydrofluorocarbons. (HFCs), Perfluorocarbons (PFCs), Sulfur Hexafluoride (SF₆)) refers to gases and other gas-like atmospheric components.

4.6.2.2 International Guidelines

European Bank for Reconstruction and Development (EBRD)

The EBRD emphasizes that it is important to determine the future greenhouse gas impact of the project, as it is aware that the projects financed by EBRD will result in significant increases or decreases in emissions. In this context, EBRD has carried out a protocol study named Protocol for Assessment of Greenhouse Gas Emissions. EBRD's main objectives regarding greenhouse gas emissions are as follows;

- Estimating the GHG impact values of the projects that are awarded each year
- Seeing wider climate change mitigation benefits.

The EBRD has prepared a protocol methodology for the assessment of greenhouse gas emissions with different approaches and basic principles to achieve greenhouse gas targets. All direct investment projects are scanned in the review phase of the project evaluation and categorized according to the type of evaluation needed.

Since November 2014, the Bank's Environmental and Social Policy (ESP) has obliged customers to provide and report the data required for the greenhouse gas assessment of projects whose emissions are expected to exceed 25,000 tons of CO₂ per year. Projects that are expected to cause a change in positive or negative emissions by more than 25,000 tons of CO₂ per year are subject to a prior greenhouse gas assessment in accordance with this protocol. Projects that are expected to reduce greenhouse gas emissions by less than 25,000 tons of CO₂ per year may also be subject to a greenhouse gas assessment, although it is not necessary.

EBRD adopts WBCSD/WRI Greenhouse Gas Protocol Scope 1, Scope 2, and Scope 3 as an approach. Scope 1 represents greenhouse gas emissions from direct plant activity, Scope 2 represents greenhouse gas emissions from electricity use, and Scope 3 represents other greenhouse gas emissions that occur in a broader cascade.

Apart from the Greenhouse Gas Emission Protocol, greenhouse gas recommendations in EBRD Resource Efficiency and Pollution Prevention and Control Performance Requirement 3 will also be taken into consideration. According to Performance Requirement 3 (PG3), the environmental and social evaluation process and alternatives of the projects will be examined and technically and financially feasible and cost-effective options will be evaluated to prevent or minimize the greenhouse gas (GHG) emissions related to the project during the design and operation of the project.

Intergovernmental Panel on Climate Change (IPCC)

The Intergovernmental Panel on Climate Change (IPCC) is a panel that publishes reports on climate change and greenhouse gases, stating the situation at certain times and revealing the risks. According to the IPCC, the continuous release of GHGs increases the likelihood of the severe, common and irreversible effects causing more heating in all components of climate change and causing long term alterations. The limitation of the climate change will require significant and continuous declines in the GHG emissions that is likely to limit the climate change risks along with the adaptation.

Cumulative CO₂ emissions determine the global average surface heating on a great extent in the late 21st century and beyond. Estimate of GHG emissions varies depending upon the socioeconomic development and climate policy on a wide range [12].

When calculating the non- CO₂ GHGs, they are calculated in terms of "CO₂ equivalent" (CO₂-e) according to their contribution to increase the greenhouse effect. CO₂ equivalent of a gas is calculated using an index so-called Global Warming Potential (GWP). GWP values continued by updating in successive IPCC reports. The most recently updated GWP values given in the IPCC Fifth Synthesis Report (AR5) are as follows (see Table 4.81).

Table 4.81: IPCC Global Warming Potential Values

Formula	Name	Lifetime (yr)	GWP	
			Cumulative forcing over 20 years	Cumulative forcing over 100 years
CO ₂	Carbon dioxide	*	1	1
CH ₄	Methane	12.4	84	28
N ₂ O	Nitrous oxide	121	264	265
CF ₄	Sulfur hexafluoride	50,000	4880	6630
HFC-152a	Hydrofluorocarbon-152a	1.5	506	138

*No single lifetime can be given for CO₂

World Bank (WB)

In line with greenhouse gas and climate studies, World Bank (WB) developed a methodology, aims to enhance access to the GHG analysis, information, capacity and additional climate finance. Developing this methodology, present UNFCCC methodologies, IPCC International GHG Inventory guidelines, GEF and CDM/JI methodological frameworks, GHG Protocol Initiative Standards World Bank Environmental Department documents and methodologies applied by other international finance institutions have been utilized.

In the transportation sector, The Transport Emission Assessment Models for Projects, or Transport Emission Assessment Models (TEEMP) for projects, based on review and testing, were found to be most in line with the guidelines for this exercise.

TEEMP modules allows GHG emission estimate of roads and highways (i.e., highways, urban and rural roads), general transport (i.e., subway, light rail system, fast bus crossing, improving of crosswalk, sharing of bicycles and bicycle roads) and train projects.

For the purposes of greenhouse gas analysis of projects that are not linked to any particular climate finance mechanism, methodologies should be provided. For reliability, the analysis must be transparent with clarity about the parameters used and the assumptions made and aligned with the approaches tested. Applicability may differ according to each project.

The World Bank has separated scopes as scope 1, scope 2 and scope 3 in the methodology it has created, as in other greenhouse gas related standards. In the figure below, scopes are given in schematic form (see Figure 4.36).



Figure 4.36: WB Project Boundary and Scope for Transport Sector Projects

4.6.3 Extend of Study Area

4.6.3.1 Temporal Extend

During the construction period, construction machinery and equipment will be used in excavation and filling processes for infrastructure and superstructure operations. Considering that the excavation to be made for the construction period will cover an area of 1000 m in total of 500 m from the right and left of the railway, the area of 1000 m for the construction period was selected as the working area and the greenhouse gas emission from this area was evaluated.

Since the impact area of the railway will be settlements during the operational period, the working areas are the residential areas in the region.

4.6.4 Identification of Baseline Conditions

4.6.4.1 Desk Studies

GHG emissions are expected along the Mersin-Gaziantep (Başpınar) High Standard Railway route, arising from the construction and operation periods. The amount of CO₂ that will be released into the air because of the fuel consumption of vehicles and vehicles planned to be used for construction works along the 286 km line will affect the greenhouse gas emission.

Along the High Standard train project route, there is an existing highway parallel to the right and left of the railway. For the High Standard Train Project, which is surrounded by both intercity and inner-city roads, vehicle intensity reduction is planned by means of reducing the vehicle use for the passengers who would like to travel.

The amount of emissions that will be caused by the fuel consumption of these vehicles is 195663.345 metric tCO₂-e. The calculation of the amount of emissions caused by fuel consumption is given below.

During the operation phase, electricity consumption caused by the use of trains will occur. The High Standard Train Project, which is given the electrification plan below, has an annual electricity use of and the emission because of calculating greenhouse gas emissions based on this electricity consumption is 141,280,877 tCO₂-e. As a result, the total amount of greenhouse gas emissions that will result from the construction and operation stages of the High Standard train project is 141,479,540.345 tCO₂-e. Operation period GHG emission calculation and total calculations are given below.

4.6.5 Impact Magnitude and Sensitivity Criteria

According to the EBRD methodology for evaluating GHG emissions, the impact size of annual greenhouse gas emissions can be categorized as follows;

- Negligible (no GHG assessment necessary)
- Low (< 20 kt CO₂-equivalent per year)
- Medium-Low (20 – 100 kt CO₂/yr)
- Medium-High (100 kt – 1 Mt CO₂/yr)
- High (>1 Mt CO₂/yr)

The environment affected by greenhouse gases and considered as sensitive receptors and having national or international importance is the environment, we call it ecosystem. The sensitivity level of the ecosystem also includes high sensitivity. According to the impact size scale given above, the High Standard Train Project is in the medium-high impact size with a CO₂-e emission of 195.663345 metric kilotons.

4.6.6 Impact Assessment

4.6.6.1 Construction Phase

Because of the works to be carried out during the construction period on the Mersin-Gaziantep (Başpınar) railway route, Scope 1 is the amount of greenhouse gas emissions that will occur according to the GHG emissions caused by the direct project and it is measured as 195663.345 metric tCO₂-e. In this context, according to the EBRD and IPCC assessments, the negative impact of the greenhouse gas, which will be released during the construction period, is expected to be negligible.

Greenhouse gas emission of vehicles passing through the existing highway are higher than the public transportation alternatives. The fact that the amount of CO₂-e arising from the project is lower and negligible than the total amount of greenhouse gases released from the existing highway can be considered as an advantage of project construction.

The comparison of the total amount of greenhouse gas emissions from the project and the amount of greenhouse gas from the current road, fuel emission data of the construction phase by each line and machinery as well as emission factors are given in the tables below (see Table 4.82, Table 4.83 and Table 4.84).

Table 4.82: GHG Emission in Terms of CO₂-e and Fuel Data of Each Line

Lines	Scope	Type of Activity Data	Activity Data			GHG Emissions
			Vehicle Type	Fuel Amount	Unit of Fuel Amount	Total GHG Emissions (metric tons CO ₂ -e)
Adana-Mersin	Scope 1	Fuel Use	Construction Equipment-Diesel Fuel	23,827,889.52	Liters	63,771.225
Adana-Toprakkale	Scope 1	Fuel Use	Construction Equipment-Diesel Fuel	13,301,417.80	Liters	35,598.944
Toprakkale-Bahçe	Scope 1	Fuel Use	Construction Equipment-Diesel Fuel	27,602,092.36	Liters	73,872.227

Lines	Scope	Type of Activity Data	Activity Data			GHG Emissions
			Vehicle Type	Fuel Amount	Unit of Fuel Amount	Total GHG Emissions (metric tons CO ₂ -e)
Bahçe-Nurdağ	Scope 1	Fuel Use	Construction Equipment-Diesel Fuel	2,726,681.94	Liters	7,297.493
Nurdağ-Başpınar	Scope 1	Fuel Use	Construction Equipment-Diesel Fuel	5,650,824.96	Liters	15,123.456
TOTAL	-	-	-	73,108,906.58	Liters	195,663.345

Table 4.83: GHG Emission in Terms of CO₂-e and Fuel Data of Each Work Item

Work Item	Scope	Type of Activity Data	Activity Data			GHG Emissions
			Vehicle Type	Fuel Amount	Unit of Fuel Amount	Total GHG Emissions (metric tons CO ₂ -e)
Construction Works	Scope 1	Fuel Use	Construction Equipment-Diesel Fuel	71,625,840.13	Liters	191,694.174
Soil Works	Scope 1	Fuel Use	Construction Equipment-Diesel Fuel	47,614,595.13	Liters	127,432.229
Art Structures	Scope 1	Fuel Use	Construction Equipment-Diesel Fuel	14,86,856.46	Liters	3,979.314
Tunnels	Scope 1	Fuel Use	Construction Equipment-Diesel Fuel	11,469,34.24	Liters	3,069.571
Slope Supporting	Scope 1	Fuel Use	Construction Equipment-Diesel Fuel	971,505.06	Liters	2,600.065
Road Superstructure	Scope 1	Fuel Use	Construction Equipment-Diesel Fuel	875,689.30	Liters	2,343.631
Soil Improvement	Scope 1	Fuel Use	Construction Equipment-Diesel Fuel	33,811.65	Liters	90.491
Railway Superstructure	Scope 1	Fuel Use	Construction Equipment-Diesel Fuel	19,496,448.29	Liters	52,178.872
Electromechanical Works	Scope 1	Fuel Use	Construction Equipment-Diesel Fuel	1,483,066.45	Liters	3,969.171
TOTAL	-	-	-	73,108,906.58	Liters	195,663.345

Table 4.84: GHG Emission Factors for Diesel Fuel Consumed by the Project Machinery

Item	Value/Amount	Units
Annual Diesel Volume Use	73,108,906.58	Liters
Density of Diesel Oil	0.832	kg/L
Diesel Emissions Factor (CO ₂ -e)	3,198	g/kg fuel
Annual GHG Emissions (Rounded)	195,663.345	tCO ₂ -e

4.6.6.2 Operation, Longer Term and Permanent Effects

The High Standard Train Project that will be operated with the termination of the construction period will require an electricity consumption. There is an electricity consumption in both lines and stations. The annual planned electricity use is and calculated GHG emission amount with this value is 141,280,877 tCO₂-e (see. Table 4.85) In comparison with the existing highway, much lower GHG emission occurs and no significant effect is expected in global environment.

Table 4.85: GHG Emission for Operation Period

Item	Value/Amount	Units	Source
Number of Passengers per Trip	322	Person	https://www.turisas.gov.tr/milli-elektrikli-tren-seti
Number of Trip per Day	10 (Two Way)	Trip	Assumption
Number of Passengers per Year	322 x 10 x 365 = 1 175 300	Person	Calculation
Number of Trip per Year (Distance Travelled)	286 x 10 x 365 = 1 043 900	km	Calculation
Annual GHG Emissions (Rounded)	141 280 877	tCO ₂ -e	Calculation

Source : Mobile Combustion GHG Emissions Calculation Tool Version 2.6

4.6.7 Cumulative Impact Assessment

Because of global impact of green gas emissions, instead of assessing regional cumulative effects, a comprehensive cumulative effect should be made like based on Turkey.

Amount greenhouse gas emissions of Turkey is 520.9 million tons (Mt) CO₂-e, which is most recent data calculated in 2018, according to 31 March 2020 TURKSTAT Greenhouse Gases Emissions Statistics source data. In this section, the amount of greenhouse gas emissions that will be caused by the High Standard Train Project is 141,479,540.345 tCO₂-e. From industry, vehicles, production, etc.in Turkey, it is not at the level of impact that will have a cumulative effect on the amount of greenhouse gas emissions caused by activities.

4.6.8 Summary of Residual Impacts, Significance Criteria and Overall Impact Significance

Although the amount of greenhouse gas emission caused by the project is advantageous and low compared to the greenhouse gas emission to be caused by the existing highway, it is possible to apply the prevention and mitigation methods for potential risks that may occur in the future, even if reduction methods are not required.

4.6.9 Mitigation Measures

Greenhouse gases will be given directly to the ecosystem from the construction period works to be carried out between Mersin and Gaziantep (Başpınar) as it is specified in the headings above, and a total amount of 141,280.887 tCO₂-e will be emitted. Although this emission amount has an advantage of being lower than the emission amount generated by the existing highway, mitigation measures are taken in order not to pose a risk in the future;

- Minimizing the transport distances for materials in excavation works during the construction period,
- Programming vehicle and equipment movements to minimize the waiting time and the distances traveled,
- Minimization of land clearance works during the construction phase as much as possible,
- Regular maintenance of used vehicles and equipment,
- Restricting the use of extra tools by well organizing excavation and filling works,
- Keeping regular greenhouse gas emission calculation records for greenhouse gas emissions resulting from electricity use for the operating period,
- Providing training to employees both during the construction and operation period, when necessary.

The mitigation measures planned to be implemented within the scope of the project are given in the ESMMP prepared for the project.

4.6.10 Assumptions and/or Limitations

In this section, which was evaluated for the High Standard Train Project between Mersin-Gaziantep (Başpınar), GHG emissions were calculated and interpreted. The evaluation work is based on the calculation results made by the contractor with the vehicle and fuel Information reported to us and other Information provided about the project. The calculation results were interpreted based on reports published by the EBRD and the IPCC as the GHG protocol.

4.7 Climate Change

4.7.1 Introduction

The main cause of climate change is the increase in greenhouse gases. The atmosphere reflects about half of the incoming sun rays from the earth. This back reflection also plays an important role in greenhouse gases known as carbon dioxide, methane, ozone, nitrous oxide, water vapor. Thus, the world reaches the average temperature, 15 °C where living things can live. In the absence of greenhouse gases, this temperature is expected to be -18 °C.

In 1750, due to the industrial revolution and the use of fossil fuels, the greenhouse gas effect increased by 40% due to the increased concentration of carbon dioxide and other mentioned gases in the atmosphere. It increased from 280 ppm to 394 ppm and continues to rise. Another important reason is the reduction in forest areas with the effect of urbanization.

Other effects that occur with temperature as a result of climate change are the frequency of weather events such as droughts, floods, hurricanes, rises in water levels, increase in the amount of acid in the oceans, and melting in glaciers. (General Directorate of Meteorology , 2021)

In this part of the project report, the impact of the Mersin-Gaziantep High Standard Train Project on climate change and the impact of climate change on the Project have been evaluated in detail through desk and field studies.

4.7.2 Policy, Legal Framework and Guidelines

The national and international legislation on climate change is quite comprehensive. Most of the topics that have been covered in this ESIA report and climate change issue are integral part of each other. The relevant national legislation is provided below.

4.7.2.1 National Legislation

Regulation on Control of Industrial Air Pollution

The purpose and scope of the Regulation on Control of Industrial Air Pollution official gazette dated 03.07.2009 and numbered 27277 was mentioned earlier in Section 4.6.2 with the target values for the proper management of emissions from pollutant sources and activities.

Regulation on Assessment and Management of Air Quality

The purpose and scope of the Regulation on Assessment and Management of Air Quality official gazette dated 06.06.2008 and numbered 26898 was mentioned earlier in Section 4.6.2 with the target values for the protection and proper management of regional air quality.

Regulation on Monitoring of Greenhouse Gas Emissions

The purpose and scope of the Regulation on Monitoring of Greenhouse Gas Emissions official gazette dated 25.04.2012 and numbered 28274 was mentioned earlier in Section 4.6.2.

Communique on Monitoring and Reporting of Greenhouse Gases

The purpose and scope of the Communique on Monitoring and Reporting of Greenhouse Gases official gazette dated 22.07.2014 and numbered 29068 was mentioned earlier in Section 4.6.2.

Regulation of Control of Flood and Sedimentation

The purpose of this Regulation official gazette dated 03.05.2019 and numbered 30763 is to set the basic hydraulic design criteria of engineering structures designed for flood and sediment control and engineering structures such as bridges and culverts over rivers, the arrangements to be made on riverbeds and their contiguous areas, and the necessary permits and approval procedures for other works, interventions to riverbeds and flood control facilities. and the measures to be taken and the determination of the site delivery issues before improvement.

Regulation on Preparation, Implementation and Monitoring of Flood Management Plans

The purpose of this Regulation official gazette dated 12.05.2016 and numbered 29710 is to regulate the procedures and principles to reduce the negative effects of floods on human health, soil, environment, natural assets, natural protected areas, special environmental protection zones, cultural heritage, social and economic activities as well as the evaluation of flood risks at the basin scale and the preparation,

implementation, and monitoring of flood management plans. This Regulation covers procedures and principles regarding the preparation, implementation, and monitoring of flood management plans.

4.7.2.2 International Legislation

Paris Convention

The Paris Agreement is the legally binding international treaty on climate change within the UNFCCC on climate change mitigation, adaptation, and finance. The convention is adopted by 196 parties. It was signed on 12 December 2015 and entered into force on 4 November 2016. The objective of the convention is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent human-induced interference with the climate. The convention's long-term goal is that to sustain the global average temperature below 2 degrees Celsius and further pursuance of 1.5 degrees Celsius. Emissions should be reduced as soon as possible to achieve the balance between human-induced emissions by sources and removal of them by greenhouse gas sinks. Under the Paris Agreement, each country must do plans and programs on mitigation of global warming.

Intergovernmental Panel on Climate Change (IPCC)

The IPCC is the intergovernmental body of the United Nations devoted to providing information regarding the scientific basis risks of climate change impacts driven by the human interference. IPCC covers the scientific and socioeconomical information regarding the human interference on climate change with its natural, political, and economical aspects and risks and suggest adaptation and offset strategies, by assessing the published literature and making it internationally accessible. In Section 4.6.2, IPCC was mentioned in detail. The purpose, scope, and calculation methodologies of the amounts of GHGs emitted was covered in the panel description.

Kyoto Protocol

The Kyoto Protocol is an international treaty which extended the 1992 United Nations Framework Convention on Climate Change (UNFCCC) that obligates state parties to reduce greenhouse gas emissions, based on the scientific agreement that (part one) global warming is occurring and (part two) that human-made CO₂ emissions are driving it. The Protocol was adopted in Kyoto, Japan, on 11 December 1997 and entered into force on 16 February 2005. There were 192 parties to the Protocol in 2020. The Kyoto Protocol implemented the objective of the UNFCCC to reduce the global warming by reducing greenhouse gas concentrations in the atmosphere to "a level that would prevent dangerous human caused intrusion with the climate system". The Kyoto Protocol applied to the six greenhouse gases. Carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆).

The United Nations Framework Convention on Climate Change (UNFCCC)

UNFCCC is the international environmental treaty on climate change and adopted by 154 nations. It aims to stabilize the greenhouse gas concentrations up to a tolerable level that would prevent the human-induced climate threats to the ecosystem. The safety level can only be achieved within a timeframe that allows the climate adaptation and resilience. In this way, production is not threatened, and economic development will not be impeded according to the UNFCCC provisions.

European Bank for Reconstruction and Development (EBRD)

The main objectives of EBRD on greenhouse gases are to determine the future greenhouse gas impact of the projects. The protocol methodology, the greenhouse gas reduction targets and other greenhouse gas recommendations of EBRD was mentioned earlier in Section 4.6.2.

International Finance Corporation/World Bank (IFC/WB)

In parallel with the greenhouse gas and climate studies, IFC/WB developed a methodology, aims to enhance the access to GHG analysis and information, capacity, and climate financing. The methodologies, guidelines, assessment models and greenhouse gas analysis criteria of the IFC/WB was mentioned earlier in Section 4.6.2 in more detail.

4.7.3 Extend of The Study Area

4.7.3.1 Spatial Extend

The possible consequences of climate change may be at the level of continents, countries and regions, as well as geographically smaller settlements that have not developed resistance to climate change. The 286 km line passes through regions with various meteorological and climatic conditions. For this reason, since it would not be a reasonable approach to determine a sharp geographical boundary in the assessment of the line's resistance to climate change and the potential risk of the Project against climate change, regional risks that have not been studied over net geographical boundaries were evaluated.

4.7.3.2 Temporal Extend

Regarding the impact of the Project on climate change, there will be greenhouse gas emissions during the production and transportation stages of the materials to be used for the Project. These emissions will be limited to the production and construction phase. During the operation phase, there is an environmental impact during the supply of the electrical energy required for the operation of The High-Standard Railway Project, and this impact has been evaluated in the greenhouse gas emission Section 4.6.

As for the impact of climate change on the Project, although there is no continuous impact, there are risks such as forest fires that may occur as a result of drought, unusual temperature changes, rise in sea level and instantaneous floods and floods in the process from the construction phase to the closure of the project.

4.7.4 Identification of Baseline Conditions

4.7.4.1 Desk Study

Existing Meteorological Conditions

Mersin, Adana and Osmaniye are located in the eastern Mediterranean region and Gaziantep is located in the Southeastern Anatolia Region. The Eastern Mediterranean Basin has a Mediterranean climate in general, with hot and dry summers and mild and rainy winters. According to the Regional Climate Change Action Plans prepared by the Ministry of Environment and Urbanization, the temperature increases the most in the Mediterranean Region. The number of hot days and nights has increased by 15 days in 100 years and the summer temperature is expected to increase by 6 °C by 2070. (Rossetti, n.d.) The general statistical temperature data of the General Directorate of Meteorology for the provinces on the route where the Project route passes are given in the table below. (See Table 4.86, Table 4.87, Table 4.88 and Table 4.89)

Table 4.86: General Temperature Statistics for Mersin Province (1940-2020)

	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Average Temperature (°C)	10.2	11.1	13.8	17.5	21.3	25.0	27.8	28.3	25.8	21.5	16.2	11.9	19.2
Average Maximum Temperature (°C)	14.6	15.5	18.1	21.6	25.0	28.2	30.8	31.6	30.1	26.7	21.6	16.5	23.4
Average Minimum Temperature (°C)	6.3	6.9	9.2	12.9	16.9	20.9	24.0	24.3	21.0	16.3	11.6	7.9	14.8
Average Sunbathing Time (hours)	4.8	5.6	6.8	7.6	8.5	9.8	10.0	9.9	9.1	7.6	5.8	4.7	7.5
The Highest Temperature (°C)	25.2	26.5	29.8	34.7	36.0	40.0	38.1	39.8	41.5	37.5	31.0	27.0	41.5
The Lowest Temperature (°C)	-6.3	-6.6	-2.2	0.6	7.0	12.0	16.1	15.0	11.0	2.7	-3.3	-3.0	-6.6

Table 4.87: General Temperature Statistics for Adana Province (Temperature) (1929-2020)

	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Average Temperature (°C)	9.5	10.5	13.4	17.5	21.8	25.6	28.2	28.7	26.1	21.7	15.9	11.2	19.2
Average Maximum Temperature (°C)	14.8	16.2	19.5	23.7	28.3	31.7	33.9	34.7	33.1	29.1	22.6	16.8	25.4
Average Minimum Temperature (°C)	5.2	6.0	8.3	11.9	15.8	19.8	23.0	23.3	20.1	15.7	10.7	6.9	13.9
Average Sunbathing Time (hours)	4.5	5.3	6.0	7.1	9.1	10.5	10.7	10.2	9.0	7.4	5.9	4.3	7.5
The Highest Temperature (°C)	26.5	28.5	32.0	37.5	41.3	42.8	44.4	45.6	45.1	41.5	34.3	30.8	45.6
The Lowest Temperature (°C)	-8.1	-6.6	-4.9	-1.3	5.6	9.2	13.2	14.8	9.3	3.5	-4.3	-4.4	-8.1

Table 4.88: General Temperature Statistics for Osmaniye Province (1987-2020)

	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Average Temperature (°C)	8.7	10.1	13.1	17.1	21.3	25.2	27.9	28.5	25.8	21.1	14.5	10.1	18.6
Average Maximum Temperature (°C)	14.5	16.1	19.1	23.5	27.7	31.3	33.5	34.3	32.3	28.2	21.6	16.2	24.9
Average Minimum Temperature (°C)	3.5	4.6	7.3	10.9	14.9	18.9	22.5	23.1	19.5	14.4	8.2	5.0	12.7
Average Sunbathing Time (hours)	3.5	3.9	4.9	6.0	7.5	7.6	7.7	7.3	6.9	5.4	3.8	3.2	5.6
The Highest Temperature (°C)	23.7	28.0	32.0	36.5	41.7	42.6	42.8	43.6	45.0	38.4	31.0	29.0	45.0
The Lowest Temperature (°C)	-8.5	-6.8	-4.0	0.1	4.6	11.5	15.0	15.0	7.8	4.1	-4.5	-5.4	-8.5

Table 4.89: General Temperature Statistics for Gaziantep Province (1940-2020)

	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Average Temperature (°C)	3.1	4.4	8.2	13.4	18.8	24.2	28.0	27.8	23.4	16.7	9.8	5.0	15.2
Average Maximum Temperature (°C)	7.5	9.4	13.9	19.6	25.5	31.2	35.2	35.2	31.1	24.2	16.2	9.7	21.6
Average Minimum Temperature (°C)	-0.7	0.1	3.0	7.3	11.9	17.1	21.1	21.0	16.2	10.0	4.5	1.0	9.4
Average Sunbathing Time (hours)	3.6	4.4	5.6	7.0	8.6	10.5	10.8	10.2	8.9	7.1	5.4	3.6	7.1
The Highest Temperature (°C)	19.0	24.3	28.1	34.0	37.8	40.2	44.0	42.8	40.8	36.4	27.3	25.2	44.0
The Lowest Temperature (°C)	-17.5	-15.6	-11.0	-4.3	0.4	4.5	9.0	10.8	3.4	-3.9	-9.7	-15.0	-17.5

Representative Concentration Pathway (RCP) for the temperature which are projected based on 1971-2000 meteorological statistics are given in the following list and the increasing trend in temperatures for the Eastern Mediterranean basin is given in the figure below. (See

Figure 4.37)

- Temperature Projections according to the RCP4.5 Scenario;
 - Between 2013-2040, the warming will be approximately 2 °C,
 - Between 2041 and 2070, the temperature will increase by approximately 2-3 °C in spring and autumn and by approximately 4°C in summer,
 - Between 2071 and 2099, the temperature is expected to increase by about 2°C in winter, and by about 3°C in spring and autumn.
- Temperature Projections according to RCP8.5 Scenario;
 - Between 2013 and 2040, the warming is approximately 3 °C, especially in the spring and summer seasons,
 - Between 2041 and 2070, the temperature will increase by approximately 2-3 °C in winter, 3-4 °C in autumn and spring and 5 °C in summer.
 - Between 2071-2099, especially summer temperatures are expected to increase to 6 °C. (General Directorate of Meteorology, 2014)

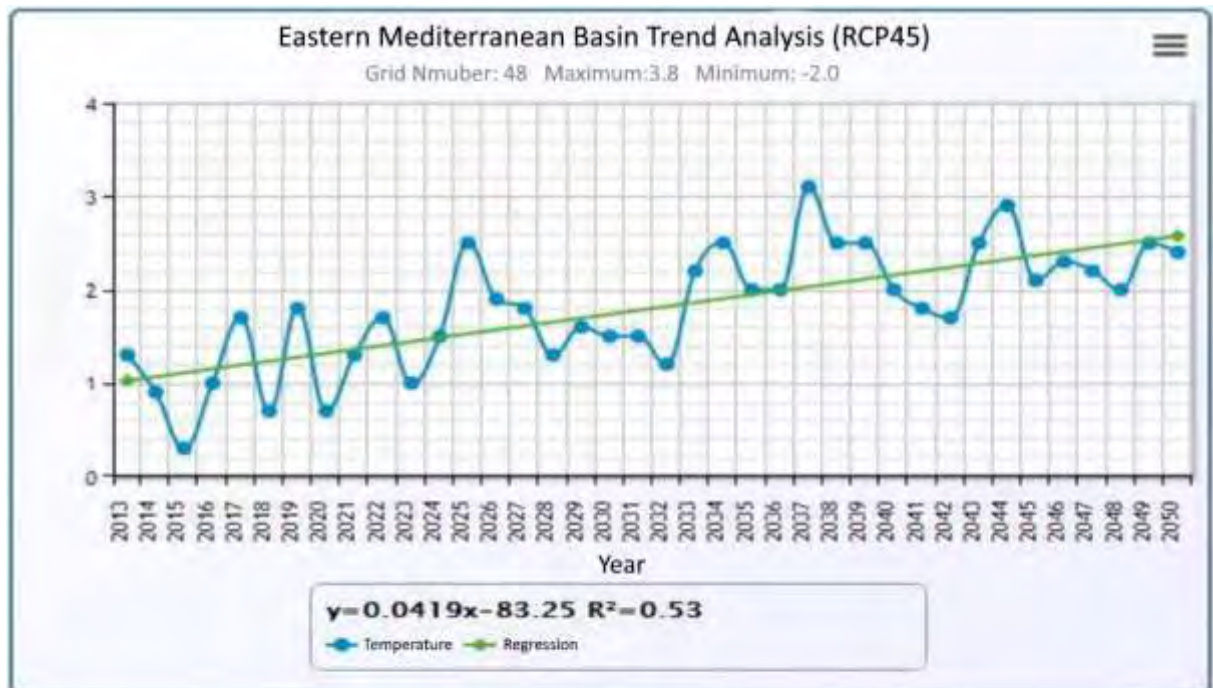


Figure 4.37: Eastern Mediterranean basin temperature trends according to the RCP4.5 Scenario

Two scenarios, optimistic and pessimistic, were evaluated in climate change model studies. The temperature is expected to increase by 0.5- 3.0°C until 2050 and 0.5- 4.0°C until 2100 according to the

optimistic scenario while it is expected to increase by 0.9-3.5°C by 2050 and by 0.9-6.3°C by 2100 according to the pessimistic scenario.

Drought

Climate change causes an increase in temperatures and thus drought is observed. There are 3 types of droughts; Meteorological drought, agricultural drought and hydraulic drought. Meteorological drought is a type of drought that occurs as a result of the warming of the air and the decrease in precipitation. Depending on the climate change, the increase in temperature causes the soil to become dry and as a result, the plants lose their moisture content day by day. With the drying of plants, the risk of forest fires increases in direct proportion. Drought maps made by the General Directorate of Agriculture and Forestry were used to create Mersin-Gaziantep High Standard Railway route drought maps created by using these maps are given in the maps below. (See Map 4.8)



Map 4.8: Drought Map along the Mersin-Gaziantep High Standard Railway Route

Flood

Floods occurs as a result of sudden floods, river floods, precipitation and hurricanes. The Mediterranean region is the 2nd region with very heavy rainfall and the frequency of disasters such as floods, storms and tornadoes are increasing day by day. Average number of rainy days and average monthly total rainfall in mm which is obtained from the Ministry of Agriculture And Forestry, General Directorate of Meteorology webpage are given for Mersin, Adana, Osmaniye and Gaziantep Province separately in the tables below. (See Table 4.90, Table 4.91, Table 4.92 and Table 4.93).

Table 4.90: Precipitation Data of Mersin (1940-2020)

	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Average Number of Rainy Days	12.1	10.6	9.0	8.1	6.3	2.9	1.4	1.3	2.1	5.9	7.8	11.5	79.0
Average Monthly Total Rainfall (mm)	119.9	86.7	56.2	34.1	23.4	10.1	11.6	6.8	11.7	38.9	77.1	139.0	615.5

Table 4.91: Precipitation Data of Adana (1929-2020)

	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Average Number of Rainy Days	12.0	10.9	10.6	9.9	7.5	3.7	1.2	1.1	3.3	6.7	7.8	11.1	85.8
Average Monthly Total Rainfall (mm)	111.1	89.6	65.0	51.1	48.7	22.2	10.2	9.6	19.6	43.6	71.2	126.2	668.1

Table 4.92: Precipitation Data of Osmaniye (1987-2020)

	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Average Number of Rainy Days	10.0	9.9	10.8	10.6	7.7	3.4	1.5	1.3	3.7	7.2	7.3	9.9	83.3
Average Monthly Total Rainfall (mm)	106.6	100.7	120.2	82.8	74.1	39.9	19.2	10.7	34.4	71.2	93.7	96.4	849.9

Table 4.93: Precipitation Data of Gaziantep (1940-2020)

	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Average Number of Rainy Days	13.5	12.3	12.6	10.8	7.8	2.5	0.7	0.7	2.1	7.1	9.0	13.1	92.2
Average Monthly Total Rainfall (mm)	102.6	83.1	72.9	53.1	31.1	8.4	6.9	5.2	7.1	37.2	62.3	98.4	568.3

- Precipitation Projections by RCP4.5 Scenario;
 - Between 2013-2040, precipitation will decrease by 20% in a significant part of the country in spring,
 - Between 2041-2070, winter precipitation will decrease by approximately 20% in the Eastern Mediterranean Region,
 - Between 2071-2099, it is predicted that there will be a 20% decrease in precipitation.
- Precipitation Projections by RCP8.5 Scenario;
 - Between 2013-2040, approximately 40% increase in summer precipitation,
 - Between 2041 and 2070, approximately 50% decrease in summer precipitation,
 - Between the years 2071-2099, it is predicted that the spring precipitation will decrease by 20%. (General Directorate of Meteorology, 2014)

The decreasing trend in precipitation for the Eastern Mediterranean basin is given in the chart below. (See Figure 4.38)

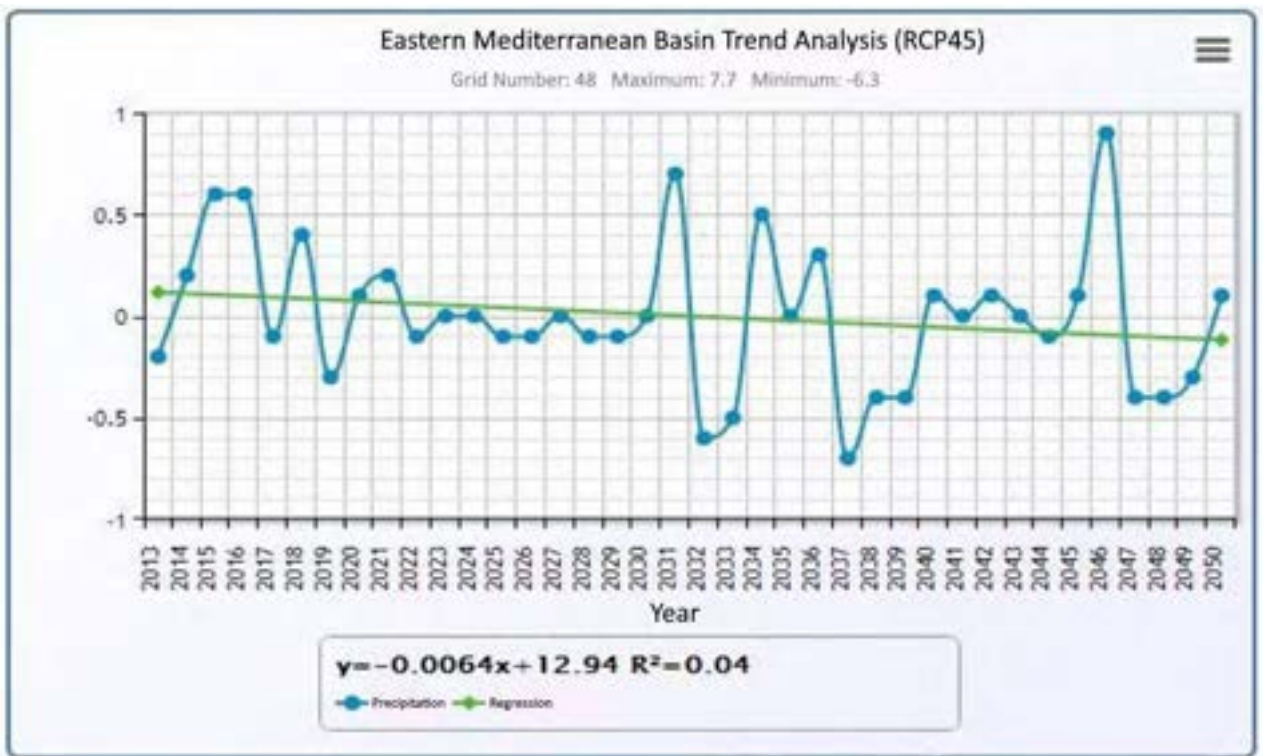


Figure 4.38: Eastern Mediterranean Basin Precipitation Trends according to the RCP4.5 Scenario

While positive anomalies are expected in precipitation amounts until 2040-2050 according to the optimistic scenario, positive anomalies are expected until 2035 according to the pessimistic scenario. After these years, decreases in average precipitation are expected.

Along the Mersin-Gaziantep High Standard Railway Project route, the railway intersects with water resources at 10 points. These water sources are Deliçay, Bardan Dam, Tarsus Dam, Seyhan Dam, Seyhan River, Ariklibas Pond, Kalecik Dam, Çakmak Pond, Seyhan Bridge and Ceyhan Bridge. Detailed information about water resources is given in Section 4.5.6.

Rising in Sea Levels

Today, the melting of the Greenland and Antarctic glaciers due to the increase in ocean temperature is the most important cause of sea level rise.

There are greenhouse gas concentration scenarios which are generated by IPCC. Greenhouse gas concentration path is defined as a Representative Concentration Pathway (RCP) which are utilized to predict the future climate. Future climate is predicted by considering the past observations. According to RCP 2.6 which is the most optimistic-case scenario, CO₂ emissions start decreasing by 2020 and move to zero by 2100. In the future predictions, the global sea level will be elevated than 40 cm when compared to present sea level. Alternatively, according to RCP 8.5, CO₂ emissions continue to increase throughout the 2100 and the global sea level in 2100 will be 1 meter higher relative to the sea level in 2000. Therefore, the sea level will continue to rise throughout the 2100 in both of the scenarios. (Aykut, 2021)



Figure 4.39: Turkish National Sea Level Monitoring System (TUDES) Tide Gauge Stations (General Directorate of Mapping, n.d.)

Sea level is determined by the General Directorate of Mapping within the scope of the Turkish National Sea Level Monitoring System. Monitoring studies are carried out with 20 digital and automatic tide gauge stations. These stations are located on the coasts of Turkey and the Turkish Republic of Northern Cyprus and meet the GLOSS standards (Global Sea Level Observation System). Air pressure, wind, humidity, air temperature are meteorological parameters that affect sea level and level changes at Turkish National Sea Level Monitoring System station. These parameter values are automatically sent to the data center in Ankara using internet and satellite communication systems in 15-minute averages. The tide gauges measure the sea level according to

the land they are installed on. The observed sea level signal includes both the true (absolute) level change and the signal of land movement in the vertical direction such as land subsidence or rise. (General Directorate of Mapping, n.d.) Turkish National Sea Level Monitoring System (TUDES) Tide Gauge Stations re given in the figure below. (See Figure 4.39)

The Mediterranean is surrounded by Europe in the north and west, Asia in the east and Africa in the south. The total water volume, including the Sea of Marmara, is about 4,249,020 km³, surface area is about 2,512,000 km², about 3,860 km from east to west, about 1,600 km from south to north, it is generally shallow, with an average depth of 1,500 m, with a maximum depth of 5150 m in Southern Greece (Simav, Yıldız, & Arslan, 2008). A table showing the physical characteristics of the Mediterranean is given below. (See Table 4.94)

Table 4.94: Physical Properties of Mediterranean

Properties	Value	Unit
Volume	4,249,020	km ³
Surface Area	2,512,000	km ²
Distance from east to west	3,860	km
Distance from south to north	1,600	km
Average depth	1,500	m

4.7.4.2 Field Study

No field study was conducted to evaluate this effect.

4.7.5 Risk Magnitude and Sensitivity Criteria

In assessing the risk of climate change on the Project, our sensitive receptors are rails, wagon, passengers, and other project components. In this section, the sensitivity of receptors and the magnitude of the risk are determined by categorizing them as given in the tables below. (See Table 4.95 and Table 4.96)

Table 4.95: Sensitivity Criteria of the Receptors

Sensitivity	Description
Very High	Passenger trains, employees and passengers in motion
High	Passengers and employees at the stations
Medium	Freight trains and their employees in motion
Low	Active train line components (rails, signaling systems, stations, power grid, parked trains, etc.)
Negligible	Passive train line components (wire fences, segregated wagons, spare maintenance equipment, etc.)

Table 4.96: Magnitude of the Risk

Magnitude	Description
High	It causes death of passengers or personnel.
Medium	Passengers or personnel are injured.
Low	Project components are damaged.
Negligible	There is no loss of life or property.

4.7.6 Risk Assessment

Impact of the Project on climate change

Carbon Losses

Major greenhouse gas emissions occur during the production and construction phases. While the production phase includes the production of the materials (wagons, rails, etc.) to be used within the scope of the Project by removing the raw materials and the use of fuels during the transportation of these materials; the construction phase includes emissions from the fuels of vehicles to be used for transportation of workers and disposal of waste during construction activities.

Greenhouse gas emissions will occur during the production of rails, wagons, and other railway components. Although it will have a negative impact during the construction phase, it is expected to have a positive cumulative impact as it will reduce the fossil fueled transportation preferences during the operation phase.

Carbon Savings

With the Mersin-Gaziantep High Speed Railway Project, a decrease in the total greenhouse gas generated in the region will be expected as people will prefer the High-Standard Train instead of individual vehicle use or other road public transportation.

Impact of the climate change on the Project

Flood

Precipitation and floods are critical for railway projects. Flood risks increase as a result of increased sudden precipitation events depend on the climate change. Due to the inability of the soil to absorb more water and the accumulation of water on the surface as a surface runoff, the rails may be damaged on the Project route and the wagons may derail. Depending on the seasons, railway crossings may become impossible as a result of the overflow of rivers. There are water channels in the provinces where Mersin-Gaziantep High Standard Railway Project passes, and potential flood risks are periodically evaluated by the State Hydraulic Works and necessary precautions are taken.

Temperature

According to the climate change projections, the average temperature is constantly increasing. Rail system, which expand due to the direct exposure of the sun to the rails in summer heat, pose a safety hazard. This heat, which increases the possibility of derailment followed by wagons, can cause consequences such as injury, death and property damage. Similarly, the risk of breaking the rails increases in extreme cold conditions. According to climate change models, the expected temperature increase will be 0.5-3.0 °C until 2050 and 0.5-4.0 °C until 2100 according to the optimistic scenario, while it will be 0.9-3.5 °C until 2050 and 0.9-6.3°C until 2100 according to the pessimistic scenario. These temperature increases are not expected to have a negative impact on the Mersin-Gaziantep High Standard Railway Project.

Rising in Sea Levels

Considering the climate change data, global sea level rise will occur, and if these sea level rises continue, it will become inevitable to create economic and social problems, especially in coastal areas. In the future, by evaluating together satellite altimeter measurements and satellite gravity (CHAMP, GRACE, GOCE) data, it is necessary to determine the volumetric and mass changes that cause sea level changes, and to investigate the causes of these changes by associating them with other physical parameters such as salinity, pressure, as well as sea surface temperature. It is considered that it will be useful to compare the findings obtained with the developed models.

In the Mediterranean region, the amount of rise in sea water level is expected to be 40 cm in the good-case scenario and 1 meter in the worst-case scenario in 2100. Within the scope of Mersin-Gaziantep High Speed

Railway Project, there is only 500 m proximity to the sea in Mersin Province, and the minimum elevation of the line has been determined as approximately 6 m. sea level rise is not expected to directly affect the project (Simav, Yıldız, & Arslan, 2008).

4.7.7 Cumulative Impact Assessment

Greenhouse gas is a global impact, and all activities that emit greenhouse gases worldwide will cause climate change. Thus, Mersin-Gaziantep High Speed Railway Project will be affected as mentioned in Section 0. Because of global impact of green gas emissions, instead of assessing regional cumulative effects, a comprehensive cumulative effect should be made like based on Turkey.

Today, the total amount of global greenhouse gas emissions is 50 billion tons of CO₂-e each year. This amount increased by 40% compared to 35 billion tons in 1990. As stated in the TURSTAT Greenhouse Gas Emission Statistics dated March 31, 2020, the amount of greenhouse gas emissions for Turkey in 2018 was calculated as 520.9 million tons (Mt) CO₂-e. Greenhouse gas emission originating from the Project was calculated as 195663,345 CO₂. The impact will be very low compared to the total carbon emissions in Turkey. In addition, it is expected that it will have a negative effect on the increase in total greenhouse gas emissions due to passengers who switch to train travel from other modal transport methods. From industry, vehicles, production, etc. in Turkey, it is not at the level of impact that will have a cumulative effect on the amount of greenhouse gas emissions caused by activities.

4.7.8 Mitigation Measures

Measures to mitigate the potential impact of climate change on Mersin-Gaziantep High Standard Train Project are given below;

- In communication with General Directorate of State Hydraulic Works and relevant local institutions, the structures to be built in flood risk areas should be constructed with Engineering measures that will provide adequate drainage and resistance against instantaneous and heavy rains,
- Measures will be taken against potential meteorological and climatic risks, in constant communication with the General Directorate of State Hydraulic Works and Meteorology. If necessary and if there is a risk, train speeds will be reduced, or some train services may be postponed,
- By providing regular inspection and maintenance of the rails, potential physical changes/damages that may occur on the rails, especially due to exposure to heat exchange, will be prevented,
- The interrelationship between railway systems and climate and weather will be improved with development in baseline data and a framework on how climate and weather conditions now affect operations, infrastructure, and planning of railroad,
- The outcomes about the climate change and future scenarios of climate and weather changes will be synthesized at both the national and regional level. Those projected changes that are expected to most affect railway will be emphasized by comparing with previous analysis of baseline sensitivity.
- Probabilistic analyses about the occurrence of forecasted events and changes will be developed,
- Potential impacts of climate change on the railway system will be searched. Spatial and temporal coupling of baseline and climate change assessments and future scenarios data would be used to establish relationships between climate change and railroad systems.
- Infrastructure elements railway and operations most at risk under scenarios of widespread or large-scale climate change will be identified.

4.7.9 Summary of Residual Impacts, Significance Criteria and Overall Impact Significance

The sensitivity of climate change risks on the Mersin-Gaziantep High Standard Railway Project was determined as very high to low (depending on the receptor type) and the risk magnitude was determined as

high to low (depending on the risk). By using the Assessment of Significance which is given in Section 4.1.3. In Table 4.3, the impact significance was determined as minor. After the implementation of the mitigation measures given in Section 4.7.8, the overall impact significance is evaluated as negligible.

4.7.10 Assumptions and/or Limitations

The assumptions are based on the studies and results of the relevant institutions and organizations on the effects of climate change. The assessments made here are based on climate change projections and expert opinions obtained from various sources.

4.8 Noise, Vibration and Physical Impacts

4.8.1 Introduction

Noise can be defined as unpleasant, unwanted, disturbing sound. Sound is defined as the result of pressure changes in the air. These pressure changes in the air stimulate the eardrum and produce sound. The human ear can distinguish sound pressure even over a wide area. The frequency of the sound and the pressure it creates are important factors in determining the loudness.

The frequency range that a healthy person can hear has been determined as 20-20000 Hz (Hertz). Accordingly, sounds below 20 Hz are defined as infra sound, and sounds above 20000 Hz are defined as ultrasound. For a speech to be intelligible, it is expected to be in the range of 200-5000 Hz. The frequency range in which the ear is most sensitive is 3000 to 4000 Hz. Another important factor used to determine the characteristics of sound as well as frequency is power. In determining the strength of the sound, the sound pressure level is used as a scale and is expressed in decibels. Since the sound from a source is a multiple of the audible sound, this sound expresses the decibel value. As the level of decibel values increases, it can be harmful for people. This situation creates noise.

Noise control is required to protect people from harm. Noise control can be achieved in three different ways: to reduce the noise at the source of formation, to reduce the noise in the spreading area, and to work and measures where the noise is detected. Sound insulation applications are made to reduce the power of the sound in areas where intense sound rhythms occur. Throughout human life, sound problems can be encountered in many areas. In this sense, examples such as transportation noise such as highway and airline, noise from industrial machinery and engine rooms, vibrations, noise of ventilation ducts, construction noise, noise of sports fields and entertainment centers, noise caused by loud advertising and music broadcasts, natural climatic events and rain noise can be given [14].

There are two part of train, which are wheels and rail for the generation of vibration during the movement of train. While system above the wheel such as bogie, springs, dampers and load of vehicle are related with vibration in the wheel, system below the rail such as track, subsoil and soil are related with vibration in the rail. Because of imperfection between the wheel and rail, vibration originates.

A study about noise and vibration was completed to identify potential impacts on the locations near the project area. Noise and vibration during the construction and operation phase of the Project were calculated and compared to applicable laws, guidelines, and/or regulations.

Taking the current number of the High Standard Train voyages as an example, it is predicted that there will be a trip every 2 hours between 07:00 and 23:00 every day during the year, and the number of high standard train voyages that will cross the year is estimated to be around 3,300 in the operation phase.

Background noise measurement points were determined as 20 points on the planned railway route, in front of the houses close to the railway. SOUNDPLAN 8.2 program was used in the calculation of the noise that may occur because of the construction site activity. Model inputs, evaluations, output documents and maps are described in Section 4.7.6.

In the scope of this project, noise measurements were carried out for the evaluation of the region close to the Project area. Limit values, desk and field studies, measurements with their points and mitigation measure in the case of necessity are detailed explained in following sections.

4.8.2 Policies, Legal Framework and Guidelines

Both national regulations and national standards are used for the evaluation, prevention and elimination of the noise impact, which is caused by the Project.

The determined regulations and standards are given below.

4.8.2.1 National Legislation

Regulation on Assessment and Management of Environmental Noise

Regulation On Evaluation And Management Of Environmental Noise, that is numbered 27601 and published on 04.06.2010, aims to ensure that the necessary measures are taken to ensure that the peace and tranquility of people and their physical and mental health are not impaired as a result of exposure to environmental noise and to be implemented gradually; determining environmental noise exposure levels by using assessment methods with noise maps, acoustic report and environmental noise level assessment report, informing the public about environmental noise and its effects, noise maps, acoustic report and environmental noise level assessment report results; especially where environmental noise exposure levels may cause harmful effects on human health and where it is necessary to protect environmental noise quality, the preparation of action plans for preventing and reducing noise and determining the procedures and principles for the implementation of these plans.

Environmental noise criteria for construction sites

Article 23 – (1) The noise level emitted from the construction sites and the criteria for preventing noise are as follows:

a) The noise level emitted from the activity types in the construction site cannot exceed the limit values given in Table-5 in Annex-VII (see Table 4.97).

Table 4.97: Environmental Noise Limit Values for the Construction Site

Type of activity (construction, demolition, and repair)	Ldaytime (dBA)
Building	70
Way	75
Other sources	70

b) The construction site activities carried out in and around the residential areas cannot be continued in the evening and nighttime periods, except during the daytime. If needed, to carry out construction site activities in and around residential areas, Rönesans must obtain work permit for evening time period from the Provincial Directorate of Environment and Urbanization.

c) Considering the intensity of complaints from the residential areas and their immediate surroundings, the construction site activities to be held on weekends and official holidays may be banned by the Decision of the Provincial Local Environment Board.

ç) The construction activities of projects such as dams, bridges, tunnels, motorways, urban main roads, mass housing that require public interest and the construction activities that will prevent daytime traffic in the city will be taken from the daytime values in Table-5 in Annex-VII for the evening if they do not work during the daytime (see Table 4.97). It can be sustained with the provision of the limit values obtained by subtracting 5 dBA and 10 dBA for the night and the Decision of the Provincial Local Environment Board to be taken in this context.

d) Impact noise that may occur because of construction site activity cannot exceed 100 dBC in terms of LCmax noise indicator.

e) In the construction site by the owner of the activity; Information on the start, completion dates and working periods of the construction and the permits obtained from the metropolitan municipality or the provincial/district municipality are displayed on a sign that can be easily seen by everyone in the construction area.

f) All construction site activities carried out in holiday resorts and touristic areas can be stopped completely on weekends or for a few months in line with the decision of the metropolitan municipality and/or the province/district municipality.

The noise level emitted from the activity of light railway are given in Table-2 in Annex-VII (see Table 4.97).

Table 4.98: Environmental Noise Limit Values for Light Rail Systems

Underground Stations		L _{eq} (dBA)	Above-ground Stations		L _{eq} (dBA)
Box offices, stairs, corridors		55	Platforms (1.8 m from platform edge)	For stopping and departing trains	70
Platforms (1.8 m from platform edge)	For stopping and departing trains	80		For passing trains	75
	For passing trains	85		For trains waiting in operation	65
	For trains waiting in operation	65			
Ventilation system inside the station		55			
Ventilation ducts in the streets (at 9.0 m)		55			
Emergency ventilation fans in closed volumes within the station (at 22.5 m)		80			

Environmental vibration criteria in buildings

Article 25

The principles for controlling environmental vibration caused by various vibration sources are as follows;

b) The vibration level that will occur in sensitive and extremely sensitive uses in the environment caused by the applications that will cause vibration such as piling in constructions and the vibrations caused by heavy construction machines cannot exceed the limit values given in Table-7 in Annex-VII (see Table 4.99).

Table 4.99: Maximum Permissible Values of Piling and Similar Vibration Generating Operations in Construction and Ground Vibrations to be Generated by Construction Machines Outside the Nearest and Most Sensitive Area (in frequency bands between 1 Hz-80 Hz) in ANNEX VII of Table-7.

	The Highest Permissible Vibration Speed (Peak Value-mm/s)	
	Continuous Vibration	Intermittent Vibration
In Residential Areas	5	10
In Industrial and Commercial Areas	15	30

Basic Criteria in the Planning Stage

Noise exposure categories

Article 27 – (1) The following noise exposure categories are taken into account in the planning of new residential areas;

- a) Category A (<55 dBA in Lday) Area: The noise at the top of this category is not disturbing. While making a planning decision, noise is not considered as a determining factor.
- b) Category B (55- 64 dBA in Lday) Area: The noise level is taken into consideration in planning decisions. Planning decisions are made by taking necessary measures against noise.
- c) Category C (65-74 dBA in Lday) Area: Planning decision is generally not made. However, in cases requiring public interest, measures are taken against noise, considering the background noise level, if it has to be permitted because a quieter place cannot be found.
- ç) Category D (> 74 dBA in Lday) Area: Planning decision is not made.

Mandatory criteria in the planning phase

Article 28 – (1) Mandatory criteria for activities in the planning phase are as follows;

- a) In the architectural projects, built after 7/3/2008 and to be constructed after the publication date of this Regulation, it is obligatory to provide the limit values given in Table-9 in Annex-VII depending on the building types.
- b) In the planning phase; Planned activities such as transportation, business, facility, entertainment place, workshop, workplace is evaluated according to the principles and criteria given in article 18, 19, 20, 21, 22, 23, 24 and 25. If there is an unsuitable situation, the activity is not allowed.
- c) During the preparation of Master Development Plans and Implementation Development Plans, the noise exposure categories foreseen in Article 27 are considered.
- ç) Noise maps and action plans must be requested as an annex to the plan and be the basis for the plan decisions to be able to make acoustic planning in the area during the preparation of Environmental Plans, Master Zoning Plans and Implementation Zoning Plans and to create calm areas and open areas in residential areas.
- d) In order to create a calmer environment in places where very sensitive uses are found, by taking the opinions of the relevant institutions and organizations, the municipality within the municipal boundaries and the adjacent area, by the special provincial administrations where the authority is transferred outside the municipal boundaries and adjacent areas; If the authority is not transferred, additional restrictive measures may be taken by the Provincial Directorate of Environment and Forestry. In this context, in a new noise, source to be established in the region, temporary or permanent limitation decisions may be taken regarding the environmental noise level or the establishment of a new business in this region may not be allowed.

Regulation on Noise Emissions in the Environment Generated by Open Field Used Equipment (2000/14 / EC)

Regulation on Noise Emissions in the Environment Generated by Open Field Used Equipment that is numbered 26392 and dated 30.12.2006 aims to protect human health and contribute to the smooth functioning of the internal market, the implementation of noise emission standards related to the noise created by the equipment used in the open area, the collection of technical documents and information, conformity assessment procedures and marking procedures and principles.

4.8.2.2 International Guidelines

International Finance Corporation (IFC)

IFC General Environmental, Health, and Safety Guidelines set the noise limits for two types of receptors and two periods, as given below (see Table 4.100).

Table 4.100: Maximum Noise Level Guidelines

Receptor	One Hour LAeq (dBA) Receptor	
	Daytime 07:00-22:00	Nighttime 22:00-07:00
Residential; institutional; educational	55	45
Industrial; commercial	70	70

The guideline requires that noise levels do not exceed the limits given in Table 4 86 or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site.

The World Health Organization (WHO)

The aim of Environmental Noise Guidelines for the European Region is to present the conclusions of the WHO working group responsible for preparing guidelines for exposure to noise during sleep. This document is an extension of the WHO Guidelines for community noise (1999). The need for “health-based” guidelines originated in part from the European Union Directive 2002/49/EC relating to the assessment and management of environmental noise (commonly known as the Environmental Noise Directive and abbreviated as END) which compels European Union Member States to produce noise maps and data about night exposure from mid-2007. The work was made possible by a grant from the European Commission and contributions from the Swiss and German governments.

The World Health Organization (WHO) has set the European target limit of outdoor night noise levels at annual average of 45 decibels (dB) in its new guidelines. This would protect the public, including the most vulnerable, such as children and the elderly.

4.8.2.3 Project Target

The limit values are compared for both regulations and the strictest values among these regulations are selected as target values for the project (see Table 4.101 and Table 4.102).

Table 4.101: Project Limit Value Noise Criteria

RAMEN for Construction Side	IFC		WHO	Project Target	
Ldaytime (dBA)	Daytime 07:00-22:00 (dBA)	Nighttime 22:00-07:00 (dBA)	Lnight,outside (dBA)	Daytime 07:00-22:00 (dBA)	Nighttime 22:00-07:00 (dBA)
70	55	45	45	55	45

Table 4.102: Vibration Criteria

RAMEN	
Continuous Vibration (mm/s)	Intermittent Vibration (mm/s)
5	10

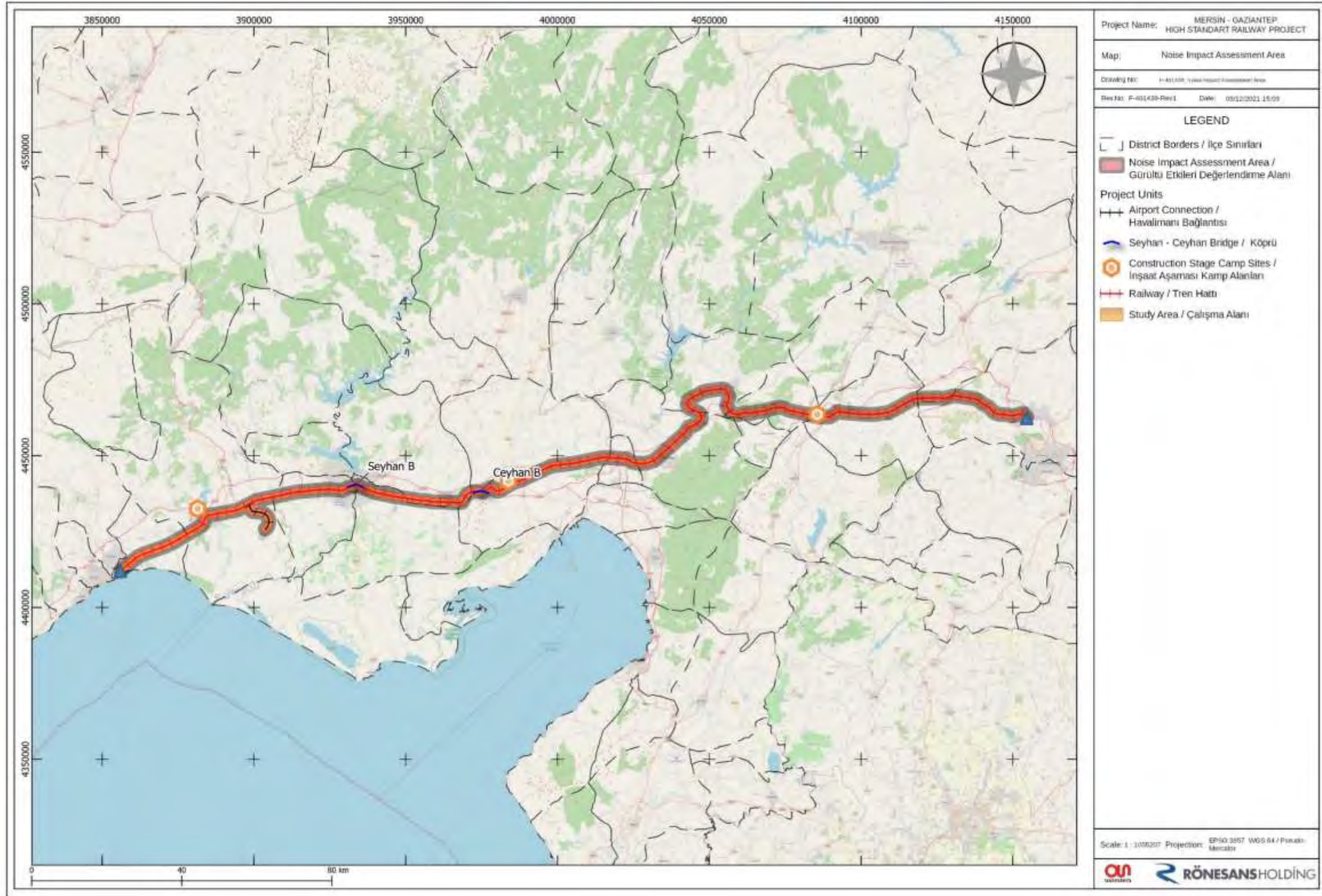
4.8.3 Extend of Study Area

4.8.3.1 Spatial Extend

Footprint of the Project is considered as spatial boundaries. This area typically extends depending on the topic from about 1 m to 1500 m as measured from the centre-alignment of the Railway. Impact area is determined as 1500 m to the right and 1500 m to the left from the Railway. In case of necessity, studies in the narrower area are performed during construction works and mitigation measures will be implemented in the sensitive receptors where the noise levels exceed the limits as defined in Section 4.7.2.

4.8.3.2 Temporal Extend

The period when the impacts can be reversible is described as temporal boundaries. For instance, short-lived impact of construction work may be observed, but the existence of this railway may have implications, which extend to the future. For this reason, some of the impacts cause by construction equipment may occur during the construction period and disappear with the completion of construction activities. The construction period will last for not more than 4 years (30.12.2020-01.06.2024) while the operational phase is designed for 100 years unless unforeseen event occurs.



Map 4.9: Noise Impact Assessment Area of the Project

4.8.4 Identification of Baseline Conditions

Baseline study is performed after the desk studies and identification of measurement points. Baseline conditions will be used as a reference for the evaluation of the noise levels before and after the High Standard Train Project.

4.8.4.1 Desk Studies

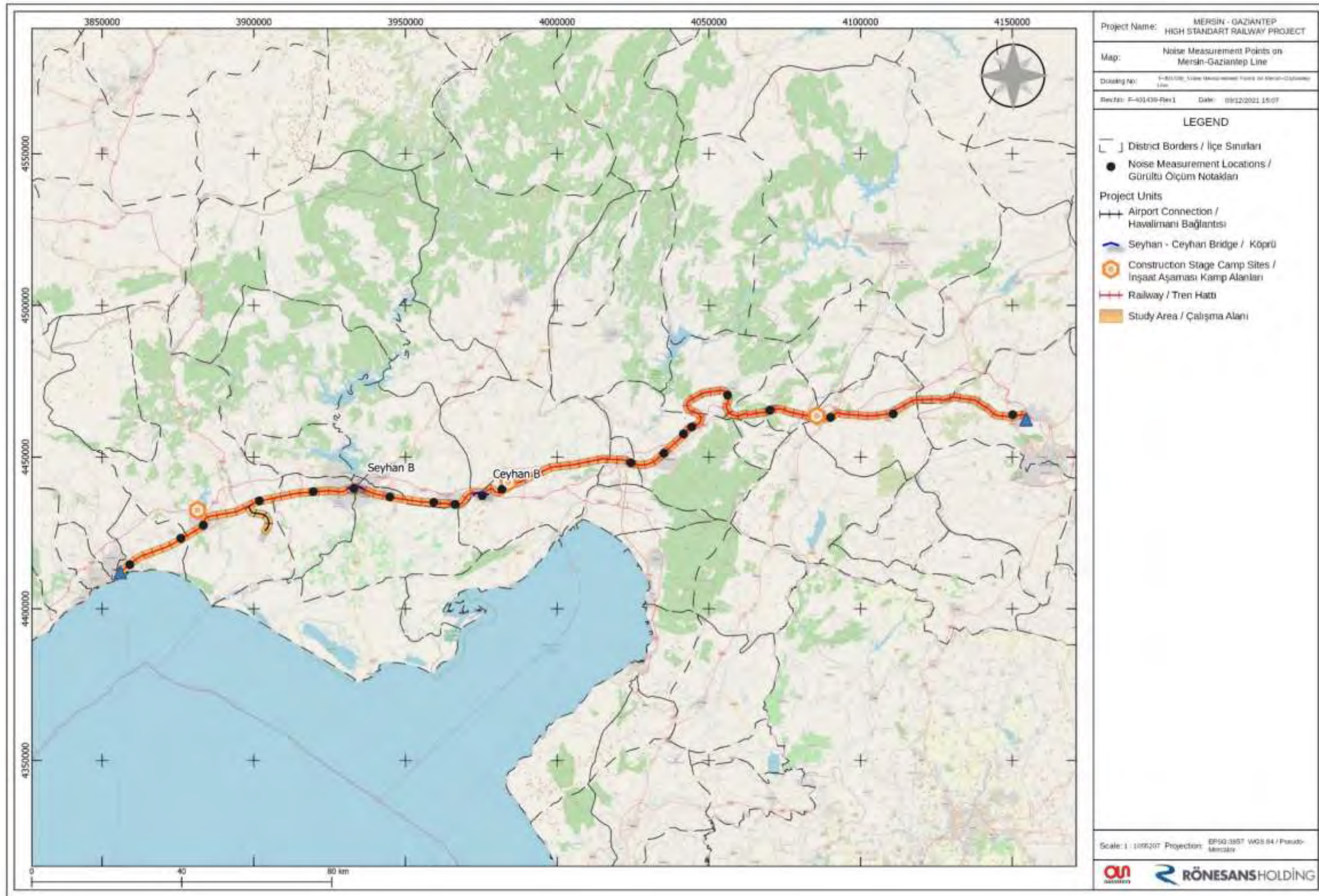
Within the context of desk studies, following steps were performed;

- Pre-modelling study is performed to determine the measurement points,
- Identification of conditions such as weather, topography,
- Determination of sensitive receptors around the project area throughout the railway route,
- Studying on national and international regulations/policies to ascertain the optimal management of impacts,
- Requirements for adherence to environmental and social sustainability of international financiers were as well addressed through reviewing relevant Environmental and Social Safeguards,
- Literature studies about the possible impact and their mitigation measures.

4.8.4.2 Field Studies

To determine the baseline noise in the project region, noise monitoring was carried out at the project site and its vicinity. Febas Environmental Laboratory carried out noise measurements between 22.10.2020 and 12.11.2020 and result were given in the following table (see Table 4.103, Table 4.104, Table 4.105, Table 4.106 and Table 4.107) and noise measurement report is also given in the Appendix 2.

Since the construction activities will be carried out in the daytime period, only the noise maps prepared for the daytime period are calculated. Background noise measurement points were determined as 20 points on the planned railway line route, in front of the houses close to the railway. Each measurement height is 1.5 m. The measurements were taken in accordance with TS 9315 ISO 1996-1 and TS ISO 1996-2 standards. Satellite image showing the measurement points is given map below (see Map 4.10). In addition, the table showing the coordinates of the measurement points is given below (see Table 4.103).



Map 4.10: Noise Measurement Points on Mersin-Gaziantep Line

Table 4.103: Coordinates of the Noise Measurement Points

Code	Coordinates		Distance to the Railway (m)
	E	N	
N1	648696	4076590	60
N2	662033	4083765	208
N3	667900	4087311	88
N4	682527	4094023	79
N5	696705	4096754	57
N6	707354	4097869	250
N7	716900	4095874	44
N8	728538	4094754	250
N9	734147	4094346	68
N10	741256	4096836	587
N11	746390	4098665	360
N12	246648	4105857	70
N13	255458	4108082	70
N14	260747	4113017	340
N15	262969	4114780	80
N16	272633	4122844	90
N17	283658	4118624	70
N18	299555	4116326	30
N19	316018	4116846	630
N20	347468	4116031	760

Environmental noise measurements were measured for 3 full days, with 15-minute measurements at each measurement point. The measurement results are given in the following tables: Lday, Levening, Lnight and average values (see Table 4.104, Table 4.105, Table 4.106 and Table 4.107).

Table 4.104: Average Environmental Noise Measurement Values for the 1st Day

Code	Measurement Date	Measurement Results (dBA) – Day 1		
		Daytime (07.00-19.00)	Evening time (19.00-23.00)	Nighttime (23.00-07.00)
N1	22.10.2020	56.7	52.1	47.7
N2	22.10.2020	56.6	50.8	45.9
N3	22.10.2020	58.6	54.5	48.0
N4	25.10.2020	54.5	50.2	44.5
N5	25.10.2020	58.3	53.6	49.2
N6	25.10.2020	57.5	55.1	48.6
N7	28.10.2020	55.3	51.6	44.3
N8	28.10.2020	56.4	54.0	49.6
N9	28.10.2020	57.0	53.2	46.4

Code	Measurement Date	Measurement Results (dBA) – Day 1		
		Daytime (07.00-19.00)	Evening time (19.00-23.00)	Nighttime (23.00-07.00)
N10	31.10.2020	53.0	50.6	45.8
N11	31.10.2020	59.2	54.2	49.1
N12	31.10.2020	56.0	52.0	46.3
N13	03.11.2020	58.8	53.5	49.2
N14	03.11.2020	57.7	52.6	47.4
N15	03.11.2020	54.2	50.6	44.6
N16	06.11.2020	57.8	53.0	48.4
N17	06.11.2020	54.7	51.0	45.8
N18	06.11.2020	58.6	53.1	48.4
N19	09.11.2020	57.6	54.2	49.7
N20	09.11.2020	54.7	51.1	45.6

Table 4.105: Average Environmental Noise Measurement Values for the 2nd Day

Code	Measurement Date	Measurement Results (dBA) – Day 2		
		Daytime (07.00-19.00)	Evening time (19.00-23.00)	Nighttime (23.00-07.00)
N1	23.10.2020	56.7	52.1	47.7
N2	23.10.2020	56.6	50.8	45.9
N3	23.10.2020	58.6	54.5	48.0
N4	26.10.2020	54.5	50.2	44.5
N5	26.10.2020	58.3	53.6	49.2
N6	26.10.2020	57.5	55.1	48.6
N7	29.10.2020	55.3	51.6	44.3
N8	29.10.2020	56.4	54.0	49.6
N9	29.10.2020	57.0	53.2	46.4
N10	01.11.2020	53.0	50.6	45.8
N11	01.11.2020	59.2	54.2	49.1
N12	01.11.2020	56.0	52.0	46.3
N13	04.11.2020	58.8	53.5	49.2
N14	04.11.2020	57.7	52.6	47.4
N15	04.11.2020	54.2	50.6	44.6
N16	07.11.2020	57.8	53.0	48.4
N17	07.11.2020	54.7	51.0	45.8
N18	07.11.2020	58.6	53.1	48.4
N19	10.11.2020	57.6	54.2	49.7
N20	10.11.2020	54.7	51.1	45.6

Table 4.106: Average Environmental Noise Measurement Values for the 3rd Day

Code	Measurement Date	Measurement Results (dBA) – Day 3		
		Daytime (07.00-19.00)	Evening time (19.00-23.00)	Nighttime (23.00-07.00)
N1	23.10.2020	54.9	52.0	48.8
N2	23.10.2020	56.2	51.1	45.5
N3	23.10.2020	58.0	56.3	49.6
N4	26.10.2020	54.3	50.6	43.2
N5	26.10.2020	58.2	53.7	48.7
N6	26.10.2020	58.6	52.8	49.3
N7	29.10.2020	55.5	51.1	46.1
N8	29.10.2020	59.2	55.5	48.5
N9	29.10.2020	54.9	50.5	47.0
N10	01.11.2020	54.4	51.0	45.1
N11	01.11.2020	56.5	53.3	48.6
N12	01.11.2020	54.7	51.5	47.9
N13	04.11.2020	57.3	51.4	46.8
N14	04.11.2020	58.8	52.9	46.4
N15	04.11.2020	56.9	51.9	44.0
N16	07.11.2020	55.3	52.0	46.7
N17	07.11.2020	55.9	51.4	46.1
N18	07.11.2020	58.8	54.5	46.6
N19	10.11.2020	59.8	55.3	47.9
N20	10.11.2020	57.6	52.4	46.2

Table 4.107: Average Environmental Noise Measurement Values

Code	Measurement Date	Measurement Results (dBA) – Average		
		Daytime (07.00-19.00)	Evening time (19.00-23.00)	Nighttime (23.00-07.00)
N1	23.10.2020	56.2	51.8	48.0
N2	23.10.2020	56.1	51.3	45.9
N3	23.10.2020	57.9	55.0	49.1
N4	26.10.2020	54.2	50.3	43.4
N5	26.10.2020	57.8	53.5	48.4
N6	26.10.2020	58.4	53.4	48.9
N7	29.10.2020	54.9	51.1	45.3
N8	29.10.2020	58.0	54.5	48.5
N9	29.10.2020	55.9	52.1	47.2
N10	01.11.2020	54.2	51.2	45.7
N11	01.11.2020	57.7	53.9	48.4
N12	01.11.2020	56.1	51.9	46.7
N13	04.11.2020	58.0	52.6	47.8

Code	Measurement Date	Measurement Results (dBA) – Average		
		Daytime (07.00-19.00)	Evening time (19.00-23.00)	Nighttime (23.00-07.00)
N14	04.11.2020	58.6	52.9	46.9
N15	04.11.2020	56.1	51.5	44.3
N16	07.11.2020	55.7	51.8	47.6
N17	07.11.2020	55.9	51.6	46.5
N18	07.11.2020	58.0	53.2	46.5
N19	10.11.2020	58.5	54.0	48.4
N20	10.11.2020	56.1	51.7	46.2

Environmental noise measurements were performed by using Svantek SVAN 971 model Class 1 noise measuring device with serial number 55499, Svantek SVAN 971 model Class 1 noise measuring device with serial number 55502, Svantek SVAN 958A model Class 1 noise and vibration measuring device with serial number N819548.

Before and after environmental noise measurements, verification measurements are made with the noise calibrator at 94 and 114 db. Class 1 noise measurement device with serial number 55499 of Svantek SVAN 971 model and calibrator serial number 57436 of Svantek SV33 model are used.

In the modeling calculation for 20 points where measurements were made, the calculated sound pressure level values for 1.5 m above the ground at the same points are given in the table below (see Table 4.108).

Table 4.108: Results of the Modelling Calculation

Code	Construction Phase	Operation Phase			
	Ldaytime (dBA)	Ldaytime (dBA)	Levening (dBA)	Lnighttime (dBA)	Average (dBA)
N1	27.5	51.7	51.7	45.7	54.4
N2	41.2	45.7	45.7	39.7	48.4
N3	33.9	50.6	50.6	44.6	53.3
N4	32.5	50.6	50.6	44.5	53.2
N5	48.9	54.0	54.0	48.0	56.7
N6	33.6	40.8	40.8	34.8	43.5
N7	16.6	53.5	53.5	47.5	56.2
N8	19.9	44.7	44.7	38.7	47.4
N9	27.6	50.6	50.6	44.5	53.3
N10	-	37.0	37.0	31.0	39.7
N11	12.5	42.0	42.0	36.0	44.7
N12	52.1	50.9	50.9	44.9	53.6
N13	27.5	52.6	52.6	46.6	53.3
N14	-	44.8	44.8	38.8	47.5
N15	-	54.0	54.0	44.4	53.1

Code	Construction Phase	Operation Phase			
	Ldaytime (dBA)	Ldaytime (dBA)	Levening (dBA)	Lnighttime (dBA)	Average (dBA)
N16	18.5	52.5	52.5	46.5	55.2
N17	11.0	52.1	52.1	46.1	54.8
N18	20.6	56.1	56.1	50.1	58.8
N19	4.1	40.7	40.7	34.7	43.4
N20	35.1	39.4	39.4	33.4	42.1

4.8.5 Impact Magnitude and Sensitivity Criteria

Very High: Areas with high concentration of educational, cultural, health services and camping area,

High: Areas with high concentration of dwellings and some commercial buildings,

Medium: Areas with high concentration of commercial buildings, and some workplaces,

Low: Industrial area,

Negligible: Temporary living area.

4.8.6 Impact Assessment

4.8.6.1 Construction Phase

Following activities during the construction activities will principally cause noise impact;

- Construction of the High Standard Train,
- Construction of the engineering structures (e.g., bridges, tunnels, overpasses etc.),
- Excavation activities,
- Transportation of the material result from excavation and construction.

Noise impact of the Railway will continue along the route during the construction phase and will result on a relatively short-term basis (typically some weeks/few months) at most of the receptors as the construction approaches and moves past each settlement.

Construction activities will be carried out along the line. Rail systems in existing lines will be adapted to high standard trains and new tunnel and railway construction works will be carried out for new parts of the line. The equipment to be used in the construction phase is given in the table below (see Table 4.109).

Table 4.109: Equipment List to be Used in the Construction Phase

Noise Source Equipment Type	Number
Truck	380
Tractor	8
Dozer	13
Wheel Loader	19
Forklift	6
Backhoe-Loader	4
Excavator	43

Noise Source Equipment Type	Number
Motor Grader	15
Hydraulic Stone Crusher	10
Diesel Compressor	2
Single-Drum Roller	22
Crane	19
Concrete Plant	2
Diesel Generator	20
Paver Finisher	5
Tamping Machine	2

It is envisaged that all the said construction equipment will be operated at the same time. However, construction equipment is expected to be concentrated in the stations.

4.8.6.1.1 Methodology

Noise maps were produced by using the SOUNDPLAN 8.2 program. Sound power level values of the construction noise equipment of the project were obtained from the program library. The data of the sound power level values of the said equipment according to octave bands are given figures below (see Figure 4.40, Figure 4.41 and Figure 4.42).

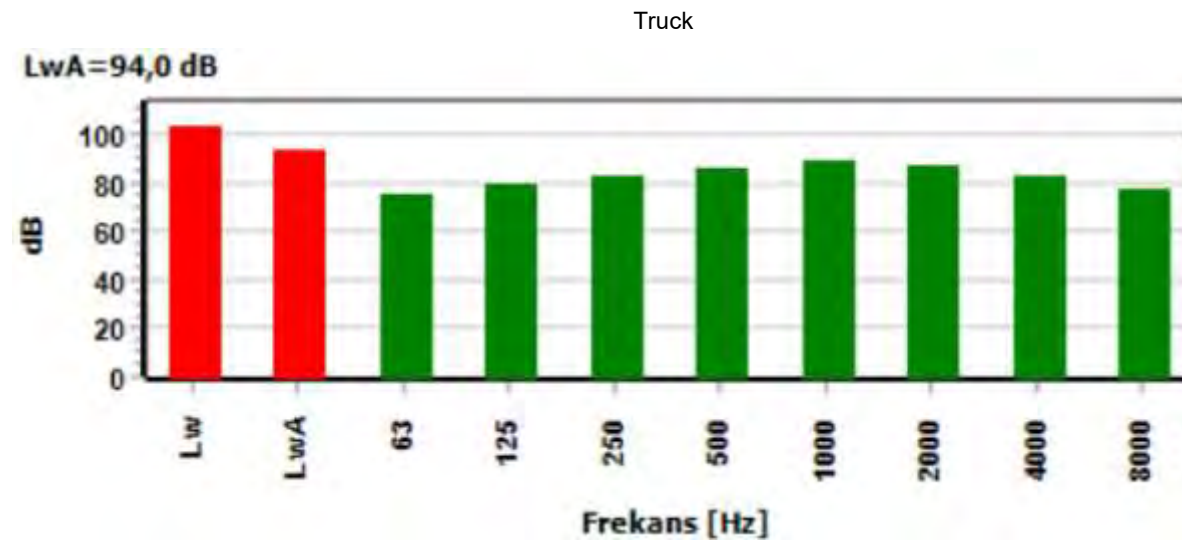
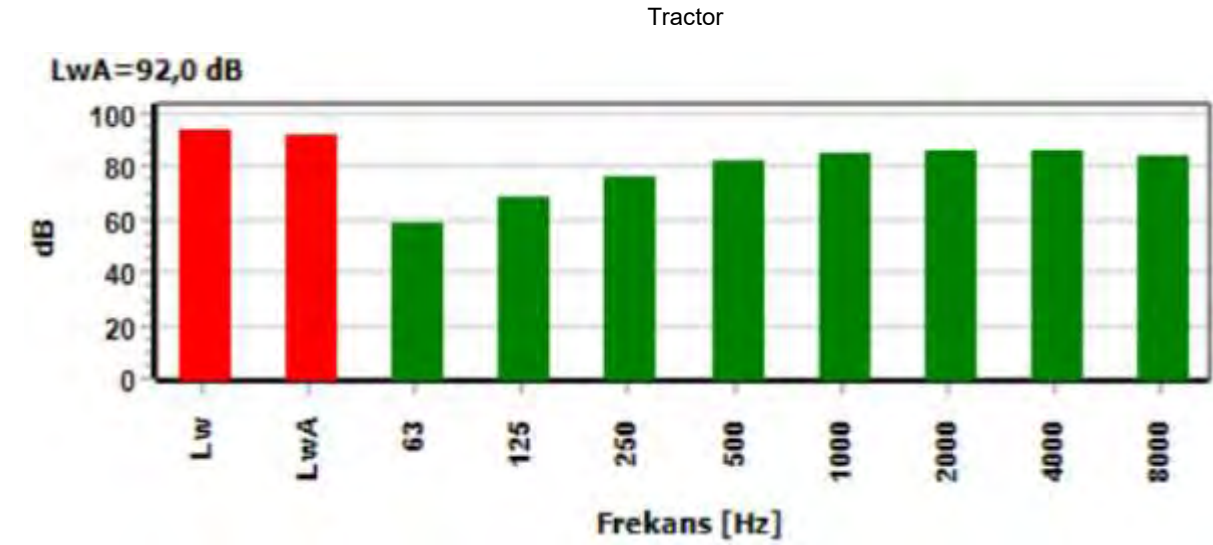
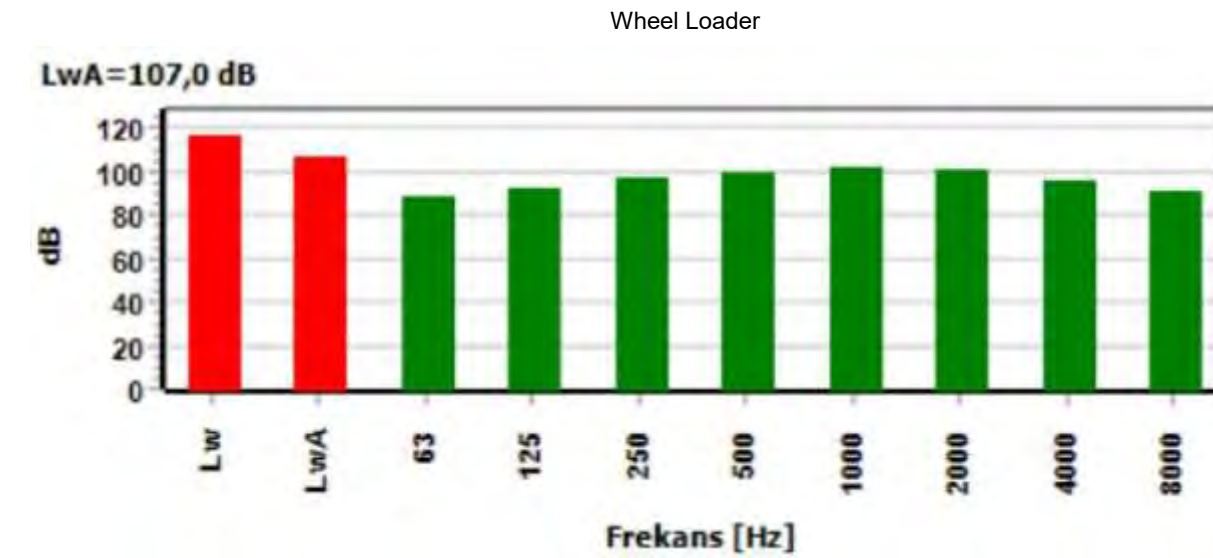
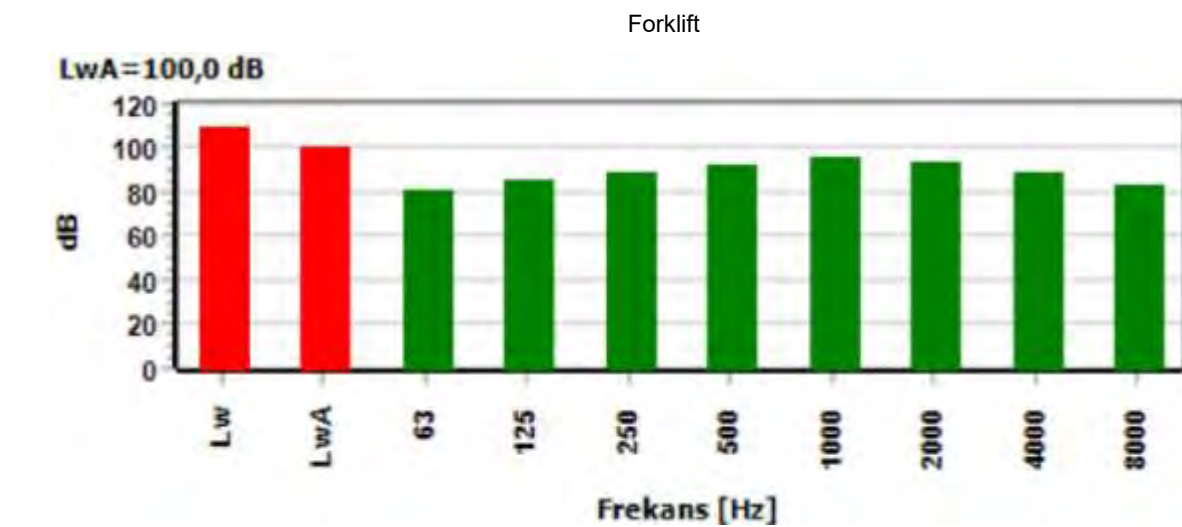
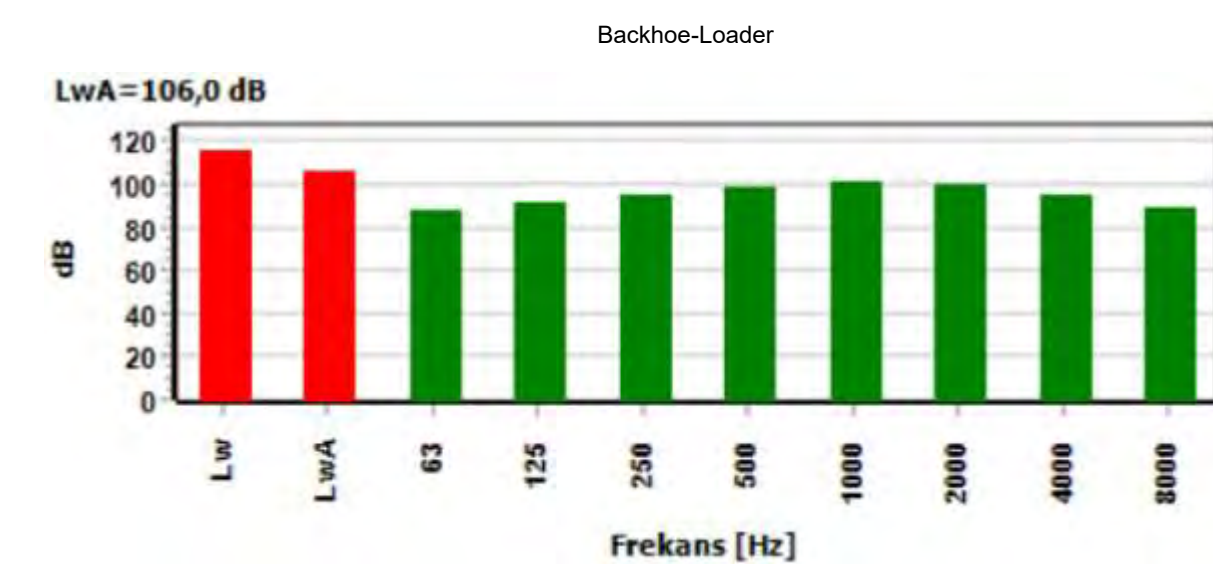


Figure 4.40: Data Of Sound Power Level Values of Equipment According to Octave Bands - 1

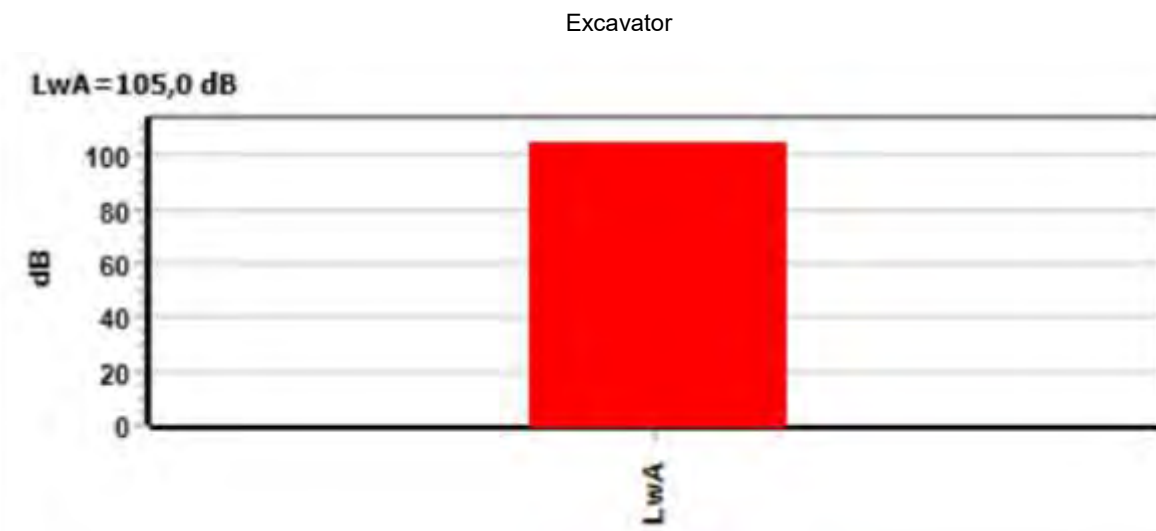
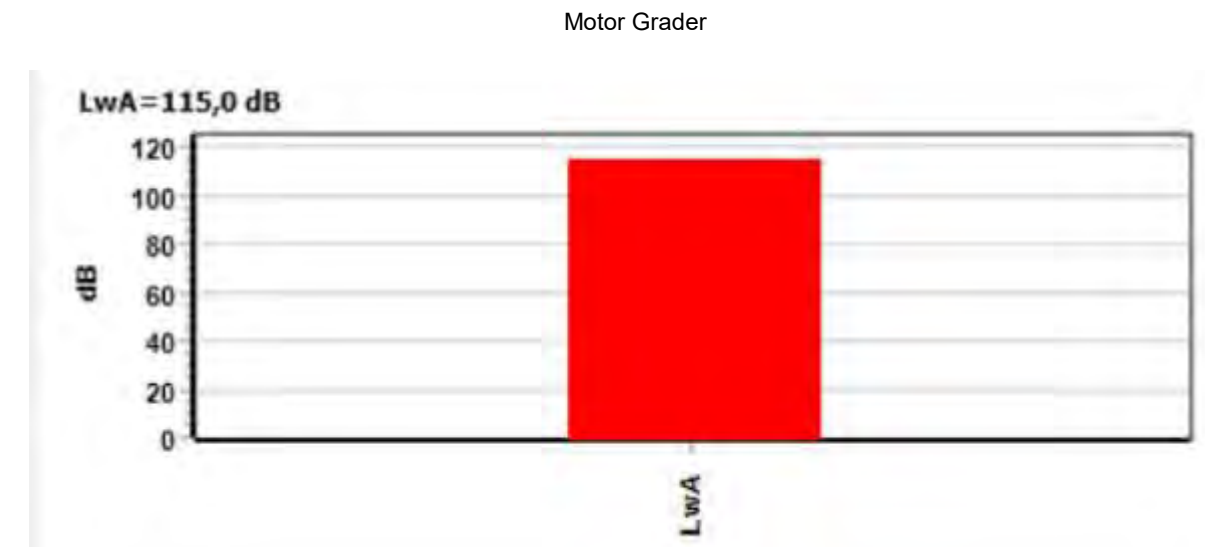
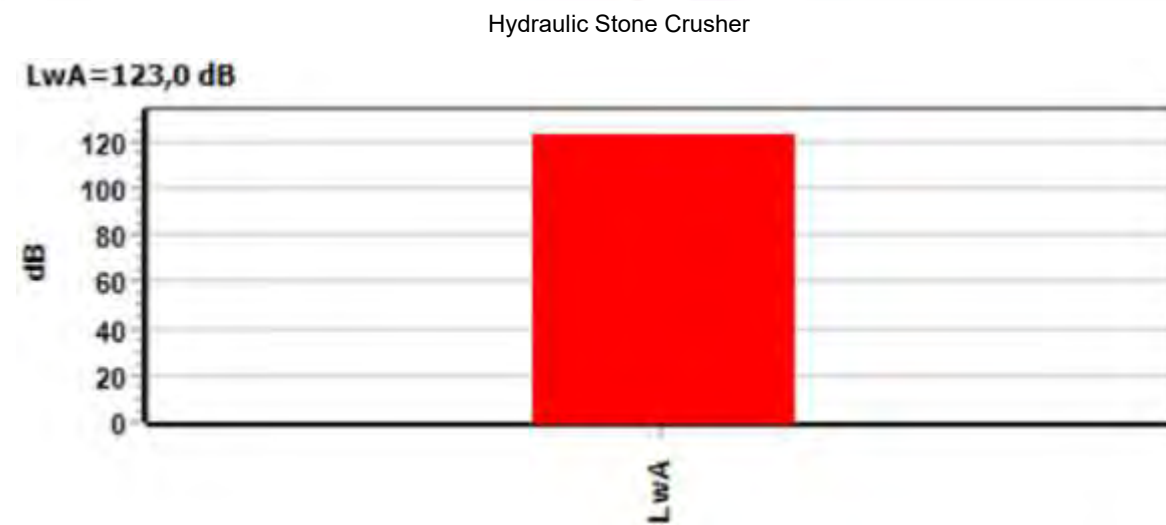
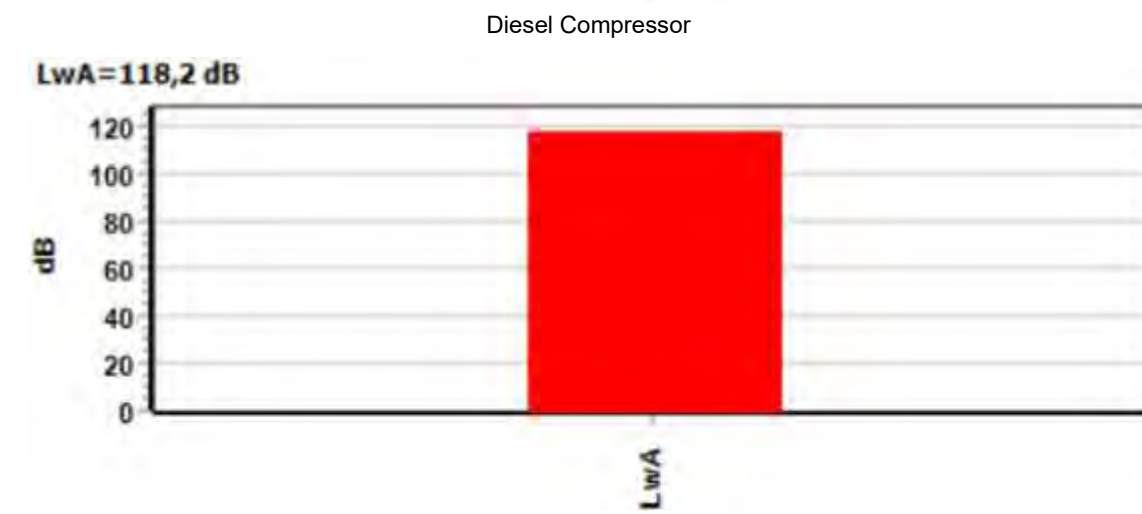
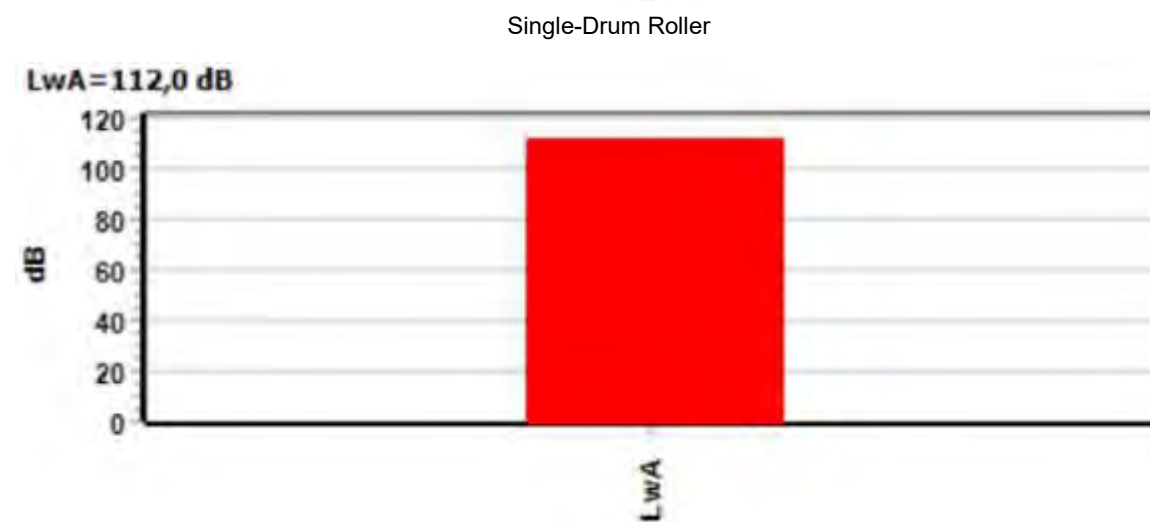
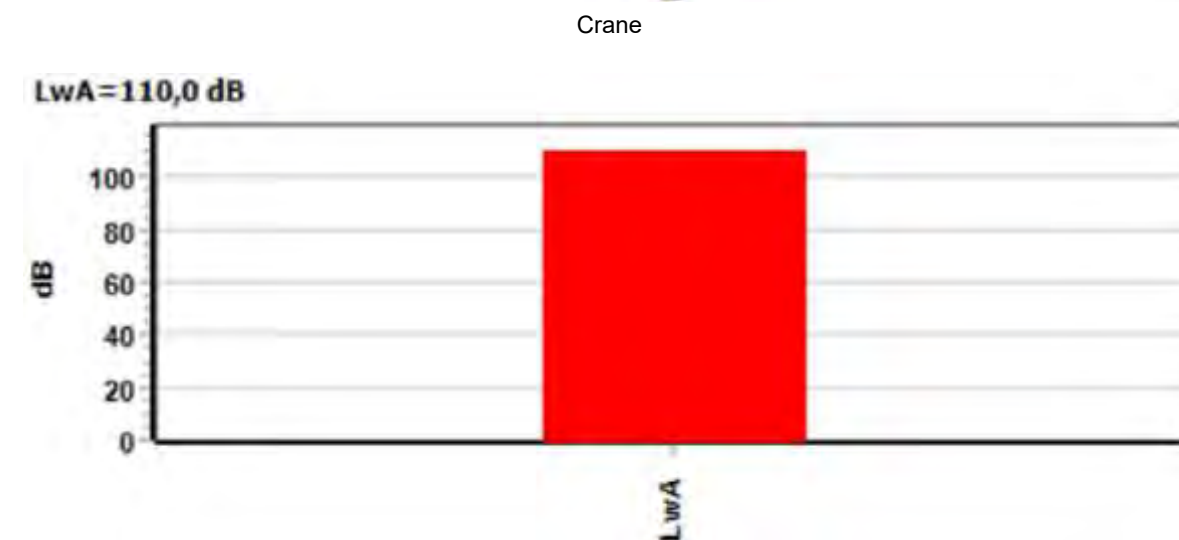


Figure 4.41: Data of Sound Power Level Values of Equipment According to Octave Bands - 2

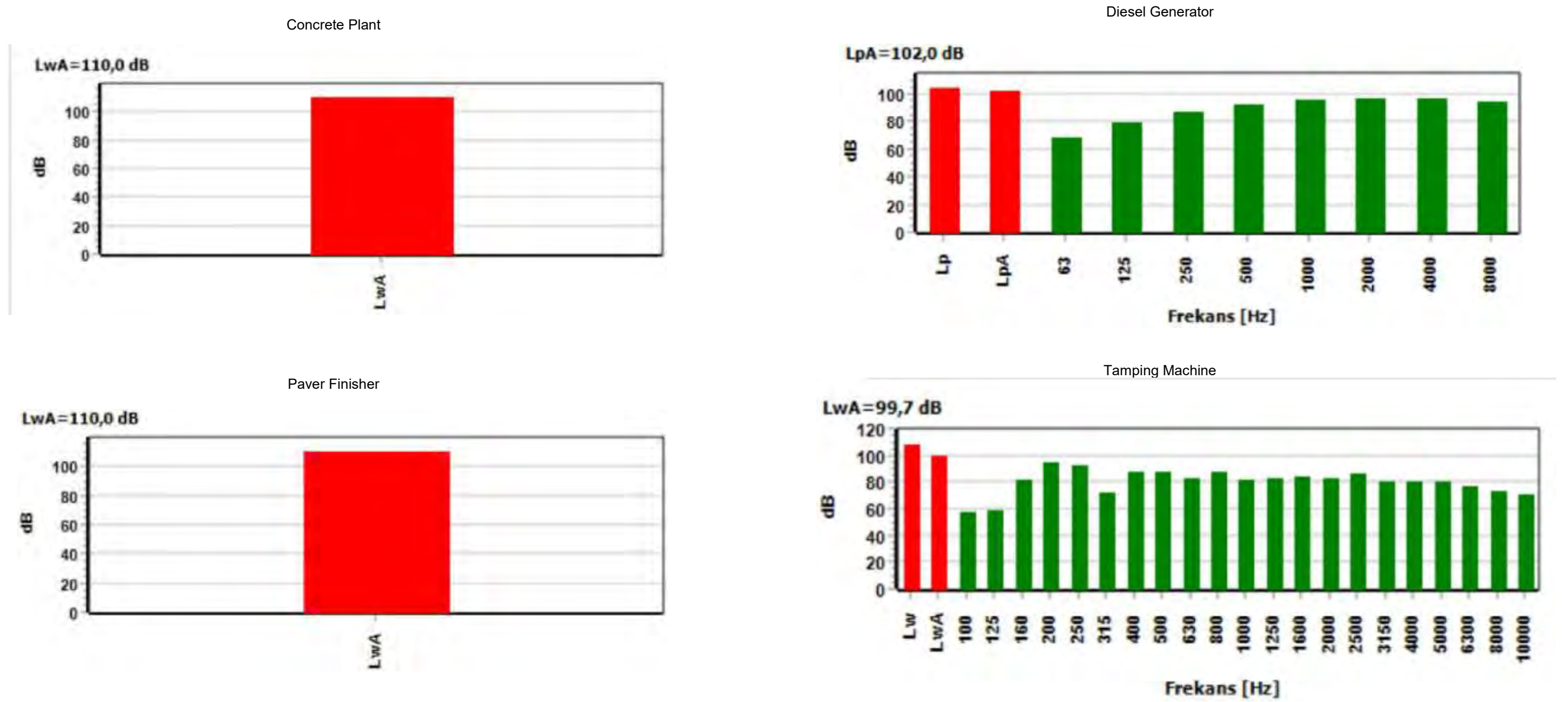
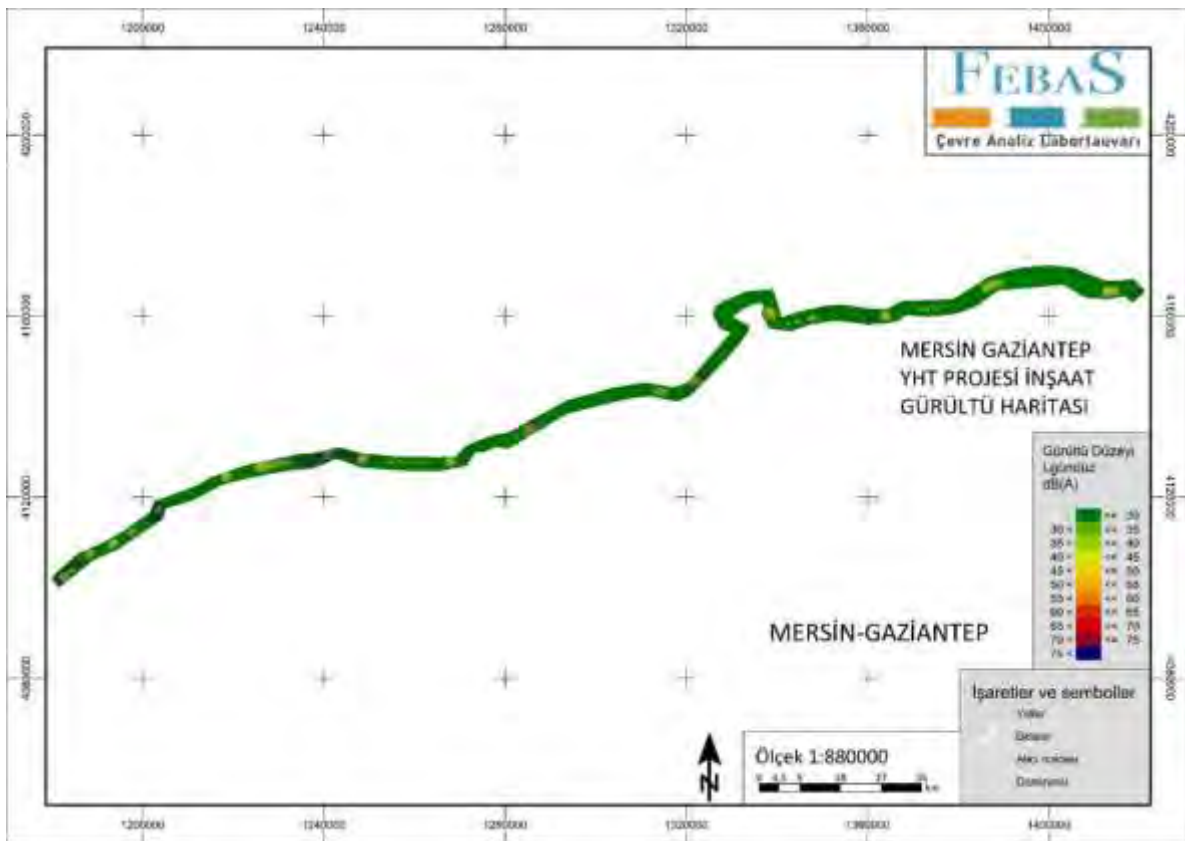


Figure 4.42: Data of Sound Power Level Values of Equipment According to Octave Bands - 3

SOUNDPLAN 8.2 program was used in the calculation of the noise that may occur because of the construction site activity. For the modeling of noise distribution in the TS ISO 9613-2 standard, first, the land height information is entered, and then the information of the point noise sources is entered after the obstacle information is entered. Basic information about the TS ISO 9613-2 standard and noise dispersion modeling report is given in Appendix 4.

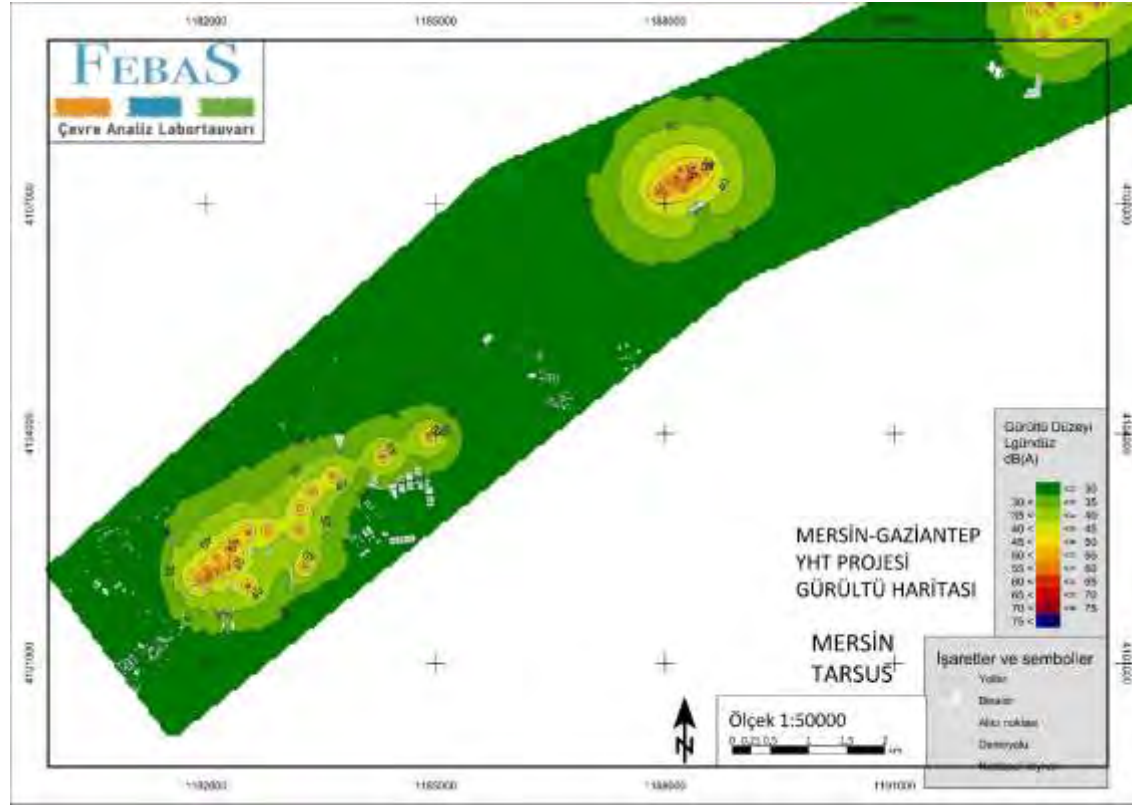
4.8.6.1.2 Modelling Output Documents and Maps

Since the construction activities will be carried out only during the daytime (07: 00-19: 00), noise maps prepared only for the daytime period are calculated. Construction site modeling output and noise maps are given below (see Map 4.11, Map 4.12, Map 4.13, Map 4.14 and Map 4.15).

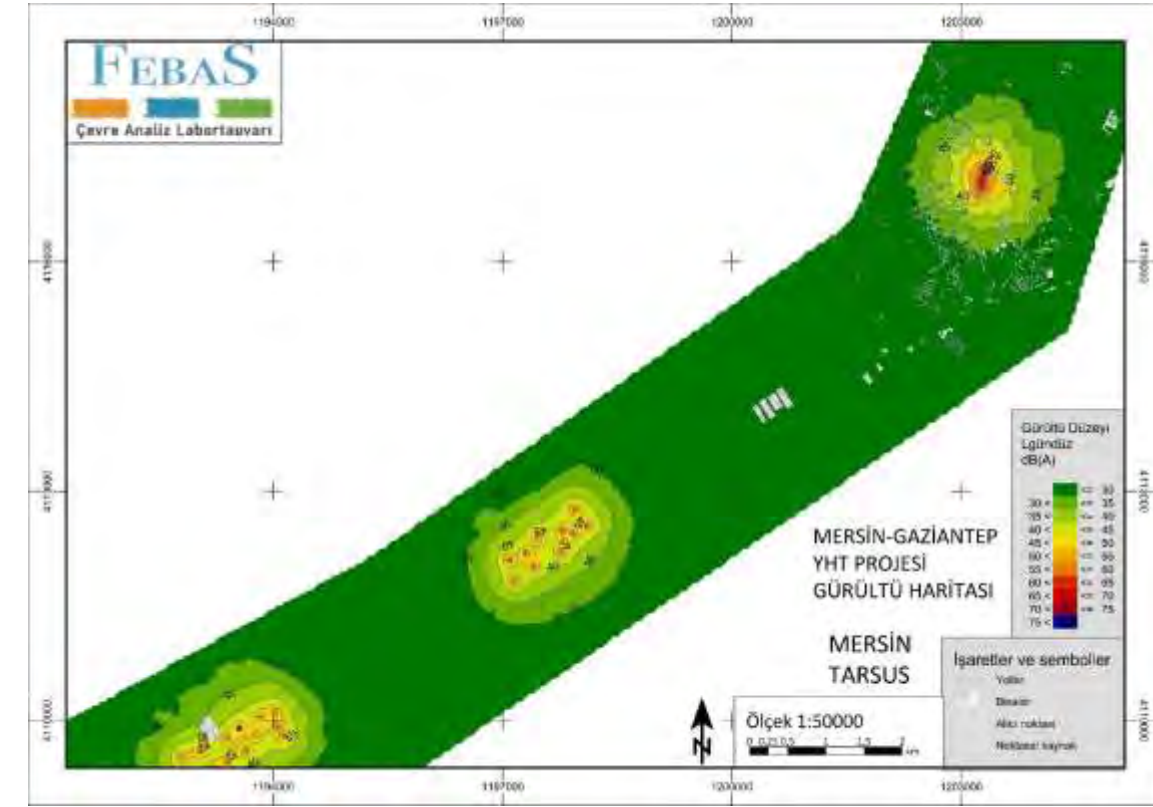


Map 4.11: Construction Period Noise Map

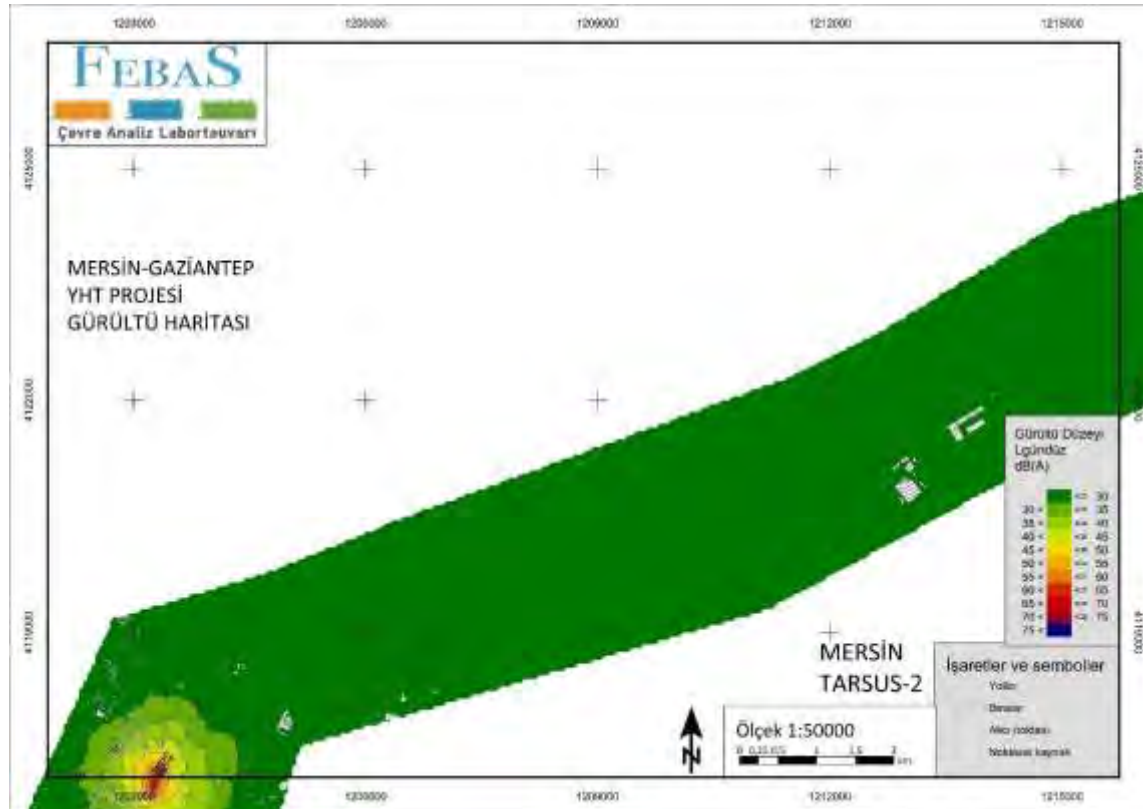
Section-1



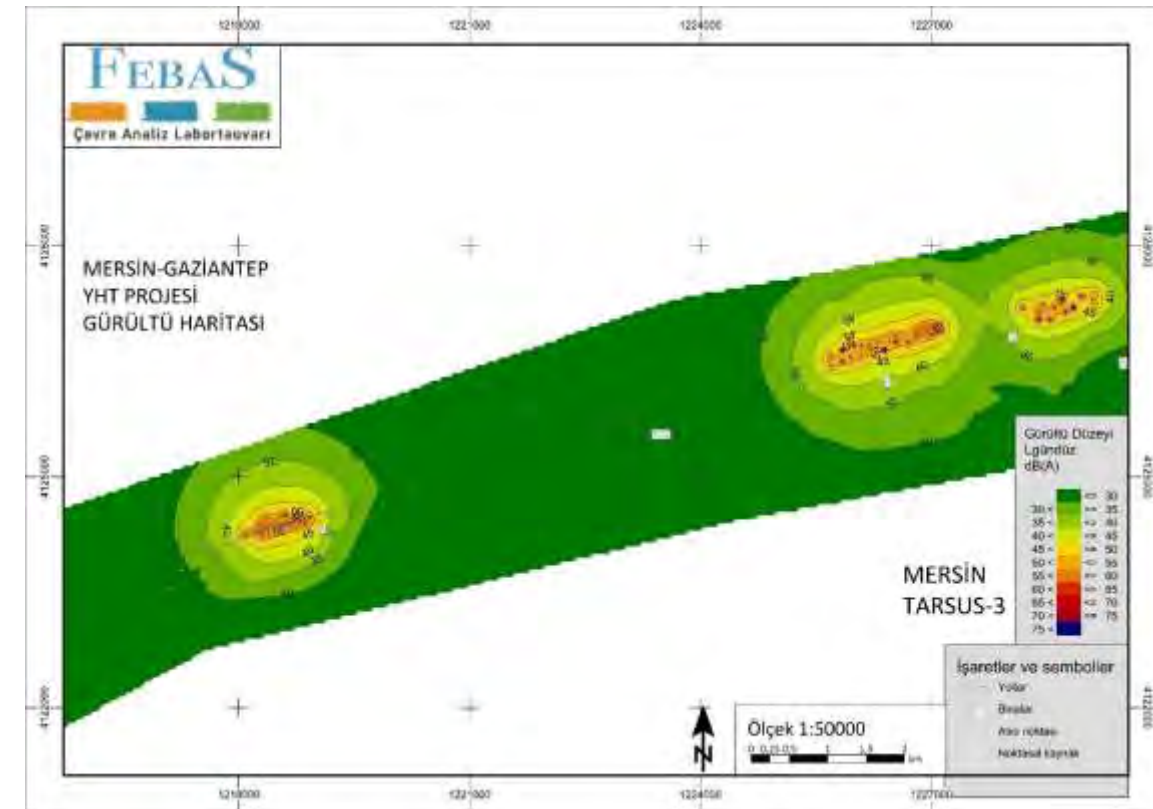
Section-2



Section-3

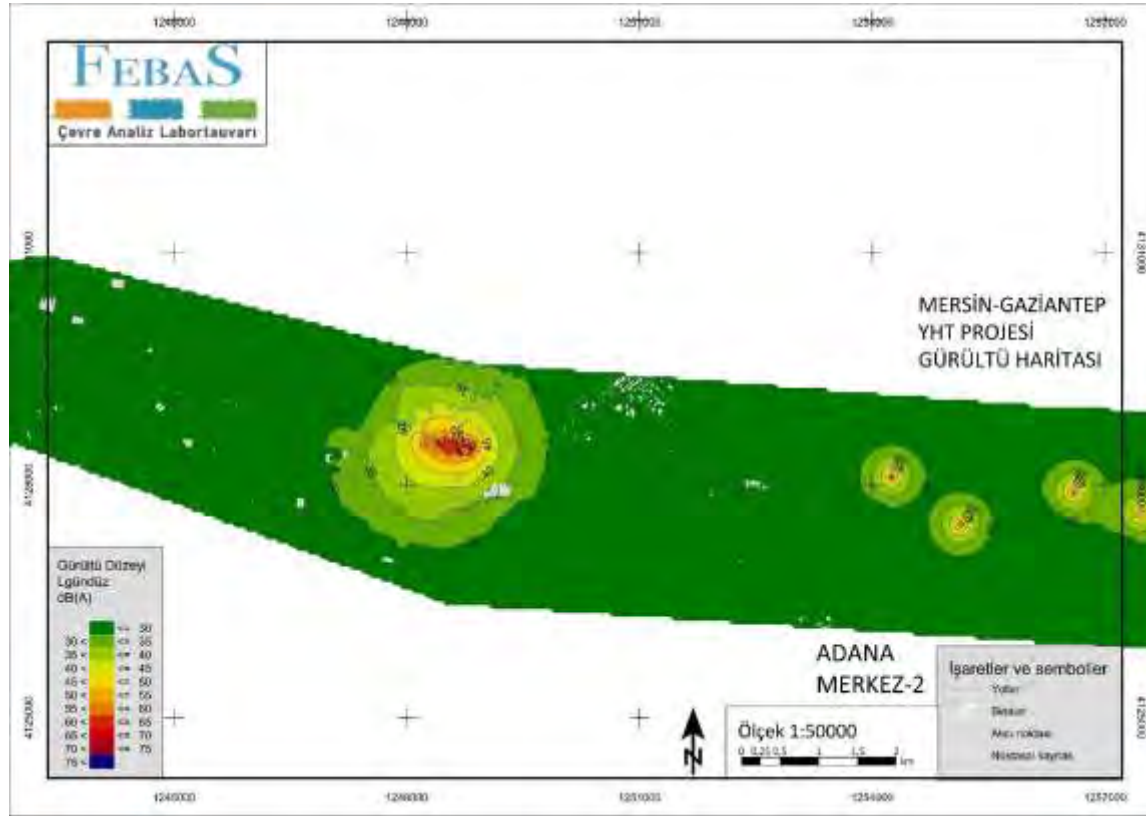


Section-4

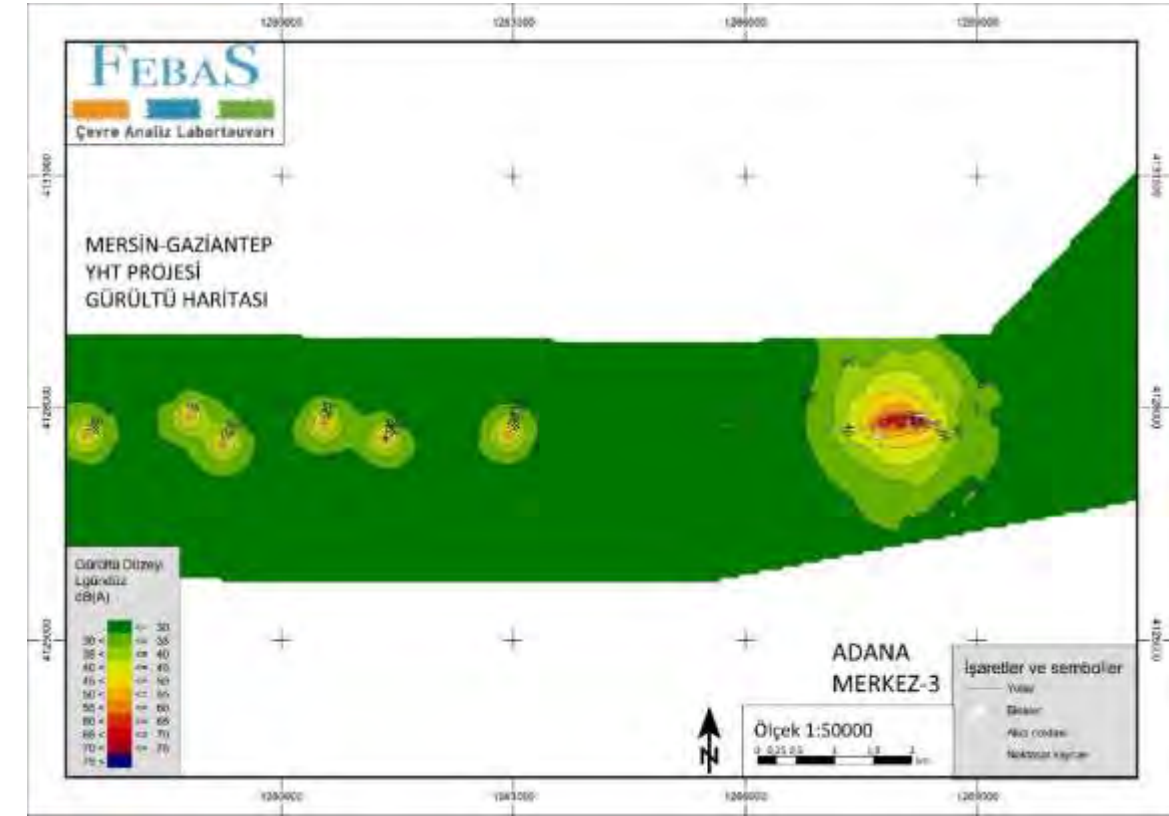


Map 4.12: Mersin-Gaziantep HST Project Construction Period Noise Maps

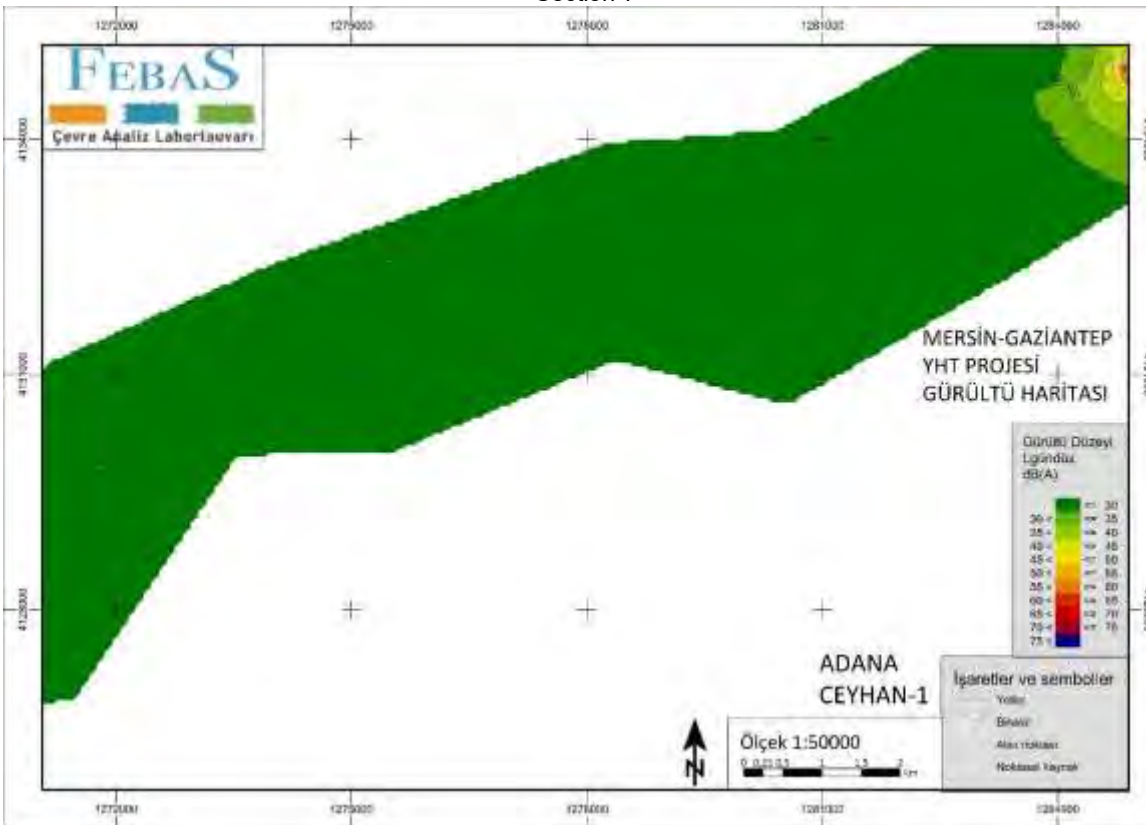
Section-5



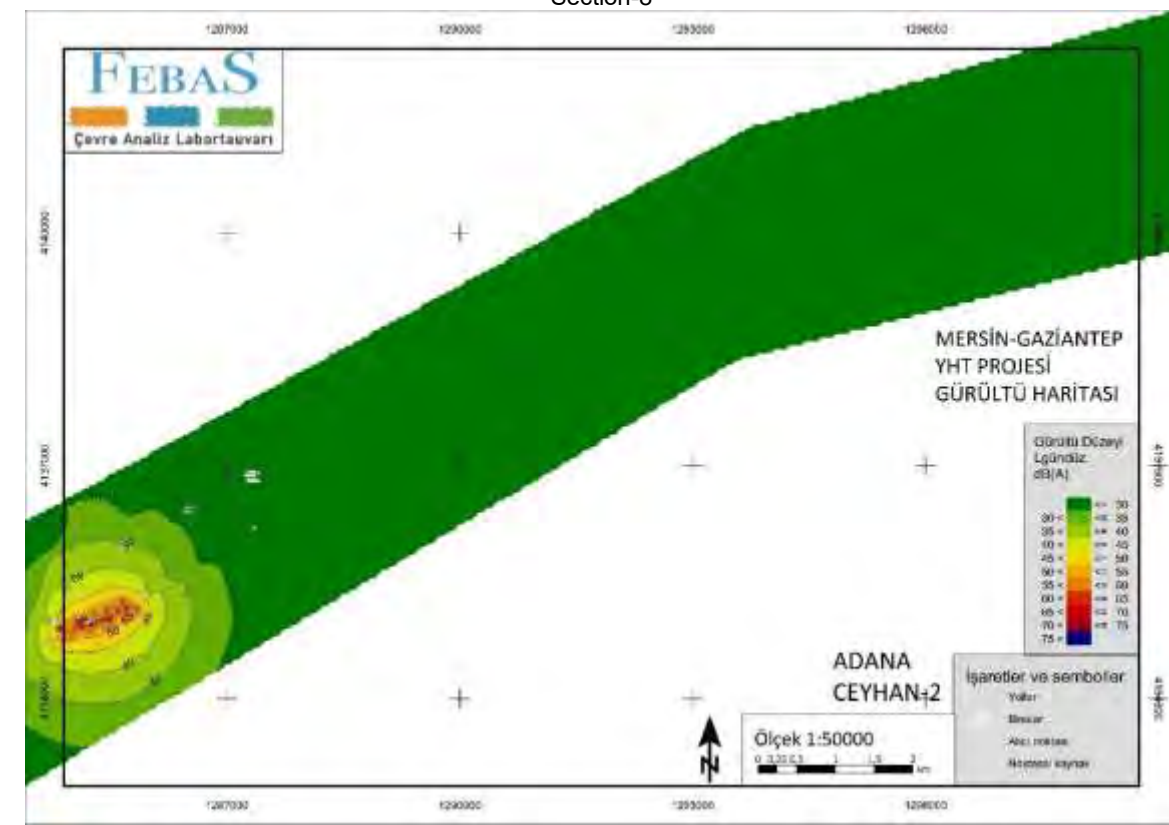
Section-6



Section-7

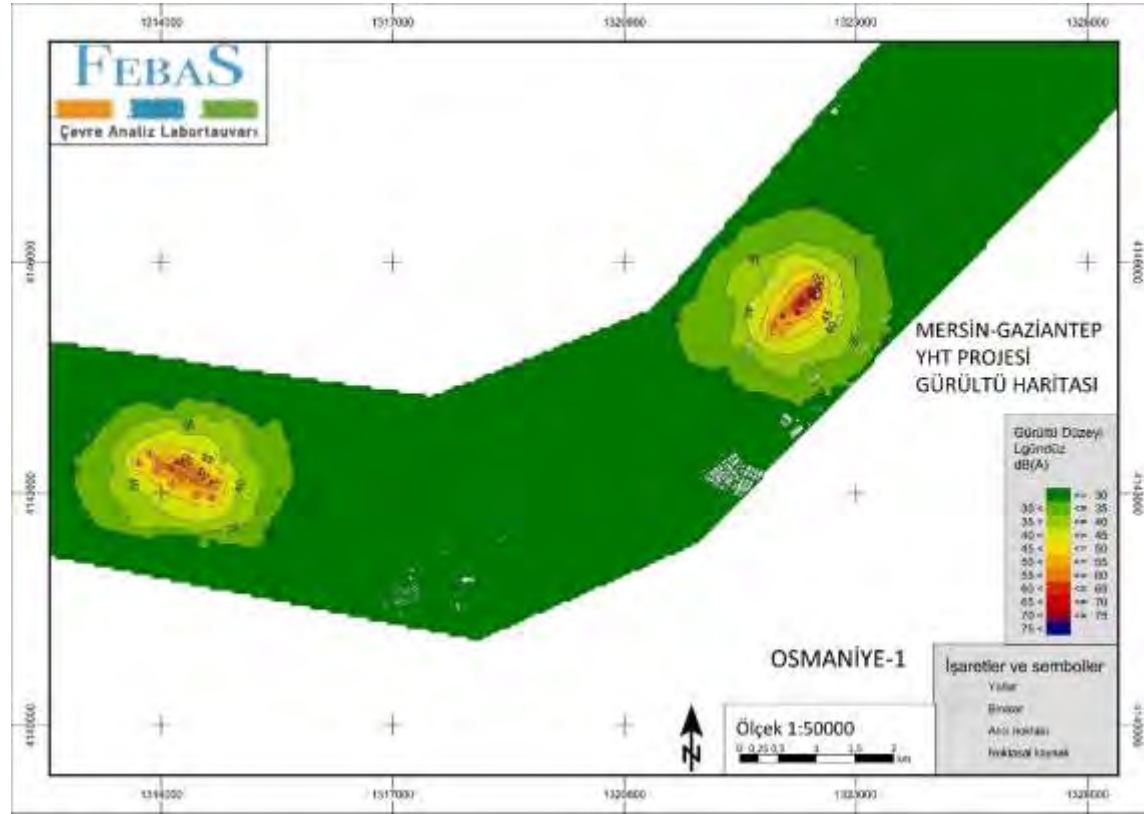


Section-8

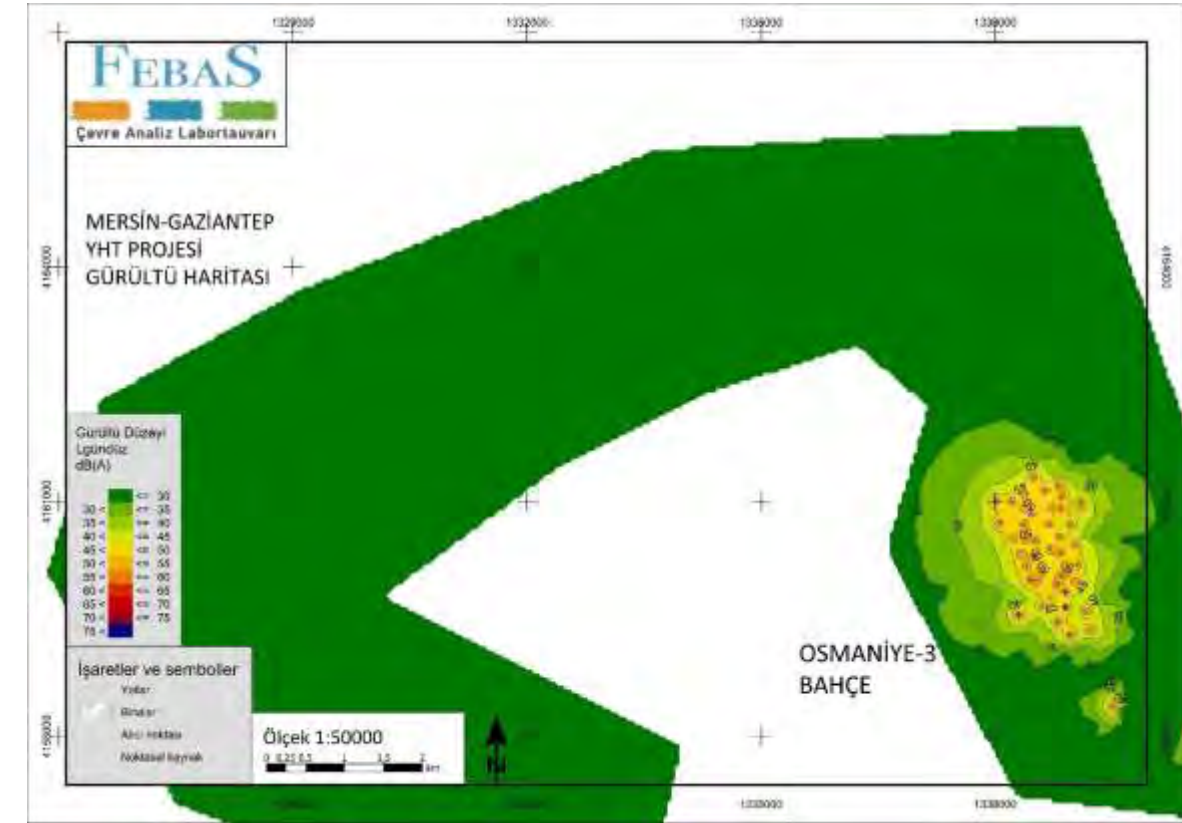


Map 4.13: Mersin-Gaziantep HST Project Construction Period Noise Maps

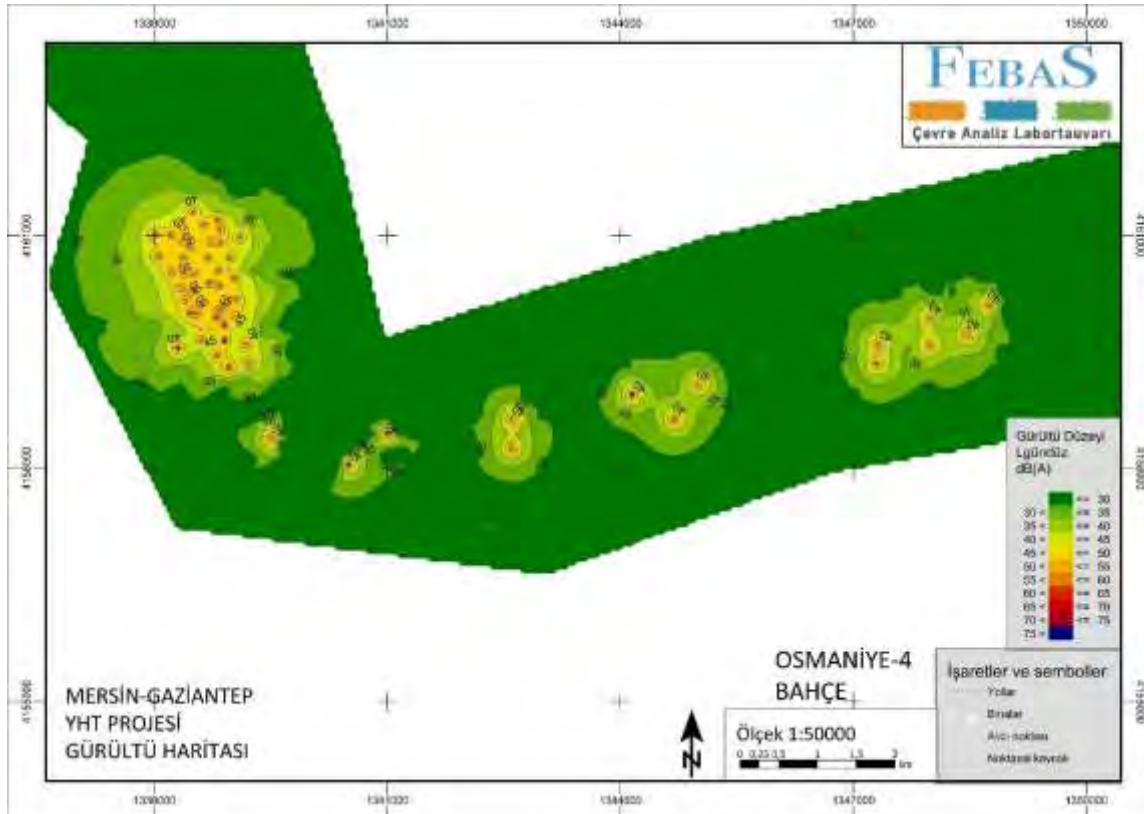
Section-9



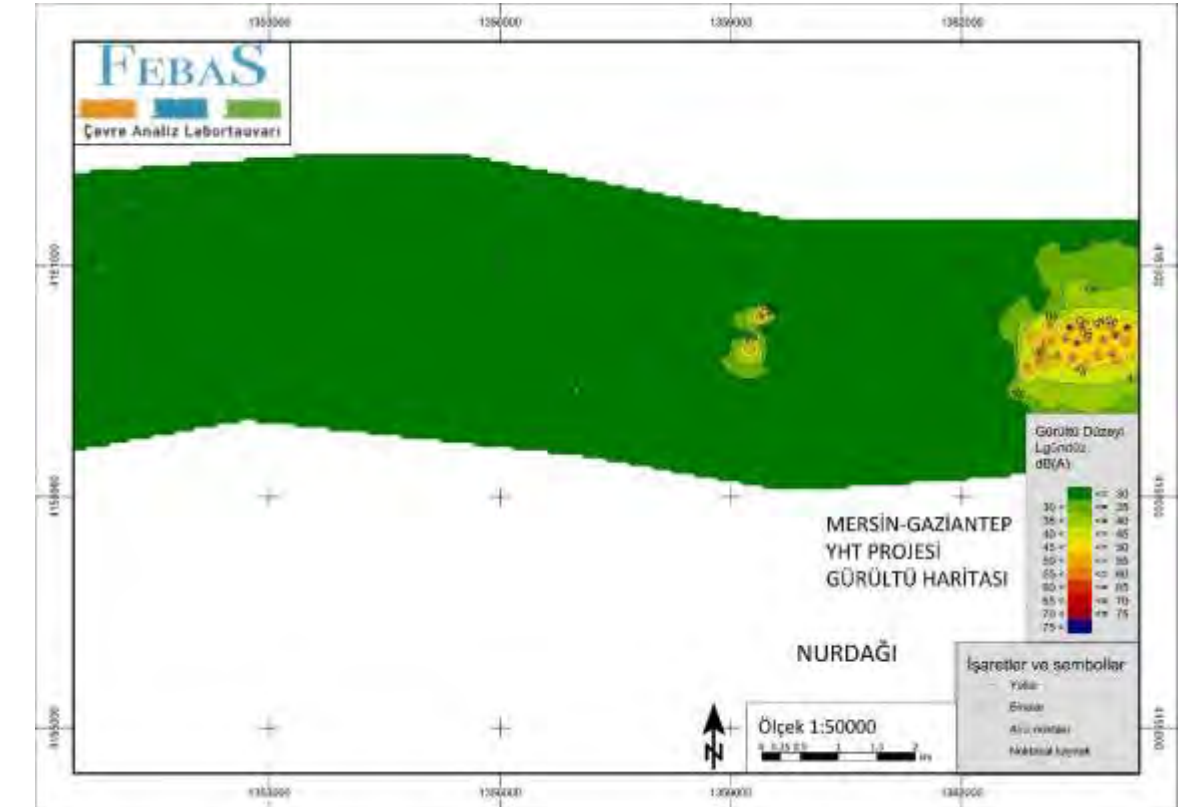
Section-10



Section-11

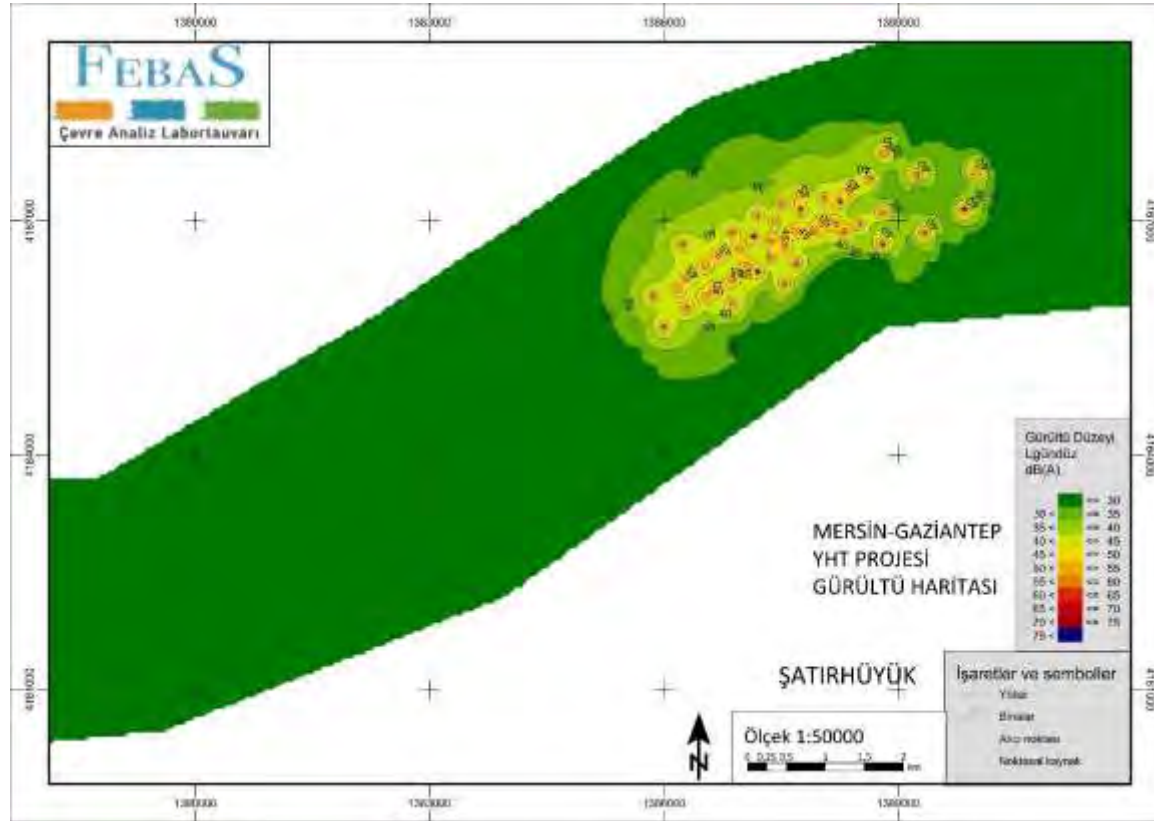


Section-12

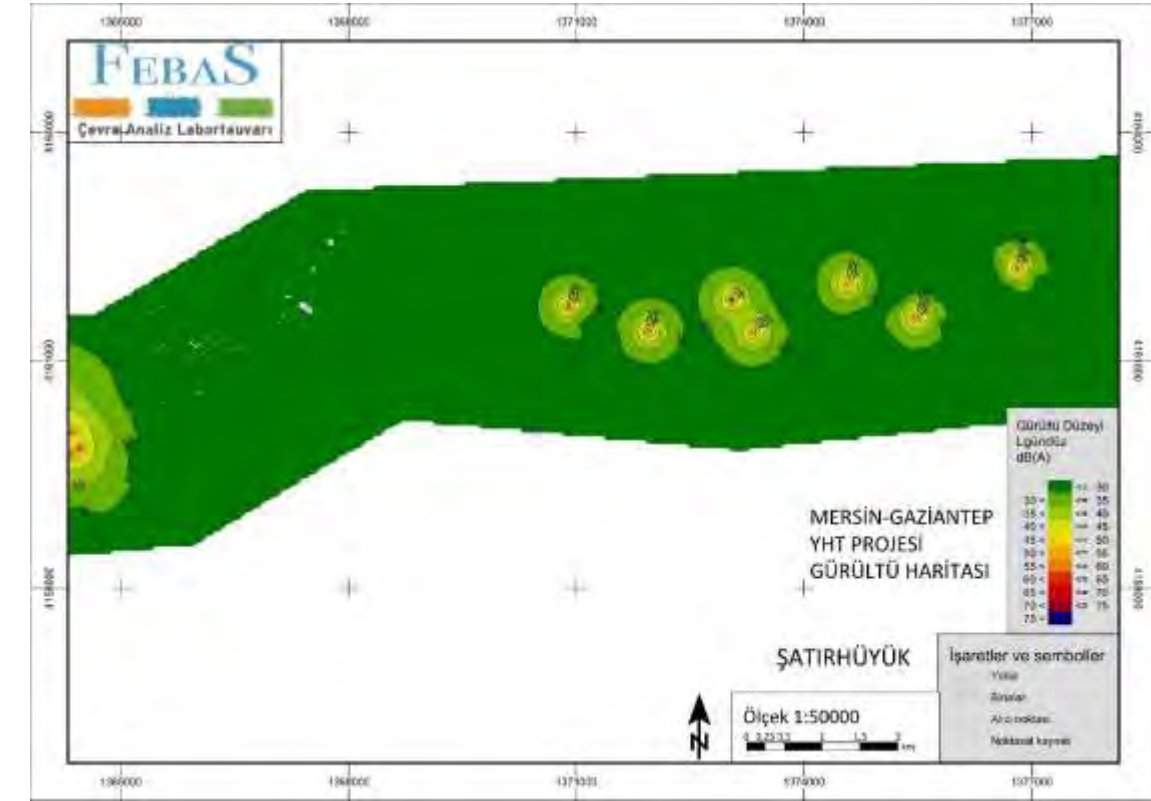


Map 4.14: Mersin-Gaziantep HST Project Construction Period Noise Maps

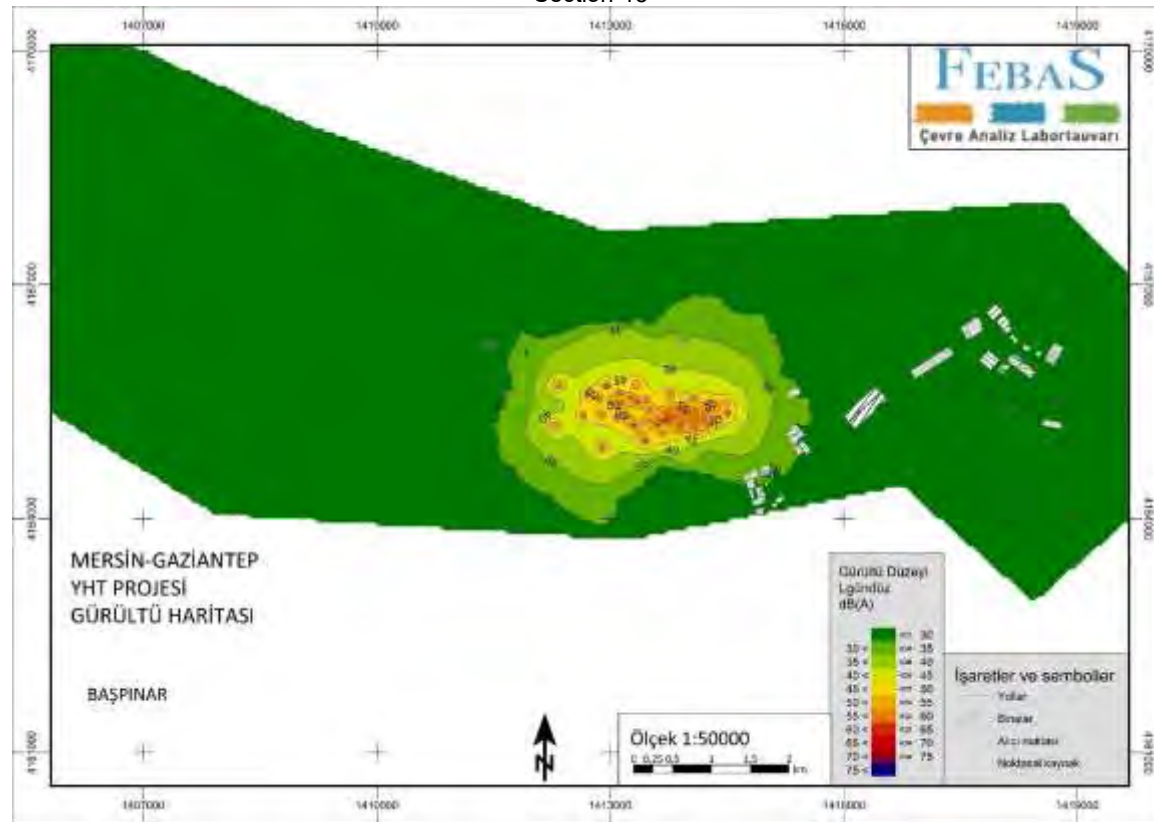
Section-13



Section-14



Section-15



Map 4.15: Mersin-Gaziantep HST Project Construction Period Noise Maps

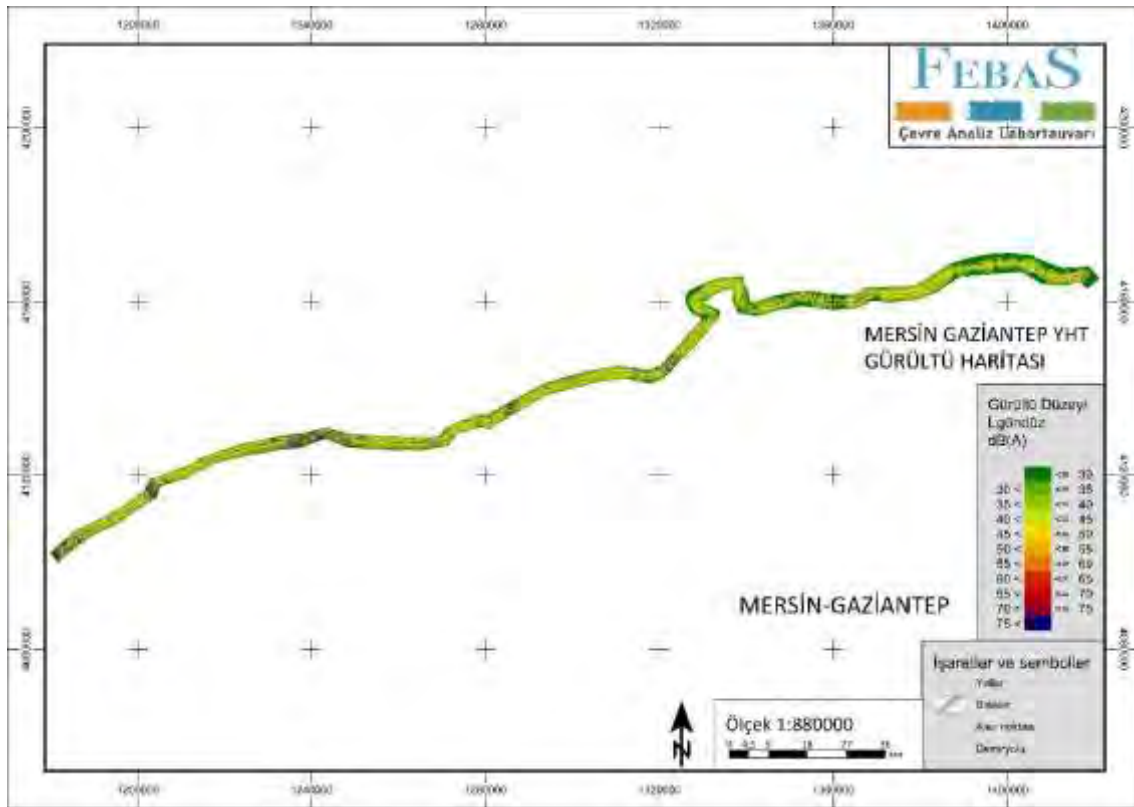
4.8.6.2 Operation, Longer Term and Permanent Effects

Operation of Mersin-Gaziantep Railway will cause noise and vibration generation from a variety of sources. Contact between wheel and rail during movement and braking of the train, aerodynamic noise that is generated by the train pushing air, and by the engine and cooling fans result in railway noise.

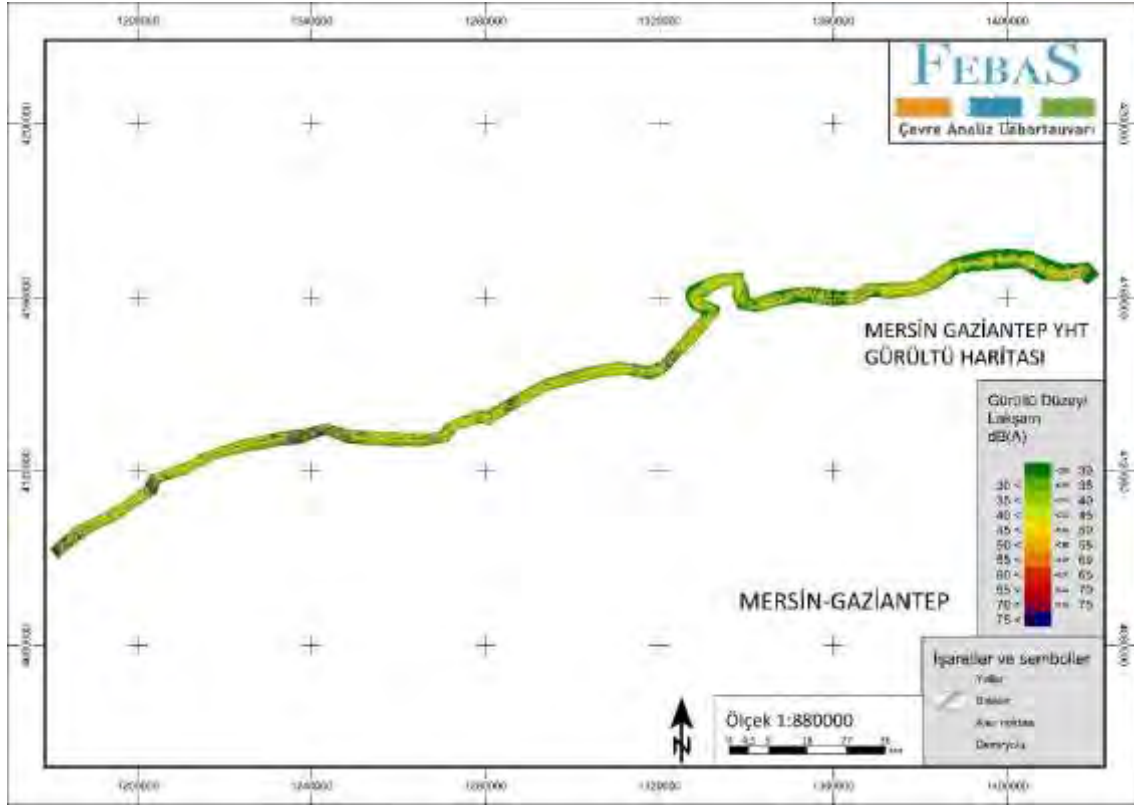
The Dutch national calculation method “Reken - Meervoorschrift Railverkeer slawaai” was used in the operation phase noise modeling in accordance with the regulation for assessment and management of environmental noise. This method is used to determine the linear sound power level of the railway source. Information on the method in question is given in Appendix 4.

4.8.6.2.1 Noise Maps

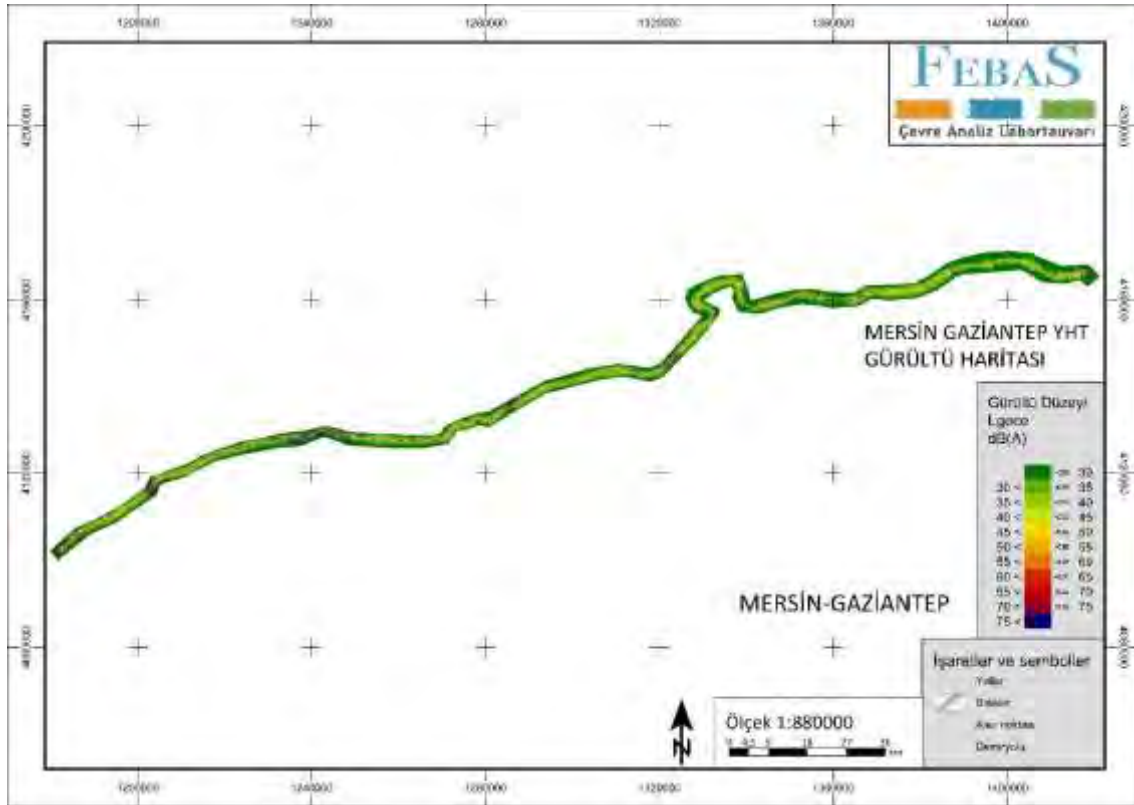
The noise maps prepared throughout the project for the operation phase are given in the maps below (see from Map 4.16 to Map 4.37).



Map 4.16: Mersin-Gaziantep HST Project Noise Map During Daytime

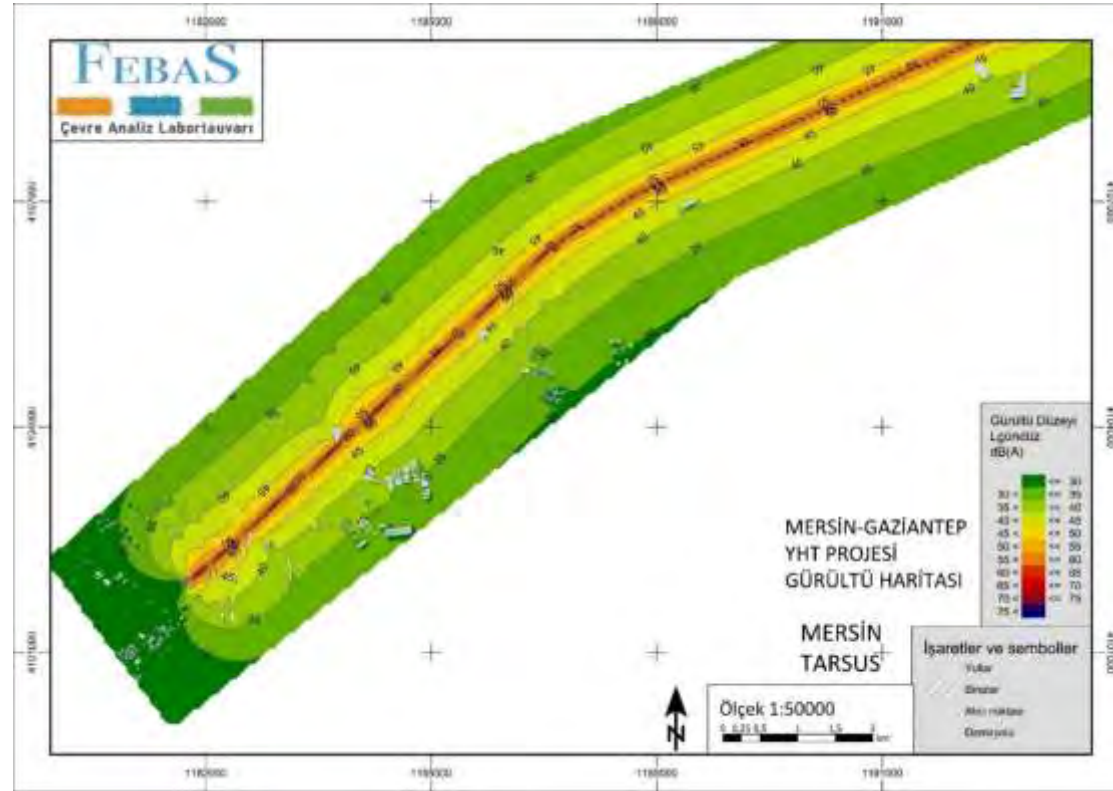


Map 4.17: Mersin-Gaziantep HST Project Noise Map During Evening-Time

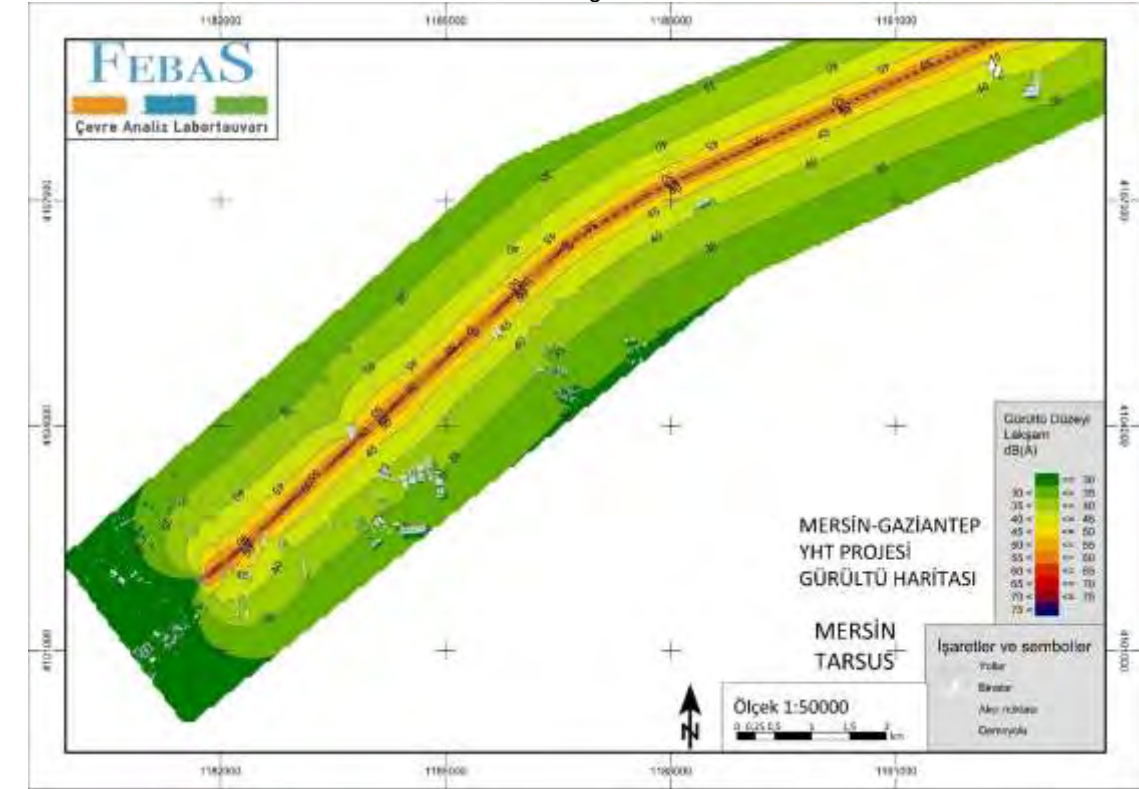


Map 4.18: Mersin-Gaziantep HST Project Noise Map During Nighttime

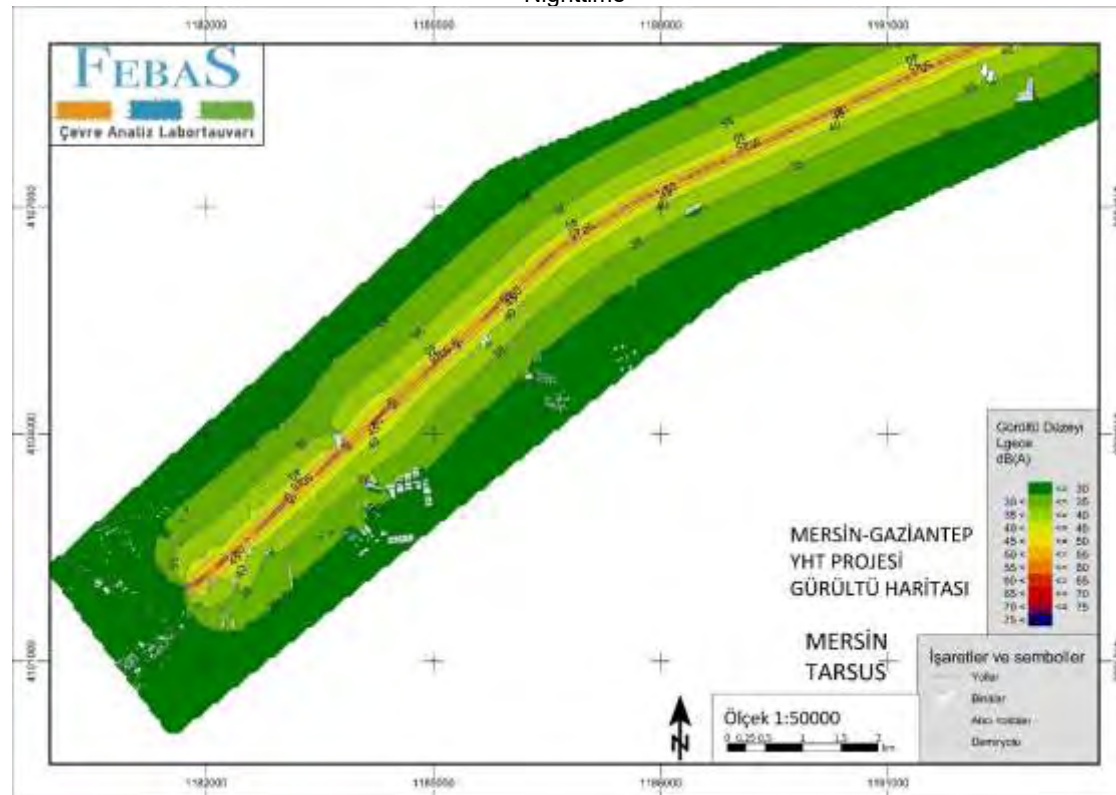
Daytime



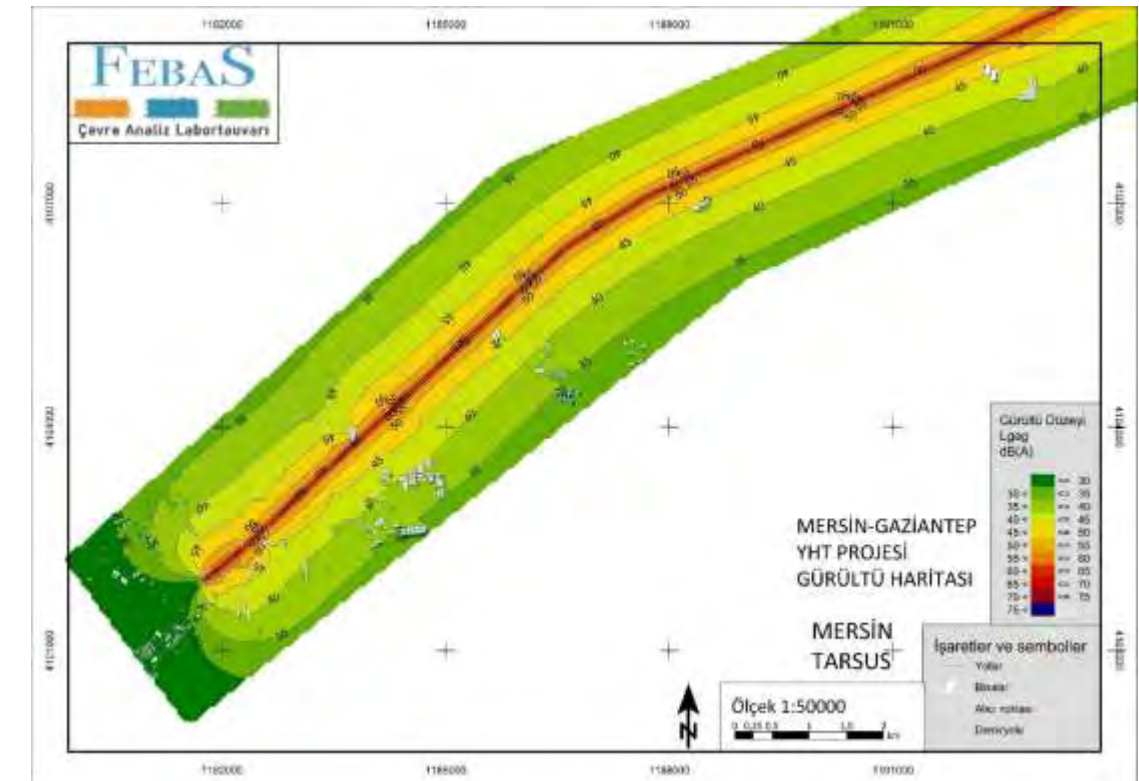
Evening-time



Nighttime

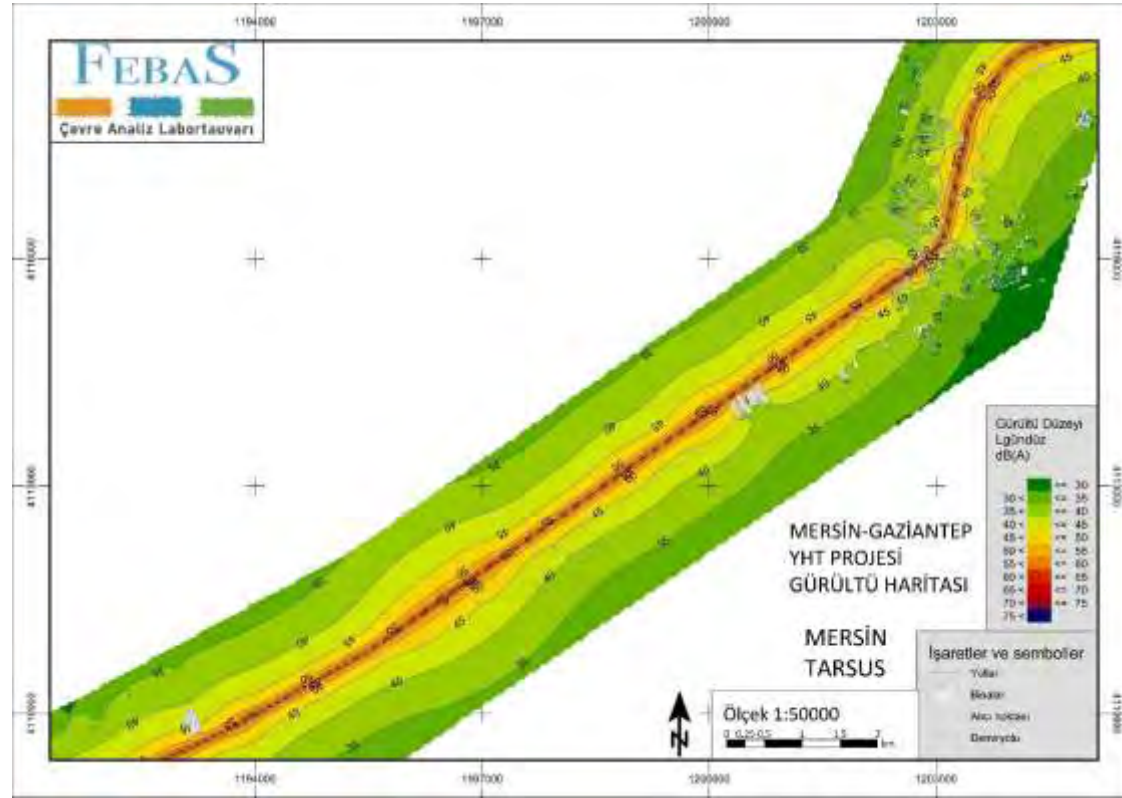


Daytime, Evening-time and Nighttime

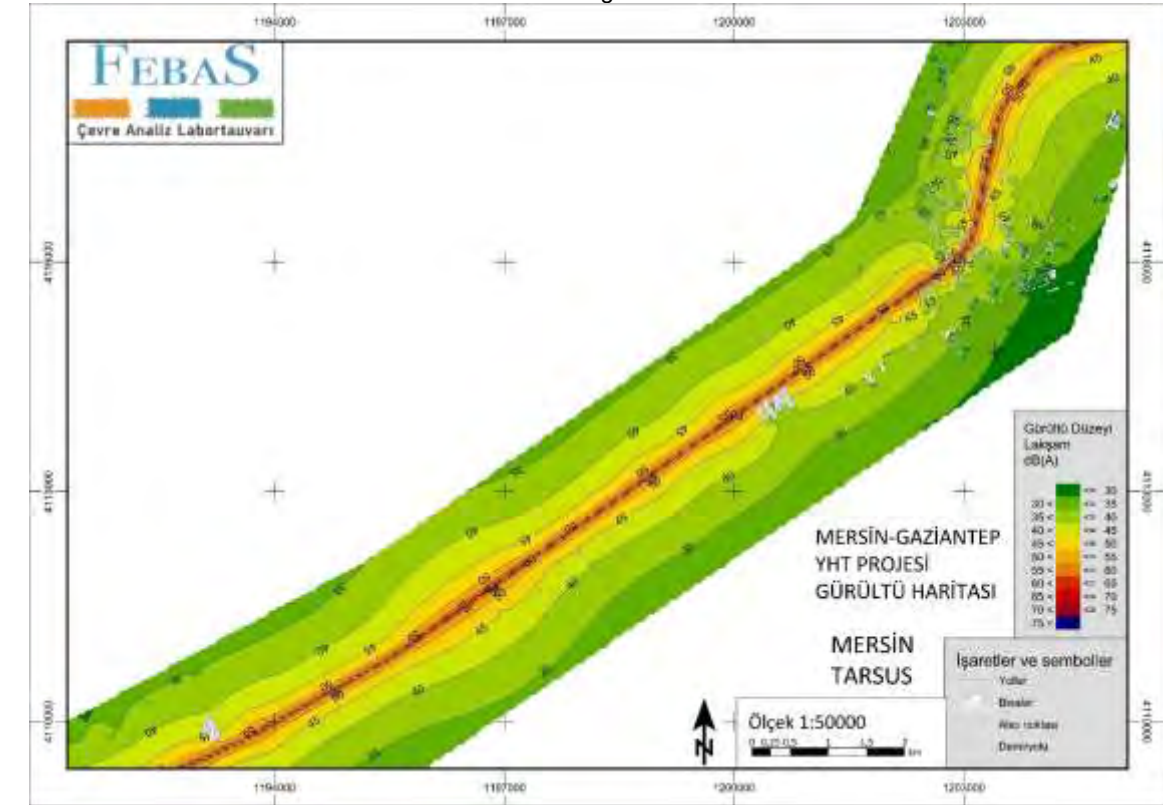


Map 4.19: Noise Map of Mersin Gaziantep in Section 1

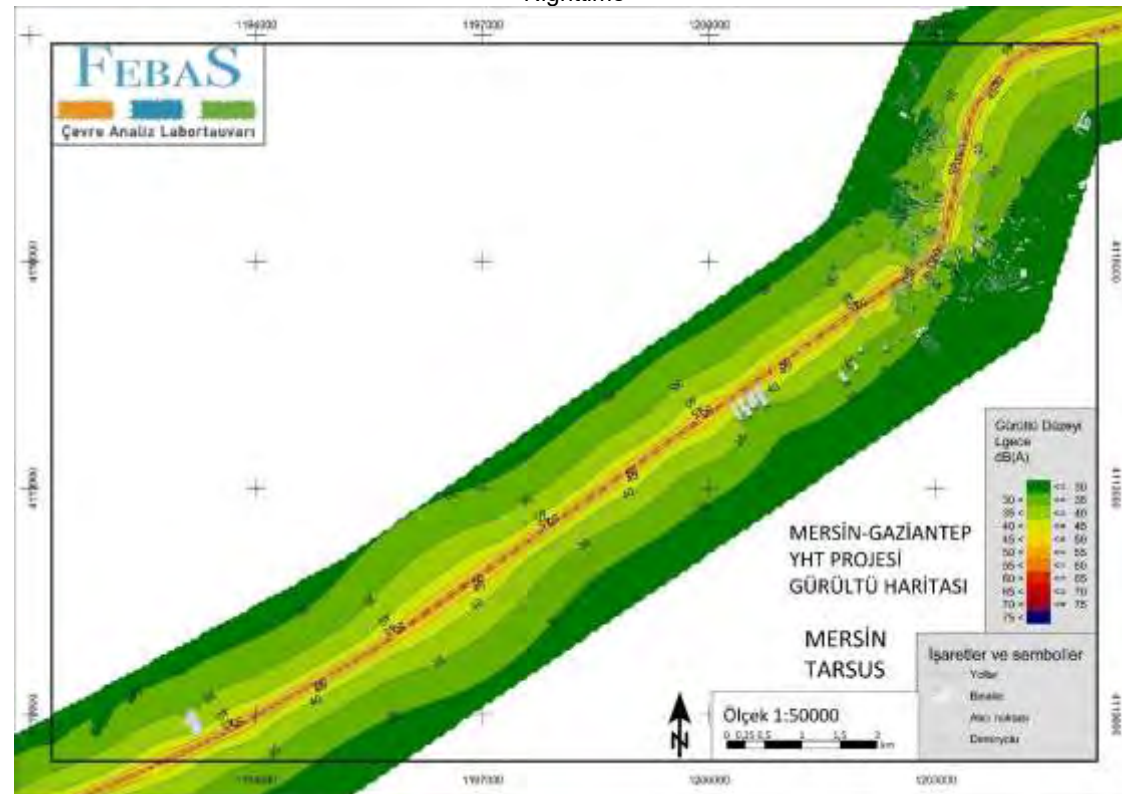
Daytime



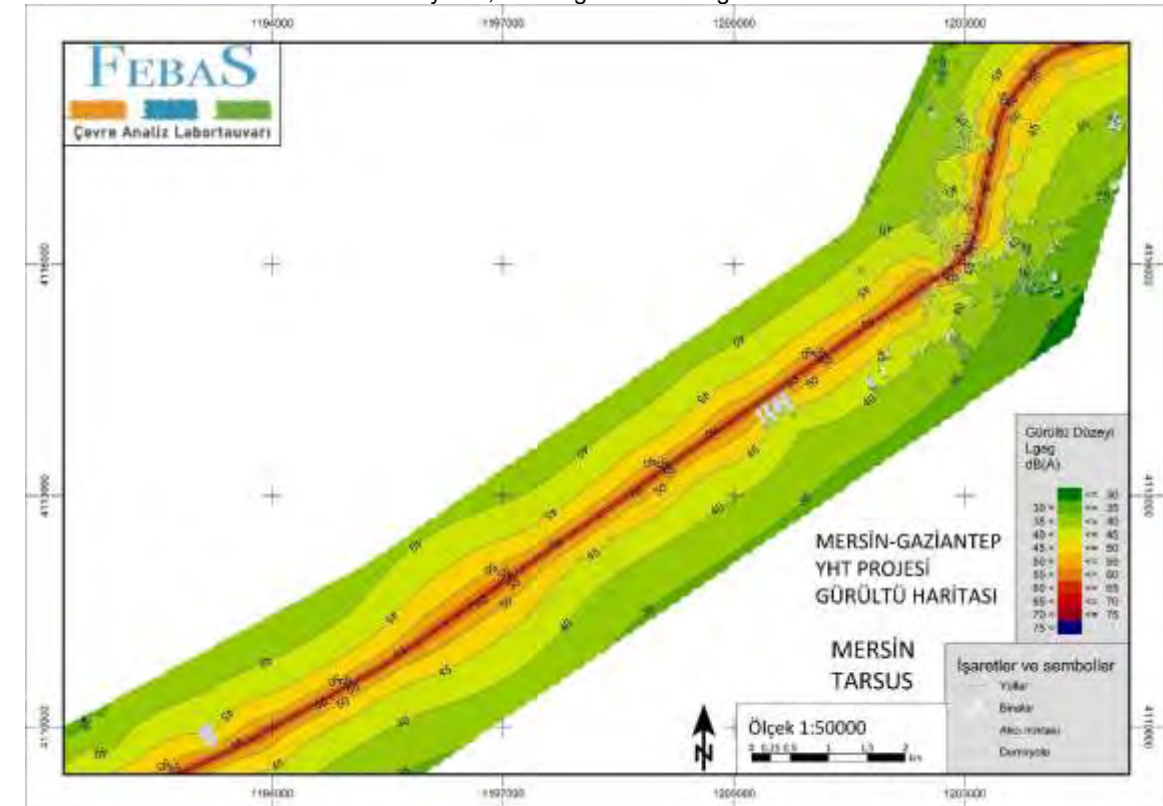
Evening-time



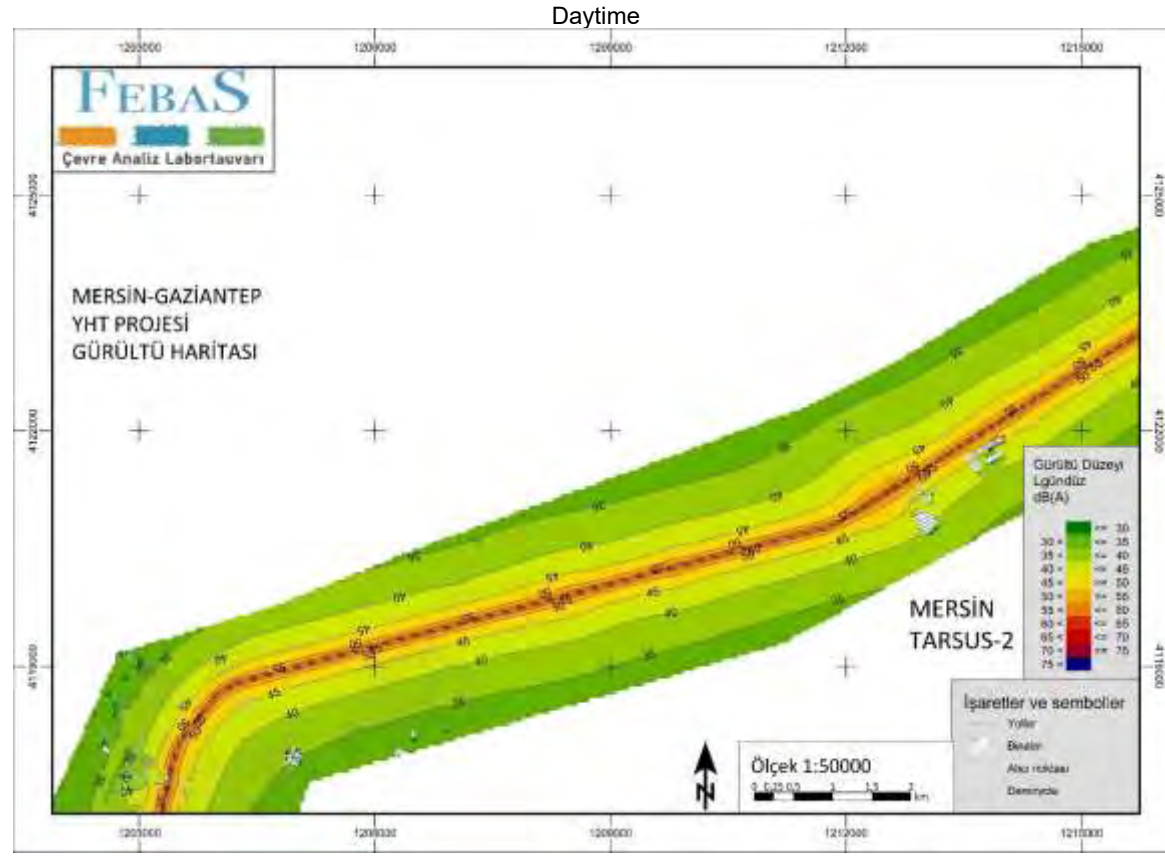
Nighttime



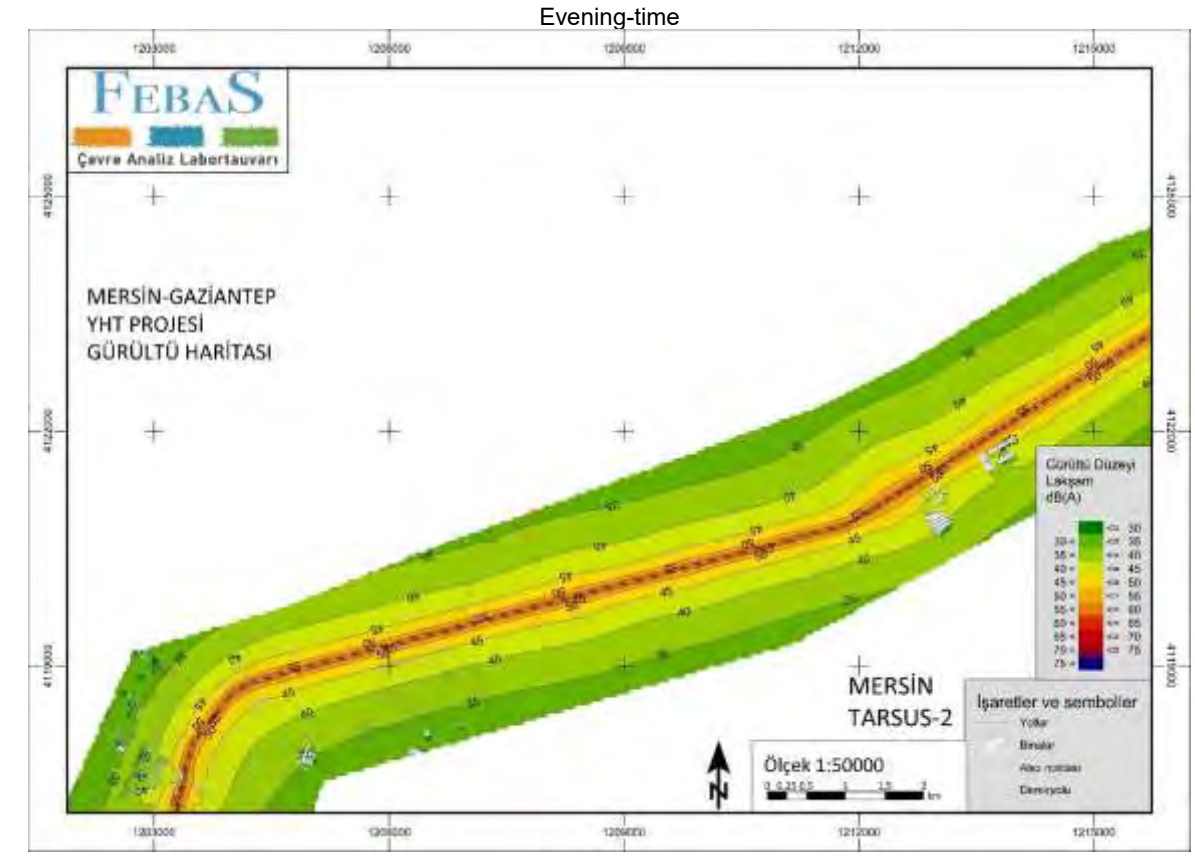
Daytime, Evening-time and Nighttime



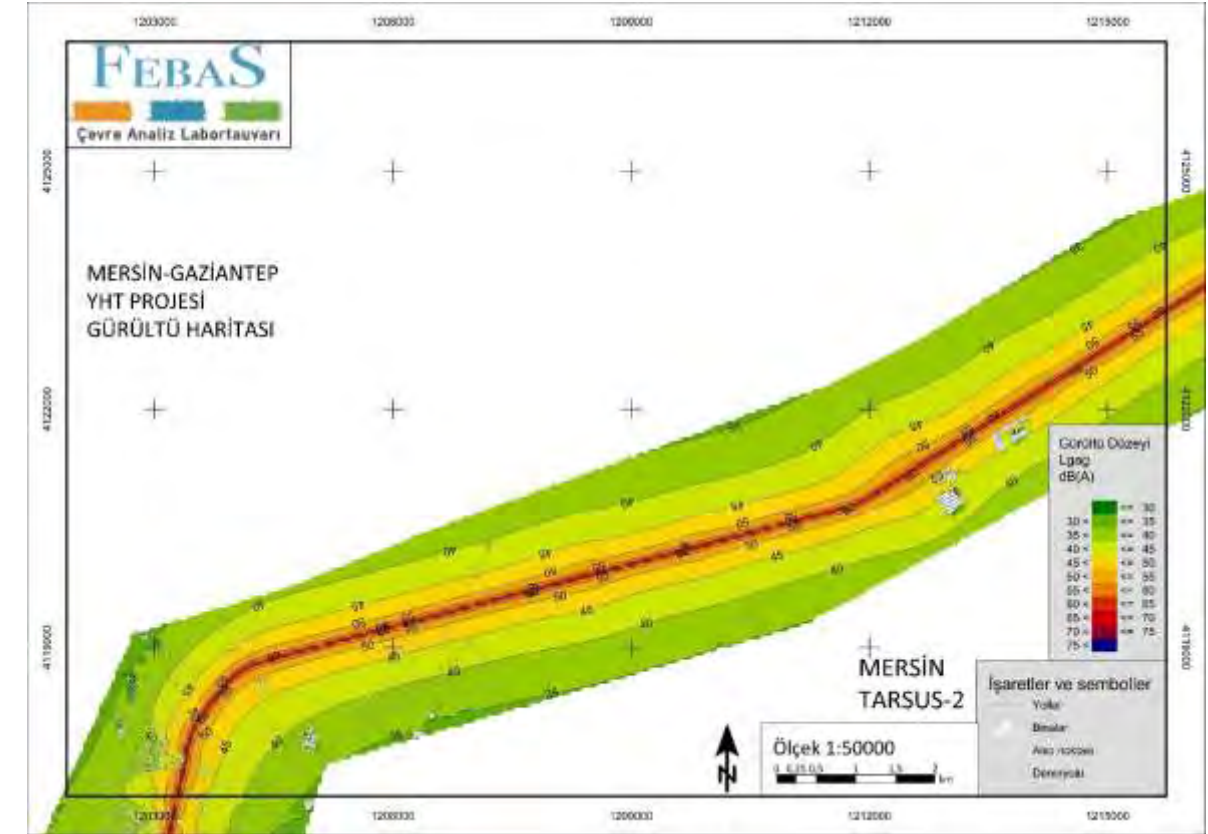
Map 4.20: Noise Map of Mersin Gaziantep in Section 2



Nighttime

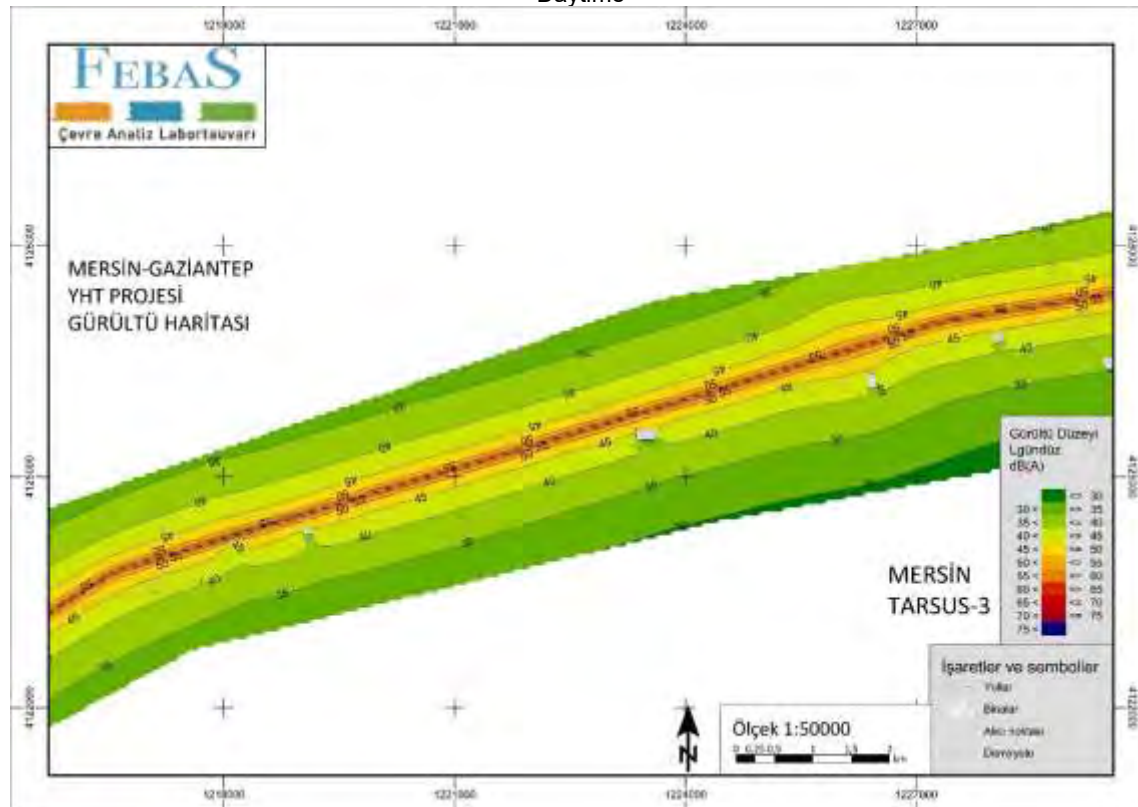


Daytime, Evening-time and Nighttime

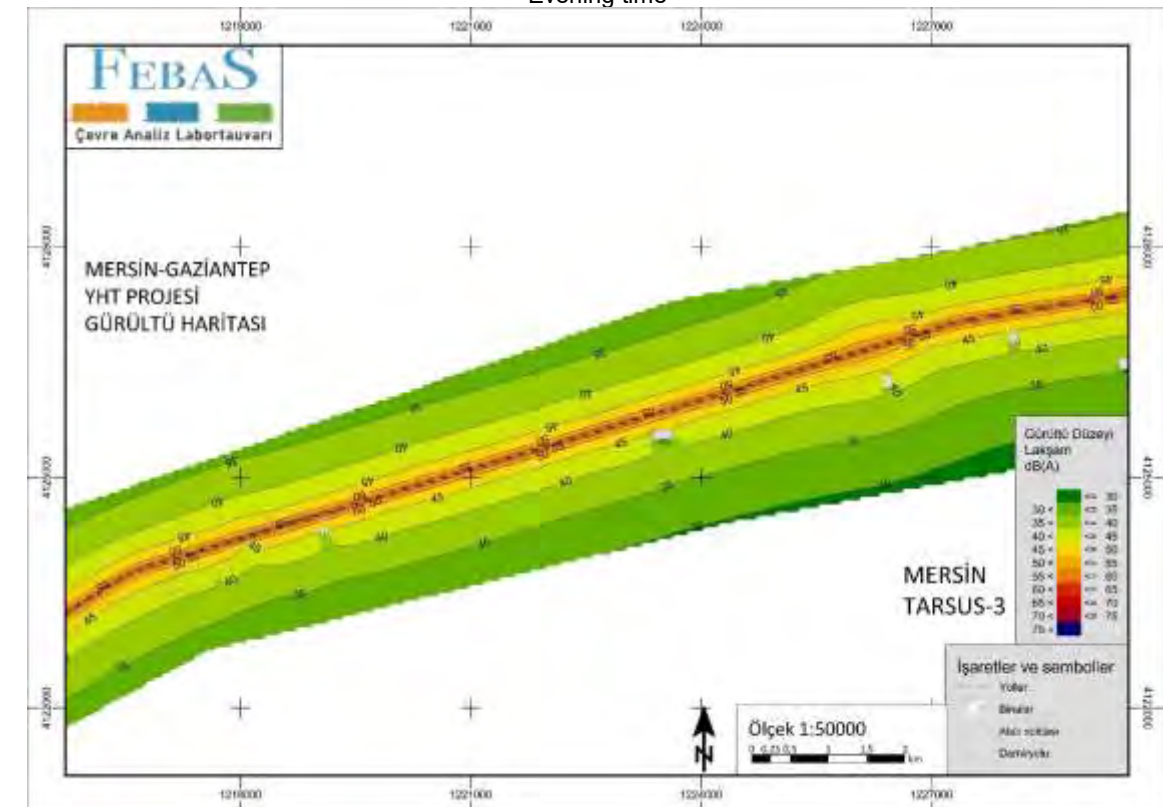


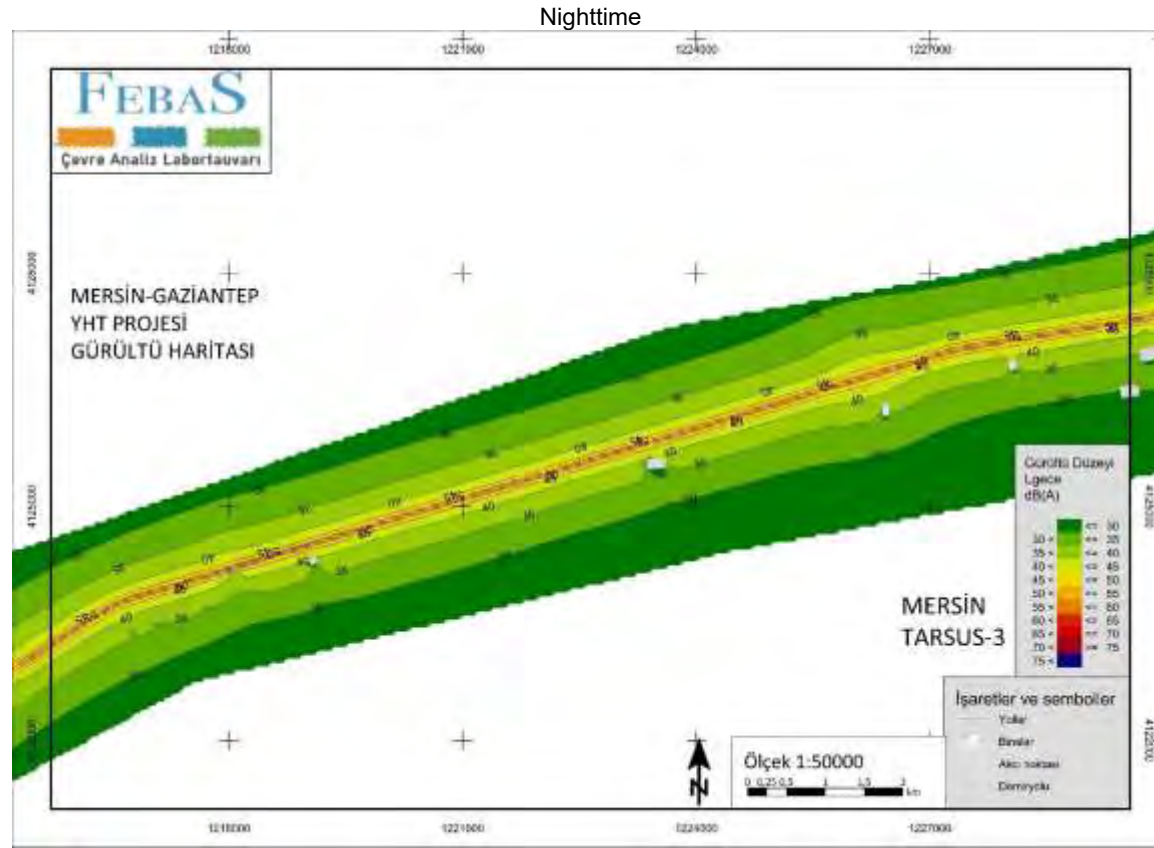
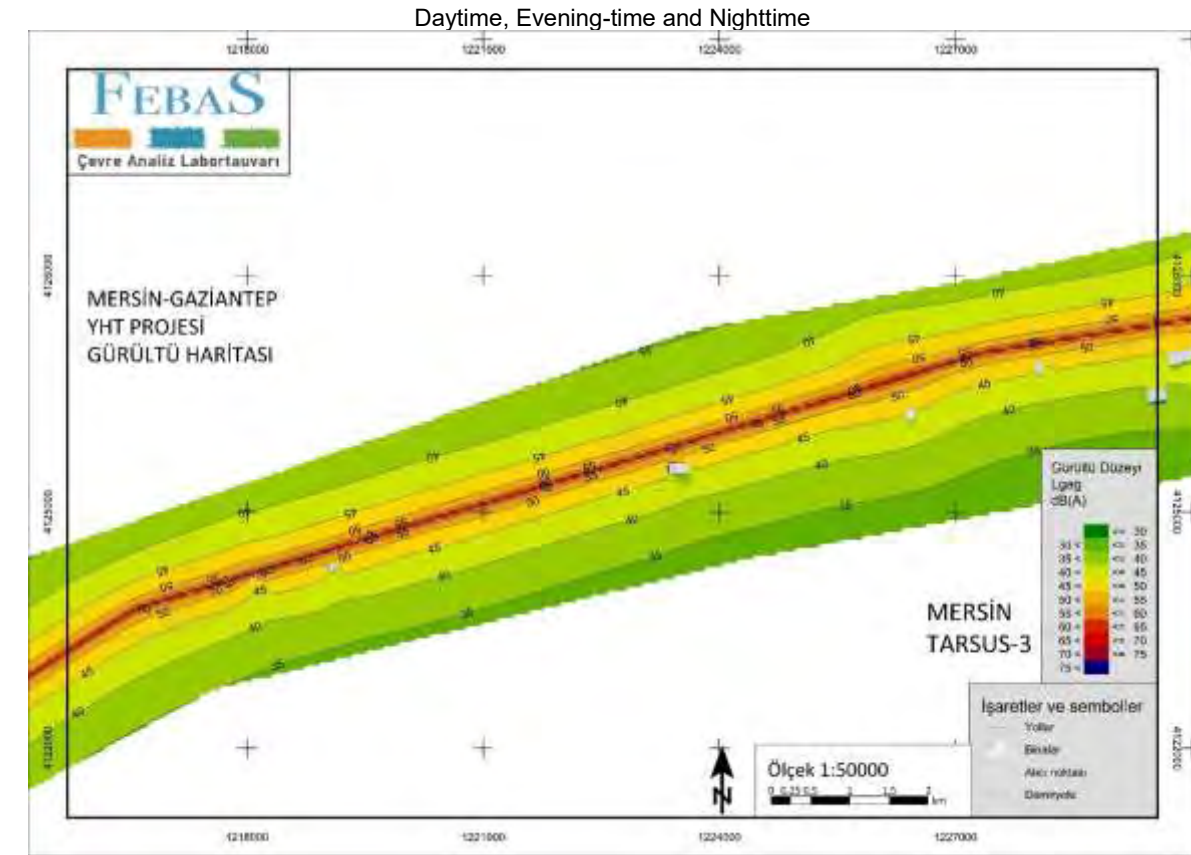
Map 4.21: Noise Map of Mersin Gaziantep in Section 3

Daytime

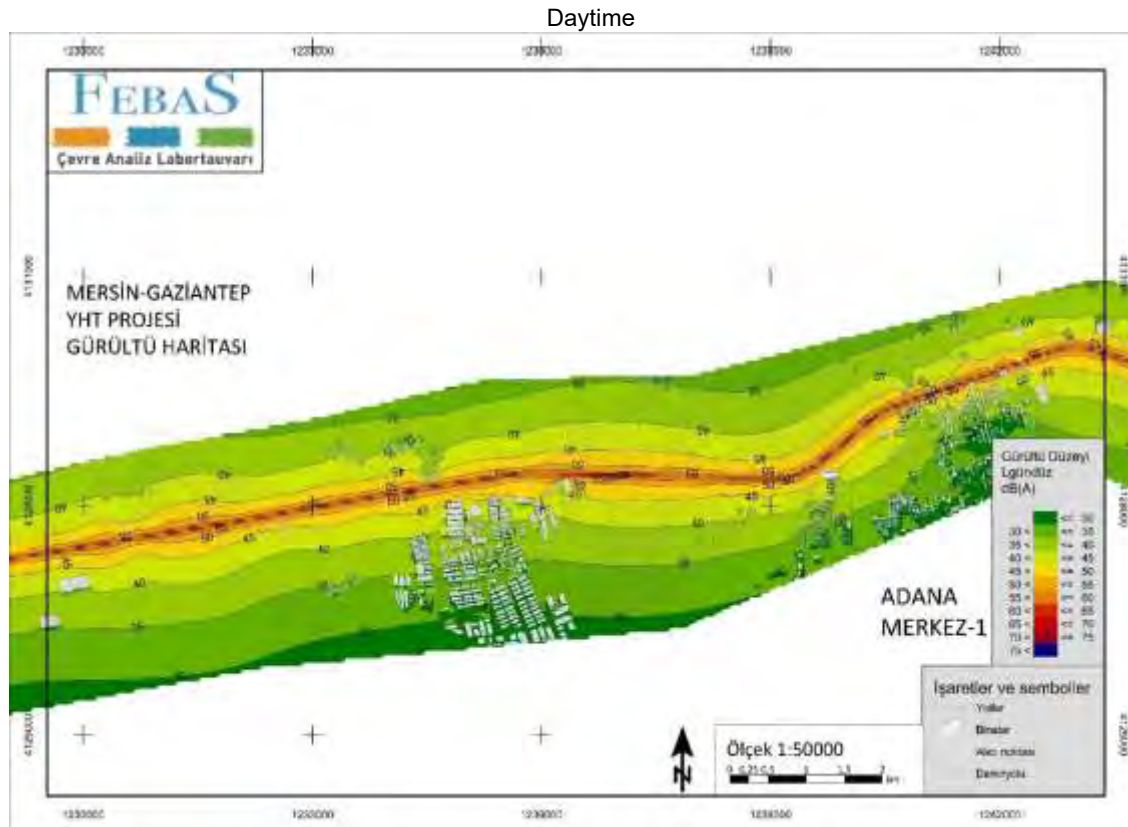
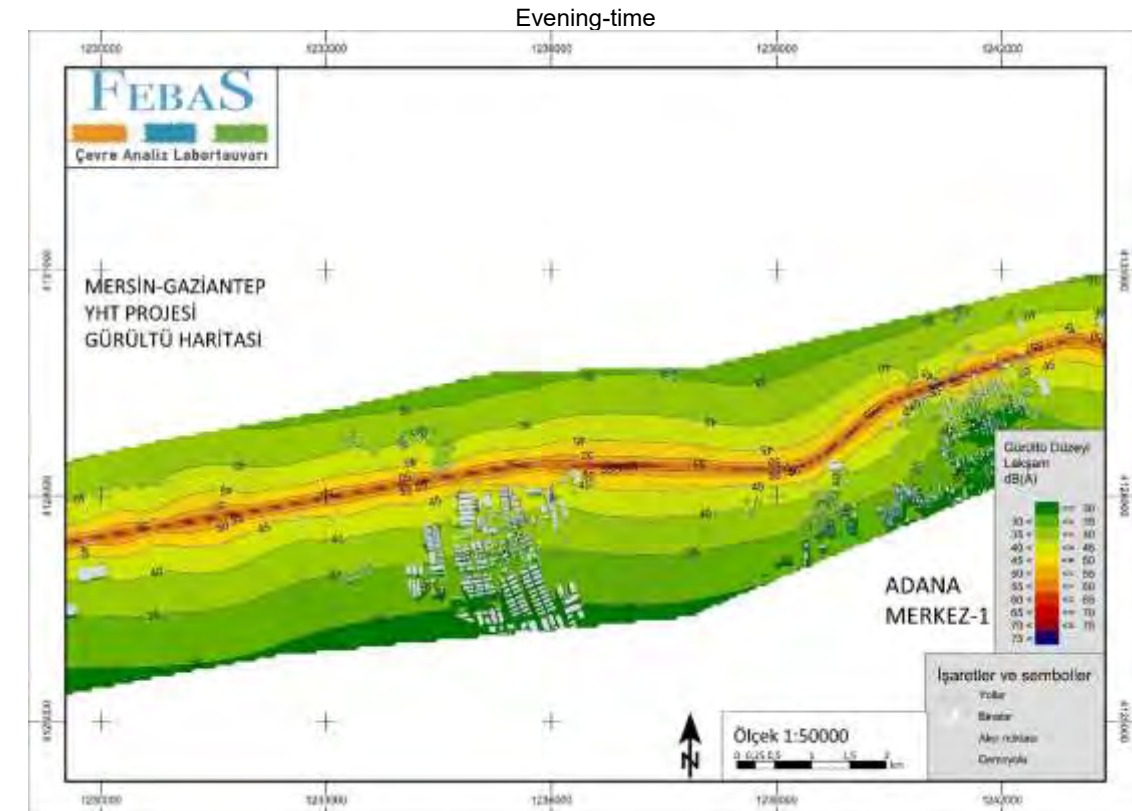


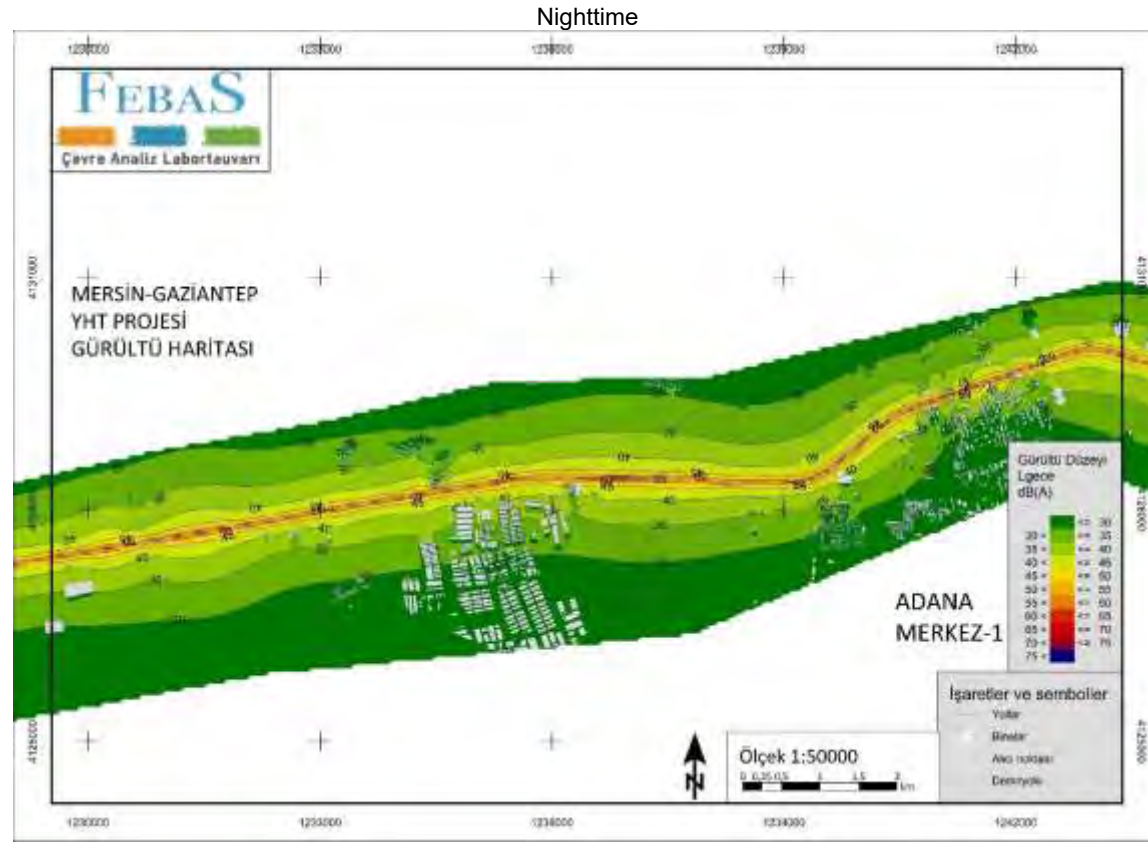
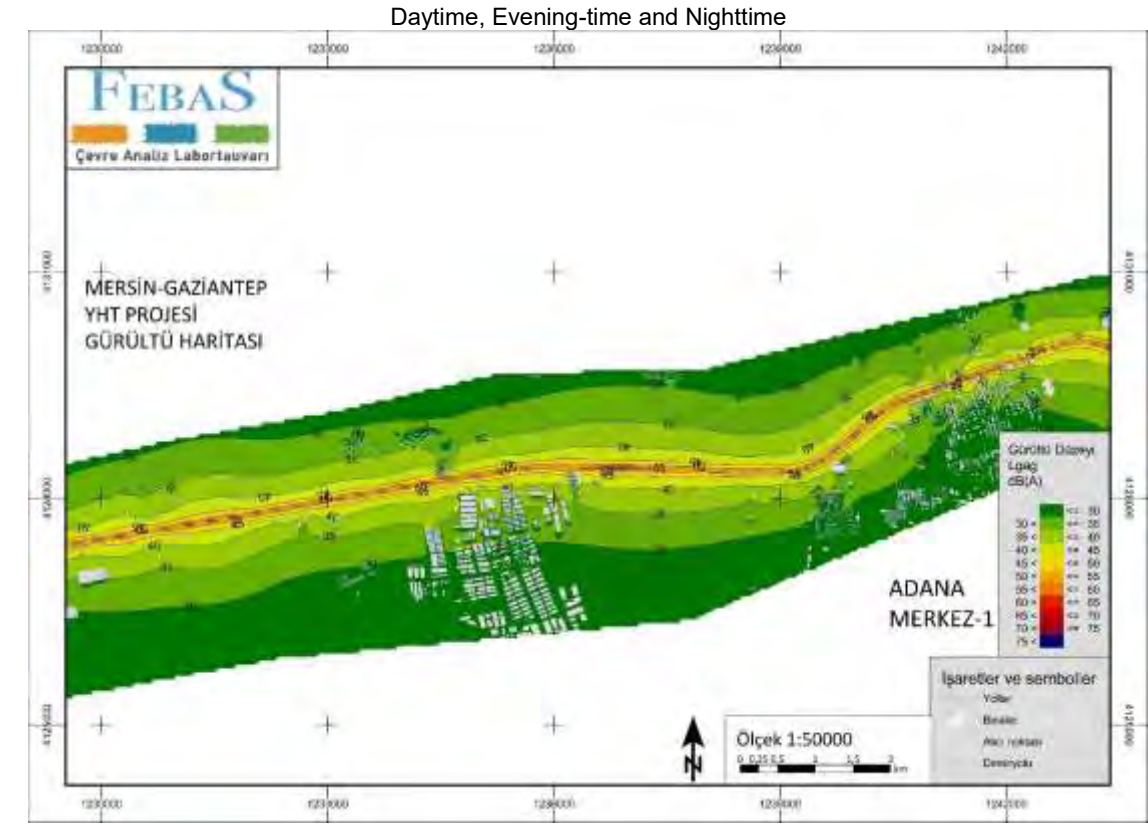
Evening time





Map 4.22: Noise Map of Mersin Gaziantep in Section 4

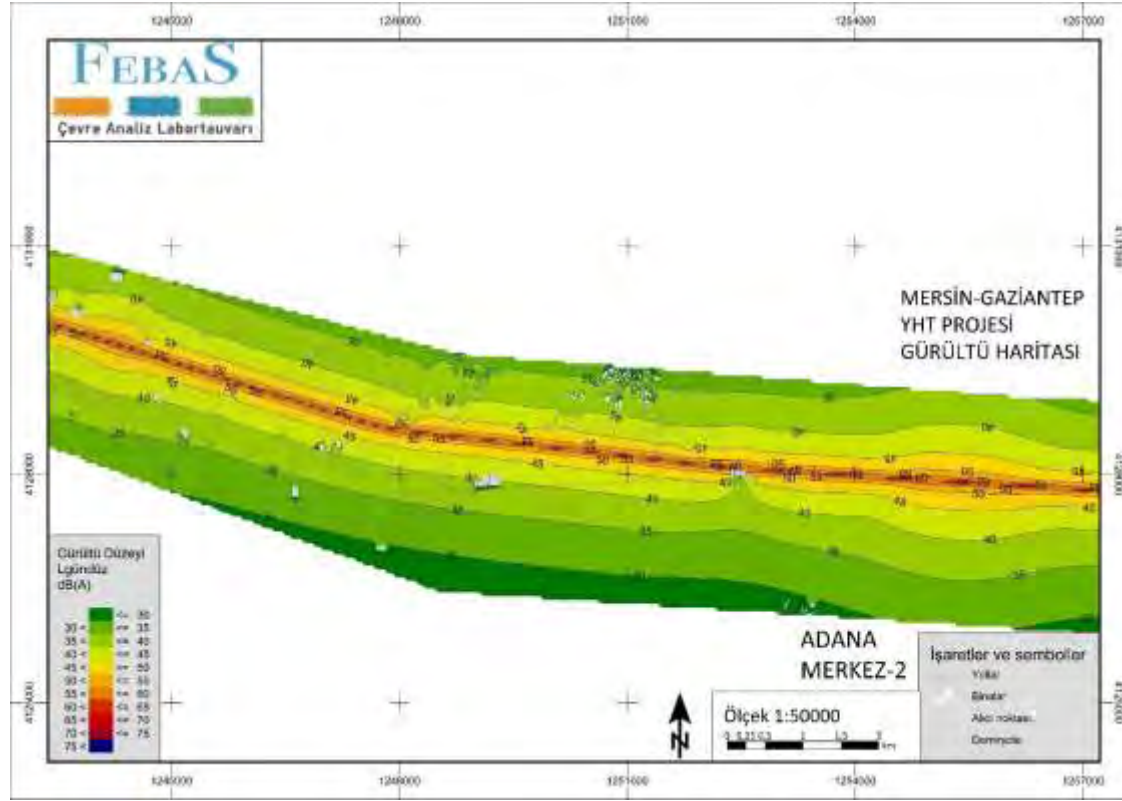




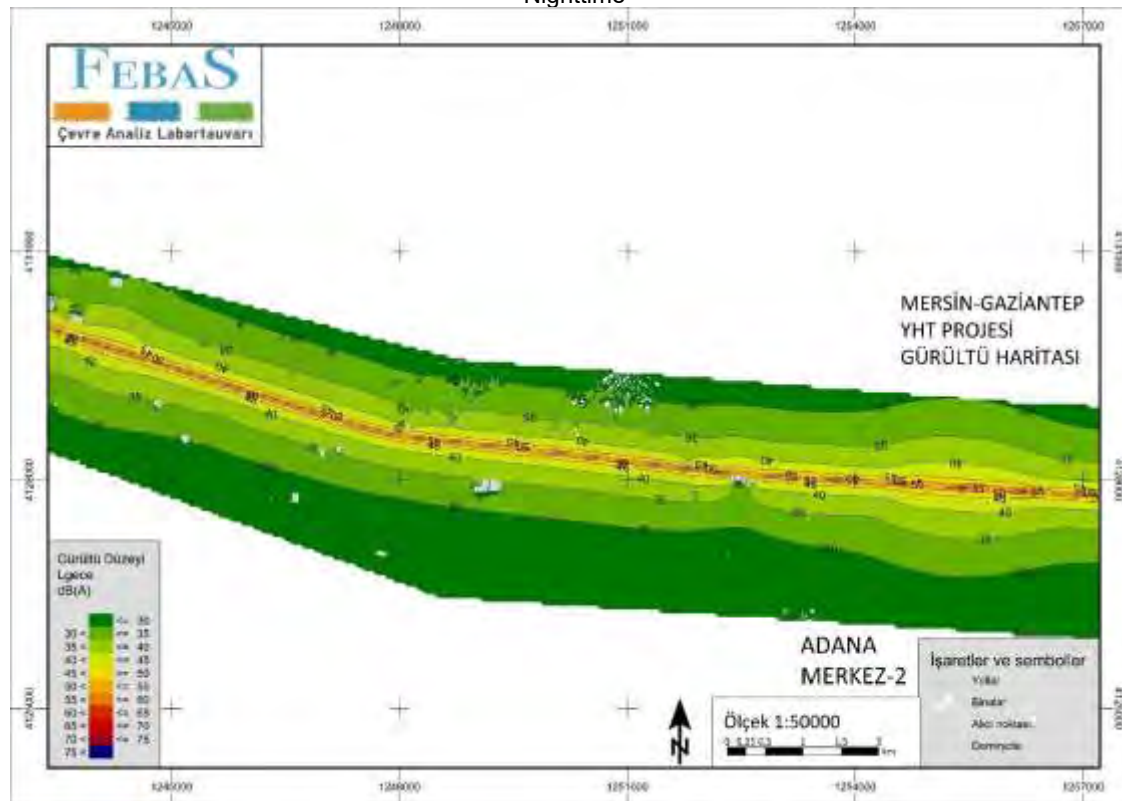
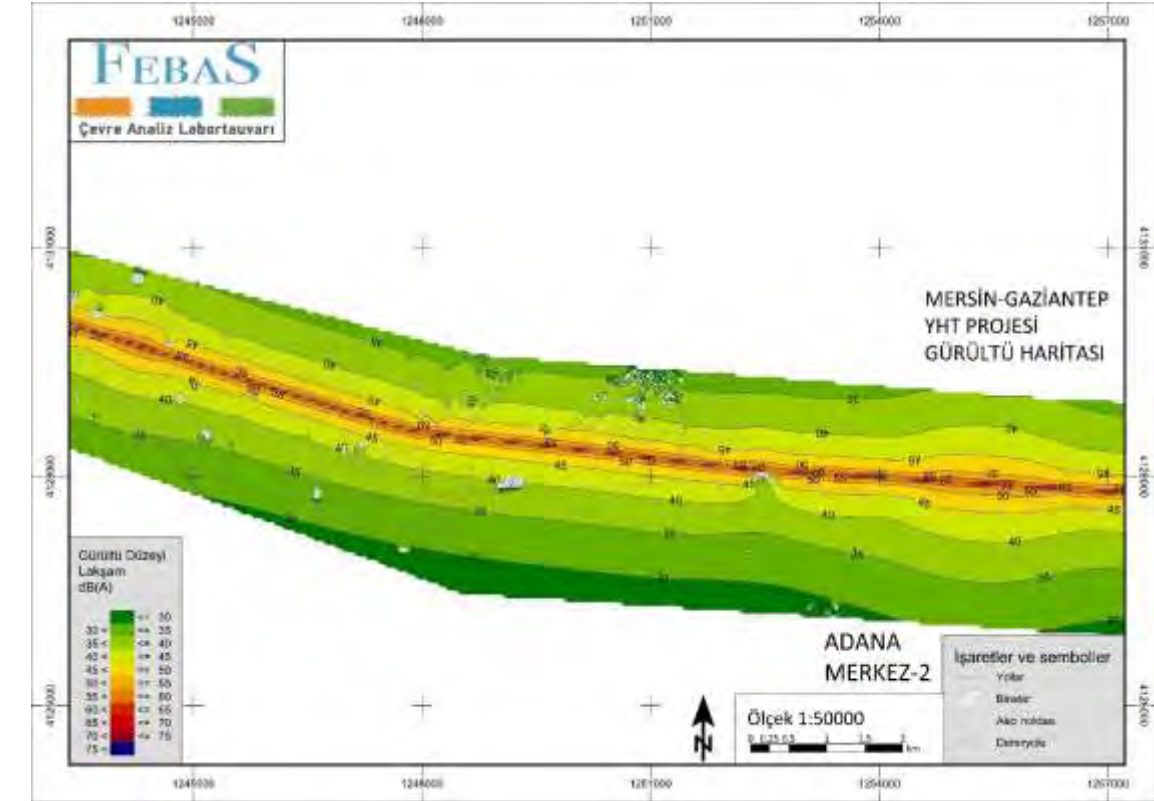
Map 4.23: Noise Map of Mersin Gaziantep in Section 5

Daytime

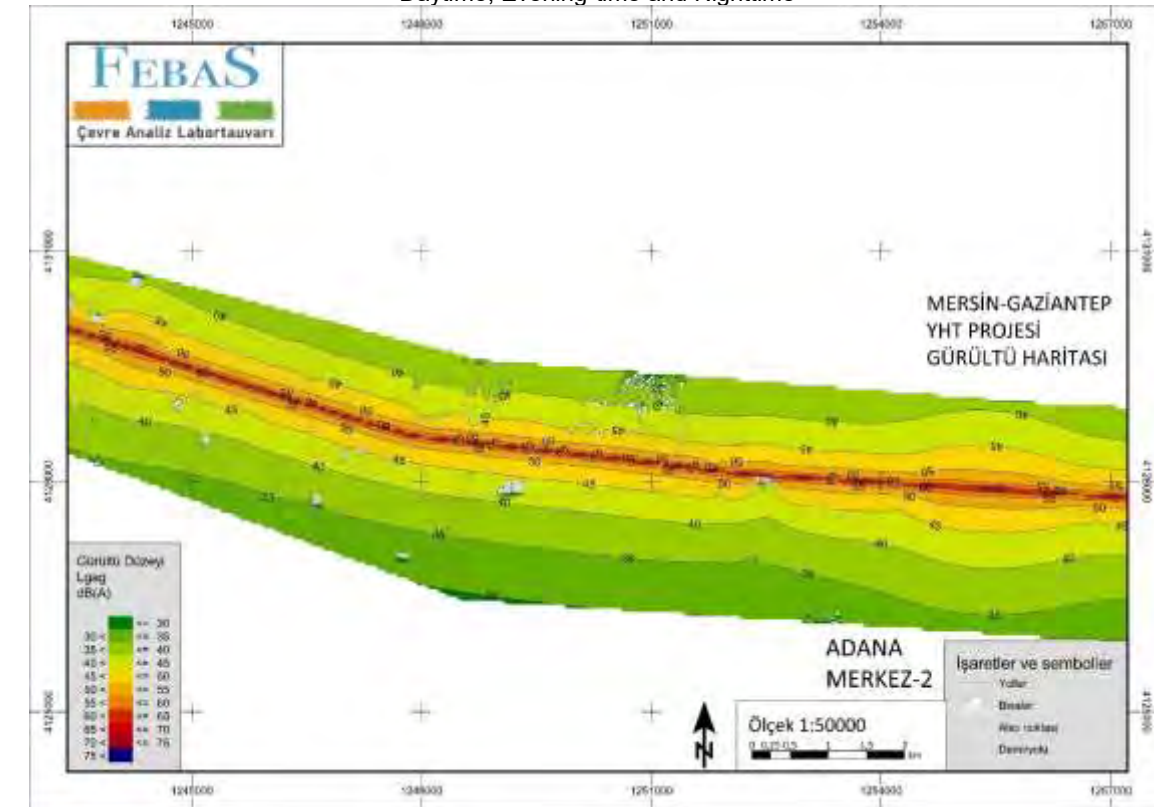
Evening-time



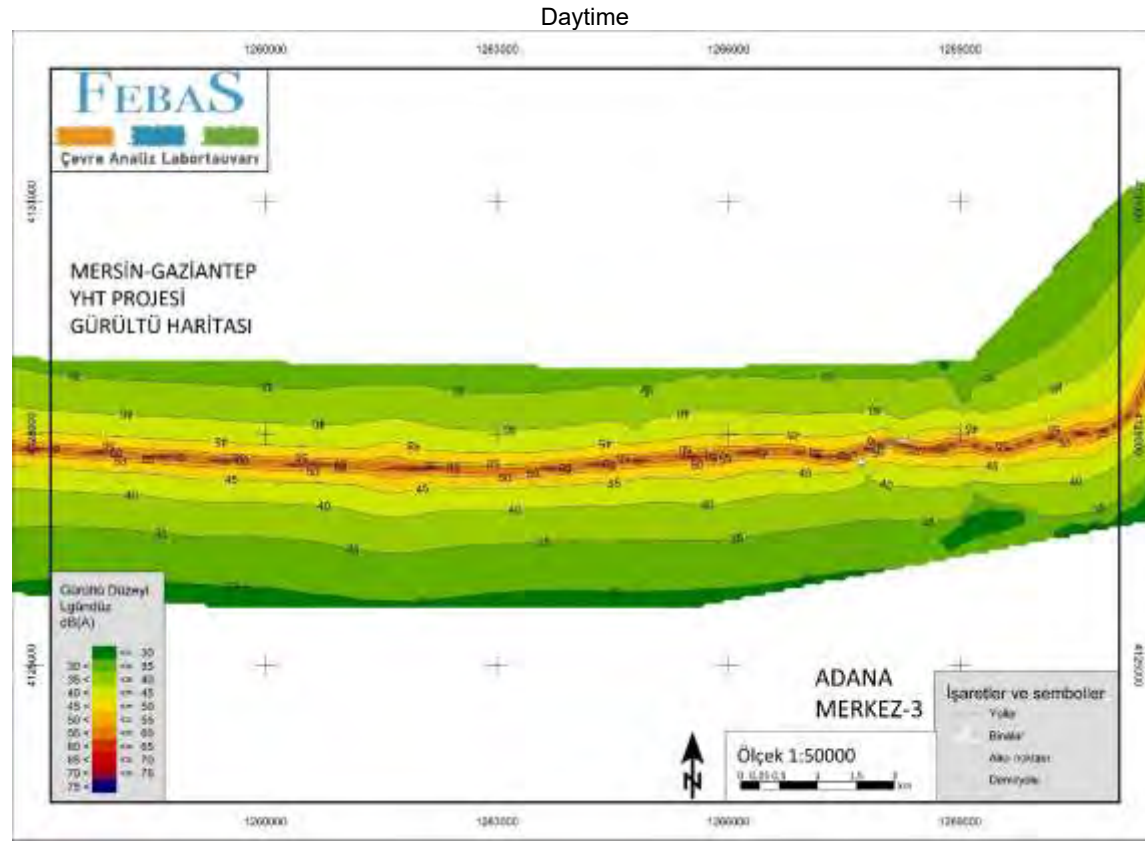
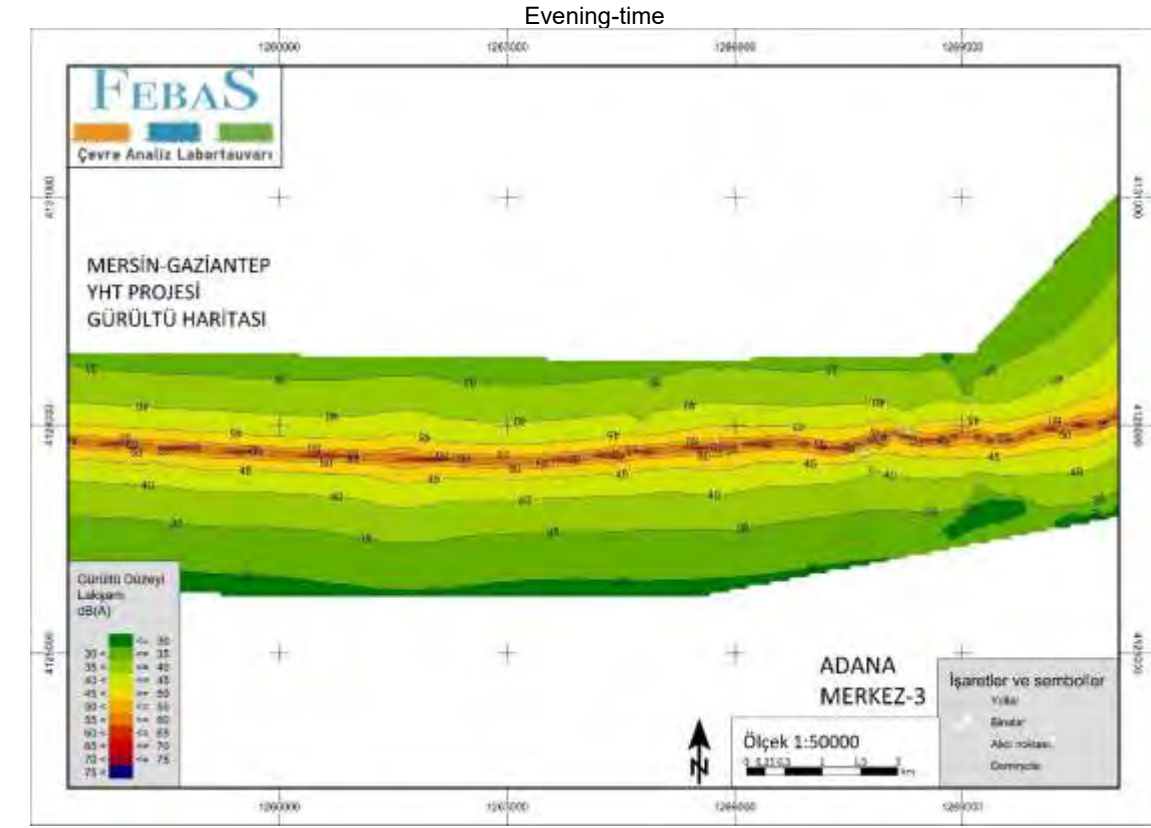
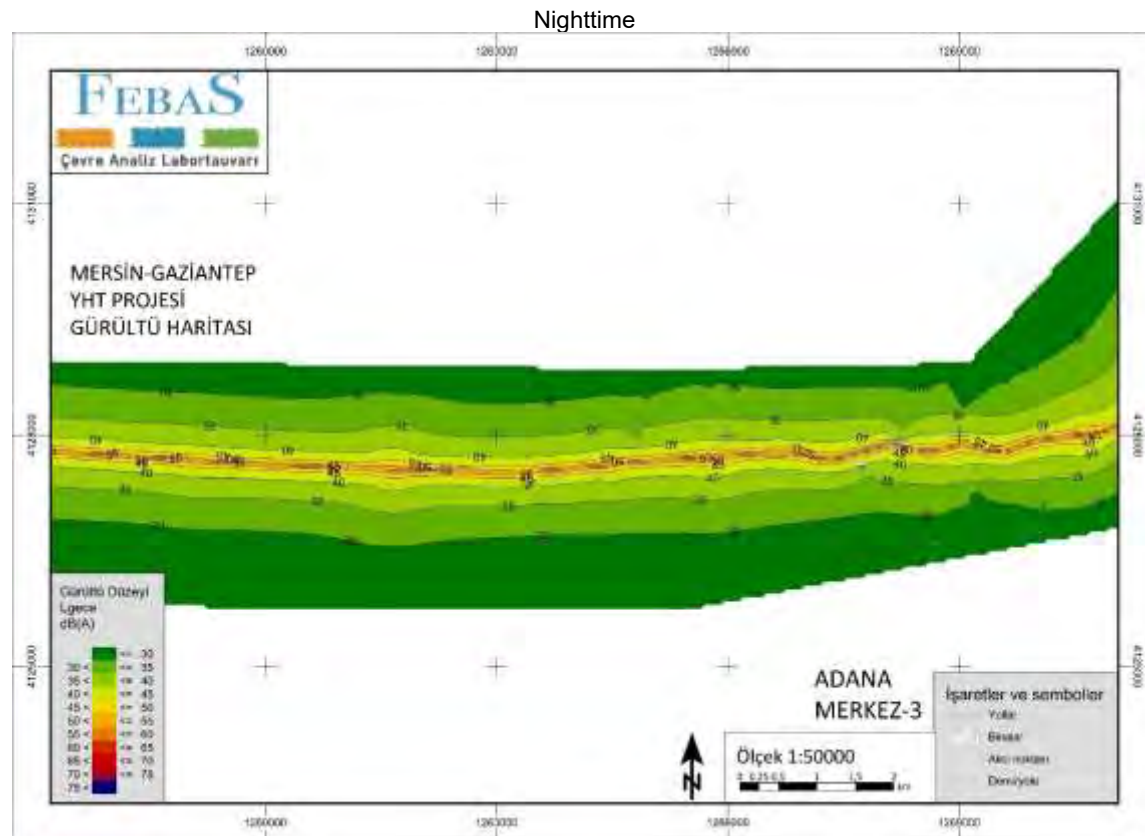
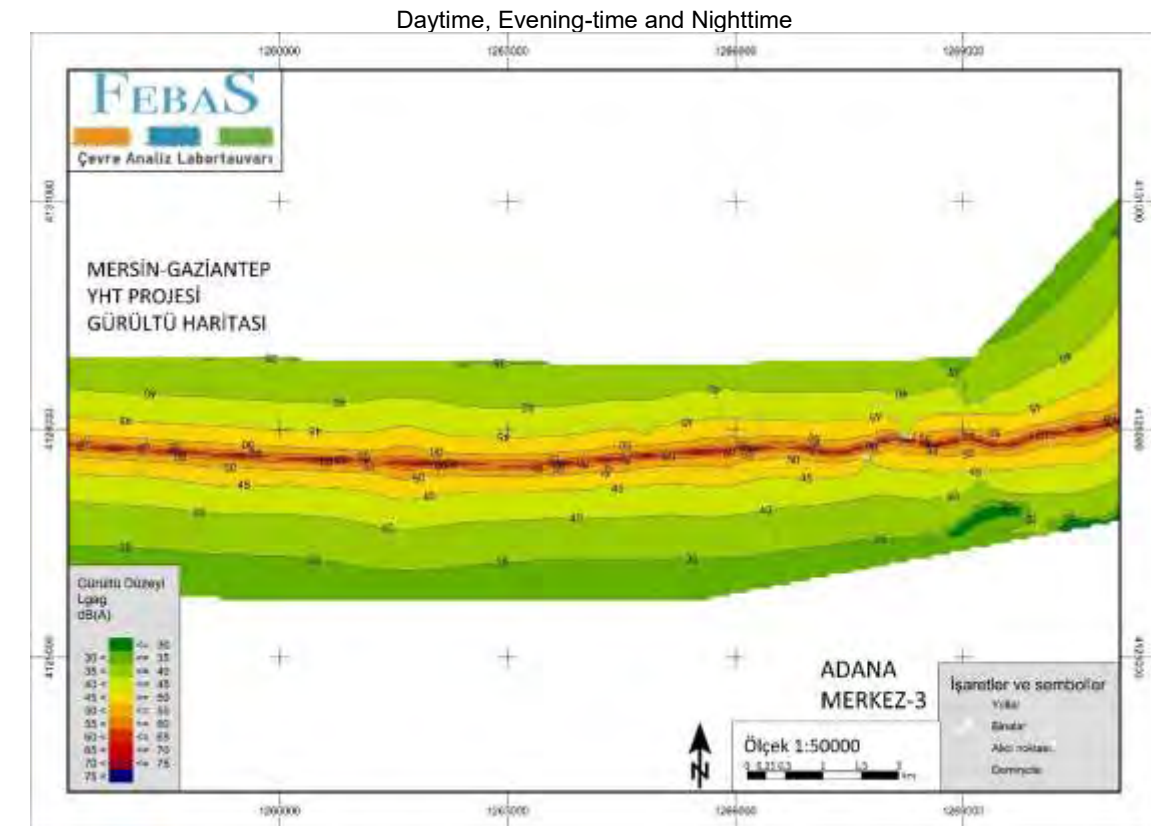
Nighttime



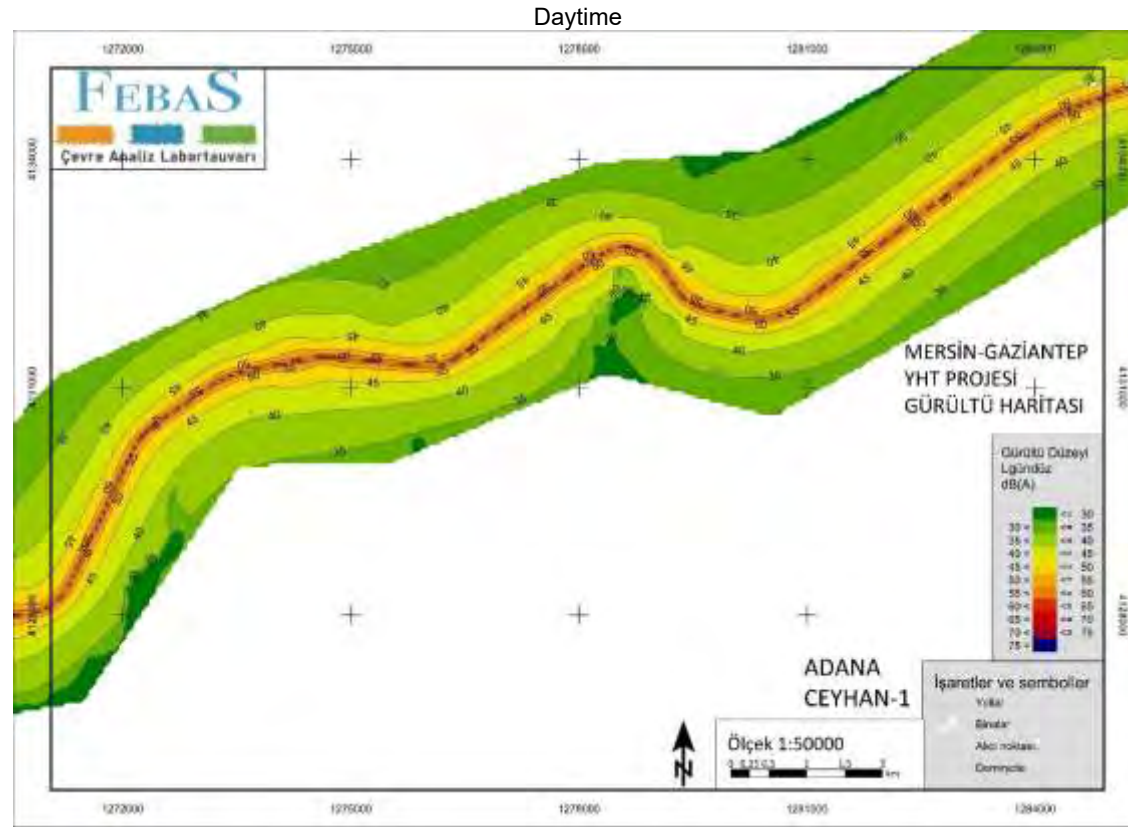
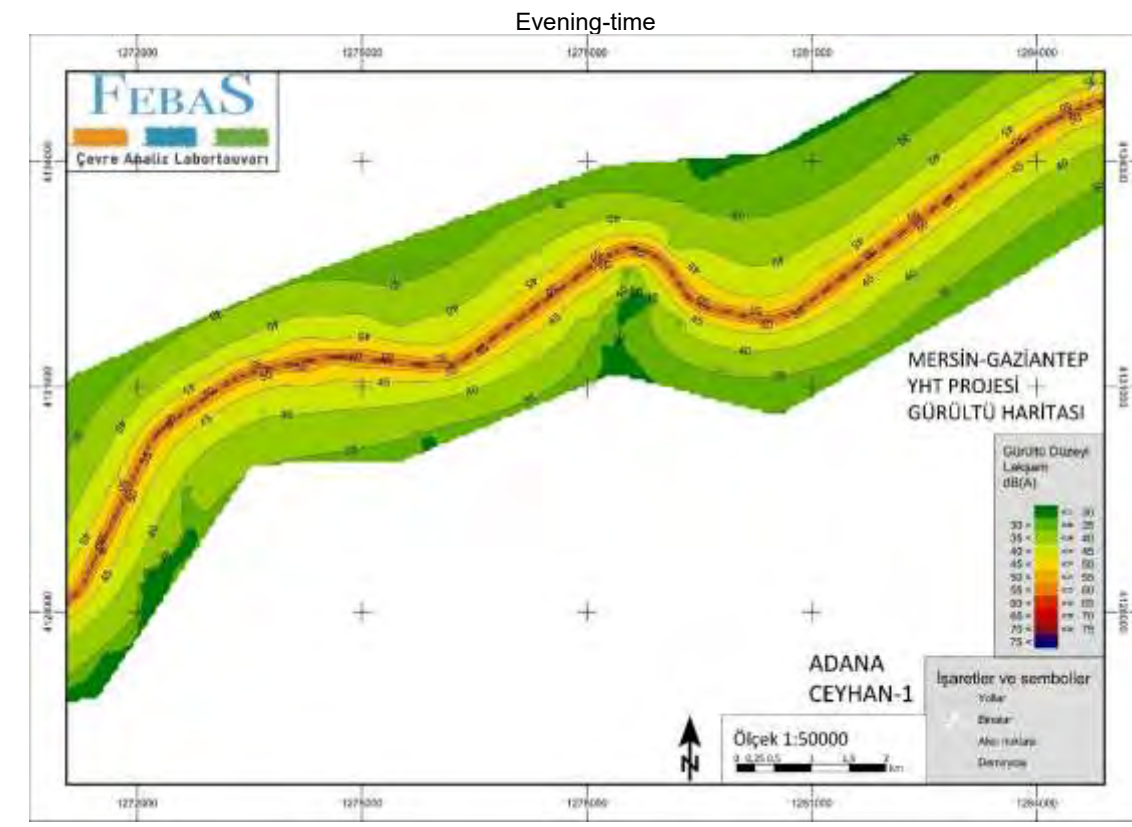
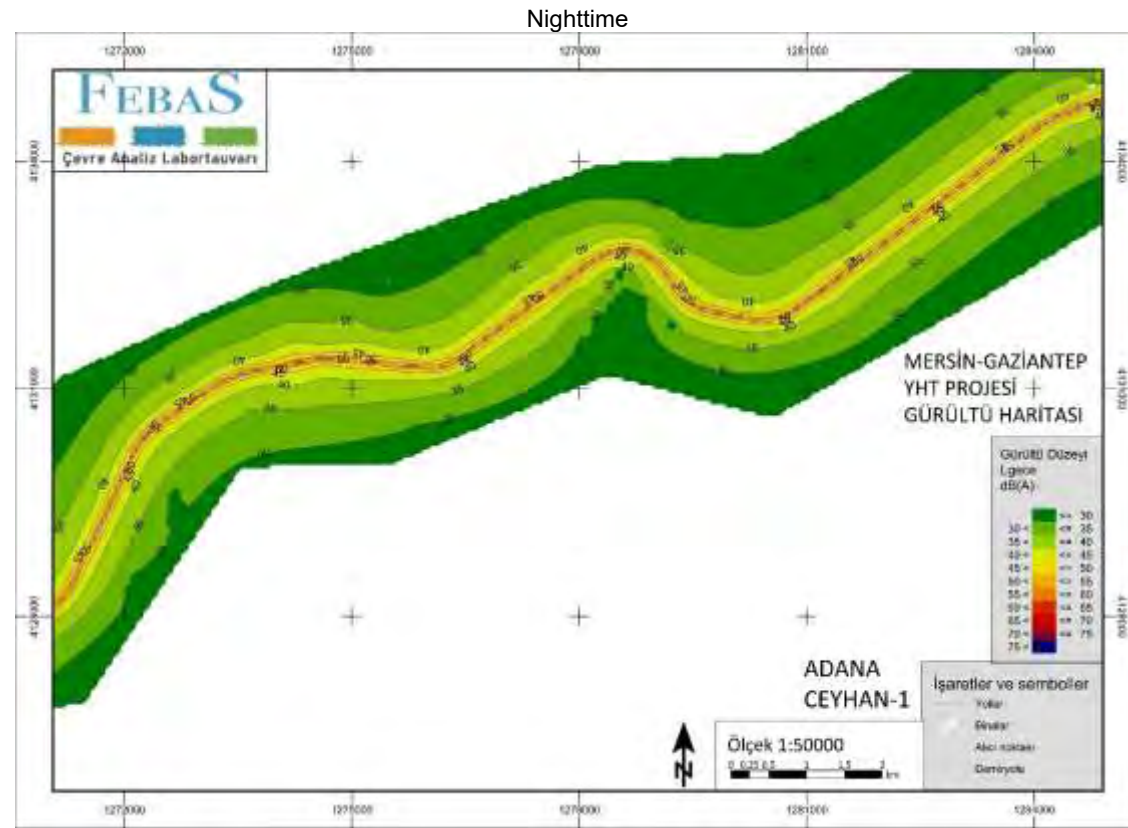
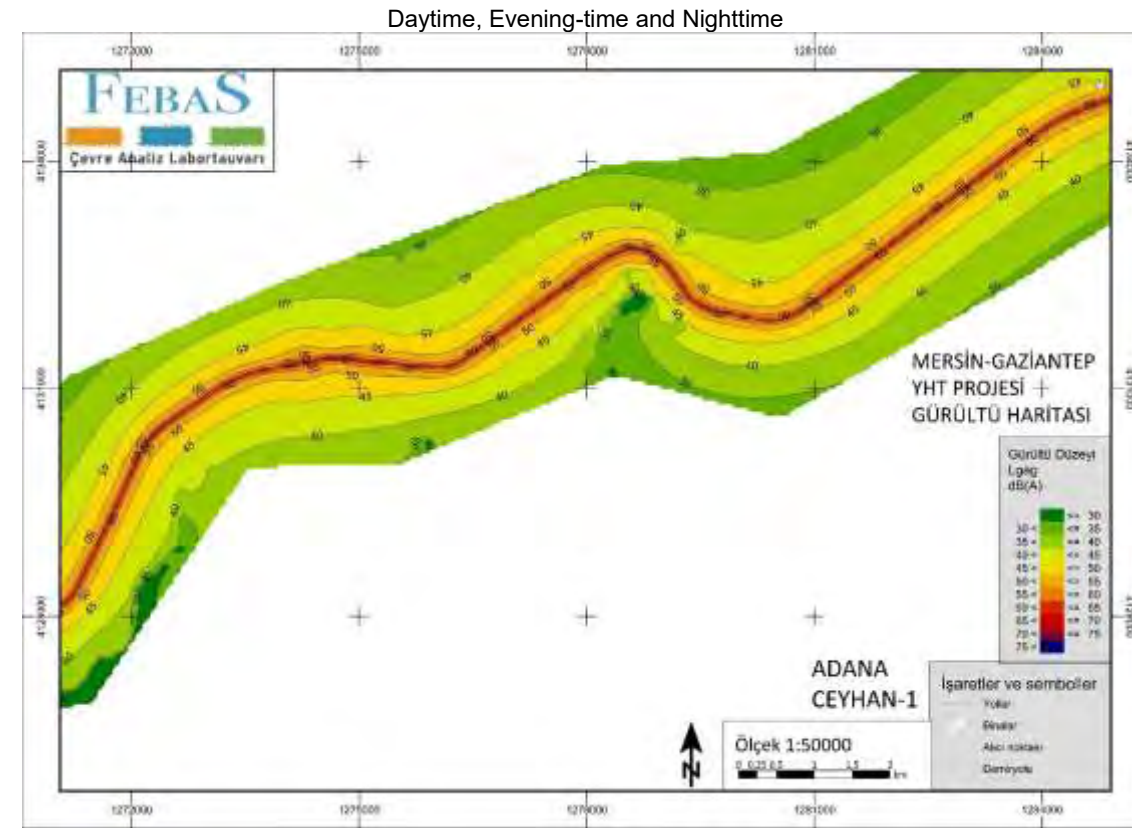
Daytime, Evening-time and Nighttime



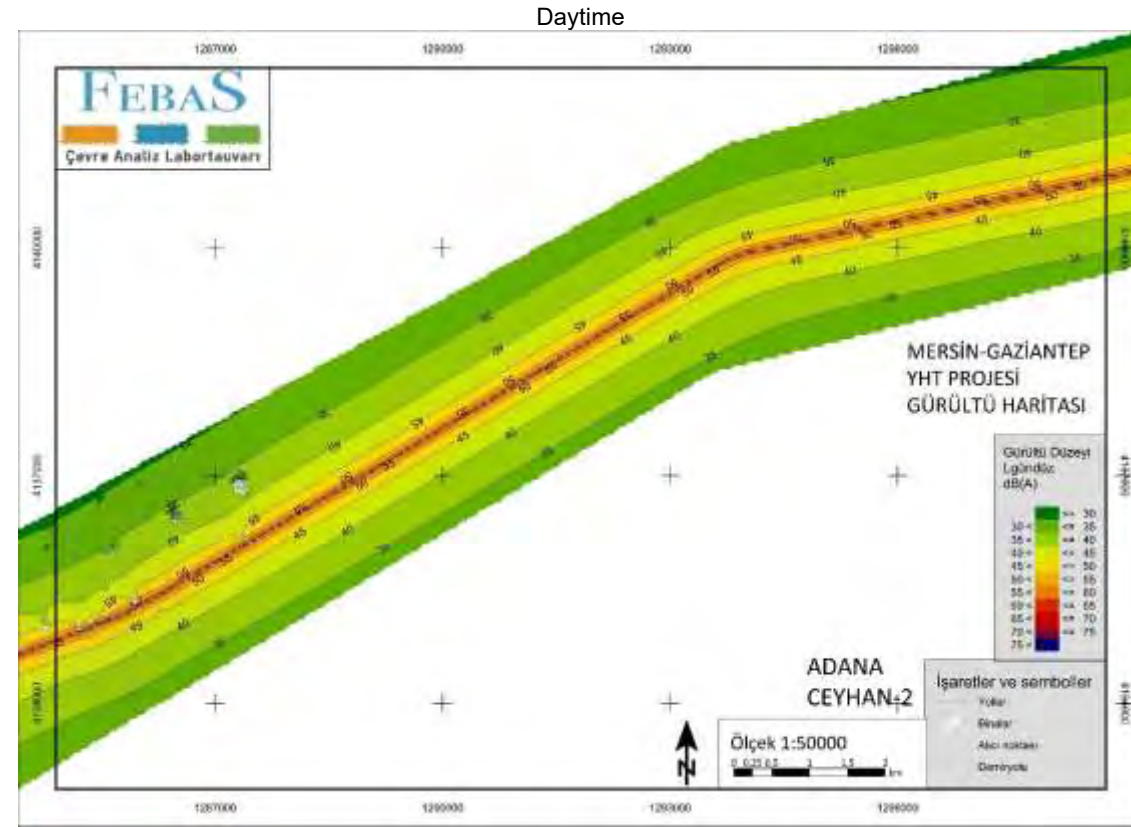
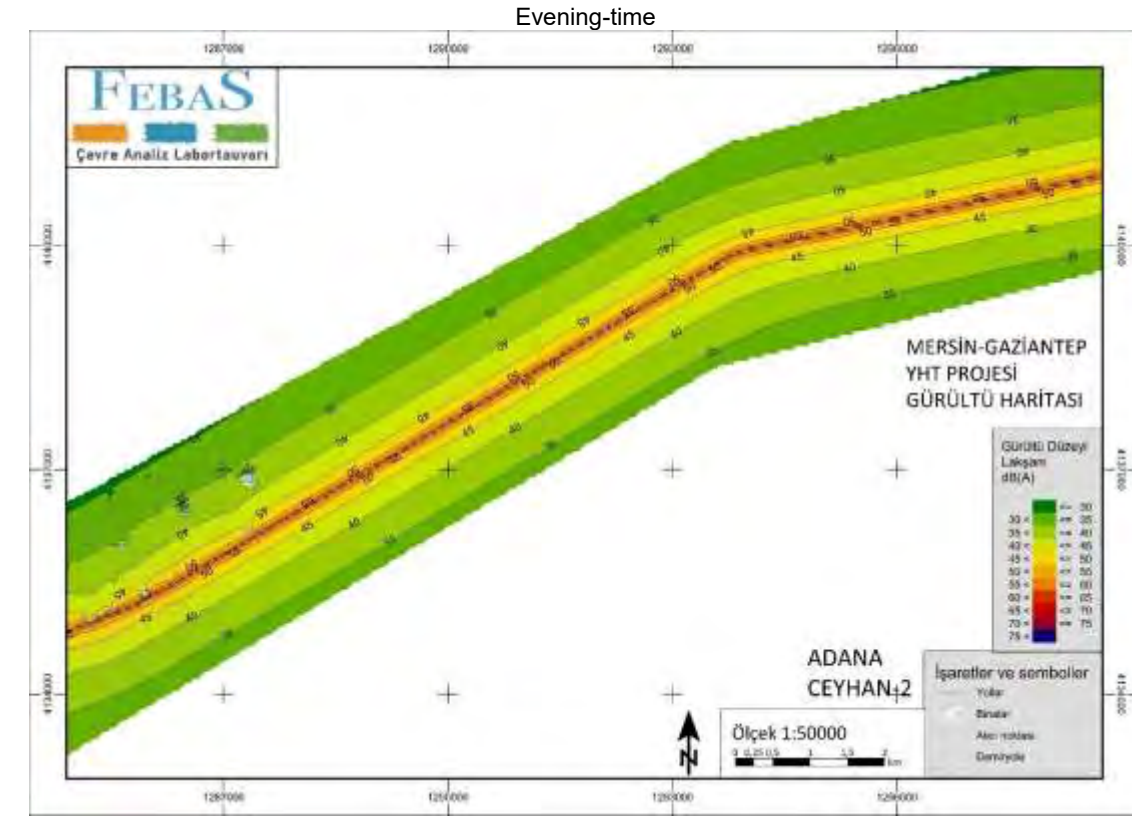
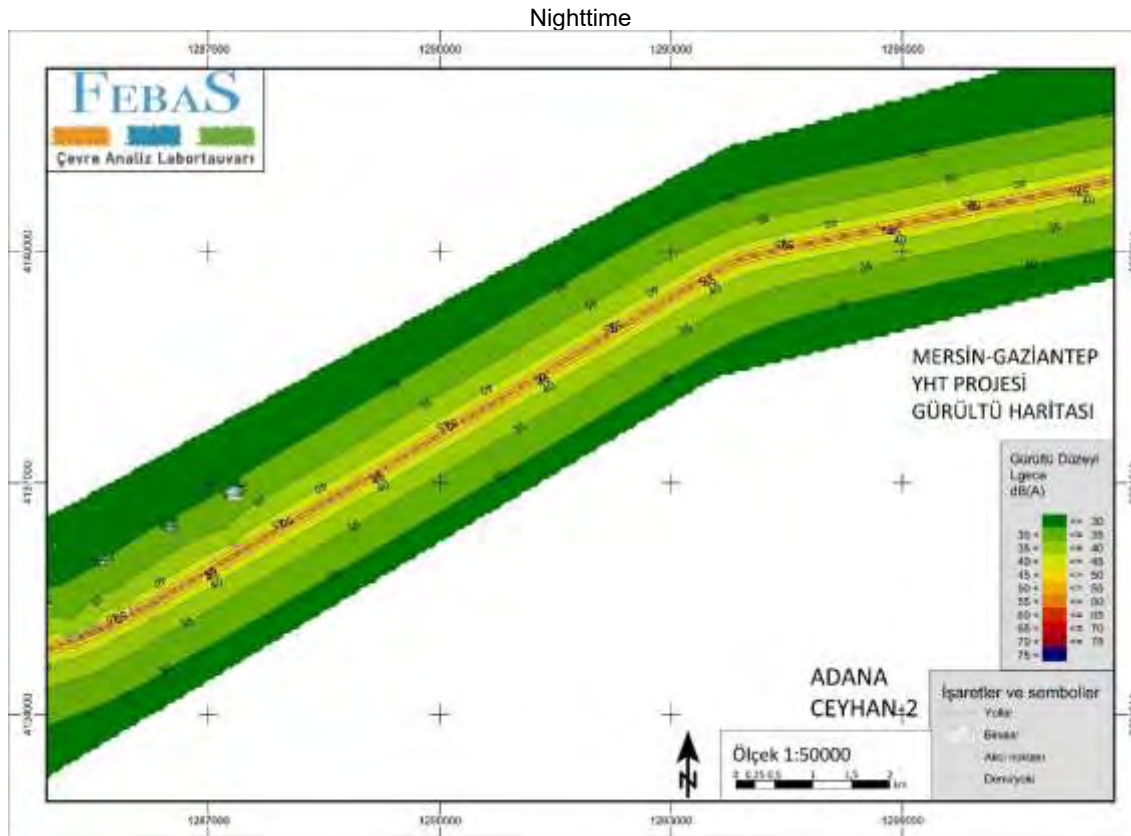
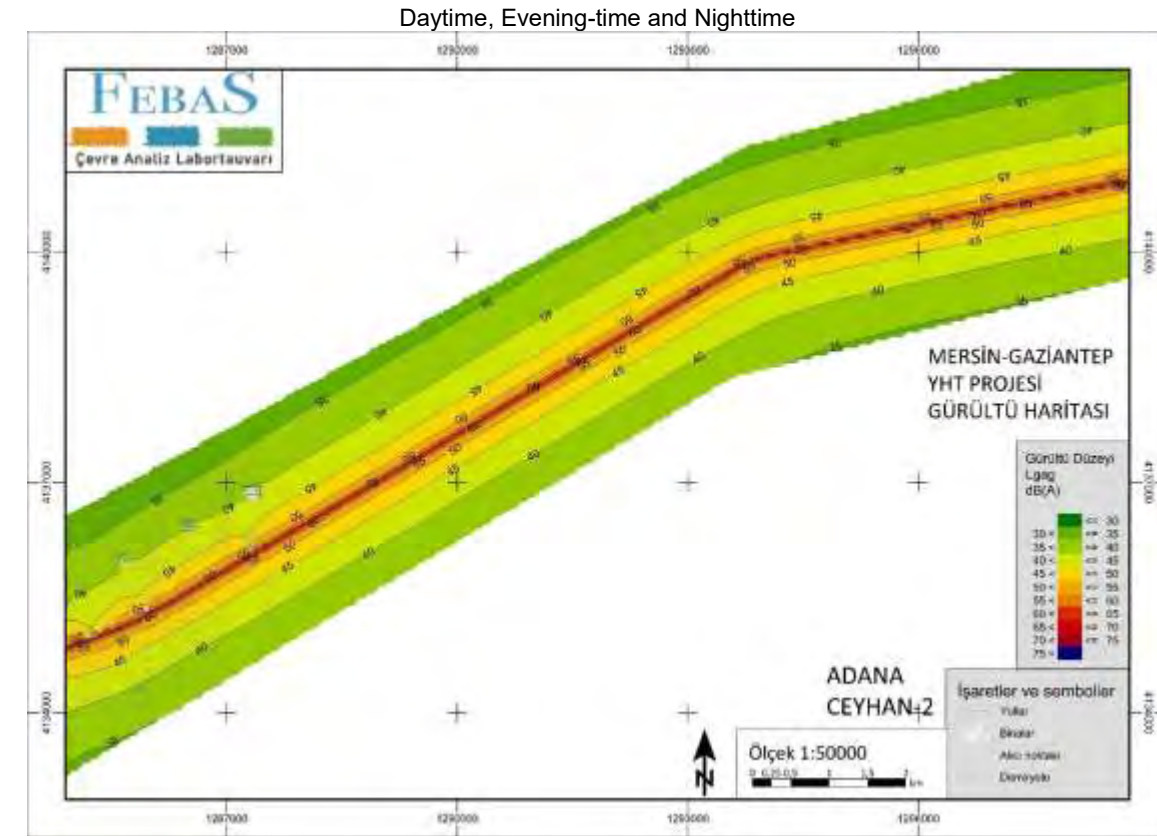
Map 4.24: Noise Map of Mersin Gaziantep in Section 6



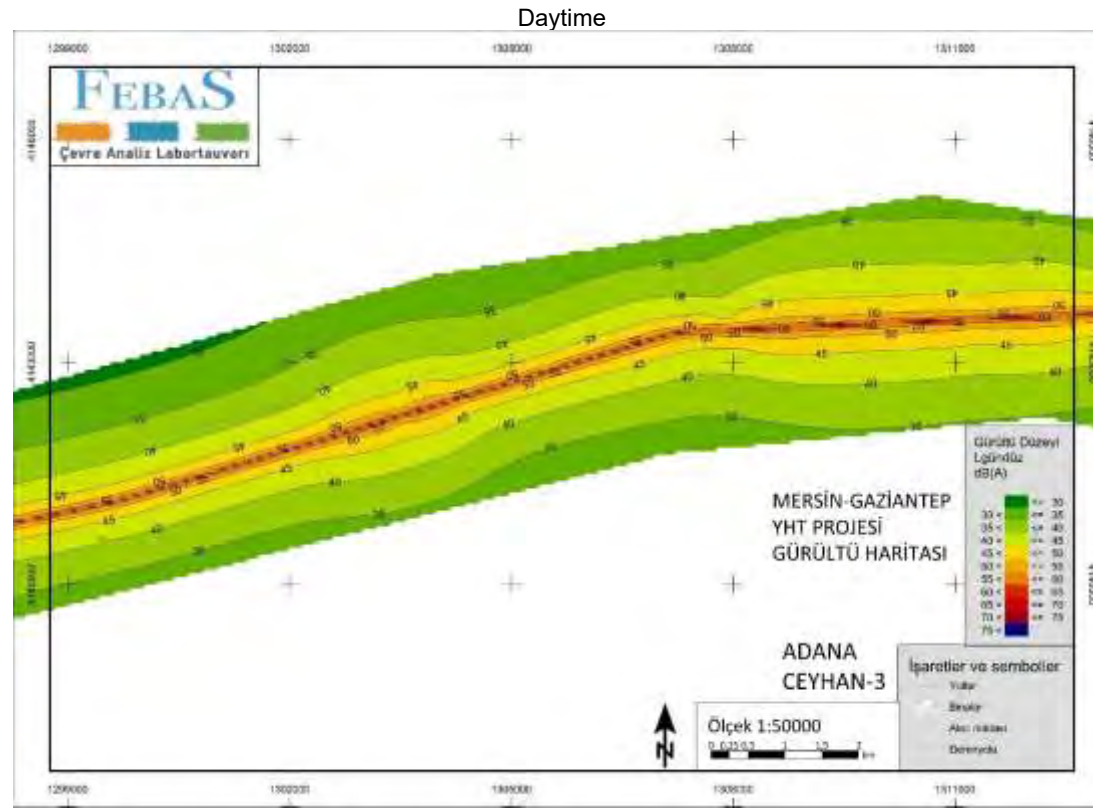
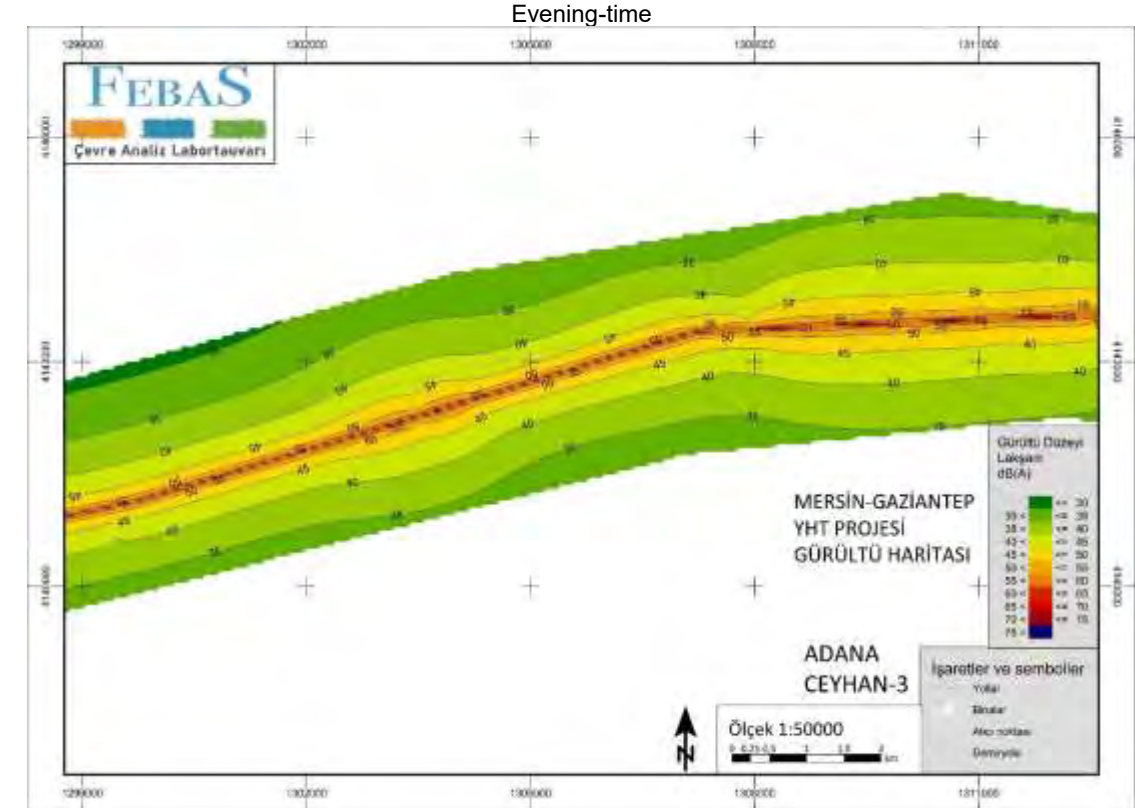
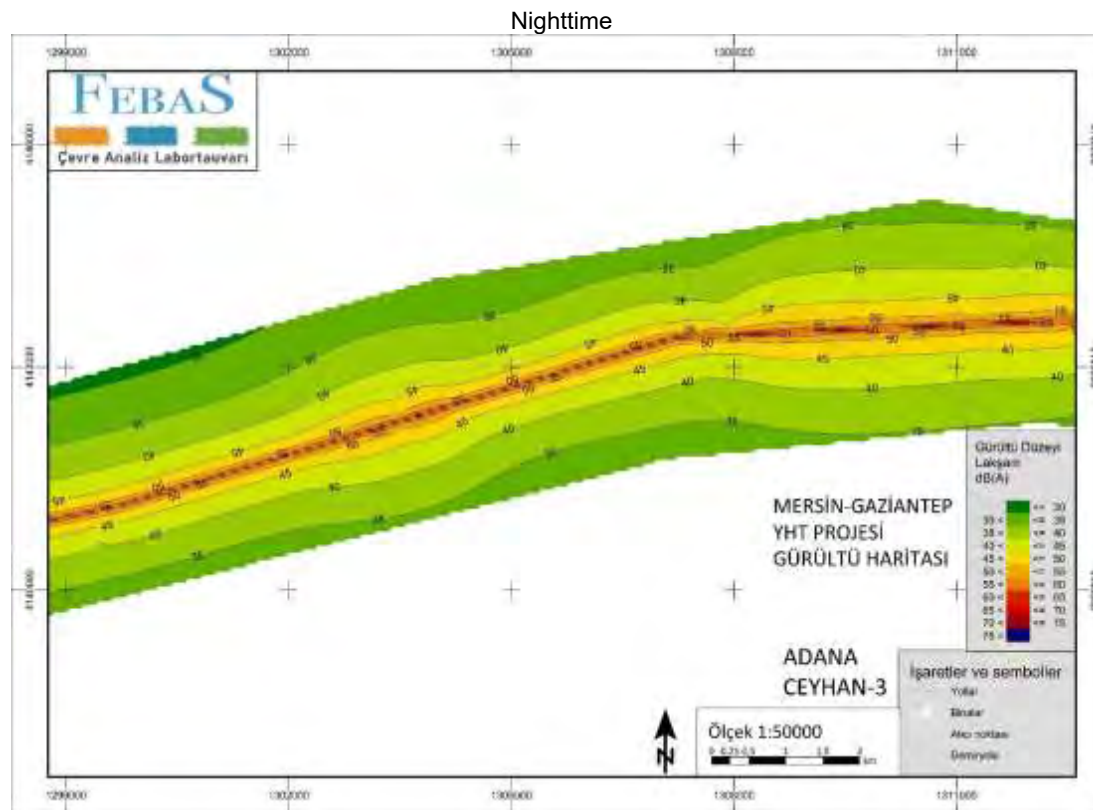
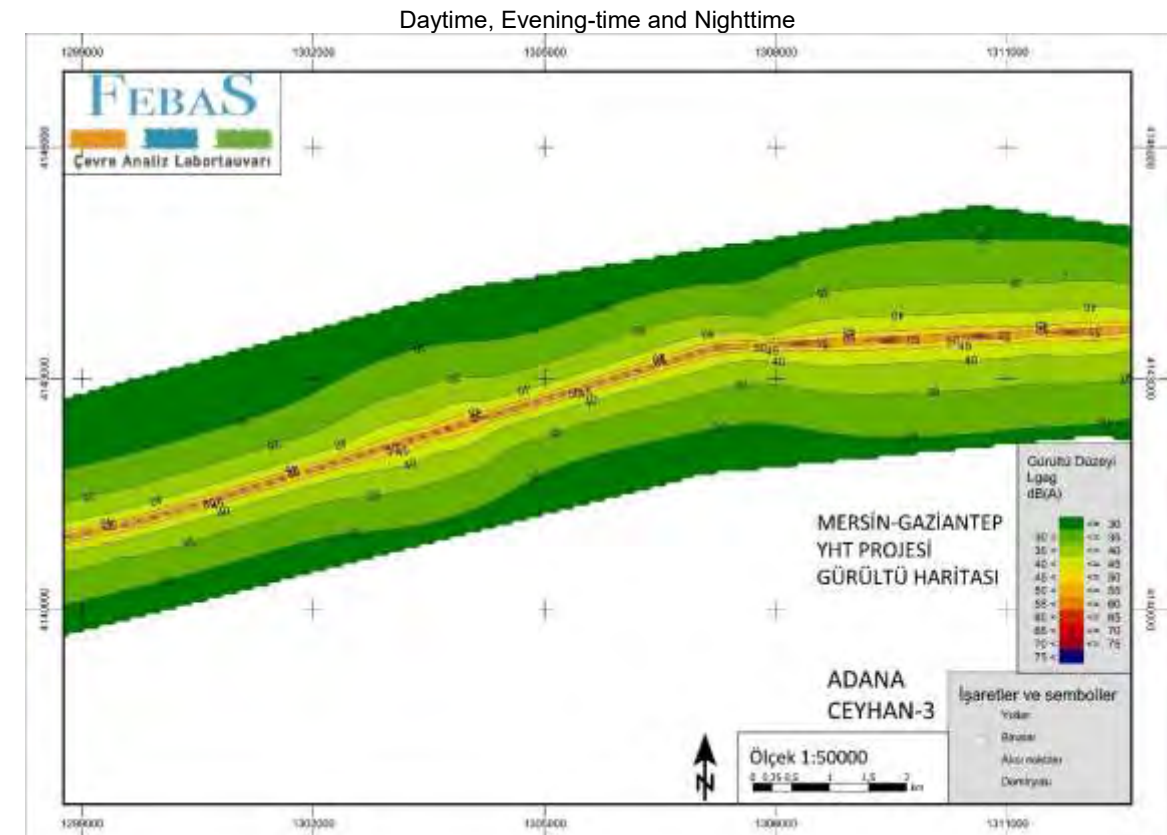
Map 4.25: Noise Map of Mersin Gaziantep in Section 7



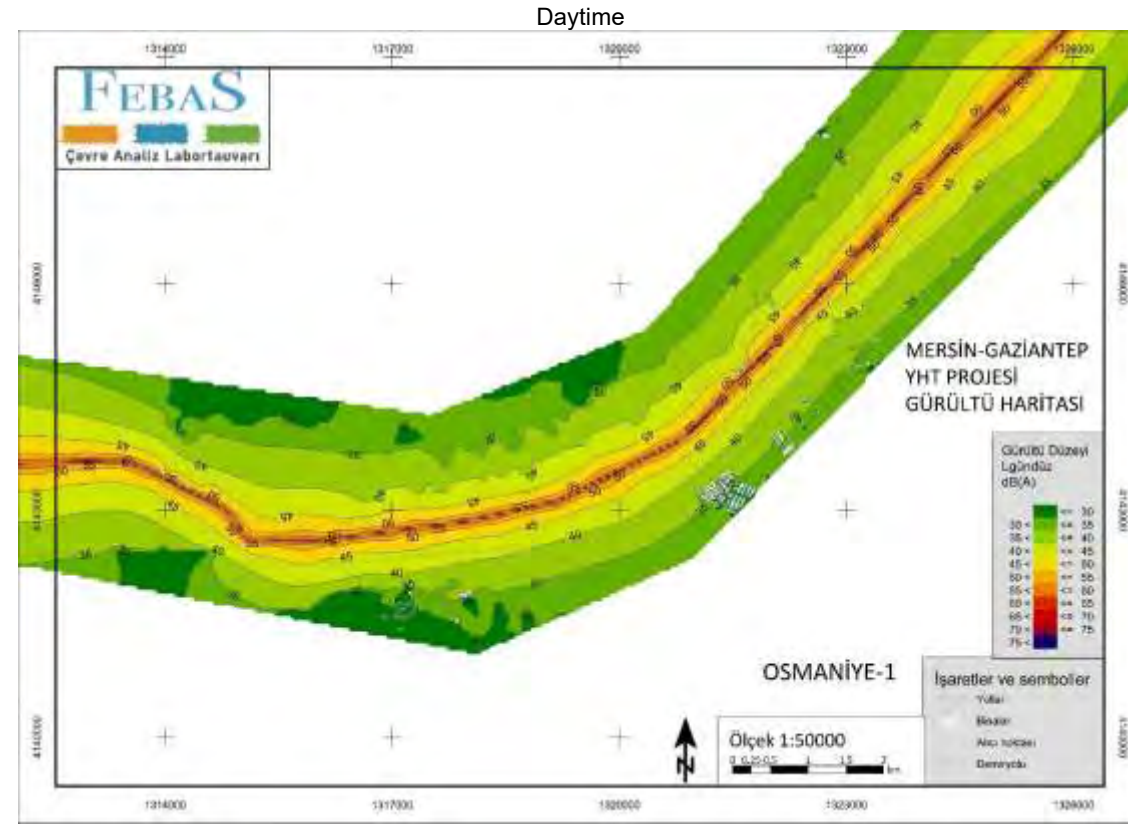
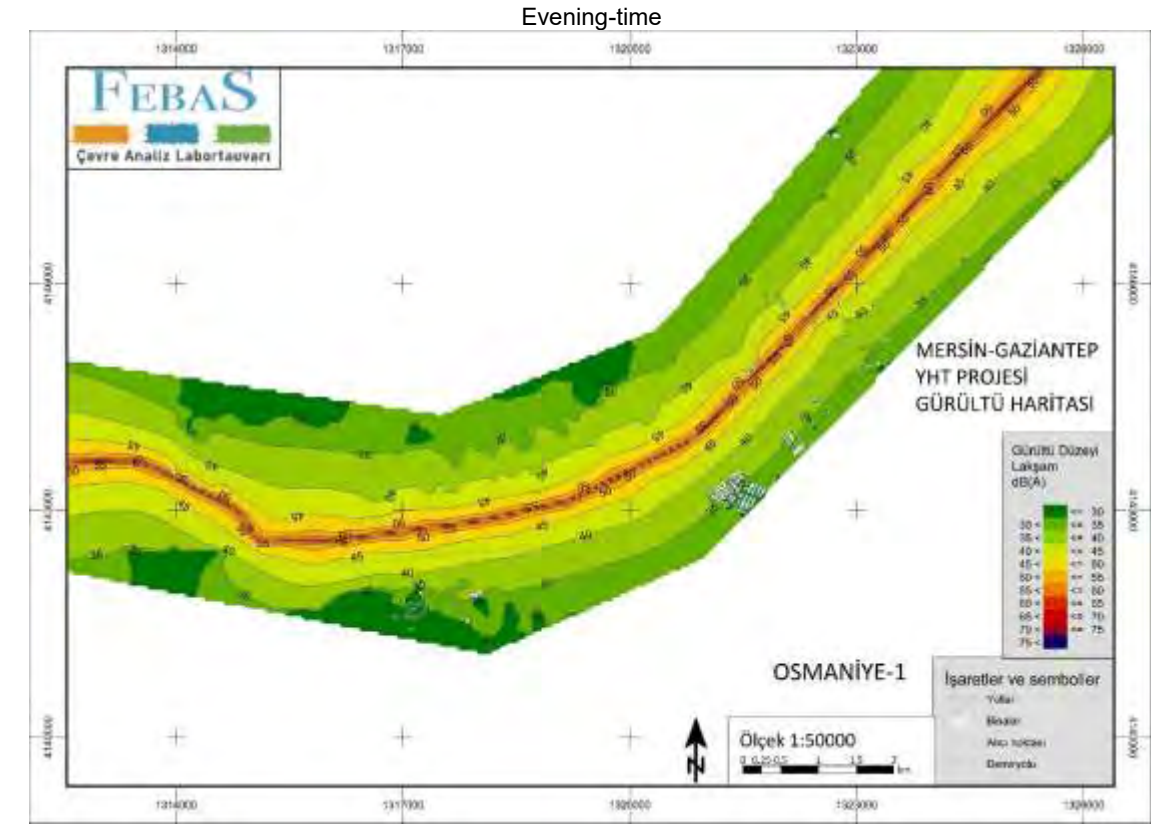
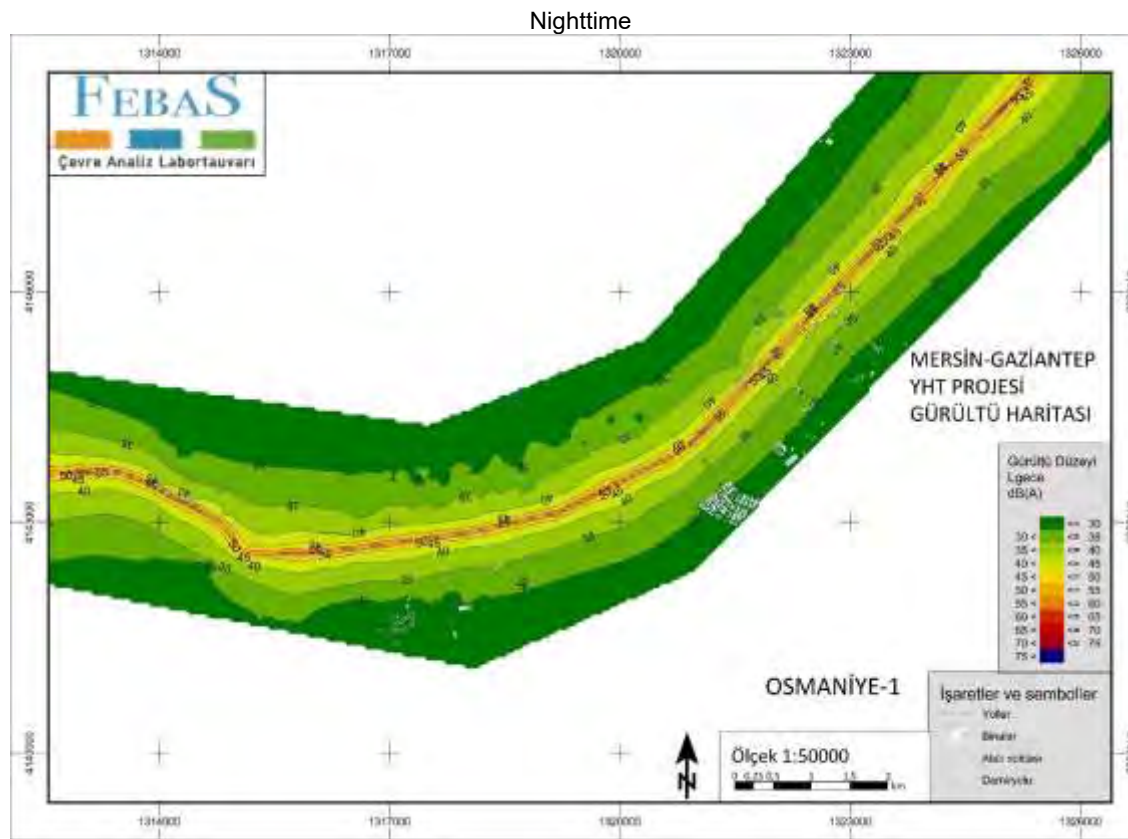
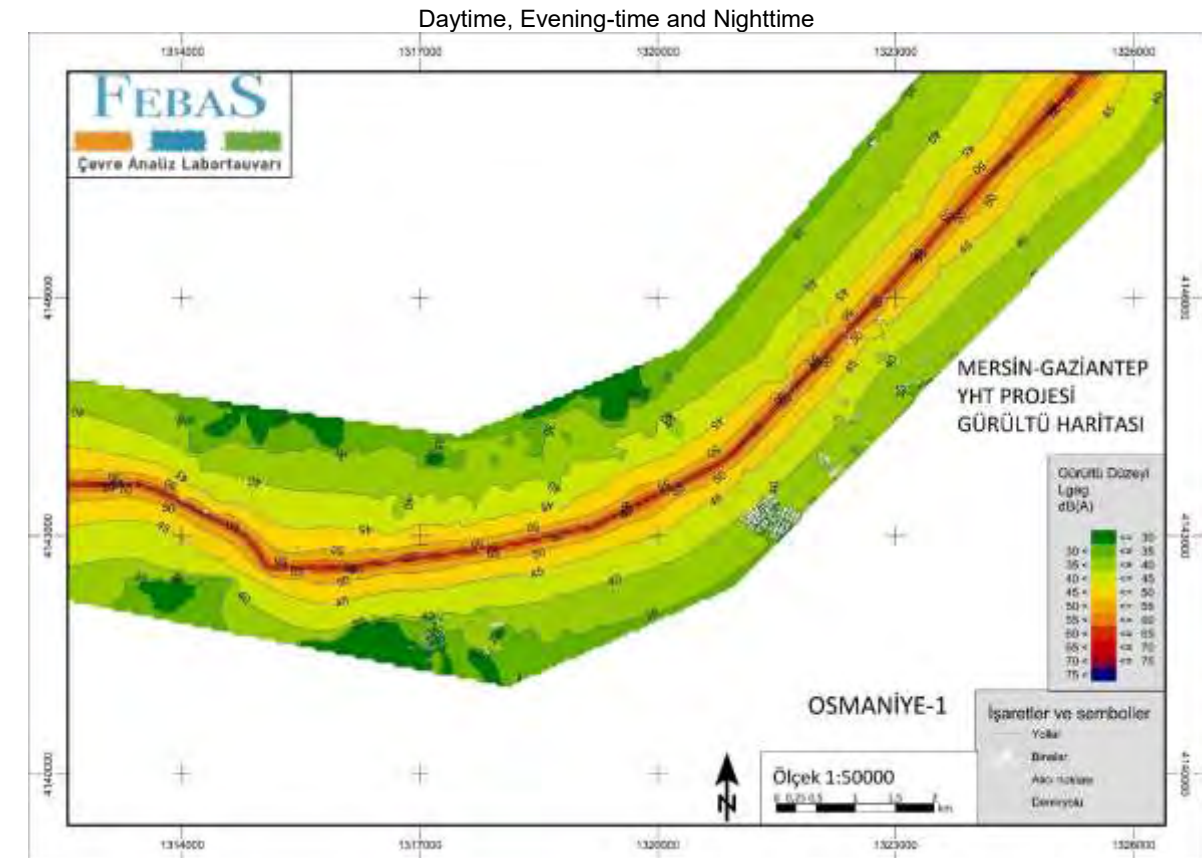
Map 4.26: Noise Map of Mersin Gaziantep in Section 8



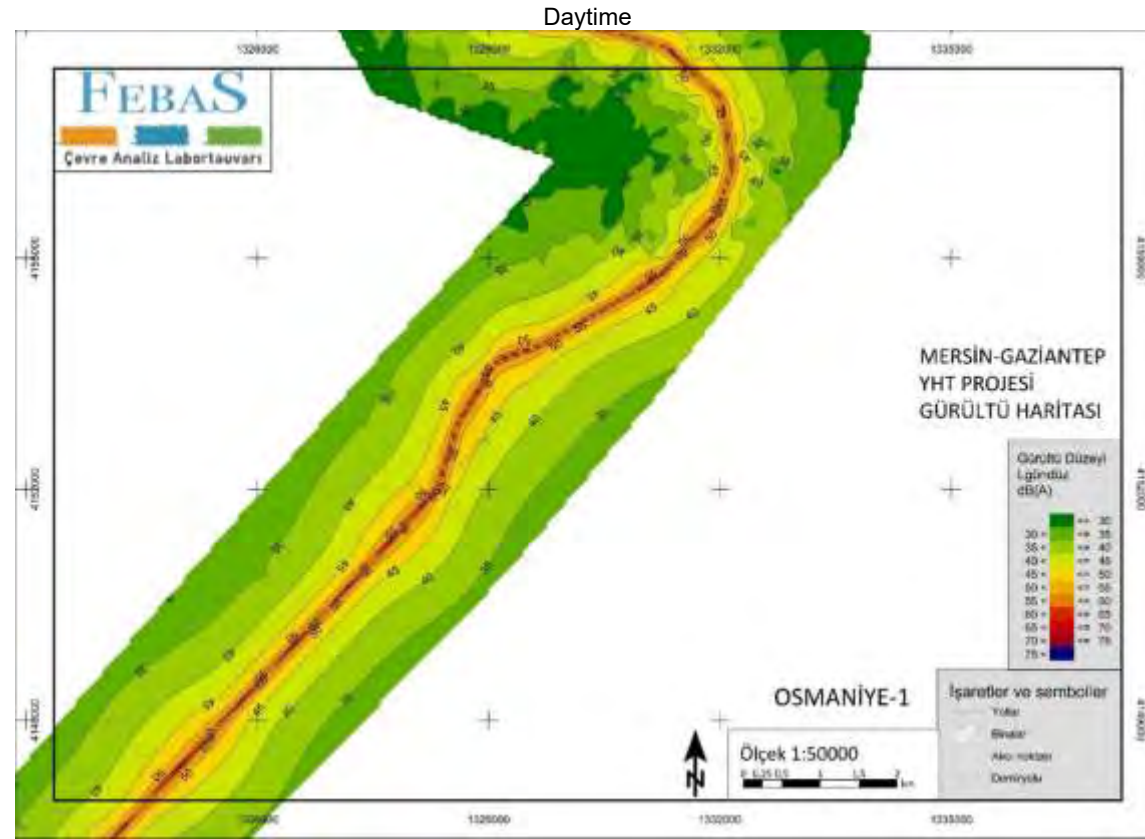
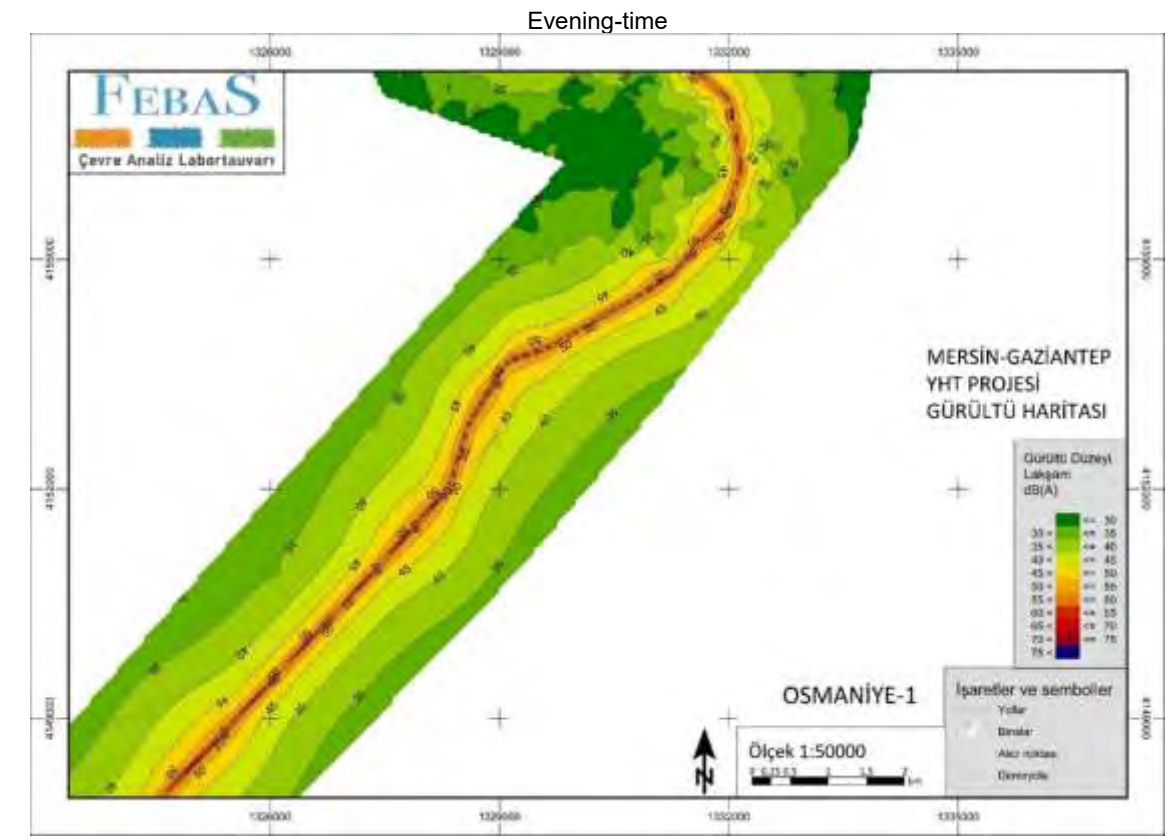
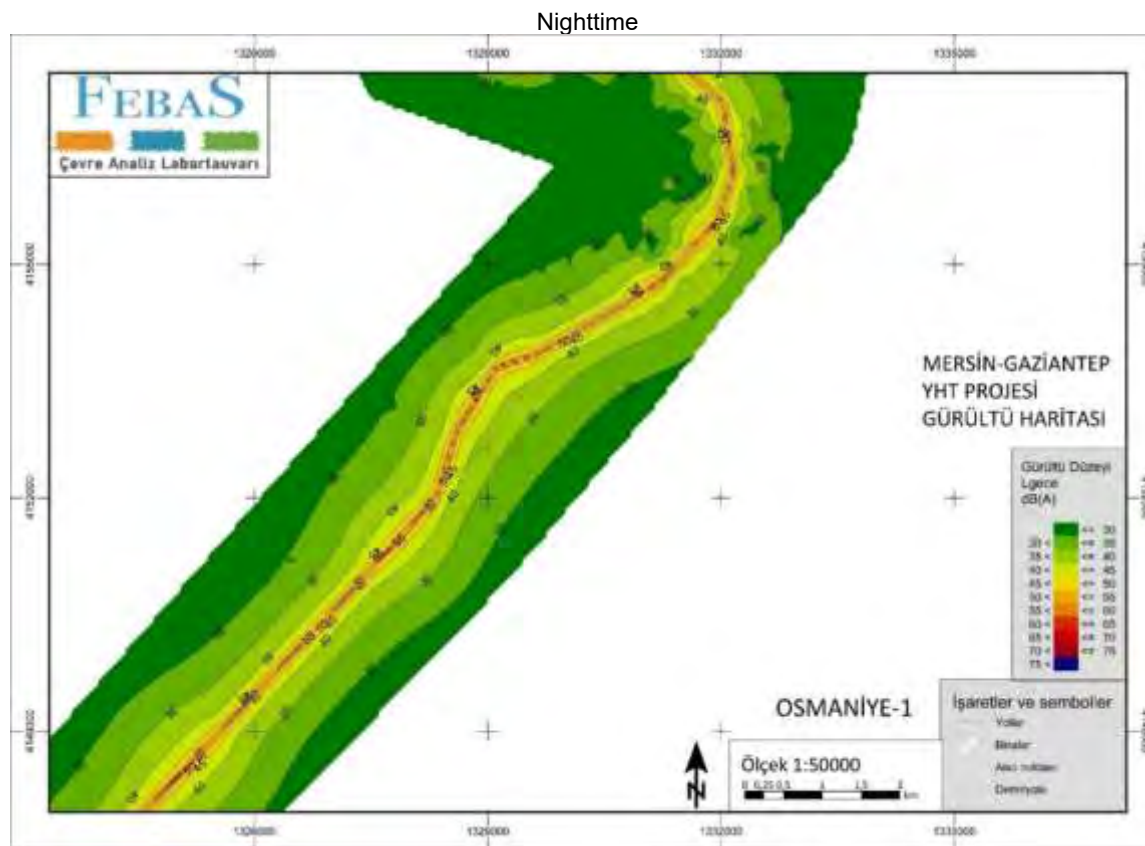
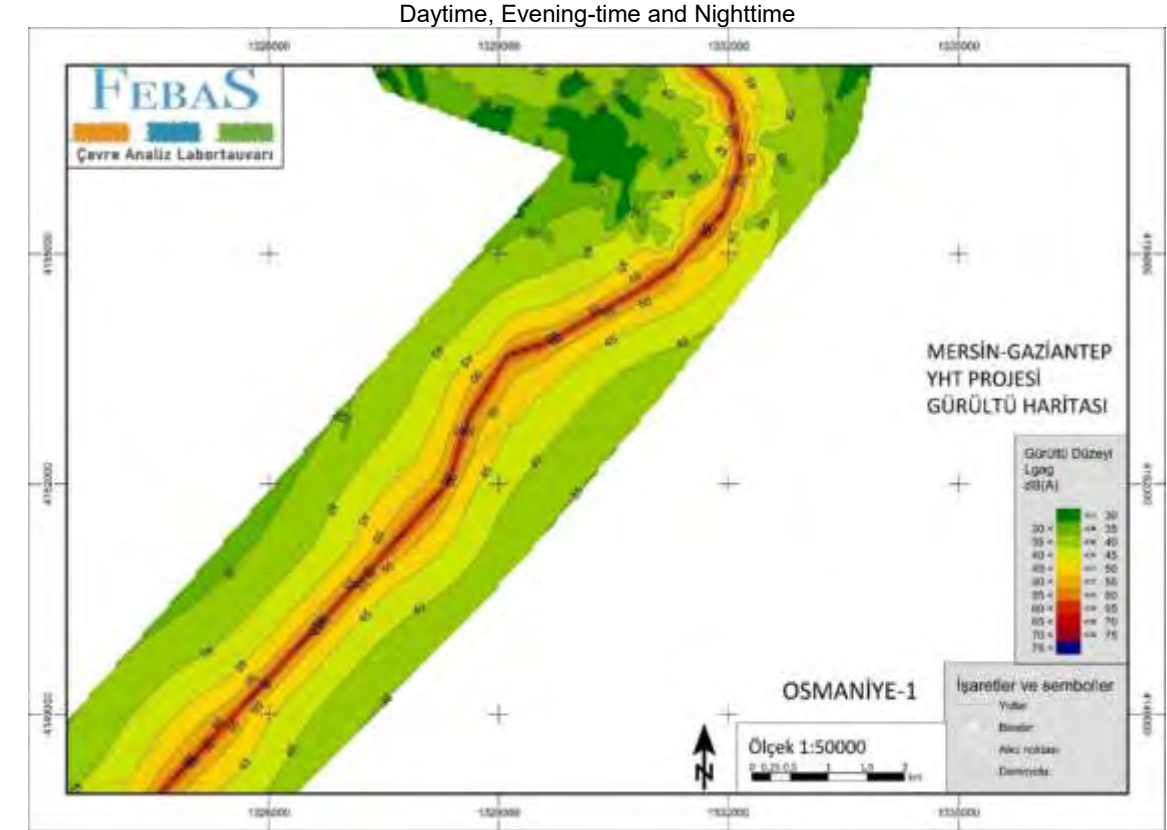
Map 4.27: Noise Map of Mersin Gaziantep in Section 9



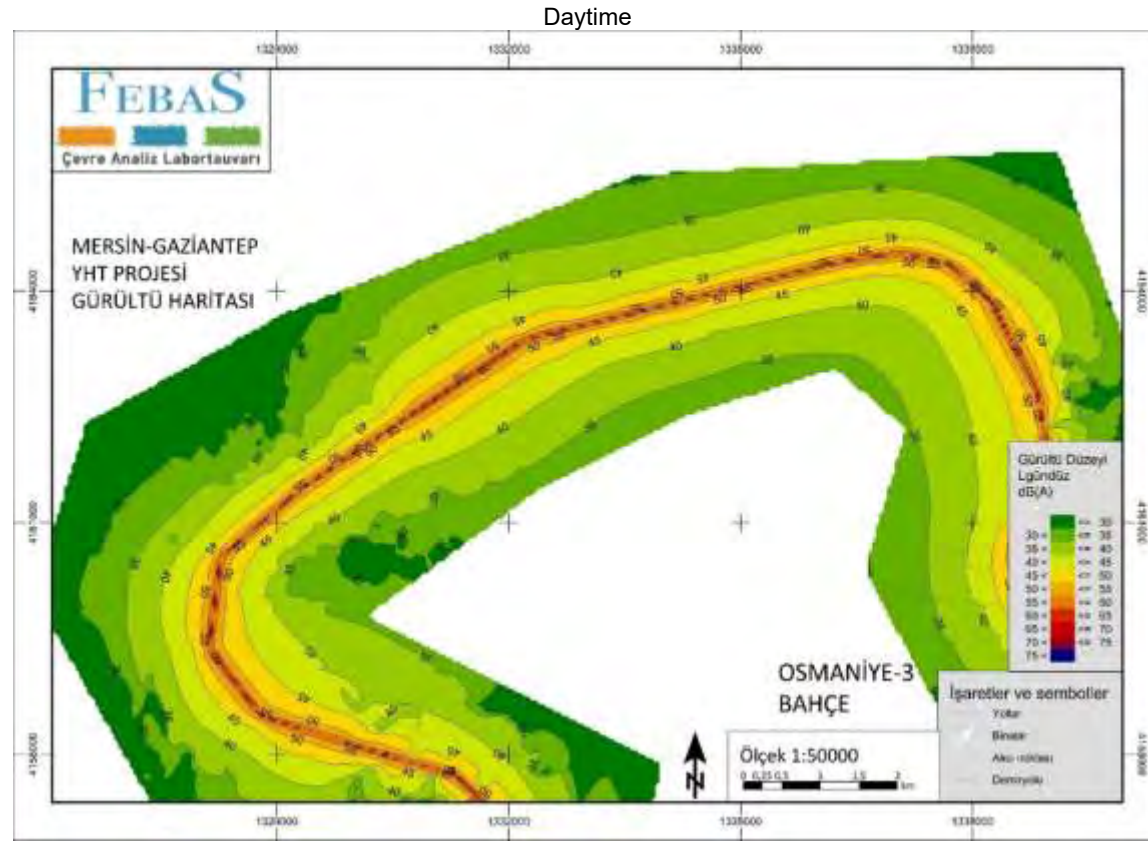
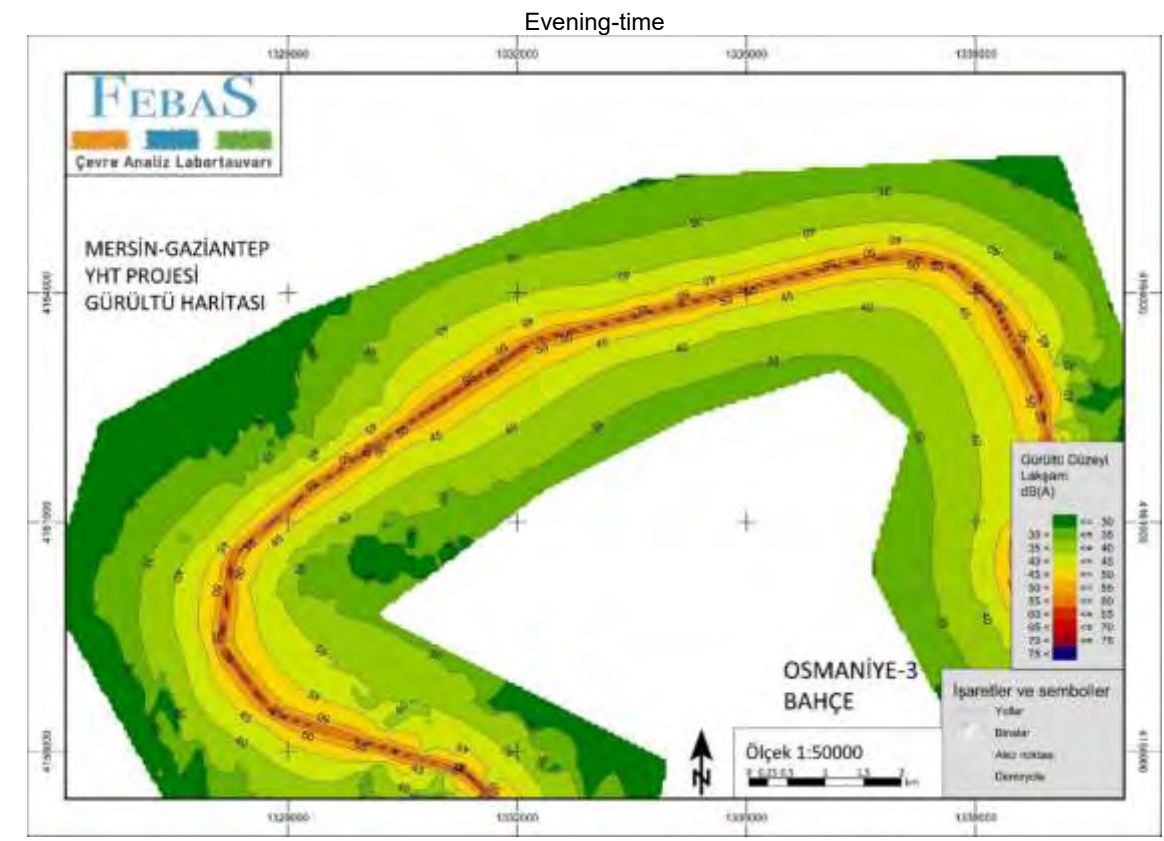
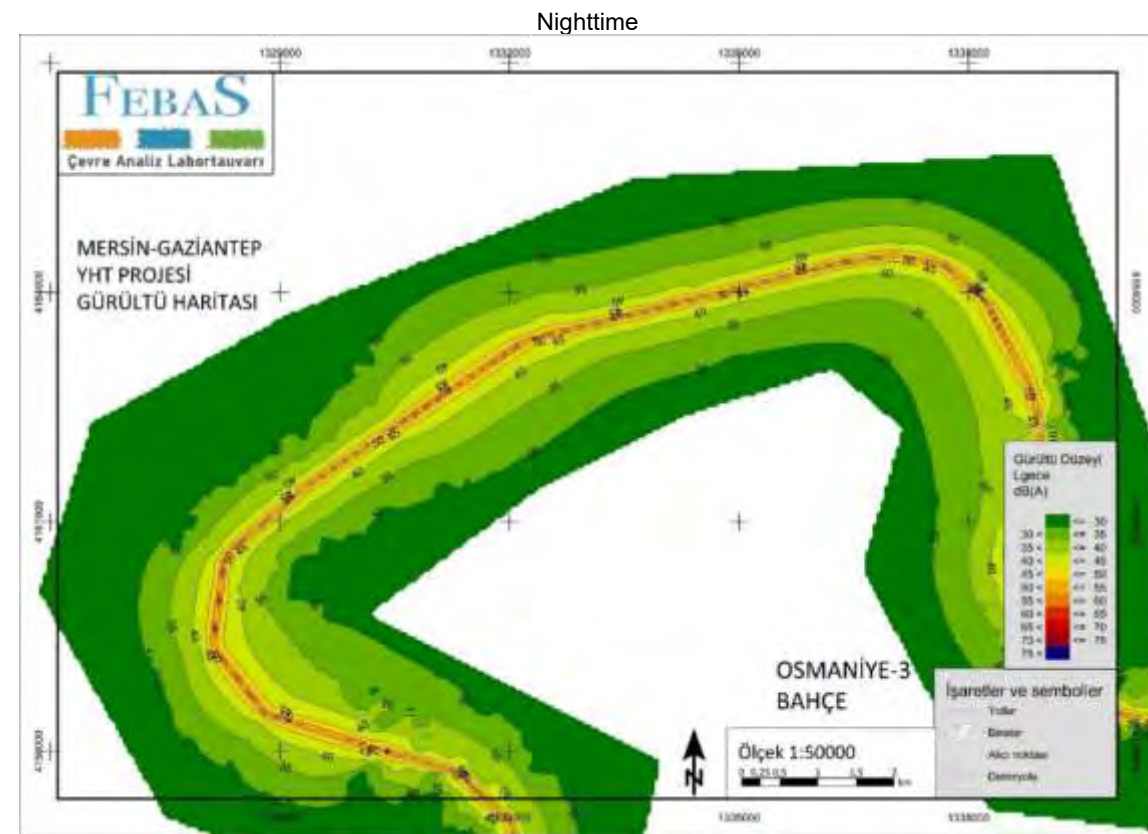
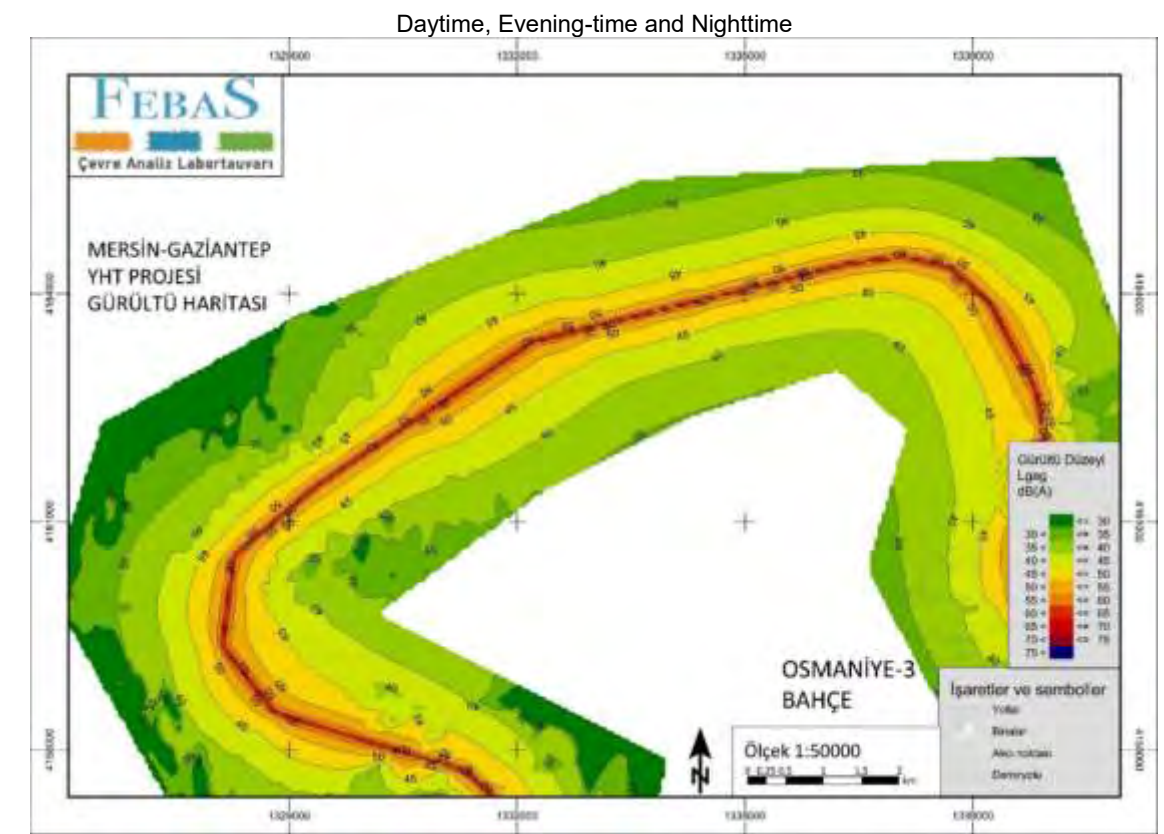
Map 4.28: Noise Map of Mersin Gaziantep in Section 10



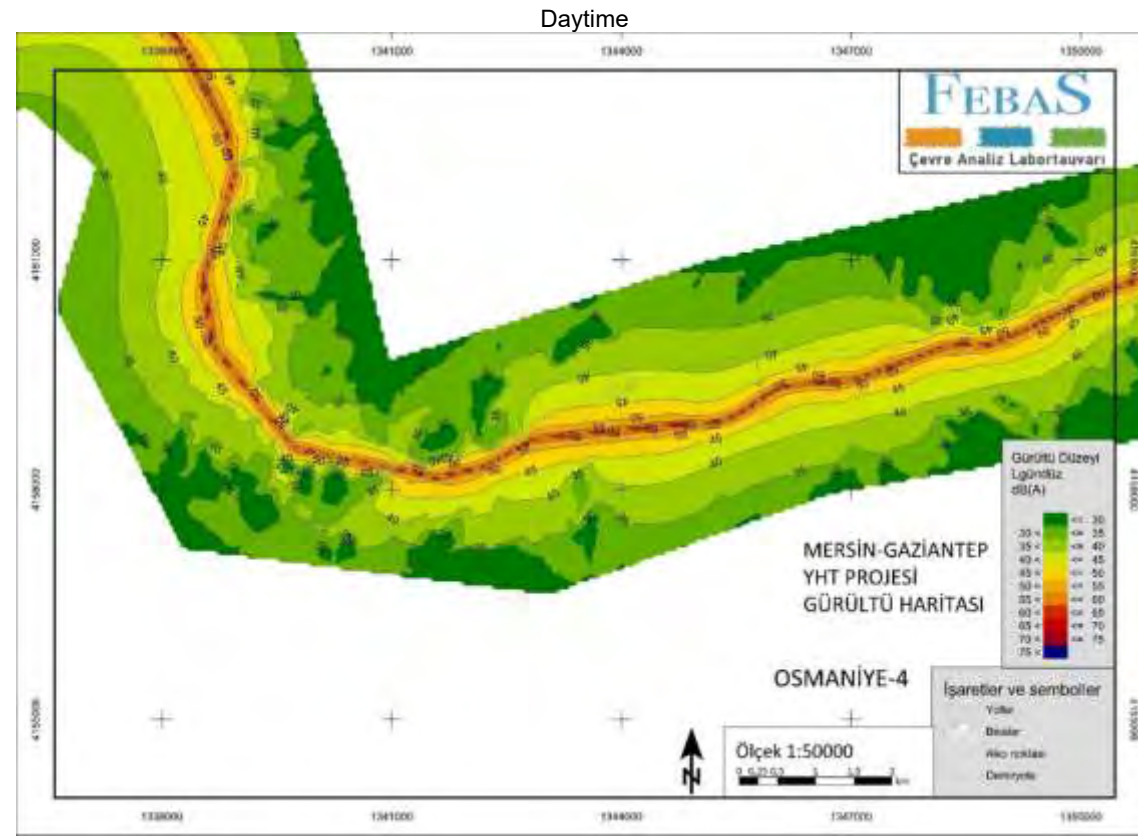
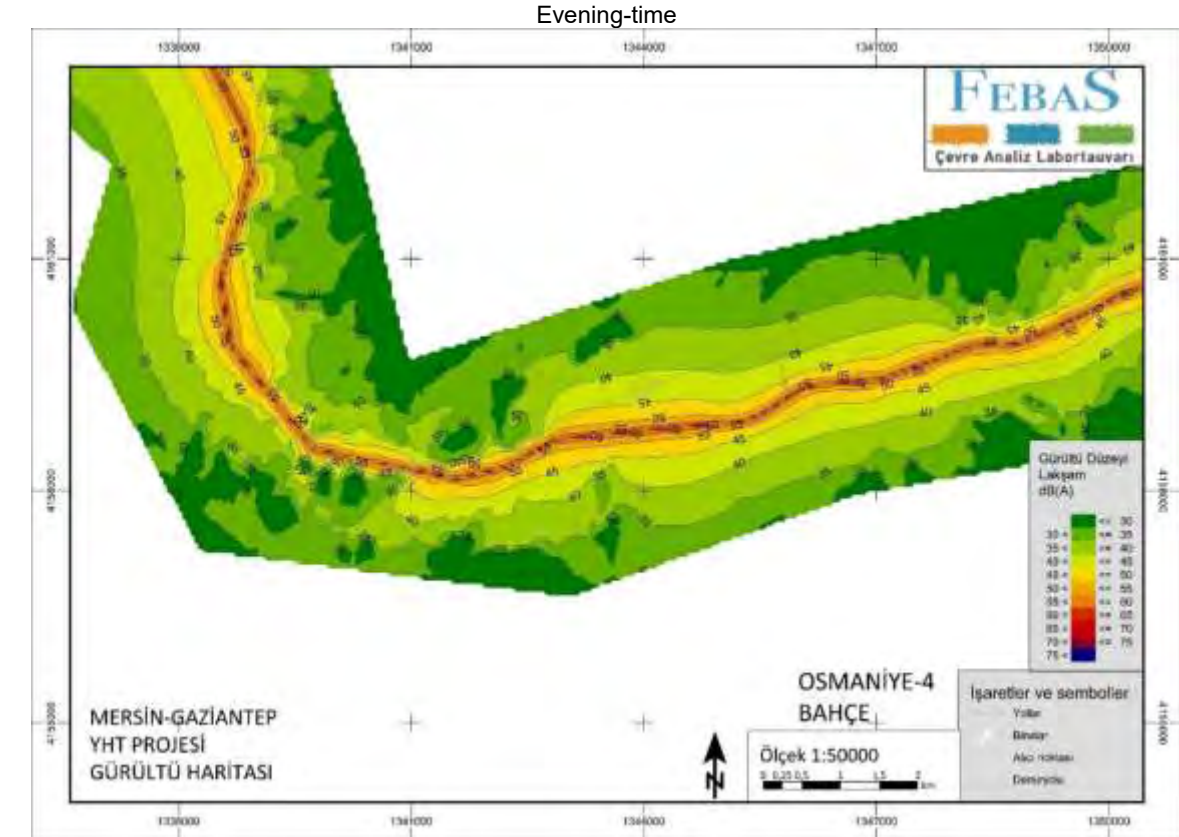
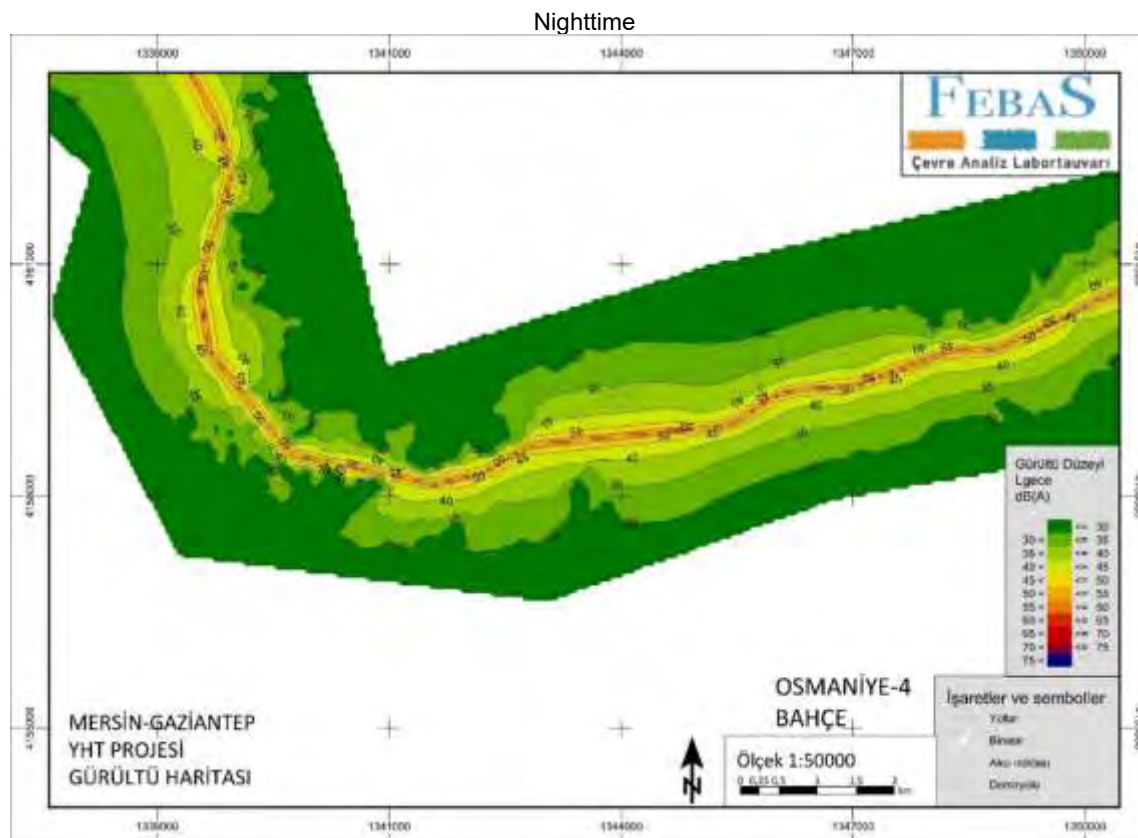
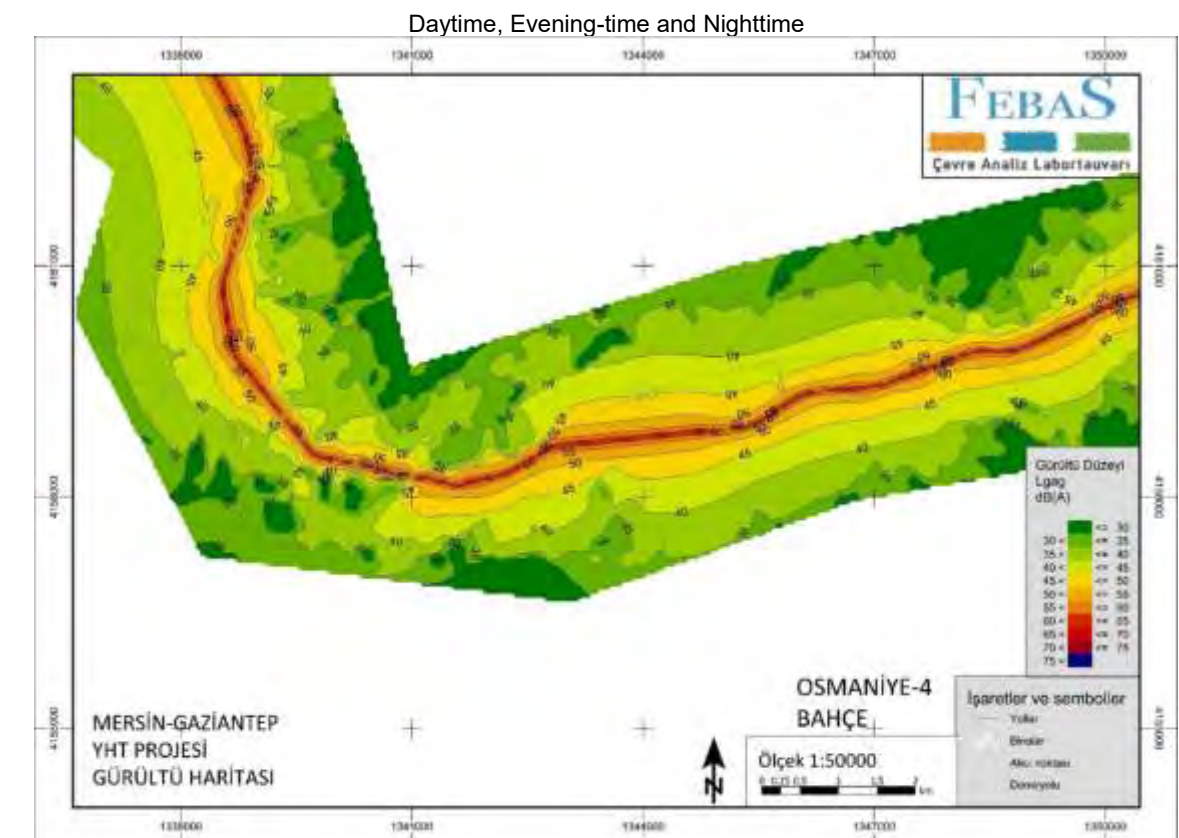
Map 4.29: Noise Map of Mersin Gaziantep in Section 11



Map 4.30: Noise Map of Mersin Gaziantep in Section 12

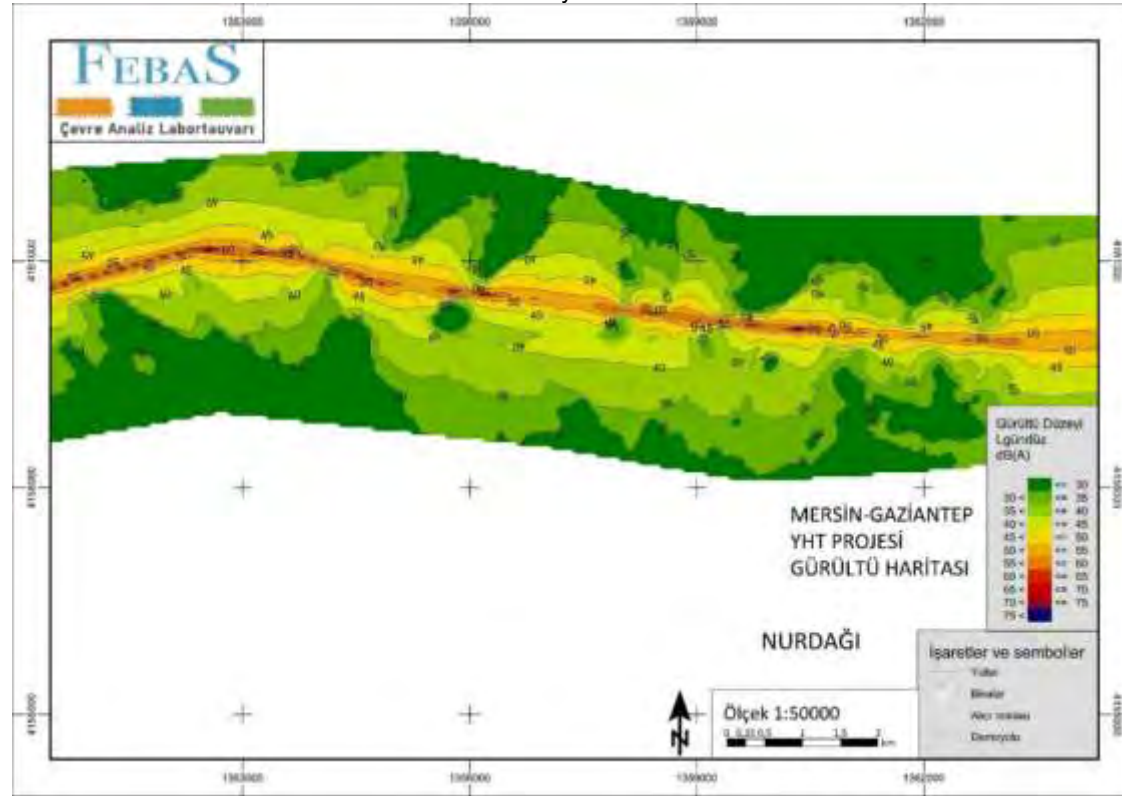


Map 4.31: Noise Map of Mersin Gaziantep in Section 13

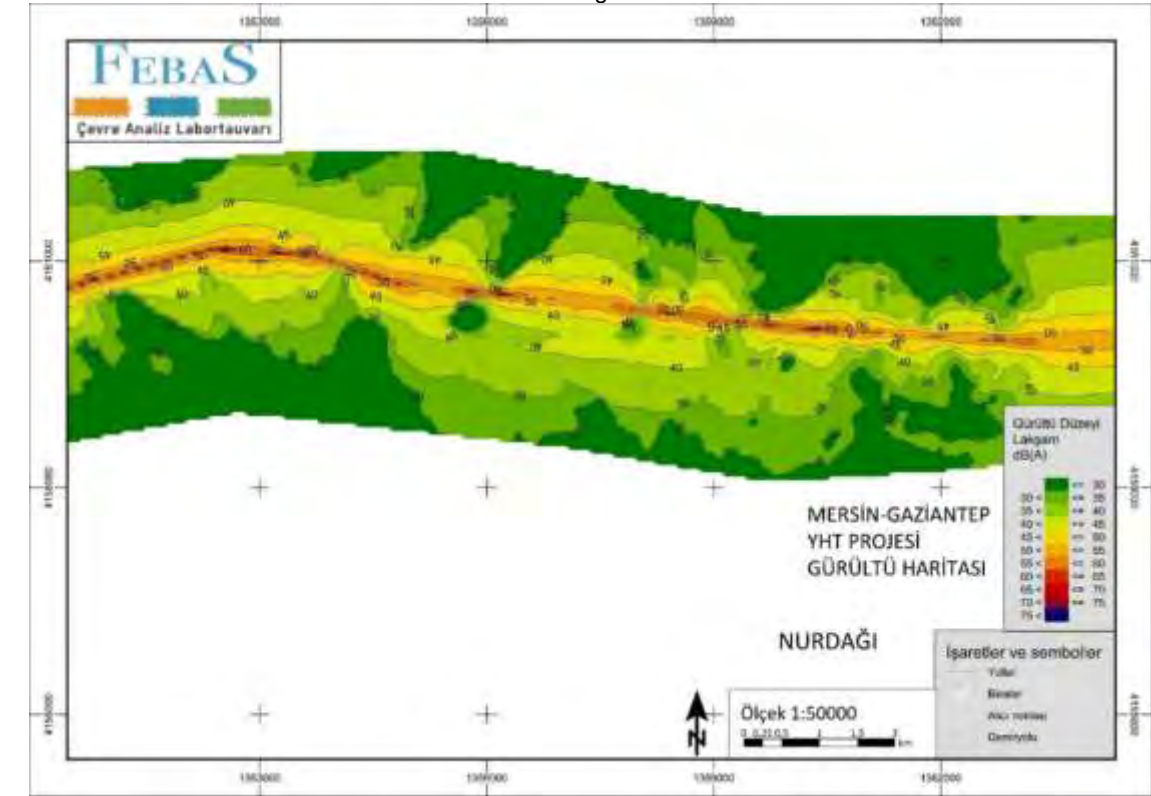


Map 4.32: Noise Map of Mersin Gaziantep in Section 14

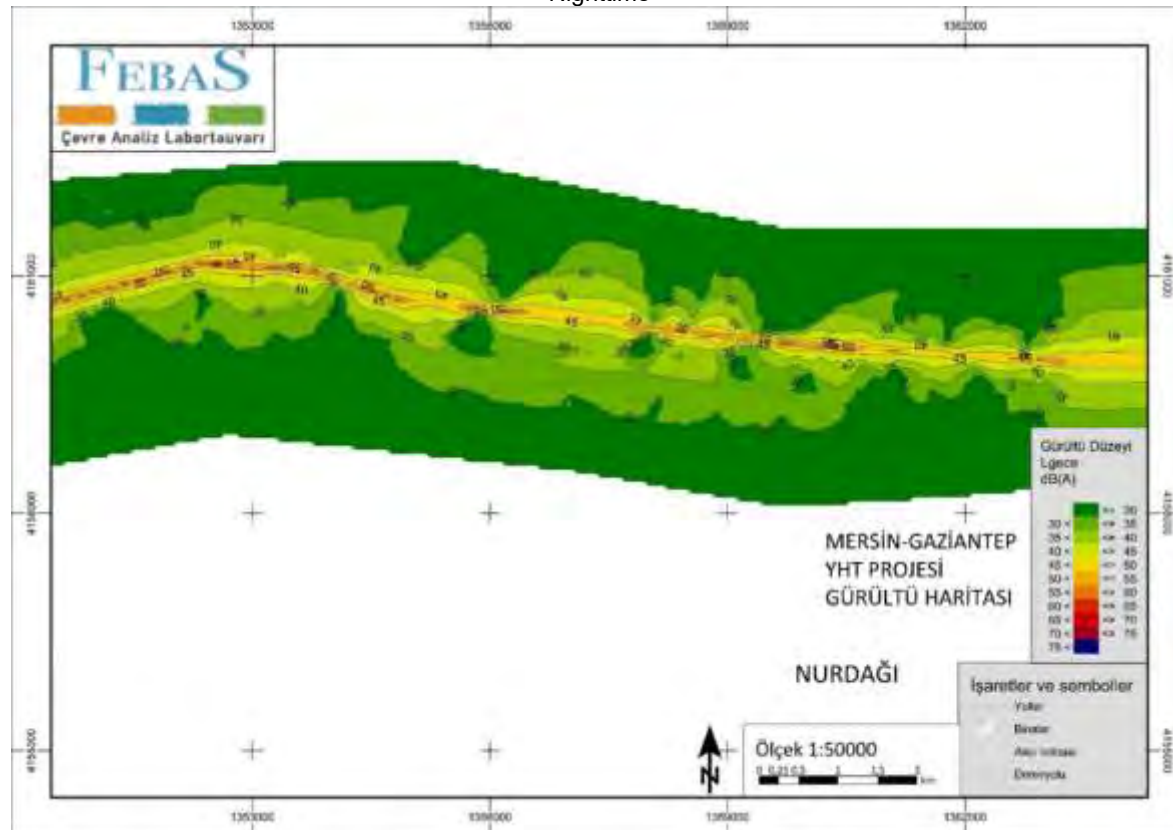
Daytime



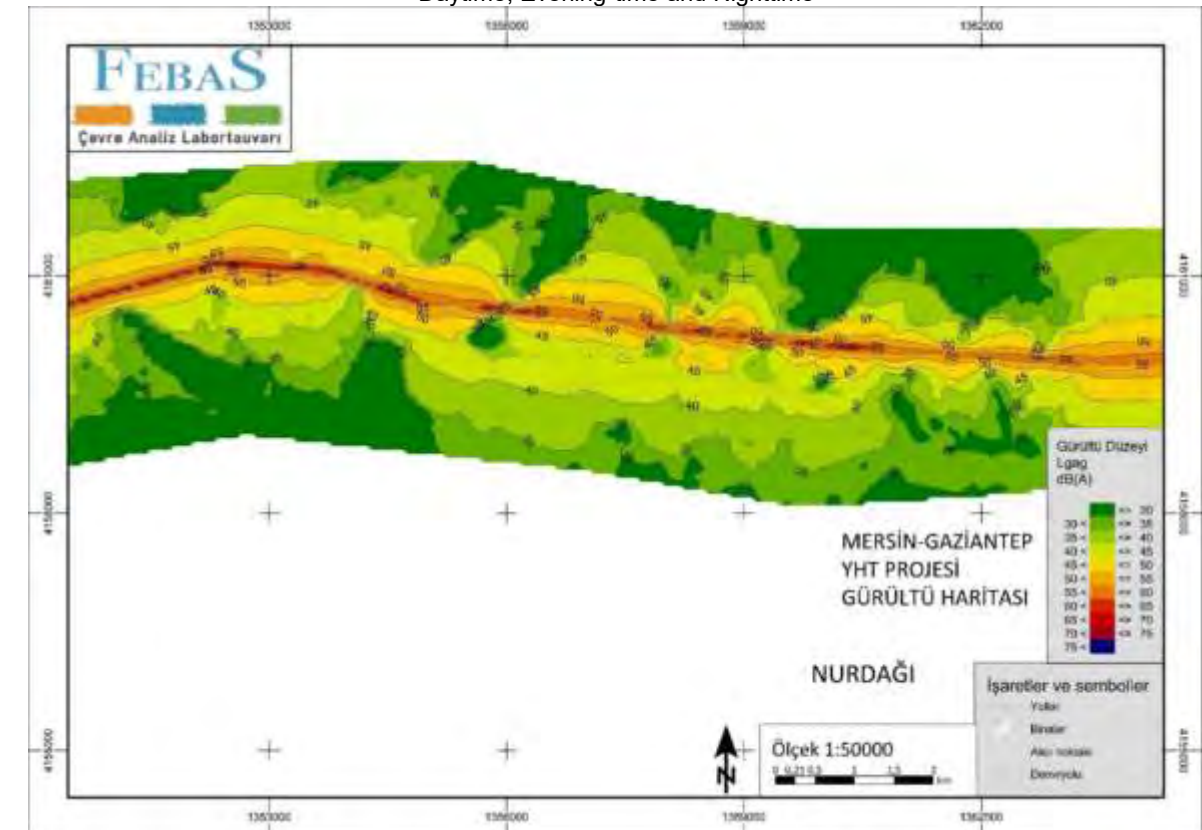
Evening-time



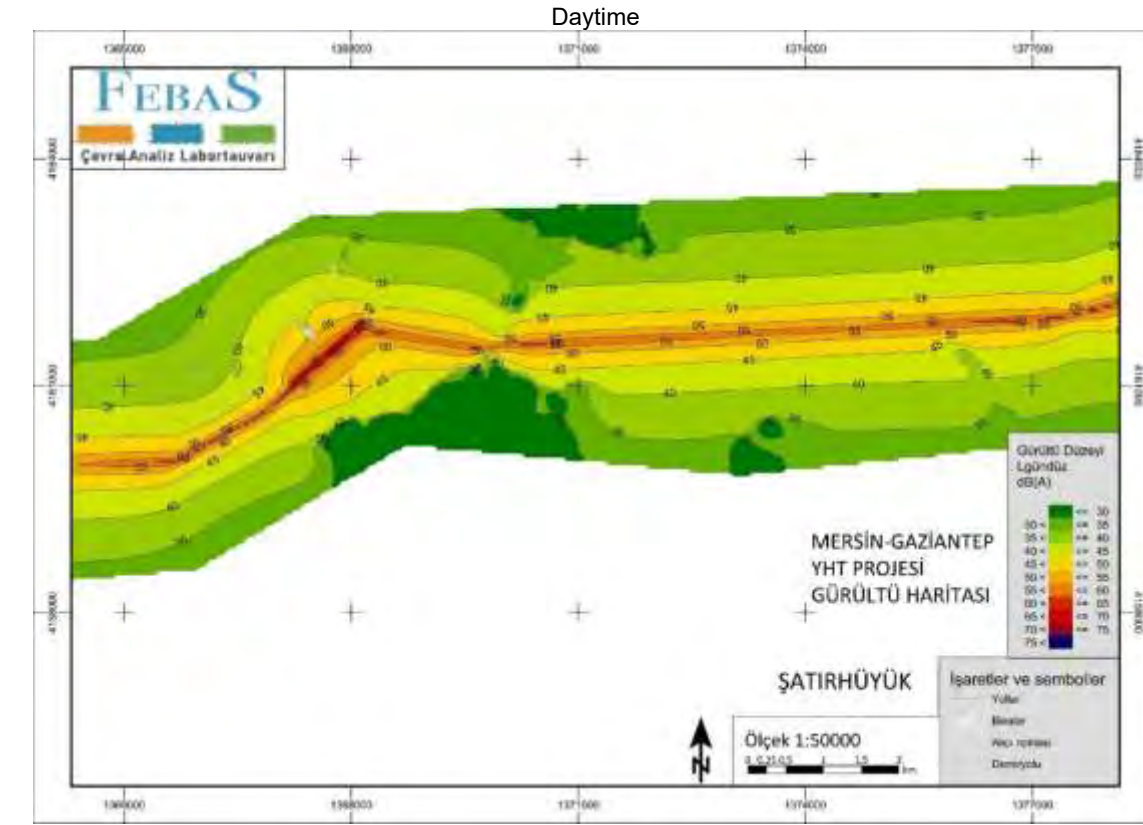
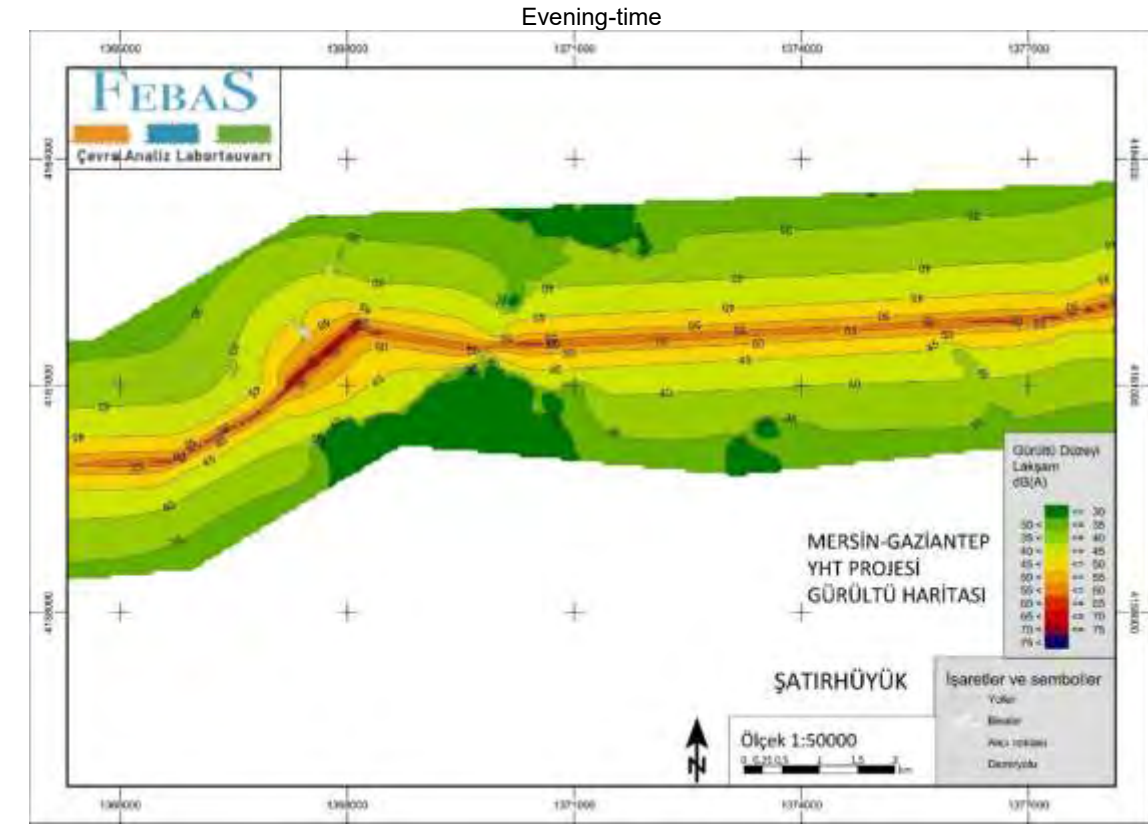
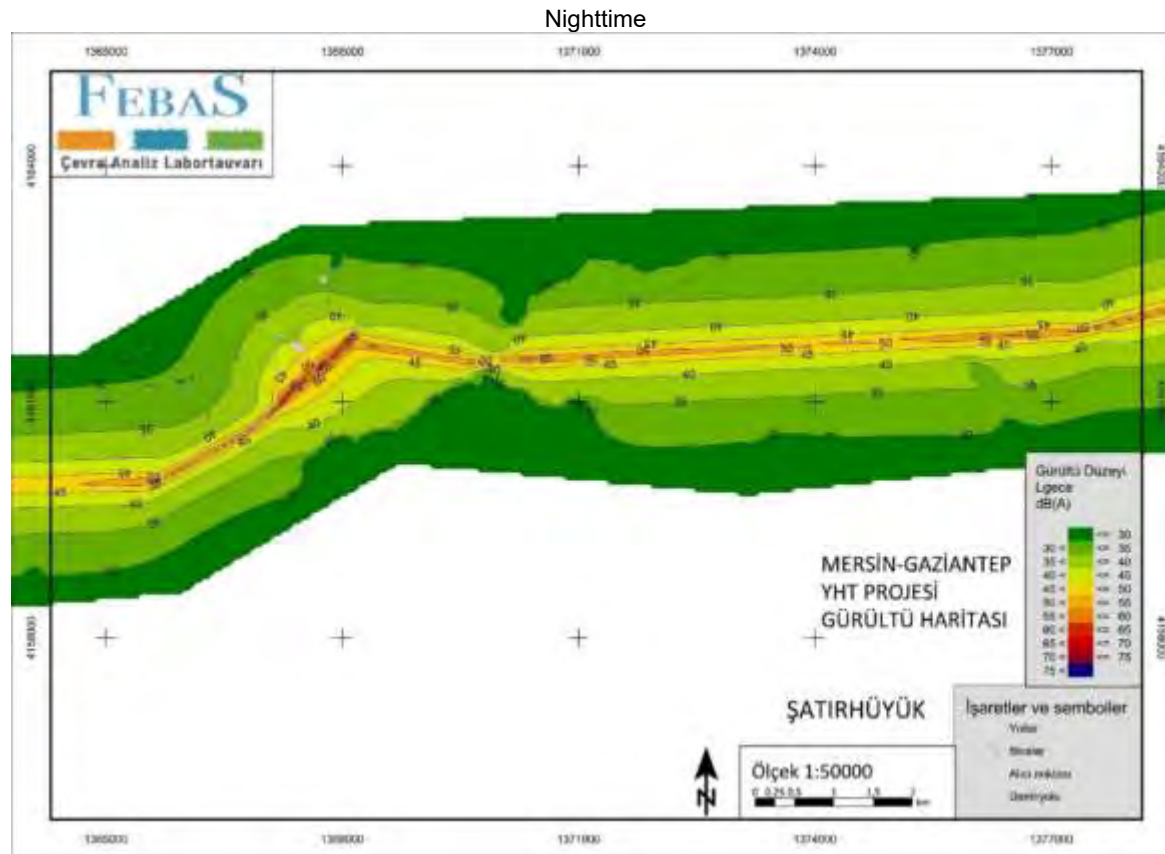
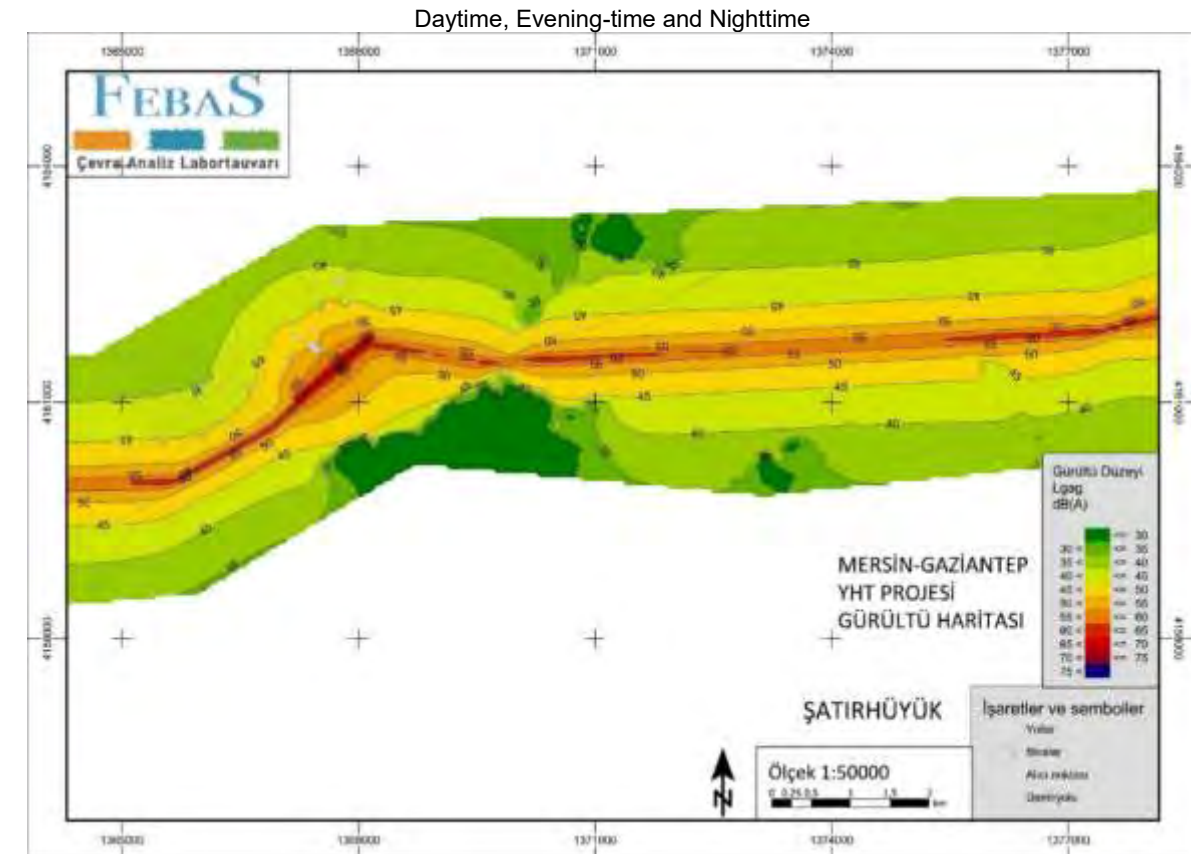
Nighttime



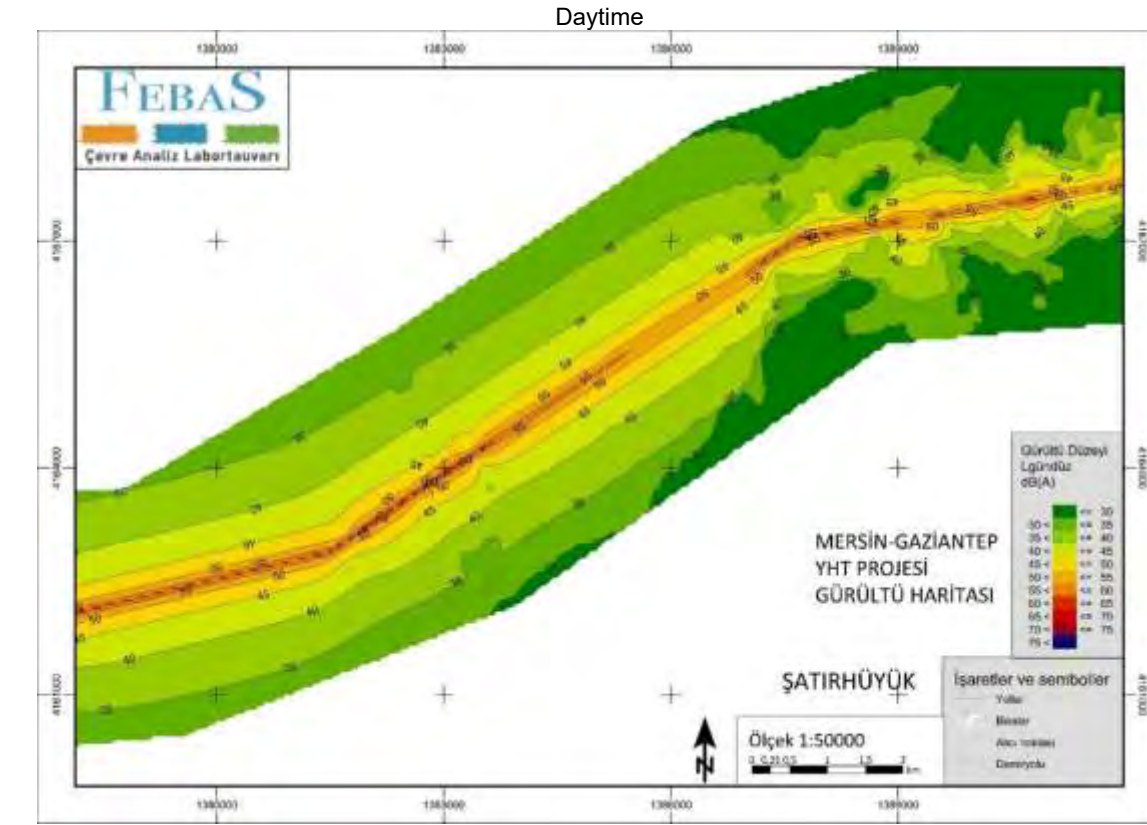
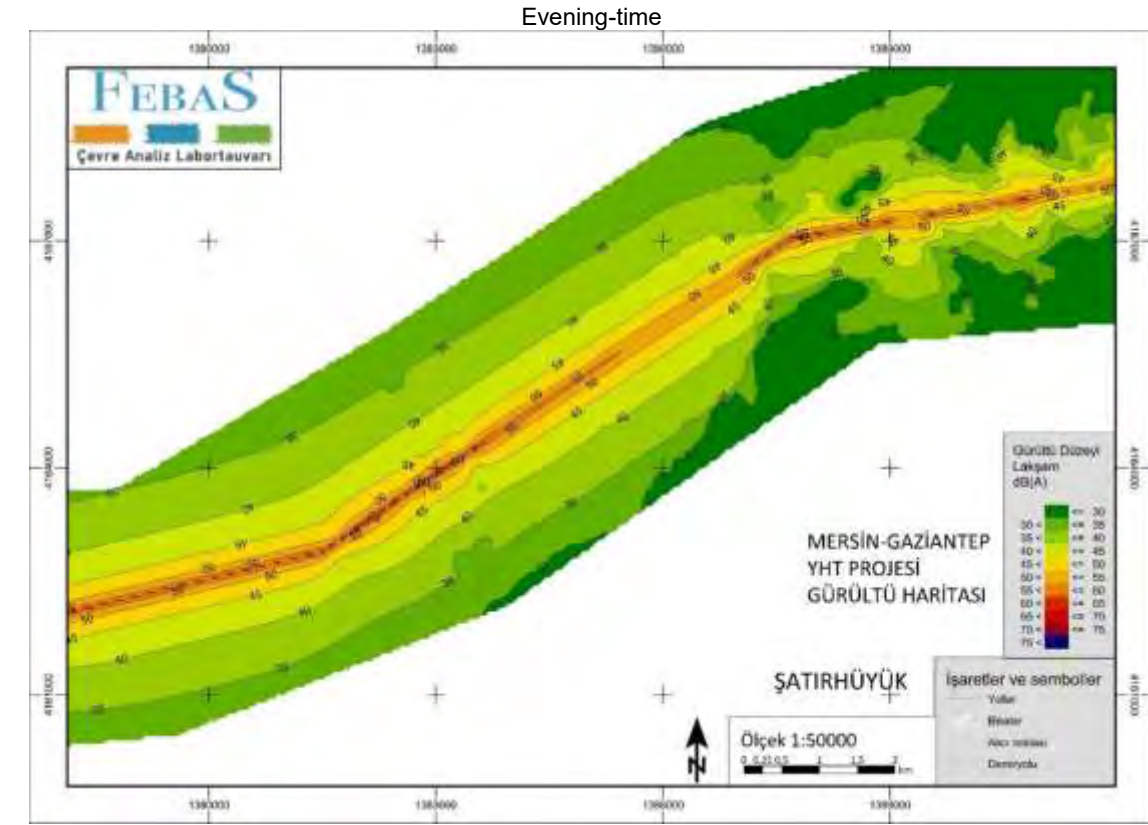
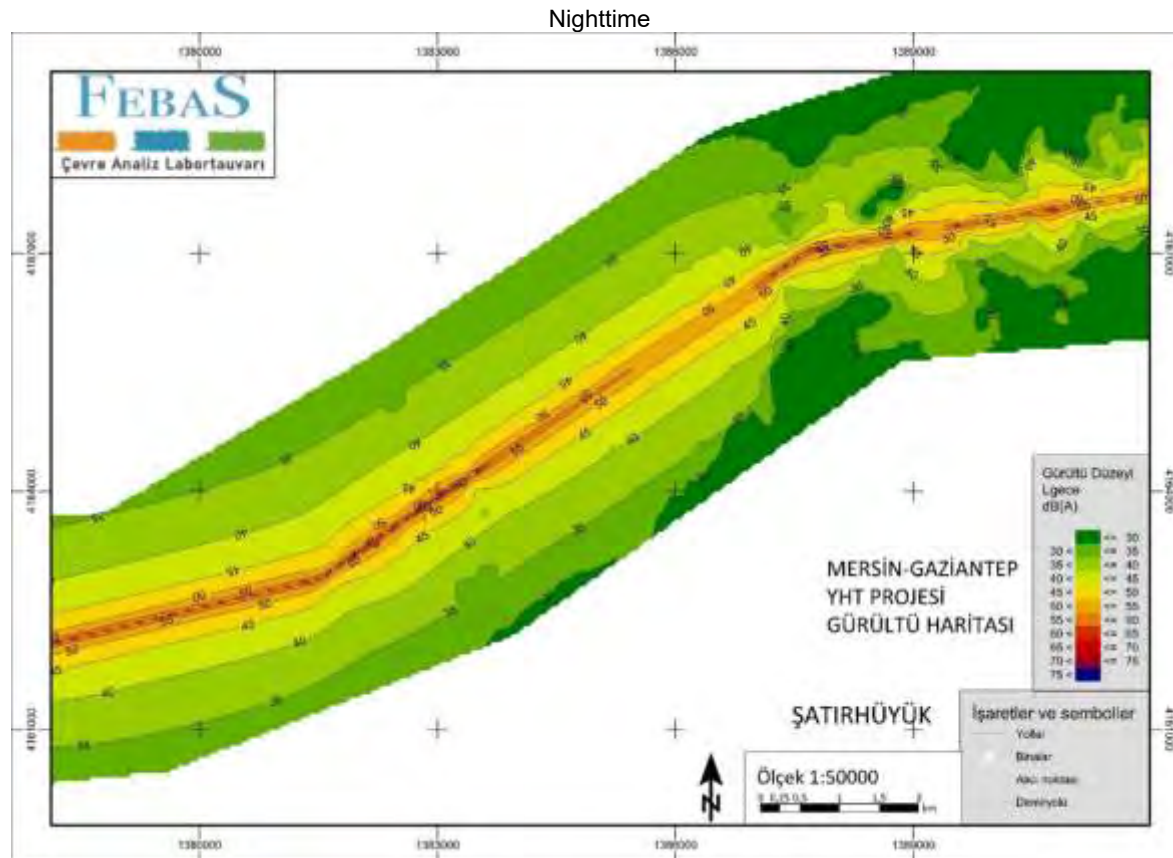
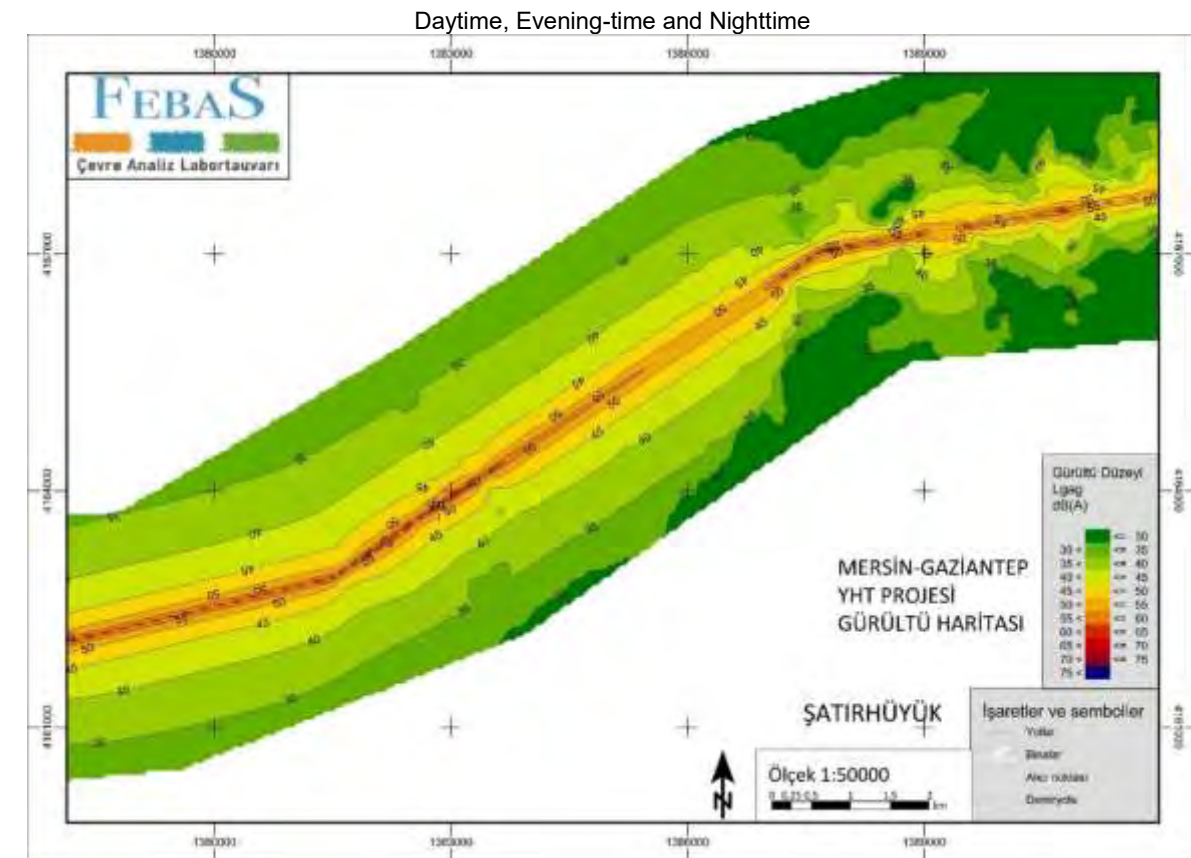
Daytime, Evening-time and Nighttime



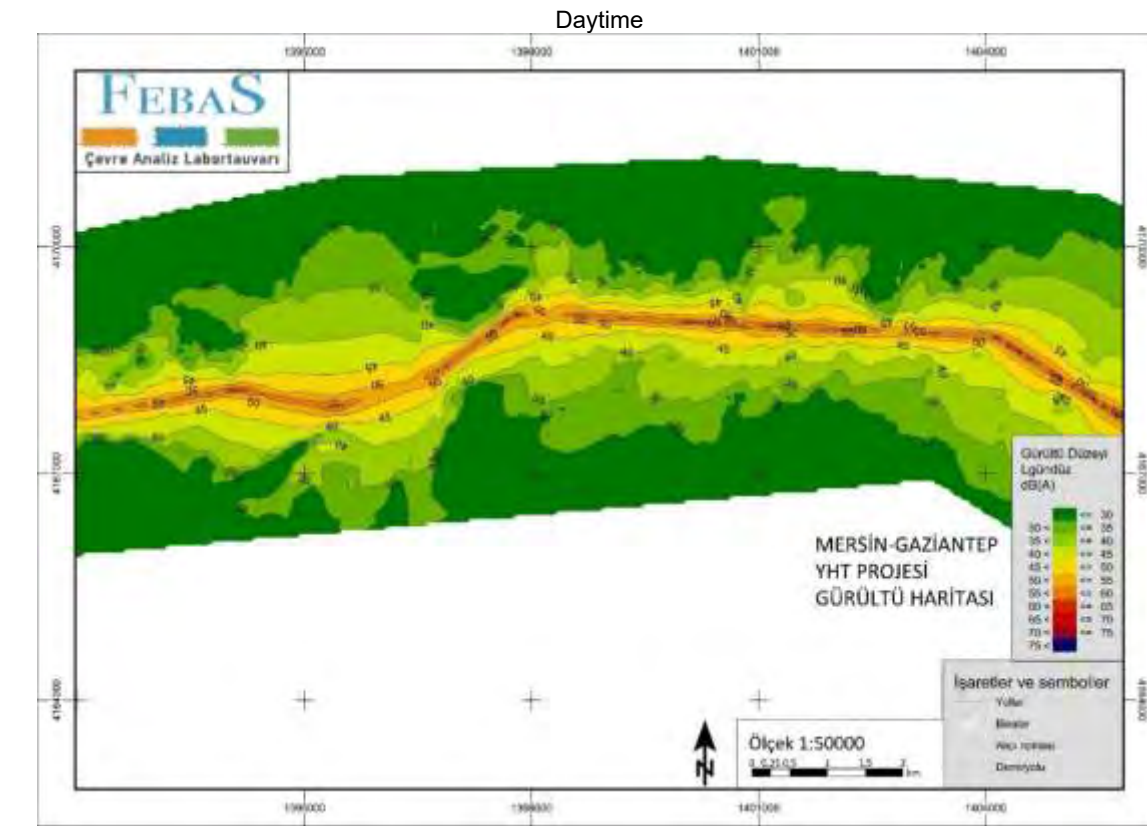
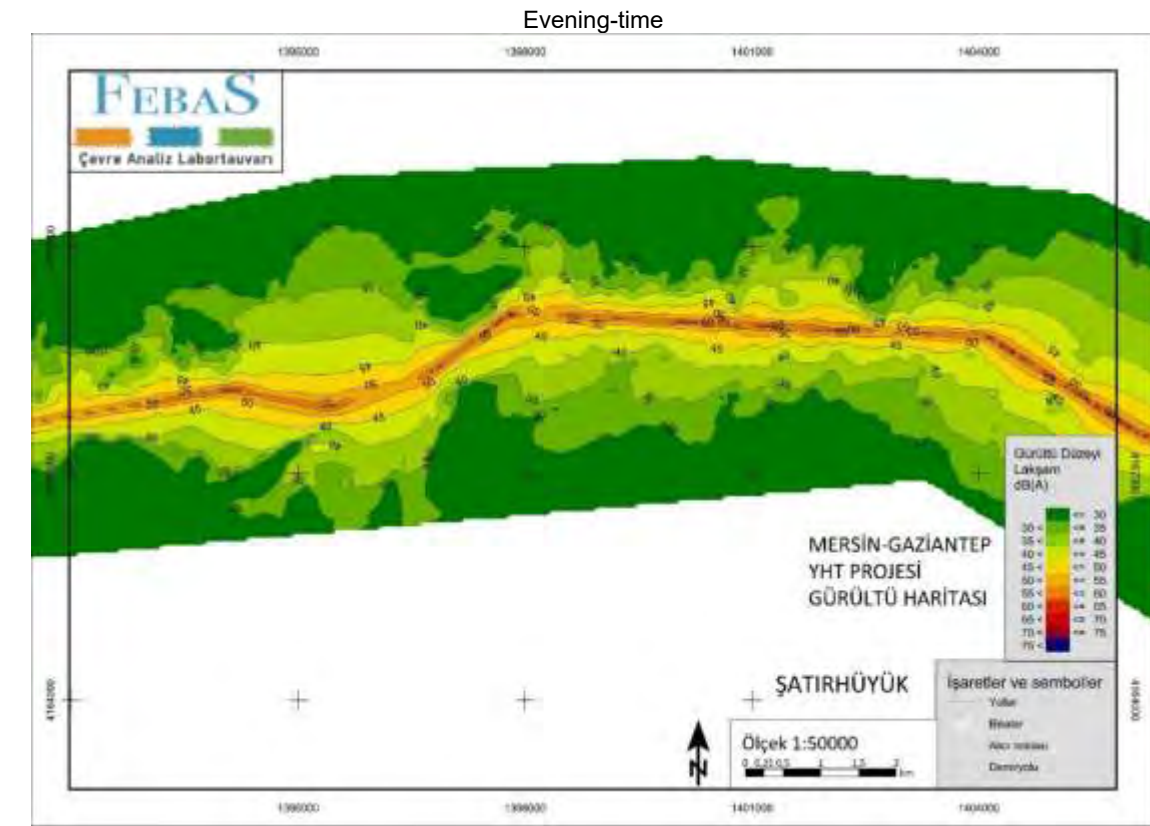
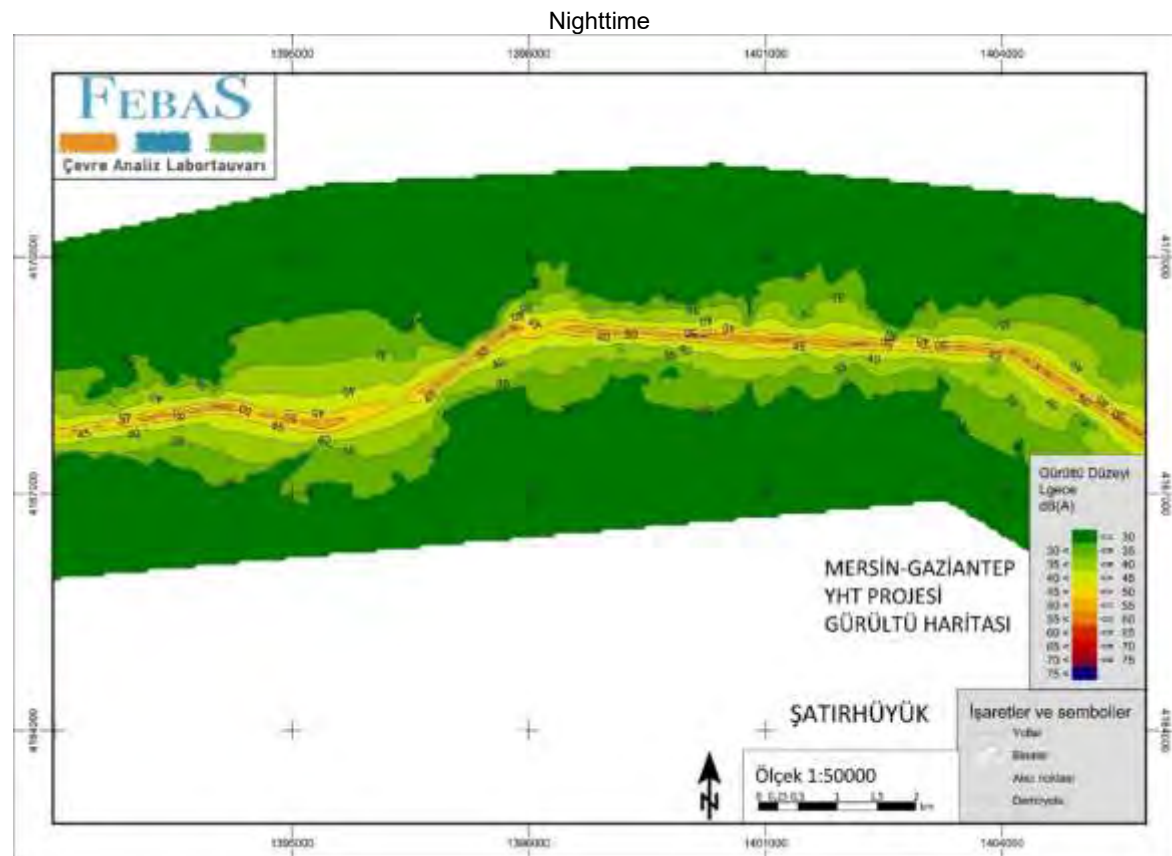
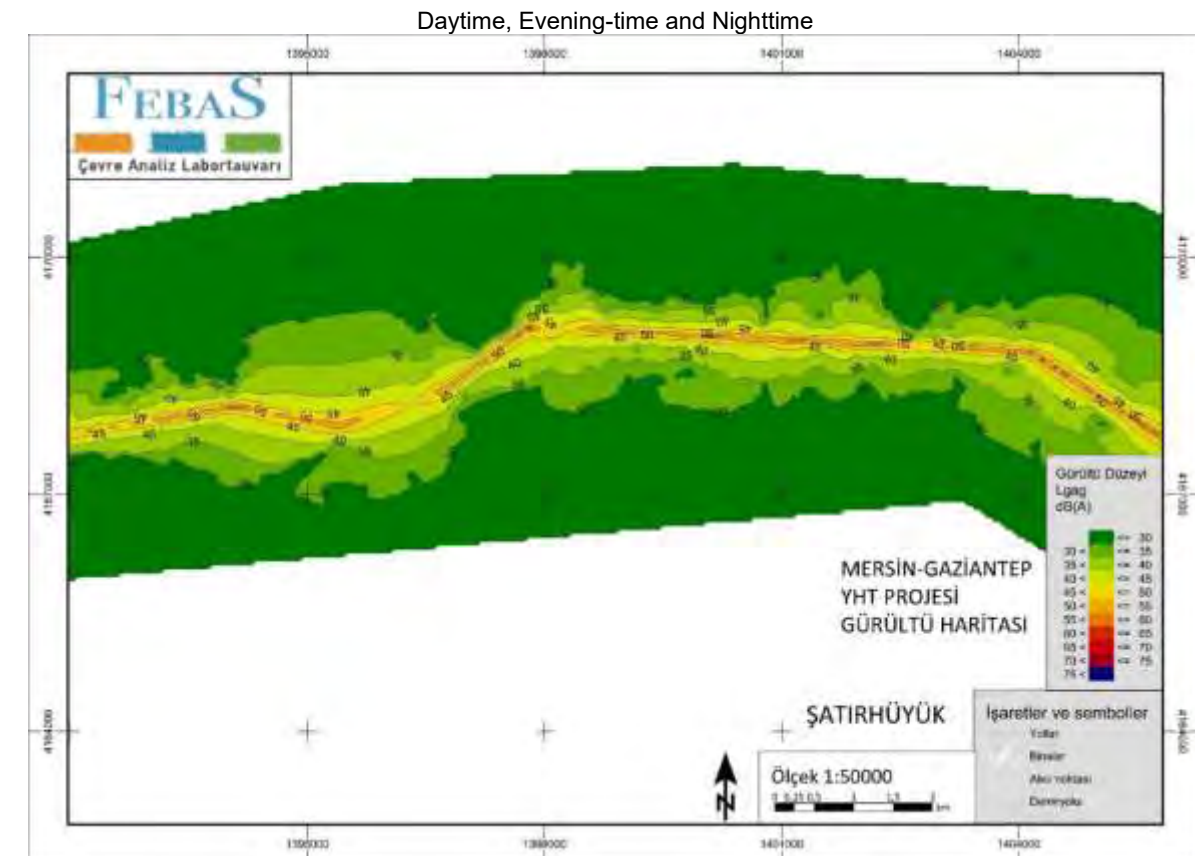
Map 4.33: Noise Map of Mersin Gaziantep in Section 15



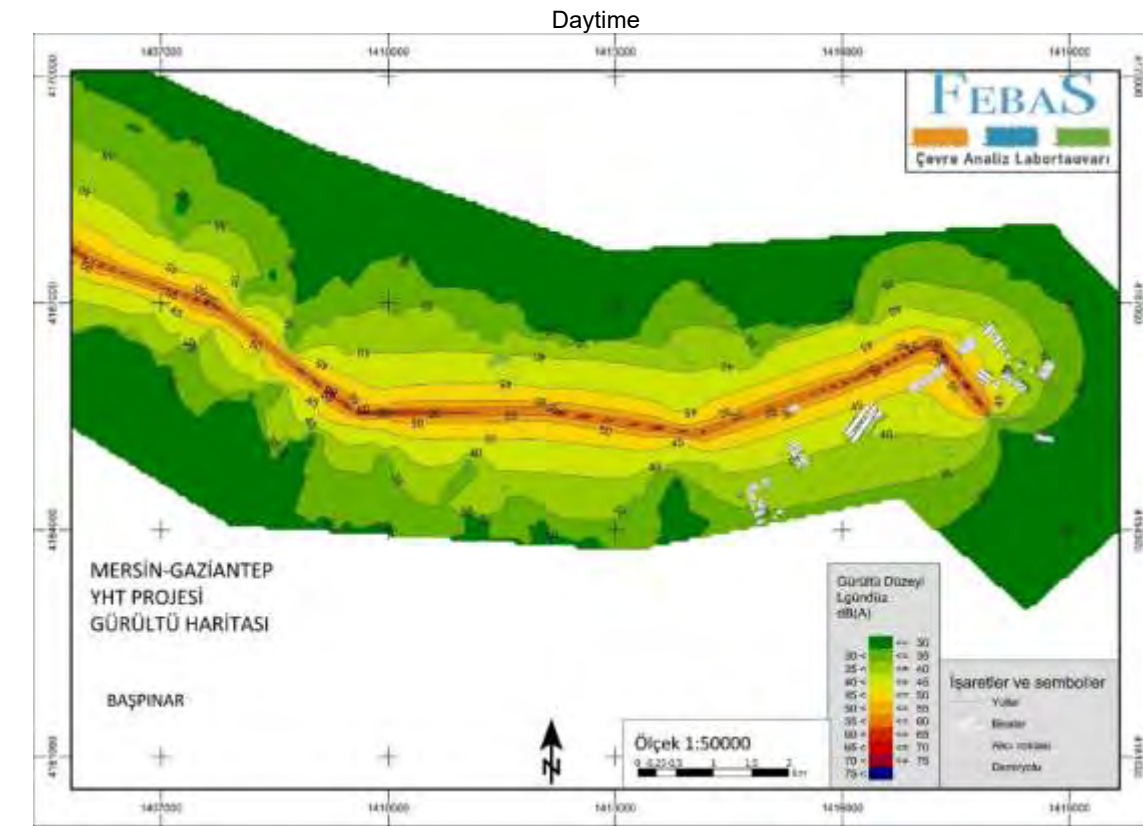
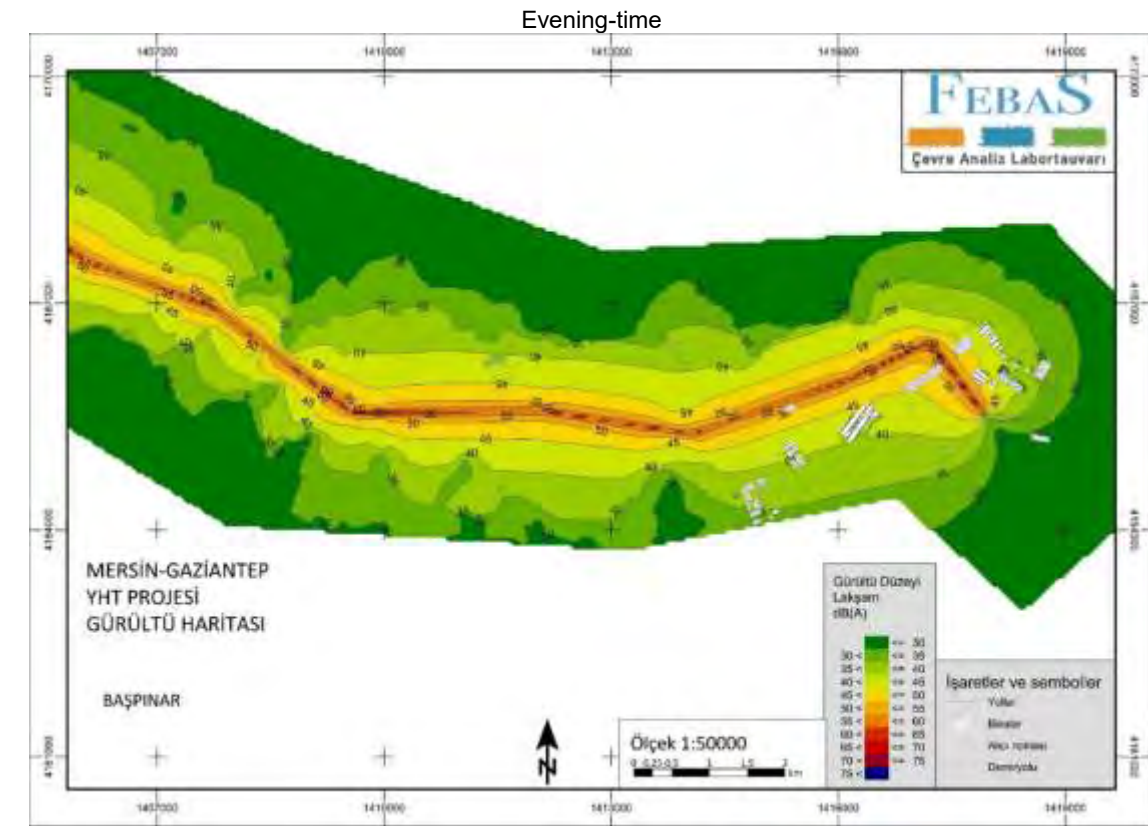
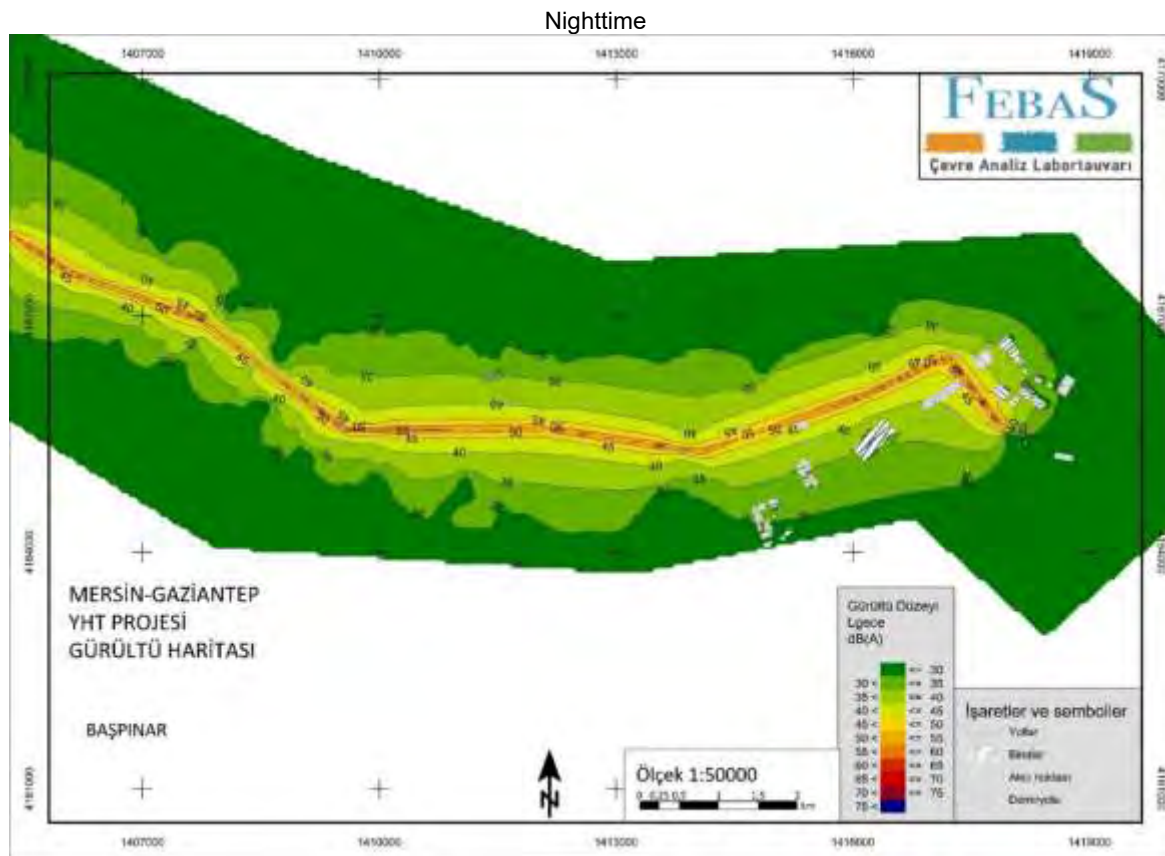
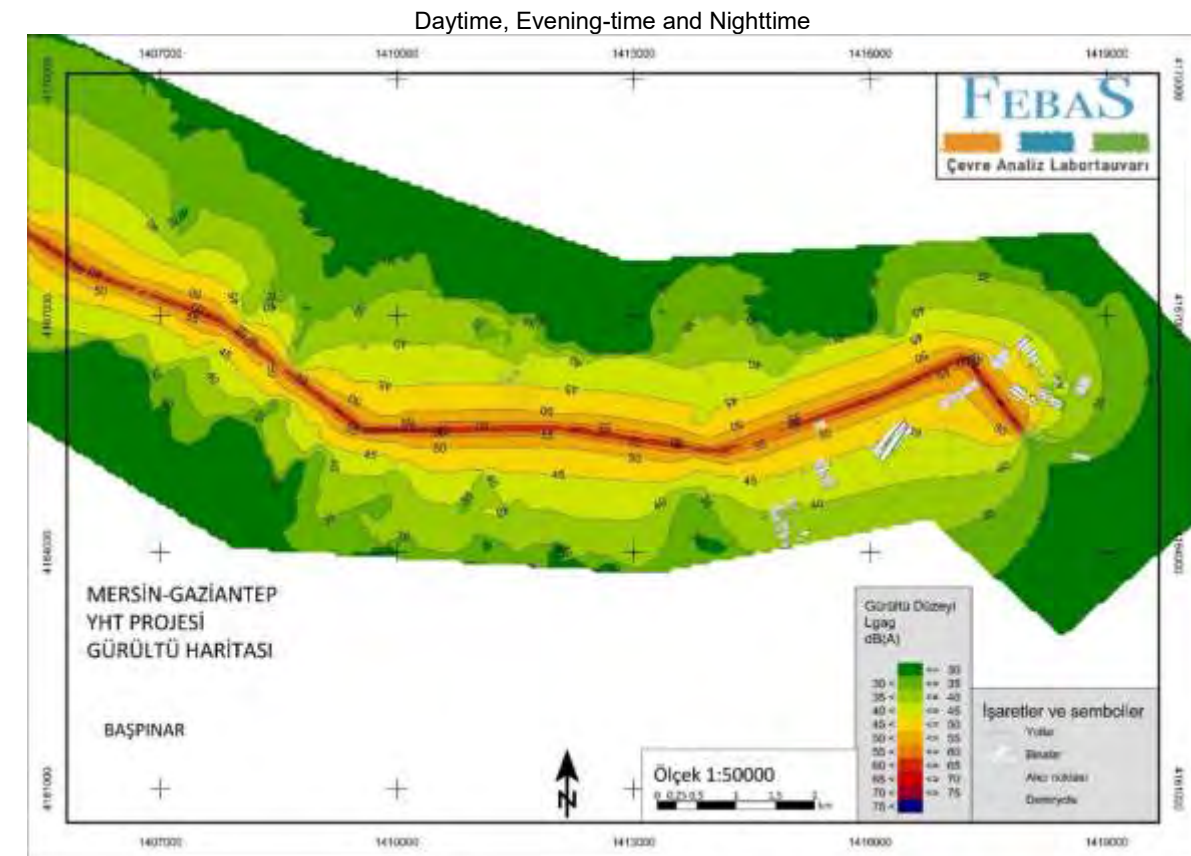
Map 4.34: Noise Map of Mersin Gaziantep in Section 16



Map 4.35: Noise Map of Mersin Gaziantep in Section 17



Map 4.36: Noise Map of Mersin Gaziantep in Section 18



Map 4.37: Noise Map of Mersin Gaziantep in Section 19

4.8.7 Cumulative Impact Assessment

This section represents the cumulative impact assessment of the Project; involve a description of the potential cumulative impacts by considering the other important projects near to the Project area.

The route from Mersin to Gaziantep runs parallel to both the highway and the state road, passing almost the same routes until reaching Gaziantep, and there are stops and stations on these routes. Background noise level includes all noise around the Railway Line.

4.8.8 Summary of Residual Impacts, Significance Criteria and Overall Impact Significance

Noise caused by construction during the Project is expected not to have a significant impact on the sensitive receptors because noise measurements in all measurement points are lower than 75 dBA during the construction period.

According to the article 27 of the Regulation on Assessment and Management of Environmental Noise and the measurement results, the residences remaining in the project area can be evaluated according to Category B in general. Category B (55- 64 dBA in Lday) Area: The noise level is taken into consideration in planning decisions. Planning decisions are made by taking necessary measures against noise.

The main source of current noise pollution in the proposed project is the locomotives. Noise measurements show that the daytime noise levels ranged between 4.1 dB (A) and 52.1 dB (A) during construction phase. During the operation phase: daytime noise levels ranged between 37.0 dB(A) and 56.1 dB(A), evening time noise levels ranged between 37.0 dB(A) and 56.1 dB(A) and nighttime noise levels ranged between 31.0 dB(A) and 50.1 dB(A). This is in comparison to the IFC Guidelines and National Environmental Standards for Environmental Noise of 55 dB (A) for the day and 45 dB (A) during the night, set for mixed residential land use. Therefore, daytime exceedances of the noise limits do not occur.

In terms of environmental noise and vibration caused from the Project, all the impact significances according to Regulation on Assessment and Management of Environmental Noise, IFC guidelines and WHO guidelines are found out to be negligible, and no limit value exceedance is detected. Since no impact rather than “negligible” found out during modeling, calculation and analysis, no residual impact is expected from the project unless there will be some crucial alteration happened in the project area or working conditions.

There are residences at a distance of 50 m to the project area in city centers throughout the project area. The authorized company undertakes to carry out environmental vibration measurements in case of any suspicion and/or complaint of vibration originating from construction equipment.

Table 4.110: Evaluation of the Noise Measurement Results according to RAMEN during Construction Phase

Code	Construction Phase	Evaluation (RAMEN)	
	Ldaytime (dBA)	Limit Value (dBA)	Fulfilled
N1	27.5	75	Yes
N2	41.2	75	Yes
N3	33.9	75	Yes
N4	32.5	75	Yes
N5	48.9	75	Yes
N6	33.6	75	Yes
N7	16.6	75	Yes
N8	19.9	75	Yes
N9	27.6	75	Yes
N10	-	75	Yes
N11	12.5	75	Yes
N12	52.1	75	Yes
N13	27.5	75	Yes
N14	-	75	Yes
N15	-	75	Yes
N16	18.5	75	Yes
N17	11.0	75	Yes
N18	20.6	75	Yes
N19	4.1	75	Yes
N20	35.1	75	Yes

According to the noise measurement levels originating from construction activities, it is seen that the noise level that may occur in the closest houses in the project does not exceed 75 dBA, which is the limit value of RAMEN.

Table 4.111: Evaluation of the Noise Measurement Results according to IFC Limit during Construction Phase

Code	Construction Phase	Evaluation (IFC)		
	Ldaytime (dBA)	Limit Value (dBA)		Fulfilled
		Background+3	Daytime Limit Value	
N1	27.5	57.1	55	Yes
N2	41.2	56.8	55	Yes
N3	33.9	58.8	55	Yes
N4	32.5	54.6	55	Yes
N5	48.9	58.4	55	Yes
N6	33.6	58.8	55	Yes
N7	16.6	55.5	55	Yes
N8	19.9	58.8	55	Yes
N9	27.6	56.3	55	Yes

Code	Construction Phase	Evaluation (IFC)		
	Ldaytime (dBA)	Limit Value (dBA)		Fulfilled
		Background+3	Daytime Limit Value	
N10	-	55	55	Yes
N11	12.5	58.1	55	Yes
N12	52.1	56.4	55	Yes
N13	27.5	58.5	55	Yes
N14	-	58.9	55	Yes
N15	-	56.7	55	Yes
N16	18.5	56.2	55	Yes
N17	11.0	56.2	55	Yes
N18	20.6	58.3	55	Yes
N19	4.1	58.9	55	Yes
N20	35.1	56.5	55	Yes

According to the statements in the Environmental, Health and Safety (EHS) Guidelines: Environmental Noise Management file prepared by the International Finance Corporation (IFC) dated April 30, 2007, noise levels should not exceed the background measurement values by 3 dBA, 55 dBA levels during the daytime (07: 00-22: 00) period, 45 dBA levels during the nighttime (22: 00-07: 00) period. As it can be seen in the table above, noise levels do not exceed the limit value set by IFC during daytime.

Table 4.112: Evaluation of the Daytime Noise Measurement Results According to RAMEN during Operation Phase

Code	Operation phase				Limit Value (dBA)	Fulfilled
	Ldaytime (dBA)	Leveningtime (dBA)	Lnighttime (dBA)	Lgag (dBA)		
N1	51.7	51.7	45.7	54.4	75	Yes
N2	45.7	45.7	39.7	48.4	75	Yes
N3	50.6	50.6	44.6	53.3	75	Yes
N4	50.6	50.6	44.5	53.2	75	Yes
N5	54.0	54.0	48.0	56.7	75	Yes
N6	40.8	40.8	34.8	43.5	75	Yes
N7	53.5	53.5	47.5	56.2	75	Yes
N8	44.7	44.7	38.7	47.4	75	Yes
N9	50.6	50.6	44.5	53.3	75	Yes
N10	37.0	37.0	31.0	39.7	75	Yes
N11	42.0	42.0	36.0	44.7	75	Yes
N12	50.9	50.9	44.9	53.6	75	Yes
N13	52.6	52.6	46.6	53.3	75	Yes
N14	44.8	44.8	38.8	47.5	75	Yes
N15	54.0	54.0	44.4	53.1	75	Yes
N16	52.5	52.5	46.5	55.2	75	Yes

Code	Operation phase				Limit Value (dBA)	Fulfilled
	Ldaytime (dBA)	Leveningtime (dBA)	Lnighttime (dBA)	Lgag (dBA)		
N17	52.1	52.1	46.1	54.8	75	Yes
N18	56.1	56.1	50.1	58.8	75	Yes
N19	40.7	40.7	34.7	43.4	75	Yes
N20	39.4	39.4	33.4	42.1	75	Yes

Table 4.113: Evaluation of the Daytime Noise Measurement Results According to IFC during Operation Phase

Code	Operation Phase	Evaluation (IFC)		
	Ldaytime (dBA)	Limit Value (dBA)		Fulfilled
		Background+3	Daytime Limit Value	
N1	51.7	57.1	55	Yes
N2	45.7	56.8	55	Yes
N3	50.6	58.8	55	Yes
N4	50.6	54.6	55	Yes
N5	54.0	58.4	55	Yes
N6	40.8	58.8	55	Yes
N7	53.5	55.5	55	Yes
N8	44.7	58.8	55	Yes
N9	50.6	56.3	55	Yes
N10	37.0	55	55	Yes
N11	42.0	58.1	55	Yes
N12	50.9	56.4	55	Yes
N13	52.6	58.5	55	Yes
N14	44.8	58.9	55	Yes
N15	54.0	56.7	55	Yes
N16	52.5	56.2	55	Yes
N17	52.1	56.2	55	Yes
N18	56.1	58.3	55	Yes
N19	40.7	58.9	55	Yes
N20	51.7	57.1	55	Yes

Table 4.114: Evaluation of the Nigh-time Noise Measurement Results According to IFC during Operation Phase

Code	Operation Phase	Evaluation (IFC)		
	Lnighttime (dBA)	Limit Value (dBA)		Limit Value (dBA)
		Background+3	Nighttime Limit Value	
N1	45.7	53.3	45	Yes
N2	39.7	50.9	45	Yes
N3	44.6	53.5	45	Yes
N4	44.5	48.9	45	Yes

Code	Operation Phase	Evaluation (IFC)		
	Lnighttime (dBA)	Limit Value (dBA)		Limit Value (dBA)
		Background+3	Nighttime Limit Value	
N5	48.0	53.9	45	Yes
N6	34.8	54.2	45	Yes
N7	47.5	50.5	45	Yes
N8	38.7	54	45	Yes
N9	44.5	52	45	Yes
N10	31.0	51	45	Yes
N11	36.0	52.9	45	Yes
N12	44.9	51.2	45	Yes
N13	46.6	52.8	45	Yes
N14	38.8	51.1	45	Yes
N15	44.4	49.3	45	Yes
N16	46.5	53.1	45	Yes
N17	46.1	51.3	45	Yes
N18	50.1	50.8	45	Yes
N19	34.7	53.9	45	Yes
N20	33.4	51.5	45	Yes

As a result of the measurements made at 20 points throughout the project area, Febas Environmental Laboratory foresee that external noise measures may be required especially in Mersin city center, Tarsus city center, Adana city center, Ceyhan city center, Osmaniye city center, Bahçe and Nurdağ regions.

According to the limit values given in Table 5 of Annex VII in Article 23 of the Regulation on Assessment and Management of Environmental Noise, the noise level that may occur in the project area due to the noise sources in the project should not exceed 75 dBA. According to the noise maps originating from construction activities, it is seen that the noise level that may occur in the closest houses in the project does not exceed 75 dBA.

4.8.9 Mitigation Measures

While some sounds have a relaxing effect in our daily life, some sounds can create discomfort. This is because the decibels are different and the higher the level is, the more damaging it is. Various acoustic materials are preferred to reduce noise. A higher quality environment can be provided with acoustic materials used for sound insulation in these areas.

The following actions will be taken at sensitive receptors where the predicted noise levels exceed or has potential to exceed the limits specified in the national and international regulations.

Many different methods are used to reduce and prevent noise. These methods are;

- Periodic machine maintenance,
- Covering the source causing the noise with absorbent materials (rubber, melamine, etc.) that can absorb sound and provide sound insulation,
- Covering with a material such as rubber to dampen the vibration at the points where vibration occurs,
- It is to make material and design changes by turning the noise source off. (Öz&Köse, 2020)
- Equipment with lower sound power levels and vibration should be selected and,

- Silencers should be installed for fans and mufflers should be installed on engine exhausts and compressor components,
- Traffic noise should be reduced by effective traffic routing,
- Local residents should be informed in advanced of the scheduled activities with noise generating potential, a mechanism to complaint recording and responding mechanism should be developed,
- Operation hours of equipment with extra noise generating potential should be limited,
- Equipment causing excessive levels of noise due to malfunction should be identified and taken out of service. Corrective actions such as repair or replacement should be taken.

In terms of environmental noise and vibration sprawled from the project, all of the impact significances according to RAMEN, IFC Guidelines, and Work Health Organization document are found out to be negligible, and any exceeding of the limiting values is not detected.

4.8.10 Assumptions and/or Limitations

In this section, which was evaluated for the High Standard Train Project between Mersin-Gaziantep (Başpınar), noise and vibration were calculated and interpreted. The evaluation work is based on the calculation and modelling results made by Febas Environmental Laboratory who reported the information to us, and other information provided about the Project. The calculation results were interpreted based on reports published by the RAMEN, IFC and WHO.

4.9 Biodiversity, Conservation and Sustainable Management of Living Natural Resources (EBRD PR6)

4.9.1 Introduction

Ecology enriches the world and is crucial for human wellbeing and prosperity. It provides new knowledge of the interdependence between people and nature that is vital for food production, maintaining clean air and water, and sustaining biodiversity in a changing climate.

The ecological studies before the project is an early element in the monitoring and evaluation plan and provide a reference point against which any future changes associated with the project activities can be assessed and offer information for subsequent monitoring.

In that manner, the comprehensive baseline study identifies the habitats, the range and status of the main flora and fauna species groups that live in the project area and its potential radius impact area, the potential presence and status of protected areas or other important areas for biodiversity. Therefore, collecting biodiversity information is rather significant in the process. The data should be at a satisfactory level to compare the initial conditions and changes due to the project in an impact evaluation approach, to set future targets of the project and to estimate the changes as the project proceeds.

The 286 km-long High Standard Train Project will start from Mersin; pass through Tarsus, Adana, Incirlik, Toprakkale, Bahçe, Nurdağ, Başpınar stations, and last at Mustafa Yavuz Station. 78 km of this 286 km line is between Mersin and Adana, 79 km between Adana and Toprakkale, 56 km between Toprakkale and Bahçe, 17 km between Bahçe and Nurdağ and the last 56 km between Nurdağ and Başpınar is planned to be. The route of the Project is passing through mostly agricultural areas and natural areas such as Nurdağı and Sof Mountain, which shows main vegetation characteristics of the route.

4.9.2 Policies, Legal Framework and Guidelines

To manage the project in ecological issues and to obtain credit from the credit institution, there are also national legal provisions and international obligations that must be implemented and carried out. The environment outside as Turkey signed contracts and agreements and other assets that are created to maintain the standards and guidelines are available.

4.9.2.1 International Conventions and Treaties

- Convention on Biological Diversity, Rio de Janeiro 1992 (Turkey 1996),
- International Convention for the Protection of Birds, Paris 1959 (Turkey 1966),
- 1983 Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) and Agreement (bird and mammals and their habitats, 1994),
- 1971 International Convention on Wetlands of International Importance especially as Waterfowl Habitat (RAMSAR Convention) and the as amended by 1982 Protocol,
- 1951 International Plant Protection Convention,
- 1950 International Convention for the Protection of Birds,

In addition to these conventions, IUCN Red List, Bern and CITES Conventions are one of the most important ones to classify species regarding their conservation concern.

International Union for Conservation of Nature (IUCN)

IUCN “Red List of Threatened Species” is widely recognized as the most comprehensive, objective global approach for evaluating the conservation status of plant and animal species.

The IUCN Red List Categories and Criteria are intended to be an easily and widely understood system for classifying species at high risk of global extinction. The general aim of the system is to provide an explicit, objective framework for the classification of the broadest range of species according to their extinction risk. However, while the Red List may focus attention on those taxa at the highest risk, it is not the sole means of setting priorities for conservation measures for their protection.

Extensive consultation and testing in the development of the system strongly suggest that it is robust across most organisms. However, it should be noted that although the system places species into the threatened categories with a high degree of consistency, the criteria do not take into account the life histories of every species. Hence, in certain individual cases, the risk of extinction may be under or over estimated. The IUCN Council adopted the new Red List system in 1994.

The IUCN Red List Categories and Criteria have several specific aims:

- to provide a system that can be applied consistently by different people,
- to improve objectivity by providing users with clear guidance on how to evaluate different factors which affect the risk of extinction,
- to provide a system which will facilitate comparisons across widely different taxa,
- To give people using threatened species lists for a better understanding of how individual species were classified.

Nine categories are defined for Red List considering extinction rate, population size, geographical distribution areas and population and distribution degree (see Figure 4.43). The red list categories are as follows:

- Extinct, EX
- Extinct in the Wild, EW
- Critically Endangered, CR
- Endangered, EN
- Vulnerable, VU
- Near Threatened, NT
- Least Concern, LC
- Data Deficient, DD
- Not Evaluated, NE

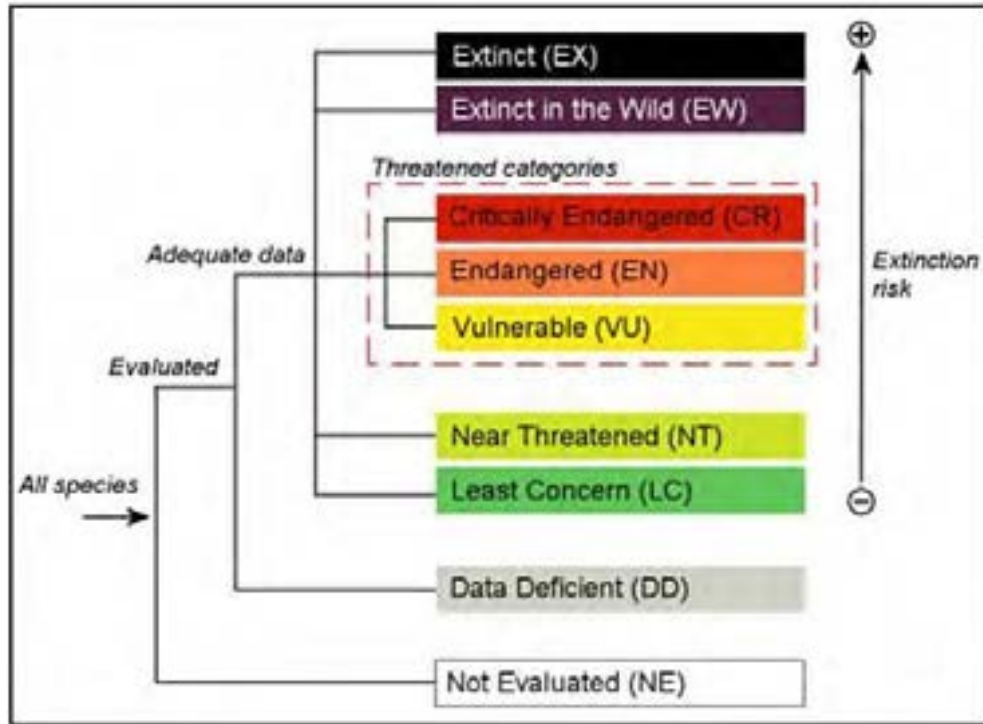


Figure 4.43: Structure of the Red List Categories of IUCN

Bern Convention

The Convention on the Conservation of European Wildlife and Natural Habitats was signed on October 19, 1979 in Bern. In Turkey, this convention was approved by the Decree of Council of Ministers numbered 84-7601, and became effective by publishing in the Official Gazette dated February 20, 1984 and numbered 18318.

The aim of this convention is to ensure the conservation of European wildlife and natural habitats by means of cooperation between the States who signed this convention.

All countries that have signed the Bern Convention must take action to:

- promote national policies for the conservation of wild flora and fauna, and their natural habitats;,
- have regard to the conservation of wild flora and fauna in their planning and development policies; and in their measures against pollution,
- promote education and disseminate general information on the need to conserve species of wild flora and fauna and their habitats,
- encourage and co-ordinate research related to the purposes of this Convention.

Moreover, co-operate to enhance the effectiveness of these measures through:

- co-ordination of efforts to protect migratory species and
- The exchange of information and the sharing of experience and expertise.

Appendices of the Bern Convention give the species list needing to be protected. The list of appendices and content of each appendix is given below:

- Annex I: Strictly protected flora species (may not be taken from the wild or harmed),
- Annex II: Strictly protected fauna species (may be neither disturbed nor captured, killed or traded),

- Annex III: Protected fauna species (species that are in need of protection but may be hunted or otherwise exploited in exceptional instances),
- Annex IV: Prohibited means and methods of killing, capture and other forms of exploitation.

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

CITES is a multilateral treaty to protect endangered plants and animals. It was drafted because of a resolution adopted in 1963 at a meeting of members of the IUCN (International Union for Conservation of Nature). The convention was opened for signature in 1973 and CITES entered into force on 1st of July 1975. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species in the wild, and it accords varying degrees of protection to more than 35,000 species of animals and plants. In order to ensure that the GATT (General Agreement on Tariffs and Trade) was not violated, the Secretariat of GATT was consulted during the drafting process. Turkey was partied CITES on 22nd of December 1996. Appendices I, II and III to the Convention are lists of species afforded different levels or types of protection from over-exploitation. Content of each appendix is given below:

- **Appendix I:** lists species that are the most endangered among CITES-listed animals and plants. They are threatened with extinction and CITES prohibits international trade in specimens of these species except when the purpose of the import is for instance for scientific research.
- **Appendix II:** lists species that are now not necessarily threatened with extinction but that may become so unless trade is closely controlled. International trade in specimens of Appendix-II species may be authorized by the granting of an export permit or re-export certificate.
- **Appendix III:** is a list of species included at the request of a Party that already regulates trade in the species and that needs the cooperation of other countries to prevent unsustainable or illegal exploitation. International trade in specimens of species listed in this Appendix is allowed only on presentation of the appropriate permits or certificates.

4.9.2.2 International Standards

Among the potential creditor corporations for the Project, the social and environmental standards and guiding documents of International Finance Corporation (IFC) and European Bank for Reconstruction and Development (EBRD) shall be taken as basis for every phase of the Project. All these standards serve for the improvement of the project's performance through its evaluation in environmental and social aspect by minimizing of negative impacts and increasing in contributions.

The processes of ESIA adopted by finance foundations, which are conformable with the EIA methodology, are explained in the following paragraphs.

IFC Performance Standards

As the financial department of the World Bank, IFC, has constituted its environmental and social policy with the intention to provide the implementation of the projects that it provides finance in line with the sustainability principle and in that regard, has established performance standards (PS) as the basis of environmental and social evaluation. The IFC performance standards (PSs) are given brief as follows.

PS 1: Social and Environmental Assessment and Management System; it underscores the importance of managing environmental and social performance throughout the life of a project.

PS 2: Labor and Working Conditions; it comprises the issues on the protection of basic worker rights under the headings of Working Conditions and Management of Worker Relationship, Protecting the Workforce, Occupational Health and Safety, Non-Employee Workers.

PS 3: Pollution Prevention and Abatement; it outlines a project approach to pollution prevention and abatement.

PS 4: Community Health, Safety and Security; it covers the assessment of the potential risks and impacts to the health and safety of the affected community from project activities.

PS 5: Land Acquisition and Involuntary Resettlement; it highlights that in addition to physical displacement, economical displacement (loss of income, etc.) should be considered during the land allocation for the project.

PS 6: Biodiversity Conservation and Sustainable Natural Resource Management; it recognizes the protection and conservation of biodiversity - the variety of life in all its forms - and its ability to change and evolve and that this is fundamental to sustainable development.

IFC Performance Standard 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. The requirements set out in this Performance Standard have been guided by the Convention on Biological Diversity, which defines biodiversity as “the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species, and of ecosystems. The objectives of the Standard 6 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 that integrate conservation needs and development priorities

PS 7: Indigenous Peoples; it includes the assessments of the indigenous peoples among the social groups at the project area.

PS 8: Cultural Heritage; it includes the protection of the cultural heritage in the project design and implementation and the usage of the cultural heritage by the project.

General Environment, Health and Safety (EHS) Guidelines of IFC is among the guiding documents to be based on during implementation. It contains information on environmental issues, occupational health and safety, community health and safety. The important aspects for the construction and decommissioning phases are given in a separate section in this guide. Furthermore, Industry Specific EHS Guidelines defines the environmental impacts and health and safety risks about the sector to which the project is related to and it leads the way for the measures to be taken.

4.9.3 Extend of Study Area

4.9.3.1 Spatial Extend

The general approach was the description of the project route and the possible sensitive habitats, especially natural lands along the route. In this scope, 15 stations were observed along the project route from Mersin to Gaziantep (see Figure 4.44). Accordingly, the general flora and fauna of agricultural lands, small riparian habitats, forests, steppes and city habitats were identified.

After evaluating of maps and literature data, it is determined that the areas having natural and undisturbed characteristics are located between Toprakkale-Osmaniye and Osmaniye-Gaziantep. In this scope, the locations where construction activities dense such as tunnels, camps and their close vicinity were surveyed.

While selecting the stations, following criteria were considered:

Selection criteria

Sustainability: utmost attention was paid for the stations not to be located in the areas that cannot be observed for all seasons during the baseline studies.

Accessibility: accessibility is a noteworthy aspect for the stations to be monitored seasonally. The deserted lands, where anthropogenic activities are at minimum levels, can be regarded as ideal locations. However, the time needed to access these stations can be a problem. Accordingly, the accessible stations were selected as much as possible.

Diversity: during selection of the survey stations, it was regarded that the stations represent the different habitat types as much as possible.



Figure 4.44: Ecology Survey Points

4.9.3.2 Temporal Extend

To examine the effect of Mersin-Gaziantep High Standard Train flora and fauna species, a working area of 1,000 m in total was selected by choosing distances of 500 m from the right and left of the route.

4.9.4 Identification of Baseline Conditions

4.9.4.1 Desk Studies

The first step of the terrestrial ecological surveys was the desktop studies. In the scope of the desktop studies, a thorough search of the available literature on the distribution, population and ecology of the species likely to occur within the project area and areas of ecological value was conducted. Research on biological diversity of provinces where Project routes passes through, were analyzed before the field surveys for global insight of the region. Moreover, Davis's "Flora of the Turkey and Aegean Islands" was also considered for flora species characterization during the desktop studies. Besides, the area was evaluated by the use of 1/25,000 scaled topographical maps and satellite images (Google Earth) to detect and validate the different habitat types.

During reporting period, plant samples photographed during field observations were identified using by "Flora of Turkey and the East Aegean Islands" and plant terminology guides (Davis, 1965-1985; Davis et al., 1988; Stearn, 1995; Baytop, 1998; Güner et al., 2000). Scientific (in Latin), Turkish and English names of the identified species, their preferred habitat, phytogeographic regions, general distributions in Turkey, situations according to the Bern and CITES Convention, endemism and IUCN Red List categories with relative abundance given in the species list.

The taxa in Table 3 are listed systematically in terms of subdivision and higher categories, and alphabetically in terms of family and below-family categories. In addition to the scientific names (Latin) of the species and subspecies taxa, the authors of the name are also given. For the Turkish and English names of the taxa, reference works, and websites were used (Baytop, 1994; Bizimbitkiler).

For general distribution of plants in Turkey, North (N), West (W), south (S), medium (C) and eastern (E) is given in species list.

In addition, the status of taxa according to Bern and CITES Conventions were checked and taxa included in this scope, if any, were marked with the symbol "●". Endemism status and IUCN threat categories of taxa are given. For IUCN threat categories, CR (Critically Endangered), EN (Endangered), VU (Vulnerable), NT (Near Threatened) and LC (Least Concern) symbols were used (Ekim et al., 2000; IUCN, 2019).

Relative abundance is calculated by local abundance / dominance method using Braun-Blanquette and Pavillard cover percentage scale. The scale is given below:

- | | |
|---|---|
| • Abundant species, weak cover percentage | 1 |
| • Abundant species or cover percentage more than 5% | 2 |
| • Cover percentage between 25% and 50% | 3 |
| • Cover percentage between 50% and 75% | 4 |
| • Cover percentage between 75% and 100% | 5 |

4.9.4.2 Field Studies

4.9.4.2.1 Terrestrial Flora

Methodology

Transect and grid method were implemented during terrestrial flora surveys. Transects are useful for measuring vegetative cover, determining composition and species dominance within a vegetation unit, or measuring vegetation changes across vegetation unit boundaries and species distribution. Quadrats are used to record floristic presence and characterize vegetation units. The Grid (Quadrature) method was also used during the field surveys. As quadrats have a defined boundary, they provide repeatable and verifiable location and abundance information. By this method, comprehensive species list and abundance of the species were determined.

Findings

In the scope of the project, 2 field surveys were conducted in 19-21 September 2020 and 21-23 November 2020. In order to determine the flora of the project route, site surveys, floristic research conducted in the areas close to the project route and literature data such as Flora of Turkey and the East Aegean Islands were used. If some exceptions are not regarded, the part of the route from Mersin to Nurdağı is in the Mediterranean phytogeographical region, and the part from the eastern of Nurdağı to Gaziantep is Iran-Turan phytogeographic region (Akman, 1993). Especially in Sof Mountain, located to the east of the route, the Iran-Turan phytogeographic region effect can be observed more clearly. The streams, canals and ponds of various sizes are a shelter for plants that are elements of the European-Siberian phytogeographical region.

Vegetation and EUNIS Habitat Types

The European Nature Information System (EUNIS) habitat classification is a pan-European system, which was developed between 1996 and 2001 by the European Environment Agency (EEA) in collaboration with experts from throughout Europe. It covers all types of natural and artificial habitats, both aquatic and terrestrial.

The habitat types which were observed along the route are Anthropogenic habitats, Red pine (*Pinus brutia*) forests, Oak (*Quercus* sp.) forests, Maquis, Steppe habitat and Riparian areas. Further details about the vegetation cover and EUNIS habitat types of the terrestrial ecology survey area are given under the headings below. The vegetation map of the project route according to provinces are given in below figures (see Figure 4.51, Figure 4.52, Figure 4.53 and Figure 4.54).

Anthropogenic Habitats

Mersin, Adana, Osmaniye and Gaziantep provinces, Tarsus, Ceyhan, Toprakkale and Nurdağı districts and many villages are located on the route of the Project. In addition, almost all of the areas except Nurdağı and Sof Mountain are agricultural areas. These settlements and agricultural areas constitute anthropogenic habitats that cover a large part of the project route.

In anthropogenic habitats which are very widespread along the route, 450 species and subspecies were identified. Widespread species among them are *Prosopis farcta* (Banks & Sol.) J.F.Macbr., *Ecballium elaterium* (L.) A.Rich. *Artemisia squamata* L., *Cynodon dactylon* (L.) Pers. var. *dactylon*, *Conyza bonariensis* (L.) Cronquist, *Cephalaria syriaca* (L.) Schrad. ex Roem. & Schult., *Crepis sancta* (L.) Bornm. *Heliotropium europaeum* L., *Lactuca saligna* L. and *Scandix pecten-veneris* L.

In anthropogenic habitats, there are generally widespread species that spread rapidly by seed and vegetative ways and can adapt to any environment. Accordingly, 11 endemic plant species have been identified in this habitat. The species are *Bellevalia modesta*, *Centaurea calcitrapa* subsp. *Cilicica*, *Acanthus hirsutus* subsp. *syriacus*, *Alcea apterocarpa*, *Anthemis arenicola* var. *arenicola*, *Beta vulgaris* subsp. *adanensis*, *Bupleurum zoharii*, *Dorycnium pentaphyllum* subsp. *haussknechtii*, *Ophrys cilicica*, *Scrophularia cryptophila* and *Trigonella kotschyi*. Among these species, *Bellevalia modesta* and *Centaurea calcitrapa* subsp. *cilicica* are in NT category while remaining species are evaluated in LC category by IUCN Red list.



Figure 4.45: Anthropogenic Habitats (Osmaniye Province)

Red Pine (Pinus brutia) Habitats

Red pine (*Pinus brutia*) forests are the most characteristic habitat type of the Mediterranean phytogeographical region. Although they are heterogeneous in the western and eastern foothills of Nurdağı, they generally have a homogeneous appearance in the upper parts (see Figure 4.46).

Red pine (*Pinus brutia*) communities were observed at approximately 300-1,100 meters around Nurdağı. Red pine forests, which have a fragmented appearance in the lower parts due to the agricultural areas and settlements, start from the Bahçe District and become more widespread towards the upper parts. This homogeneous appearance is disturbed by plateau settlements, small agricultural areas and roads in places. Red pine (*Pinus brutia*) forest is a “closed” (getting no light) habitat type, so it has lower species diversity than open habitat types. 172 species and subspecies were identified in this habitat. Most of these taxa prefer openings within habitat. Widespread species among them are *Pinus brutia* Ten., *Juniperus oxycedrus* L. subsp. *oxycedrus*, *Drimys maritima* (L.) Stearn, *Hedera helix* L., *Cistus creticus* L., *Trifolium arvense* L. var. *arvense*, *Myrtus communis* L. subsp. *communis*, *Jasminum fruticans* L., *Rosa canina* L., *Daphne gnidioides* Jaub. & Spach, *Dactylis glomerata* L. subsp. *hispanica* (Roth) Nyman and *Oryzopsis coerulescens* (Desf.)



Figure 4.46: Pinus brutia Habitat (Nurdağı Highway)

In anthropogenic habitats which are very widespread along the route, 450 species and subspecies were identified. *Prosopis farcta* (Banks & Sol.) J.F.Macbr., *Ecballium elaterium* (L.) A.Rich. *Artemisia squamata* L., *Cynodon dactylon* (L.) Pers. var. *dactylon*, *Conyza bonariensis* (L.) Cronquist, *Cephalaria syriaca* (L.) Schrad. ex Roem. & Schult., *Crepis sancta* (L.) Bornm., *Heliotropium europaeum* L., *Lactuca saligna* L. and *Scandix pecten-veneris* L.

As a result of field surveys and literature review, 12 endemic plant species have been identified in this habitat. According to IUCN Red List criteria, *Sideritis cilicica* is in “EN” category, *Bupleurum lophocarpum*, *Cytisus drepanolobus*, *Glycyrrhiza flavescens*, *Lactuca fenzlii* and *Lathyrus spathulatus* subsp. *elongatus* are in “NT” category, *Alkanna aucheriana*, *Alkanna kotschyana*, *Colchicum balansae*, *Galium adhaerens*, *Gladiolus anatolicus* and *Stachys sparsipilosa* are in “LC” category.

Oak (Quercus sp.) forests

The Oak (*Quercus* sp.) Forest can be observed in patches after approximately 900 meters of Nurdağı and Sof Mountain. The habitat type observed with Red pine (*Pinus brutia*) in Nurdağı, and as fragmented with steppe on Sof Mountain. On the other hand, these forests have solid distribution on the northern and eastern slopes that are relatively humid (see Figure 4.47). A total of 238 species and subspecies were identified in the habitat type. The identified number of taxa is higher when compared to Red pine forests since *Quercus* forests has more open areas. Widespread species among identified species are *Quercus cerris* L., *Quercus ithaburensis* Decne. subsp. *macrolepis* (Kotschy) Hedge & Yalt., *Quercus brantii* Lindl., *Ostrya alba* L., *Jasminum fruticans*, *Anagyris foetida* L., *Pinus brutia*, *Rosa canina* and *Veronica macrostachya* Vahl subsp. *Macrostachya*.



Figure 4.47: Oak (*Quercus* sp.) Habitat (Nurdağı Highway)

Oak (*Quercus* sp.) forests are relatively sparse than red pine forests. Open spaces, usually including rocky areas, are common in the habitat. As a result of field surveys and literature review, 13 endemic species were identified in this habitat. According to IUCN Red List criteria, *Muscari babachii* “CR” category, *Symphytum aintabicum* “VU” category, *Allium gayi*, *Helleborus vesicarius*, *Ornithogalum alpigenum* ve *Lathyrus spathulatus* subsp. *elongatus* “NT” category, *Alkanna aucheriana*, *Alkanna kotschyana*, *Astragalus densifolius* subsp. *densifolius*, *Galium adhaerens*, *Gladiolus anatolicus*, *Ranunculus reuterianus* and *Trigonella kotschy* “LC” category.

Maquis

Maquis is the dominant habitat type in the region located between Mersin Province and Nurdağı western foothills. However, the most of this habitat has been converted into agricultural land. Therefore, the natural maquis habitat can be observed in narrow areas between agricultural lands and gardens (see Figure 4.48). A total of 385 species and subspecies were identified in maquis habitat, which is the most common natural habitat type of the project route. Widespread species among identified species are *Quercus coccifera* L., *Phillyrea latifolia* L., *Paliurus spina-christi* Mill., *Olea europaea* L. var. *europaea*, *Rhamnus lycioides* L. subsp. *graeca* (Boiss. & Reut.) Tutin, *Jasminum fruticans*, *Calicotome villosa* (Poir.) Link, *Daphne sericea* Vahl subsp. *sericea*, *Drimys maritima*, *Cistus creticus*, *Ruscus aculeatus* L., *Lithodora hispidula* (Sm.) Griseb. subsp. *hispidula* and *Rosa canina*.



Figure 4.48: Degenerated Maquis Habitat (Yilankale)

Due to its relatively sparse appearance compared to Red Pine (*Pinus brutia*) and Oak (*Quercus* sp.) Forests, the number identified endemic taxa is higher. Accordingly, 26 endemic species were identified in this habitat. According to IUCN Red List criteria, *Heptaptera cilicica* ve *Sideritis cilicica* “EN” category, *Allium gayi*, *Astragalus lycius*, *Bellevallia modesta*, *Centaurea lycopifolia*, *Helleborus vesicarius*, *Glycyrrhiza flavescens*, *Lathyrus spathulatus* subsp. *elongatus*, *Thlaspi cilicium* ve *Trifolium aintabense* “NT” category, *Alcea apterocarpa*, *Alkanna aucheriana*, *Alkanna kotschyana*, *Arabis aubrietoides*, *Astragalus densifolius* subsp. *densifolius*, *Bupleurum zoharii*, *Colchicum balansae*, *Crocus cancellatus* subsp. *cancellatus*, *Dorycnium pentaphyllum* subsp. *haussknechtii*, *Galium adhaerens*, *Gladiolus anatolicus*, *Iris sari*, *Ophrys cilicica*, *Thymus cilicicus* ve *Trigonella kotschy* are in “LC” category.

Steppe habitat

The area from the eastern foothills of Nurdağı to the Sof Mountain consists of almost completely anthropogenic habitats. Natural areas are observed only between the east of Nurdağı district center and Kömürler-Tüllüce villages. Secondary steppe habitat is dominant in these areas and Sof Mountain. It can be said that thousands of years of anthropogenic activities and climate change are effective in transforming these parts, which were covered with the *Quercus brantii* forest in the past, into secondary steppes today (see Figure 4 47). Sof Mountain, where the steppe habitat is dominant, has generally rocky areas. Sparse *Quercus brantii* communities are observed in the upper parts of Sof Mountain and on the relatively humid northern slopes. The steppes are the second largest habitat types along the project route. Since it has rocky areas, most of them cannot be used as agricultural land. A total of 400 species and subspecies were identified in steppe habitat. Widespread species among identified species are *Acantholimon venustum* Boiss. var. *venustum*, *Aegilops triuncialis* L. subsp. *triuncialis*, *Allium scorodoprasum* L. subsp. *rotundum* (L.) Stearn, *Anthemis pseudocotula* Boiss., *Bromus japonicus* Thunb. subsp. *japonicus*, *Bromus tectorum* L., *Centaurea urvillei* DC. subsp. *urvillei*, *Crataegus orientalis* Pall. ex M.Bieb. subsp. *orientalis*, *Cruciata taurica* (Pall. ex Willd.) Ehrend., *Genista albida* Willd., *Geranium tuberosum* L. subsp. *tuberosum*, *Helianthemum ledifolium* (L.) Mill.,

Hypericum pallens Sol., *Juniperus oxycedrus* L. subsp. *oxycedrus*, *Koeleria macrantha* (Ledeb.) Schult., *Paronychia kurdica* Boiss., *Phleum subulatum* (Savi) Asch. & Graebn. subsp. *subulatum*, *Poa bulbosa* L., *Prunus orientalis* (Mill.) Koehne, *Quercus brantii* Lindl., *Teucrium chamaedrys* L. subsp. *tauricola* Rech.f., *Teucrium polium* L. subsp. *polium*, *Veronica syriaca* Roem. & Schult., *Xeranthemum annuum* L. and *Ziziphora tenuior* L.



Figure 4.49: Secondary Steppe Habitat (Sof Mountain) and *Quercus brantii* Communities

As a result of field surveys and literature review, 22 endemic species were identified in this habitat. Most of endemic taxa prefer the upper parts of Sof Mountain and the steppe areas among *Quercus brantii* openings.

According to IUCN Red List criteria, *Astragalus aintabicus* and *Centaurea haussknechtii* are in “EN” category, *Symphytum aintabicum* “VU” category, *Allium gayi*, *Astragalus lycius*, *Bupleurum lophocarpum*, *Cytisus drepanolobus*, *Helleborus vesicarius*, *Ornithogalum alpigenum* and *Thlaspi cilicium* “NT” category, *Acanthus hirsutus* subsp. *syriacus*, *Arabis aubrietoides*, *Astragalus densifolius* subsp. *densifolius*, *Colchicum balansae*, *Crocus cancellatus* subsp. *cancellatus*, *Dorycnium pentaphyllum* subsp. *haussknechtii*, *Galium scabrifolium*, *Hedysarum pogonocarpum*, *Iris sari*, *Rosularia globulariifolia*, *Tanacetum argenteum* subsp. *argenteum* and *Trigonella kotschyi* are in “LC” category.

Riparian Habitats

The High Standard Railway route passes over the Seyhan and Ceyhan rivers, which are two important surface water resources, within the borders of Adana Province. Apart from these two large rivers, it completes the route by passing near small and medium-sized water sources. Most of the small and medium-sized water resources are used as irrigation channels and are of great importance for agricultural lands.

A total of 152 species and subspecies taxa were identified in riparian habitats observed on project route. The widespread species are *Phragmites australis* (Cav.) Trin. ex Steud., *Typha domingensis* Pers., *Juncus inflexus*

L., *Epilobium parviflorum* Schreb., *Alnus orientalis* Decne. var. *orientalis*, *Xanthium orientale* L. subsp. *italicum* (Moretti) Greuter, *Rumex sanguineus* L., *Senecio aquaticus* Hill subsp. *erraticus* (Bertol.) V.A. Matthews, *Vitex agnus-castus* L., *Platanus orientalis* L., *Ranunculus arvensis* L., *Potentilla reptans* L., *Salix alba* L., *Veronica anagallis-aquatica* L., *Tamarix smyrnensis* Bunge, *Bolboschoenus maritimus* (L.) Palla subsp. *maritimus*, *Carex distans* L., *Cyperus longus* L. subsp. *longus*, *Juncus gerardii* Loisel. subsp. *gerardii* and *Sorghum halepense* (L.) Pers. var. *halepense*. No endemic species was observed among these species.



Figure 4.50: Riparian Habitat close to the Route



Figure 4.51: Vegetation Map (Mersin Section)



Figure 4.52: Vegetation Map (Adana Section)



Figure 4.53: Vegetation Map (Osmaniye Section)



Figure 4.54: Vegetation Map (Gaziantep Section)

Floristic Analyses

As a result of the surveys carried out and literature data, 870 species which belong to 101 families (3 Pteridophyta (ferns) and 98 Spermatophyta (seedy plants) are identified during the field in project route. Among 870 species, 45 of them are endemic. The statistics of the identified species are given in Table 4.115, the list of all species are given in Annex 1 and the list of the endemic species and conservation statuses according the IUCN Red List are given in Table 4.116.

Table 4.115: Statistical Analyses of Identified Species

Taxonomic Category	Family	Species
Pteridophyta	3	5
Spermatophyta	98	865
Gymnospermae	2	7
Angiospermae	96	858
Dicotyledons	80	693
Monocotyledons	16	165
Total	101	870

Table 4.116: List of Endemic Species and conservation statuses according the IUCN Red List

No	Taxa	IUCN Red List
1	<i>Muscari babachii</i> Eker & Koyuncu	CR
2	<i>Astragalus aintabicus</i> Boiss.	EN
3	<i>Centaurea haussknechtii</i> Boiss.	EN
4	<i>Heptaptera cilicica</i> (Boiss. & Balansa) Tutin	EN
5	<i>Sideritis cilicica</i> Boiss. & Balansa	EN
6	<i>Symphytum aintabicum</i> Hub.-Mor. & Wickens	VU
7	<i>Allium gayi</i> Boiss.	NT
8	<i>Astragalus lycius</i> Boiss.	NT
9	<i>Bellevalia modesta</i> Wendelbo	NT
10	<i>Bupleurum lophocarpum</i> Boiss. & Balansa	NT
11	<i>Centaurea calcitrapa</i> L. subsp. <i>cilicica</i> (Boiss. & Balansa) Wagenitz	NT
12	<i>Centaurea lycopifolia</i> Boiss. & Kotschy	NT
13	<i>Cytisus drepanolobus</i> Boiss.	NT
14	<i>Glycyrrhiza flavescens</i> Boiss.	NT
15	<i>Helleborus vesicarius</i> Aucher ex Boiss.	NT
16	<i>Lactuca fenzlii</i> N.Kilian & Greuter	NT
17	<i>Lathyrus spathulatus</i> Čelak. subsp. <i>elongatus</i> (Bornm.) Ponert	NT
18	<i>Ornithogalum alpigenum</i> Stapf	NT
19	<i>Thlaspi cilicium</i> (Boiss.) Hayek	NT
20	<i>Trifolium aintabense</i> Boiss. & Hausskn.	NT
21	<i>Acanthus hirsutus</i> Boiss. subsp. <i>syriacus</i> (Boiss.) Brummitt	LC
22	<i>Alcea apterocarpa</i> Boiss.	LC
23	<i>Alkanna aucheriana</i> A.DC.	LC

No	Taxa	IUCN Red List
24	<i>Alkanna kotschyana</i> A.DC.	LC
25	<i>Anthemis arenicola</i> Boiss. var. <i>arenicola</i>	LC
26	<i>Arabis aubrietoides</i> Boiss.	LC
27	<i>Astragalus densifolius</i> Lam. subsp. <i>densifolius</i>	LC
28	<i>Beta vulgaris</i> L. subsp. <i>adanensis</i> (Pamukçu.) Ford-Lloyd & J.T. Williams	LC
29	<i>Bupleurum zoharii</i> Snogerup	LC
30	<i>Colchicum balansae</i> Planch.	LC
31	<i>Crocus cancellatus</i> Herb. subsp. <i>cancellatus</i>	LC
32	<i>Dorycnium pentaphyllum</i> Scop. subsp. <i>haussknechtii</i> (Boiss.) Gams	LC
33	<i>Galium adhaerens</i> Boiss. & Balansa	LC
34	<i>Galium scabrifolium</i> (Boiss.) Hausskn.	LC
35	<i>Gladiolus anatolicus</i> (Boiss.) Stapf	LC
36	<i>Hedysarum pogonocarpum</i> Boiss.	LC
37	<i>Iris sari</i> Schott ex Baker	LC
38	<i>Ophrys cilicica</i> Schltr.	LC
39	<i>Ranunculus reuterianus</i> Boiss.	LC
40	<i>Rosularia globulariifolia</i> (Fenzl) A.Berger	LC
41	<i>Scrophularia cryptophila</i> Boiss. & Heldr.	LC
42	<i>Stachys sparsipilosa</i> R.Bhattacharjee & Hub.-Mor.	LC
43	<i>Tanacetum argenteum</i> (Lam.) Willd. subsp. <i>argenteum</i>	LC
44	<i>Thymus cilicicus</i> Boiss. & Balansa	LC
45	<i>Trigonella kotschy</i> Fenzl	LC

4.9.4.2.2 Terrestrial Fauna

Methodology

The site observations of the fauna were commenced in the mornings following the time/hour coordination of the GPSs and cameras of all fauna teams; thereby the observation points and tracks of the experts were recorded as of the commencement of the observation. Additionally, each survey point recorded as way points in GPSs and some animals were also recorded when seen between two survey points.

The line transect method was used for field surveys. Transect methodology - a common and traditional method - is practical and efficient. Surveys comprise line transects to be walked. Transect route is selected so as to cover a walking line along which various fauna species are expected to be either observed or their signs of existence to be detected such as feces, feather, footprints or calls, etc. The surveyor walks, watches and listens around to determine the species till the end of the transect.

Furthermore, the fauna experts photographed the burrow, hair, trace, feces, voice, bone, teeth and skins of the vertebrates and invertebrates species observed during the site surveys to be used in the identification of the species living at the area.

At the end of the observation day, the tracks were saved in computer and archived as "kmz" files. All taken photos of all fauna experts were saved and archived. During site survey, Nikon 8x2 binocular, Canon Mark II camera with several lens 100 x 400 telephoto lens were used.

Conversations were made with the local residents and workers to gather more data on the vertebrates at the project route.

The fauna lists prepared through the collected data include the Turkish and English names of the species, EUNIS habitat types, the national and international protection criteria (IUCN, Bern, CITES), their densities and the localities where the species are detected. After collection of the data, species that are suitable for monitoring were determined.

Findings

In the scope of the project, 2 field surveys were conducted in 19-21 September 2020 and 21-23 November 2020. In order to determine the flora of the project route, site surveys, floristic research conducted in the areas close to the project route were used. The findings of these surveys are given according to species groups.

Frogs (Amphibia)

Although amphibians are not found directly in the project route, they can be seen in humid places, inside the water and its edges and in dense vegetation adjacent to these areas (see Figure 4.55). The studied sites are not located directly in the water or in areas very close to the water sources due to the characteristics of the project. This situation reduces the incidence of amphibians.

The number of amphibian species detected in study area is 4. The list of the identified species are given in Table 4.117 and photographs of some detected species are given in Figure 4.56 and Figure 4.57





Figure 4.55: Proper Habitats for Amphibians

Table 4.117: Frog (Amphibia) Species Identified at the Study Area

ORDER & Familia & Species (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	dn*
ANURA						
Bufonidae						
<i>Pseudepidalea variabilis</i>	Gece Kurbağası	Green Toad	LC	App-III	-	4
<i>Bufo bufo</i>	Siğilli kurbağa	Common Toad	LC	App-III	-	1
Hylidae						
<i>Hyla savignyi</i>	Ağaç Kurbağası	Oriental Tree Frog	LC	App -II	-	1
Ranidae						
<i>Pelophylax bedriagae</i>	Levanten Ova Kurbağası	Levant Water Frog	LC	App -III	-	4

*dn: density, 1, rare, 2. sparsely, 3. moderate, 4. Common



Figure 4.56: Pseudepidalea variabilis (crushed by car)



Figure 4.57: Pelophylax ridibundus

Protection Status of the Amphibian Species detected at the Study Area

According to IUCN Red List

In accordance to the results of assessment of the Red List (www.redlist.org) prepared and updated by IUCN, all of the amphibian species recorded at the study area are listed in LC (Least Concern) category.

According to BERN Convention

As a consequence of the studies carried out, one of the amphibian species is in the Protection List in Appendix-II (Strictly Protected Fauna Species) of Bern Convention; 3 species are listed in Appendix-III (Protected Fauna Species).

According to CITES

None of the species are evaluated in Annexes of CITES.

Endemism

There is no endemic species among the amphibian species detected at the study area.

Reptiles (Reptilia)

As a result of the field surveys conducted and literature review, 24 species were determined in the area. Since the general structure of the studied area varies widely from agricultural areas to rocky areas, reptiles are frequently observed (see Figure 4.58). The reptile population density in the field is also very high during the hot seasons and decreases due to the weather temperatures that begin to decrease with the autumn season.

The list of the identified species are given in Table 4.118 and photographs of some detected species are given in below (see Figure 4.59 and Figure 4.60).



Figure 4.58: Proper Habitats for Reptiles

Table 4.118: Reptile (Reptilia) Species Identified at the Study Area

ORDER & Familia & Species (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	dn*
TESTUDINES						
Testudinidae						
<i>Testudo graeca</i>	Yaygın Tosbağa	Spur-thighed Tortoise	VU	App- 2	-	4
Geoemydidae						
<i>Mauremys rivulata</i>	Balkan çizgili kaplumbağası	Balkan Pond Turtle	NE	App- 2	-	1
SQUAMATA : Suborder: SAURIA						
Gekkonidae						
<i>Hemidactylus turcicus</i>	Geniş Parmaklı Keler	Mediterranean House Gecko	LC	App- 2		2
<i>Cyrtopodion kotschyi</i>	İnce parmaklı keler	Kotschy's Gecko	LC	App- 2		1
Agamidae						
<i>Trapelus lessonae</i>	Bozkır keleri	Steppe Agama	LC	App- 2		3
<i>Laudakia stellio</i>	Dikenli Keler	Stellion	NE	App- 2		4
Chamaeleonidae						
<i>Chamaeleo chamaeleon</i>	Bukalemun	Mediterranea Chameleon	LC	App- 2	App- 2	1
Scincidae						
<i>Chalcides ocellatus</i>	Benekli Kertenkele	Ocellated Skink	LC	App- 2	-	1
<i>Trachylepis vittata</i>	Şeritli Kertenkele	Bridled Mabuya	LC	App- 2	-	1
<i>Trachylepis aurata</i>	Tık naz kertenkele	Levant Skink	LC	App- 2	-	1
<i>Ablepharus chernovi</i>	Çernov Kertenkelesi	Chernov's Snake-eyed Skink	LC	App- 2	-	1
<i>Eumeces schneiderii</i>	Sarı Kertenkele	Schneider's Skink	NE	App- 2	-	1
Lacertidae						
<i>Ophisops elegans</i>	Tarla Kertenkelesi	Snake-eyed Lizard	NE	App- 2	-	4
<i>Anatololacerta danfordi</i>	Toros Kertenkelesi	Danford's Lizard	LC	App- 2	-	3
<i>Lacerta media</i>	Sivas Kertenkelesi	Three-lined Lizard	LC	-	-	1
<i>Phoenicolacerta laevis</i>	Hatay kertenkelesi	Lebanon Lizard	LC	-	-	1
Amphisbaenidae						
<i>Blanus strauchi</i>	Kör Kertenkele	Anatolian Worm Lizard	LC	App- 2	-	3
Anguidae						
<i>Pseudopus apodus</i>	Oluklu kertenkele	European Glass Lizard	NE	App- 2	-	1
SQUAMATA: Suborder: SERPENTES						
Boidae						
<i>Eryx jaculus</i>	Mahmuzlu Yılan	Sand Boa	NE	App- 2	-	1
Colubridae						
<i>Eirenis modestus</i>	Uysal Yılan	Ring-Headed Drawf Snake	LC	App- 2	-	1
<i>Natrix natrix</i>	Küpeli Su Yılanı	Grass Snake	LC	App- 2	-	1
<i>Dolichophis caspius</i>	Hazer yılanı	Caspian Whipe Snake	NE	App- 2	-	1
<i>Dolichophis jugularis</i>	Kara yılan	Large Whipe Snake	LC	App- 2	-	1
Viperidae						
<i>Macrovipera lebetina</i>	Koca Engerek	Lebetine Viper	NE	App- 2	-	1

Protection Status of the Reptilian Species detected at the Study Area

According to IUCN Red List

In accordance to the results of assessment of the Red List (www.redlist.org) prepared and updated by IUCN, among the reptile species detected at the project site and its vicinity, 15 species is in "LC" (Least Concern) in low risk categories, 8 species are Not Evaluated (NE) and only one species is in VU (Vulnerable) category. This species is Testudo graeca (Spur-thighed Tortoise) and by listing as Vulnerable (VU) species by IUCN, it is considered as endangered species. However, the population status of the species is rather good in the region and in Turkey and this category of IUCN is thought to be only valid for Europe.

According to BERN Convention

9 reptile species, whose distribution on site is determined through studies, are included in the Protection Lists of Appendix-II of Bern Convention (Strictly Protected Fauna Species), 12 reptile species are listed in Appendix-III (Protected Fauna Species). 3 species are not evaluated in any lists of BERN Convention.

According to CITES

The studies revealed that only Chamaeleo chamaeleon is included in Appendix-II of CITES Convention and the trade of these species trade should be closely controlled.

Endemism

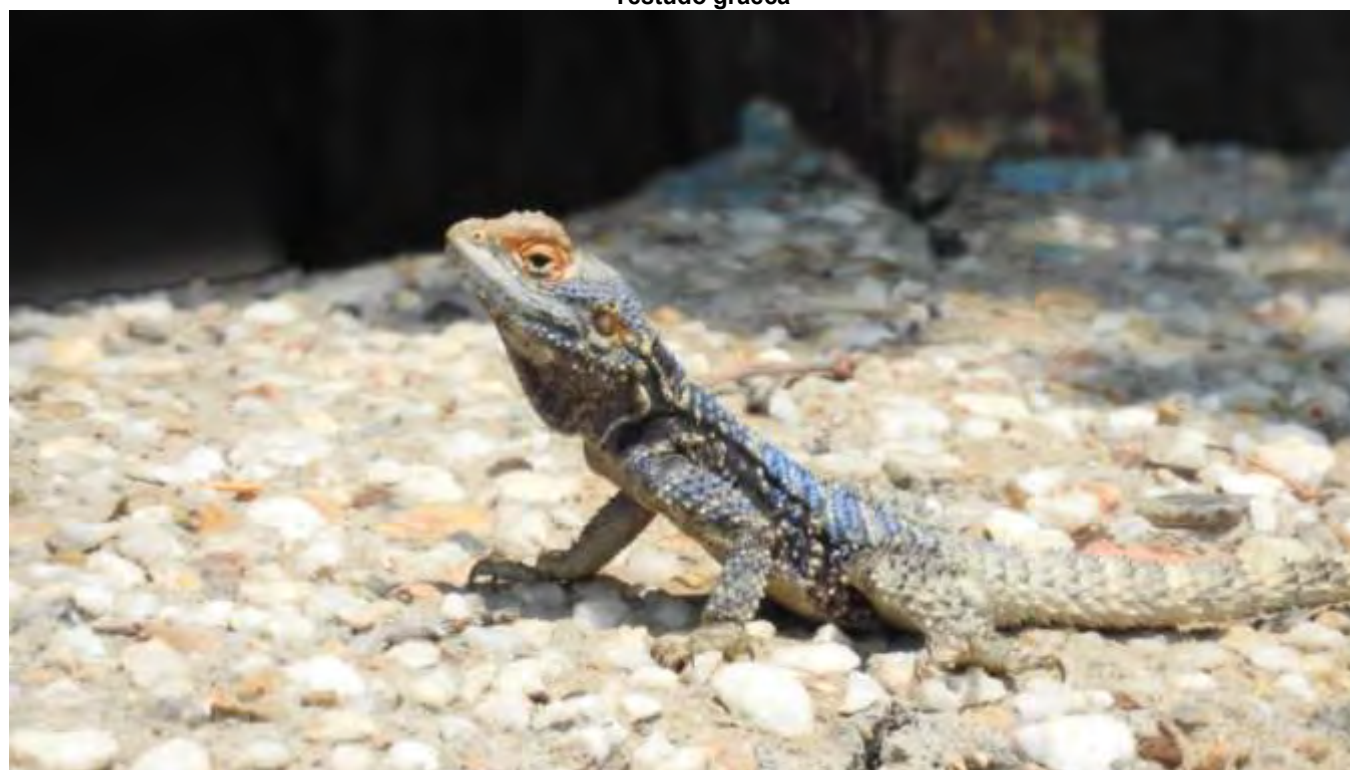
The only endemic species is Anatolacerta danfordii. The species widespread in rocky areas.



Testudo graeca



Ophisops elegans



Laudakia stellio



Trapelus lessonae

Figure 4.59: Some of the Detected Reptile Species – 1



Skin of *Dolichophis caspius*



A juvenile individual of *Anatalolacerta danfordi*

Figure 4.60: Some of the Detected Reptile Species – 2

Birds (Aves)

Turkey is quite rich in terms of species diversity of birds. The ecosystem and seasonal diversity, as well as the north-south or south-north migration movement are the bases of this diversity. Accordingly, birds use diverse ecosystems for activities such as feeding, breeding and recreation.

In the scope of the project, ornithological observations were made at the observation stations determined depending on the ecosystem characteristics, geographic structure, elevation and habitat diversity of the project site. As a result of the field surveys and literature review, a total of 151 bird species belonging to 16 orders and 46 families were determined.

The list of the identified species are given in Table 4.119 and photographs of some detected species are given in Figure 4.61

Table 4.119: Bird (Aves) Species Identified at the Study Area

ORDER & Familia & Species (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	dn*
PODICIPEDIFORMES						
Podicipedidae						
<i>Tachybaptus ruficollis</i>	Küçük Batağan	Little Grebe	LC	App-II	-	1
<i>Podiceps cristatus</i>	Tepeli Batağan	Great Crested Grebe	LC	App-III	-	1
PELECANIFORMES						
Phalacrocoracidae						
<i>Phalacrocorax aristotelis</i>	Tepeli Karabatak	Shag	LC	App-II	-	1
<i>Phalacrocorax carbo</i>	Karabatak	Cormorant	LC	App-III	-	1
CICONIIFORMES						
Ciconiidae						
<i>Ciconia</i>	Akleyek	White Stork	LC	App-II	-	1
<i>Ciconia nigra</i>	Karaleylek	Black Stork	LC	App-II	App-II	1
Ardeidae						
<i>Egretta garzetta</i>	Küçük Ak Balıkçıl	Little Egret	LC	App-III	-	1
<i>Nycticorax nycticorax</i>	Gece Balıkçılı	Night Heron	LC	App-II		1
<i>Ardea cinerea</i>	Gri Balıkçıl	Grey Heron	LC	App-II		1
Threskiornithidae						
<i>Plegadis falcinellus</i>	Çeltikçi	Glossy ibis	LC	App-II	-	1
ANSERIFORMES						
Anatidae						
<i>Anas querquedula</i>	Çıkrıkçın	Garganey	LC	App-III	-	1
FALCONIFORMES						
Accipitridae						
<i>Neophron percnopterus</i>	Küçük Akbaba	Egyptian Vulture	EN	App-II	App-II	1
<i>Circaetus gallicus</i>	Yılan Kartalı	Short-toed Eagle	LC	App-II	App-II	1

ORDER & Familia & Species (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	dn*
<i>Circus aeruginosus</i>	Saz Delicesi	Marsh Harrier	LC	App-II	-	1
<i>Circus cyaneus</i>	Gökçe delice	Hen Harrier	LC	App-II	App-II	1
<i>Accipiter nisus</i>	Atmaca	Sparrowhawk	LC	App-II	App-II	2
<i>Accipiter gentilis</i>	Çakırkuşu	Goshawk	LC	App-III	App-II	1
<i>Buteo buteo</i>	Şahin	Buzzard	LC	App-II	App-II	2
<i>Buteo rufinus</i>	Kızıl Şahin	Long-Legged Buzzard	LC	App-II	App-II	1
Falconidae						
<i>Falco peregrinus</i>	Gök Doğan	Peregrine	LC	App-II	App-I	1
<i>Falco subbuteo</i>	Delice Doğan	Eurasian Hobby	LC	App-II	App-I	1
<i>Falco biarmicus</i>	Bıyıklı doğan	Lanner Falcon	EN	App-II	App-II	
<i>Falco eleonora</i>	Ada doğanı	Eleonora's Falcon	LC	App-II	App-II	1
<i>Falco naumanni</i>	Küçük kerkenez	Lesser Kestrel	LC	App-II	App-II	2
<i>Falco tinnunculus</i>	Kerkenez	Kestrel	LC	App-II	App-II	2
GALLIFORMES						
Phasianidae						
<i>Alectoris chukar</i>	Kımalı Keklik	Chukar	LC	App-III	-	1
<i>Coturnix coturnix</i>	Bıldırcın	Quail	LC	App-III	-	2
GRUIFORMES						
Rallidae						
<i>Gallinula chloropus</i>	Sutavuğu	Moorhen	LC	App-III	-	1
<i>Fulica atra</i>	Sakarmeke	Coot	LC	App-III	-	1
CHARADIIFORMES						
Recurvirostridae						
<i>Himantopus himantopus</i>	Uzunbacak	Black-Winged Stilt	LC	App-II	-	1
Charadriidae						
<i>Charadrius dubius</i>	Halkalı Küçük Cılbıt	Little Ringed Plover	LC	App-II	-	1
Scolopacidae						
<i>Actitis hypoleucos</i>	Dere Düdükçünü	Common Sandpiper	LC	App-III	-	1
<i>Tringa glareola</i>	Orman düdükçünü	Wood Sandpiper	LC	App-II	-	2
Laridae						
<i>Larus michahellis</i>	Gümüş Martı	Yellow-legged Gull	LC	App-III	-	2
<i>Larus ridibundus</i>	Karabaş martı	Black-Headed Gull	LC	App-III	-	1

ORDER & Familia & Species (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	dn*
<i>Chlidonias hybrida</i>	Bıyıklı sumru	Whiskered Tern	LC	App-III	-	1
COLUMBIFORMES						
Columbidae						
<i>Columba livia</i>	Kaya Güvercini	Rock Dove	LC	App-III	-	2
<i>Columba palumbus</i>	Tahtalı	Wood Pigeon	LC	-	-	1
<i>Streptopelia decaocto</i>	Kumru	Collared Dove	LC	App-III	-	4
<i>Streptopelia turtur</i>	Üveyik	Turtle Dove	LC	App-III	-	1
<i>Streptopelia senegalensis</i>	Küçük Kumru	Laughing Dove	LC	App-III	-	4
CUCULIFORMES						
Cuculidae						
<i>Cuculus canorus</i>	Guguk	Cuckoo	LC	App-III	-	1
STRIGIFORMES						
Strigidae						
<i>Otus scops</i>	İshak kuşu	Scops Owl	LC	App-II	App-II	1
<i>Athene noctua</i>	Kukumav	Little Owl	LC	App-II	App-II	1
CAPRIMULGIFORMES						
Caprimulgidae						
<i>Caprimulgus europaeus</i>	Çobanaldatan	Nightjar	LC	App-II	-	1
APODIFORMES						
Apodidae						
<i>Tachymarptis melba</i>	Ak Karınlı Ebabil	Alpine Swift	LC	App-II	-	4
<i>Apus pallidus</i>	Boz Ebabil	Pallid Swift	LC	App-II	-	2
<i>Apus apus</i>	Ebabil	Swift	LC	App-III	-	4
CORACIIFORMES						
Alcedinidae						
<i>Alcedo atthis</i>	Yalıçapkını	Kingfisher	LC	App-II	-	1
Meropidae						
<i>Merops apiaster</i>	Arıkuşu	Bee Eater	LC	App-II	-	4
Coraciidae						
<i>Coracias garrulus</i>	Gökkuzgun	European Hopper	NT	App-II	-	1
Upupidae						
<i>Upupa epops</i>	İbibik	Eurasian Hoopoe	LC	App-II	-	2
PICIFORMES						
Picidae						
<i>Dendrocopos syriacus</i>	Alaca Ağaçkakan	Syrian Woodpecker	LC	App-II	-	1

ORDER & Familia & Species (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	dn*
<i>Dendrocopos medius</i>	Ortanca Ağaçkakan	Middle Spotted Woodpecker	LC	App-II	-	1
<i>Jynx torquilla</i>	Boyun Çevrien	Wryneck	LC	App-II	-	1
PASSERIFORMES						
Alaudidae						
<i>Galerida cristata</i>	Tepeli Toygar	Crested Lark	LC	App-III	-	3
<i>Lullula arborea</i>	Orman Toygarı	Woodlark	LC	App-III	-	1
<i>Alauda arvensis</i>	Tarlakuşu	Skylark	LC	App-III	-	2
<i>Calandrella brachydactyla</i>	Bozkır Toygarı	Short-toed Lark	LC	App-III	-	1
<i>Melanocorpha calandra</i>	Boğmaklı Tarlakuşu	Calandra Lark	LC	App-II	-	1
Hirundinidae						
<i>Riparia riparia</i>	Kum Kırlangıcı	Sand Martin	LC	App-II	-	3
<i>Hirundo rustica</i>	Kırlangıç	Swallow	LC	App-II	-	4
<i>Hirundo daurica</i>	Kızıl Kırlangıç	Red-rumped Swallow	LC	App-II	-	4
<i>Hirundo rupestris</i>	Kaya Kırlangıcı	Eurasian Crag	LC	App-II	-	1
<i>Delichon urbicum</i>	Ev Kırlangıcı	House Martin	LC	App-II	-	4
Motacillidae						
<i>Motacilla flava</i>	Sarı Kuyruksallayan	Yellow Wagtail	LC	App-II	-	1
<i>Motacilla alba</i>	Ak Kuyruksallayan	Pied Wagtail	LC	App-II	-	1
<i>Motacilla cinerea</i>	Dağ Kuyruksallayanı	Grey Wagtail	LC	App-II	-	2
<i>Anthus campestris</i>	Kır İncirkuşu	Tawny Pipit	LC	App-II	-	1
<i>Anthus spinoletta</i>	Dağ İncirkuşu	Water Pipit	LC	App-II	-	1
<i>Anthus trivialis</i>	Ağaç İncirkuşu	Tree Pipit	LC	App-II	-	1
<i>Anthus pratensis</i>	Çayır İncirkuşu	Meadow Pipit	LC	App-II	-	1
Pycnonotidae						
<i>Pycnonotus xanthopygos</i>	Arap Bülbülü	Yellow-vented Bulbul	LC	App-III	-	4
Troglodytidae						
<i>Troglodytes troglodytes</i>	Çıtkuşu	Wren	LC	App-II	-	1
Muscicapidae						
<i>Muscicapa striata</i>	Benekli Sinekkapan	Spotted Flycatcher	LC	App-II	-	2
<i>Ficedula semitorquata</i>	Yarımband Sinekkapan	Semi-collared Flycatcher	LC	App-II	-	1
<i>Ficedula albicollis</i>	Bantlı Sinekkapan	Collared Flycatcher	LC	App-II	-	5
<i>Erithacus rubecula</i>	Kızılgerdan	Robin	LC	App-II	-	2

ORDER & Familia & Species (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	dn*
<i>Luscinia megarhynchos</i>	Bülbül	Nightingale	LC	App-II	-	2
<i>Luscinia svecica</i>	Buğdaycıl	Bluethroat	LC	App-II	-	1
<i>Cercotrichas galactotes</i>	Kızıl Çalı Bülbülü	Rufous Bush Robin	LC	App-II	-	1
<i>Phoenicurus phoenicurus</i>	Kızılkuşruk	Redstart	LC	App-II	-	1
<i>Phoenicurus ochruros</i>	Karakızılkuşruk	Black Redstart	LC	App-II	-	1
<i>Saxicola rubetra</i>	Çayır Taşkuşu	Whinchat	LC	App-II	-	1
<i>Saxicola rubicola</i>	Taşkuşu	Stonechat	NE	App-II	-	1
<i>Oenanthe isabellina</i>	Boz Kuyrukkakan	Isabellina Wheatear	LC	App-II	-	1
<i>Oenanthe oenanthe</i>	Kuyrukkakan	Northern Wheatear	LC	App-II	-	2
<i>Oenanthe hispanica</i>	Kara Kulaklı Kuyrukkakan	Black-eared Wheatear	LC	App-II	-	1
<i>Oenanthe finchi</i>	Aksırtlı Kuyrukkakan	Finnch's Wheatear	LC	App-II	-	1
<i>Monticola saxatilis</i>	Taşkızılı	Rock Thrush	LC	App-II	-	1
<i>Monticola solitarius</i>	Gökardıç	Blue Rock Thrush	LC	App-II	-	1
Prunellidae						
<i>Prunella modularis</i>	Dağbülbülü	Dunnock	LC	App-II	-	1
Turdidae						
<i>Turdus merula</i>	Karatavuk	Blackbird	LC	App-III	-	4
<i>Turdus philomelos</i>	Öter Ardıç	Song Thrush	LC	App-III	-	2
<i>Turdus viscivorus</i>	Ökse Ardıç	Mistle Thrush	LC	App-III	-	1
Cisticolidae						
<i>Prinia gracilis</i>	Dikkuyruklu Ötleğen	Graceful Prinia	LC	App-II	-	1
Sylviidae						
<i>Cettia cetti</i>	Setti bülbülü	Cetti's Warbler	LC	App-III	-	1
<i>Acrocephalus schoenobaenus</i>	Kındıra karnışçını	Sedge Warbler	LC	App-II	-	1
<i>Acrocephalus scirpaceus</i>	Saz karnışçını	Reed Warbler	LC	App-III	-	1
<i>Acrocephalus arundinaceus</i>	Büyük Saz Karnışçını	Great Reed Warbler	LC	App-II	-	1
<i>Locustella luscinioides</i>	Bataklık Karnışçını	Savi's Warbler	LC	App-III	-	1
<i>Hippolais pallida</i>	Ak Mukallit	Olivaceous Warbler	LC	App-III	-	1
<i>Hippolais olivetorum</i>	Zeytinlik Mukkalidi	Olive-tree Warbler	LC	App-II	-	1
<i>Phylloscopus collybita</i>	Çıvgın	Chiffchaff	LC	App-II	-	1
<i>Phylloscopus trochilus</i>	Söğüt Bülbülü	Willow Warbler	LC	App-II	-	1

ORDER & Familia & Species (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	dn*
<i>Phylloscopus bonelli</i>	Dağ Söğüt Bülbülü	Bonelli's Warbler	LC	App-II	-	1
<i>Sylvia melanocephala</i>	Maskeli Ötleğen	Sardinian Warbler	LC	App-II	-	1
<i>Sylvia rueppelli</i>	Kara Boğazlı Ötleğen	Rüppel's Warbler	LC	App-II	-	1
<i>Sylvia curruca</i>	Küçük Akgerdanlı Ötleğen	Lesser Whitethroat	LC	App-II	-	1
<i>Sylvia nisoria</i>	Çizgili Ötleğen	Barred Warbler	LC	App-II	-	1
<i>Sylvia hortensis</i>	Karayüzlü Ötleğen	Orphean Warbler	LC	App-II	-	1
<i>Sylvia communis</i>	Çalı Ötleğeni	Whitethroat	LC	App-II	-	1
<i>Sylvia atricapilla</i>	Kara Başlı Ötleğen	Blackcap	LC	App-II	-	4
Paridae						
<i>Poecile lugubris</i>	Ak Yanaklı Baştankara	Sombre Tit	LC	App-II	-	4
<i>Cyanistes caeruleus</i>	Mavi Baştankara	Blue Tit	LC	App-II	-	4
<i>Parus ater</i>	Çam Baştankarası	Coal Tit	LC	App-II	-	4
<i>Parus major</i>	Büyük Baştankara	Great Tit	LC	App-II	-	4
Aegithalidae						
<i>Aegithalos caudatus</i>	Uzun Kuyruklu Baştankara	Long-Tailed Tit	LC	App-III	-	2
Sittidae						
<i>Sitta krueperi</i>	Anadolu Sıvacısı	Krüper's Nuthatch	NT	App-II	-	2
<i>Sitta europaea</i>	Sıvacı	Nuthatch	LC	App-II	-	3
<i>Sitta neumayer</i>	Kaya Sıvacısı	Rock Nuthatch	LC	App-II	-	1
Certhiidae						
<i>Certhia brachydactyla</i>	Bahçe Tırmaşığı	Short-toed Treecreeper	LC	App-II	-	1
Oriolidae						
<i>Oriolus oriolus</i>	Sarıasma	Golden Oriole	LC	App-II	-	9
Laniidae						
<i>Lanius collurio</i>	Kızıl Sırtlı Örümcekkuşu	Red-Backed Shrike	LC	App-II	-	3
<i>Lanius senator</i>	KızılBaşlı Örümcekkuşu	Woodchat Shrike	LC	App-II	-	3
<i>Lanius minor</i>	Karaalınlı Örümcekkuşu	Lesser Grey Shrike	LC	App-II	-	2
<i>Lanius nubicus</i>	Maskeli Örümcekkuşu	Masked Shrike	LC	App-II	-	3
Corvidae						
<i>Garrulus glandarius</i>	Alakarga	Jay, Eurasian Jay	LC	-	-	4
<i>Pica pica</i>	Saksağan	Magpie	LC	-	-	4
<i>Corvus corone pallescens</i>	Leş Kargası	Hooded Crow	LC	-	-	4

ORDER & Familia & Species (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	dn*
<i>Corvus frugilegus</i>	Ekin Kargası	Rook	LC	-	-	4
<i>Corvus corax</i>	Kuzgun	Raven	LC	App-III	-	2
Sturnidae						
<i>Sturnus vulgaris</i>	Sığırcık	Starling	LC	-	-	4
<i>Sturnus roseus</i>	Pembe sığırcık	Rose-coloured Starling	LC	App-II	-	2
Passeridae						
<i>Passer domesticus</i>	Serçe	House Sparrow	LC	-	-	4
<i>Passer montanus</i>	Ağaç Serçesi	Tree Sparrow	LC	App-III	-	4
<i>Passer hispaniolensis</i>	Söğüt Serçesi	Spanish Sparrow	LC	App-III	-	4
<i>Petronia petronia</i>	Kaya Serçesi	Rock Sparrow	LC	App-II	-	2
Fringillidae						
<i>Fringilla coelebs</i>	İspinoz	Chaffinch	LC	App-III	-	4
<i>Serinus serinus</i>	Küçük İskete	Serin	LC	App-II	-	4
<i>Carduelis chloris</i>	Florya	Greenfinch	LC	App-II	-	2
<i>Carduelis carduelis</i>	Saka	Goldfinch	LC	App-II	-	4
<i>Carduelis cannabina</i>	Ketenkuşu	Eurasian Linnet	LC	App-II	-	1
<i>Carduelis spinus</i>	Karabaşlı İskete	Eurasian Siskin	LC	App-II	-	1
<i>Coccothraustes coccothraustes</i>	Kocabaş	Hawfinch	LC	App-II	-	1
Emberizidae						
<i>Emberiza cia</i>	Kaya Kirazkuşu	Rock Bunting	LC	App-II	-	1
<i>Emberiza cirrus</i>	Bahçe Kirazkuşu	Cirl Bunting	LC	App-II	-	4
<i>Emberiza hortulana</i>	Kirazkuşu	Ortolan Bunting	LC	App-III	-	5
<i>Emberiza caesia</i>	Kızıl Kirazkuşu	Cretzschmar's Bunting	LC	App-II	-	5
<i>Emberiza melanocephala</i>	Karabaşlı Kirazkuşu	Black-Headed Bunting	LC	App-II	-	4
<i>Miliaria calandra</i>	Tarla Kirazkuşu	Corn Bunting	LC	App-III	-	5

Protection Status of the Bird Species detected at the Project Site

According to IUCN Red List

In accordance to the results of assessment of the Red List (www.redlist.org) prepared and updated by IUCN, among bird species recorded at the study area, 2 species are listed in NT (Near Threatened) and 1 species is in "NE (Not Evaluated)" category. 2 species are listed in EN category. Remaining 146 species are listed in LC (Least Concern) category.

According to BERN Convention

106 bird species, whose distribution on site is determined through studies, are included in the Protection Lists of Appendix-II of Bern Convention (Strictly Protected Fauna Species), 38 bird species are listed in Appendix-III (Protected Fauna Species). 6 species are not listed in any lists. Seven species are not evaluated in Appendices of Bern Convention.

According to CITES Convention

The studies revealed that 2 species are included in Appendix I and only 14 species are included in Appendix-II of CITES Convention and the trade of these species trade should be closely controlled.

Endemism

There is no endemic species among the bird species detected at the study area.



Buteo rufinus



Streptopelia senegalensis



Hippolais pallida



Pycnonotus xanthopygos

Figure 4.61: *Buteo rufinus*

Mammals (Mammalia)

Mammals spread in almost all habitats on earth since they are homoithermal animals. Therefore, it is possible to encounter mammal species throughout the year along the project route and its close vicinity.

As a result of the field surveys and literature review, totally 24 species were determined. Among detected species, 1 species belongs to hedgehog (Erinaceimorpha) order, 4 of them belong to bats (Chiroptera) order, 1 belong to rabbits (Lagomorpha), 10 belongs to rodents (Rodentia), 6 of them belongs to carnivore (Carnivora) and also 2 of them are even-toed (Artiodactyla) order.

The list of the identified species is given in Table 4.120 and photographs of some detected species are given in Figure 4.62.

Table 4.120: Mammal (Mammalia) Species Identified at the Study Area

ORDER & Familia & Species (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	dn*
ERINACEOMORPHA						
Erinaceidae						
<i>Erinaceus concolor</i>	Kirpi	Eastern Hedgehog	LC	-	-	4
CHIROPTERA						
Rhinolophidae						
<i>Rhinolophus ferrumequinum</i>	Büyük Nalburunlu Yarasa	Greater Horseshoe Bat	LC	App-II	-	1
<i>Rhinolophus hipposideros</i>	Küçük Nalburunlu Yarasa	Lesser Horseshoe Bat	LC	App-II	-	2
<i>Rhinolophus euryale</i>	Akdeniz Nalburunlu Yarasası	Mediterranean Horseshoe Bat	NT	App-II	-	3
Vespertilionidae						
<i>Pipistrellus pipistrellus</i>	Cüce Yarasa	Common Pipistrelle	LC	App-III	-	4
LAGOMORPHA						
Leporidae						
<i>Lepus europaeus</i>	Yabani Tavşan	European Hare	LC	App-III	-	4
RODENTIA						
Sciuridae						
<i>Sciurus anomalus</i>	Sincap	Persian Squirrel	LC	App-II	-	4
Cricetidae						
<i>Microtus sp.</i>			-	-	-	2
Muridae						
<i>Apodemus flavicollis</i>	Sarıboyunlu Ormanfarezi	Yellow-Neck Mouse	LC	-	-	1

ORDER & Familia & Species (in Latin)	Turkish Name	English Name	IUCN	BERN	CITES	dn*
<i>Apodemus mystacinus</i>	Kayalık faresi	Broad-Toothed Field Mouse	LC	-	-	1
<i>Rattus rattus</i>	Sıçan	Black Rat	LC	-	-	4
<i>Rattus norvegicus</i>	Göçmen sıçanı	Brown rat	LC	-	-	4
<i>Mus macedonicus</i>	Sarı Evfaresi	Balkan Short Tailed Mouse	LC	-	-	2
<i>Meriones tristrami</i>	Anadolu çölfaresi	Tristram's jird	LC	-	-	1
Spalacidae						
<i>Nannospalax xanthodon</i>	Anadolu Körfaresi	Anatolian Mole-Rat	DD	-	-	2
Hystriidae						
<i>Hystrix indica</i>	Oklukirpi	Indian Porcupine	NE	-	-	1
CARNIVORA						
Canidae						
<i>Vulpes vulpes</i>	Tilki	Red Fox	LC	-	-	2
<i>Canis aureus</i>	Çakal	Golden Jackal	LC	-	-	1
<i>Felis silvestris</i>	Yaban kedisi	Wild Cat	LC	App-II	-	1
Mustelidae						
<i>Martes foina</i>	Kaya Sansarı	Beech Marten	LC	App-III	-	3
<i>Meles meles</i>	Porsuk	European Badger	LC	App-III	-	1
<i>Mustela nivalis</i>	Gelincik	Least Weasel	LC	App-III	-	2
ARTIODACTYLA						
Suidae						
<i>Sus scrofa</i>	Yabandomuzu	Wild Boar	LC	-	-	4
Bovidae						
<i>Capra aegagrus</i>	Yabankeçisi	Wild Goat	VU	App-II	-	1

Protection Status of the Mammalian Species detected at the Study Area

According to IUCN Red List

In accordance to the results of assessment of the Red List prepared and updated by IUCN, among the mammalian species detected at the project site and its vicinity, only *Capra aegagrus* (Wild Goat) is listed in Vulnerable (VU) category. Among 24 mammalian species, 1 species is in VU (Vulnerable), 1 species is in NT (Near Threatened), 18 species are in LC (Least Concern), 1 species is in DD (Data Deficient) and 1 species is in NE (Not Evaluated) category.

According to BERN Convention

As a consequence of evaluation of BERN lists, among the 24 mammalian species detected on site, 5 species are listed in Bern List Appendix-II (Strictly Protected Fauna Species), 5 mammalian species are listed in Bern List Appendix-III (Protected Fauna Species) and 14 species are not listed in any lists.

According to CITES Convention

No mammalian species is included in the mammalian species lists as per CITES Convention.

Endemism

There is no endemic mammalian species at the project area and its close vicinity.



Erinaceus concolor (crashed by car)



Martes foina



Lepus europaeus (feces)



Vulpes vulpes (feces)

Figure 4.62: Some Detected Mammals Species

4.9.5 Possible Impacts on Terrestrial Flora and Mitigation Measures

The general impacts on terrestrial flora are determined as:

- Direct Human Impacts
- Habitat Loss
- Vegetation Clearing
- Wastes & Pollutants
- Landscape

The impacts of the project activities and measures to be applied during the construction and operation on terrestrial flora and vegetation are presented in Table 4.121.

Table 4.121: Project Activities and Mitigation Measures

Ecological Feature/Species	Possible Impact	Phase	Mitigations
Terrestrial Flora & Vegetation	Direct Human Impacts	Construction & Operation	<ul style="list-style-type: none"> • Arrange "Induction Meeting" for new comers in order to provide information about environmental & social policies, responsibilities, and management system as in line with the Environmental & Social Management System, • Hold regular trainings in order to raise awareness associated with the natural assets & importance of the site and protection of the natural structure including legislative framework, related conventions and their requirements as in line with the Environmental & Social Management System.
Terrestrial Flora & Vegetation	Habitat Loss Vegetation Clearing	Construction	<ul style="list-style-type: none"> • Limit the working area in order to keep the clearing area in minimum and avoid unnecessary clearing, • Limit access to non-working areas, • Engage a qualified ecologist to attend the site on a regular basis to monitor the activities, • Develop a monitoring program to be applied during construction works as in line with the Environmental & Social Management System.
Terrestrial Flora & Vegetation	Wastes & Pollutants	Construction	<ul style="list-style-type: none"> • Allocate a storage area to store chemicals and hazardous wastes at site with concrete basin and sheltering against wind, dust and sun, • Supply necessary and appropriate absorbents at the at site, • Do not allow debris dumping at site, • Remove waste regularly from the site and dispose properly, • Develop a "Waste Management Plan" as in line with the Environmental & Social Management System.
Terrestrial Flora & Vegetation	Landscape	Construction & Operation	<ul style="list-style-type: none"> • Develop a "Landscape Repair Plan" to restore the vegetation of the area including landscape analyses, methodology to be applied for repairing, assessment and determination of landscape characteristics, management, control and monitoring of the plan as in line with the Environmental & Social Management System., • Start landscape repairing following completion of the construction, • Develop a monitoring program to be applied during post construction works. • Engage a qualified ecologist to attend the site on a regular basis to monitor the activities.

In addition to general impacts and mitigation measures give in Table 1, the habitats, endemic and species evaluated in CITES are evaluated specifically under the headings below.

4.9.5.1 Habitat Assessment

The habitats along project route were evaluated based on “EUNIS - European Nature Information System” and 6 different habitat types were defined.

Among 6 habitats, *Pinus brutia* forests and maquis are widespread not only in Turkey but also in Mediterranean Phytogeographic Region.

Another common habitat type along project route is “Oak Forests” which can be observed higher elevations of Sof Dağı and Nurdağı. The dominant species of this habitat type, which are *Quercus cerris* and *Quercus infectoria* subsp. *veneris*, are common species in Turkey. In addition to Turkey, these species also grow in Central and Southeast Europe, Cyprus, Palestine, Iraq, Iran and Transcaucasia. Besides, *Quercus brantii* is also found in Syria, Iraq and Iran, as well as *Quercus ithaburensis* subsp. *macrolepis* also grows in Central Anatolia, Aegean and Mediterranean regions, the Balkans and Southeastern Italy. In the light of these data, “Oak (*Quercus* sp.) Forests” and the species consisting these forests are not widespread in Turkey.

“Anthropogenic habitats”, which are frequently observed in the project area, occupy areas where Maquis habitats were dominant in the past. This habitat type has already lost its natural structure. On the other hand, the least common habitat type of the project site is “Riparian (wetland) areas”. Except for Nurdağı and Sof Dağı, the “Riparian (wetlands) areas” can be observed within anthropogenic areas. These areas are not natural as a result of agricultural activities such as irrigation, fertilization, pesticides and the negative effects of wastes. The project route will pass through tunnels along Nurdağı and Sof Dağı. Therefore, “Riparian (wetland) areas” in these parts are will not be affected by the activity.

The “Steppe habitat” in Sof Mountain and its close vicinity was formed by the destruction of the *Quercus brantii* habitat due to anthropogenic effects. Since it is secondary habitat, it contains many taxa belonging to the forest habitat. The secondary steppe habitats can be observed in wide area in Southeastern Anatolia region, Syria and Iraq.

Because of the evaluation, it is concluded that all determined habitats are widespread in the area. Accordingly, no major impacts are foreseen considering the project route.

4.9.5.2 Endemic Species

A total of 45 species are determined as endemic among 870 species and subspecies According to IUCN criteria, 6 of these taxa are evaluated in threatened categories, CR (Critically Endangered), EN (Endangered) and VU (Vulnerable) which requires protection. A total of 39 taxa, 14 of which are in the NT (Near Threatened) and 25 in LC (Least Concern) category are widespread endemics (IUCN, 2019). The endemics requiring protection and their exposure to the activities to be carried out within the scope of the project are given below.

Muscari babachii Eker & Koyuncu: The taxon is evaluated in “CR (Critically Endangered)” category according to the IUCN Red List criteria (Ekim et al., 2000; IUCN, 2019). The species can be found in forest clearances between 1600-1900 meters in Nurdağı Eker & Koyuncu, 2008). Within the scope of project, tunnels will cross Nurdağı. Accordingly, tunnel entrances and exits will be lower than 1600 meters. Therefore, it is not expected that the species will be affected from Project activities since the growth location of the species is not close the Project route.

Astragalus aintabicus Boiss.: The taxon is evaluated in “EN (Endangered)” category according to the IUCN Red List criteria (Ekim et al., 2000; IUCN, 2019)The species can be found in steppe habitats between 1,100-1,200 meters in Sof Dağı (Özuslu, 2003). Within the scope of project, Sof Dağı will be crossed by tunnels. Accordingly, tunnel entrances and exits will start at about 710 meters west of Sof Mountain and reach 940 meters towards the east of the mountain. Therefore, it is not expected that the species will be affected from Project activities since the growth location of the species is not close the Project route.

Centaurea haussknechtii Boiss.: The taxon is evaluated in “EN (Endangered)” category according to the IUCN Red List criteria (Ekim et al., 2000; IUCN, 2019). The species can be found in steppe habitats between 1,100-1,200 meters in Sof Dağı (Özuslu, 2003). Within the scope of project, Sof Dağı will be crossed by tunnels. Accordingly, tunnel entrances and exits will start at about 710 meters west of Sof Mountain and reach 940 meters towards the east of the mountain. Therefore, it is not expected that the species will be affected from Project activities since the growth location of the species is not close the Project route.

Heptaptera cilicica (Boiss. & Balansa) Tutin: The taxon is evaluated in “EN (Endangered)” category according to the IUCN Red List criteria (Ekim et al., 2000; IUCN, 2019). The species can be found in maquis habitats between 400-600 meters in Mersin and Adana (Davis 1965, 1985). On the other hand, the project route passes through agricultural areas between Mersin and Adana and no maquis habitat were observed in these areas. Therefore, it is not expected that the species will be affected from Project activities since the growth location of the species is not close the Project route.

Sideritis cilicica Boiss. & Balansa: The taxon is evaluated in “EN (Endangered)” category according to the IUCN Red List criteria (Ekim et al., 2000; IUCN, 2019). The species can be found in Pinus brutia and maquis habitats between 600-1,000 meters in Mersin and Adana (Davis 1965, 1985). On the other hand, the project route passes through agricultural areas between Mersin and Adana and no Pinus brutia and maquis habitat were observed in these areas. Therefore, it is not expected that the species will be affected from Project activities since the growth location of the species is not close the Project route.

Symphytum aintabicum Hub.-Mor. & Wickens: The taxon is evaluated in “VU (Vulnerable)” category according to the IUCN Red List criteria (Ekim et al., 2000; IUCN, 2019). The species can be found in Quercus brantii habitats between 1,000-1,100 meters in Sof Dağı (Özuslu, 2003). Within the scope of project, Sof Dağı will be crossed by tunnels. Accordingly, tunnel entrances and exits will start at about 710 meters west of Sof Mountain and reach 940 meters towards the east of the mountain. Therefore, it is not expected that the species will be affected from Project activities since the growth location of the species is not close the Project route.

As a result of the evaluation of the species locations and project route, it is concluded that the species are located in higher elevation from project route and will not be effected from project activities. On the other hand, no proper habitat where the species can be found is not observed along the project route regarding elevation.

4.9.5.3 Species Evaluated in Appendices of CITES

6 taxa identified in the project area and it vicinity are included in the list of CITES Agreement (including International Trade of Endangered Wild Animal and Plant Species). The impacts on the Project carried out within the scope of the CITES Mersin-Gaziantep High Standard Railway Line Project are explained below.

Table 4.122: Taxa

Photograph of the Species	Name of the Species	Habitat	Flowering Period	Status	Measures to be taken
	<i>Cephalanthera rubra</i> . (Orchidaceae)	Widespread between 0-2000m in maquies, <i>Quercus</i> sp., <i>Pinus brutia</i> and mixed forest. The maquis along project route and forests in Nurdağı are proper habitats for this species.	May-July	CITES	In the scope of construction works, prior to the stripping of the vegetative soil, the areas where operations will take place will be controlled by an ecologist specialized in her/his respective field and the bulbs and tubers of the taxa encountered in the region will be collected and stored and planted in similar areas with the assistance of the specialized ecologists. The stock locations of bulbs and tubers and the specifications of these stocks will be determined by the flora specialist.
	<i>Himantoglossum affine</i> (Orchidaceae)	Widespread between 0-1250m in maquies, <i>Quercus</i> sp., <i>Pinus brutia</i> forest. The maquis along project route and forests in Nurdağı and Sofdağı are proper habitats for this species.	May-July		
	<i>Ophrys transhyrcana</i> subsp. <i>transhyrcana</i> (Orchidaceae)	Widespread between 0-1400m in humid areas and along the creeks, rivers. All riparian habitats along the project route.	April-May		
	<i>Orchis laxiflora</i> subsp. <i>laxiflora</i>	Widespread between 0-1400m in humid areas and along the creeks, rivers. All riparian habitats along the project route.	April-May		
	<i>Orchis morio</i> subsp. <i>picta</i>	Widespread between 60-1120 in maquis and meadows. The maquis along project route and forest openings are important habitats for this species.	March-May		
	<i>Orchis tridentata</i>	Widespread between 0-1600m in maquis and meadows. The maquis along project route and forest openings are important habitats for this species.	April-May		

4.9.6 General Assessment on Fauna and Mitigation Measures

The project route is not located directly in the water or in areas very close to the water sources. This situation reduces the incidence of amphibians. It is especially difficult to see amphibians directly in the field of activity. These animals are more common in humid biotopes and water sources in the close environment. For this reason, amphibian and reptile species and populations that feed, nest and breed directly within the activity area are very few. Considering that reptile, species can easily travel long distances in suitable habitats in time; individuals of this species may be encountered in the activity area or in its close vicinity in the future. In this case, as the noise and vibrations that will occur during the construction phase and the habitat fragmentation will affect the species.

There are some habitats, which can be nesting and feeding areas for local and migrating birds. In addition, there will be a transition of birds from one place to another due to the presence of many large and small wetlands in the environment in basin. At the same time, it was concluded that these areas were used as important resting or feeding areas. As a result of these observations, it has been determined that both songbird species and many birds benefit from the field. The species most likely to be affected by the activity are field birds, and there are sufficient alternative areas where these species can live with the activity.

Starting the project activities after the breeding period and continuing until the next breeding period will minimize the impact on bird species or other wildlife elements that will carry out breeding activities in and around the site. In this respect, an important opportunity will be provided for the living creatures living in or near the project site to move to other alternative sites. It is necessary to evaluate this situation and the status of the populations with the faunal periodic monitoring to be made in the following processes.

Among mammals, predatory mammals such as jackals and foxes are widespread in the field and its close vicinity, and there is always the possibility of individuals of these species in the field. Especially in winter conditions, it may be possible for them to come to the field and its immediate surroundings for hunting.

The mitigation measures regarding terrestrial fauna species are given below;

- Construction and operational activities should be limited to the project area. No activity should be carried out within the project route.
- The project area should be surrounded by wire mesh if possible, and wild animal entry into the area should be limited.
- In order to prevent animals from using domestic waste for feeding, garbage containers will be covered and domestic solid waste should be stored in controlled areas.
- Such activities cutting, rubble, etc. could be harmful to this habitat, should not be carried out in parts outside of the project area.
- Within the scope of the project, existing roads should be used as much as possible and new roads should not be opened unless it is necessary.
- Although not directly in the field of activity, nearby water resources and streams with seasonal flows, biotopes are the most advantageous habitat for many amphibians and reptiles. In addition, these areas in the region are very important in the thermoregulation of nocturnal wild animals. Therefore, it is essential to protect these resources and areas at every stage of the activity. Whatever the reason, intervention in these resources and areas should be avoided.
- According to the air quality modelling studies carried out within the scope of the project, it is determined that dust and exhaust emissions that will occur during the land preparation and construction phase provide the limit values of ground level concentration given in the Regulation on Control of Air Pollution from Industrial Sources (Official Gazette dated 03.07.2009 and numbered 27277). In this context, to reduce dust emission,
 - o Unloading and loading operations will be carried out without scattering,
 - o Material will be covered with a nylon tarp or with other materials with a grain size no less than 10 mm,
 - o Upper layers will be stored with a humidity level of 10%,

- o Roads should be wide enough and asphalt covered,
 - o Vehicles that can cause dust emission should be covered.
- Heavy construction machinery and other necessary plants (concrete batch plants and crushing and screening plant/s) will produce noise that will arise during the land preparation and construction period of the project. Acoustic Report assessing noise impact in construction and operation phases, including background noise measurements daytime, in the evening and at night at the nearest settlement areas, is prepared by accredited laboratory. As demonstrated in the report, the calculated noise levels are below the legal limits provided in Annex VII Table 4 of the Regulation on Assessment and Management of Environmental Noise (Official Gazette dated 04.06.2010 and numbered 27601) and the noise will only be detectable within the plant area.
- Training on "culture of living in peace with the nature" must be given to employees and operators at every stage of the project,
- When any vertebrate species is seen while on a vehicle or on foot, it will not be interfered with,
- When any vertebrate is encountered by car after the sunset, the car must be stopped and lights must be turned off sufficient time should be given in order to allow it to move away safely,
- When a nest or youngster is encountered in the work area, it must not be touched or approached. If a nest, egg or youngster is encountered, it must be removed from the activity field by receiving help from experts,
- No living species will be intentionally hunt, killed or caught,
- No interference, in any manner, with wild species that are feeding,
- During the spring and autumn migration periods, especially the Eastern Black Sea section is used by many bird species during the transition. During transitions in group or in case of accommodation, birds will not be disturbed to the extent possible, and any disruptive and noisy activities will be minimized until the transition ends,
- Sand and gravel should not be taken from beach, dune and streambeds for use in buildings and for material supply.
- A lighting system should be planned in a way to give minimum artificial light to
- Especially heavy vehicle drivers should drive slowly when driving around the area and avoid unnecessary horn use.
- During the project activities, devices or applications producing smell, light, heat and sound that wild animals will perceive as a threat should be minimized.
- During stripping fauna expert will be employed to take necessary measures to move Birds, which are widespread in agricultural areas, are expected to be directly affected by the activities to be carried out in the project route. It has also been observed that bird of prey species that feed on rodents in the field also use this area. However, it is considered that there are alternative environments where these species can survive and there will be no significant impact if the activity starts outside the breeding period. In the observations made in December (2020), it was observed that the activity started after the breeding period and a process was followed by which the species could easily adapt.
- Turkey is one of important routes used by migratory species. It is determined that some of the main routes pass near the project site. For this reason, the area is used during the migration period. It is expected that bird species may pass through the area during migration periods. Accordingly, the project route should be monitored for the project route should be monitored for 2 years for construction period and 2 years for operation period in terms of birds and migration to find out possible impacts on bird species.

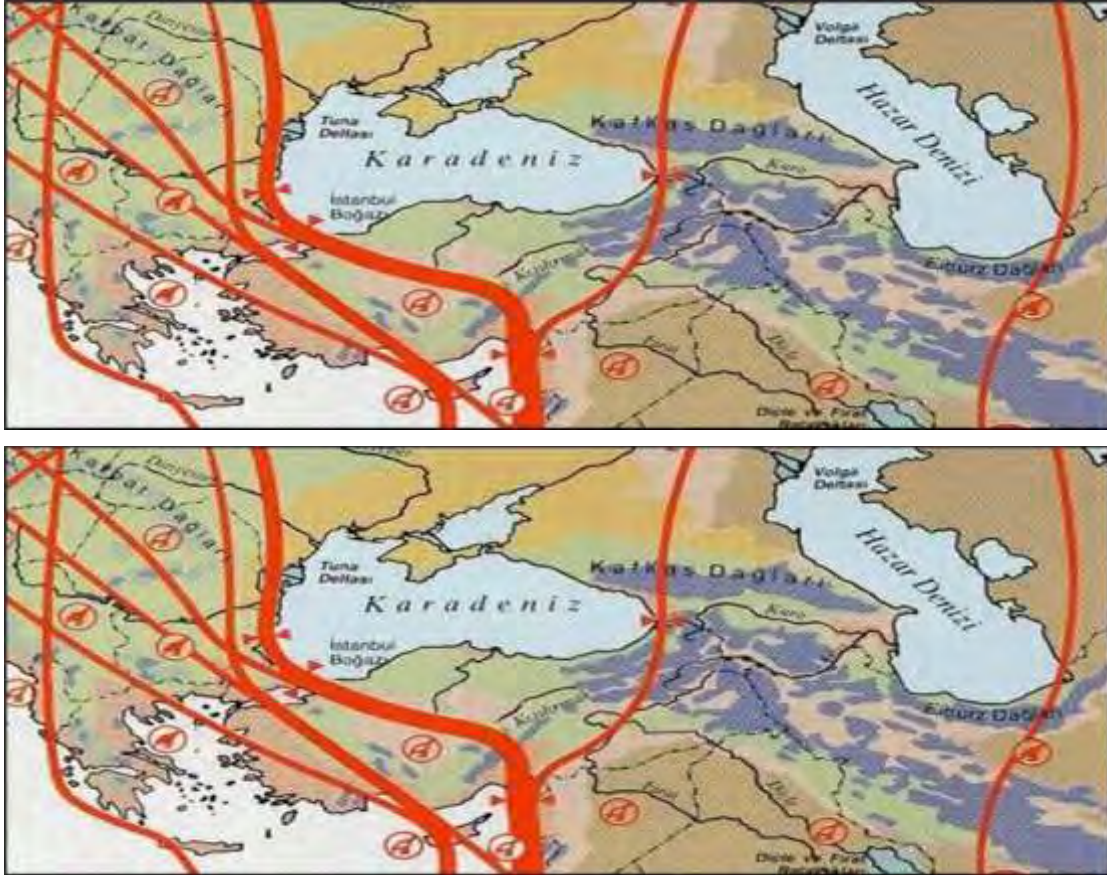


Figure 4.63: Bird Migration Routes

- In order for all possible impacts likely to occur on all fauna components, the project route should be monitored for 2 years for construction period and 2 years for operation period.
- The monitoring should be 2 times to cover Spring and Autumn periods. The studies should be carried out in April and May for Spring, late September or October for Autumn season. It is important that the period should cover the bird migration period.
- During monitoring studies both construction and operation period, amphibians, reptilians, birds and mammals should be surveyed by specialists in selected stations along the route.
- To find out possible impacts on fauna, gathered data during monitoring studies should be compared with baseline studies which were conducted in 2020.

4.10 Cultural Heritage (EBRD PR8)

4.10.1 Introduction

Being in contact with the Aegean in the west, the Balkans in the northwest, the Caucasus and Iran in the east, Mesopotamia in the south, and the Eastern Mediterranean cultures, Anatolia has different geographical and cultural characteristics within itself. This cultural diversity / variability can actually be defined depending on geographical features.

As stated in the Archaeological Evaluation Report, The Archaeological-Cultural Heritage management unit of the project will consist of two units. The first unit is the Science Committee / Advisory Board. This unit will take part in all activities in the field.

When the Mersin-Gaziantep High Standard Train project is considered as the physical boundary, the eastern part of the Mediterranean Region and the junction point of this region and the Southeastern Anatolia region (although Gaziantep is located within the political borders of the Southeastern Anatolia Region, it has more of a transitional geographical characteristic can be seen). Within the borders of Mersin, Adana and Osmaniye Mediterranean Region, Gaziantep forms the westernmost border of the Southeastern Anatolia Region. For this reason, while cultural diversity is evaluated within the scope of the project, the Kilikya Cultural region stands out.

The High Standard Train project (Ovalık Kilikya and İslahiye Cultural Area), which will start in Mersin and end in Gaziantep, will be located in two cultural regions. These cultural regions are also divided into sub-regions within themselves. The region, which has different geographical features, is approximately 400 km long. The region, which has more than 400 registered cultural areas, is extremely important with its cultural diversity. İslahiye Cultural Region is an important cultural region that includes Gaziantep and is located at the westernmost point of the Southeastern Anatolia region. In addition, the part of the Mediterranean Region, one of the seven geographical parts of Anatolia, from Alanya to the Gulf of Iskenderun, is defined as the Cilicia Cultural Region.

Rönesans for the implementation of the find procedure and the protection of archaeological-cultural heritage data is responsible.

As stated in the Archaeological Evaluation Report, as in general of Anatolia, there are different geographical features in the Mediterranean Region and the Cilicia cultural region covering a part of it. The region is divided into two based on its topographical feature.

Strabo describes approximately the part from Alanya to Mersin-Limon/Lamos as Mountainous Cilicia (KlikiaTracheia), and the part from Mersin-Limonlu / Lamos to Iskenderun as the Ovalık Cilicia (Klikia Pedias). Ovalık Cilicia; It consists of the Tarsus-Berdan River and Seyhan River, which take its source from the Taurus Mountains, and the alluvial fill carried by the Ceyhan River, which also takes its source from the Anti-Taurus River. The Ovalık Cilicia, which consists of multiple plains of various sizes, is divided into two. This distinction roughly provides a hill extension with a height of 750m in places starting from Misis / Yakapınar and extending towards Karataş. The northern part of this hill extension is defined as Yuksekova, and consists of Kozan, Osmaniye, Yumurtalık, Erzin and Dörtöl plains. The western part of the hill extension is called Seyhan Plain, West Plain or Lower Plain and consists of multiple plains.

One of the elements that make the region important and indispensable today, as it has throughout the historical process, is the passages that connect with the surrounding cultural regions. One of these passes continues over Mersin - Silifke and connects to the Konya plateau via Göksu valley and to Western Anatolia in a distant distance. Another important passage is Gülek Pass, which has been used throughout the ancient process and is the lifeblood of both road and rail transportation today. This passage connects the region to Central Anatolia and, in a distant distance, to the entire Black Sea. Beylan-Belen is one of the most magnificent passages that have witnessed history. This passage, which allows the Amanos Mountains to be overcome, connects Cilicia to the whole of Syria through the Amuk plain. This passage and long-distance connection is Mesopotamia, which is the main attraction center of the culture. Another pass that crosses the Amanos is connected to the Southeastern Anatolia region via Kahramanmaraş and Gaziantep by crossing the Nur Mountains via Osmaniye - Bahçe. The long-distance connection of this pass is Upper Mesopotamia and indirectly the whole Mesopotamia. The transition point of the Mersin-Gaziantep High Standard Train Project is also this area.

Gaziantep, the fourth city of implementation of the project; Fırat River in the east, the Taurus Mountains, which are extremely curved and broken in the west and north, and the Northern Syrian plains are located in the south. It was formed by the combination of wide plains (İslahiye plain, Kilis plain and Northern Syria plains) in the low plateau system.

Gaziantep, located in the area defined as İslahiye Cultural Area in the literature, is an important cultural crossroad at the westernmost point of the Southeastern Anatolia region. It is one of the most important centers of the commercial route coming from Mesopotamia over the Euphrates River. It is referred to as Doliche in ancient sources, Teluck in Byzantine sources, and Duluk in Arabic sources. In 13th century sources, Duluk and today's Antep were paired and defined as Hantap.

The High Standard Train project (Ovalık Cilicia and İslahiye Cultural Area), which will start in Mersin and end in Gaziantep, will be located in two cultural regions. These cultural regions are also divided into sub-regions

within themselves. The region, which has different geographical features, is about 400km long. The region, which has more than 400 registered cultural areas, is extremely important with its cultural diversity.

This section constitutes an assessment of the potential impacts on the project area and its environment related to the cultural heritage during construction, operation, and decommissioning. Cultural heritage can be defined as works, monuments, buildings, and sites with various values including symbolic, historical, artistic, aesthetic, ethnological or anthropological, religious, scientific, and social significance. Cultural heritage is an important component of the cultural identity and social cohesion of communities, groups, and individuals. Cultural heritage elements are divided into three groups;

- Tangible Cultural Heritage,
 - o Movable Cultural Heritage (paintings, sculptures, handicrafts, etc.),
 - o Immovable Cultural Heritage (archaeological sites, monuments, etc.),
 - o Underwater Cultural Heritage (inundated settlements and wrecks),
- Intangible Cultural Heritage (traditions, religions, etc.),
- Natural Cultural Heritage (biological and geological formations, natural culture areas, etc.).

Archeology is a scientific study that includes physical evidence of past human populations obtained through the collection and analysis of artifacts and excavation. Physical archaeological resources include movable antiques, monuments, historical buildings, historical landscapes, cemeteries, and burial sites. Both immovable and movable cultural assets can be found in archaeological sites.

Archeology and cultural heritage are important to civilization and cultural life, so they are protected from potentially damaging activities.

This section aims to describe any known or potential cultural heritage in the Project Area and assess potential Project impacts on this cultural heritage.

The project aims to avoid impacts on cultural heritage as much as possible by balancing cultural heritage aspects with other environmental and engineering requirements. Where important cultural heritage elements are affected, this section also provides appropriate mitigation measures aimed at minimizing these impacts.

4.10.2 Policies, Legal Framework and Guidelines

There are national legislation and international guidelines that have been established in the field of Cultural Heritage and Archeology, in which measures for protection, transport and monitoring are taken and managed.

4.10.2.1 National Legislations

Law on the Protection of Cultural and Natural Heritage

Within the scope of the Law on the Protection of Cultural and Natural Properties, there are issues related to the movable and immovable cultural and natural assets in our country and the duties and responsibilities of real and legal persons in relation to these issues. In this law, the definitions of movable and immovable cultural and natural assets are determined, the necessary actions to be taken regarding them are arranged, and the establishment and duties of the organization that will take the implementation decisions are determined.

According to the Law on the Conservation of Cultural and Natural Assets Law No. 2863, cultural assets (heritage) are scientific and culturally unique values that are related to science, culture, religion, and fine arts belonging to prehistoric and historical periods or have been the subject of social life in prehistoric or historical periods is defined as all movable and immovable assets above ground, underground or underwater. On the other hand, Natural properties are stated with the expression "above ground, underground or underwater, belonging to geological periods, prehistoric and historical periods, and which must be rare or protected in terms of their characteristics and beauty".

Examples of immovable cultural assets within the scope of the law include, but are not limited to, archaeological sites, acropolis and necropolis, castles, castles, towers, walls, historical barracks, places of worship and tunnels. Examples of immovable cultural assets are all kinds of animal and plant fossils, human skeletons, all kinds of tools made of bone or metal, tiles, ceramics and ceramic-like pots and pans, sculptures, figures, tablets, weapons to be cut for defense and attack, anchor, leather, are documents written or described on fabric, papyrus, parchment or metal and movable items and their items made of tiles, earthenware, glass, wood, and textiles.

4.10.2.2 International Guidelines

International Finance Corporation (IFC)

In the field of Cultural Heritage, IFC proposes Performance Standard 8. Performance Standard 8 mentions the necessity of preserving cultural heritage for today and for the future. This Performance Standard aims to protect cultural heritage from the negative impacts that may arise from activities at every stage of the project and to ensure equal use of existing or existing cultural heritage.

According to Performance Standard 8, cultural heritage means "tangible cultural heritage types such as movable or immovable object, property, area, building or group of structures of archaeological (prehistoric), paleontological, historical, cultural, artistic and religious value, sacred settlement, Intangible cultural types that bear sacred values such as rocks, lakes and waterfalls, which are recommended to be used for commercial purposes such as cultural knowledge, innovation and practices that reveal unique natural features or tangible objects and traditional lifestyles of communities".

For tangible cultural heritage items, applicable laws that fulfill the legislative obligations of the country where the project is located must be followed. With this law, cultural heritages must be determined and protected by the practices accepted in the world for the protection, finding, research and certification of cultural heritages by authorized institutions.

European Bank for Reconstruction and Development (EBRD)

The European Bank for Reconstruction and Development (EBRD) specifies the implementation of Performance Requirements 8 Cultural Heritage guidelines in order to understand the conservation and importance of cultural heritage. The EBRD emphasizes that cultural heritage, both tangible and intangible, is important for economic and social development and is an integral part of the continuity of cultural identity and practices (including traditions, beliefs and/or languages).

The PR8 requirement states that in case the project activities, the relevant laws and regulations and the obligations arising from the relevant international agreements affect any cultural heritage in the region and agreements approved by the project owner countries must be followed.

The main objectives of Performance Requirement 8 are as follows;

- support the protection and conservation of cultural heritage;
- adopt the mitigation hierarchy approach to protecting cultural heritage from adverse impacts arising from the project;
- promote the equitable sharing of benefits from the use of cultural heritage in business activities; and
- where significant elements of cultural heritage are identified, promote the awareness, appreciation and enhancement of cultural heritage as well as potential socioeconomic benefits for local communities

According to the EBRD PR8, the term cultural heritage defines it as a resource group that does not belong to people (that is not their own property), and that is accepted as a reflection of their developing values, beliefs, knowledge, and traditions from the past to the present. It covers all tangible (physical) and intangible cultural heritage recognized locally, regionally, or nationally or in the international community.

Physical cultural heritage refers to mobile or immovable objects, sites, groups of buildings and associated cultural or sacred sites, and natural features and landscapes of archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Intangible cultural heritage refers to practices, representations, expressions, knowledge, and skills that communities, groups, and in some cases, individuals consider being part of their cultural heritage and are passed down from generation to generation.

4.10.3 Extend of Study Area

The High Standard Train Project is planned to pass through Mersin-Adana-Osmaniye-Gaziantep provinces and the districts of these provinces. The provinces where the line is planned to pass and the areas surrounding the stations are considered as study areas. The working area related to cultural heritage and archaeological sites are the construction areas where excavations will be carried out in the project.

Excavation operations will be carried out within an area of 199 km on the route line of 286 km in total. Considering that cultural heritage and archaeological areas may be affected during the construction operations on the given routes, the impact area is determined according to these routes.

Routes for construction works within the scope of the project;

- Mersin-Adana Railway Route,
- Adana-İncirlik-Ceyhan-Toprakkale Railway Route,
- Toprakkale-Osmaniye-Bahçe Railway Route,
- Nurdağ-Başpınar Railway Route.

On the Mersin-Adana route;

- Working on an area of 76 km as 4 lines and realizing construction operations,
- Construction of 12 stations, railway stations and stops in the 76 km working area (Tırmıl Station, Karacailıas Station, Taşkent Station, Huzurkent Station, Tarsus Station, Çukurova Airport Connection Station, Yenice Station, Zeytinli Station, Küçükdilli Station, Bus Terminal Station, Şakirpaşa Station, Adana Station),
- For Çukurova Airport, it is planned to realize the missing construction works on the 9.5 km double line.

On the Adana-İncirlik-Ceyhan-Toprakkale route;

- Excavation works in a 49 km area between Adana-İncirlik-Ceyhan on a 79 km route,
- Construction works are planned to be carried out for the renovation of 3 stations (İncirlik Station, Yakapınar Station, Ceyhan Station).

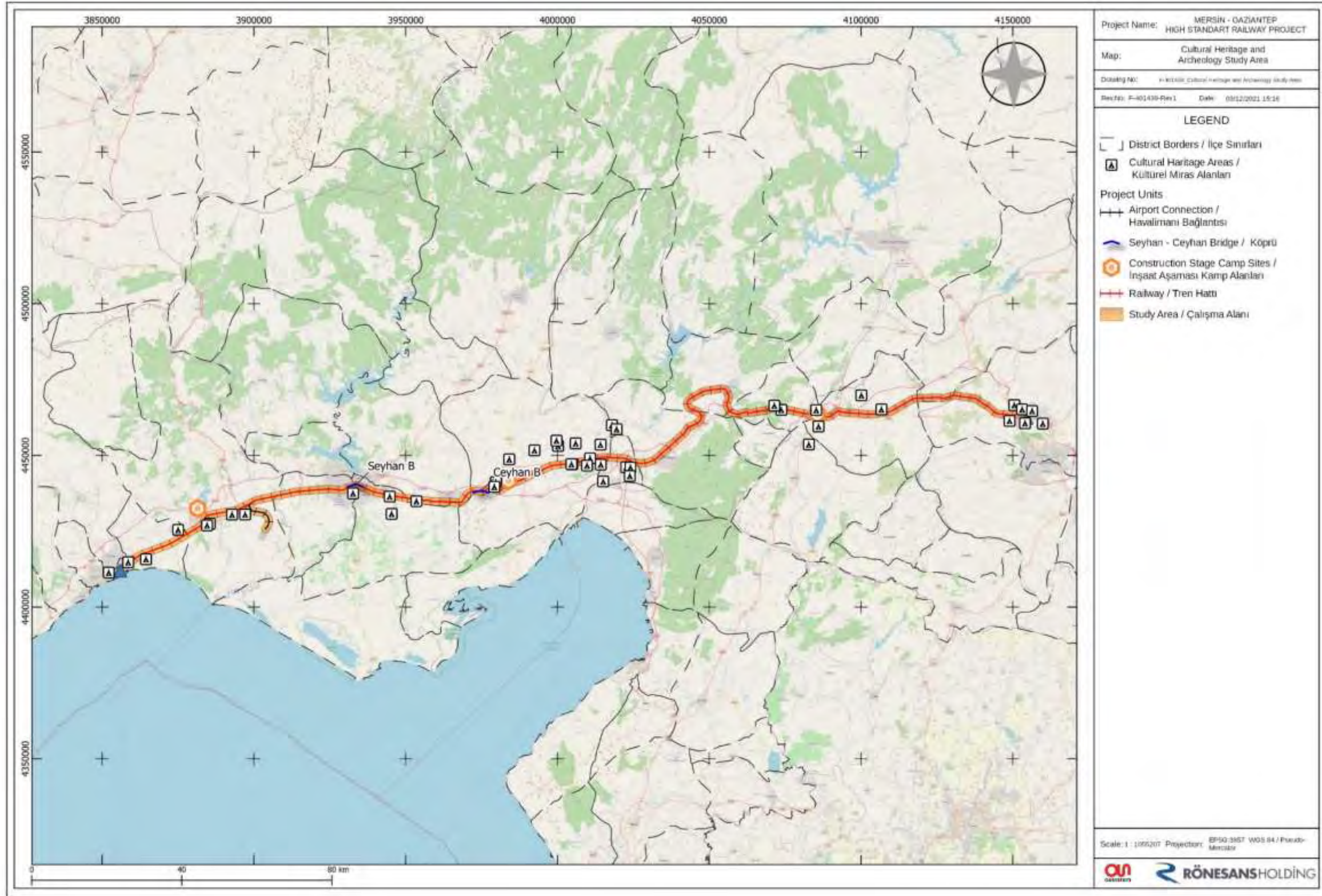
On the Toprakkale-Osmaniye-Bahçe route;

- Construction works of the double railway line on the 58 km route,
- Construction works of 3 stations (Osmaniye Station, Düziçi Station, Bahçe Station) are planned.

On the Nurdağ-Başpınar route;

- Construction works in the last 16 km of the 56 km route line,
- 1 station construction is planned

Cultural heritage and archeology study area is given below (see Map 4.38).



Map 4.38: Cultural Heritage and Archeology Study Area

4.10.4 Identification of Baseline Conditions

4.10.4.1 Desk Studies

It was determined whether there are cultural heritage and archeological findings in the region with the studies carried out on the routes followed for the High Standard Train Project covering Mersin-Adana-Osmaniye-Gaziantep provinces. The findings were given in the EIA files previously made for each line, as stated in the Archaeological Evaluation Report. In the table below, it is given whether there are cultural heritage and archeology findings and by which study (see Table 4.123 and Table 4.124).

Table 4.123: Cultural, Historical, Natural and Protected Areas around the Project Area

Locations	Cultural, Historical, Natural and Protected Areas	Status	Reference
Mersin-Tarsus	Tarsus Dalyanı Natural Protected Area	Natural Protected Area	Environment and Urban Ministry
Mersin-Tarsus	Göksu Deltası Natural Protected Area	Natural Protected Area	Environment and Urban Ministry
Mersin-Tarsus	Taşocağı Cave	Protected Area	Environment and Urban Ministry
Mersin-Center	Yumuktepe Mound	Archeological Area	Literature Study
Mersin-Tarsus	Tırmıl / Türmil Mound	Archeological Area	Literature Study
Mersin-Karacailyas	Karacailyas Mound	Archeological Area	Literature Study
Mersin-Nacarli	Nacarli Mound	Archeological Area	Literature Study
Mersin-Tarsus	Gözlükule Mound	Archeological Area	Literature Study
Mersin-Tarsus	Donuktaş Temple	Archeological Area	Literature Study
Mersin-Tarsus	Mahmutağa Mound	Archeological Area	Literature Study
Mersin-Tarsus	Hacıbozan Mound	Archeological Area	Literature Study
Adana-Ceyhan	Tatarlı Köyü Natural Protected Area	Natural Protected Area	Environment and Urban Ministry
Adana-Yüreğir	Misis Antik Kenti	Archeological Area	İncirlik Toprakkale 2nd Line Train Project Final EIA Report / Board decision dated 28.07.2011 and numbered 7393 taken by Adana Cultural and Natural Heritage Preservation Regional Board and Literature Study
Adana-Seyhan	Tepebağ Mound	Archeological Area	Literature Study
Adana-Yüreğir	İncirlik Mound	Archeological Area	Literature Study
Adana-Center	Kürkçüler Mound	Archeological Area	Literature Study
Adana-Yüreğir	Camili (Üçok Damgalı) Mound	Archeological Area	Literature Study
Adana-Ceyhan	Sirkeli Mound	Archeological Area	Literature Study
Adana-Yukarı Ova	Bozhöyük and Kuyluk Hills	Archeological Area	Literature Study
Adana-Ceyhan	Kamışlı / Yarma Mound	Archeological Area	Literature Study
Osmaniye-Toprakkale	Delihalil Hill Antique Settlement	Archeological Area	Literature Study
Osmaniye-Toprakkale	Toprakkale Castle and Settlement	Archeological Area	Literature Study

Locations	Cultural, Historical, Natural and Protected Areas	Status	Reference
Osmaniye-Yenimahalle	Yapılıpınar Mound	Archeological Area	Literature Study
Gaziantep-Nurdağ	Olucak (Ağaçlı Mound) - Gökçedere (Nergis) Mound	Archeological Area	Literature Study
Gaziantep-Şehitkamil	Coba (Sakçagözü) Mound	Archeological Area	Literature Study
Gaziantep-Nurdağ	Gedikli-Karahöyük	Archeological Area	Literature Study

The protected areas that are mentioned in Table 4.123 are not near the train project area. Cultural Heritage and Archaeological area near the project area are given below (see Table 4.124).

Table 4.124: Cultural Heritage and Archeological Findings by Routes

Locations	Cultural, Historical and Natural Areas "Cultural Heritage" and "Natural Heritage" Status	Reference
Mersin-Adana Railway	<ul style="list-style-type: none"> There are no cultural heritage and natural heritage sites in and close to project area. There is no sensitive area 	<ul style="list-style-type: none"> Project Introduction File for The Addition of the 3rd And 4th Line Railway Between Adana-Mersin Stations Literature Study
Adana-İncirlik-Ceyhan-Toprakkale Railway	<ul style="list-style-type: none"> It will pass just north of the Old Misis settlement at the 25th km of the Adana-Ceyhan line; The Misis Antique City of Yüreğir District of Adana Province passes through the 1st and 3rd degree archaeological site, Sirkeli Mound and its Vicinity, located at the starting point of the Yukarı Ovalı within the borders of Çeyhan district at approximately 38th km of the Adana - Ceyhan line, Kamışlı/ Yarma Höyük, located at the 21st km of Ceyhan-Mustafabeyli line, It is the most sensitive point of the project, 	<ul style="list-style-type: none"> İncirlik Toprakkale 2nd Line Train Project Final EIA Report / Board decision dated 28.07.2011 and numbered 7393 taken by Adana Cultural and Natural Heritage Preservation Regional Board Literature Study
Toprakkale-Bahçe Railway	<ul style="list-style-type: none"> Neronias Ancient City located in the area between Düziçi Station and T4 tunnel entrance 	<ul style="list-style-type: none"> Literature Study
Bahçe-Nurdağ Railway	<ul style="list-style-type: none"> İslahiye (Sakçagözü) Plain is one of the sensitive points in the region. 	<ul style="list-style-type: none"> Literature Study

The archaeological sites specified in the Archaeological Evaluation Report are given below by province.

Mersin

Located in the city center of Mersin, Yumuktepe Mound (Yumuktepe Höyük) is one of the most important settlements of Oval Cilicia. The mound, which is in a modern settlement, is located to the east of the Müftü Stream. Excavation and research projects were carried out at certain intervals, the first of which was in 1936.

A cultural sequence from the Neolithic Period to the Middle Ages has been unearthed in the mound, which is still being explored today.

The mound is of great importance for both Near East and Anatolian archeology, as it provides information about 8000 thousand years of human history. However, it has been severely damaged due to both natural conditions (continuous erosion of the Mufti Creek) and the constant intervention of the modern world. Once, the mound was completely afforested to make a park. For this reason, today it looks like a wooded hill. It is located approximately 2.5 km west of the High Standard Train application project line and is outside the application area.

The picture of the area where Yumuktepe Mound (Yumuktepe Höyük) is located is given below (see Figure 4.64).



Figure 4.64: Yumuktepe Mound (Yumuktepe Höyük)

One of the important settlements in the city center is within the borders of Akdeniz district and is called Tırmıl/Türmil Mound (Tırmıl/Türmil Höyük). As a result of the work carried out on the 12 m high mound, BC. A chronology dating back to 5 thousand years has been determined. There is a castle structure at the top of the mound. It is one of the fortified (sheltered) points on the Tarsus-Mersin line, which was one of the important commercial routes in the region especially during the Early Byzantine period. The mound is located 400 m northwest of the project implementation line. With this location, it is seen as one of the low-density sensitive areas within the project impact area.

The picture of the area where Tırmıl Mound (Tırmıl/Türmil Höyük) is located is given below (see Figure 4.65).



Figure 4.65: Tırmıl Mound (Tırmıl Höyük)

Karacailyas Mound (Karacailyas Höyüğü), located within the borders of the Mediterranean district, is known by the name of the neighborhood where it is located. It is on the east side of Deliçay, approximately 2 km northwest of Karacailyas. In the mound located 1.5 km south of the project implementation area. There is a chronological sequence going back to the 7th thousand years. While it had a height of at least 12 m in the 1950s, it has become a small hill with a height of 5 meters due to the intense destruction it is exposed to today. There is a citrus garden on a large part of the settlement, which is spread over an area of 300x200 m. This caused intense damage to the mound.

The picture of the area where Karacailyas Mound (Karacailyas Höyüğü) is located is given below (see Figure 4.66).

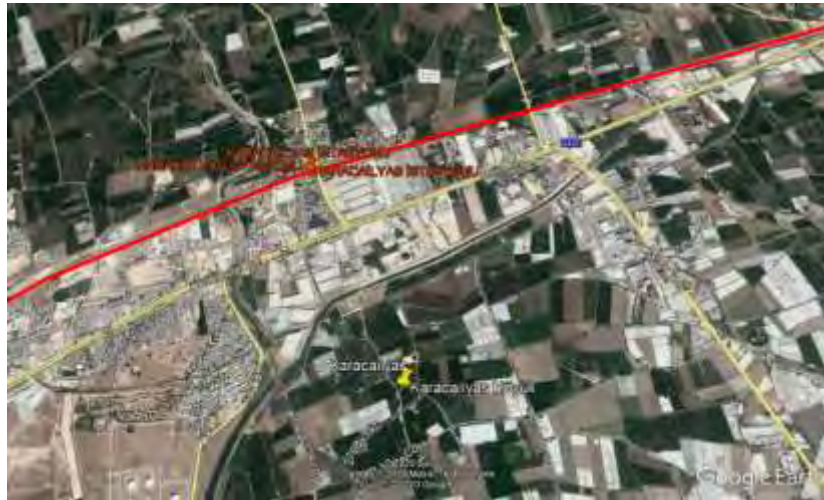


Figure 4.66: Karacailyas Mound (Karacailyas Höyük)

Nacarlı Mound (Nöcarlı Höyük) It is located within the borders of Nacarlı village between Mersin and Tarsus. The settlement with a peak height of 30 m has a 300x200 m span. Archaeological data showing the Chalcolithic Age and the early periods of the Iron Age were obtained with short excavations carried out in the 1950s. Intensive agricultural activities continue around the project and the mound, which is located 2.4 km

northwest of the Huzurkent Station. Even if this is under protection, it causes a certain amount of damage to the mound. The Mersin-Gaziantep High Standard Train Project to be implemented is far from the implementation site and it is not thought that this project will be affected during the implementation phase.

The picture of the area where Nacarlı Mound (Nöcarlı Höyük) is located is given below (see Figure 4.67).



Figure 4.67: Nacarlı Mound (Nöcarlı Höyük)

One of the important settlements for both the region and the neighboring cultural regions, which is located within the borders of Tarsus district of Mersin province, is Gözlükule. Gözlükule Mound (Gözlükule Höyüğü) is located 100 m north of Adana-Mersin state road and is completely among modern settlements. The settlement, which is 1km southeast of the project implementation line, actually consists of more than one hilly. The excavation and research work that started at the end of the 19th century has come to this day by periodically and by long breaks. As a result of these studies, the cultural stratigraphy starting from the Neolithic Period to Late Rome and Early Byzantine has been revealed in Gözlükule. Although it is outside the application area, it has been briefly described because of its importance for Anatolian archeology, just like Yumuktepe.

The picture of the area where Gözlükule Mound (Gözlükule Höyüğü) is located is given below (see Figure 4.68).



Figure 4.68: Gözlükule Mound (Gözlükule Höyüğü)

Tarsus-Donuktaş Temple is within the urban texture of Tarsus and the modern Cumhuriyet District is within the spreading area. It is 700 m northeast of Gözlükule Höyük and 1.7 km northeast of the project implementation line. It is outside the domain of the application scene. It is remarkable in terms of research history and data. Described by Barbaou in 1550, the building was seen as a palace. Later in the 1850s, the building, which attracted the attention of French travelers and archaeologists in the ongoing process, was defined as the tomb of the Assyrian King Sardanapalus. The building, which has a length of about 100m and a width of 45m and also very thick walls, was built in the Roman Period. It was understood that Tarsus was a temple dedicated to its founding god in the 2nd century.

The picture of the area where Donuktaş Temple is located is given below (see Figure 4.69).



Figure 4.69: Donuktaş Temple

Mahmutağa Mound is located within the borders of Mahmutağa district. The mound is located on a small hill at a distance of 150 m to Adana Mersin highway and approximately 1 km to the project implementation line. The destruction rate is very high due to agricultural activities. Looking through the surface finds, it is seen that there are ceramic data belonging to the Chalcolithic, Bronze and Iron ages. The project does not remain within

its impact area. Hacıbozan Mound located approximately 2 km south of the project implementation line by the Adana - Mersin highway, is approximately 5 m above the alluvial plain. It was included in the cultural inventory in 1951. Like other mounds in the region, Hacıbozan Höyük was greatly affected by intense agricultural activities. As part of the surveys conducted in the region after 1951, the mound was revisited and ceramic samples dating to the Chalcolithic and Early Bronze Periods (7000-5000 years ago) were collected. The project does not remain within its impact area.

Adana

Tepebağ Mound (Tepebağ Höyüğü), located on the bank of Seyhan River, actually forms the core of modern Adana today. It has a height of 15 m above the plain level and covers an area of approximately 20 hectares with a measurement of approximately 400 m on the north-south line and 650 m on the east-west line. While a part of the mound, which has intense housing today, is covered with architecturally visual houses from the 18-19th century, a significant part is completely covered with undefined and featureless architectural units (shanty houses). The first excavations on the mound were made in 1936. Work continued at regular intervals. It was registered in 1967 and declared as a 1st Degree Archaeological Site. The most comprehensive work on the mound started in 2014. With the excavations carried out since this date, the cultural soil has been reached at a depth of 5 meters. B.C. A stratigraphy dating back to the middle of the 2nd millennium (4000 thousand years ago) has been identified. It is known that there are archaeological data indicating the existence of the Neolithic Period regardless of the layer. Tepebağ mound, located outside the project impact area, is important in terms of its symbolic feature.

The picture of the area where Tepebağ Mound (Tepebağ Höyüğü) is located is given below (see Figure 4.70).



Figure 4.70: Tepebağ Mound (Tepebağ Höyüğü)

İncirlik Mound (İncirlik Höyüğü) is in the district of İncirlik in the district of Yüreğir in Adana. It is located to the south of the Adana-Osmaniye E5 highway, 75 m from the project implementation site and 285m from the project implementation area. The mound is about 20 m above the plain level today. It covers an area of 300x150 m. However, it is seen that there is a spread especially towards the state road. The dense urbanization in this part made it very difficult to identify and define. Archaeological material starting from the Chalcolithic Period to the Late Roman Early Byzantine period has been identified in the mound with surface studies carried out by different scientists in different periods.

The picture of the area where İncirlik Mound (İncirlik Höyüğü) is located is given below (see Figure 4.71).



Figure 4.71: İncirlik Mound (İncirlik Höyüğü)

Kürkçüler Mound (Kürkçüler Höyüğü), when the aerial photograph is examined, a chain of mounds starting from Tarsus to Misis-Mopsuhetia can be seen. This line is also the line where the Mersin-Adana-Osmaniye State Road passes through the railway. No matter how much technology develops, advantageous points on geography have always been preferred by people and will be preferred from now on. Just like İncirlik Höyük, the mound is in the south of Adana-Osmaniye State Road and in the south direction at a distance of 200 m to it and 350 m from the project implementation line. Since it is on the road and is easily accessible, it was frequently visited and informed by researchers working in the region. Although it is not in a modern settlement, the destruction in the mound is very high. Besides agricultural activities, the fact that it is in the industrial zone has been the main reason for this destruction. A chronological sequence has been defined indicating the Chalcolithic Age and Bronze Age.

The picture of the area where Kürkçüler Mound (Kürkçüler Höyüğü) is located is given below (see Figure 4.72).



Figure 4.72: Kürkçüler Mound (Kürkçüler Höyüğü)

Camili (Üçok Damgalı) Mound (Camili (Üçok Damgalı) Höyüğü) is located further south between İncirlik Mound and Kürkçüler Mound and is 4.5 km away from the Adana - Osmaniye state road and the project site. It is situated on a rocky formation extending in the north-south line. The alluvial fill around the hilly area where the mound is located is a clear proof of how the Ceyhan River has changed the geography. BC in the mound outside the project impact area. Archaeological data have been found indicating the periods of 2 thousand and later. It is also known to exist in stone tools that may be in the Early Neolithic Period. It is one of the most important mound settlements in the region due to its location and the results obtained.

The picture of the area where Camili (Üçok Damgalı) Mound (Camili (Üçok Damgalı) Höyüğü) is located is given below (see Figure 4.73).



Figure 4.73: Camili (Üçok Damgalı) Mound (Camili (Üçok Damgalı) Höyüğü)

The Misis Antique City where is on the way of Adana-Toprakkale Railway line in Yüreğir Adana is about 1.22 km away from the railway line and is about 27 km away from Adana Province. It is located near Ceyhan River (Pyramos). The history of Misis begins with the Mound, which is probably in the Neolithic Period (6000 BC) and The Misis Antique City is within the 1st and 3rd degree archaeological site. Misis was captured by Hittite, Assyrian, Macedonian and Seleucids, and became an important center during the Roman and Byzantine Periods. It has been rebuilt since the 8th century AD and witnessed many wars. It is the Havraniye Caravanserai built in 1542 with mosaics belonging to the 4th century AD, the 9-eyed stone bridge, the walls in the acropolis and the city remains, and the single domed cubic mosque built in 1648.

The picture of the area where The Misis Antique City is located is given below (see Figure 4 72).



Figure 4.74: The Misis Antique City

Sirkeli Mound (Sirkeli Höyük) is one of the most important mounds in the plain. It is located 40 km east of Adana city center within the borders of Ceyhan district. It is at the crossing point and dominant of the roads reaching from Mesopotamia to Northern Syria, from the Upper Plain to the interior of Anatolia, and from the far point to Western Anatolia. The mound, in other words, is an upper city at an altitude of 30 m from the Ceyhan plain, a 300x400 m mound settlement with a fan form in the north, and a 300x400 m large mound containing the trapezoidal plateau in the north from the lower city, which spreads towards the north, southeast and west of this settlement, and It consists of a lower city extending in the southeast direction. This spread includes the project implementation line. Sirkeli Mound and the settlement spread to all directions of the mound starting from the Chalcolithic Period (5000 BC) to BC. There is a settlement that continues uninterruptedly until the end of the 1st century. The rock relief on the rock mass at the northeast end of the mound is extremely important. This rock relief Hittite King II. It belongs to Muwatalli.

The picture of the area where Sirkeli Mound (Sirkeli Höyük) is located is given below (see Figure 4.75).

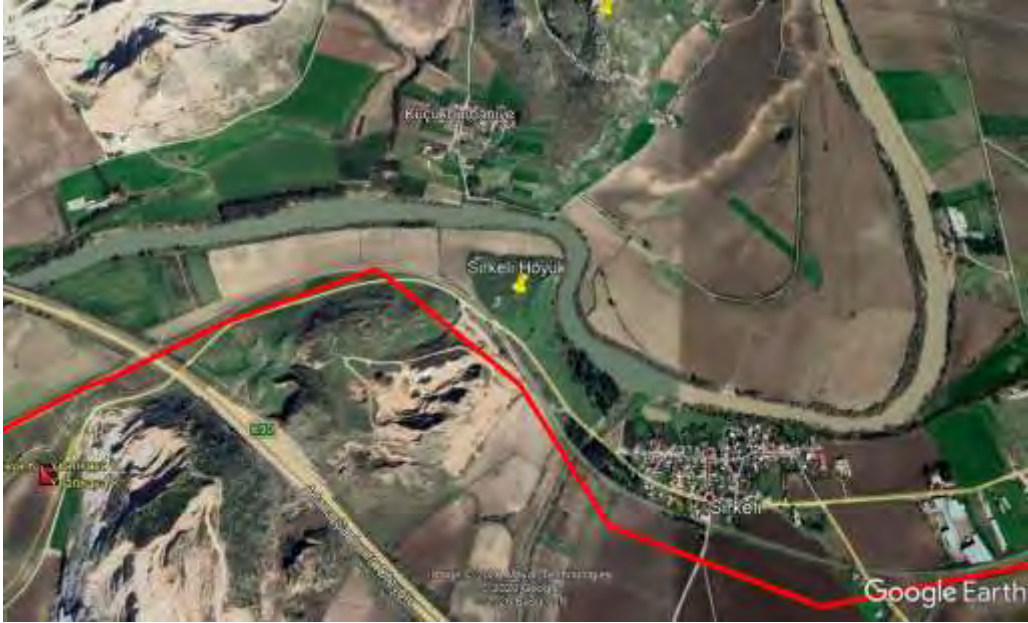


Figure 4.75: Sirkeli Mound (Sirkeli Höyük)

Bozhöyük and Kuyluk Hills are among the largest mounds in the Yukarı Ova. It is located 14 km east of Ceyhan city center and 2 km west of Kuzucak village. The project is 150 m from the application line. This area actually consists of four settlements that have been inhabited in different periods and are connected with each other from time to time. However, when it comes to today, two of these settlements have been destroyed due to intensive agricultural activities. For him, the identification is made over Bozhöyük Hill and Kuyluk Hill, located just west of it. Data showing the existence of Roman and Byzantine Periods in Kuyluk Hill were recorded with the studies carried out. Since they are located approximately 200 m south of the project implementation line, this is considered one of the sensitive points during production activities in the field.

The picture of the area where Bozhöyük and Kuyluk Hills is located is given below (see Figure 4.76).



Figure 4.76: Bozhöyük and Kuyluk Hills)

Kamışlı/Yarma Mound (Kamışlı/Yarma Höyük) is located 2.5 km west of Mustafabeyli town center and 2.6 km north-northeast of Azizli village. It is 250 m south of the Adana-Osmaniye State Road. The entire surrounding of the mound, which has been heavily damaged, is used as agricultural land. In addition, another cause of damage is the train road passing right in the middle. The Natural High Standard train project implementation line will also pass through the mound. Archaeological data showing the existence of the Roman and Byzantine periods were obtained from the surface studies carried out on the mound. It is the highest risk area of the project. During the application, it is recommended to conduct a survey in this area and a rescue excavation that will develop accordingly. Recommended working methodology is given below;

- before to start excavation works, detailed site survey and if needed archeological excavation should be conducted by archeologist/s,
- Results of detailed site survey and/or archeological excavation should be submitted to related Directorate of Cultural Heritage Preservation Regional Board,
- Commission of Directorate of Cultural Heritage Preservation Regional Board will decide to how construction works will be held. Three options which will be implemented to continue construction works of the Project are given below,
 - o Start rescue excavation and archeological finds should be moved by archeologists from the construction site or,
 - o Replace the railway route to out of the archeological site or,
 - o No need any action and the construction works of the Project can continue under the supervision of an archaeologist.

The picture of the area where Kamışlı/Yarma Mound (Kamışlı/Yarma Höyük) is located is given below (see Figure 4.77).



Figure 4.77: Kamışlı/Yarma Mound (Kamışlı/Yarma Höyük)

The part of the High Standard Train Project between Adana-Ceyhan district and Osmaniye-Toprakkale districts consists of the combination of more than one sediment and alluvial plain within the general definition of Çukurova and is called the Yukarı Ova. There are dozens of mounds in the north and south of the High Standard Railway that passes through the westernmost end of the Yukarı Ovalı.

Osmaniye

Delihalil Hill Antique Settlement is within the boundaries of Toprakkale district. The entire area, including Toprakkale settlement, is basaltic. Delihalil Hill Ancient settlement consists of three separate settlements in the east, west and south directions. While the east and south settlements are like small neighborhoods, the west settlement is the central settlement, consisting of public spaces and regularly defined neighborhood clusters. Delihalil settlement is the most important center that sheds light on the Late Antiquity of the region and is outside the project impact area.

The picture of the area where Delihalil Hill Antique Settlement is located is given below (see Figure 4.78).



Figure 4.78: Delihalil Hill Antique Settlement

Toprakkale Castle and Settlement is located at the northern exit of the Toprakkale Kısık Strait and in the middle of this strait. Due to its location, it has been in control of the roads since ancient times. The hill on which the castle is located is a mound. Intense archaeological material was found on the southwest, west and northern skirts of the hill. These are dated to the Hittite Empire, Iron Age, and Late Hellenistic, Roman, Byzantine and Middle Ages periods in the settlement.

The picture of the area where Toprakkale Castle and Settlement is located is given below (see Figure 4.79).



Figure 4.79: Toprakkale Castle and Settlement

Yapılıpınar Mound (Yapılıpınar Höyük) is located in the city center of Osmaniye within the borders of Yenimahalle. The mound, located just west of the Osmaniye - Kadirli motorway, is a shallow mound measuring 200x100 m in dimensions and with a maximum height of 5 m. During the studies carried out on the mound, archaeological data indicating the end of the Neolithic and Bronze Ages were identified. The mound, which is outside the project implementation line, is important in terms of showing the cultural depth of Osmaniye going back to the Neolithic Period.

The project line starting from Mersin extends parallel to the old line up to Şekerdere locality located within the borders of Osmaniye province. From this point on, the High Standard Train application line turns to Düziçi with a route that will reach Yarbaşı and Düziçi settlements. At this point, after passing through various tunnels, Haruniye plain is reached as Düziçi.

MS. the ruins of the ancient city of Neronias, which is thought to have been founded in reference to the famous King Nero, who ruled Rome between the years 54-68 in the 1st century, are under the modern Düziçi district. Especially in Lowland Cilicia. Roman cities established since the 1st century have had wide spreading areas. For this reason, it is known that the city of Neronias-Eirenopolis Düziçi also has a wide distribution area, as mentioned above. Therefore, this area should be one of the sensitive working points in the field studies of the project.

The project line follows a parallel course with the old line and state roads in Kalecik between Düziçi-Bahçe districts and arrives at Bahçe district. As a result of the recent salvage excavations and surveys conducted in the district of Bahçe, it was observed that the density of rock tombs and mosaic areas increased. Necropolis areas consisting of chamber tombs have been identified in both the north and south of the line, which is outside the impact area of the project implementation line.

After the Nur Mountain tunnel crossings, the project line enters within the provincial borders of Gaziantep. Nurdağ and Şehit Kamil, the districts where the project will take place, are geographically defined within the İslahiye cultural zone. The region has an important cultural inventory from the Neolithic Period to the present day.

Gaziantep

Olucak (Ağaçlı Mound) - Gökçedere (Nergis) Mound are located on the north and south of the project line, respectively, at the exit from the Nurdağ tunnels. Archaeological data dated 5000 years ago were identified during the surveys carried out in these mounds outside the project impact area. Gözlühöyük and Kakırt Mound, located approximately 6 km south of the project line, are also dated to the same period.

Coba (Sakçagözü) Mound (Coba (Sakçagözü) Höyük) is located approximately 3 km west of Sakçagözü town and is 12 m above the plain. Excavations were carried out in different periods on the mound, which measures approximately 150x100 m. With these studies carried out in two periods between 1907-12 and 1949-51, the Chalcolithic Period and BC. The cultural layers dated to the Late Hittite period to the 1st millennium BC were unearthed. B.C. Its strata dated to the Late Hittite Kingdoms at the beginning of the 1st Millennium BC are the most magnificent period of the mound.

The picture of the area where the Coba (Sakçagözü) Höyük (Coba (Sakçagözü) Höyük) is located and the Geç Hittite Lions and Orthostats, one of the architectural remains unearthed in the Mound, are given below (see Figure 4.80 and Figure 4.81).

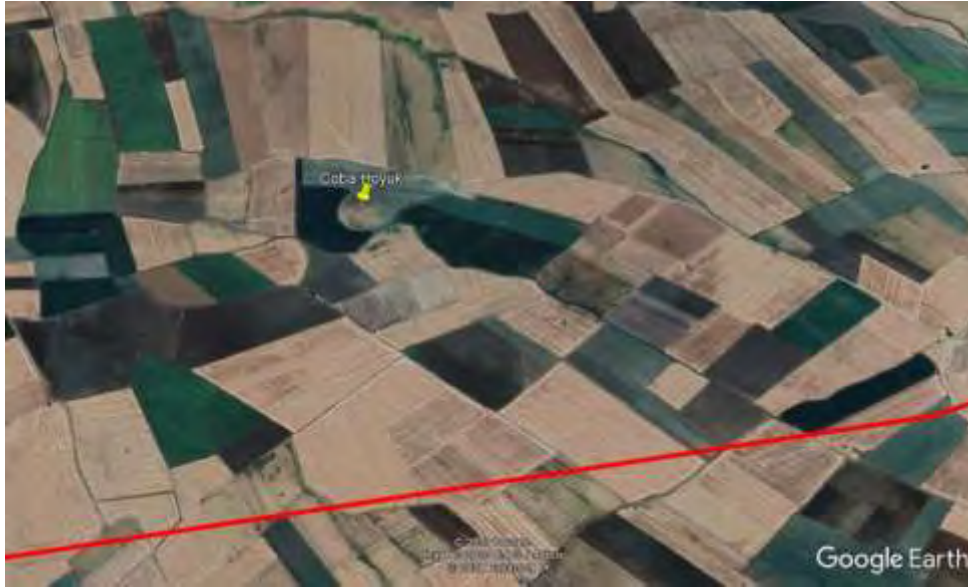


Figure 4.80: Coba (Sakçagözü) Mound (Coba (Sakçagözü) Höyük)



Figure 4.81: Geç Hittite Lions and Orthostats

Gedikli-Karahöyük is located on the western border of the fertile Sakçagözü (Keferdiz) plain, approximately 30 km northeast of Nurdağ district. It is a large mound with a width of 250x190 m and a height of over 30 m. Architectural layers covering the Late Chalcolithic, Early, Middle, Late Bronze Ages and the Iron Age were unearthed with the work carried out on the mound.

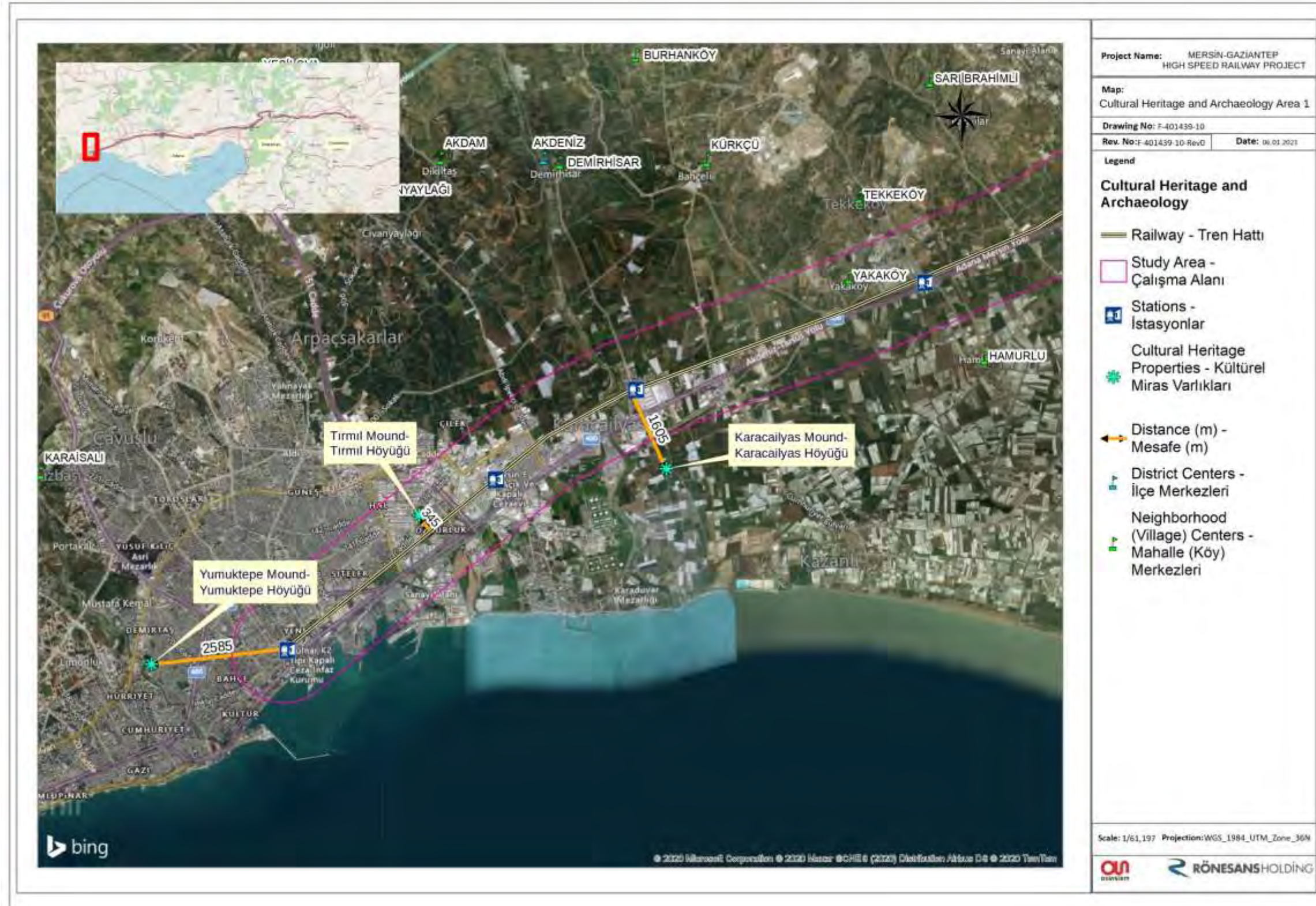
The project line continues with the tunnel passages starting from the east of Şatırhüyük village in the northeast of the Sakçagözü plain and descends to the Dülük Plain within the boundaries of Şehitkamil District. The project line ends in Başpınar Organized Industrial Zone. Surveys were carried out in different periods in Başpınar Organized Industrial Zone, in the surrounding areas including Aktoprak, Sam and Dülük villages. With these studies, data indicating Paleolithic Periods around the project line were obtained. This region is one of the sensitive areas of the project.

The picture of the area where Gedikli-Karahöyük is located is given below (see Figure 4.82).

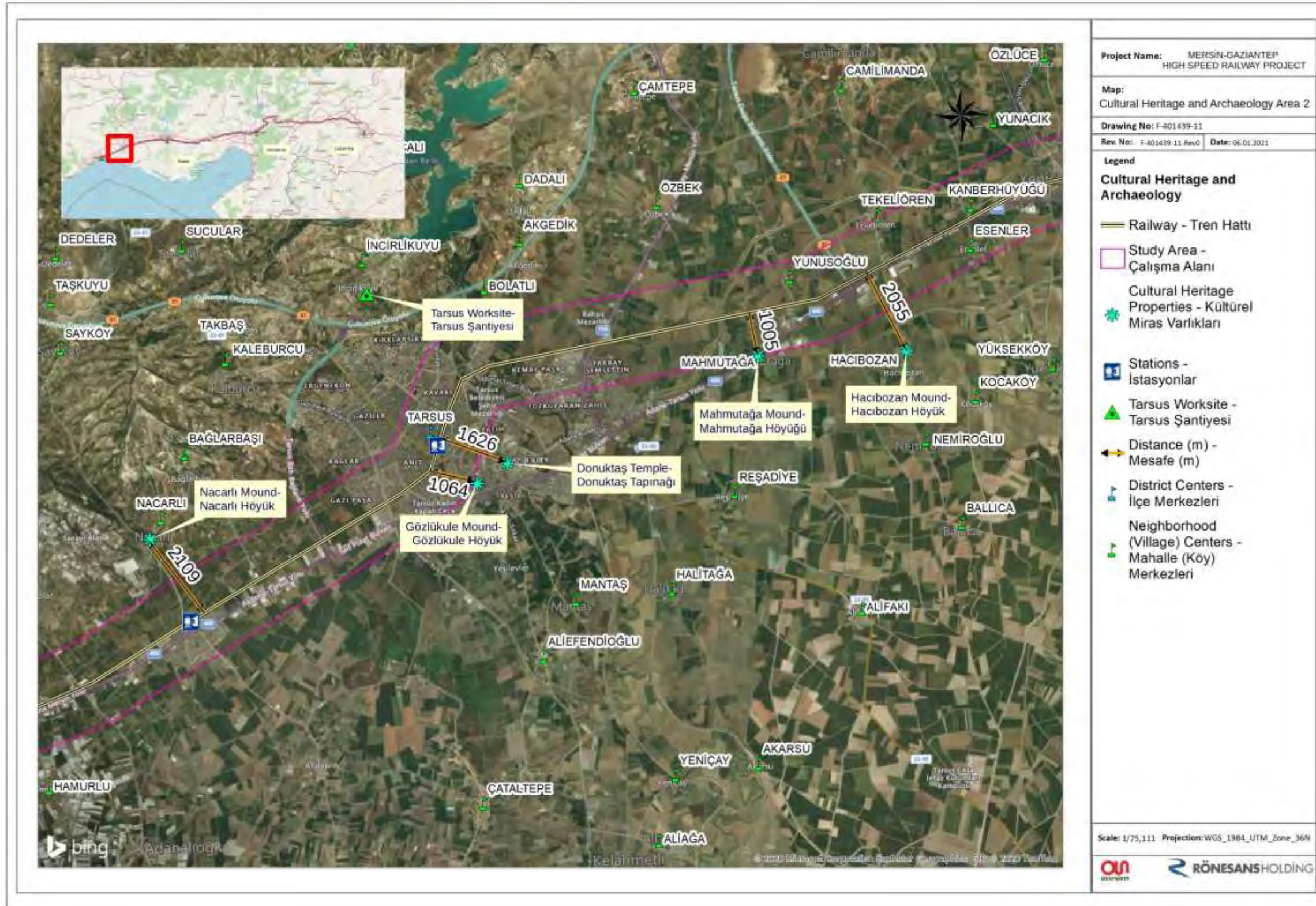


Figure 4.82: Gedikli-Karahöyük

Maps showing cultural heritage and archeology sites are given below. Maps are divided into fields (see between Map 4.39 to Map 4.48).



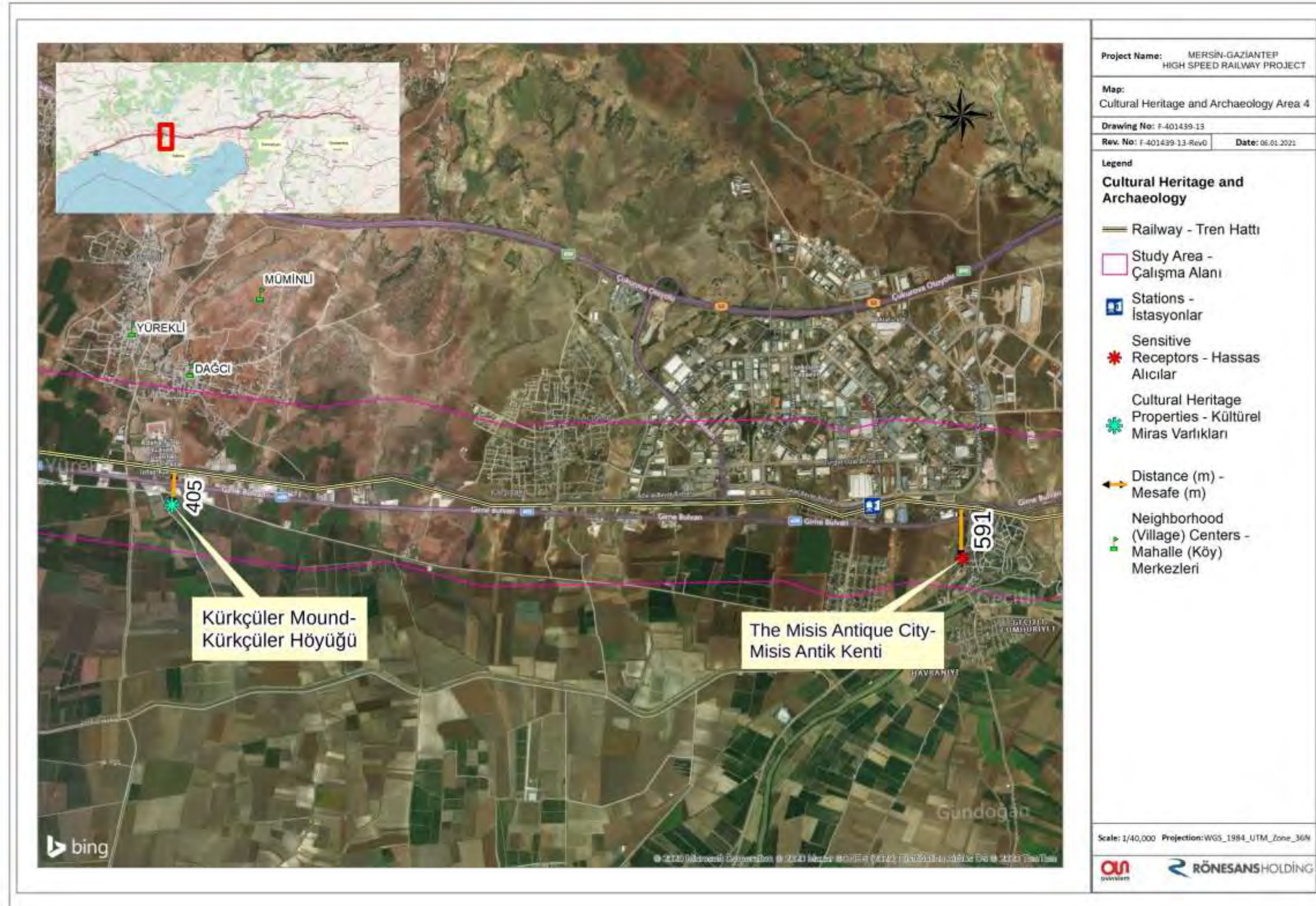
Map 4.39: Cultural Heritage and Archaeology Area 1



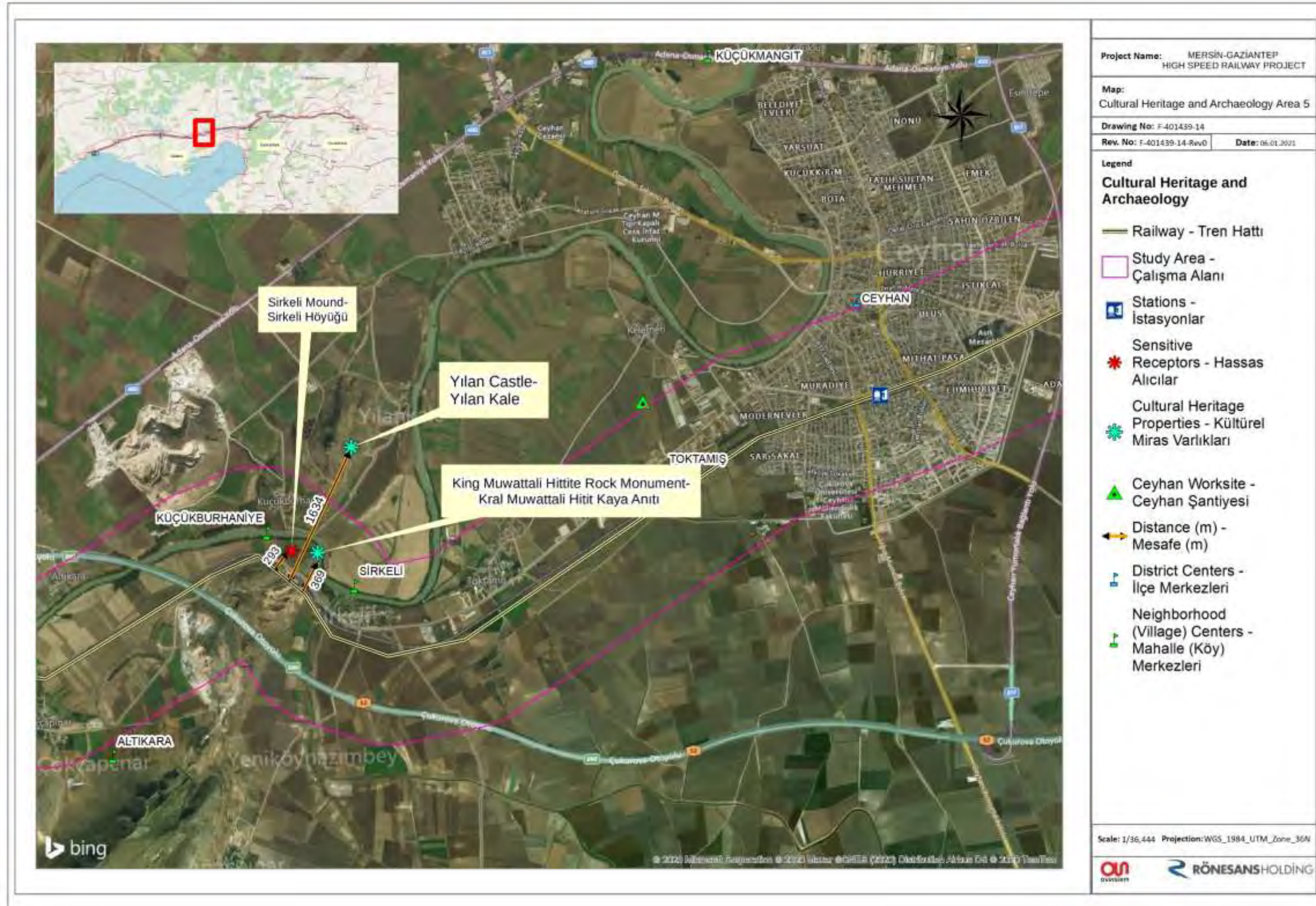
Map 4.40: Cultural Heritage and Archaeology Area 2



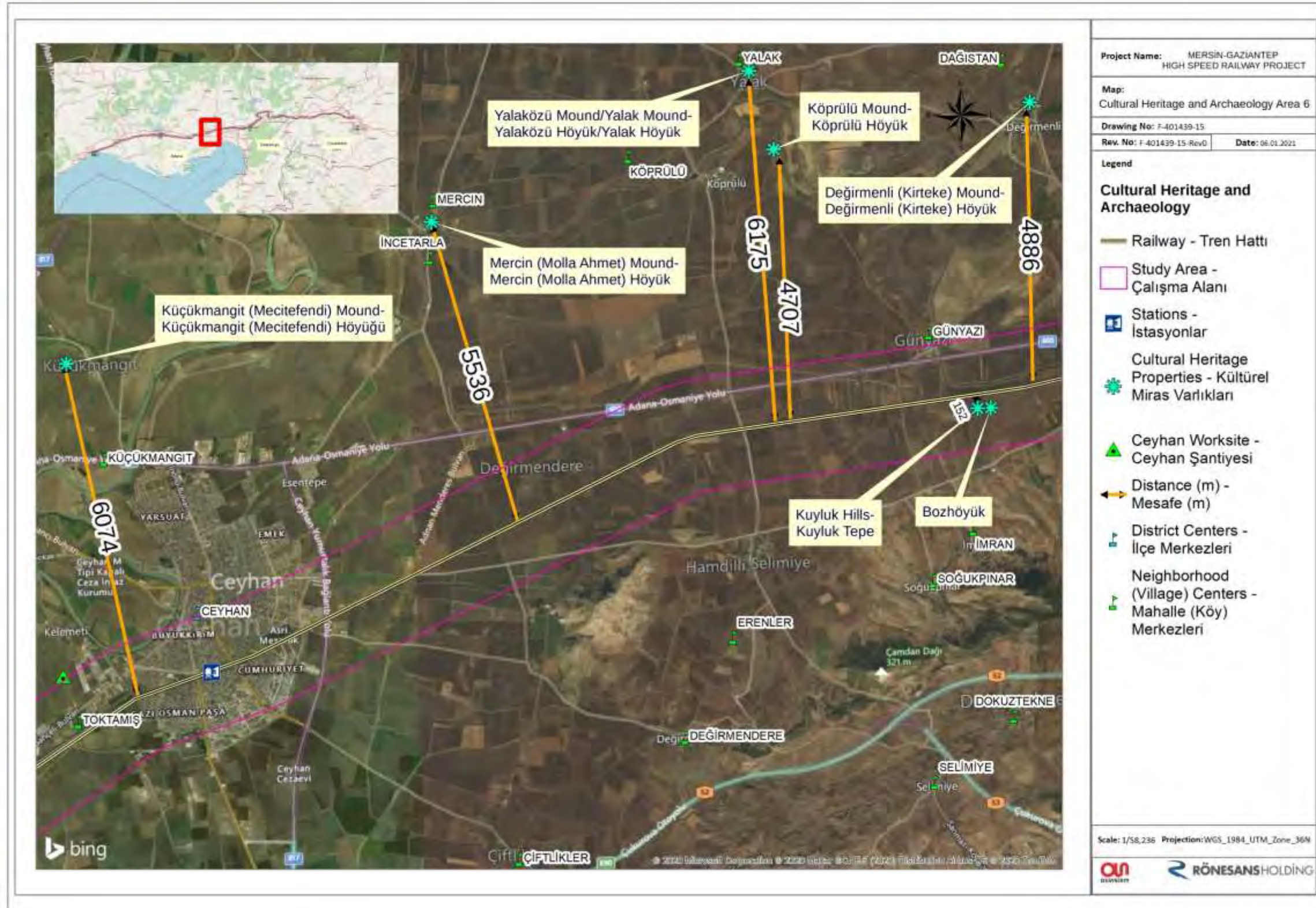
Map 4.41: Cultural Heritage and Archaeology Area 3



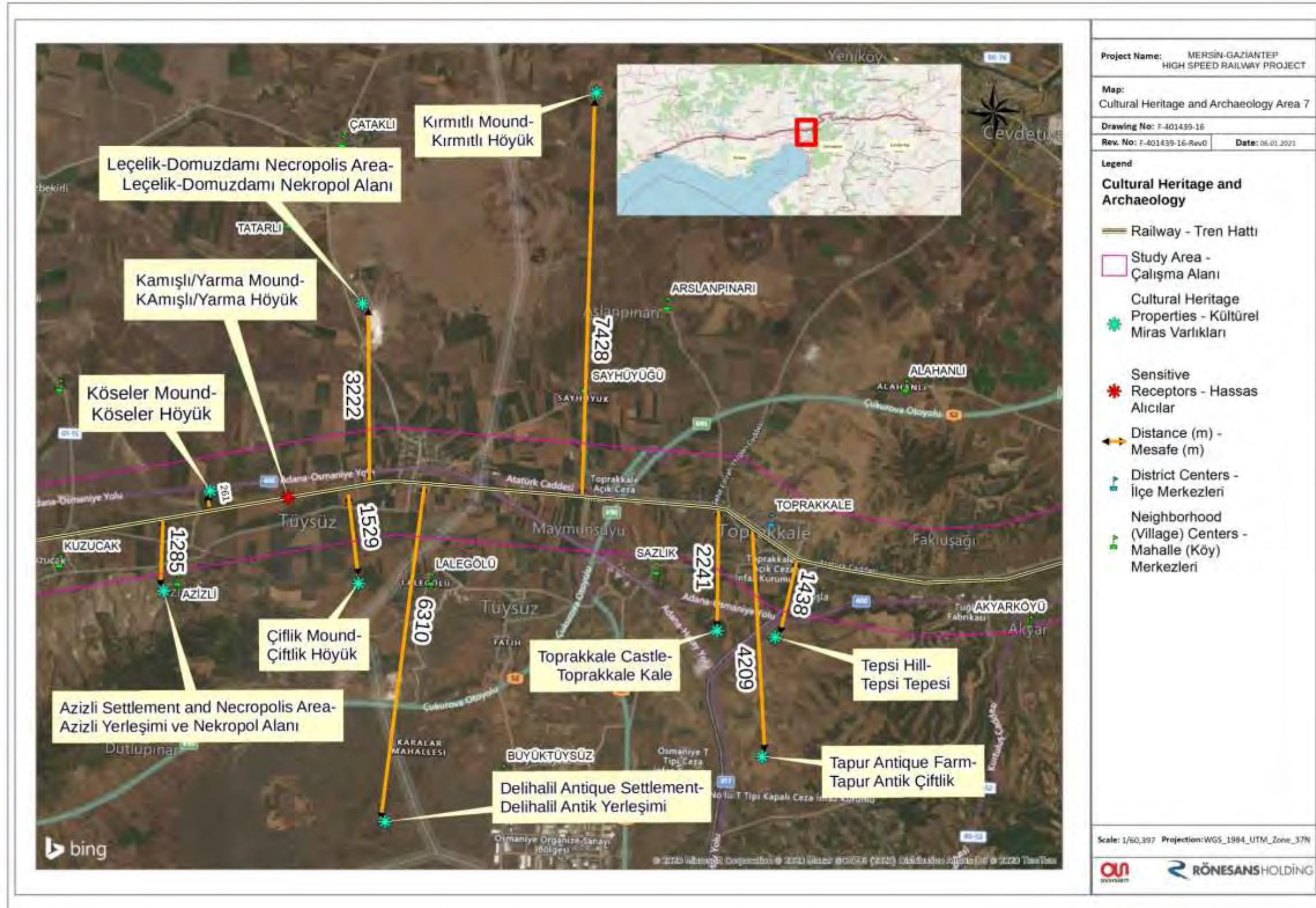
Map 4.42: Cultural Heritage and Archaeology Area 4



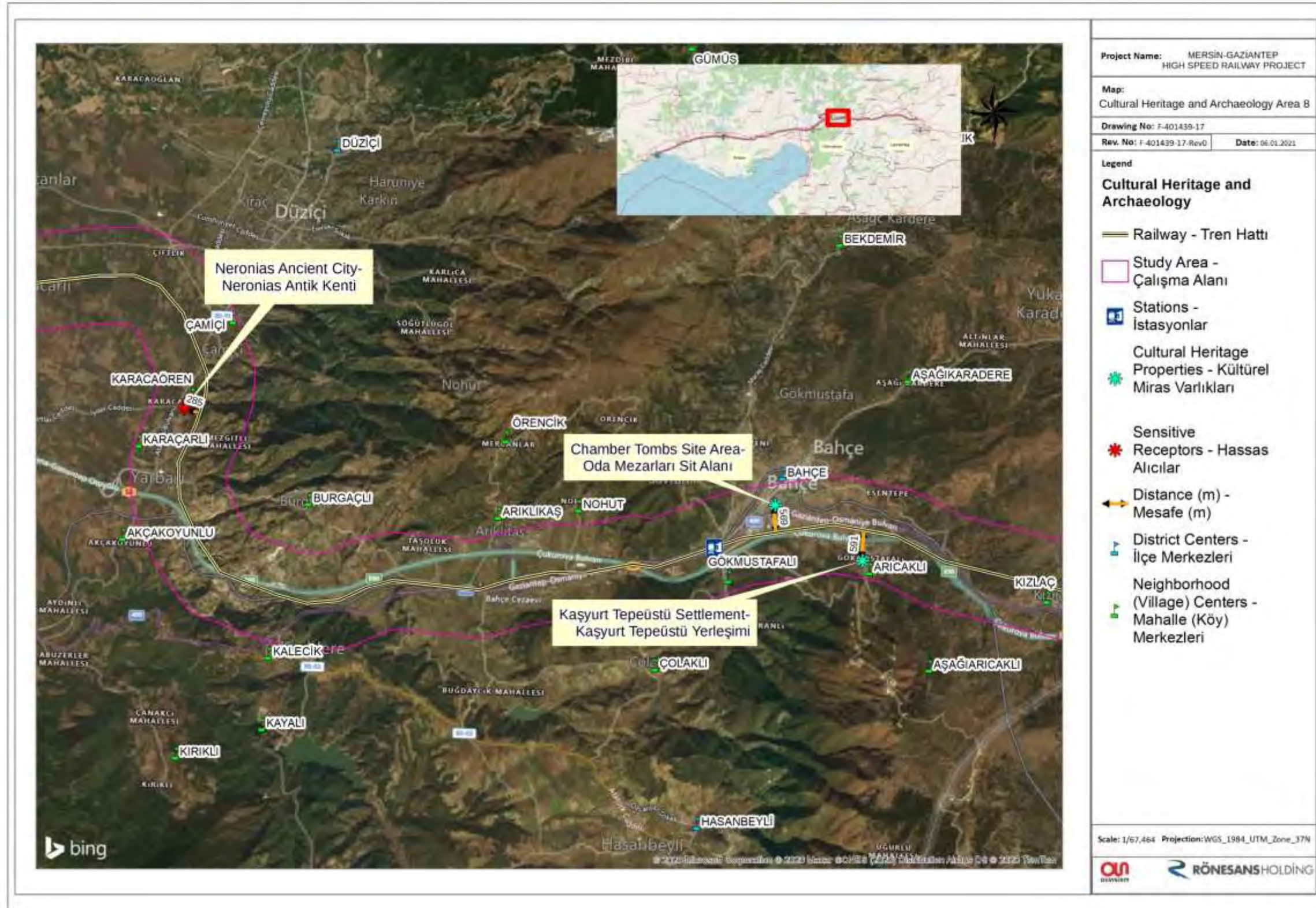
Map 4.43: Cultural Heritage and Archaeology Area 5



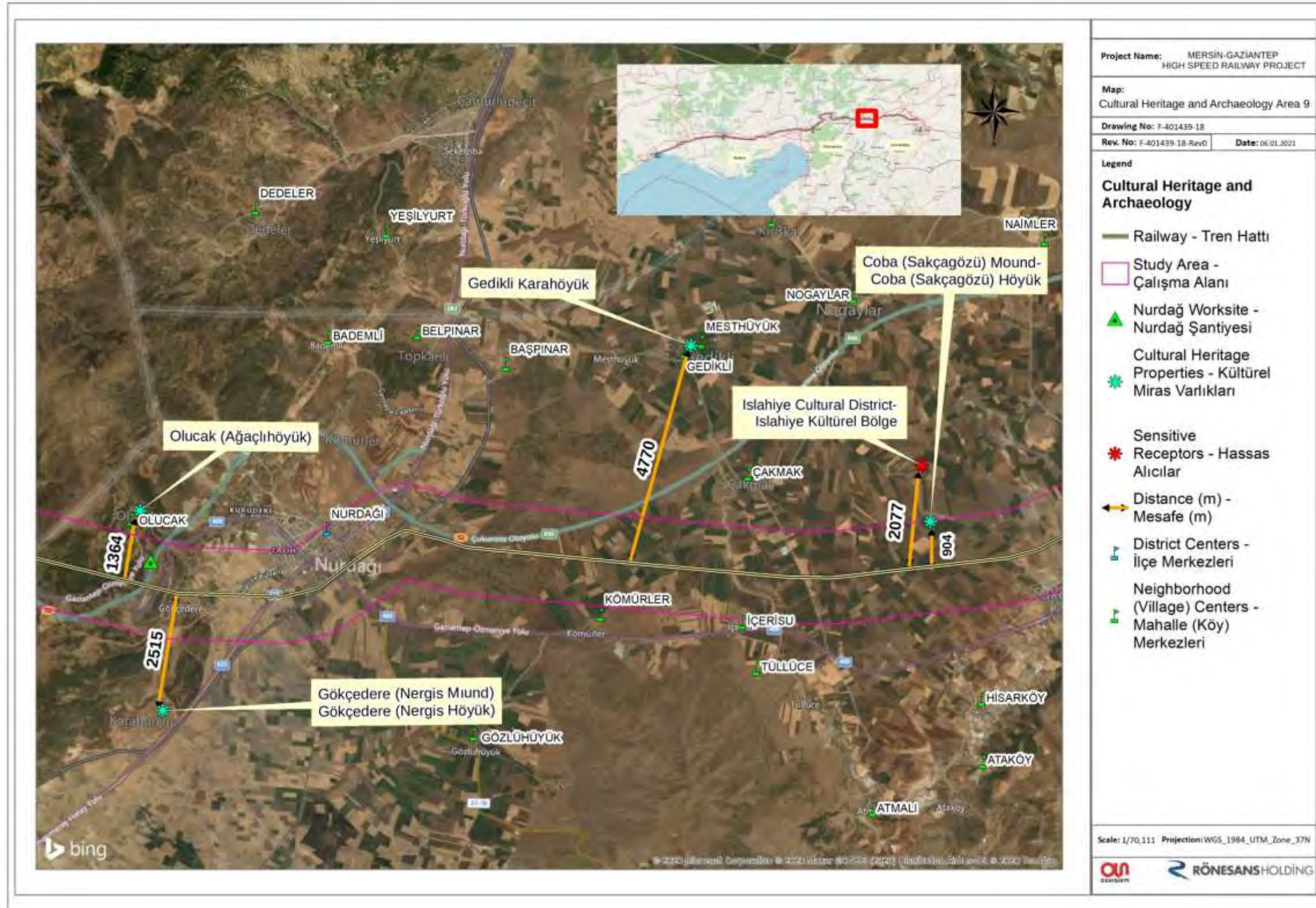
Map 4.44: Cultural Heritage and Archaeology Area 6



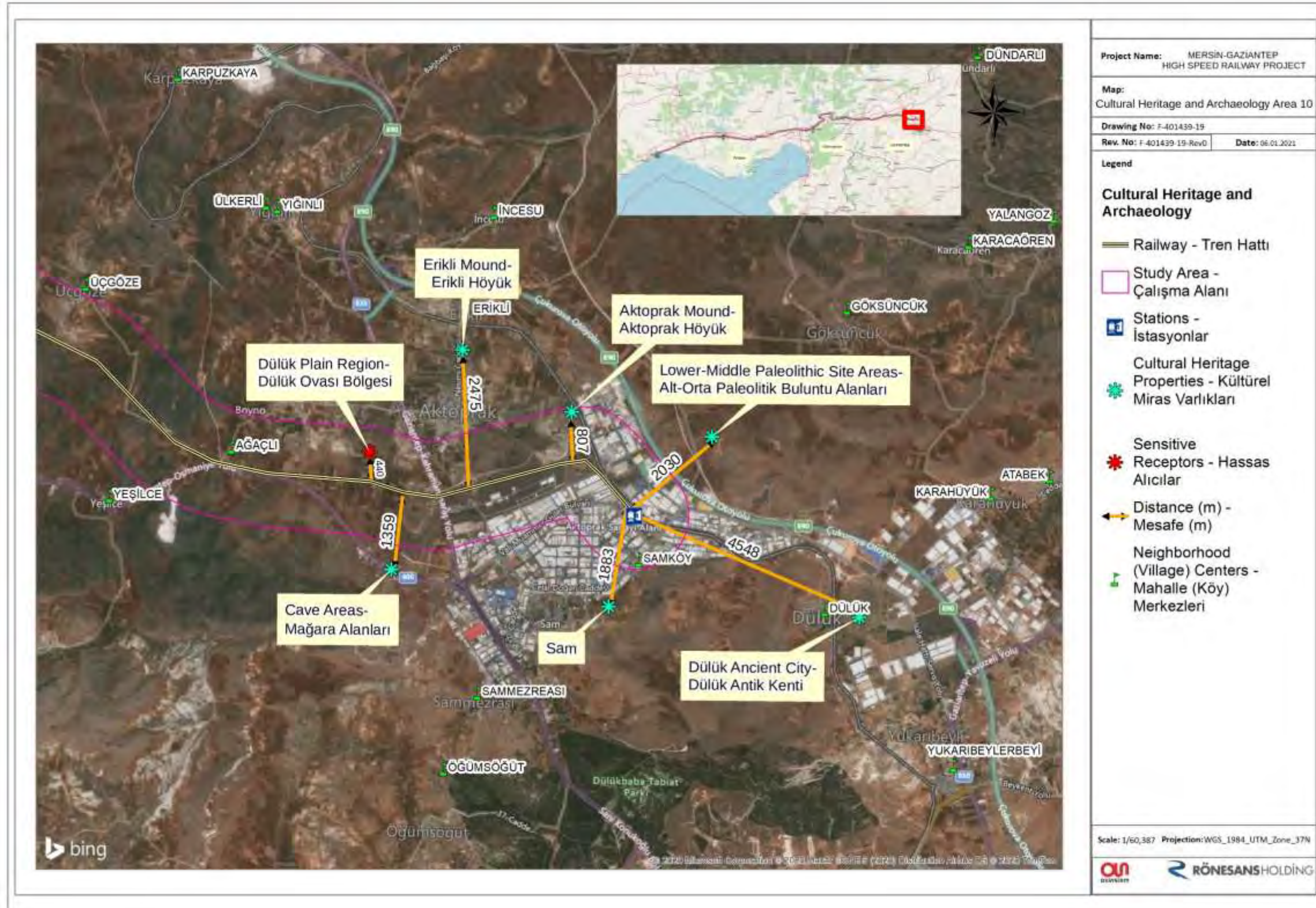
Map 4.45: Cultural Heritage and Archaeology Area 7



Map 4.46: Cultural Heritage and Archaeology Area 8



Map 4.47: Cultural Heritage and Archaeology Area 9



Map 4.48: Cultural Heritage and Archaeology Area 10

4.10.4.2 Field Studies

Although the areas found by Desk Studies around the project are not located near the High Standard Railway, the Museum Directorate will be contacted with any findings encountered during construction excavations and field work.

4.10.5 Impact Magnitude and Sensitivity Criteria

This section discusses about the impact magnitude by grading the effects of the construction, operation, and decommissioning phases of the project on cultural heritage and archeology in the region. The magnitude and significance of the impact of the project on cultural heritage and archaeological sites in the region are shaped by the impact on the receptor. Cultural heritage and archeology sensitive receptors have been assessed for their sensitivity, providing a definition of receptor sensitivity and in accordance with relevant applicable legal regulations and standards.

The value of cultural heritage attributes is assessed in relation to priorities or recommendations and attributed values set out in international and / or national legal regulations and national research agendas. Then the classification is made to determine the sensitivity and importance of the source. This method should be carried out, as objectively as possible, but qualitative evaluation by classification is inevitable. The value of cultural heritage can be defined using the following International Commission on Monuments and Sites (ICOMOS) rating scale and the rating scale table is shown below (see Table 4.125);

- Very High
- High
- Medium
- Low
- Negligible
- Unknown

Table 4.125: ICOMOS Sensitivity Rating Scale

Sensitivity	Description of sensitivity according to ICOMOS 2011 Guidance on Heritage Impact Assessments for Cultural World Heritage Properties Appendices 3A
Very High	<ul style="list-style-type: none"> • Archaeological sites, buildings or historic urban landscape areas of international importance recognized as world heritage property, • Assets that are internationally acknowledged and can contribute significantly to research objectives, • Extremely well-preserved historical, • Areas associated with intangible cultural heritage activities approved by national governments. Technical or scientific developments or associations of global significance.

Sensitivity	Description of sensitivity according to ICOMOS 2011 Guidance on Heritage Impact Assessments for Cultural World Heritage Properties Appendices 3A
High	<ul style="list-style-type: none"> Protected areas, including nationally designated archaeological monuments, structures, historical landscapes, conservation areas containing important buildings, protected by the laws of the State Party, Unidentified areas of specified quality and significance, Assets that can contribute significantly to accepted national research objectives, Considerably well-preserved historical sights, Nationally designated areas or activities associated with globally significant Intangible Cultural Heritage activities. Associations of specific innovations, technical or scientific developments or of national importance.
Medium	<ul style="list-style-type: none"> Identified or unidentified archaeological assets, special buildings, Historical (unlisted) buildings that can be shown to have exceptional qualities or historical relationships that may contribute significantly to regional research objectives. Protected Areas, containing buildings that contribute significantly to their historical character. Historic cityscapes or settled areas with significant historical integrity in their buildings or built environments. Unidentified, well preserved, landscapes of historical and regional value, Areas associated with Intangible Cultural heritage activities approved by local authorities, Associations with specific innovations or developments of regional or local significance.
Low	<ul style="list-style-type: none"> Identified or unspecified archaeological assets of local importance, poorly and or poorly protected, endangered survival, Assets of limited value but potentially contributing to local research objectives, "Locally Listed" buildings, Historic (unlisted) buildings of modest quality in terms of texture or historical relevance, Settlements or built settings with limited historical integrity in the historic city view or its buildings, Intact, unidentified, historical landscapes that matter to local groups, Historical landscapes with limited survival due to insufficient protection and / or lack of contextual relationships Intangible Cultural heritage activities of local importance, Certain associations of local importance.
Negligible	<ul style="list-style-type: none"> Beings with little or no archaeological relevance. Buildings or urban landscapes with no architectural or historical value, Landscapes of little or no historical significance
Unknown	<ul style="list-style-type: none"> Entities whose archaeological existence cannot be determined, Buildings of historical significance and quantity of hidden (inaccessible) potential

Using major, moderate, minor, and negligible and no change classifications based on the current ICOMOS standard, the magnitude of the change on cultural heritage receptors that a project can cause can be defined. This classification is given in the table below (see Table 4.126).

Table 4.126: Magnitude of Impact Scale of ICOMOS

Magnitude of Impact	Description of magnitude according to ICOMOS 2011 Guidance on Heritage Impact Assessments for Cultural World Heritage Properties Appendices 3A
High	<ul style="list-style-type: none"> Major changes in attributes that reflect the value of cultural World Heritage properties such as archaeological sites, buildings, or historic urban landscape areas, with the source completely changed, Change in most or all of the major historic landscape elements, plots, or components; extreme visual effects; major change in sound quality.
Medium	<ul style="list-style-type: none"> Changes to many important historical building elements, archaeological elements, resulting in significant alteration of the source, Visual change of many important historical landscape elements, plots, or components; noticeable differences in noise or sound quality; moderate changes in the historical landscape character.
Low	<ul style="list-style-type: none"> Minor but noticeable changes in important historical building elements, archaeological elements, Visual change of a few important historical landscape elements, plots, or components; noticeable differences in noise or sound quality; minor changes in the historical landscape character.
Negligible	<ul style="list-style-type: none"> Minor changes in important archaeological materials or environment, historical building elements or environment that do not affect it, Minor changes in major historical landscape elements, parcels, or components; almost unchanged visual effects; so small changes in noise levels or sound quality.
No Change	<ul style="list-style-type: none"> No change to elements, parcels, or components; no visual or audible changes; no changes in amenity or community factors.

4.10.6 Impact Assessment

This section shows the impacts of the construction and operation phases of the project on cultural heritage and archeology in the region. Mersin - Gaziantep High Standard Train project includes four provinces and two cultural regions. It includes the provinces of Mersin, Adana and Osmaniye, which form the lowland Cilicia cultural region, and the provinces of Gaziantep in the Islahiye Cultural Region.

Within the scope of the project, an examination was made in terms of immovable cultural assets (archaeological cultural heritage), based on the line passing through the borders of these four provinces. The study, conducted as a literature review, was completed in two stages as digital data scanning and printed publication review. Digital data evaluation: It was in the form of scanning the database of the Ministry of Culture and Tourism General Directorate of Cultural Heritage and Museums and the databases of the Provincial Directorate of Culture of four provinces on the project line. The print publication was searched on books, articles, journals, periodicals, and academic studies containing information about the region. In total, over 150 printed sources were scanned. During this study, 450 sites were examined, 76 of them were evaluated in detail considering their proximity to the project implementation site and their contribution to Anatolian

archeology. Of these 76 sites, six regions have been identified as sensitive areas (These sensitive receptors may change during the project construction process and will be updated with any changes).

Sensitive area detection has been tried to be done on the line of the project as a literature review (desk). This study was carried out by considering two criteria. The first of these is the registered areas existing in the project implementation line and the physical proximity of the line with these areas. It is the area with a zero point on the line known to be registered. This area, whose locations are marked in KMZ satellite images, is Sirkeli Höyük, which has a great importance in the archaeological literature. Another of the other five sites is Kamışlı/Yarma Höyük, which was identified by scientific studies in the region. The line passes through the zero point in this placement. The other four areas are defined by their proximity to the registered archaeological data in their surroundings and the prediction that these archaeological data can be found within the spreading areas. It is anticipated that the risks and negativity in these areas will be zero or minimized by negotiating with the necessary institutions/organizations and the execution of the Chance Find Procedure.

There is a The Misis Antique City around Adana-Toprakkale Railway line in Yüreğir Adana in the planned project area. The Misis Antique City is approximately 2 km away from the railway. The High Standard Train will pass just north of the Old Misis settlement at the 25th km of the Adana-Ceyhan line. During the application, the manufacturing process in this area will be a much more controlled and sensitive work.

Also, around 38th km of Adana - Ceyhan line, within the borders of Ceyhan district, there are archaeological sites in Sirkeli Höyük and its surrounding at the starting point of the Yukarı Ova.

Höyük at the western end of the Ceyhan River and the Hittite King II on the rock block next to the Ceyhan River. This area is extremely important for both Anatolian and World archeology because of the ski relief of Muwatalli. The manufacturing process of the line that will pass through the southern skirt of the mound constitutes the second most sensitive period in the project. The line passes through the zero point of the mound

Kamışlı/ Yarma Mound, located at the 21st km of the Ceyhan-Mustafabeyli line, is the most sensitive point of the project. It is seen that the project line passes right in the middle of the mound. The area was visited and the presence of ceramics that could be dated to the Roman and later periods were observed. The line passes through the zero point of the mound.

The ancient city of Neronias, located in the district of Düziçi, has shown that there are densely settlements in the region and a spread towards the plain with the archaeological studies carried out recently. Roman cities, which were established in the lowland Kilikya since the 1st century BC, had wide spreading areas. Neronias-Eirenopolis / Düziçi city is also known to have a wide distribution area. Therefore, the area between Düziçi Station and T4 tunnel entrance has been defined as another sensitive point during the project's implementation process in the field.

İslahiye cultural region is one of the important points of Anatolian Archeology. Especially Zincirli Höyük, Coba (Sakçagözü) Höyük, Gedikli Karahöyük on the plain, especially in the early periods BC. The most important settlements of the Late Hittite Principalities in the 1st millennium years. The project line passes the Nurdağ tunnels from Osmaniye province Bahçe district and enters the Nurdağ district of Gaziantep. The line that starts with the T1 exit at the exit of Nurdağ District and continues along the Sakçagözü plain leaves the plain with the T2 entrance. The plain between T1 and T2 is another sensitive point of the project. This line of 19km has the potential to provide important data in terms of chance find.

The sixth and last sensitive point in the project line is Dülük Plain. In the plain located within the borders of Şehitkamil district, there is intense data especially regarding the Paleolithic Period. For this reason, the T7 tunnel exit and the Başpınar Organized Industrial Zone have been defined as a sensitive point.

Mentioned archaeological sites are a moderately sensitive archaeological structure according to the ICOMOS scale. It is a cultural heritage property recognized by national authorities, where excavations are exhibited in museums, but not defined as a world heritage property.

The project route and the works in the project preparation/operation phases are not expected to cause a visual and/or physical change/impact on the Mentioned archaeological sites. The project is carried out without damaging the rock tombs in the area and is monitored under the supervision of the Museum Directorate. In this context, the impact magnitude of the project is insignificant and is not expected to cause any changes.

The EIA studies have been examined, and most of cultural heritage asset are far away from Train Project. There are six sensitive area, and the railway route passes through the zero point of two of these sensitive areas. These two areas are Sirkeli Mound and Kamışlı Mound. If any movable or immovable cultural property is encountered during the project time, the works will be stopped and the nearest local administrative authority and/or the Museum Directorate will be informed.

4.10.7 Cumulative Impact Assessment

Since Sirkeli Mound, Kamışlı Mound, Islahiye Cultural Region, Misis Antique City, the ancient City of Neronias and Dülük Plain are located in the cultural heritage site, it is important whether the projects planned to be built around it will have a cumulative effect on this region. The projects surrounding the cultural heritage property have been examined and it has been determined that a situation that could create a cumulative effect is not expected with the High Standard Train Project.

4.10.8 Summary of Residual Impacts, Significance Criteria and Overall Impact Significance

The impact of the High Standard Train Project on cultural heritage and archeology has been examined under the above headings. Six sensitive areas have been identified and these are Sirkeli Mound, Kamışlı Mound, Islahiye Cultural Region, Misis Antique City, The ancient City of Neronias and Dülük Plain.

The impact assessment has been evaluated nationally and internationally, and the ICOMOS guideline has been used on the degree of impact and sensitivity. According to the ICOMOS guide, the archaeological sites are a low-sensitivity archaeological site except sensitive areas where the line passes through the zero point. There will be no adverse impact on the archaeological site and cultural heritage areas of the project during the construction and operation phases.

4.10.9 Mitigation Measures

Sensitive areas were determined on the investigated railway route by evaluating the cultural heritage and archaeological findings on the project route and surrounding the project area. No possible impact is expected on these sensitive are of the project.

As stated in the Archaeological Evaluation Report (EK), starting from the planning phase, the creation of the Chance Findings Procedure with the "Scientific Committee/Advisory" committee that will take charge in all and all areas of the production process will minimize the risks. The scientific committee/advisory board will make field visits daily, if necessary, but more weekly or monthly, during field studies and will share these visits with all relevant or requesting authorities and institutions by making a study report and They will take the responsibility of the scientific publications to be made during or at the end of the archaeological studies carried out within the scope of the project. The chance find procedure prepared is valid for all activity areas of the project in the field (railway line, connection roads, road opened for production purposes, quarries, tunnels, entrances, exits, etc.) or similar activities that develop or will develop as a main activity connection.

According to the Chance Find Procedure, "Field Monitoring Experts" will be present at every point of the field applications. These will share their daily observations, which will take part in the construction process of the project, with the units they are affiliated with. In a possible determination, they will ensure that production activities in that area are stopped, and they will take the area under control. They will ensure that production continues outside that specified area. Although the application process of the Chance Find Procedure is a production schedule, the existence of this procedure provides the opportunity for effective inspection, control and implementation throughout the project.

The second unit of the Archaeological-Cultural Heritage unit are field monitoring experts. Field monitoring experts will be obliged to monitor the construction works daily from the moment the activity starts on the field. In this process, if any archaeological find is encountered, it will inform the upper units and the scientific committee that it will ensure that the construction activities in that area are stopped within the scope of the interviews and 2863 law. From this moment on, the Museum Directorate of the province where the production

activity is located will be informed. They will prepare reports on daily work and share the reports they have prepared with the units they are affiliated with.

The complete operation of the process in the field will ensure that the Chance Find Procedure is operated, and the production activities are interrupted in this process. They will be responsible for the surface research and/or archaeological excavations deemed necessary to be carried out within the scope of the project.

The Museum Directorate and the Conservation Board of the province affiliated with the General Directorate of Cultural Heritage and Museums decide on what steps should be taken in the field. In the progress of the project, the Museum Directorate will be informed when a possible cultural heritage and archaeological find is encountered during the construction and operation phases.

Before starting the construction works, meetings will be held with the work area that covers the Chance Find Procedure and the General Directorate of Cultural Heritage and Museums of the Ministry of Culture and Tourism. With this meeting to be arranged, all kinds of archaeological studies to be carried out within the scope of Mersin-Gaziantep High Standard Train Project will be defined by the relevant institution. In addition, this contact to be made will pave the way for many bureaucratic processes between the company and the institution and will ensure that there are no possible disruptions in terms of schedule.

The mitigation measures planned to be implemented within the scope of the project are given in the ESMMP prepared for the project.

4.10.10 Assumptions and/or Limitations

For the cultural heritage and archaeological findings in this part of the ESIA, the Environmental Impact Assessment (EIA) studies that are mandatory in national projects, nationally authorized opinion reports, Chance Find Procedure Report, Archaeological Assessment Report, and the assumptions in these reports, the ESIA Cultural Heritage and Archeology section was established.

4.11 Waste and Wastewater

4.11.1 Introduction

In the waste and wastewater section, the effects of waste and wastewater generation that will arise from the construction and operation phases of the project are mentioned, and methods to reduce and prevent these impacts are presented. The effects of waste and wastewater generation have been evaluated with both national legislation and regulations and international standards. Both are given below in subtitle.

Waste Management

A certain amount of rock and soil material will be produced from the excavation removed during Mersin-Gaziantep (Başpınar) construction activities. During the construction phase, a total 19,557,959 m³ excavation and 12,438,093 m³ filling will be made. Determination of excess material disposal sites to be removed as a result of construction operations and the method of disposal (area, compression, slope stability, drainage, access, etc.) should be defined. Sites for the disposal of inert materials (construction and demolition waste) will be determined in consultation with the authorities (municipalities). During the Construction Phase, the management of site excavation materials will be carried out in accordance with the IFC EHS Construction Material Removal Guidelines and General EHS Guidelines and national legislation.

Waste management is clearly stated in the environmental and social management plan. The effects of wastes were determined by evaluating different categories. The project is divided into certain parts and construction operations will be carried out in almost every section. 17 km of signaling process will be done only between Bahçe and Nurdağ and no construction works will be carried out. However, even if the signaling process is carried out in this section and the construction process is not carried out, it is possible that the cable and other related wastes will come out during signalization process.

The wastes generated from the project activities will be sent to the relevant municipal landfill areas, stored there, and disposed of.

Wastewater Management

Domestic wastewater will be generated due to the water consumption of the personnel during the project activities. Package treatment will not be used for wastewater that will be generated during both construction and operation periods, and it is planned to connect to the network line. Wastewater Connection Permit and Certificate will be obtained after the controls of the relevant Municipality. There is no industrial wastewater generation during the construction and operation phases of the project.

Domestic wastewater generated from the project activities will be discharged to the network and treated in the wastewater treatment facilities of the relevant municipalities.

4.11.2 Policies, Legal Framework and Guidelines

Both national regulations and international standards and guidelines for waste and wastewater environmental impacts are given below.

4.11.2.1 National Legislations

4.11.2.1.1 Solid Wastes

The regulations applied within the scope of national legislation for the evaluation and management of solid wastes to be generated from project activities (construction and operation) are as follows;

- Official Gazette dated 02.04.2015 and numbered 29314 Regulation on Waste Management
- Official Gazette dated 27.12.2017 and numbered 30283 Regulation on the Control of Packaging Waste
- Official Gazette dated 21.12.2019 and numbered 30985 Regulation on Waste Oil Control
- Official Gazette dated 25.11.2006 and numbered 26357 Regulation on the Control of Waste Tires
- Official Gazette dated 31.08.2004 and numbered 25569 Regulation on Control of Waste Batteries and Accumulators
- Official Gazette dated 22.05.2012 and numbered 28300 Regulation on Control of Waste Electrical and Electronic Appliances
- Official Gazette dated 18.03.2004 and numbered 25406 Regulation on Control of Excavated Soil, Construction and Demolition Wastes
- Official Gazette dated 13.12.2014 and numbered 29204 Regulation on Safety Information Forms on Hazardous Substances and Mixtures
- Official Gazette dated 26.12.2008 and numbered 27092 Regulation on the Preparation and Distribution of Safety Data Sheets Regarding Dangerous Substances and Preparations
- Official Gazette dated 11.12.2013 and numbered 28848 Regulation on Classification, Labeling and Packaging of Substances and Mixtures

Domestic wastes (glass, paper, plastic, metal, organic, etc.) arising from activities during construction and operation periods will be collected in separate containers in accordance with the regulations given above and will be transported and disposed of in accordance with the regulations. Recyclable wastes that will create odor, leak or because dust will be collected and separated in suitable containers. Non-recyclable solid wastes will be transported in collection containers and disposed of in consultation with the relevant municipalities.

Waste oils, waste batteries, waste tires and any electronic wastes that may come out will be collected separately in the field and their transportation and disposal will be ensured in accordance with the relevant regulations.

During the construction activities, excavated soil from land preparation, infrastructure, superstructure etc. will be reused for backfilling as much as possible. All activities will be carried out in accordance with the Regulation on Control of Excavation Soil, Construction and Demolition Wastes (Official Gazette dated 18.03.2004 and numbered 25406).

Regulation on Waste Management

Waste Management Regulation dated 02.04.2015 and numbered 29314 aims to determine the general principles regarding the management of wastes from generation to disposal without harming the environment and human health, to prevent and reduce waste generation, to reduce the use of natural resources and to ensure waste management through ways such as reuse, recycling and recover of waste, to production and control of the product within the scope of the regulation, which have certain criteria, basic conditions and features in terms of environment and human health.

The Waste Management Regulation covers the waste given in Annex-4 of the regulation and electrical and electronic equipment, packaging, vehicle, battery, and accumulator products.

Regulation on the Control of Packaging Waste

The Regulation on Control of Packaging Wastes dated 27.12.2017 and numbered 30283 aims to produce packages with certain environmental criteria, basic conditions and features, prevention of the formation of packaging waste, to reduce the amount of packaging waste that cannot be prevented by reuse, recycling and recovery methods.

Prevention of direct and indirect release to the receiving environment in a way that harms the environment, the establishment of technical and administrative standards regarding the collection, transportation, separation and recycling of packaging wastes in a specific management system, as well as legal, administrative and the technical principles.

The Regulation on Control of Packaging Wastes is the regulation that must be applied for all packages except for faulty, wasted and not put on the market and production waste.

Regulation on Waste Oil Control

The purpose of the Control of Waste Oil dated 21.12.2019 and numbered 30985 is to determine the technical and administrative principles for the temporary storage, collection, transportation, refining, energy recovery and disposal of waste oils, and to protect the environment and human health and to ensure that natural resources are efficient. It is to determine the principles regarding its use.

Waste Oil Control Regulation covers waste oils such as mineral oils in the definition of waste oil and the management of these wastes. The management includes temporary storage, collection, transportation, refining, energy recovery, disposal, measures to be taken and notifications to be made.

Regulation on the Control of Waste Tires

The Regulation on the Control of End-of-Life Tires dated 25.11.2006 and numbered 26307 aims to prevent damage to the environment in the direct or indirect delivery of end-of-life tires to the receiving environment, to establish a collection and transportation system for recovery or disposal, to establish a management plan and to make the necessary arrangements in the management of end-of-life tires and regulate the necessary obligations to ensure standards, import and export.

It includes all end-of-life tire waste, excluding bicycle and solid tires. Regulation on the Control of Waste Tires covers the collection of end-of-life tires separately from waste, legal restrictions and obligations regarding

transportation, temporary storage, recovery, disposal, import, export and transit, the measures to be taken, the inspections to be carried out, the scope of legal and criminal responsibilities.

Regulation on Control of Waste Batteries and Accumulators

The purpose of the Regulation on Control of Waste Batteries and Accumulators dated 31.08.2004 and numbered 25569 is to provide the necessary legal and technical principles in many stages from the production of batteries and accumulators to their final disposal. These principles;

- Ensuring the production of batteries and accumulators with certain environmental criteria, basic conditions and features,
- Prevention of direct or indirect release to the receiving environment in a way that harms human health and the environment,
- Ensuring the quality control of battery and accumulator products, control of their import and control of the amount of harmful substances contained by labeling and marking,
- Determining the principles regarding import, export and transit passes,
- Providing the necessary technical and administrative standards in its management,
- Prevention of production, export, import and sale of batteries and accumulators containing harmful substances,
- Establishing a collection system and creating a management plan for the recovery or final disposal of used batteries and accumulators.

The scope of the relevant regulation;

- Labeling and marking of battery and accumulator products, reducing the amount of harmful substances in its production, collecting wastes separately from domestic and other wastes after use, prohibition on its transportation, disposal and import, transit and export, regulating the responsibilities to be held,
- Devices with permanently placed batteries depending on the purpose of industrial use, batteries used in scientific and professional fields, installed in vital medical devices, pacemakers, batteries or accumulators in devices that need to be removed only by qualified personnel, and that need continuous continuous operation are out of the scope of this Regulation.
- Management of production wastes arising from battery or accumulator production and disposal facilities is also out of the scope of this Regulation.

Regulation on Control of Waste Electrical and Electronic Appliances

Regulation on Control of Waste Electrical and Electronic Equipment dated 22.05.2012 and numbered 28300 aims to limit the use of some harmful substances in electrical and electronic equipment in order to protect the environment and human health from the production of electrical and electronic equipment to their final disposal, to determine the practices be exempted from these limitations, to control the import of electrical and electronic equipment, to manage the legal and technical processes related to reuse, recycling, recovery methods and targets in order to reduce the generation of electrical and electronic waste and the amount of waste to be disposed of.

Regulation on Control of Excavated Soil, Construction and Demolition Wastes

The purpose of the Regulation on Control of Excavation Soil, Construction and Demolition Wastes dated 18.03.2004 and numbered 25406 is to regulate the technical and administrative issues and general rules that must be followed in order to reduce, collect, temporarily accumulate, transport, recycle, evaluate, and dispose of these wastes at the source in a way that does not harm the environment and the.

It covers the principles of separate collection, temporary accumulation, transportation, recovery, evaluation and disposal of excavation soil and construction and demolition wastes occurring after human activities and natural disasters, whose sources and components are detailed in Annex-1 of the Regulation.

Regulation on Safety Information Forms on Hazardous Substances and Mixtures

The Regulation on Safety Data Sheets Regarding Hazardous Substances and Mixtures dated 13.12.2014 and numbered 29204 aims to regulate the administrative and technical procedures and principles regarding the preparation and distribution of safety data sheets in order to ensure effective control and surveillance against the adverse effects of harmful substances and mixtures placed on the market on human health and the environment. The regulation covers the procedures and principles regarding the articles given below;

- Preparation and distribution of safety data sheets of substances and mixtures classified as harmful in accordance with the Regulation on Classification, Labeling and Packaging of Substances and Mixtures published in the Official Gazette dated 11/12/2013 and numbered 28848 repeated,
- Information to be included in safety data sheets and the shape of the form,
- Preparing the safety data sheets for plant protection products without prejudice to the provisions of the special regulations on plant protection products,
- Preparation and distribution of safety data sheets on mixtures that are not considered harmful within the scope of the provisions of the Regulation on Classification, Labeling and Packaging of Hazardous Substances and Mixtures, but that meet the conditions in the second paragraph of Article 5,
- In case the substance is permanent, bioaccumulative and toxic or very persistent and very bioaccumulative according to the criteria specified in Annex-2, preparing safety data sheets for these substances placed on the market,
- Certification of safety data sheet maker.

However, it does not cover the transport of hazardous substances and mixtures by rail, road, seaway, inland waterway or airway, and substances and mixtures subject to customs control in transit on the condition that they do not enter any process.

Regulation on the Preparation and Distribution of Safety Data Sheets Regarding Dangerous Substances and Preparations

The purpose of the Regulation on Preparation and Distribution of Safety Data Sheets for Dangerous Substances and Medicines dated 26.12.2008 and numbered 27092 is to regulate the administrative and technical procedures and principles regarding the preparation and distribution of safety data sheets in order to ensure effective control and efficient surveillance of dangerous substances and medicines placed on the market against adverse effects on human health and the environment.

The scope of the Regulation on Safety Data Sheets Regarding Hazardous Substances and Mixtures and the Regulation on the Preparation and Distribution of Safety Data Sheets for Dangerous Substances and Medicines serving almost the same purpose is also similar;

- Preparation and distribution of safety data sheets of substances and medicines classified as dangerous and placed on the market within the scope of the provisions of the Regulation on Classification, Packaging and Labeling of Dangerous Substances and Medicines,
- Although it is not considered dangerous within the scope of the provisions of the Regulation on Classification, Packaging and Labeling of Dangerous Substances and Medicines, it covers the procedures and principles to be followed in the preparation and distribution of safety data sheets for preparations placed on the market with special conditions.

Regulation on Classification, Labeling and Packaging of Substances and Mixtures

The Regulation on Classification, Labeling and Packaging of Substances and Mixtures dated 11.12.2013 and numbered 28848 aims to regulate the administrative and technical procedures and principles regarding the classification, labeling and packaging of substances, mixtures and some articles placed on the market in order to provide a high level of protection against adverse effects on human health and the environment and to ensure their free circulation like the two regulations given above.

4.11.2.1.2 Wastewater

Regulations applied within the scope of national legislation for the utilization and management of domestic wastewater from project activities (during construction and operation);

- 31.12.2004 dated and numbered 25687 Water Pollution Control Regulation,
- 08.01.2006 dated and numbered 26047 Regulation of Urban Wastewater Treatment.

Domestic wastewater will be connected to the network line without performing package treatment. Before it is given to the network line, necessary arrangements will be made in accordance with the above-mentioned regulations and a Wastewater Connection Permit and Certificate will be obtained for network connection. An additional wastewater treatment plant will not be established on the project site and there is no industrial wastewater generation for both construction and operation phases.

Below are the regulations given for wastewater control and management.

Water Pollution Control Regulation

The Water Pollution Control Regulation that is numbered 25687 and published on 31.12.2004, aims to determine the legal and technical principles required to prevent water pollution in line with sustainable development goals, in order to protect the potential of underground and surface water resources and to ensure their best use.

This Regulation covers the quality classifications and usage purposes of water environments, planning principles and prohibitions regarding the protection of water quality, principles of wastewater discharge and discharge permit principles, principles regarding wastewater infrastructure facilities, and monitoring and inspection procedures and principles to prevent water pollution.

Regulation of Urban Wastewater Treatment

The Urban Wastewater Treatment Regulation numbered 26047 of 08.01.2006 aims to protect the environment against the negative effects of the collection, treatment and discharge of urban wastewater and wastewater discharge originating from certain industrial sectors.

The regulation covers the technical and administrative principles regarding the collection, treatment and discharge of urban and certain industrial wastewater discharged into sewage systems, monitoring, reporting and inspection of wastewater discharge.

4.11.2.2 International Guidelines

4.11.2.2.1 Waste Management

Guidelines applied within the scope of international guideline for the evaluation and management of wastes to be generated from project activities (during construction and operation);

- International Finance Corporation (IFC) Environmental, Health, and Safety General Guidelines
- International Finance Corporation (IFC) Waste Management
- International Finance Corporation (IFC) Environmental, Health, and Safety Guidelines Railways
- European Bank for Reconstruction and Development (EBRD) Standards

- European Union (EU)

International Finance Corporation (IFC)

IFC General EHS, Waste Management and IFC Standards are suitable for this part of ESIA. According to IFC General EHS, effective management of environmental, health and safety issues is provided by following the steps below;

- EHS project hazards identified as threats to people and those they value as early as possible in the facility development or project cycle to include EHS issues in the site selection process, product design process, engineering planning process for capital demands, engineering work, facility planning competencies; and to identify the risks involved,
- Include EHS professionals who have the necessary experience, competence and training to assess and manage EHS impacts and risks, and carry out specific environmental management functions, including the preparation of project or activity-specific plans and procedures that include technical recommendations provided in the General EHS document,
- Determining the nature of the project activities, such as whether the project will generate significant amounts of waste or contain hazardous substances or processes,
- Prioritizing risk management strategies with an overall risk reduction goal for human health and the environment, focusing on the prevention of irreversible and/or significant impacts,
- Choosing strategies that eliminate the cause of the danger at its source,
- Incorporating engineering and management controls to reduce or minimize the likelihood and magnitude of undesirable consequences when avoidance of impact is not possible.

IFC General provides guidelines on almost every environmental impact to further elaborate the EHS. There is an IFC Waste Management Guide on waste management. This guideline applies to non-hazardous and hazardous waste management and projects in various industry sectors that generate, store, or process any amount of waste. It is not intended to be applied to projects or facilities where the main job is the collection, transportation, treatment or disposal of wastes. According to the IFC Waste Management Guideline, waste management should be addressed through a Waste Management System that addresses the problems associated with the minimization, production, transportation, disposal, and monitoring of waste.

According to the solid waste definition of the IFC Waste Management, solid (non-hazardous) wastes usually include all types of garbage wastes. Examples of such waste include domestic waste and idle construction/demolition materials; wastes such as metal scrap and empty containers (other than those previously used to contain hazardous materials that in principle should be managed as hazardous waste); and residual waste from industrial processes such as boiler slag, clinker and fly ash. Hazardous waste shares the properties of a hazardous substance (e.g., ignition, corrosion, reactivity, or toxicity) or other physical, chemical or biological properties that, if improperly managed, could pose a potential risk to human health or the environment. Waste can also be defined as "hazardous" by local regulations or international conventions, based on the origin of the waste and its inclusion in hazardous waste lists or its characteristics. Facilities that generate and store waste should implement the following;

- Determining waste management priorities based on understanding potential Environmental, Health and Safety (EHS) risks and impacts and considering waste generation and consequences,
- Establish a waste management hierarchy that considers the prevention, reduction, reuse, recovery, recycling, disposal and ultimately disposal of waste,
- Waste generating facilities should characterize their waste according to its composition, source, types of waste produced, production rates or local legal requirements,
- Avoiding or minimizing the generation of waste materials as much as possible.

Environmental, health and safety guidelines for IFC Railways often provide guidelines for the operating period.

The number of passengers and the services provided for waste management, such as train and passenger train terminals that can produce solid, non-hazardous food waste from food businesses, and the services provided, and packaging materials and paper, newspapers and various disposable food containers from the trains and ordinary passenger areas, maintenance and improvement of the railway infrastructure recommends waste management strategies.

Performance standards as well as IFC General EHS, Waste Management and IFC Railways Guidelines should be followed. Within the scope of IFC Performance Standard 3, if the project owner company cannot prevent the production of hazardous and non-hazardous waste, it will reduce waste production, ensure that the waste is recycled and reused safely for human health and the environment. In cases where wastes cannot be recycled and reused, wastes will be treated, disposed of or disposed of in an environmentally appropriate manner.

European Union Legislations (EU)

European Union has published the following directives on waste;

- Directive 2008/98/EEC on Waste,
- Directive 2006/66/EC on Batteries and Accumulators and Waste Batteries and Accumulators,
- Directive 2002/96/EC on Waste Electrical and Electronic Equipment,
- Directive 94/62/EC on Packaging and Packaging Waste,
- Directive 91/689/EEC on Hazardous Waste.

European Bank for Reconstruction and Development (EBRD)

For waste management, pollution prevention and abatement measures, which are in the 2008 EBRD Environmental and Social Policy, need to be implemented. The EBRD requires compliance with EU environmental standards for waste management. The planned High Standard Train Project must be designed and operated in accordance with relevant EU environmental requirements and applicable national laws. According to EBRD requirements, project owners will prevent or minimize the generation of hazardous and non-hazardous waste materials and reduce their hazard as far as practicable.

4.11.2.2.2 Wastewater Management

The guidelines applied under the international guideline for the utilization and management of wastewater originating from project activities (construction and operation) are similar to the institutions that are the publishers of the guidelines applied for wastes;

- International Finance Corporation (IFC) Environmental, Health, and Safety General Guidelines
- International Finance Corporation (IFC) for Water and Sanitation
- International Finance Corporation (IFC) Environmental, Health, and Safety Guidelines Railways
- European Union (EU)

International Finance Corporation (IFC)

General IFC EHS Guidelines apply to projects where, directly or indirectly, process wastewater, wastewater from service activities or rainwater are discharged into the environment. Projects that have the potential to produce process wastewater, sanitary (domestic) sewage or rainwater should take the necessary measures to prevent, minimize and control adverse effects on human health, safety, or the environment. Wastewater management, including water conservation, wastewater treatment, stormwater management, and wastewater and water quality monitoring, also needs to be met.

Environmental, Health and Safety Guidelines for IFC Railways often mention about measures for the operating period. The Guideline apply to activities typically carried out by railway infrastructure operators dedicated to passenger and load transport. The Guideline covers railway operations, including the construction and maintenance of railway infrastructure and the operation of rolling stock such as locomotives and wagons, locomotive maintenance activities, and other mechanical repair and maintenance of locomotives and wagons. All environmental issues have been discussed in detail and guidelines have been explained to minimize the potential impact on the environment. The directives recommend measures to prevent, minimize, or control wastewater waste from passenger terminals and the passenger rail service.

European Union Legislations (EU)

The Guideline published by the European Union (EU) on the management of wastewater is given below;

- Directive 91/271/EEC concerning Urban Wastewater Treatment (As amended by Directive No 98/15/EC and Decree No 93/481/EEC),
- Directive 2008/105/EC on Environmental Quality Standards in the Field of Water Policy,
- EU Directive 2006/11/EC on pollution caused by certain dangerous substances discharged into the aquatic environment,
- Dangerous Substances to Water Discharges Directive (76/464/EEC) as emission control-oriented legislation,
- Directive 98/83/EC on the Quality of Water Intended for Human Consumption.

4.11.3 Extent of Study Area

Public toilets will be used where possible along the line, where necessary, portable toilet cabinets will be used and the wastes will be discharged to the local municipality or transferred via sewage line.

4.11.4 Identification of Baseline Conditions

4.11.4.1 Desk Studies

4.11.4.1.1 Waste

During the construction phase of the High Standard Train Project, construction wastes originating from earthworks, ground improvement, engineering structures, superstructure works, electrification and signaling processes, household and packaging wastes from the staff to work on the site, waste oils from vehicles and equipment to be used, medical wastes, end-of-life tires hazardous wastes and wastes from waste batteries and accumulators are generated.

In the operational phase, it is likely that wastes arising from the personnel working at the stations and the use of the train and the passengers will occur.

As mentioned above, domestic solid wastes, packaging wastes and construction wastes will be generated during the construction phase of the project. For the calculation of domestic solid wastes, which will be originated by staffs, Turkey Statistical Institute (TURKSTAT) data were utilized. Mersin-Gaziantep (Başpınar) High Standard Railway Route will cross 4 different provincial borders, namely Mersin, Adana, Osmaniye and Gaziantep, and the data from TURKSTAT will be different for these 4 provinces. For 2018, which TURKSTAT for the cities mentioned below data, are given;

- Mersin Province: 1.08 kg/person-day
- Adana Province: 0.98 kg/person-day
- Osmaniye Province: 0.85 kg/person-day
- Gaziantep Province: 0.88 kg/person-day
- Total number of household waste per person: $1.08+0.98+0.85+0.88 = 3.79$ kg/person-day

In the calculation, the value with the highest number of personnel in the project was used as the number of employees. In this context, the total number of personnel who will work in the project between March and April, when the number of employees is the highest, is 385 people (the total amount was calculated since it is not certain how many personnel will be in each construction site).

- Domestic solid waste amount: $3.79 \text{ kg/person-day} \times 385 \text{ person} = 1,459 \text{ kg/day}$

Within the scope of the High Standard Train Project, packaging waste (paper and cardboard packaging, plastic packaging, metal packaging, glass packaging, etc.) will also be formed. Based on the statement that there will be a collection capacity of at least 20% of the vehicle capacity used for the collection of domestic wastes in the packaging waste collection system mentioned in the Sixth Chapter of the Packaging Waste Control Regulation, it has been accepted that approximately 20% of the domestic solid waste amount will be released as packaging waste. Packaging waste calculation is as follows;

- $$\begin{aligned} \text{Packaging Waste Amount} &= \text{Domestic solid waste amount (kg/day)} \times 0,20 \\ &= 1.459 \text{ kg/day} \times 0.20 \\ &= 0.2918 \text{ kg/day} \end{aligned}$$

In the Mersin-Gaziantep (Başpınar) High Standard Train Project, the routes will be divided into certain sections, construction works will be carried out there, and a certain excavation material will be obtained from these construction works. The excavation and filling amounts to be made within the scope of the High Standard Train Project are given below (see Table 4.127).

Table 4.127: Amounts of Excavation and Filling to be made between Mersin-Gaziantep (Başpınar)

Excavation and Filling	Amounts of Excavation and Filling to be Made Between Mersin-Gaziantep (Başpınar) (m ³)
Excavation	22,080,000
Filling	14,141,000

The materials extracted after excavation will be evaluated in order to determine their technical properties, and those suitable materials will be used in filling works. For excavations that are not suitable for use in the filling, they will be sent to the stockpiles determined/to be determined within the scope of the project and/or to the municipal waste sites in consultation with the relevant municipalities.

4.11.4.1.2 Wastewater

Domestic wastewater will arise from the personnel working during the construction phase and there is no industrial wastewater generation. For the calculation of domestic wastewater, which will be originated by staffs, Turkey Statistical Institute (TURKSTAT) data were utilized. Mersin-Gaziantep (Başpınar) High Standard Railway Route will cross 4 different provincial borders, namely Mersin, Adana, Osmaniye and Gaziantep, and the data from TURKSTAT will be different for these 4 provinces. For 2018 which is the most recent year, average municipal waste amounts per capita (kg/person-day) of TURKSTAT for the cities mentioned below data are given;

- Mersin Province: 196 liter/person-day
- Adana Province: 155 liter/person-day
- Osmaniye Province: 160 liter/person-day
- Gaziantep Province: 182 liter/person-day
- Total amount of domestic wastewater per capita: $196+155+160+182 = 693 \text{ liter/person-day}$

The total number of personnel to work in the project between March and April, when the highest number of employees was reached, is 385 people.

Domestic wastewater amount: 693 liter/person-day x 385 person = 266,805 liter/day

During the operation phase, domestic wastewater produced by train passengers and visitors at train stations and stops, and in railway offices and administrative buildings will be a source of environmental impact. This waste water may contain oils and greases, detergents, chemicals, metals, and solids in concentrations that can pass into the drainage system and from there to the nearest stream. The resulting domestic wastewater will go to the network system, and it is assumed that the stations and administrative buildings along the railway are part of the railway operation.

The operation phase is under the responsibility of TCDD and Rönesans is responsible for the construction phase.

4.11.4.2 Field Studies

For the Mersin-Gaziantep (Başpınar) High Standard Train Project route, a preliminary field study was carried out and the route was recognized. Since there is an existing railway route and some parts of it started to be built in different years, the waste areas are known with the previous studies.

The location for the treatment plant has not been selected, as the wastewater; treatment system will not be installed and will be given to the wastewater network.

4.11.5 Impact Magnitude and Sensitivity Criteria

Since the impacts of domestic solid wastes and other wastes generated during the construction phase are short-term and reversible and they are mostly domestic wastes, the impact size is low.

Receiver source sensitivity is moderate because the receiving environment is living organisms and ecosystem. The impact magnitude is negligible.

Since the domestic wastewater generated during the construction phase is not of an industrial nature, it has a short-term and reversible effect. Thus, its impact size is low.

4.11.6 Impact Assessment

4.11.6.1 Construction Phase

4.11.6.1.1 Waste

The domestic solid waste load that will arise during the construction phase is 1459 kg/day, and the packaging waste load is 0.2918 kg/day. Domestic solid wastes and packaging wastes, which will occur during the construction phase of the project, will be kept in the construction site in a way that will not pose a risk to water, air, soil, plants, animals, and people, prevent adverse effects on the natural environment and thus not harm the environment and human health. Then, they will be sent to the nearest landfill and removed from the field.

In the management of domestic solid wastes to be generated within the scope of the Project, provisions of the Waste Management Regulation dated 02.04.2015 and numbered 29314, international standards, IFC Standards and EU Directives will be followed. Recyclable and non-recyclable packaging wastes such as glass, plastic and metal will be collected separately from the others and managed in accordance with the Packaging Waste Control Regulation dated 27.12.2017 and numbered 30283, IFC Standards and EU Directives. Negotiations will be made with the relevant municipalities to ensure collection, storage, and disposal.

Construction/excavation wastes will be used as filling and wastes that are not suitable for filling will be kept in the designated area in the construction site and sent to the relevant municipal solid waste site. In this context, the relevant provisions of the "Regulation on the Control of Excavation Soil, Construction and Demolition Wastes" will be complied with regarding the reuse and disposal of excavation phases materials within the scope of the project.

First aid equipment will be available to respond to an emergency that may occur during the construction phase of the High Standard Train Project, and medical wastes from this equipment (bandages, bandages, contaminated cotton, etc.) will be generated. These medical wastes will be collected separately from other wastes such as domestic, packaging, hazardous and non-hazardous wastes and sent to the disposal facility of the relevant municipality. By preventing from harming to the environment and human health directly or indirectly, the Medical Waste Control Regulation, the relevant IFC standard/guideline and EU directives will be complied with for the management in this regard.

In case of any malfunction of the construction equipment to be used for the works in the construction phase, it is possible that waste oils will occur during the maintenance and repair of the machines in cases where this failure is made in the construction site. The waste oils generated will be stored in sealed bags/containers placed on an impermeable ground within the project. Tanks and/or containers shall be easily filled and emptied. In case that oil filters are removed from the vehicles, waste engine oil will be collected in, a separate lidded container located next to the temporary storage tanks. Apart from waste oils from the same construction machinery and equipment, it is likely to occur in hazardous wastes from absorbers, filter materials, protective clothing, and waste drums and cartridges contaminated with pollutants. It will be managed in accordance with the Waste Oil Management Regulation dated 21.12.2019 and numbered 30985, Waste Management Regulation dated 02.04.2015 and numbered 20814 and the relevant IFC standard/guideline and EU directives, by ensuring ground impermeability to prevent the passage of these waste oils and hazardous wastes to the soil and water.

In case that the replacement of the tires that have completed their life is in the field, they will be given to the conversion companies that have "Temporary Storage Permit or Environmental License" from the Ministry of Environment and Urbanization and evaluated. Within the scope of the project, the management will be carried out in accordance with the Regulation on Control of End of Life Tires, IFC standard/guideline and EU directives.

In cases where it is necessary to change the batteries of construction machinery and equipment, it will be replaced with a battery full and waste batteries will be generated. Apart from batteries, it will also generate waste from batteries that have reached the end of their life. These wastes will be collected and given to licensed companies. The provisions of Waste Batteries and Accumulators Control Regulation, IFC standard/guideline and EU directives will be complied in the collection and disposal of waste batteries and accumulators.

The solid wastes, which are calculated and mentioned above, do not cause any risk or negative impact on the environment and people during and after the construction period of the High Standard Train Project.

4.11.6.1.2 Wastewater

The domestic wastewater load that will arise from the activities during the construction period of the High Standard Train Project is 266,805 liter/day.

The Work Term Plan, which shows the timing of the works such as construction and commissioning, which takes place in the process of realization of infrastructure facilities such as sewage that wastewater resources need to meet the receiving environment discharge standards specified in the regulation, will be prepared and the wastewater load calculated appropriately within this plan will be given to the recovery (network line).

There is no industrial wastewater generation from the project. For the construction phase of the High Standard Train Project, only domestic wastewater will be generated, and the above-mentioned wastewater load will be obtained by getting the permit mentioned in Article 44 of the Water Pollution Control Regulation Wastewater Connection Permit and Certificate and in compliance with the issues described in articles 45, 46, 47 and 48 of the same regulation will be sent to the network line.

It will be ensured that the domestic waste water load originating from the activities is removed without causing any harm to the environment and people. In addition, its management will be ensured in accordance with the relevant regulations and international standards and directives.

4.11.6.2 Operation, Longer Term and Permanent Effects

4.11.6.2.1 Waste

When the construction period of the High Standard Train is over and the operation period starts, domestic solid wastes and packaging wastes are formed as in the construction period. These wastes originate from employees, who work at stations and stops, and train passengers.

The amount of domestic solid waste and packaging waste will vary depending on the number of passengers and trips. Collection containers will be placed in suitable places within the station for domestic solid wastes and packaging wastes (separately for plastic, glass and metals) that will occur at the stations and stops. For the disposal of wastes, it will be provided in Convention with the companies and the relevant municipalities.

4.11.6.2.2 Wastewater

Domestic wastewater to be generated at the stations during the operation phase of the project will vary according to the number of trips, passengers and personnel to work at the station. Necessary permits and documents will be obtained for the disposal of wastewater that will occur during the operation phase, and their disposal will be provided by connecting to the existing network line system in the region.

Regarding the management of wastewater, Water Pollution Control Regulation, Urban Wastewater Regulation, IFC Standards/Guidelines and EU Directives will be taken into consideration.

4.11.7 Cumulative Impact Assessment

In the cumulative solid waste and wastewater assessment, it was reviewed whether the capacities of the solid wastes and wastewaters to be established on the route line and the construction activities and the waste storage areas and wastewater treatment facilities in the provinces where the route passes are met.

3 construction sites that planned to be established are in Merkez Tarsus, Ceyhan and Nurdağ settlements.

Landfill in Tarsus has a capacity of 225 (225,000 kg/day) in winter and 233 (233,000 kg/day) ton/day in summer, according to the Mersin Province Environmental Status Report 2014. The amount of domestic solid waste calculated as the total waste that will arise from all construction sites of the project is 1459 kg/day. Considering that the wastes to be generated during the construction period will be from the domestic solid waste category, where the most waste will come, the formation of a solid waste in the specified amount will have a cumulatively insignificant effect

Tarsus Municipality wastewater treatment facility has a capacity of 61,272 m³/day according to Mersin Province Environmental Status Report 2014, Osmaniye Municipality wastewater treatment facility has a capacity of 70,000 m³/day according to Osmaniye Province 2016 Environmental Status Report and Gaziantep Water and Sewerage Administration (GASKI) 2018 Activity According to its report, Gaziantep wastewater treatment plant has a capacity of 473,900 m³/day. Since domestic wastewater from the construction sites will be discharged to the network line, it will reach the connected district and provincial treatment facilities. The total amount of domestic wastewater to be formed from the construction sites is 266,805 liter/day = 0.266805 m³/day.

When the total amount given in the calculation made according to the total number of personnel of the construction sites is compared with the above wastewater treatment capacities, it is seen that the cumulative effect has almost no effect.

4.11.8 Summary of Residual Impacts, Significance Criteria and Overall Impact Significance

The waste and wastewater impact of Mersin-Gaziantep (Başpınar) High Standard Train Project route construction and operation were examined. Domestic solid waste load is calculated as 1,459 kg/day and packaging waste load as 0.2918 kg/day, and it is seen that solid waste load will not have an impact on the environment and the ecosystem. Considering that, other solid wastes will come out at a lower amount than the domestic will and packaging waste load, the total waste load is not enough to have a significant impact.

The wastes generated on the route of the project are temporarily stored and sent to the waste storage areas of the relevant municipalities for disposal.

The domestic wastewater load to be formed from the construction sites, which is established during the construction period, will be 266,805 liter/day and the wastewater load to be generated from the operation will vary according to the number of passengers and voyages to be used. Industrial wastewater will not be generated, only domestic wastewater will be generated. The calculated wastewater load will be given to the network line and it is not expected to have an impact on the environment and ecosystem.

4.11.9 Mitigation Measures

The construction phase solid wastes are not expected to have a negative impact on the environment and ecosystem. The calculated solid waste load is a low amount. If a possible potential risk occurs, the following measures and mitigation methods are taken;

- Providing a different suitable storage area when necessary,
- Providing appropriate storage conditions, including collecting hazardous and non-hazardous wastes separately at the source, labeling the name of the waste, and classifying it,
- Separate collection of recyclable wastes will be collected and properly disposed of by the relevant Municipality,
- Providing personnel training about waste management.

The domestic wastewater of construction phase is not expected to have a negative impact on the environment and ecosystem. In this context, it is not necessary to take any additional mitigation measures. When a possible risk occurs, the discharge of wastewater to the network can be monitored continuously.

The mitigation measures planned to be implemented within the scope of the project are given in the ESMMP prepared for the project.

4.11.10 Assumptions and/or Limitations

Waste and wastewater generation resulting from construction and operation phases of Mersin-Gaziantep (Başpınar) High Standard Train Project has been analyzed based on data about number of the employee sent by Rönesans, TURKSTAT 2018 municipality statistics and Environmental Status Reports.

4.12 Traffic and Transport

4.12.1 Introduction

The High Standard Train Project planned to be built on the Mersin-Gaziantep (Başpınar) route will be carried out by rehabilitating the existing railway in some sections and building additional lines in some places. The current railway proceeds in parallel with the highway from Mersin to Gaziantep, which also separates other settlements located between these two provinces. Both the highway (O-51/52) and the state road (D400/825) surround the High Standard Railway Route.

With the High Standard Railway Route that passes through Mersin, Adana, Osmaniye and Gaziantep provincial borders and covers a total of 286 km, it will ensure that the transportation to the mentioned 4 provinces and districts is in a shorter time than the highway. High Standard Railway passes through 4 provinces and 14 districts. It will also reduce the load on road transport, as it will reduce the number of vehicles passing through the highway and state road (see Table 4.128).

Table 4.128: Cities and Districts

Cities	Districts
Mersin	Akdeniz
	Tarsus
	Toroslar
Adana	Seyhan
	Yüreğir
	Sarıçam
	Ceyhan
Osmaniye	Toprakkale
	Center
	Düziçi
	Bahçe
Gaziantep	Nurdağ
	Pazarcık
	Şehitkamil

On the route from Mersin to Gaziantep Başpınar, Mersin-Adana D400 Road, Adana-Erdemli Highway (O-51), Adana Ring Road (O-51), Adana-Şanlıurfa Highway (O-52), Adana-Osmaniye D400 the road runs in parallel with the Osmaniye-Gaziantep D400 Road, the Gaziantep-Antakya D825 Road, and intersects in some areas with the Adana-Şanlıurfa Highway (O-52), the Adana-Osmaniye D400 Road, the Osmaniye-Gaziantep D400 Road, and the Gaziantep-Antakya D825 roads. In addition, within the scope of this project, a single connection road will be built under Rönesans responsibility, and this road is the 9.5 km double-line connection road to Çukurova Airport.

Mersin-Tarsus

According to the 2019 State Roads Load Map published by the General Directorate of Highways, located between Mersin and Tarsus, the number of vehicles passing through the state road is estimated by counting 56,521 vehicles per day and a total of 25,697 vehicles per day with continuous vehicle counting and classification station. According to the 2019 Highway Volume Map published by the General Directorate of Highways, 82,218 vehicles pass through this road daily.

Tarsus-Adana

According to the 2019 State Roads Volume Map published by the General Directorate of Highways, the number of vehicles passing through the state road between Tarsus and Adana Center is estimated and counted with 53,707 vehicles per day and continuous vehicle counting and classification stations, and 20,152 vehicles per day. According to the 2019 Highway Volume Map published by the General Directorate of Highways, 73,859 vehicles pass through the state roads daily.

Adana-Osmaniye

According to the 2019 State Roads Volume Map published by the General Directorate of Highways between Adana and Osmaniye, the estimated number of vehicles passing through the state road is counted and a total of 61,416 vehicles per day.

A total of 16,551 vehicles and portable vehicle counting, and classification stations are counted per day, and 14,420 vehicles are counted per day. According to the 2019 Highway Volume Map published by the General Directorate of Highways, 92,387 vehicles pass through the Adana-Osmaniye highway per day.

Osmaniye-Gaziantep

According to the 2019 State Roads Volume Map published by the General Directorate of Highways, between Osmaniye and Gaziantep, the number of vehicles passing through the state road is estimated and counted with 239,343 vehicles per day and continuous vehicle counting and classification stations, and 34,741 vehicles per day. According to the 2019 Highway Volume Map published by the General Directorate of Highways, 274,084 vehicles pass through the Osmaniye-Gaziantep state roads in total daily.

In the traffic and transportation section, the intersection points of the High Standard Train Project with the existing highway and the traffic density are given and the effects on traffic and transportation have been examined.

4.12.2 Policies, Legal Framework and Guidelines

4.12.2.1 National Legislations

Highways Traffic Law

The purpose of the Highways Traffic Law Official Gazette dated 8.10.1983 and numbered 18195 is to ensure the traffic order in terms of life and property safety and to determine the measures to be taken in all matters concerning traffic safety.

The Highways Traffic Law covers the rules, conditions, rights and obligations related to traffic, their implementation and supervision, the relevant organizations and their duties, powers and responsibilities, working procedures and other provisions. This Law is applied on highways, but unless there is a provision to the contrary; a) Areas that are open to the public in areas other than highway, and places used for road vehicle traffic in parks, gardens, parking spaces, garages, passenger and goods terminals, service and fuel stations, b) On access controlled highways and in public parts of highways that are paid for, and The provisions of this law are also applied to the parts of the vehicles that provide public service on the seas, lakes and rivers connecting a certain highway, which are reserved for road vehicles.

Turkey Law on the Liberalization of Railway Transport

01.05.2013 dated 28634 numbered Turkey Law on the Liberalization of Railway Transport, railway passengers and the most appropriate in terms of quality of services freight transport, the lowest price offered effective and will be, the Republic of Turkey State Railways General Directorate to be configured as railway infrastructure operator, the Republic of Turkey It aims to establish a company as a railway train operator with the name of State Railways Transportation Inc., to build railway infrastructure and to use this infrastructure, public legal entities and companies registered with the trade registry to operate railway infrastructure and railway train management. Liberalization Law on Railway Transport of Turkey covers railway infrastructure operators and railway train operators that operate on the national railway infrastructure network.

Regulation on Transportation of Hazardous Substances via Highways

The Transport of Dangerous Substances by Highway Regulation dated 24.04.2019 and 30754 numbered, aims hazardous materials transportation activities by highway to be made public; human health and without harming the environment with other living beings safe, secure, and orderly execution and participating in the operation. In addition, it aims to define the procedures and principles related to the responsibilities and obligations of senders, recipients, fillers, loaders, unloading, packers, tank-container/portable tank operators, carriers, and drivers of all types of vehicles carrying dangerous goods.

This regulation, involved in the transportation of dangerous goods by road; senders, recipients, loaders, packers, loaders, tank-container / portable tank operators, transporters and unloaders, used in the transportation of dangerous goods; type approval certification of vehicles, packaging and freight transport units, first, intermediate, periodic and exceptional tests and inspections of the said transport units, training and inspections for dangerous goods transport activities, international dangerous goods transport with foreign plate vehicles within the borders of our country, all public institutions and its organizations, on behalf of the Turkish Armed Forces, Gendarmerie General Command, Security General Directorate and Coast Guard Command; It includes the dangerous goods transportation by third parties.

Communique on Dangerous Goods Safety Consultancy

Communique No. 29007 of 22.05.2014 on Hazardous Materials Safety consultancy, hazardous materials; bearing, sender, packing, loading, filling and emptying operations of their businesses, human health, other living beings and to do so in a safe manner without causing harm to the environment, these businesses in order to assist enterprises to be employed in Hazardous Materials Safety Advisors (HMSA) or to the service and Hazardous Materials Security Consulting organizations (HMSCO) will work with these organizations and service recipients within HMSA qualifications, training, certification preparation task, it aims to regulate the procedures and principles of its powers and responsibilities.

Enterprises that are involved in the transportation of dangerous goods and operate, ship, pack, load, fill and unload a net amount of fifty tons or more within a calendar year and have a Hazardous Material Activity Certificate within the scope of the third paragraph of Article 6 and the total vehicle Transport operators with a carrying capacity of fifty tons and over, and enterprises temporarily storing hazardous material covered by this paper, who are involved in the dangerous goods transport process, regardless of their quantity, dealing with hazardous substances with a transport category of zero in the table in ADR Section 1.1.3.6.3, companies operating as sending, packing, loading and filling, HMSAs to be employed by the enterprises and Hazardous Materials Safety Consultancy Organizations (HMSCO) to receive consultancy services and HMSAs to take part in these organizations, HMSAs that will take part in the transportation of hazardous materials. It includes the training and exams to be held with the institutions.

Highways Traffic Regulation

In terms of life and property safety, in accordance with the Highway Traffic Regulation dated 18.07.1997 and numbered 23053, Highways Traffic Law; It aims to determine the other provisions indicated and deemed necessary to be regulated in the Regulation regarding the measures to be taken in matters concerning the maintenance of traffic order and traffic safety on highways, and the principles and procedures for their implementation.

Road Traffic Regulation covers traffic-related rules and their implementation and control, traffic regulation, registration of vehicles, technical conditions, on highways, offices and measures to be taken during their deportation, the provision of documents and the examination of vehicle drivers, the rights and obligations of those who benefit from the highway, education, and Enforcement Committee the duties and responsibilities of the organization coordination and collaboration with the layout of traffic-related based on other issues regarding procedural, shapes and conditions the provisions.

Regulation on Road Infrastructure Safety Management

21.10.2018 dated Road Infrastructure Safety Management Regulation No. 30572, in the context of road infrastructure safety management road safety impact assessments, road safety checks, safety ranking and road network management, road safety inspections aim at identifying the application associated with the procedures and principles.

This regulation covers roads open to traffic with sections of the highway under planning, design and construction that are outside of road tunnels longer than 500 meters.

4.12.2.2 International Guidelines

International Finance Corporation (IFC)

International Finance Corporation (IFC) Environmental, Health, and Safety (EHS) Guidelines and IFC Performance Standards are applied for the management of traffic and transportation ethics. General EHS guidance includes issues such as safe driving, medical supervision, training in relation to traffic generated by vehicles used in industrial traffic, i.e., during the construction phase of the project. In addition, the Air Emissions and Ambient Air Quality and Noise issues contained in the General EHS guide also include environmental effects caused by vehicle use, so the standards given by these headings are considered.

In addition to the General EHS manual, compliance with the standards provided for Traffic Safety and transport of hazardous materials under the heading IFC Community Health and Safety will be ensured. These standards include setting of a vehicle due to the nature of workplace materials or human security measures to ensure traffic safety and the prevention of accidents during transport that can occur by all of the adoption in the use of transport containers for the transport of dangerous goods, transport documents to be maintained.

It is ensured that IFC Performance Standard 1 Environmental and Social Risks and Impacts Assessment and Management are carried out to identify, define and prevent risks that may occur, and are implemented in the part of establishing a management system in the occupational health and safety section.

European Bank for Reconstruction and Development (EBRD)

The European Bank for Reconstruction and Development (EBRD) states that the project owner should develop measures to identify, assess and monitor traffic and road safety risks to employees and potentially affected communities, and to address them where appropriate.

For projects operating mobile equipment on public roads and other forms of infrastructure, the client is obliged to develop practices to prevent incidents and injury to the public associated with the operation of the equipment in question.

EBRD Performance Requirement 4 Health, Safety and Security is similar to IFC Performance Standards. It notifies that the necessary measures are taken for road and driver safety.

4.12.3 Extend of Study Area

4.12.3.1 Spatial Extend

The High Standard Train Project planned to be built on the Mersin-Gaziantep (Başpınar) route will be carried out by rehabilitating the existing railway in some sections and building additional lines in some places. The current railway proceeds in parallel with the highway from Mersin to Gaziantep, which also separates other settlements located between these two provinces. Both the highway (O-51/52) and the state road (D400/825) surround the High Standard Railway Route.

With the High Standard Railway Route that passes through Mersin, Adana, Osmaniye and Gaziantep provincial borders and covers a total of 286 km, it will ensure that the transportation to the mentioned 4 provinces and districts is in a shorter time than the highway. High Standard Railway passes through 4 provinces and 13 districts. It will also reduce the load on road transport, as it will reduce the number of vehicles passing through the highway and state road (see Table 4 118).

4.12.3.2 Temporal Extend

Other than the Çukurova Airport connection road, no connection road will be constructed on the High Standard Train Project route. When a possible connection road is needed, temporary connection roads will be constructed by obtaining permits from the necessary institutions, and necessary national legislation and international regulations will be complied with during construction and implementation.

4.12.4 Identification of Baseline Conditions

4.12.4.1 Desk Studies

With a total of 56,521 vehicles including 38,712 automobiles, 8483 medium-loaded commercial vehicles, 591 buses, 2,829 trucks and 5,906 trucks+trailers, which were measured by estimating the state road between Mersin and Tarsus; A total of 25,697 vehicles, including 15,621 automobiles, 3,134 medium-loaded commercial vehicles, 318 buses, 2,047 trucks, and 4,577 trucks+trailers, were counted through the continuous vehicle counting and classification station. The total number of vehicles between the Mersin-Tarsus state road, where both the estimated and continuous vehicle counting and classification station are being counted, is 82,218.

A total of 52,575 vehicles, with 41,387 light vehicles and 11,188 heavy vehicles, passed through the highway between Mersin and Tarsus.

With a total of 53,707 vehicles, including 41,700 automobiles, 6745 medium-loaded commercial vehicles, 512 buses, 3,157 trucks and 1593 trucks + trailers, which were measured by making an estimate of the state road between Tarsus and Adana Center; A total of 20,152 vehicles, including 14,875 automobiles, 2,490 medium-loaded commercial vehicles, 230 buses, 1,122 trucks, 1,432 trucks + trailers, were counted with the continuous vehicle counting and classification station. The total number of vehicles between Tarsus-Adana state road, where both the estimated and continuous vehicle counting and classification station and the counting is made, is 73,859.

104,790 vehicles have passed between Tarsus-Adana Central highway, with 71,170 light vehicles and 33,620 heavy vehicles.

With 39,435 automobiles, 5923 medium-loaded commercial vehicles, 281 buses, 11,857 trucks and 9920 trucks + trailers in total, 61,416 vehicles, which were measured by making an estimated count between Adana and Osmaniye; A total of 16,551 vehicles, including 10,904 automobiles, 2938 medium-loaded commercial vehicles, 266 buses, 1285 trucks, 1158 trucks + trailers, counted by the continuous vehicle counting and classification station; A total of 14,420 vehicles, including 8324 automobiles, 1244 medium-loaded commercial vehicles, 26 buses, 1501 trucks, 3325 trucks + trailers, were counted with the portable vehicle counting and classification station. The total number of vehicles between the estimated and continuous vehicle counting and classification station and the portable vehicle counting and classification station and the Adana-Osmaniye state road where the count is made is 92,387.

368,984 vehicles passed between Adana and Osmaniye, with 274,916 light vehicles and 94,068 heavy vehicles.

With a total of 239,343 vehicles, including 183,434 automobiles, 25,434 medium-loaded commercial vehicles, 1843 buses, 17,942 trucks and 11,918 trucks + trailers, which were measured by making an estimated count between Osmaniye and Gaziantep; A total of 34,741 vehicles, consisting of 28,054 automobiles, 3248 medium-loaded commercial vehicles, 122 buses, 1134 trucks, 2183 trucks + trailers, were counted with the continuous vehicle counting and classification station. The total number of vehicles between the Adana-Osmaniye state road, where both the estimated and continuous vehicle counting and classification station are being counted, is 274,084.

There were 58,343 light vehicles, 111,886 heavy vehicles, and 170,229 vehicles between the Osmaniye-Gaziantep highways.

The average total number of vehicles given in line with the volume maps published by the General Directorate of Highways and the total traffic load increase are given below.

Average total number of vehicles crossing the state road between Mersin and Gaziantep: 522,548 vehicles.

Average total number of vehicles on the highway between Mersin and Gaziantep: 696,578 vehicles.

During the construction phase, 315 vehicles for excavation, 91 for filling, 17 for foundation excavation, 29 for Plenti production, 87 for granular fillings, 11 for asphalt paving, 35 for basalt paving, 61 for basalt line paving, 15 for non-basalt line paving, scissors paving It is planned to use 13 vehicles for line dismantling, 5 for scissor removal, 14 for sleeper production, 8 for basalt quarry, 8 for panel production and 58 for the support team. 758 vehicles will be used for all operations.

Total traffic load increase= Total traffic load from project / Total traffic load x100

Total traffic load increase on the state road during the construction period

$$= 758 / 522,548 \times 100$$

$$= 0.15\%$$

Total traffic load increase on the highway during the construction period

$$= 758 / 696,578 \times 100$$

$$= 0.11\%$$

As can be seen from the calculation, the traffic load increase on the state road is 0.15% and the traffic load on the highway is 0.11% during the construction period. During the operating period, the traffic load will vary depending on the private vehicles, shuttles and public transportation vehicles used by passengers and employees. Although the traffic load to and from the stations is increasing, if it is considered that approximately 2 million passengers go from Mersin to Gaziantep, approximately 1 million of these passengers will use the High Standard Train and will also reduce the traffic load. It will have an increasing and decreasing effect on the traffic load during the operational period.

During the operation period, vehicle traffic will occur for the purpose of entering and leaving stations within the scope of the project. It is assumed that there are 100 vehicles entering and exiting the station from Tarsus Station, Çukurova Airport Connection, Yenice Station, İncirlik Station central stations and 50 vehicles entering and exiting from other 14 stations and stops.

Total vehicles to be used during the operating period

$$(100 \times 4) + (50 \times 14)$$

$$= 1,100 \text{ vehicles}$$

Total traffic load increase on the state road during the operation period

$$= 1,100 / 522,548 \times 100$$

$$= 0.21\%$$

Total traffic load increase on the highway during the operation period

$$= 1,100 / 696,578 \times 100$$

$$= 0.16\%$$

The figures showing the vehicles passing through the State Road and the Highway are given below (see Figure 4.83 and Figure 4.84).

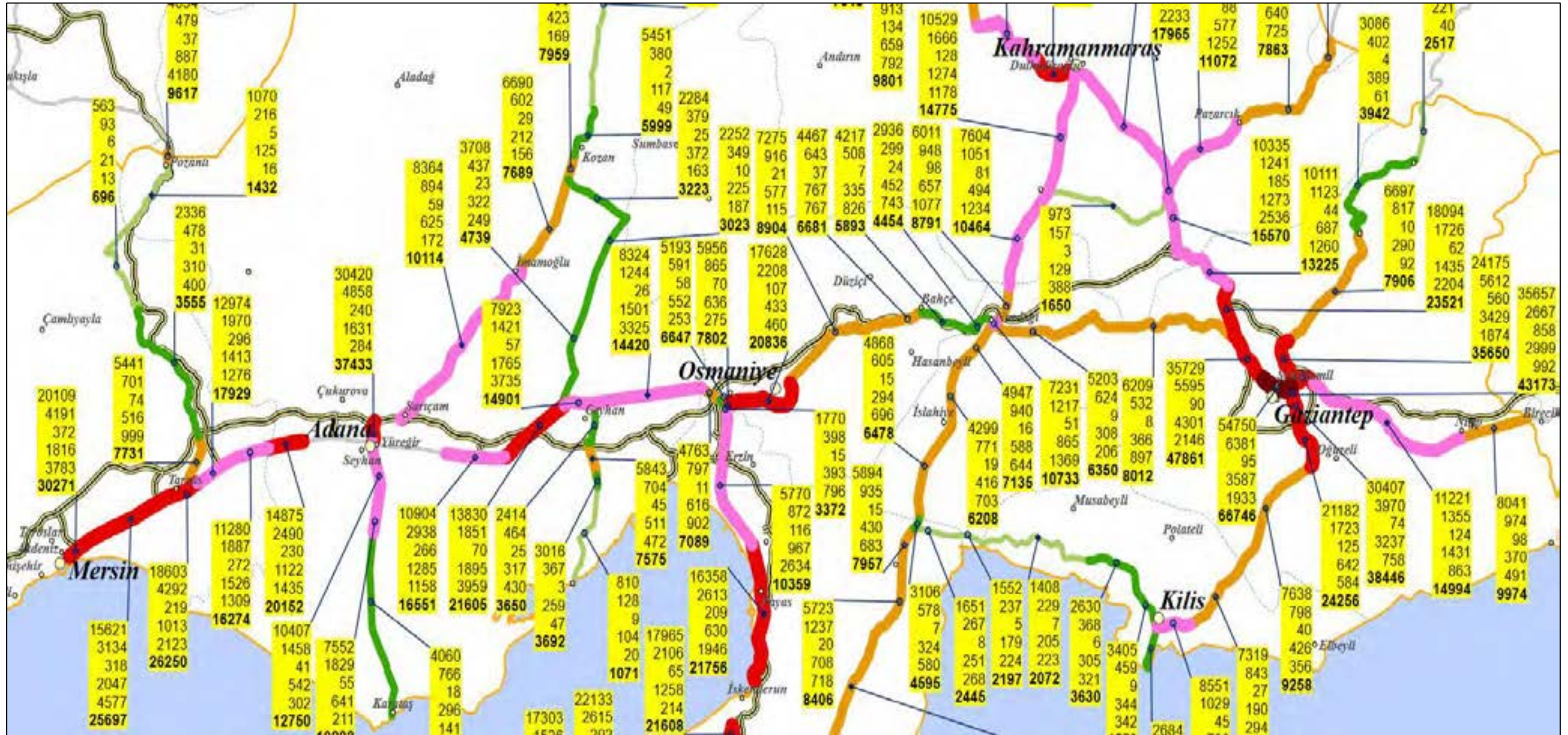


Figure 4.83: State Roads Traffic Load Map [48]

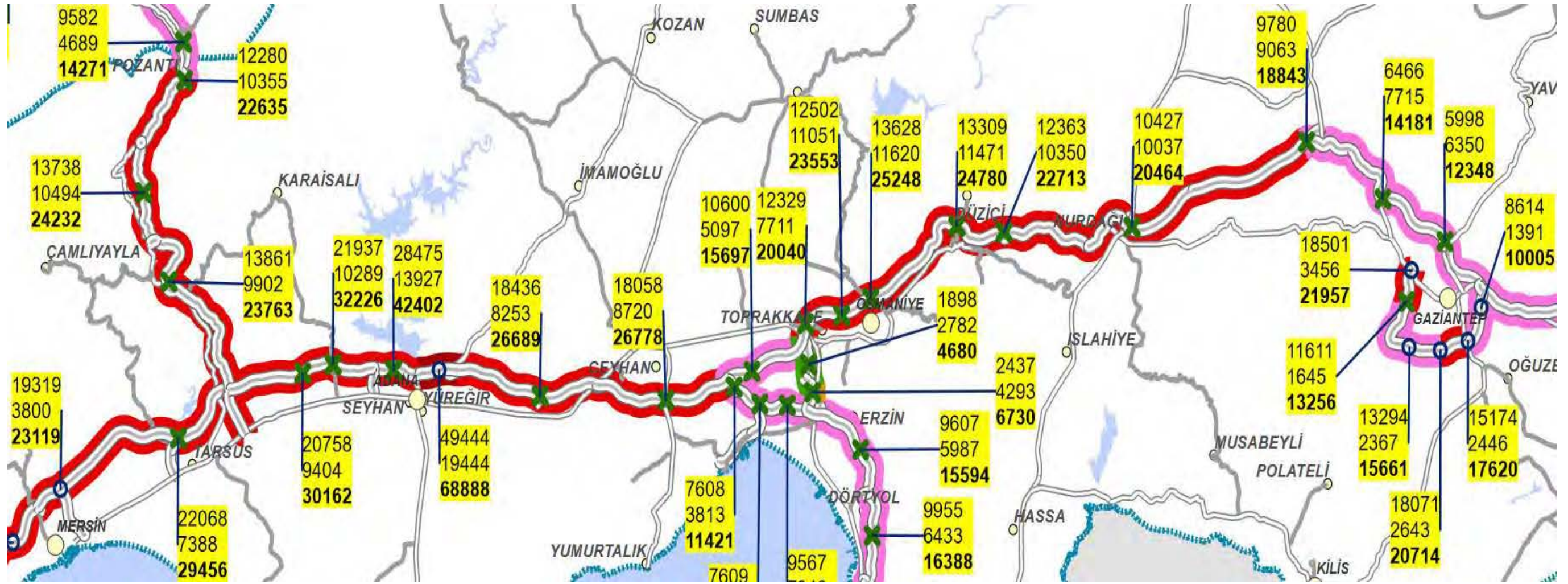


Figure 4.84: Highways Traffic Load Map [48]

Periodic maintenance, general inspections, exhaust emission inspections of the vehicles to be used within the Röneseans will be carried out, as well as the Compulsory Liability Insurance Policies of all vehicles within the scope of the General Conditions of Highways Motor Vehicles Compulsory Liability Insurance and their registration to traffic will be provided in this way.

4.12.5 Impact Magnitude and Sensitivity Criteria

In the analysis of the effect size of traffic and transportation, it can be considered as a low impact since the examined effect is road-related and will not be a permanent situation during the construction period. For the operating period, it can be called low magnitude because it has a very low effect, although there is a slight departure from the basic conditions. There will be changes for both stages, but these changes will not be significant and will have an effect similar to the baseline situation. Therefore, the effect can be described as low magnitude.

The receptor is tolerant of change without damaging its character, has a low environmental value or is of local importance, so the sensitivity criteria are low.

4.12.6 Impact Assessment

4.12.6.1 Construction Phase

In the Mersin-Gaziantep (Başpınar) High Standard Train Project, the number of vehicles passing on both the state road and the highway for traffic and transportation was obtained from the 2019 Volume Maps of the General Directorate of Highways and the contribution to the current traffic load was calculated in Section 4.11.4.

According to the 2019 Volume Maps of the General Directorate of Highways, on the current highway between Mersin and Gaziantep, the number of vehicles passing by the state road daily is 522,548 and the number of vehicles passing by the highway daily is 696,578. It is planned to use 758 vehicles in total for all activities to be carried out during the construction period. In this context, in line with the calculations, the vehicles to be used during the construction period of the High Standard Train Project will increase the current state road traffic load by 0.15% and the highway traffic load by 0.11%. These calculated amounts are not expected to have a significant impact on the current traffic load. Even when the daily total vehicle passage and the number of vehicles to be used for this project are compared, it is seen that the effect size of the project vehicles will be low.

Since the effect that will occur for the construction period is not long-term and creates a temporary situation, the low impact that will occur can be regarded as insignificant.

4.12.6.2 Operation, Longer Term and Permanent Effects

In this section, where the Mersin-Gaziantep (Başpınar) High Standard Train Project traffic and transportation impact assessment is examined, the calculation of the traffic load that will occur during the operation period is given in Section 4.11.4.

Automobiles, buses, and service vehicles will be used during the operation period and 1,100 extra vehicles will be added in addition to the current situation in total. In this context, the traffic load for the state road calculated for the operational period will increase by 0.21% and for the highway by 0.16%. As in the construction period, the increase in traffic load calculated during the operation period will have a low effect. It is expected to have a low impact for the region, although it will have a permanent effect on the current situation, not as a temporary situation like the construction period.

Increasing the traffic load is an impact, as well as increasing the use of high standard trains by reducing the use of highways by passengers; it will facilitate the traffic load that will occur on the existing highway during the operation period. This lightening of the traffic load also provides a positive effect.

4.12.7 Cumulative Impact Assessment

The states and highways that can be preferred to reach Gaziantep from Mersin are as follows; Mersin-Adana D400 Road, Adana-Erdemli Highway (O-51), Adana Ring Road (O-51), Adana-Şanlıurfa Highway (O-52), Adana-Osmaniye D400 the road runs in parallel with the Osmaniye-Gaziantep D400 Road, the Gaziantep-Antakya D825 Road, and intersects in some areas with the Adana-Şanlıurfa Highway (O-52), the Adana-Osmaniye D400 Road, the Osmaniye-Gaziantep D400 Road, and the Gaziantep-Antakya D825 roads. These roads and vehicles to be used during the construction and operation phase of the project will create a cumulative effect in the region. In this context, in the cumulative impact assessment section, the extent of the cumulative effect of the traffic load, which will be caused by the construction and operation period activities of the route line between Mersin and Gaziantep, on the existing traffic, has been evaluated.

Currently, the number of vehicles crossing the state road daily is 522,548 and the number of vehicles passing through the highway daily is 696,578, and the total number of vehicles to be used in both construction and operation phases is 1858. When the current vehicle status and project-based vehicle status are compared, vehicle traffic arising from the project is not expected to affect the current situation at a high level. Although it will increase vehicle traffic a little cumulatively, this amount will not have a major impact on traffic and transportation. Therefore, the cumulative impact on vehicle traffic will be low.

4.12.8 Summary of Residual Impacts, Significance Criteria and Overall Impact Significance

In this section, where the Mersin-Gaziantep (Başpınar) High Standard Train Project route is constructed and the effect on the existing road traffic and transportation is examined, the daily number of vehicles on the existing highway is calculated from the 2019 Volume Maps of the General Directorate of Highways. According to this calculation, the vehicles to be used during the construction period of the project are expected to increase the state road traffic load by 0.15% and the highway traffic load by 0.11%. Considering these rates, the number of vehicles that will pass through the state road and highway, and the total number of vehicles planned to be used in the project, the project is not expected to have a negative impact on traffic and transportation.

Since the impact is traffic and transportation related to the road and the effect is short-term, temporary for the construction period, it is in the low magnitude and low importance class. When a potential adverse impact risk is encountered, the following mitigation methods can be applied. Any measures to be taken to ensure traffic safety will be under the responsibility of the construction contractor during the construction phase and the operating contractor during the operation phase.

4.12.9 Mitigation Measures

Although a negative impact on traffic and transport is not expected in the High Standard Train Project, the prevention and reduction methods given below are applied when a possible risk is not encountered and/or encountered;

- All activities related to traffic and transportation within the scope of the High Standard Train Project will be carried out in accordance with the provisions of the Road Traffic Law.
- Activities related to the transport of dangerous goods shall comply with the provisions of the regulation on the transport of dangerous goods by road No. 15742 of 22 October 1976.
- In the current situation, additional connecting roads will not be opened except for the Çukurova airport connection, and in cases where it is necessary to open, the necessary permits will be obtained from the relevant Regional Directorate of Highways and other authorities.
- Existing roads will be used for transport as much as possible during both the construction and operation stages, and all impact mitigating measures will be taken to avoid any damage to the roads.
- Existing asphalt roads will be used as necessary without damage. In cases of damage, such as removal of asphalt, repair work will be carried out.
- Stabilized roads used will be watered against dust formation.

- Vehicles carrying long, heavy, and dangerous loads will depart at certain hours in a way that does not disrupt traffic.
- Regular planning of the traffic hours will be made, and these hours will be enforced to be applied,
- Carrying out monitoring within the scope of traffic and transportation.

The mitigation measures planned to be implemented within the scope of the project are given in the ESMMP prepared for the project.

4.12.10 Assumptions and/or Limitations

Mersin-Gaziantep (Başpınar) High Standard Train Project has been analyzed by calculating the traffic load and the traffic and transportation effect caused by the use of vehicles during the construction and operation phases, in line with the Roadways 2019 Volume Maps (State Roads Volume Map and Highway Volume Map) and the number of equipment and vehicle use sent by Rönesans.

4.13 Resources Efficiency and Pollution Prevention and Control (EBRD PR3)

4.13.1 Introduction

The basic definition to efficiency is the ratio of desired output to required input. Resource efficiency is the vice versa of over-exploitation of world's resources. It means using the resources in a sustainable manner, less input with a greater output. It facilitates the shift towards a low-carbon economy and a sustainable growth.

Resource efficiency and pollution prevention control is an important environmental discipline recognized by IFC PS3, aims to minimize pollution and maximize sustainable resource efficiency with an integrated approach. Increased economic activities and urbanization generates increased level of pollution to the environment. As pollution occurs, finite resources are depleted and threat all the living beings at the regional, local, and global levels. In addition, GHGs emitted from the activities threatens the public health and sustainability. On the other hand, GHG mitigation technologies and pollution prevention control technologies have become more available and achievable in all parts of the world and widely applied in industrial and agricultural sectors. Industrial and agricultural sectors should try to reach out the most sustainable level of production to ensure the welfare of future generations. Besides, resource efficiency and pollution prevention and control targets and objectives are part of Environmental and Social Management System (ESMS) and Environmental and Social Management and Monitoring Plan (ESMMP), describing most of a project's environmental enhancements (energy efficiency, cleaner production, etc.).

This PS summarizes the resource efficiency and pollution prevention in a manner that best available practices and technologies are relied on and projects are initiated in an environmentally and commercially feasible manner. The main objectives are to avoid or at least minimize human health and environmental impacts arising from project activities are as follows;

- To promote sustainable use of resources (energy, water, etc.),
- To reduce pollution specific to project activities so that the increase the human welfare and environmental conditions,
- To reduce GHG emissions specific to project.

4.13.2 Policies, Legal Framework and Guidelines

4.13.2.1 National Legislation

Regulation on Energy Performance in Buildings

The Regulation on Energy Performance in Buildings, that is numbered 27075 and published on 05.12.2008, aims to determine the legal and technical principles required for the efficient utilization of energy and energy

resources in buildings as well as protection of the environment during the construction and operation phases of the projects, to use these resources in the best way and to prevent the wasting of energy resources.

The scope of this regulation is the procurement of energy by renewable energy resources and cogeneration plants, formation of the building inventory, measures to increase the efficiency of buildings and set implementation strategies on increasing the efficiency of buildings in a way that the outside appearance will not be altered significantly.

4.13.2.2 International Legislation

IFC/WB PS 3: Resource Efficiency and Pollution Prevention and Control

Industrial activities and urbanization increase pollution level that may threaten health and environment. PS 3 Guideline of IFC/WB, published in 2012, promote practice of available technologies upon energy efficiency, use of resources (energy, water) sustainably and reduce GHG emissions. The paragraph herein is detailed in the following sections.

EBRD PR 3: Resource Efficiency and Pollution Prevention and Control

The objectives of this PR are to identify project-related opportunities for energy and water efficiency improvements and waste prevention and implement mitigation measures in a hierarchical manner arising from the resource use and pollution emitted from the project and measures for GHG reduction. Those impacts are crucial to manage for the project-lifetime under the project-specific ESMS and ESMMP.

Environmental and Social Framework for Investment Project Financing (IPF) Operations

This guideline has similar requirements for the management of the resources throughout the project lifecycle relying on the GIIP. Material, waste, and energy use should be kept at its most sustainable level, GHG and black carbon emissions in both long and short term should be reduced as well as waste generation including hazardous and to minimize impacts associated with the pesticide use for human and soil health.

4.13.3 Resource Efficiency

Client for improving efficiency in energy and water consumption and raw material acquisition should take cost-effective measures. Through the implementation of efficiency improvements, eco-effective products can be designed, and conservation of raw materials, energy and water should be provided. Raw material input should be as least as possible in any process while at the same time providing the most out of the process. This approach brings about sustainable use of energy and water and pollution reduction.

4.13.3.1 Water Consumption

When the project significantly consumes water, the client should implement measures that avoid or at least minimize water use. This can be achieved through alternative water resources to offset the scarcity that will arise from high water demand. Other alternative can be the re-evaluation of project location prior to construction.

4.13.3.2 Energy Consumption

During the construction and operation of Project, electricity usage should be minimized. All personnel should be trained. Information about electricity consumption during the operation period of train is not provided.

The energy consumption per passenger of high standard trains is usually lower than in existing and slower trains running between the same stations, according to several advantages of the high standard trains such as a more homogeneous speed profile, a new line design with less distance, a lower ancillary service

consumption, less mass per seat and smoother trains, more efficient aerodynamic profile, bigger trains, better load factor and more efficient electric system. Energy Conservation Procedure prepared by Rönesans will be accorded. Related general procedures and plans prepared by Rönesans will be implemented as specific to the Project or will be reprepared for the Project (see Appendix 8).

4.13.4 Pollution Prevention

The client should control the excessive releases and flows of pollutants to air, water, and soil locally and regionally, relying on GIIP. Where pollution exists from past activities, the client will consider whether a cumulative assessment is required. Baseline conditions may include;

- Assimilative capacity (the capacity that the ecosystem absorbs pollutants to its highest level before collapse occurs),
- Existing and future land use (See Section 4.7),
- The proximity of project boundaries to an area of high biodiversity or high ecological sensitivity,
- Reversible or irreversible alterations resulting from cumulative impacts to the project.

If the project area vicinity has already degraded ecosystems that are to be summed up with the project's impacts itself, additional mitigation measures are required. These strategies include project location alternatives and emission abatement.

4.13.4.1 Wastes

The client should avoid generation of waste materials of any kind, either hazardous or non-hazardous. Where waste generation cannot be avoided, it should be at least minimized. Where waste is cannot be recovered or reused, the client will remediate or discharge wastes in environmentally benign manner. Residues from handling and processing should also be treated appropriately.

If the waste is hazardous, GIIP should be applied. When third parties carry out disposal, the client will use contractors for waste to reach its destination in a legitimate manner. When the disposal cannot be carried out complying with the recognized standards, alternative disposal options should be considered, or facilities should construct their own waste recovery sites or landfills.

4.13.4.2 Hazardous Materials Management

Hazardous materials are known namely as toxic materials. They play as a part of industrial symbiosis in some cases: they are either used as a raw material or produced as a final product. In this context, production, transportation, handling, storage, shipment and use of them for projects should be evaluated. The less toxic substitutes should be considered if they are to be used by another industry for manufacturing operations or other operations throughout a material's life cycle. However, the usage hazardous materials should be avoided for purposes of any kind due to their high toxicity, their persistence in the environment, their accumulation in the food gap and ozone depletion potential. In the scope of Project, Material Safety Information Form, which is related, with hazardous materials used during the construction and operation period will be available. There will no storage of chemical substances within the scope of Project. Hazardous Material Management Procedure and Hazardous Waste Management Procedure will be accorded. Related general procedures and plans prepared by Rönesans will be implemented as specific to the Project or will be reprepared for the Project.

4.13.4.3 Pesticide Use and Management

Pest and vector management is of high importance for projects as their ingestion cause severe diseases for living beings. Thus, the client should implement commercially available pest control methods in cultural, biological, chemical and economic means to prevent transmission of diseases to the humans and animals. Integrated Pest Management (IPM) and Integrated Vector Management (IVM) approaches are available for

this purpose and should be integrated to control of pesticide and vector management for public health significance. WHO Recommended Classification of Pesticides classifies the pesticide products as follows;

- Hazard Class Ia (extremely hazardous),
- Hazard Class Ib (highly hazardous),
- Hazard Class II. (moderately hazardous)

In general, chemical pesticides are used for fighting against the pests. However, the pesticide selection of minimum toxicity is quite important. They are effective against the target species at the same time they have minimal impacts on the environment. If chemical pesticides are to be selected, they should be confined in leakproof containers and properly labelled for possible access in case that the personnel are not professionally trained for their management. In addition, pesticides will be handled, stored, applied, and disposed of in compliance with the Food and Agriculture Organization's International Code of Conduct on the Distribution and Use of Pesticides or GIIP.

4.13.4.4 GHGs

GHG mitigation options should be considered to implement by client in a technically and financially feasible manner. These options include low carbon or renewable sources, sustainable agriculture and husbandry practices and the reduction of mobile source emissions, adopting emission reduction technologies and government incentives for GHG reduction policies.

For projects that are estimated to generate more than 25000 tons of CO₂-equivalent on a yearly basis, they must be controlled within the project site as well as the indirect emissions or off-site emissions (Scope 2 emissions defined by WBCSD/WRI Greenhouse Gas Protocol), in line with the internationally recognized methods, which relies on GIIP.

4.13.5 Impact Assessment

As there will be energy consumption, water consumption and GHG emissions during the project-lifetime, all the issues stated above are subjected to the resource efficiency and pollution prevention and control standards in sections 4.12.3 and 4.12.4. All information given serve as a base for impact assessment. In general, measures to be implemented are based on best available practice taking the key requirement of cost-effectiveness into consideration. Energy efficiency can best be provided by proper insulation and temperature arrangements (not allowing the over-heating as well as minimal heating) in stations and construction site where the staff works.

Water will be consumed only in stations and dust suppression. The Project contribution to citywide water consumption of 4 provinces is 0.023%, which is negligible and does not affect conservation of the water resources adversely. In contrast, total GHG emissions from the construction period exceeds the limit value stated in IFC. Thus, GHG mitigation measures will be implemented during the construction period while the operation phase does not require GHG mitigations.

The table containing information of possible impacts their mitigation measures for more sustainable use of resources for projects of any scale and pollution prevention or at least minimization strategies is given below. These also fall into the "12 Principles of Green Chemistry" which relates to resource efficiency and pollution prevention and control (see Table 4.129).

Green chemistry is the design of chemical products or processes that is used to eliminate the generation of hazardous substances. It also enables the evaluation of life cycle assessment, also known as sustainable chemistry.

- Minimizing the transport distances for materials in excavation works during the construction period,
- Programming vehicle and equipment movements to minimize the waiting time and the distances traveled,
- Minimization of land clearance works during the construction phase as much as possible,

- Regular maintenance of used vehicles and equipment,
- Restricting the use of extra tools by well organizing excavation and filling works,
- Keeping regular greenhouse gas emission calculation records for greenhouse gas emissions resulting from electricity use for the operating period,
- Providing training to employees both during the construction and operation period, when necessary.

4.13.6 Mitigation Measures

Table below provides the necessary information as a part of environmental management plan, given that the impacts with their significance, sensitivity of receptors, mitigation measures of impacts and residual impacts (project's contribution to existing baseline conditions). Tables have been divided into categories to characterize the adverse effects specific to impacts, their magnitude and significance and most importantly their mitigation measures and residual impacts likely to remain after implementing the mitigation measures.

The mitigation measures planned to be implemented within the scope of the project are given in the ESMMP prepared for the project.

Table 4.129: Principles of Green Chemistry

Principle/Mitigation	Definition
Prevention	No wastes should be generated in chemical syntheses. If prevention is not possible, treatment or cleanup should be implemented.
Atom Economy	Syntheses should be carried out in a way that the final product contains the number of reactants, without yielding any byproducts.
Less Hazardous Products	Design syntheses to use and generate substances with little or no toxicity.
Safer Products	Design effective products having negligible or no toxicity.
Reduction of Solvents or Auxiliaries	Use of solvents and auxiliaries should be reduced to the extent possible, safer ones can be used instead.
Increase Energy Efficiency	Chemical reactions should be run at moderate temperatures and pressures.
Use of Renewable Feedstocks	Use renewable starting materials instead of depletable ones
Reduction of Derivatives	Derivatives may block a reaction to proceed; they use additional reagents and generate waste, so that they should be minimized.
Use of Catalysts	Catalysts are effective and facilitates a reaction to proceed faster and carry out a reaction many times.
Design for Degradation	Design chemical products in a way that they break down in the environment easily so that they do not accumulate.
Real-Time Analysis for Pollution Prevention	Ensure real-time monitoring and control during synthesis to minimize or avoid byproduct formation.
Inherently Safer Chemistry	Design chemicals in a way that to minimize potential of chemical accidents including explosions, fires, and releases to the environment.

4.14 Labour and Working Conditions (EBRD PR2)

Labour and Working Conditions, it is the planning studies carried out in a systematic manner in order to protect from conditions that may harm human health and take precautions during the performance of business activities in the workplace. According to the mixed commission of WHO and International Labor Organization (ILO); "Occupational health is to protect and develop the physical, mental and social well-being of workers in all professions at the highest level; prevent workers from losing their health due to working conditions; protecting workers from risks arising from unhealthy factors in the workplace; It aims to ensure that the worker works in a job suitable for his physical and psychological equipment and, in short, to adapt the work to the human and to adapt each person to his job".

Labour and Working Conditions is very wide and diverse in scope. In addition, it has some basic principles for its implementation and planning. These principles;

- The right to work in a health and safety job is the right of all employees.

- Creating a policy at a level that all interested parties can implement,
- Creating a management system that can be developed and examined periodically,
- Occupational Health and safety policies and programs should be focused on prevention and protection,
- Created policies and programming should cover all workers.

In 2016, the International Labor Organization (ILO) published Turkey's Occupational Health and safety profile. According to this publication, although work accidents in Turkey have fallen steadily since the last two decades, with the change of the notification system in 2013, work accidents figures have been almost three times higher than the previous year.

In Turkey, which was enacted on 22 April 2005, No. 155 Occupational Safety, health, and the working environment in relation to the contract with occupational health and safety risk identification and assessment, and Prevention and protection requirements, both national and occupational health and safety system to ensure compliance at international standards and guidelines that are reengineered.

Mersin-Gaziantep (Başpınar) High Standard Railway Line is a 286 km line and is divided into certain segments.

In this 286 km line, all construction, electrification and signalization operations on the Mersin-Ceyhan route, other operations except construction between Ceyhan and Toprakkale, construction, electrification, and signalization operations except tunnel construction between Toprakkale and Bahçe, only signaling operations between Nurdağ and Bahçe, the first 41 km between Nurdağ and Başpınar, except construction operations for the remaining 15 km will be carried out. As most of the construction activities within the scope of the project, Labour and Working Conditions measures must be taken and implemented in all of these stages.

There are both national legislation and international standards and guidelines to be based as guidelines for Labour and Working Conditions practices and management. Labour and Working Conditions applications will be implemented in accordance with both national legislation and international standards and guidelines.

Construction Phase

Workers' rights including occupational health and safety need to be considered to avoid accidents and injuries, loss of man-hours, labour abuses and to ensure fair treatment, remuneration and working and living conditions. These issues should be considered not only for those who are directly employed by the Project, but also their sub-contractors and those within the supply chain. Rönesans engages with fair labour and working conditions in its policies and procedures.

Worker Health and Safety

Bearing in mind the nature of the activities being undertaken during construction, worker health and safety is a key risk area with the potential for accidents that may result in injuries and potentially fatalities as well as lost man- hours. Many national companies may currently not meet international safety requirements and standards. Employees working informally and those with limited or without awareness of their rights (for example, migrant workers, or those newly entering the labour market) are likely to be most at risk.

Worker Rights

The labour laws in Turkey are in line with international labour laws and Turkey has ratified the core International Labour Organisation (ILO) conventions:

- Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87);
- Right to Organise and Collective Bargaining Convention, 1949 (No. 98) ;
- Forced Labour Convention, 1930 (No. 29);

- Abolition of Forced Labour Convention, 1957 (No. 105);
- Minimum Age Convention, 1973 (No. 138);
- Worst Forms of Child Labour Convention, 1999 (No. 182);
- Equal Remuneration Convention, 1951 (No. 100) ; and
- Discrimination (Employment and Occupation) Convention, 1958 (No. 111).

Discrimination is likely to occur as women are generally not employed in construction activities and may not be selected by contractors. However, Rönesans Human Resources Policies and Procedures seeks to apply gender diversity principles in all the phases of recruitment, selection, training, development and promotion of all employees

Employment and Procurement

The Project shall develop a Human Resources Policy, Labour and Employment Plan as well as specific recruitment policies and procedures, specifically:

- The Project should develop a fair and transparent employment and procurement policy and processes to avoid any potential for nepotism or favouritism. The policy should be shared with the local community members and leadership.
- Rönesans will notify identified representatives of the local agencies of the specific jobs and the skills required for the Project, prior to the commencement of construction phase. This will give the local population time to prepare and apply for the available job opportunities on time. This is mainly applicable to unskilled and semi-skilled workers who will be locally sourced.
- There will be no requirement for applicants to make payments for applying for, or securing, employment on the proposed Project.
- The Project will ensure that recruitment procedures are transparent and monitored to ensure that those recruited present their actual experience, geographical location, health status, and age and that requirements for local employment are being met.
- The Project will develop and implement a program of up-skilling, training and development for workers to assist them in accessing opportunities associated with the Project and in finding work following completion of their contracts.
- The Project will provide training on health and safety and quality standards required by the Project for provision of goods and services to the Project to ensure that local businesses have the opportunity to benefit.
- The Project will develop a Workers Grievance Mechanism.

Management System

The Project should develop a Human Resources Policy, Labour and Employment Plan. These requirements should also be passed on to any sub-contractors. Key issues with the Human Resource (HR) management will include, but not be limited to the following:

- Provision of clear and understandable information regarding rights under national labour and employment law, and any applicable collective agreements, including those related to hours of work, wages, overtime, compensation, etc.
- Provision of reasonable working conditions and terms of employment.
- Provision of adequate accommodation (where relevant).
- Provision of employment, compensation/remuneration and working conditions, including working hours, based on equal opportunity and fair treatment, avoiding discrimination on any aspects.
- Provision of adequate welfare facilities on site.

- Implementation of a grievance mechanism for the Project workers.
- Adoption and implementation of a sexual harassment policy.
- Adoption of open attitude towards freedom of association.

The Project will develop a H&S programme which will include risk assessments (such as working at heights, confined space machine guarding), work permit systems and a H&S management system, in line with industry best practice, including worker performance safety tracking (safety observations) to assure worker safety. All workers will receive induction and continuous training regarding this system (See Implementation of Social Monitoring in ESMMP)

Sub-Contractor and Supplier Management

- Subcontractor and Supplier Contracts should make explicit reference to the need to abide by Turkish law, international standards (in particular IFC PS 2) and the ratified ILO conventions and the Project policies relating to health and safety, labour and welfare standards.
- As part of the subcontractor and supplier selection process, Rönesans should take into consideration performance with regard to worker management, worker rights, health and safety as outlined in Turkish law and international standards.
- Rönesans should provide support to sub-contractors and suppliers to ensure that labour and working conditions are in line with Turkish legislation and IFC PS 2 through gap analysis, awareness raising and information provision, as necessary.
- Regular checks / audits by Rönesans should be undertaken to ensure the relevant labour laws are adhered to at all times.

Workers' Rights

- Rönesans should ensure no employee or job applicant is discriminated against on the basis of his or her gender, marital status, nationality, ethnicity, age, religion or sexual orientation.
- All workers (including those of subcontractors) should, as part of their induction, receive training on worker rights in line with Turkish legislation to ensure that positive benefits around understanding labour rights are enhanced. This process should be formalised within the Code of Conduct that would be provided by Rönesans (as in ESMMP).
- All workers (including those of subcontractors and suppliers) should have contracts, which clearly state the terms and conditions of their employment and their legal rights. These contracts should be aligned with Turkish labour law, the ILO core conventions and the requirements of IFC PS2. Contracts should be verbally explained to all workers where this is necessary to ensure that workers understand their rights. Contracts should be in place prior to workers leaving their home location if applicable.
- The Project should put in place a worker grievance mechanism that should be accessible to all workers, whether permanent or temporary, directly or indirectly employed. The worker grievance mechanism should be open to Rönesans and the subcontractor workforce in the event that their grievance is not adequately resolved by their direct employer. Rönesans would then have the authority to act to resolve this grievance.
- All workers should have access to training on communicable diseases and STDs and community interactions in general.
- Accommodation should be provided to workers in accordance with international good practice on workers' accommodation, including IFC standards to prevent transmission of diseases associated with poor living conditions.

- Rönensans should undertake surveillance and assurance that no children or forced labour is employed directly, and to the extent possible by third parties related to the Project and primary suppliers where such risk may exist.

National Legislations

Occupational Health and Safety Law

The Occupational Health and Safety Law dated 30.06.2012 and numbered 6331 regulates the duties, powers, responsibilities, rights and obligations of employers and employees in order to ensure occupational health and safety at workplaces and to improve existing health and safety conditions.

The OHS Law No. 6331 is applied to all businesses and workplaces belonging to the public and private sector, employers and employer representatives of these workplaces, all employees, including apprentices and interns, regardless of their field of activity. Activities outside of this scope are;

- Activities of the Turkish Armed Forces, general law enforcement forces and the Undersecretariat of the National Intelligence Organization, excluding those in factories, maintenance centers, sewing shops and similar workplaces,
- Intervention activities of disaster and emergency units,
- Household services,
- Those who produce goods and services on their own behalf and account without employing employees,
- During the execution services for convicts and detainees, the workplace, education, security, and vocational training activities performed within the scope of improvement.

The general obligation of the employer, protection from risks, occupational health and safety services, workplace physicians and occupational safety experts, determination of the hazard class, emergency plans, occupational accidents and occupational diseases, employee training are mentioned and precautions to be taken about these issues. Except for the business lines outlined above, it is obligatory for both employers and employees to comply and enforce in all workplaces and working areas.

Employer representatives who act on behalf of the employer and take part in the management of the work and the workplace are considered as employers for the implementation of this Law.

The employer is obliged to ensure the work-related health and safety of the employees and within this framework;

- It works to prevent occupational risks, to take all kinds of measures, including training and information, to organize, to provide the necessary tools and equipment, to adapt health and safety measures to changing conditions and to improve the current situation.
- Monitors and controls whether occupational health and safety measures taken in the workplace are followed and ensures that non-conformities are eliminated.
- Makes or has a risk assessment done.
- While assigning tasks to the employee, it considers the employee's suitability for the job in terms of health and safety.
- Takes necessary measures to prevent employees other than those given adequate information and instructions from entering places with life and special danger.

Receiving services from experts outside the workplace does not remove the employer's responsibilities. Employees' obligations in the field of occupational health and safety do not affect the employer's responsibilities and the employer cannot reflect the cost of occupational health and safety measures to the employees.

Labor Law

The Labor Law No. 4857 and dated 10.6.2003 in the Official Gazette is to regulate the rights and responsibilities of workers employed based on an employment contract with employers regarding the working conditions and the working environment.

Sea and air transportation business, fewer than 50 workers (50) including the business or businesses of agriculture and forestry is carried out in workplaces where the family remaining within the boundaries of the economy related to agriculture in all kinds of building work, members of a family and 3rd Degree (3rd Degree included) to disagree with someone else among the relatives of handicrafts are made from the outside in where homes and jobs, in home services, apprentices, about athletes, about those who rehabilitate, it applies to all workplaces other than workplaces where three people work in accordance with the description of Article 2 of the law on Merchants and Craftsmen 507, employers of these workplaces, as well as employers' representatives and employees, regardless of their activity issues.

All kinds of responsibilities and obligations provided for by the employer in this law also apply to the employer's proxies. The title of employer's attorney does not eliminate the rights and obligations granted to employees. The principal employer is jointly responsible with the sub-employer for the obligations of the sub-employer to its employees arising from this law, the employment contract, or the collective bargaining agreement to which the sub-employer is a party in relation to that workplace.

Regulation on Duties, Authorities, Responsibilities and Training of Occupational Safety Specialists

Regulation on Duties, Authorities, Responsibilities and Training of Occupational Safety Specialists, dated 29.12.2012 and numbered 28512, regulates the qualifications, training and certification, duties, powers and responsibilities, and working procedures and principles of occupational safety specialists working in occupational health and safety services. It covers workplaces and educational institutions within the scope of the Occupational Health and Safety Law No. 6331.

Communique on Workplace Hazard Classes Regarding Occupational Health and Safety

In accordance with the Article 9 of the Occupational Health and Safety Law numbered 6331, the hazard classes of the workplaces in terms of occupational health and safety are specified in the Workplace Hazard Classes List in Annex-1 of this communiqué. In determining the hazard class, the hazard class of the actual work carried out in a workplace is taken into consideration.

Occupational Health and Safety Risk Assessment Regulation

The Occupational Health and Safety Risk Assessment Regulation, dated 29.12.2012 and numbered 28512, regulates the procedures and principles of risk assessment to be made in terms of occupational health and safety at workplaces. It covers workplaces under the Occupational Health and Safety Law numbered 6331.

According to this regulation, the employer makes risk assessment in terms of occupational health and safety with the aim of ensuring, maintaining, and improving the working environment and the health and safety of the employees. Carrying out a risk assessment does not eliminate the employer's obligation to ensure occupational health and safety at the workplace. The employer provides all kinds of information and documents related to risk assessment to the person or persons assigned in risk assessment studies.

Regulation on Occupational Health and Safety in Construction Works

The Regulation on Occupational Health and Safety in Construction Works dated 05.10.2013 and numbered 28786 determines the minimum occupational health and safety conditions to be taken in construction works. It is applied in workplaces under the Occupational Health and Safety Law numbered 6331.

The employer, in addition to the obligations specified in Article 4 of the Law, also provides the following issues in construction works;

- Keeping the construction area tidy and clean enough,
- In the selection of working places in the building area; determination of how transportation will be provided and areas or roads for equipment, movement, and passages,
- Arranging the usage and transportation conditions of the material,
- Technical maintenance and controls of the facility and equipment before starting to be used and periodically,
- Separating suitable storage areas for various materials and especially dangerous materials and substances and determining the boundaries of these areas,
- Regulating the conditions for the use of dangerous materials and their removal,
- Storage, disposal or removal of wastes and residues with appropriate methods and equipment,
- The periods foreseen for various jobs or work stages are re-determined according to the state of the work in the construction area,
- Cooperation between subcontractors and employees on their behalf,
- Consideration of interaction with industrial activities in or near the building site,
- Having personal protective equipment in accordance with the Regulation on the Use of Personal Protective Equipment at Workplaces and harmonized national standards published in the Official Gazette dated 2.7.2013 and numbered 28695, and their use by employees.

International Agreement and Guidelines

International Labor Organization

The International Labor Organization, which was established with the aim of developing and advancing the standards in the labor laws and practices in this field in countries, aims to realize rights in working life, to encourage decent employment opportunities, to strengthen social protection and to strengthen dialogue on working life issues. The ILO has four strategic goals;

1. The dissemination and implementation of standards, basic principles and rights in working life,
2. Increasing the opportunities required for women and men to work in decent jobs and earn decent income,
3. Expanding the scope of social protection for all and increasing its effectiveness,
4. Strengthening tripartite and social dialogue.

There are 59 contracts from ILO Conventions, which are approved by Turkey, and 55 of them are in force. Some of Turkey's approved contracts are as follows;

Table 4.130: Turkey's Approved Contracts

Convention Name	ILO Admission Date	The date that Convention entered into force in Turkey
Unemployment Convention numbered 2	29. 10. 1919	14. 07. 1950
Freedom of Association (Agriculture) Convention numbered 11	25. 10. 1921	29. 03. 1961
Weekly Rest (Industry) Convention numbered 14	25. 10. 1921	27. 12. 1946
Weekly Rest (Industry) Convention numbered 14	25. 10. 1921	27. 12. 1946
Minimum Age (Trimmers and Attendants) Convention* numbered 15	29.10. 1921	29. 09. 1959

Convention Name	ILO Admission Date	The date that Convention entered into force in Turkey
Minimum Wage Determination Method Convention numbered 26	30. 05. 1928	29. 01. 1975
Forced Labor Convention numbered 29	06. 06. 1930	30. 10. 1998
Paid Employment Offices Convention numbered 34	08. 06. 1933	27. 12. 1946
Worker Compensation Convention (Occupational Diseases) numbered 42 (Revised)	04. 06. 1934	27. 12. 1946
On the Underground Works Convention numbered 45 (Women)	04. 06. 1935	21. 04. 1938
Minimum Age (Sea) Convention numbered 58 (Revised)	22. 10. 1936	29. 09. 1959
Minimum Age (Industry) Convention numbered 59 (Revised)	03. 06. 1937	12. 07. 1993
Young People's Medical Examination (Industry) Convention numbered 77	19. 06. 1947	05. 03. 1951
Labor Inspection Convention numbered 81	17. 06. 1948	12. 07. 1993
Freedom of Association and Protection of the Right to Union Convention numbered 87	17. 06. 1948	14. 07. 1950
The Establishment of the Job and Employment Service Convention numbered 88	08. 06. 1949	29. 03. 1961
Working Conditions Convention (Public Conventions) numbered 94	08. 06. 1949	29. 03. 1961
Protection of Wages Convention numbered 95	18. 06. 1949	23. 01. 1952

EU Directive 89/391/EEC

The European Union Directive 89/391/EEC of 12.06.1989 was created to promote improvements in safety and health of workers. Therefore, it contains information on occupational risk prevention, safety and health protection, elimination of risk and accident factors, information, consultation, national laws and/or practices, and principles, guidelines, and training principles for employee implementation.

This Directive applies to all sectors of activity, both public and private (industrial, agricultural, commercial, administrative, service, education, culture, entertainment, etc.). However, it cannot be applied to certain specific public service activities, such as the armed forces of the police, or certain specific activities in the civil protection service. The Member State will take the necessary steps to ensure that employers, workers and representatives of workers are subject to the legal provisions necessary for the implementation of this Regulation.

The directive, consisting of 19 articles, includes main headings for the health and safety of employers and workers.

IFC Environmental, Health, and Safety (EHS) Guidelines Occupational Health and Safety

The IFC Occupational Health and Safety section provides guidance and examples of reasonable measures to be implemented in managing key risks to occupational health and safety. Most of the guidance also applies to construction and decommissioning activities, although the focus is placed on the operational phase of projects. According to the IFC Occupational Health and Safety guidelines, employers should hire technically

qualified contractors to manage the occupational health and safety issues of their employees and carry out hazard management activities through formal procurement Conventions.

According to IFC, preventive and protective measures should be taken in the following order of priority;

- Eliminating the hazard by removing the activity from the work process. Examples include substitution with less hazardous chemicals, using different manufacturing processes, etc.
- Controlling the hazard at its source through use of engineering controls. Examples include local exhaust ventilation, isolation rooms, machine guarding, acoustic insulating, etc;
- Minimizing the hazard through design of safe work systems and administrative or institutional control measures. Examples include job rotation, training safe work procedures, lock-out and tag-out, workplace monitoring, limiting exposure or work duration, etc.
- Providing appropriate personal protective equipment (PPE) in conjunction with training, use, and maintenance of the PPE.

The application of prevention and control measures to occupational hazards should be based on comprehensive occupational safety or occupational hazard analysis. The results of these analyzes should be prioritized as part of an action plan based on the likelihood and severity of the consequence of exposure to the hazards identified. An example of a qualitative risk ranking/analysis matrix has been provided by IFC OHS to help set priorities (see Table 4.131).

Table 4.131: Risk Ranking Table to Classify Worker Scenarios Based on Likelihood and Consequence

Likelihood	Consequences				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain	L	M	E	E	E
Likely	L	M	H	E	E
Moderate	L	M	H	E	E
Unlikely	L	L	M	H	E
Rare	L	L	M	H	H
Legend E: extreme risk; immediate action required H: high risk; senior management attention needed M: moderate risk; management responsibility should be specified L: low risk; manage by routine procedures					

IFC Performance Standards

The Labor and Working Conditions standard, which is the IFC Performance Standard 2, is another IFC guide that will set an example for occupational health and safety. IFC Performance Standard 2 recognizes that the pursuit of economic growth through job creation and income generation must be balanced with the protection of fundamental rights of the employees.

Failure to establish and develop a sound worker-management relationship can weaken employee engagement and jeopardize a project. Conversely, through a constructive worker-management relationship and by treating workers fairly and providing them with safe and healthy working conditions, tangible benefits such as increasing the efficiency and productivity of operations of the customers improve the project.

The requirements set out in this Performance Standard are partly guided by international Conventions negotiated through the International Labor Organization (ILO) and the United Nations (UN). The purpose of the IFC PS 2 are;

- Establishing, maintaining, and improving the worker-management relationship,
- Promoting fair treatment, non-discrimination and equal opportunity of employees and compliance with national labor and employment laws,
- Protecting the workforce by addressing child labor and forced labor,
- Promoting safe and healthy working conditions and to protect and improve the health of employees.

While the applicability of this Performance Standard is determined in the Social and Environmental Assessment process, the implementation of the necessary actions to meet the requirements of this Performance Standard is managed through the Social and Environmental Management System of the client. The assessment and management system requirements are outlined in Performance Standard 1.

European Bank for Reconstruction and Development (EBRD) Requirements

The European Bank for Reconstruction and Development (EBRD) Requirement 2: Labor and Working Conditions states that the workforce is a valuable asset for employers and their business activities, and that good human resources management and a sound worker based on respect for rights of workers, including freedom of association and the right to work. Acknowledges that there is a management relationship. EBRD PR2 objectives are given below;

- To respect and protect the basic principles and rights of employees,
- To promote a decent work agenda, including fair treatment, non-discrimination, and equal opportunities for employees,
- To establish, maintain and improve a solid worker-management relationship,
- To encourage compliance with collective Conventions, national labor and employment laws,
- To protect and improve the safety and health of employees, especially by promoting safe and healthy working conditions,
- To prevent forced labor and child labor (as defined by ILO).

Rönesans has a "Manual for Health Safety & Environment" management plan, which has been created within the scope of Occupational Health and Safety. In the activities carried out in line with this plan, responsible people are appointed, and management is ensured by taking necessary OHS measures.

Rönesans, from the above-mentioned national legislation, Occupational Health and Safety Law, Labor Law, Regulation on Duties, Authorities, Responsibilities and Training of Occupational Safety Specialists, Communiqué on Workplace Hazard Classes Regarding Occupational Health and Safety, IFC Standards and Guidelines and EU Directives will properly carry out business activities.

4.15 Community Health, Safety and Security (EBRD PR4)

Impacts on the health and safety of the community may arise during construction as a result of noise, vibration, dust and other emissions from earth moving activities, and operation of equipment and vehicles which have already been addressed in different chapters of the ESIA Section 4.7 "Impacts on Noise and Vibration from Construction Activities" and Section 4.3 "Impacts on Air Quality Related to Construction Equipment Emissions".

Other risks involving the public associated with construction could include physical accidents on sites, impacts from construction traffic, and accidents involving the handling of hazardous materials during construction. Children and youths are amongst those vulnerable to the physical hazards associated with construction activities, including falls from unguarded areas at height, and construction traffic, especially in the event of unauthorized entry.

The EPC Contractor's ongoing stakeholder engagement activities in accordance with Project "Stakeholder Engagement Plan" will serve to inform the local communities regarding potential health and safety issues during the construction period. Stakeholder engagement activities will include ongoing community meetings with the vulnerable and marginalized groups such as children and young persons (including visits to schools) and press releases and local postings to inform the public regarding the relevant hazards associated with construction activities that will be relevant to their particular locations. These stakeholder engagement requirements are detailed in the project SEP, provided in Appendix 6.

IFC PS 4 recognizes that project activities, equipment and infrastructure can increase community exposure to risks and impacts. The objective of community health and safety measures is to anticipate and avoid health impacts during the project lifetime and to ensure that the safety of personnel and property is carried out in line with the human rights and in a way that avoid or at least minimize risks to the vulnerable communities.

Community Health and Safety impacts during construction, rehabilitation, operation, and maintenance of railways are common for large construction projects, which are also discussed in the IFC General EHS Guidelines. These impacts include dust, noise emissions, vibration from construction vehicles and machinery, hazardous substance formation, transport, and storage and communicable diseases associated with the biological impacts associated with the temporary labor in construction. General EHS Guidelines provide community health and safety issues specific to earthwork extraction projects including land instability, water, explosion risks and decommissioning. Additional potential risks to community health and safety are uncontrolled access to construction sites, exposure to waterborne diseases associated with the small impoundment formations and exposure to increased traffic of materials transport vehicles.

However, no relevant Turkish national legislation has been published specific to community health, safety, and involving the mitigation measures.

- Health and safety issues concerning the community include those subtopics;
- General rail operational safety,
- Transport of dangerous/hazardous goods,
- Level crossings safety,
- Pedestrian safety,
- Occupational health and safety monitoring.

Mitigation / Management Measures

Rönesans has a "Manual for Health Safety & Environment" management plan, which has been created within the scope of Occupational Health and Safety. In the activities carried out in line with this plan, responsible people are appointed, and management is ensured by taking necessary OHS measures:

- Adopting best transport safety practices across all aspects of the project and the adoption of a Traffic Safety Management Plan, including for sub-contractors, to prevent, minimize and control risks and adverse impacts from traffic accidents. Measures will include:
 - o Obligation that all drivers are appropriately licensed;
 - o Obligation that all vehicles are safe and have current inspection certificates;
 - o The rush hours of the access roads will be considered and usage of the access roads will be avoided during rush hours (especially during hours that children are travelling to and from school).
 - o Minimizing pedestrian interactions with the construction vehicles through fencing, flagmen, warning signs, etc.;
 - o Improving local traffic signage by collaboration with the responsible local authorities and communities;
 - o Coordinating with emergency responders to ensure that appropriate first aid is provided in the event of accidents;
 - o Developing and implementing a series of security measures including the installation of sufficient and adequate site boundary and access controls near settlements to prevent unauthorized entry to construction sites, especially by children.

Hazardous Material Safety During Construction

Hazardous materials, such as fuels, oil, paints, and solvents are likely to be used during construction. The storage, handling, transport and disposal of all hazardous materials should comply with Project requirements, and with adoption of good construction site practices (e.g., appropriate locked storage and sign-posting of hazardous materials).

Access control/restrictions to the construction site should be provided, and thus the risks to the community through exposure to any such hazardous materials during construction of the railway, are expected to be very limited.

Details with respect to the anticipated quantities of hazardous materials to be used on site and the locations of where such materials are stored should be elaborated in the detailed site layout and management plans, to be produced by the EPC Contractor.

The large majority of construction waste and spoil will be inert and suitable for disposal in normal disposal areas. Only a limited amount of waste (e.g. oily waste, containers with hazardous residues etc.) is expected to be disposed of as hazardous waste. Again, adoption of good construction waste management practices (e.g., placement in appropriate containers and sign-posted temporary hazardous waste storage sites, with restricted access, regular removal of waste) will ensure that risks to the public are very low.

Security

Security personnel will be employed at the site to protect assets and prevent community members entering restricted areas. In the event of protests, trespass or other actions by community members or other stakeholders there is the potential for unlawful or abusive interaction between security guards and community members especially if site security are not adequately trained.

Community safety and security risks have the potential to impact Project workforce and communities on the direct footprint of the proposed project. In order to minimise negative impacts from security, the following mitigation measures should be applied:

- A Grievance Mechanism should be developed, whereby affected people can raise issues and concerns associated with vehicle movements, driver behaviors and report accidents or damage to property they feel are caused by Project vehicles. Raise awareness to communities regarding the Grievance Mechanism to deal with community concerns and issues in a timely manner to avoid issues escalating. This will include the use of the Community Liaison Officers (CLOs) who will be present around the Project Site pre and during construction.
- The Project should develop a Traffic Safety Management Plan to prevent, minimize and control risks and adverse impacts from traffic accidents.
- Project security should comply with Turkish laws and regulations as well as the requirements of the Voluntary Principles for Security and Human Rights. The security should include, among other things, selection of personnel based on a careful background screening, training with regards to human rights requirements, and monitoring of performance.
- The Project should implement a Community Health and Safety Management Plan and a Security Management Plan for construction phase containing measures to protect the Project facilities and personnel against potential violent protest or social unrest and to train security personnel in safeguarding of community human rights.
- High-risk or value elements of construction sites should be fenced to minimise the risk of trespass and robbery. In addition, clear and visible signage should be put in place where appropriate to advise community members of the risk of site trespass.
- Sensitise local community members prior to the commencement of the construction phase so that they are aware of presence and role of security guards, the risk of site trespass and how to interact with the Project in the event of any concerns or issues.

- The Project should consult with local leaders such as mukhtars. As part of the SEP, the consultations should be aimed at finding ways of ensuring site trespass and robbery are minimised either through punitive or rehabilitative measures (See Implementation of Social Monitoring in ESMMP)

Rönesans, from the above-mentioned national legislation, Occupational Health and Safety Law, Labor Law, Regulation on Duties, Authorities, Responsibilities and Training of Occupational Safety Specialists, Communiqué on Workplace Hazard Classes Regarding Occupational Health and Safety, EBRD (2019), IFC Standards and Guidelines and EU Directives will properly carry out business activities.

General Rail Operational Safety

General rail operational safety is a concept that potentially affects both crew members and passengers due to such problems such as train collisions with other trains or road vehicles in transition points as well as operational problems such as power cuts and loss of signals. Following mitigation measures will be implemented for those risks in the scope of the Project;

- Implementation of rail operational safety processes aims reducing the collisions such as positive train control (PTC) system. If a full PTC system is not applicable, installation of automatic rail switches is required. They are distinct from the manual switches due to the interchangeable replacements of the switches between main track and siding to compensate loss of signals. This information should be announced to all passengers and crew,
- Implementation of hazardous material security plan and relevant trainings, prohibition of unauthorized access as well as establishment procedures for storage and transport of hazardous materials are required.

Level Crossings Safety

Level crossings at grade road and rail junctions represent high-risk accident locations for railways. On railways with congestion, a flagman (person who is in charge of protecting all personnel employed in the railway operation) can be charged to prevent traffic at the crossing and clear the tracks before the train comes. Automatic warning lights, bells, and beams or automatically closing gates are commonly used for this objective. The gates also function as barriers against intrusion of any highway or road traffic onto the railway. Crossings with no gate present inevitable risks. Following mitigation measures will be implemented for those risks in the scope of the Project;

- Use of bridges or tunnels in place of level crossings. Level crossings may be beneficial as it may improve train performance. Because the limitation of train speed may not be an effective measure to reduce accidents.
- Installation of automatic gates to all level crossings and proper and regular maintenance should be provided for safer operation.

Pedestrian Safety

Trespassers on rail lines and facilities can expose risks caused by moving trains, electrical equipment and hazardous materials, substances. Following mitigation measures will be implemented for those risks in the scope of the Project;

- Installation of a clear and attentive warning signalization system at crossing points of the track such as stations and level crossings,
- Installation of fences or barriers at station ends to prevent access to the track without any permission,
- Raising public awareness especially to elderly people and children,

- Designing stations in a way that the permitted route is safe and clearly indicated,
- Use of closed-circuit television to monitor the stations and other areas where trespassing occurs often and/or voice alarms to prevent trespassers to access the track.

Accident and Fatality Rates

In all railway projects, number of accidents should be reduced to zero or at least minimized among the project personnel and contractors/subcontractors. It should be paid particular attention to the reduction of accident and fatality rates as it may result in a waste of time in workplace, disability and even death. Facility rates should be graded in accordance with the performance of facilities in terms of their performance against accident and fatality rates in this sector in consultation with legal bodies (e.g., US Bureau of Labor Statistics and UK Health and Safety Executive).

Occupational Health and Safety Monitoring

Accredited professionals should carry out monitoring of the OHS. Facilities also should keep records and keep track of occupational accidents and/or occupational-vocational diseases that possibly occur in the workplace arising from physical, chemical, or biological hazards. For detailed information upon this, IFC General EHS Guidelines can be used as a guide.

Across the world, train accidents have a decreasing trend as well as the death rates originating from the trains. The lowest statistical values belong to European Union and Australia.

Apart from the IFC Requirements, all construction areas and access routes should be investigated, and restrictive measures should be applied prior to construction works. Speed limits should be implemented and checked as well as periodic vehicle maintenance. Investigation of grievances from local inhabitants and stakeholders due to the construction activities are also incredibly important. For biochemical risks mitigation, air conditioning and ventilation should be supplied, and periodic medical checks of staff should be implemented as well as carrying out health awareness raisings on emergency preparedness and response in railway tracks.

4.15.1 Impact Assessment

As most of the construction activities are subject to subtopics above, mentioned community health and safety measures must be taken and implemented in all these stages as there are many potential dangers due to the abundance of railway structures, main road junctions, access roads, signalization beams and pollution load to be occurred during the construction. All the information given serve impact assessment purposes along the project line as a large-scale transport will occur which necessitates paying particular attention to mitigation measures for accidents. For the Project, conventional line rehabilitation will enable the enhancement of worn-out structures along the line; will be expected to provide a safer area for the community, preventing the unexpected accidents.

Overall impact assessment summary table specific to community health and safety is given below. In addition, for detailed information on the public concerns related to construction and health effects and surveys conducted on the possible grievances specific to construction.

The mitigation measures planned to be implemented within the scope of the project are given in the ESMMP prepared for the project.

5 SOCIAL IMPACT ASSESSMENT (EBRD PR1 and PR7)

5.1 Introduction

Interorganizational Committee on Principles and Guidelines for Social Impact Assessment (2003) defines social impacts as follows: "By social impacts we mean the consequences to human populations of any public or private actions that alter how people live, work, and play, relate to one another, organize to meet their needs and generally cope as members of society. The term also includes cultural impacts involving changes to the norms, values, and beliefs that guide and rationalize their cognition of themselves and their society." [1]

The impact assessment process is carried out in three steps, which are identification, assessment, and mitigation. The identification stage consists of a systematic definition of possible impacts for all phases of the project. Project related activities and facilities through all phases are considered in terms of their interaction with the environment in order to determine the potential impacts, both adverse and beneficial, on the environment. Potential impacts are evaluated for the relevant stages of the project cycle (construction, operation, and decommissioning).

Measures are developed to avoid, or where avoidance is not possible, minimize, mitigate, or offset/compensate for identified potential impacts associated with the project on the environment.

The impacts will be assessed after obtaining the baseline information, which shows the existing status of the environment. The findings of the assessment must be compliant with both the applicable national regulations and the international standards. The mitigation measures will be addressed in the ESIA Report, if there are any adverse impacts associated with the proposed Project.

5.2 Policies, Legal Framework and Guidelines

Among the potential creditor corporations for the Project, the social and environmental standards, and guiding documents of International Finance Corporation (IFC) and European Bank for Reconstruction and Development (EBRD) shall be taken as basis for every phase of the Project. All these standards serve for the improvement of the project's performance through its evaluation in environmental and social aspect by minimizing of negative impacts and increasing in contributions.

As the financial department of the World Bank, IFC, has constituted its environmental and social policy with the intention to provide the implementation of the projects that it provides finance in line with the sustainability principle and in that regard, has established performance standards (PS) as the basis of environmental and social evaluation. The IFC Performance Standards (PSs) are given brief as follows.

PR 1: Assessment and Management of Environmental and Social Risks and Impacts; it establishes the importance of integrated assessment to identify the environmental and social impacts and issues associated with projects and the client's management of environmental and social performance throughout the life of the project.

PR 2: Labor and Working Conditions; it recognises that for clients and their business activities, the workforce is a valuable asset, and that good human resources management and a sound worker-management relationship based on respect for workers' rights, including freedom of association and right to collective bargaining, are key ingredients to the sustainability of business activities.

PR 7: Indigenous Peoples; it recognises 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.

PR 8: Cultural Heritage; it aims to protect irreplaceable cultural heritage and to guide clients to avoid or mitigate adverse impacts on cultural heritage in the course of their business operations

5.3 Extend of Study Area

5.3.1 Spatial Extend

Mersin, Adana, Osmaniye and Gaziantep Provinces are located on the route of the train project. The main stations are in Mersin and Adana Provinces, Toprakkale, Bahçe and Nurdağ Districts, Başpınar Quarter and Mustafa Yavuz locality. All of these settlements are located in the south and southeast of Turkey.

5.4 Identification of Baseline Conditions

5.4.1 Desk Studies

Secondary data sources have been used in this study include census data, geographical data (including maps), and national and local government statistics and documents.

The objective of this section is to present the baseline information on socio-economic characteristics, through the desktop studies carried out in the scope of the Project.

The scope of this section embraces all the findings about the socio-economic characteristics, together with the methodology followed during the studies. The provided information will constitute a basis for the ESIA.

This phase of the study is mainly composed of the compilation of the existing data, from the official databases of Turkish Statistical Institute (TurkStat).

The following headings cover "Population Structure" and "Economic Structure", which are the main topics used in the analysis of socio-economic structure.

Population

As a candidate country of the European Union (EU), Turkey (TR) is included in the "Nomenclature of Territorial Units for Statistics" (NUTS) which is a geo code standard for referencing the subdivisions of countries for statistical purposes. The main aim of such a classification is to collect and analyses the data at certain regional levels, even though the administrative boundaries are subject to change with time, thus enabling to distribute the regional funds equally. The hierarchy of the three NUTS levels and the subdivisions do not necessarily correspond to administrative divisions within the country. The studies regarding the regional redefinition in Turkey has been conducted by the (former) State Planning Institute (now, Ministry of Development), with the contribution of State Statistical Institute (TurkStat) and completed in 2002. After the studies, the three NUTS levels in Turkey are classified as (see also Figure 5.1) [4]:

NUTS-1: 12 Regions

NUTS-2: 26 Sub-regions

NUTS-3: 81 Provinces [5]



Figure 5.1: NUTS Level Map for Turkey [8]

According to this classification, there are 4 provinces. Mersin, Adana and Osmaniye provinces locate in within TR6 Mediterranean Region, Gaziantep Provinces locate in TRC Southeast Anatolia Region.

In addition to this classification, below the NUTS levels there are two Local Administrative Unit (LAU). The first of these units (LAU-1) is districts and the second (LAU-2) is municipalities [11].

LAU-1: 922 Districts

LAU-2: 1,389 Municipalities [16]

According to this classification, there are 12 districts and 14 municipalities. The detailed information about NUTS and LAU levels of the related settlements are given in Table 5.1

Table 5.1: NUTS and LAU Level Information of the Settlements [35]

Country	NUTS 1		NUTS 2		NUTS 3		LAU-1	LAU-2
Turkey	Regions		Sub-regions		Provinces		Districts	Municipalities
TR	TR6	Mediterranean Region	TR62	Adana Sub-region	TR621	Adana Province	Seyhan	Seyhan
							Yüreğir	Yüreğir
							Sarıçam	Sarıçam
							Ceyhan	Ceyhan
			TR622	Mersin Province	TR622	Mersin Province	Akdeniz	Akdeniz
							Tarsus	Tarsus
							Toprakkale	Toprakkale
							Central	Central
	TRC	Southeast Anatolia Region	TR63	Hatay Sub-region	TR633	Osmaniye Province	Düziçi	Düziçi
							Ellek	Ellek
							Yarbaşı	Yarbaşı
							Bahçe	Bahçe
	TRC	Southeast Anatolia Region	TRC1	Gaziantep Sub-region	TRC11	Gaziantep Province	Nurdağı	Nurdağı
							Şehitkamil	Şehitkamil

In 2019, populations of Turkey, Mediterranean Region and Southeast Anatolia are 83,154,997, 10,627,530 and 8,975,618, respectively. The share of the populations of the Mediterranean Region (12.78%) and the Southeast Anatolia Region (10.79%) in the Turkish population is similar [35].

When the populations of the provinces on the route are sorted from large to small, Adana Province (2,237,940 people) ranks first, Gaziantep Province (2,069,364 people) is second, Mersin Province (1,840,425 people) is third and Osmaniye Province (538,759 people) comes in fourth place [35].

Seyhan District is the most populated settlement (796,286 people), while Bahçe District has the lowest population on the route (22,155 people) [35].

The total population of Şehitkamil District (794,931) comes second in the district's population ranking, but only 3.54% of this district's population is on the route. This population distribution is mainly depended on railway route and the sampling method is designed according to the route. For detailed information, see the "Sample Selection" under "Methodology Section"[35].

The detailed population information of NUTS and LAU levels of the related settlements are given in Table 5.2 and Table 5.3.

Table 5.2: Population in NUTS Level [35]

Country	Population	NUTS 1		Population	NUTS 2		Population	NUTS 3		Population
Turkey	2019	Regions		2019	Sub-regions		2019	Provinces		2019
TR	83,154,997	TR6	Mediterranean Region	10,627,530	TR62	Adana Sub-region	4,078,365	TR621	Adana Province	2,237,940
								TR622	Mersin Province	1,840,425
					TR63	Hatay Sub-region	3,321,755	TR633	Osmaniye Province	538,759
		TRC	Southeast Anatolia Region	8,975,618	TRC1	Gaziantep Sub-region	2,838,319	TRC11	Gaziantep Province	2,069,364

Country	Population	NUTS 1		Population	NUTS 2		Population	NUTS 3		Population
Turkey	2019	Regions		2019	Sub-regions		2019	Provinces		2019

Table 5.3: Population in LAU Level [35]

Province		LAU-1	Population	LAU-2	Population
		District	2019	Municipality	2019
TR621	Adana	Seyhan	796,286	Seyhan	796,286
		Yüreğir	414,574	Yüreğir	414,574
		Sarıçam	181,610	Sarıçam	181,610
		Ceyhan	160,977	Ceyhan	160,977
TR622	Mersin	Akdeniz	262,265	Akdeniz	262,265
		Tarsus	342,373	Tarsus	342,373
TR633	Osmaniye	Toprakkale	20,119	Toprakkale	10,791
		Central	268,647	Central	237,476
		Düziçi	84,133	Düziçi	53,484
				Ellek	6,465
				Yarbaşı	3,590
		Bahçe	22,155	Bahçe	15,227
TRC11	Gaziantep	Nurdağı	40,221	Nurdağı	40,221
		Şehitkamil	794,931	Şehitkamil	794,931

Demography is the main heading evaluated under the heading as the main elements of the social structure. The main data sources while creating this section was the Address Based Population Registration System.

The general structure of the population in terms of gender is more or less equally distributed, as 50.2% males and 49.8 % females, with no distorting figures (see Figure 5.2).

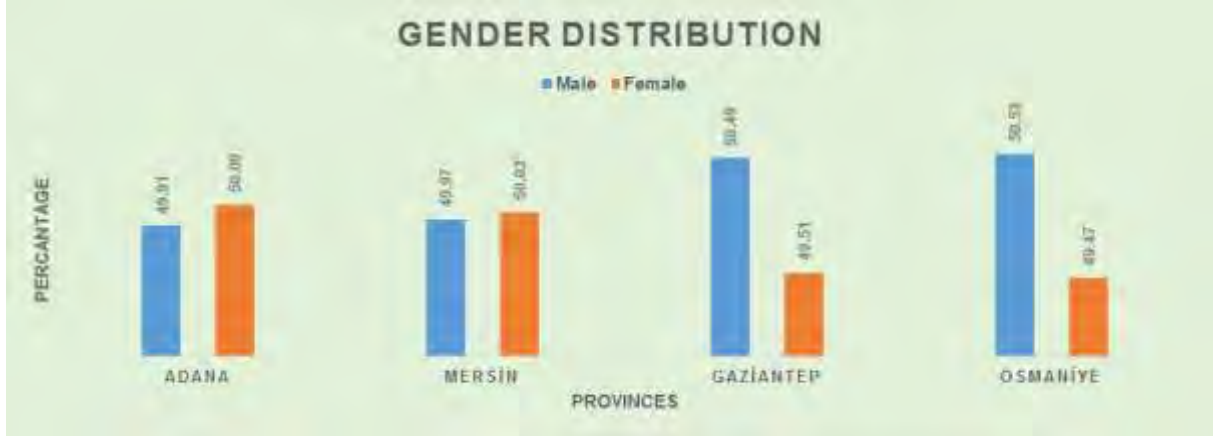


Figure 5.2: Gender Distribution of the Region [35]

The detailed information on the population distribution by age groups and gender are shown as age pyramids of the provinces are given in Figure 5.3.



Figure 5.3: Age Pyramid of the Provinces [35]

In the ten-year period of 2010-2019, the population change in the region was realized as an increase. This process of population change is parallel to the change in Turkey.

The average annual population growth rate compared to the previous year is 0.79% in Adana, 1.24% in Mersin, 1.24% in Gaziantep and 1.31% in Osmaniye. According to Table 5.4, the largest population growth rate was observed in Osmaniye Province. For detail information, see Figure 5.4

Table 5.4: Annual Population Change in Provinces [35]

	Mersin	Adana	Osmaniye	Gaziantep
2010	1,647,899	2,085,225	479,221	1,700,763
2010-2011	1.22%	1.13%	1.28%	1.22%
2011	1,667,939	2,108,805	485,357	1,753,596
2011-2012	0.89%	0.80%	1.40%	0.89%
2012	1,682,848	2,125,635	492,135	1,799,558
2012-2013	1.36%	1.11%	1.39%	1.36%
2013	1,705,774	2,149,260	498,981	1,844,438
2013-2014	1.26%	0.76%	1.57%	1.26%
2014	1,727,255	2,165,595	506,807	1,889,466

	Mersin	Adana	Osmaniye	Gaziantep
2014-2015	1.04%	0.81%	1.20%	1.04%
2015	1,745,221	2,183,167	512,873	1,931,836
2015-2016	1.64%	0.85%	1.81%	1.64%
2016	1,773,852	2,201,670	522,175	1,974,244
2016-2017	1.13%	0.67%	1.06%	1.13%
2017	1,793,931	2,216,475	527,724	2,005,515
2017-2018	1.14%	0.16%	1.27%	1.14%
2018	1,814,468	2,220,125	534,415	2,028,563
2018-2019	1.43%	0.80%	0.81%	1.43%
2019	1,840,425	2,237,940	538,759	2,069,364
Average Annual Population Change	1.24%	0.79%	1.31%	1.24%

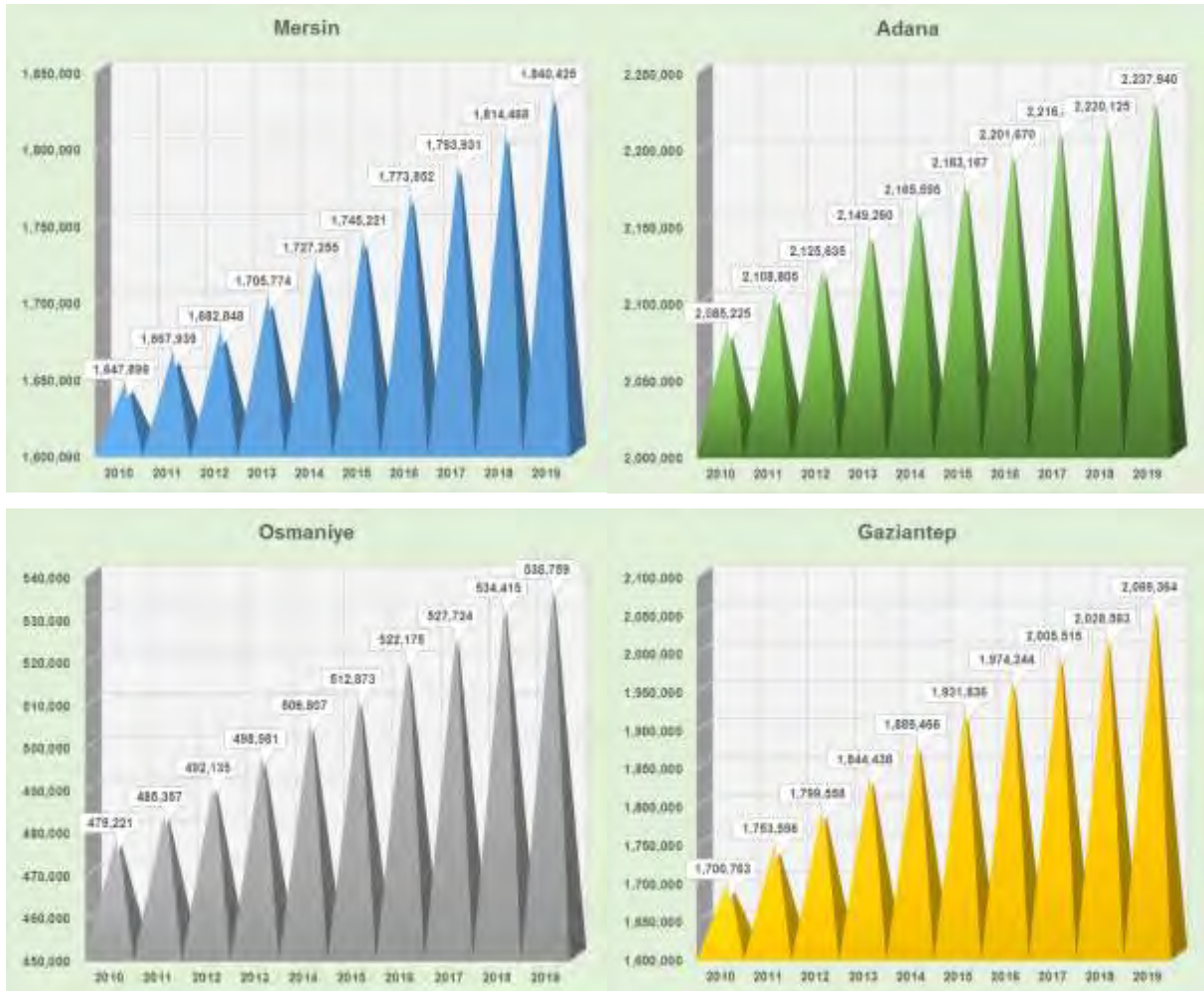


Figure 5.4: Population Changes in the Provinces between 2010 and 2019 [35]

Economy

The main indicators of employment are employment, labour force and unemployment. This is the definition of some indicators used in the report [38].

Employing; comprises all the non-institutional working-age population who are included in the “persons at work” and “not at work” described below.

- Employing Rate; is the ratio of employed persons to the non-institutional working-age population.
- Non-Institutional Population; comprises all the population, the residents of schools, dormitories, kindergartens, rest homes for elderly persons, special hospitals, military barracks and recreation quarters for officers.
- Labour Force; comprises all employed persons and all unemployed
- Labour Force Participation Rate; indicates the ratio of the labour force to non-institutional working-age population.
- Persons Unemployed; the unemployed comprises all persons 15 years of age and over who were not employed during the reference period had used at least one channel for seeking a job during the last three months and were available to start work within two weeks.
- Unemployment Rate; is the ratio of unemployed persons to the labour force.

According to the Table 5.5 and Table 5.6, the unemployment rate in Adana-Mersin Sub-region (11.9%) is lower than in Turkey (13.7%). In the sub-regions (TR63 Sub-region and TRC1 Sub-region) where Osmaniye and Gaziantep provinces are located respectively, these rates are (18.1% and 15.2%) significantly higher than Turkey. This situation is related to the low number of employment and employment participation rates in the relevant regions.

Table 5.5: Regional Economic Indicators for over 15 Age Population in 2019 (x 1,000 people) [39]

Regions and Sub-regions		Employment	Labour Force	Unemployed	Not in the Labour Force
TR	Turkey	28,080	32,549	4,469	28,920
TR6	Mediterranean Region	3,413	3,976	563	3,777
TR62	Adana, Mersin Sub-region	1,311	1,489	178	1,518
TR63	Hatay, Kahramanmaraş, Osmaniye Sub-region	915	1,117	202	1,217
TRC	Southeast Anatolia Region	2,031	2,618	586	3,065
TRC1	Gaziantep, Adıyaman, Kilis Sub-region	756	891	136	986

Table 5.6: Regional Economic Indicators for over 15 Age Population in 2019 (%) [39]

Regions and Subregions		Employment Rate	Labour Force Participation Rate	Unemployment Rate
TR	Turkey	45.7	53.0	13.7
TR6	Mediterranean Region	44.0	51.3	14.2
TR62	Adana, Mersin Sub-region	43.6	49.5	11.9

Regions and Subregions		Employment Rate	Labour Force Participation Rate	Unemployment Rate
TR63	Hatay, Kahramanmaraş, Osmaniye Sub-region	39.2	47.9	18.1
TRC	Southeast Anatolia Region	35.7	46.1	22.4
TRC1	Gaziantep, Adiyaman, Kilis Sub-region	40.2	47.5	15.2

The economic activities are industry, tourism and agriculture in TR62 Adana-Mersin Sub-region. When the spatial distribution of economic activities in the region is examined (see also Figure 5.5);

- Agriculture, industry and tourism in Adana-Tarsus-Mersin metropolitan area;
- Agriculture and industry in Adana's Kozan and Ceyhan districts;
- Agriculture and tourism are concentrated in Erdemli, Silifke and Anamur districts of Mersin [40].



Figure 5.5: Distribution of Economic Activities in TR62 Sub-region-1 [40]

The northern and western parts of the region show relatively underdeveloped features, and mostly agricultural and services sector activities stand out. Apart from the metropolitan centre of the region consisting of Adana and Mersin centres and Tarsus district, the two districts that have sub-centers in the region are Ceyhan and Silifke.

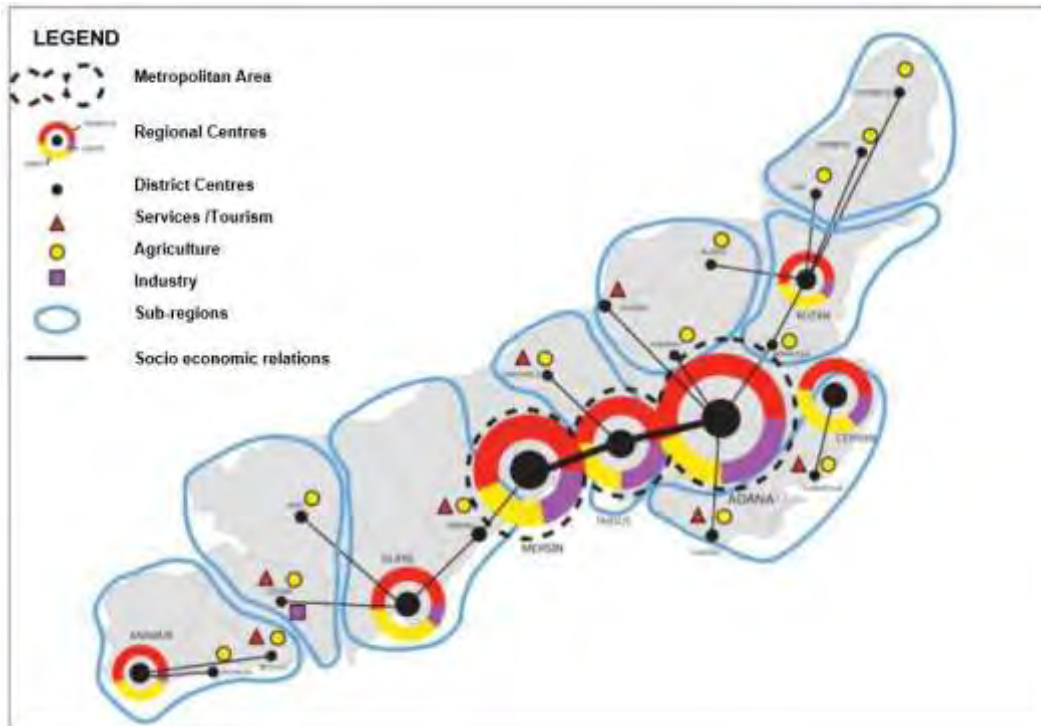


Figure 5.6: Distribution of Economic Activities in TR62 Sub-region-2 [40]

Osmaniye is suitable for agricultural production, animal husbandry and forestry with its geographical location and natural structure, but economic mobility is observed in many industrial sectors in the province with the influence of expanding industries in the surrounding provinces and the expansion of incentive measures in the recent period [41].

As Osmaniye province became one of the priority provinces in development, investments were made in various sectors with the incentives given. At the beginning of these investments is the iron and steel sector [41].

According to the "socio-economic development ranking survey of Provinces and Regions" announced by the State Planning Organization in May 2011, the Gaziantep Province ranks 30. among 81 provinces [42].

Gaziantep has been under the influence of many surrounding provinces in economic terms, and has made serious investments in tourism in recent years. It is one of the provinces leading the Turkish economy with its production and export volume [43].

5.4.2 Field Studies

Project Social Impact Area (PSIA)

The Project Social Impact Area (PSIA) covers the entire area directly and indirectly affected by the project activities mentioned above. Therefore, 6,686,488 people, consisting of cities (Mersin, Adana, Osmaniye and Gaziantep) districts, villages and quarters connected to these cities, are covered by PSIA.

However, it is almost impossible to study the socio-economic structure of such a large population community and assess the possible social impacts. Thus, in order to study the direct and indirect effects that are expected to occur on such a large population, a sampling is needed to represent the entire population.

Sampling

One of the methods used to create a statistically significance level Alpha (α) sample to study the socio-economic structure of large population groups is the use of the “Table of Sample Size for $\alpha=0.05$ ” presented in Table 5.7 and the statistical formula developed depending on this table.

Table 5.7: Table of Sample Size for $\alpha=0.05$

Population	± 0.03 Sampling Error (d)			± 0.05 Sampling Error (d)			± 0.10 Sampling Error (d)		
	p=0.5 q=0.5	p=0.8 q= 0.2	p=0.3 q=0.7	p=0.5 q=0.5	p=0.8 q= 0.2	p=0.3 q=0.7	p=0.5 q=0.5	p=0.8 q= 0.2	p=0.3 q=0.7
100	92	87	90	80	71	77	49	38	45
500	341	289	321	217	165	196	81	55	70
750	441	358	409	254	185	226	85	57	73
1,000	516	406	473	278	198	244	88	58	75
2,500	748	537	660	333	224	286	93	60	78
5,000	880	601	760	357	234	303	94	61	79
10,000	964	639	823	370	240	313	95	61	80
25,000	1,023	665	865	378	244	319	96	61	80
50,000	1,045	674	881	381	245	321	96	61	81
100,000	1,056	678	888	383	245	322	96	61	81
1,000,000	1,066	682	896	384	246	323	96	61	81
100,000,000	1,067	683	896	384	245	323	96	61	81

N= Number of individuals in the population

n= Number of individuals to be selected for sampling

p= Probability of frequency of occurrence of the case (0.5)

q= Frequency of absence of the case (1-p)

t= the theoretical value in the t table at a certain degree of freedom and the error level detected (1.96)

d= Standard error value (0.05)

$$n = \frac{N \cdot p \cdot q \cdot t^2}{(N - 1) \cdot d^2 + t^2 \cdot p \cdot q}$$

Table 5.8: Number of Population and Household in PSIA [44]

NUTS Level Codes	Provinces	Population	Average Household Size	Number of Household
TR621	Adana	2,237,940	3.6	614,659
TR622	Mersin	1,840,425	3.3	555,033
TR633	Osmaniye	538,759	3.6	150,510
TRC11	Gaziantep	2,069,364	4.1	506,476

NUTS Level Codes	Provinces	Population	Average Household Size	Number of Household
Total Population	6,686,488		Total number of household	1,826,678
			Average Household Size	3.7

When the formula is applied according to the first method,

N= 6,686,488

p= 0.5

q= 1-p

t= 1.96

d= Standard error value (0.05)

$$n = \frac{6,686,488 * 0.5 * 0.5 * 1.96^2}{(6,686,488 - 1) * 0.05^2 + 1.96^2 * 0.5 * 0.5} = \frac{6,421,703}{16,716 + 0.9604} = 384.08$$

In this Social Impact Assessment (SIA) study, a sample calculation based on the number of households will be used, as the ability to represent is stronger. As a result there is the sampling is 384/3.7=103.78. Taking into account the dense population in PSIA, an increase of between 80% and 95% was observed across the sample according to population density of the related region.

Baseline Findings of the Field Survey

The questionnaires have been prepared before starting the field research. Interviewers, who will conduct the Household Survey, have received training to assure standardization in data gathering and minimize the bias of interviewers prior to survey.

The Household Survey was the most important tools for collecting the basic information that has been used in the social impact assessment process.

183 household questionnaires were completed in the field survey conducted as part of the social impact assessment in 4 provinces, 15 Districts, and 120 settlements (village, neighborhoods) designated as the project's impact area. 33.3% of questionnaire forms belong to Mersin, 42.1% to Adana, 18.6% to Osmaniye, and 6.0% to Gaziantep (see Table 5.7 and Table 5.8).

Table 5.9: Cross Tabulation of Household Questionnaires according to Districts

Districts	Provinces				
	Mersin	Adana	Osmaniye	Gaziantep	Total
Akdeniz	18	0	0	0	18
Toroslar	6	0	0	0	6
Yenişehir	3	0	0	0	3
Tarsus	34	0	0	0	34
Seyhan	0	35	0	0	35
Yüreğir	0	22	0	0	22
Çukurova	0	1	0	0	1

Districts	Provinces				
	Mersin	Adana	Osmaniye	Gaziantep	Total
Sarıçam	0	3	0	0	3
Ceyhan	0	16	0	0	16
Central	0	0	19	0	19
Toprakkale	0	0	5	0	5
Düziçi	0	0	5	0	5
Bahçe	0	0	5	0	5
Nurdağ	0	0	0	5	5
Şehitkamil	0	0	0	6	6
Total	61	77	34	11	183
	33.3%	42.1%	18.6%	6.0%	100.0%

Table 5.10: Cross Tabulation of Household Questionnaires according to Districts

Province	District	Number of Settlement	Population	% in the Province	% in the PSIA
Mersin	Akdeniz	8	70	32.71	10.31
	Toroslar	5	27	12.62	3.98
	Yenişehir	3	11	5.14	1.62
	Tarsus	24	106	49.53	15.61
	Total	40	214	100.00	31.52
Adana	Seyhan	23	118	40.41	17.38
	Yüreğir	14	92	31.51	13.55
	Çukurova	1	4	1.37	0.59
	Sarıçam	2	9	3.08	1.33
	Ceyhan	12	69	23.63	10.16
	Total	52	292	100.00	43.00
Osmaniye	Central	15	62	51.24	9.13
	Toprakkale	3	23	19.01	3.39
	Düziçi	2	20	16.53	2.95
	Bahçe	3	16	13.22	2.36
	Total	23	121	100.00	17.82
Gaziantep	Nurdağ	3	23	44.23	3.39
	Şehitkamil	2	29	55.77	4.27
	Total	5	52	100.00	7.66
Grand Total	Grand Total	120	679	100.00	100.00

70.5% of respondents were the household head and 87.4% of these were male (see Table 5.11).

Table 5.11: Cross Tabulation of Household Questionnaires according to Gender of Respondents

	Male	%	Female	%	Total	%
Household head	124	96.1	5	3.9	129	70.5
Child of household head	35	76.1	11	23.9	46	25.1
Sibling of household head	1	100.0	0	0.0	1	0.5
Spouse of the household head	0	0.0	6	100.0	6	3.3
Home mate	0	0.0	1	100.0	1	0.5
Total	160	87.4	23	12.6	183	100.0

Population

According to the findings of household surveys, the average household size in the Project Social Impact Area (PSIA) is 3.7 (see Table 5.12).

Table 5.12: Average Household Size in the PSIA

	Mersin		Adana		Osmaniye		Gaziantep		Total	
Household Size	N	%	N	%	N	%	N	%	N	%
1	8	13.1	9	11.7	1	2.9	0	0.0	18	9.8
2	9	14.8	7	9.1	10	29.4	0	0.0	26	14.2
3	15	24.6	13	16.9	6	17.6	1	9.1	35	19.1
4	12	19.7	26	33.8	10	29.4	3	27.3	51	27.9
5	12	19.7	13	16.9	4	11.8	6	54.5	35	19.1
6	3	4.9	5	6.5	1	2.9	0	0.0	9	4.9
7	1	1.6	3	3.9	1	2.9	1	9.1	6	3.3
9	0	0.0	0	0.0	1	2.9	0	0.0	1	0.5
10	1	1.6	1	1.3	0	0.0	0	0.0	2	1.1
Number of the household questionnaire	61		77		34		11		183	
Total population	214		292		121		52		679	
Average household size	3.51		3.79		3.56		4.73		3.71	

PSIA has a total of 679 inhabitants. Approximately, 54% of the total population of PSIA is male and 46% is female. Most of the population is in the 15-24 age group. The distribution of male and female by age groups is similar (see Table 5.13).

Table 5.13: Cross Tabulation of Age Group according to Gender

	Gender				Total	
Age Group	Male		Female			
	N	%	N	%	N	%
0-5	16	2.4	18	2.7	34	5.0
6-14	42	6.2	46	6.8	88	13.0
15-24	82	12.1	56	8.2	138	20.3
25-34	53	7.8	40	5.9	93	13.7
35-44	39	5.7	43	6.3	82	12.1
45-54	58	8.5	57	8.4	115	16.9
55-64	62	9.1	36	5.3	98	14.4
65-74	13	1.9	9	1.3	22	3.2
75-84	1	0.1	8	1.2	9	1.3
Total	366	53.9	313	46.1	679	100.0

Education

Primary school graduates (28.9%) have the highest rate in the grouping made according to the last graduated education level (see Table 5.14).

Table 5.14: Frequency Table of Education Level

	N	%
Primary school and its equivalent	196	28.9
High school and its equivalent	168	24.7
Secondary school and its equivalent	110	16.2
Tertiary education and its equivalent	47	6.9
Attend to school	44	6.5
Undergraduate education and its equivalent	40	5.9
Not in school-age	29	4.3
Illiterate	23	3.4
Literate	16	2.4
Postgraduate education	5	0.7
Other	1	0.1
Total	679	100

Economical Condition

Of the total population in PSIA, 53% (362 people) have no job or source of income. Of the remaining 317 people, 75% are active. 39.4% of active workers work in the private sector. 75% of those who have an income, even though they are not actively working, are retired (see Table 5.15 and Table 5.16).

Table 5.15: Frequency Table of Employment and Income Status

	N	%
No labor / no income	362	53.3
Employed in private sector	125	18.4
Retired	57	8.4
Tradesman / business owner	51	7.5
Employed in public sector	29	4.3
Daily /seasonal works	22	3.2
Elderly/ widowed /disabled / veteran's pension	10	1.5
Engaged in farming	7	1.0
Unemployment pay	5	0.7
Peddler	5	0.7
No answer	4	0.6
Engaged in husbandry	2	0.3
Total	679	100.0

Table 5.16: Frequency Table of Profession and Main Income Source

	N	%
Employed in private sector	125	39.4
Retired	57	18.0
Tradesman / business owner	51	16.1
Employed in public sector	29	9.1
Daily /seasonal works	22	6.9
Elderly/ widowed /disabled / veteran's pension	10	3.2
Engaged in farming	7	2.2
Unemployment pay	5	1.6
Peddler	5	1.6
No answer	4	1.3
Engaged in husbandry	2	0.6
Total	317	100.0

Health

The availability of chronic disease (16.20%, 110 people) and disability (3.98%, 27 people) is quite low (see Figure 5.7).

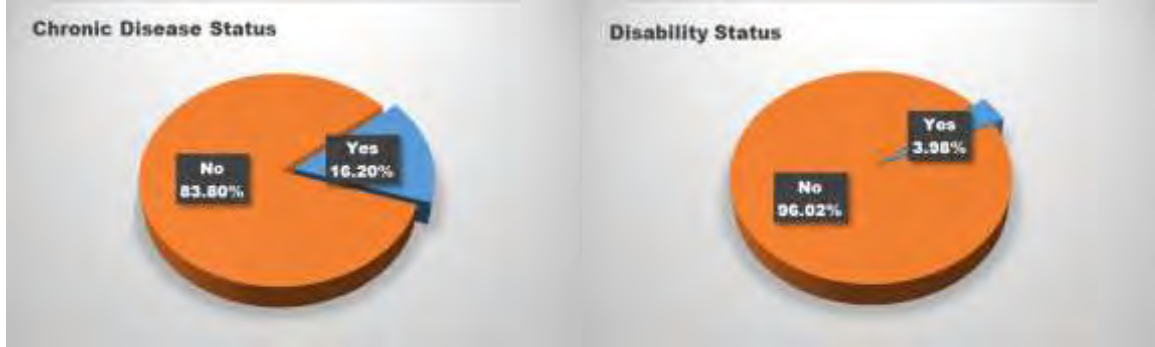


Figure 5.7: Distribution of Health Conditions

Travel Habit

Approximately 90% of the total population (608 people) in PSIA has a habit of traveling (see Figure 5.8). 52.6% of the population (320 people) who have a habit of traveling prefer passenger cars as a means of travel (see Table 5.17).

Table 5.17: Frequency Table of Most Preferred Travel Vehicle

	N	%
Passenger car	320	52.6
Bus	184	30.3
Train	48	7.9
Public transport vehicles	30	4.9
Airplane	18	3.0
Company car	4	0.7
Staff Service/school service	3	0.5
Hitchhiking	1	0.2
Total	608	100.0

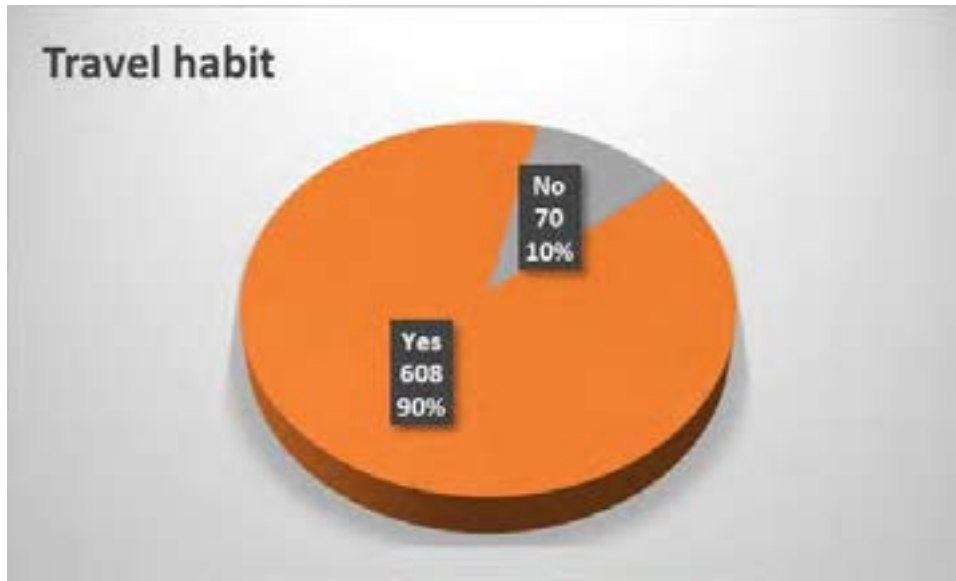


Figure 5.8: Distribution of Travel Habit

In the grouping according to the most preferred travel vehicle, train users are in the third rank. The alternative travel vehicle for those who prefer a train is mostly a bus. Among those who use the train as an alternative travel vehicle, some use the bus the most (see Table 5.18).

Table 5.18: Cross Tabulation of Most Preferred Travel Vehicle according to Alternative Travel Vehicles

Most preferred travel vehicle	Alternative travel vehicle									Total
	Passenger car	Bus	Train	Airplane	Company car	Public transport vehicles	Rent a car	Other	No alternative vehicle	
Passenger car	0	128	66	32	2	22	9	0	61	320
Bus	28	0	69	47	0	2	0	1	37	184
Train	8	30	0	1	0	6	0	0	3	48
Airplane	4	11	2	0	0	0	0	0	1	18
Company car	1	0	0	0	0	0	0	0	3	4
Public transport vehicles	13	0	0	0	0	0	0	0	17	30
Staff Service/school service	1	0	0	0	0	0	0	0	2	3
Hitchhiking	0	1	0	0	0	0	0	0	0	1
Total	55	170	137	80	2	30	9	1	124	608

The places where 608 people with travel habits made the most trips are given in the below table between Table 5.19 and Table 5.20 in the context of the Districts. According to these data, the most traveled 3 settlements are Mersin, Adana, and İstanbul, respectively. In general, travel is in the immediate vicinity. Travel from District centers (for example, Tarsus-Mersin, Toprakkale-Osmaniye) to provincial centers is dense. At the same time, trips were frequent between adjacent provinces such as Mersin-Adana or Adana-Osmaniye. Unlike these, İstanbul is in demand in terms of travel.

Table 5.19: Distribution of “Top 3 Most Traveled Cities by Districts” in Mersin

Departure Point		Destination Point	Number of Passengers	% in Province
Province	District			
Mersin	Akdeniz	İstanbul	12	6.19
Mersin	Akdeniz	Diyarbakır	11	5.67
Mersin	Akdeniz	Adana	9	4.64
Total number of passengers in the District			64	32.99
Mersin	Toroslar	Şanlıurfa	7	3.61
Mersin	Toroslar	Erdemli	5	2.58
Mersin	Toroslar	Kocaeli (İzmit)	4	2.06
Total number of passengers in the District			26	13.40
Mersin	Yenişehir	İstanbul	6	3.09
Mersin	Yenişehir	Diyarbakır	3	1.55
Mersin	Yenişehir	İzmir	1	0.52
Total number of passengers in the District			11	5.67
Mersin	Tarsus	Mersin	24	12.37
Mersin	Tarsus	Adana	22	11.34
Mersin	Tarsus	İstanbul	8	4.12
Total number of passengers in the District			93	47.94
Total number of passengers in the Province			194	100.00

Table 5.20: Distribution of “Top 3 Most Traveled Cities by Districts” in Adana

Departure Point		Destination Point	Number of Passengers	% in Province
Province	District			
Adana	Seyhan	Bitlis	14	7.00
Adana	Seyhan	Mersin	13	5.08
Adana	Seyhan	Diyarbakır	11	4.30
Total number of passengers in the District			107	41.80
Adana	Yüreğir	Mersin	23	8.98
Adana	Yüreğir	İstanbul	8	3.13
Adana	Yüreğir	Gaziantep	6	2.34
Total number of passengers in the District			80	31.25
Adana	Çukurova	Mardin	4	1.56
Total number of passengers in the District			4	1.56
Adana	Sarıçam	Mersin	5	1.95
Adana	Sarıçam	Ağrı	3	1.17
Adana	Sarıçam	İstanbul	1	0.39
Total number of passengers in the District			9	3.52
Adana	Ceyhan	Adana	14	5.47
Adana	Ceyhan	Mersin	12	4.69
Adana	Ceyhan	Gaziantep	7	2.73

Departure Point		Destination Point	Number of Passengers	% in Province
Province	District			
Total number of passengers in the District			56	21.88
Total number of passengers in the Province			256	100.00

Table 5.21: Distribution of “Top 3 Most Traveled Cities by Districts” in Osmaniye

Departure Point		Destination Point	Number of Passengers	% in Province
Province	District			
Adana	Seyhan	Bitlis	14	7.00
Adana	Seyhan	Mersin	13	5.08
Adana	Seyhan	Diyarbakır	11	4.30
Total number of passengers in the District			107	41.80
Adana	Yüreğir	Mersin	23	8.98
Adana	Yüreğir	İstanbul	8	3.13
Adana	Yüreğir	Gaziantep	6	2.34
Total number of passengers in the District			80	31.25
Adana	Çukurova	Mardin	4	1.56
Total number of passengers in the District			4	1.56
Adana	Sarıçam	Mersin	5	1.95
Adana	Sarıçam	Ağrı	3	1.17
Adana	Sarıçam	İstanbul	1	0.39
Total number of passengers in the District			9	3.52
Adana	Ceyhan	Adana	14	5.47
Adana	Ceyhan	Mersin	12	4.69
Adana	Ceyhan	Gaziantep	7	2.73
Total number of passengers in the District			56	21.88
Total number of passengers in the Province			256	100.00

Table 5.22: Distribution of “Top 3 Most Traveled Cities by Districts” in Gaziantep

Departure Point		Destination Point	Number of Passengers	% in Province
Province	District			
Gaziantep	Nurdağ	Gaziantep	13	27.08
Gaziantep	Nurdağ	Mersin	4	8.33
Gaziantep	Nurdağ	Kahramanmaraş	3	6.25
Total number of passengers in the District			23	47.92
Gaziantep	Şehitkamil	Şanlıurfa	8	16.67
Gaziantep	Şehitkamil	Eskişehir	5	10.42
Gaziantep	Şehitkamil	Ankara	4	8.33
Total number of passengers in the District			25	52.08
Total number of passengers in the Province			48	100.00

Opinions about the Current Travel Opportunities

According to the results of the 183-household survey, the vast majority of respondents (105 people) interviewed believe that today's travel opportunities are insufficient. Especially in Osmaniye and Mersin, this situation is more pronounced (see Figure 5.9).



Figure 5.9: Opinions about the Current Conditions of Travel Opportunities

The respondents who say that current travel opportunities are insufficient to have mentioned the general shortcomings of transport services. This has also been highlighted for low-income families (see Table 5.23).

Table 5.23: Frequency Table of the Insufficiency of Current Travel Opportunities

According to you, why are travel opportunities insufficient today?	Insufficient	%
In general, transportation services are insufficient.	63	60.00
Transportation for low-income people is insufficient.	17	16.19
Road transportation is insufficient.	12	11.43
Aviation is insufficient.	8	7.62
Railway transportation is insufficient.	4	3.81

According to you, why are travel opportunities insufficient today?	Insufficient	%
Marine transportation is insufficient.	1	0.95
Total	105	100.00

Opinions about the Planned Project

The majority of the 183 respondents (171 people) interviewed expressed a positive opinion about using the planned High Standard Railway (see Figure 5.10).

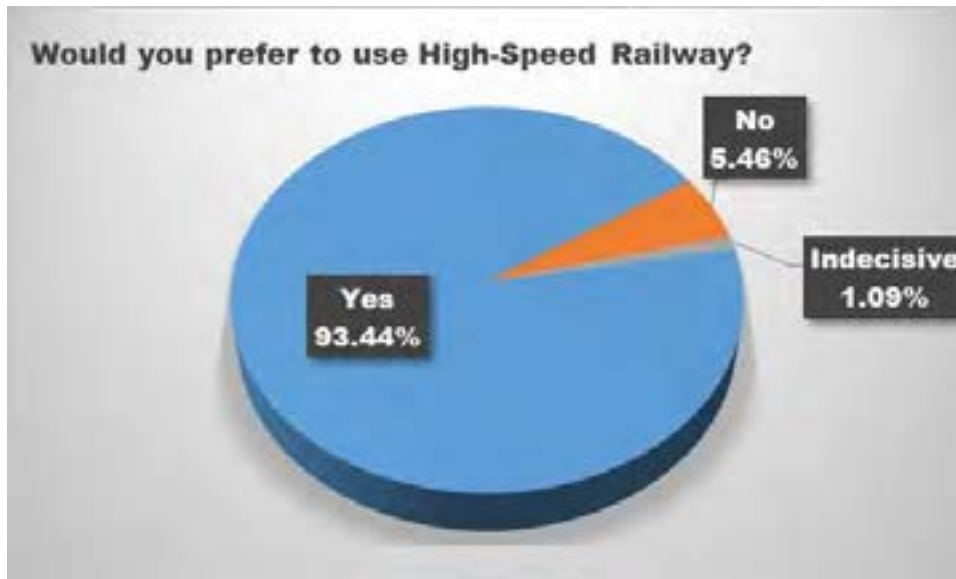


Figure 5.10: Preference Status to use High Standard Railway

The first three reasons offered by the respondents who say they want to use High Standard Railway are that the train is fast, comfortable and saves time, respectively. These three statements are more than 70% of all reasons for preference (see Table 5.24).

Table 5.24: Frequency Table of Positive Opinions

Why would you prefer to use High Standard Railway?	Number of Positive Opinions	%
Speedy	77	45.03
Comfortable / easy	25	14.62
Saves time	22	12.87
Safety	10	5.85
Increases opportunities for sightseeing/holiday	10	5.85
Affordable	9	5.26
Provides ease of transportation	6	3.51
Wonder / Curiosity	4	2.34
Pleasurable	3	1.75
Provides an alternative transportation	2	1.17
Healthy	1	0.58

Why would you prefer to use High Standard Railway?	Number of Positive Opinions	%
State Project	1	0.58
It will be suitable for disabled people	1	0.58
Total	171	100.00

The majority of the 183 respondents (174 people) interviewed expressed a positive opinion about the possible impact of the planned Project (see Figure 5.11).

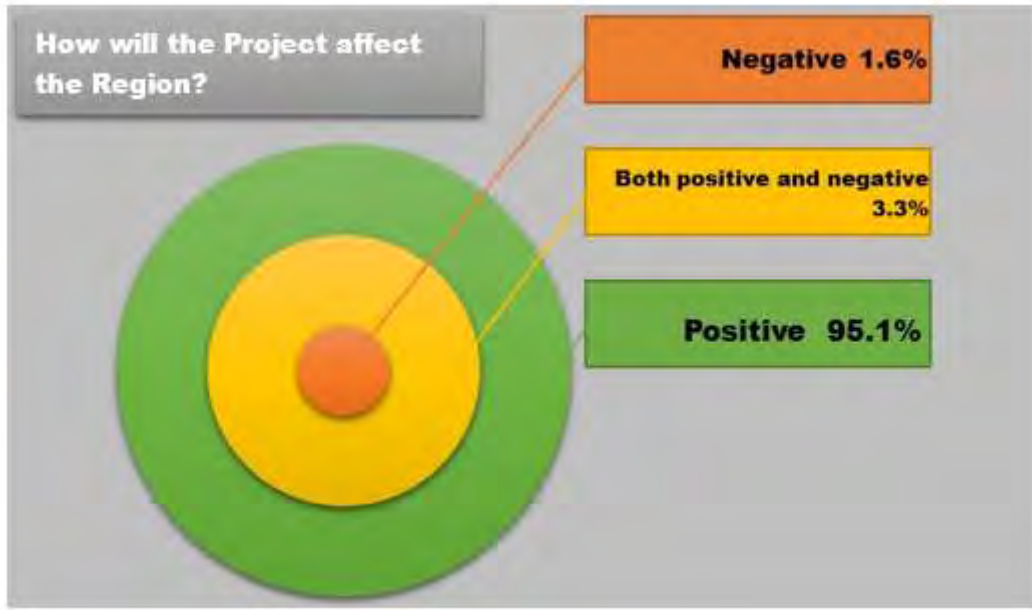


Figure 5.11: Opinions about the Possible Impact of the Project

Table 5.25: Opinions about the Possible Impact of the Project

How will the Project affect the Region?				
Positive	#	Both positive and negative	Negative	#
Does not affect.	1		Does not affect.	1
It causes an increase in the labor force.	1	6	It would fail.	1
Provides comfort in daily commuting to work/school.	1		It would be harmful to bus companies.	1
Provides the development of tourism.	1		Ethnic/cultural/social problems may occur.	1
Provides the development of transportation opportunities.	2	6	It would be harmful to bus companies.	2
Provides the development of transportation opportunities.	46		It would fail.	2
Provides the development of tourism.	25		It would be harmful to bus companies.	1
Provides economic development.	22		Total	3
Improves the city.	18			
It causes an increase in the labor force.	15			
It causes an increase in trade/benefit of tradespeople.	10			
Provides fast travel.	10			
Provides an advantage to the people of the region.	8			
It reduces traffic volume.	4			
It will be an alternative means of transportation for low-income people.	4			
Provides comfort in daily commuting to work/school.	3			
Provides comfortable travel.	3			
Reduces air pollution.	2			
It improves gastronomy.	1			
Provides safe/healthy travel.	1			
Relative relationship increase.	1			
Travel/vacation opportunities increase.	1			
Total	74			

Knowledge about the Project

One of the important findings of the household survey is that the level of knowledge about the Project is very low (55.7%) (see Figure 5.12).



Figure 5.12: Awareness Level about the Project

A small number of people who express detailed knowledge of the project have only heard about the project or seen the work. Besides, the respondents with moderate knowledge have similar information (see Table 5.26).

Table 5.26: Frequency Table of Information about the Project

	Adequate	Moderate	None	Total
I know the project will be done/ begin/ open	5	44	0	49
I have heard that the work is unfinished/stopped/incomplete	2	0	0	2
I see the work	2	18	0	20
I know that the project will be between Mersin and Gaziantep	0	6	0	6
I hear there will be no stations in the city	0	3	0	3
No information	0	0	102	102
Other	0	1	0	1
Total	9	72	102	183

In parallel with the low level of information, there are many questions about the Project. When the project will, start and when it will end are the two most curious issues. Other important curiosity issues are about the ticket price, the route of the train, and station locations (see Table 5.27).

Table 5.27: Frequency Table of Questions about the Project

	Frequency	Percent
I wonder when the Project will start.	54	29.5
I wonder when the Project will end.	46	25.1
I'm curious about the ticket price for the train.	19	10.4
I wonder about the route of the train.	11	6.0
I wonder where the stations will be.	10	5.5
There is no curiosity about the project.	8	4.4
I wonder how long the train journey will take.	7	3.8
I wonder about the interior features (couchette, compartment, pullman etc.) of the train.	7	3.8
I wonder how fast the train will go.	3	1.6
I wonder about the number of trips.	3	1.6
I am curious about the future of the project.	3	1.6
I wonder if the project will be safe.	3	1.6
I wonder who will be the Contractor.	2	1.1
I wonder about the condition of railroad crossings.	2	1.1
I wonder about the cost of the Project.	1	0.5
I wonder what the risk of the train accident is.	1	0.5
I wonder about if fell trees will / I wonder if it will pass through farmland.	1	0.5
I wonder what the impact will be on traffic.	1	0.5
I wonder what the impact will be on perimeter security.	1	0.5
Total	183	100.0

About 76% of governmental institutions (mayor, government officials, ministry, etc.) were preferred as informants for curious issues (see Table 5.28). As a method of information, it is common means of communication about 71% (national television, newspapers, social media, etc.) (see Table 5.29).

Table 5.28: Frequency Table of Requested Information Provider

	Frequency	Percent
Mayor /Governor /District Governor	43	23.5
Government officials	34	18.6
Ministry of Transportation	33	18.0
President	29	15.8
Contractor	18	9.8
TCDD	9	4.9
There is no curiosity about the project.	8	4.4
News/Speakers / Journalists	4	2.2
Headman of village	3	1.6
No answer	2	1.1
Total	183	100.0

Table 5.29: Frequency Table of Requested Disclosure Method

	Frequency	Percent
Television	88	48.1
Social media	21	11.5
National news/radio	21	11.5
SMS	9	4.9
Notice boards / Posters / Leaflets / Billboards	8	4.4
There is no curiosity about the Project.	8	4.4
Announcements	6	3.3
Face-to-face consultation	6	3.3
Local television/news	5	2.7
Meeting	5	2.7
Internet	3	1.6
No answer	2	1.1
Other	1	0.5
Total	183	100.0

Complaints about the Project

In the household survey conducted at PSIA, 9 households out of 183 households expressed complaints about the Project (see Table 5.30).

Table 5.30: Frequency Table of Complaints Related with Project

	Tarsus	Bahçe	Seyhan	Ceyhan	Nurdağ	Total
We had problems with level crossings.	3	0	0	0	0	3
Slow progress of the Project.	0	0	1	0	0	1
Traffic congestion.	0	0	0	1	0	1
Train stoppage due to the Project.	1	0	0	0	0	1
Road closed during tunnel construction.	0	1	0	0	0	1
Dust has formed.	0	1	0	0	0	1
I am unemployed because the tunnel collapsed	0	0	0	0	1	1
Total	4	2	1	1	1	9

5.5 Impact Magnitude and Sensitivity Criteria

After all the impacts have been assessed, it is then necessary to prioritize them for action. In impact, assessment speak; this is called 'establishing significance', 'significance assessment' or 'significance determination'. In effect, criteria for establishing significance need to be determined and each impact rated (or ranked) based on those criteria (See Figure 5.13).

		Consequence Level		
Magnitude		A Positive	B Neutral	C Negative
1	High	A1	B1	C1
2	Medium	A2	B2	C2
3	Low	A3	B3	C3

Figure 5.13: Template of the Impact Assessment Process

5.6 Impact Assessment

5.6.1 Construction and Operation Phase

The goal is to make a social impact assessment on different aspects of the Project in a way, which allows a comprehensive analysis work to be done. The information produced by this study will focus on construction phase of the Project. The key objective of this study is; to assess and understand the impact of construction and operation of the High Standard Train Line and its infrastructure to both the regional economy and population.

To evaluate the socio-economic impacts of a High Standard Railway Line Project, it is necessary to consider the relations of different issues affecting each other together. It is an actual situation to say that the population will increase due to the arrival of workers to work in the region during the construction and operation phases of the High Standard Train Line Project. Still, this alone is not an adequate assessment. In short, it is necessary to consider the indirect impacts of the High Standard Train Line Project. On society, especially population growth, employment, and built environment.

The impact assessment of socioeconomics is presented in the following sub-headings, and the general assessment is given following each section. The information produced by this study will focus on both construction and operation phases of the Project.

Demography

The direct impact of the project on the population and the indirect impact on the population's age and gender structure should be evaluated within the context of social +construction and operation. The most critical impact of the Project on demography is the increase in the region's population. The reason for the population growth is the workers who will work during the construction and operation phases.

- One of the significant and unavoidable impacts of macro projects is population growth. The local population growth also means population growth for the Mediterranean Region
- One of the most critical direct impacts of population growth caused by megaprojects on the current population structure is the youthening of the population. The population growth is due to workers who will work during the Project's construction and operation phases.
- The most critical consequence of expats' arrival in the area is interaction with the indigenous people. This interaction will be bilateral.
- The most important result of the interaction process due to workers migrating to the region is the social conflicts between foreign workers and the region's local people.

Education

During both operation and construction phases arrival of the well-trained staff to the region is considered as a positive impact on the increase in the level of education. It is quite possible that this effect will occur.

- The low-educated labor force does not have a changing effect on the level of education in the region.
- Conversely, the labor force needed during the operation period is mostly well-trained, qualified personnel.
- The qualified labor force will increase the number of people who have trained university and post-university level education in the distribution of the population according to the level of education. This situation could be observed more at the local level.

Health

The risks that may arise during the construction period may be related to intensified vehicle traffic. These risks can be listed as vehicle accident risks, accidents in areas open to pedestrian traffic caused by vehicles. The presence of such risks may increase local concerns about the project. Such effects, which are likely to occur during the construction period, will be on the agenda for a short time. Accident risks, as well as dust, noise, and emissions from heavy tonnage vehicles, also need to be evaluated from a public health perspective.

Employment and Unemployment

The most significant local impact of the macro projects is on jobs and incomes. There are findings that facilities generate substantial economic and employment benefits to the surrounding communities and are economic mainstays.

Starting the construction of the Project, needed employment will raise and job seekers may come to the project area. Jobseekers may migrate to the Region from various places. It is possible to say that significance of the impact as a result of an influx of construction workers is largely dependent on the number of people. When the construction activities of the project, will be a significant impact on the regional economy especially in Mediterranean Region.

Services and Public Facilities

In general, the changes that take place in the natural topography and landscape custom tend to be confused by the local population. For this reason, such impacts can often be considered negative. Changes in landscape continue during construction and are limited to the construction time.

The major effect extends over the long period, which continues with the construction of temporary housing during the construction period and permanent housing construction during the operation period. Demand for housing and housing built at this rate primarily directly affects expats, followed by local people. People in the rental housing supply are positively impacted by rising rental prices while rising rental prices negatively impact local people.

Construction is the period when the related facilities cannot meet the demand. The difficulty in meeting demand is that existing infrastructure facilities (sewage, drinking water, etc.) add additional mass with population growth. However, due to the problems experienced at this phase, existing facilities and services will be improved so that they can meet the needs. In short, the negative impact experienced during the construction phase will turn into a positive effect as time passes, especially in the operation phase. Similarly, the recreation areas and transport network (at both local and regional levels) will develop and diversify. These developments will take place in the form of the construction of new recreation areas and the formation of existing recreation areas.

Vulnerable Groups

The impact of the Project on the construction and operation period was examined on the low-income people and disabled people, who are minorities in the local population. How the expected impacts for the construction and operation phase will affect these sensitive groups has been studied in detail.

5.7 Mitigation Measures

Mitigations on Demography

The most important impact of the Project on the society is the increase in the population of the region due to expats. This increase will cause the young population to gain weight in the population structure. These effects of population growth can be monitored primarily in the region close to the project area. Population growth is overall definite, and its effects are positive for both local people and for the Mediterranean Region. The stated positive effects of population growth are more pronounced during the construction phase but will also apply to the operation phase. Neither a mitigation measure is required for the construction phase nor for the operation phase about population growth.

Mitigations on Social and Cultural Conflicts

Social conflicts, seen as a short-term impact, would be heavily related to the construction phase. The expected impact of social conflict will be short-term and will not be strong enough to change the social structure of the region. These social conflicts, which were raised during the construction phase, would have almost disappeared for the operation phase as a result of the cultural interaction. Induction trainings for new comers related with relationship/communication with locals, code of conduct, and the social dynamics of the country will be beneficial for mitigating the social conflicts.

The most important effect of population growth in cultural life is the change in the daily life of the local people. These changes are more evident during the construction phase because the population growth was greater. As well as social conflicts, there will be cultural conflicts in this phase. The fact that employed workers during the construction phase are foreign nationals forms the basis of cultural conflicts. Differences in language, beliefs, and lifestyle can create cultural conflict. Local people are particularly affected by this issue.

The most important impact on lifestyle in the local area is related to food and consumption habits. Consumer goods offered to newcomers may restrict access to products (e.g., food) that local people are accustomed to. This effect is evident during the construction phase and can also be observed during the operation phase.

As of the initiation of the construction phase, measures can be taken by establishing an effective communication and training network for newcomers. It is important to provide training where newly arrived workers can learn the social and cultural structure of the region.

Nevertheless, information meetings can be held for local residents about the project's construction phase. Local authorities and law enforcement agencies need to know the importance of the issue in order to prevent potential conflicts. For this reason, regular and continuous communication should be established with local stakeholders.

Mitigations on Education

An increase impact in the level of education could be seen due to the migration of expats. However, the construction phase has no significant impact on education levels. Conversely, the arrival of qualified personnel needed during the operation phase may lead to an increase in the level of education. In both phases, the current education system will be forced to evolve, as the demands of workers who come to the region with their families on educational institutions will be intense.

Mitigations on Health

As with the education system, the health system will be under pressure from the growing population and will resort to increased capacity to respond to the need. The negative impact of the construction phase on health is likely related to the dust and noise created by increasing activities in the region. However, they are impacts that can be easily mitigated by applying common appropriate measures.

Mitigations on Employment Conditions

The most important effect of the Project is the economic benefit. This economic benefit can be felt both locally, in the region and across the country. There is a significant economic benefit, especially in the local area. The significant reason for the economic growth of the macro projects is employment opportunities. This employment affects jobseekers in the local area. Thus, unemployment in the local area is reduced. Direct employment refers to personnel employed during the construction and operation phase of the Project. Indirect employment covers the services that will be created to meet the demands of these personnel. The only negative point here will be the competition between the unemployed in the local area and the workers from outside. The prevention of this economic conflict depends on the good determination of the number of local employments.

Mitigations on Services and Public Facilities

Although the mentioned impacts on the services are not seen as a direct negative effect, reducing the mass on existing facilities by coordinating with local authorities during the construction phase can be used as a measure. In addition to these some mitigation, measure could be applied cooperating with local government /municipalities.

Traffic congestion can cause to critical problems, which are related public health and occupational health. Therefore, both drivers and passengers who access to camp site as using public roads, should be trained on safety travel. In addition, local people should be included to traffic training program via educational institutions. These kind of training programs should be supported by Contractor and they will be made accessible by public announcements. As a result, effectiveness of public relations and public information network is determinant on to applying mitigation measurements.

Both construction activities and the transportation of workers from place to place will cause an additional load on the existing traffic, pressure on existing roads, which should be improved and/or rehabilitated as well as the training of drivers using the vehicles.

Coordination with the local municipality will reduce the load on the sewerage and water system, and waste disposal. Besides, water and wastewater policies should be developed, especially during the construction period.

Mitigations on Vulnerable Groups

Minority groups are among the first to be affected by instability in society in general. Therefore, they are under the influence of the expected social conflicts.

Low-income groups are also included in sensitive groups. They are, therefore, expected to be heavily affected by instability in society. The people who would first want to benefit from economic growth in the region are low-income groups. Increased education and health services due to newly arrived workers are an advantage for low income groups. Besides, the development of municipal services provides an advantage for low-income groups. Another consideration would be high house and land prices, seen as an economic benefit for the region, a disadvantage for low-income groups. Low-income groups will be most affected, particularly from rising rent prices.

Sensitive groups are heavily damaged by challenges in education and health care. The difficulty of transportation and the problem of traffic also bring an extra burden for these groups. In this sense, the development of the region in terms of education and health impacts these sensitive groups.

The project's impact on economic growth and subsequent development of social services is also positive for these sensitive groups.

6 INFORMATION DISCLOSURE and STAKEHOLDER ENGAGEMENT (EBRD PR10)

6.1 Introduction

Stakeholder Engagement Plan (SEP) of the Mersin-Gaziantep Train Project as part of the ESIA process.

SEP will be developed to ensure the process of interaction with the external stakeholders in the course of implementation of the Mersin-Gaziantep Train Project in compliance with the requirements of the Turkish national law/regulations and the International Finance Corporation's (IFC) Performance Standards on Social and Environmental Sustainability.

As described in the IFC Performance Standard 1, the purpose of the SEP is to establish and maintain positive relationships with external stakeholders (i.e. individuals, communities, local government authorities, or other interested/affected parties) over the lifetime of the project.

The SEP also includes a grievance mechanism for community members and other stakeholders to raise any concerns and problems related to the Project.

Stakeholder engagement is an ongoing process and the SEP will be regularly monitored and updated throughout all stages of the Mersin-Gaziantep Train Project implementation.

6.2 Objectives

The SEP will be developed with the aim of explaining how the Project Company will communicate with all stakeholders, that is, people, institutions and organizations who might affect/be affected by or interested in the Project. The main objective of the SEP is to define a technically and culturally appropriate approach to consultation and disclosure.

The main objectives of the SEP are therefore to:

- Identify all stakeholders that may be directly/indirectly affected from or affect the Project,
- Provide timely, relevant, accessible, and easily understood information to stakeholders in an appropriate non-technical format,
- Foster strong project community relationships,
- Specify procedures and methodologies for stakeholder consultations,
- Build and maintain relationships between the Project and stakeholders through open dialogue,
- Provide opportunity for all stakeholders to express their opinions and concerns,
- Ensure a technically and culturally appropriate approach to engagement with all stakeholders,
- Establish a grievance mechanism for all stakeholders.

6.3 Legal Framework

The Stakeholder Engagement Plan (SEP) aim to guide The Project Management Department on how to continuously and constructively involve stakeholders in the project management process. According to this scope, both national and international legal framework have a binding force.

6.3.1 National Legislation

The Turkish environmental legislation is in parallel with the EU Legislation due to the Turkey's harmonization process to EU. The baseline for the environmental impact of this Project is the Environmental Law No. 2872 (Official Gazette dated 11.08.1983 and numbered 18132). On the other hand, the EIA principles and procedures are detailed in the Environmental Impact Assessment Regulation (last version: Official Gazette dated 25.11.2014 and numbered 29186).

6.3.2 International Standards

Performance Standards based on Equator Principles follow an effective policy to inform the Parties at every stage of project activity and ensure their active participation in the process. It is essential to inform the public that clear, distinct and accurate information should be shared with the relevant persons at the appropriate time.

Performance Standards for the Client to meet throughout the life of an investment. To manage environmental and social risks and impacts so that development opportunities are enhanced, the Client will follow the PS's. These are;

- Identification of stakeholders,
- Informing stakeholders about possible impacts of the project,
- Ensuring effective participation of stakeholders in the process,
- Creating an action plan covering vulnerable people,
- Establishing a grievance mechanism for the continuity of information exchange and participation,
- Execution of follow-up, monitoring and evaluation activities that will ensure the continuity of the grievance mechanism,
- Detection and management of potential negative effects in advance,
- Keeping the grievance mechanism active for unforeseen circumstances,
- Reporting to be done in a certain frequency and continuous manner.

As for the SEP the IFC Sustainability Framework: Policy and Performance Standards on Environmental and Social Sustainability is being followed. It outlines a systematic approach to stakeholder engagement that will help investors build and maintain over time a constructive relationship with their stakeholders, in particular the locally affected communities.

As stated in IFC Performance Standard 1 - Environmental and Social Risk and Affect Assessment and Management, stakeholder engagement is the basis for building strong and constructive relationships in the successful management of environmental and social effects of a project.

As per the IFC standards, engagement of stakeholders is a continuous process with changing grades, stakeholder engagement consists of analyzing and planning stakeholders, informing stakeholders, establishing consultation and participation, creating a grievance mechanism, and continuously reporting to Affected Communities. The form, frequency and effort level of stakeholder engagement should be appropriate to the development stage with the risks and adverse effects that the project creates [3].

In this respect, an Environmental and Social Impact Assessment ESIA Report has been prepared to meet the requirements of the IFC performance standards.

6.4 Roles and Responsibilities

The primary responsibilities of the Client are to coordinate stakeholder engagement activities and to support the stakeholders during the Project activities. The following are core tasks of the Client in the stakeholder engagement process;

- External communication system; to inform the stakeholders about the Project progress,
- Meeting; to public disclosure or information,
- Registration; to follow grievances and complaints,
- Tracking and Monitoring; to ensure fulfillment of the commitments,
- Social management programs; to ensure sustainability of the social benefit,
- Social investment programs; to contribute the PSIA particularly vulnerable groups.

6.5 Methodology for Stakeholder Engagement

6.5.1 Approach

The SEP outlines a systematic approach to stakeholder engagement that will help Client to develop and maintain a constructive relationship with their stakeholders during all stages of the Mersin-Gaziantep Train Project.

IFC defines stakeholder engagement as follows: “the term “stakeholder engagement” is emerging as a means of describing a broader, more inclusive, and continuous process between a company and those potentially impacted that encompasses a range of activities and approaches, and spans the entire life of a project” [2].

As for the SEP the IFC Sustainability Framework: Policy and Performance Standards on Environmental and Social Sustainability is being followed. It outlines a systematic approach to stakeholder engagement that will help investors build and maintain over time a constructive relationship with their stakeholders, in particular the locally affected communities.

As stated in IFC Performance Standard 1 - Environmental and Social Risk and Affect Assessment and Management, stakeholder engagement is the basis for building strong and constructive relationships in the successful management of environmental and social effects of a project.

As per the IFC standards, engagement of stakeholders is a continuous process with changing grades, stakeholder engagement consists of analyzing and planning stakeholders, informing stakeholders, establishing consultation and participation, creating a grievance mechanism, and continuously reporting to Affected Communities. The form, frequency and effort level of stakeholder engagement should be appropriate to the development stage with the risks and adverse effects that the project creates.

In this respect, an ESIA Report will be prepared to meet the requirements of the IFC performance standards.

6.5.2 Identification of Stakeholders

Stakeholder identification is a key step in managing the overall stakeholder engagement process.

IFC defines stakeholder as follows: “Stakeholders are persons or groups who are directly or indirectly affected by a project, as well as those who may have interests in a project and/or the ability to influence its outcome, either positively or negatively. Stakeholders may include locally affected communities or individuals and their formal and informal representatives, national or local government authorities, politicians, religious leaders, civil society organizations and groups with special interests, the academic community, or other businesses” [2].

In this respect, a comprehensive list of stakeholders has been prepared for the Mersin-Gaziantep Train Project. Stakeholders have been identified as the following bullets and within the Table 6.1.

- Project affected settlements,
- Vulnerable groups in the PSIA,
- Local authorities,
- Municipalities,
- Social services providers,
- Trade unions,
- Universities,
- Heads of village (Mukhtars)
- NGOs
- Local media

The potential stakeholders should be categorized according to the interaction of the stakeholder with the Project and its related activities, and the level of the interaction of the stakeholder. The interaction of the stakeholder with the Project could be positive, negative or neutral. Besides, the interaction level could be low, medium or high. As a result, interaction of a stakeholder with Project can be treated as multifaceted (see Figure 6.1).

		Type of Interaction		
Level of the Interaction		A Positive	B Neutral	C Negative
1	High	A1	B1	C1
2	Medium	A2	B2	C2
3	Low	A3	B3	C3

Figure 6.1: Identification of Stakeholder according to Interaction Condition

Table 6.1: Expected Interaction Levels by Stakeholders

Type of Interaction	Level of Interaction	Consequence Level	Community Stakeholders	Identification	Strategic Objective
Positive	High	A1	Governorate	Regional authority	Possible participation in the implementation of the project
Positive	High	A1	District Governorate		
Positive	High	A1	Municipalities		
Positive	High	A1	Mukhtar	Local authority	Possible representation of the project affected people in local level
Positive	Medium	A2	Universities	Representatives of potential beneficiary	Possibility to influence and make decisions and/or have an interest in the Project
Positive	Medium	A2	Public Institutions / Public Services Providers	Authorities	Possible participation in the implementation of the project
Positive	Medium	A2	Chambers, Unions and Development Agencies	Decision makers	Possibility to influence and make decisions and/or have an interest in the Project
Negative	Medium	C2	Associations and NGOs	NGOs that may be interested in project	Vulnerable people and social groups that may be more negatively affected by the Project
Neutral	Low	B3	Local Media	Representatives of local communication	Possibility to have an interest in the Project

Vulnerable groups will be a part of the stakeholder identification plan. Vulnerable groups/people in the Project area will be identified through the socio-economic study conducted as part of the ESIA studies. The Project will identify and consult specifically with potentially vulnerable groups such as women headed households, women, poor, disabled and elderly people. Special meetings for vulnerable groups; e.g. women meetings will be held on village level to make sure that their concerns are addressed as well. It is important to note that a special effort will be made to identify who are the most vulnerable among the potentially affected and are special engagement efforts necessary.

6.5.3 Identification of Communication and Informing Channels

Public disclosure is one of the main steps of stakeholder engagement. Verbal, written and visual sources could be used as the informing tools. The most important verbal sources are meetings, which could be organized in a several periods. Brochures, leaflets, posters and advertisement are both written and visual tools to inform. Besides, the official website could contain different information sources. In this sense, the website is the most useful and effective mechanism of communication, inform and disclosure.

The disclosure mechanisms are shown in Table 6.2. Each of mechanism were classified according to receiver (or audience) and project phases.

Table 6.2: Identification of Communication and Informing Channels

Disclosure Mechanism	Tools	Audience (√_Yes, Ø_No)		Project Phase
		Project Affected Persons	Institutions	1-Pre-Construction 2-Construction 3-Operation 4-Disclosure
Human Resources Office	Branch of Project Information	√	Ø	1,2,3
	Branch of Social Responsibility	Ø	√	3,4
Meetings	Public Participation Meetings	√	√	1,2,3
	Face to face Meetings	√	√	1,2,3
	Online Meetings	√	√	1,2,3
	Ad hoc workshops	√	√	1,2,3
	Focus Group Discussion	√	Ø	1,2
Written / Visual Document	Brochure / Leaflet	√	√	1,2,3
	Posters	√	√	1,2,3
	Advertisement	√	√	1,2,3
Internet Sources	Project website	√	√	1,2,3
	Official accounts on social media	√	√	1,2,3

6.5.4 Preliminary Works

6.5.4.1 Public Participation Meetings

Pursuant to the Article 9 of the Turkish EIA Regulation (MoEU 2014, 29186), Public Participation Meetings (PPMs) were held to inform the public about the Project. In that regard, four PPM were held in Osmaniye, Gaziantep and Adana, respectively. The first PPM was held as of 2010 and the last one was in 2011. . The details of the PPMs are given in Table 6.3

Table 6.3: Completed PPMs

	Province	District	Date
1	Osmaniye	Bahçe	20.07.2010
2	Gaziantep	Nurdağı	21.07.2010
3	Osmaniye	Toprakkale	11.05.2011
4	Adana	Ceyhan	12.05.2011

6.6 Findings and Results of the Stakeholder Interviews

6.6.1 Consultation with Institutions

In December 2020, 30 institutions were interviewed. 11 of the meetings of this institution were conducted in Mersin, 9 in Adana, 6 in Osmaniye and 4 in Gaziantep. The majority of the interviews (11) were conducted with representatives of metropolitan municipalities and district municipalities. 9 interviews were conducted in other public institutions, and 6 of them are institutions related to the Ministry of Transport (see Table 6.5).

Table 6.4: Distribution of Institution Interviews Results by Province

	Positive	%	Negative	%	Number of Interviewed Institution	%
Mersin	7	31.8	4	50.0	11	36.7
Adana	7	31.8	2	25.0	9	30.0
Osmaniye	4	18.2	2	25.0	6	20.0
Gaziantep	4	18.2	0	0.0	4	13.3
Total	22	100.0	8	100.00	30	100.0

Because of the Covid-19 pandemic, institutions affiliated with the Ministry of Health specifically declined to interview.

In connection with the publication of the 31225 numbered and dated 26 August 2020 Presidential Circular on the application of flexible working methods such as remote work, alternating work and administrative permission for employees in public institutions and organizations, it was not possible to conduct face-to-face interviews.

Table 6.5: Interviews with the Institutions and the Interview Results

	Community Stakeholders	Province	District	Institution	Representative Person	Main Issue(s) of the Interview	Type of Interaction	Level of Interaction	Consequence Level
1	Chambers, Unions and Development Agencies	Mersin	Akdeniz	Mersin Chamber of Commerce and Industry	Manager of the Projects	<ul style="list-style-type: none"> There is a need to connection to the airport 	Positive	Medium	A2
2	Municipalities	Mersin	Akdeniz	Mersin Metropolitan Municipality Transportation Department	Transportation Engineer	<ul style="list-style-type: none"> Local governments and the Ministry of Transportation should work in a coordination manner. The planned project needs to be integrated into the Transport Master Plan. 	Positive	High	A1
3	Governorates	Mersin	Akdeniz	Mersin Governorate	Deputy Governor	<ul style="list-style-type: none"> A coordination meeting should be held on a provincial basis, with representatives of all public institutions. 	Positive	High	A1
4	Associations and NGOs	Mersin	Tarsus	Tarsus Branch of Turkish Disabled Association	Chairman of the Association	<ul style="list-style-type: none"> Disabled people, like everyone else, should be able to benefit from the project. For example, elevators for disabled people can be made. 	Negative	Medium	C2
5	Associations and NGOs	Mersin	Tarsus	Tarsus Branch of the Autism Association	Chairman of the Association	<ul style="list-style-type: none"> Problems such as traffic congestion, narrowing of roads, parking problems may increase. 	Negative	High	C1
6	Associations and NGOs	Mersin	Tarsus	Tarsus Visually Impaired Association	Vice President	<ul style="list-style-type: none"> Accessibility issues for the visually impaired should be resolved. For example, an audible alarm / signalization system can be installed in train traffic system. 	Negative	High	C1
7	Municipalities	Mersin	Tarsus	Tarsus Municipality	Mayor and Deputy Mayor	<ul style="list-style-type: none"> In order for the Project to be useful, it should go underground. Going above ground increases the cost of the project a lot. The Project's location can changes the future of the city. There is a third-degree site area in the city center. The city center of Tarsus is a very busy area from a logistical point of view. 	Negative	High	C1
8	Public Institutions / Public Services Providers	Mersin	Akdeniz	TCDD Gar Directorate	Deputy Manager	<ul style="list-style-type: none"> The light rail system problem also needs to be solved. 	Positive	Medium	A2
9	Local Media	Mersin	Akdeniz	Güney Newspaper	Editor	<ul style="list-style-type: none"> Transportation traffic and traffic for tourism use the same route. There is no alternative transportation on the east-southeast route. New projects will provide an alternative. In the region, there is an inequality of opportunity in education. Support for 	Positive	Medium	A2

	Community Stakeholders	Province	District	Institution	Representative Person	Main Issue(s) of the Interview	Type of Interaction	Level of Interaction	Consequence Level
						education can be provided for rural and low-income settlements.			
10	Public Institutions / Public Services Providers	Mersin	Akdeniz	Mersin Provincial Directorate of Environment and Urbanisation, Branch of Zoning Planning	Manager	<ul style="list-style-type: none"> When establishing a transport system, aviation, marine and land transport must be integrated. Problems can arise when there is a disconnect. 	Positive	Medium	A2
11	Public Institutions / Public Services Providers	Mersin	Akdeniz	Directorate of TCDD Mersin Port Authority	Deputy Manager	<ul style="list-style-type: none"> Access of the Project to Taşucu Port reduces road traffic density. The port's capacity can increase. Because the port's stockpiling site will be inadequate in the future. Transporting cargo by train can reduce the port's density. 	Positive	Medium	A2
12	Municipalities	Adana	Seyhan	Adana Metropolitan Municipality Head of Projects Department	Head of Department	<ul style="list-style-type: none"> Underpasses and overpasses at junction points need to be well planned. It would make sense if the railway route extended to Ankara. 	Positive	Medium	A2
13	Chambers, Unions and Development Agencies	Adana	Seyhan	Çukurova Development Agency, Investment Support Office	Expert and Coordinator	<ul style="list-style-type: none"> A participation meeting should be held with all stakeholders. Information meetings and workshops should be organized. 	Positive	Medium	A2
14	Municipalities	Adana	Seyhan	Seyhan District Municipality	Deputy Mayor	<ul style="list-style-type: none"> Investments in Adana have shifted to surrounding provinces such as Osmaniye and Gaziantep. Transport investments increase cultural and tourism activities. 	Positive	High	A1
15	Municipalities	Adana	Çukurova	Adana Metropolitan Municipality, Head of Transportation Department-Directorate of Rail Systems	Manager	<ul style="list-style-type: none"> Government transport projects appear to be more profitable than those of private companies are. 	Positive	Medium	A2
16	Chambers, Unions and Development Agencies	Adana	Seyhan	Adana Chamber of Industry	General Secretary	<ul style="list-style-type: none"> It is useful combined with existing High Standard Train Lines. Communication should be made with our institution about social investment projects. 	Positive	Medium	A2
17	Public Institutions / Public Services Providers	Adana	Seyhan	Adana Regional Directorate of TCDD Transportation Incorporated Company, Directorate of Services	Principal deputy assistant	<ul style="list-style-type: none"> Connection should also be provided in terms of cargo transportation. 	Positive	Medium	A2
18	Public Institutions / Public Services Providers	Adana	Seyhan	Adana 6 th Regional Directorate of TCDD, Railway Maintenance Service, Branch of Superstructure	Engineer	<ul style="list-style-type: none"> Tourism potential increases if the train line extends to Silifke. Access roads to Adana-Yumurtalık-Karataş regions are in insufficient condition. If transport develops here, 	Positive	High	A1

	Community Stakeholders	Province	District	Institution	Representative Person	Main Issue(s) of the Interview	Type of Interaction	Level of Interaction	Consequence Level
						development is achieved in terms of tourism. Thereby, dependence on Mersin on marine tourism decreases.			
19	Public Institutions / Public Services Providers	Adana	Seyhan	Adana 6 th Regional Directorate of TCDD, Railway Maintenance Service	Assistant Service Manager	<ul style="list-style-type: none"> There are agricultural activity areas along the project route. There are concerns about expropriation. Local people in these areas need to be particularly informed. 	Negative	Medium	C2
20	Municipalities	Adana	Ceyhan	Ceyhan District Municipality, Directorate of Mukhtar Affairs	Responsible Manager	<ul style="list-style-type: none"> The work in Ceyhan stopped due to the some legal process 	Negative	Low	C3
21	Municipalities	Osmaniye	Central District	Osmaniye Municipality	Deputy Mayor	<ul style="list-style-type: none"> Relations between nearby cities develop, but problems can occur at inner-city crossing points. Both institutions and local people have not acknowledgement about the Project. 	Positive	Low	A3
22	Public Institutions / Public Services Providers	Osmaniye	Central District	Osmaniye Provincial Directorate of Environment and Urbanisation	Deputy Manager	<ul style="list-style-type: none"> If access to the Organized Industrial Zone increases, the industry also develops. Toprakkale region is in the direction of the development of the city, but in distance. Distance will not be a problem if the transport problem is solved. 	Positive	Medium	A2
23	Public Institutions / Public Services Providers	Osmaniye	Central District	Osmaniye Provincial Directorate of Environment and Urbanisation, Directorate of Planning and Settlement	Manager of Branch Office	<ul style="list-style-type: none"> In the Central District of Osmaniye, there must be station. If the station is in Toprakkale, the number of passengers will decrease. For people living in Osmaniye, 5 or 6 km is a long distance. They do not prefer to go to Toprakkale to use the train. 	Negative	Low	C3
24	Municipalities	Osmaniye	Düziçi	Düziçi District Municipality	Deputy Mayor	<ul style="list-style-type: none"> The station has a significance within the district. East-West trains pass through here. Train use is not common as existing trains are delayed. However, it is preferable if there is a high-standard train. High standard trains are an alternative to passenger cars. 	Positive	High	A1
25	Municipalities	Osmaniye	Bahçe	Bahçe District Municipality	Deputy Mayor	<ul style="list-style-type: none"> Because of the high standard train, the overpass was built. Access roads to some villages were blocked. Access to the highway of Savranlı and Çolaklı villages and Hasanbeyli town was cut off. Nowadays they cross over 	Negative	High	C1

	Community Stakeholders	Province	District	Institution	Representative Person	Main Issue(s) of the Interview	Type of Interaction	Level of Interaction	Consequence Level
						the railway track to access the roadway. When the rails are laid, transportation is completely disrupted.			
26	Municipalities	Osmaniye	Nurdağı	Nurdağı District Municipality, Branch of Zoning and Urbanisation	Technician	<ul style="list-style-type: none"> There is no economic activity other than vehicle trading. There is no industrial activities there is no business area in capacity. Livestock is low, while farming is in good condition. Young people are going out of province due to the unemployment If job opportunities are opened to young people, if employment is provided, there will be many who will benefit. 	Positive	High	A1
27	Municipalities	Gaziantep	Şehitkamil	Adana Metropolitan Municipality,	Deputy Mayor	<ul style="list-style-type: none"> Gaziray (light rail system), Metro and high standard rail are parts of an integrated transport system within the Transport Master Plan. 	Positive	High	A1
28	Chambers, Unions and Development Agencies	Gaziantep	Şehitkamil	Silk Road Development Agency	Expert	<ul style="list-style-type: none"> Advantage: contributes to the economy. Gaziantep; van, Urfa, Diyarbakır, Mardin, Şırnak, Kızıltepe, Nusaybin, Birecik, Suruç, Adıyaman is the logistics center for the regions. Disadvantage: It is bad that Gaziantep is the last station. The line is not cut in Gaziantep and it is more useful to connect to lines such as Konya, Adana, and Ankara. 	Positive	High	A1
29	Governorates	Gaziantep	Şehitkamil	Gaziantep Governorate	Deputy Governor	<ul style="list-style-type: none"> Transportation between Mersin and Gaziantep is problematic in both commercial and tourist traffic. A high standard train corrects this situation. 	Positive	High	A1
30	Public Institutions / Public Services Providers	Gaziantep	Şehitkamil	TCDD General Directorate of Infrastructure	Gar Manager	<ul style="list-style-type: none"> It increases the value of where the high standard train passes. High standard rail increases Gaziantep's popularity. There is a very big project like Gaziray. 	Positive	High	A1

6.6.2 Consultation with Mukhtars

In accord with the law no. 6360 on the establishment of the Metropolitan Municipality and the twenty-seven districts and amending certain laws and decrees to the provinces, fourteen in law, which came into force in 2012, the administrative status of towns, villages and quarters in Mersin, Adana and Gaziantep, has changed. Within the framework of this change, settlements in the status of villages become quarters. Therefore, Ceyhan and Şehitkamil districts are on the border of the Metropolitan Municipality, they show rural features.

In metropolitan areas (urban areas) where the population density is high, such as Seyhan, Yüreğir, Akdeniz and Tarsus, the number of quarters is small, and the number of populations of the quarters is high. On the other hand, in districts (rural areas) where the population density is low, such as Düziçi and Nurdağı, the number of villages is high, and the number of populations of the villages is low.

Support will be taken from Mukhtar survey to close this gap between “urban areas” and “rural areas” included in the sample. For this reason, the Mukhtar survey will be conducted in “villages and quarters not in the centre of the city /district”, which are considered “rural areas”.

The rural areas were where Mukhtar surveys were conducted in the villages / quarters that are connected to, Ceyhan, Toprakkale, Düziçi, Bahçe, Nurdağı and Şehitkamil districts.

19 mukhtar interviewed was conducted as of December 2020. 9 of the interviews were conducted in Osmaniye, 5 in Adana and 5 in Gaziantep (see Table 6.6)

According to the general results of the mukhtar interviews, 8 of the interviews expressed negative opinions, 7 of the interviews expressed neutral opinions and the remaining 4 interviews expressed positive opinions (see Table 6.7)

Table 6.6: Distribution of Mukhtar Interviews Results by Province

	District	Positive	%	Negative	%	Neutral	%	Number of Interviewed Mukhtar	%
Adana	Ceyhan	1	25.0	2	25.0	2	28.6	5	26.3
Osmaniye	Bahçe	0	0.0	3	37.5	0	0.0	3	15.8
Osmaniye	Düziçi	3	75.0	0	0.0	1	14.3	4	21.1
Osmaniye	Toprakkale	0	0.0	1	12.5	1	14.3	2	10.5
Gaziantep	Nurdağı	0	0.0	2	25.0	1	14.3	3	15.8
Gaziantep	Şehitkamil	0	0.0	0	0.0	2	28.6	2	10.5
Total		4	100.0	8	100.00	7	100.0	19	100.0

Table 6.7: Completed Mukhtar Interviews and the Interview Results

	Province	District	Village Neighborhood /	Main Issue(s) of the Interview	Type of Interaction	Level of Interaction	Consequence Level
1	Adana	Ceyhan	Çakaldere	The project has no positive or negative impact. It is a state Project. I know that expropriations have been made and payments have been received.	Neutral	Low	B3
2	Adana	Ceyhan	Kuzucak	The project has no impact.	Neutral	Low	B3
3	Adana	Ceyhan	Toktamiş	There were two levels at the crossing. One of them needs to be shut down.	Negative	Low	C3
4	Adana	Ceyhan	Küçükburhaniye	Traffic is blocked when the freight train passing through Ceyhan and the passenger train passes through it are closed (<i>during the train crossing</i>). If the freight train breaks down, it gets very busy for hours. A patient cannot go to Adana from the surrounding hospital.	Negative	High	C1
5	Adana	Ceyhan	Çokçapınar	The devices were put for dust measurement noise measurements. They told us the route.	Positive	Low	A3
6	Osmaniye	Bahçe	Savranlı	The asphalt is broken. We met with the construction masters. The road to and from the village was closed due to the train (<i>Aygır-Hasanbeyli-Çolaklı</i>). We wonder if it will be connected because the road to the village is cut off.	Negative	High	C1
7	Osmaniye	Bahçe	Nohut	The available land of the village is very limited.	Negative	High	C1
8	Osmaniye	Bahçe	Burğaçlı	The water drawn from the source (headwater or spring) in the village dried up. Payanlı neighborhood, which is located between Yarbaşı and Taşoluk. There were 30-40 houses, and when the waters from their springs passed through the tunnel. The waters of the neighborhoods have dried up. The orchards are dry. The houses are flooded with tanks.	Negative	High	C1
9	Osmaniye	Düziçi	Çamiçi	We have knowledge about neither the Project nor expropriation.	Neutral	Low	B3
10	Osmaniye	Düziçi	Akçakoyunlu	In terms of employment, it benefits everywhere economically.	Positive	High	A1
11	Osmaniye	Düziçi	Bostanlar	No one uses many trains, but we'd be happy for the train to pass through here.	Positive	Medium	A2
12	Osmaniye	Düziçi	Yazlamazlı	The tunnel is being built. The work continues. Our villagers are very curious about where the line will pass.	Positive	Medium	A2
13	Osmaniye	Toprakkale	Karataş	I have neither knowledge nor idea. I just think it would be good for the country.	Neutral	Low	B3
14	Osmaniye	Toprakkale	Kışla	A level crossing (uncontrolled) is closed in the neighborhood. The neighborhood revolted. They put up a concrete barrier. A citizen comes and goes in other ways.	Negative	High	C1
15	Gaziantep	Nurdağı	Aslanlı	There is a construction site across from my village, but no one's debriefing. Moreover, the chief who works at the construction site doesn't know anything. We can't find an interlocutor to ask questions.	Negative	High	C1

	Province	District	Village Neighborhood /	Main Issue(s) of the Interview	Type of Interaction	Level of Interaction	Consequence Level
				Gar will be with us, we know the stop will be here, but there are no people to ask questions. There's a construction site, the tunnel is being worked, but we don't even know how many workers are on the construction site.			
16	Gaziantep	Nurdağı	Sakçagözü	The project did not enter our territory.	Neutral	Low	B3
17	Gaziantep	Nurdağı	Şatırhüyük	They disrupt the roads used by construction vehicles, and there are spills of material from trucks and construction machinery. Probably Fernas ' tools. We don't know where to complain. These roads are the between Sakçagözü and Şatırhüyük	Negative	High	C1
18	Gaziantep	Şehitkamil	Sam	Project work has no effect on our settlement.	Neutral	Low	B3
19	Gaziantep	Şehitkamil	Boyno	Project work has not yet reached us.	Neutral	Low	B3

6.6.3 Focus Group Discussions and In-Depth Interviews

A focus group discussion/interview is a group process structured to obtain detailed information about a particular subject matter. A focus group discussion consists of 7-12 participants to discuss a clearly defined topic. A focus group session lasts about 1-1.5 hours and its maximum period can be 2 hours. A specialist asks open-ended questions and ensures that discussions continue in an orderly manner. In this study, it was considered sufficient to organize a focus group meeting to represent each province, and 4 focus group meetings were realized (see Table 6.8).

To be held in open or closed areas at the national and international level scientific, cultural, artistic, and similar meetings or activities regarding the Presidential Circular (20.03.20 dated and 31074 numbered) according to the circular, online focus group interviews were conducted. In cases where the number of people required to hold a focus group meeting is insufficient, support was obtained from in-depth interview methods.

Table 6.8: General Results of Focus Group Interviews and In-Depth Interview

Province	Heading	Issue	Representatives / Members	Main Issue(s) of the Discussions /Interviews	Type of Interaction	Level of Interaction	Consequence Level
Mersin	Vulnerable groups	Disabled person	<ul style="list-style-type: none"> - Tarsus Branch of Turkish Disabled Association - Tarsus Branch of the Autism Association - Tarsus Visually Impaired Association 	<p>All activities should take into account the rights of disabled people.</p> <p>Disabled people should also benefit from the projects being carried out.</p> <p>Contact with disabled associations should be made.</p> <p>Before developing the project, a workshop should be held with the representatives of the association.</p>	Positive	Medium	A2
Adana	Vulnerable groups	Female	<ul style="list-style-type: none"> - Adana "Kadın Eli" Women's Development, Production and Business Cooperative 	<p>Definitely effects positively.</p> <p>Daily arrivals and departures on the Adana-Mersin route are very busy.</p> <p>Between Adana and Mersin, trains are preferred instead of buses and passenger cars.</p> <p>We want to spread our work in Adana to the region.</p> <p>We want to work with associations / cooperatives that carry out similar studies</p> <p>We are very keen to be stakeholders of the Project.</p>	Positive	High	A1
Osmaniye	NGOs / Professional Associations	Cooperation and solidarity	<ul style="list-style-type: none"> - Osmaniye Branch Office of Science Dissemination Society - Osmaniye Scientific Art And Culture Association (İLSANDER) - Osmaniye Branch Office of Anatolian Artisan Industrialists ' and Businessmen's Association (ANESİAD) - Osmaniye Branch Office of Beyazay Association of Turkey - Osmaniye Branch Office of Chamber of Agricultural Engineers 	<p>We have heard that there are problems with expropriation, especially in settlements in Bahçe District along the route.</p> <p>The fact that project work began longer than expected may have created problems. Local people, associations, craftsmen and people engaged in construction work do not have sufficient knowledge of the project. For example, it is very important to share information about the route.</p> <p>It is a station in Toprakkale, and the absence of a station in Osmaniye can be a disadvantage.</p>	Positive	Medium	A2
Gaziantep	Universities	Students	Graduate students of the department of sociology of Gaziantep University	<p>Since Gaziantep is a city that receives migration and develops, the development of transport contributes to this situation.</p> <p>The positive impact of the project increases or decreases depending on the route. For example, it must extend to the eastern region or merge with other major lines.</p> <p>Freight transport by train is common in Gaziantep, but there is no passenger transport.</p>	Positive	Medium	A2

6.7 Grievance Mechanism

The purpose of the grievance mechanism is primarily to respond the complaints and requests of stakeholders. The grievance mechanism should be open, widespread and public. In addition, an effective grievance mechanism is a written resource for stakeholder management. Therefore, it is important to encourage stakeholders to submit their requests and complaints in writing.

Effectiveness of a grievance mechanism as a management procedure depends on the existence of the following key determinants:

- **Clearness and clarity:** Both visual and written sources used in public disclosure should be prepared with clearest form. For instance, addresses and phone numbers of the assigned person should be in visible form for also elderly and handicapped people.
- **Prevalence and accessibility:** All the visual and written material such as brochures, advertisements, posters should be delivered to all settlements in the PSIA.
- **Privacy and respecting to personal rights:** Throughout all the activities, the collected personal data should be protected in accordance with The Personal Data Protection Law No. 6698.

6.7.1 Flowchart

In order to respond to requests and complaints related to the project, the functioning of the grievance mechanism is illustrated in the following Figure 6.2 and Table 6.9.

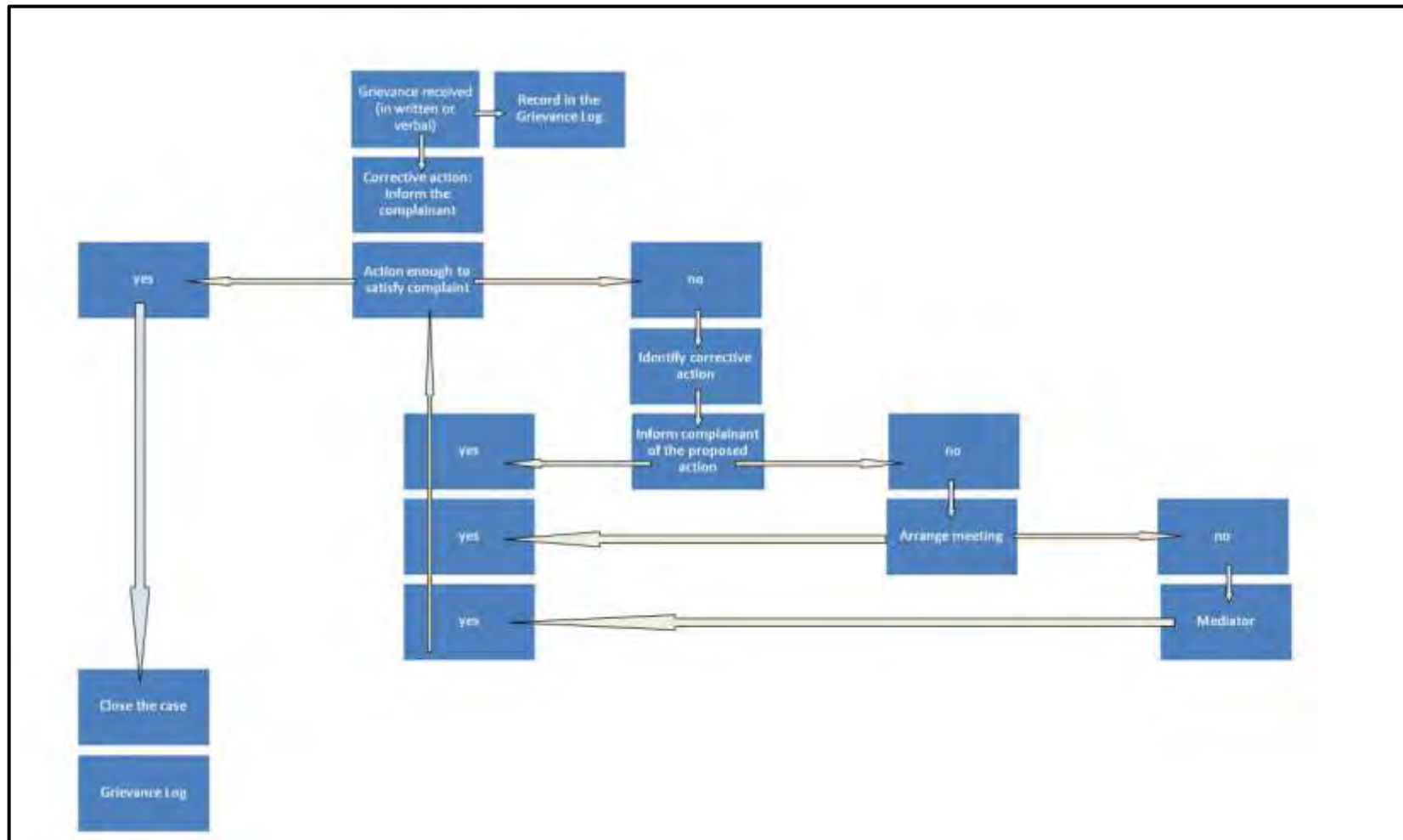


Figure 6.2: Grievance Mechanism Flowchart

Table 6.9: Steps on Flowchart

		STEP 1	STEP 2	STEP 3	STEP 4
		Receiving and Registration	Reviewing and Investigation	Response and Feedback	Monitoring and Evaluation
Actions of the Parties in the Step	Complainant	Completion and submission of a grievance form	Waiting for response till 30 days	Waiting for response till 30 days	Grievances are monitored to ensure they are properly handled within the deadline and principles.
	Respondent	Grievance is considered to be officially accepted	Check the validity and severity of the grievance	A formal response explaining how the grievance has been resolved will be provided to each complainant within 30 days.	
		Result of 1st Step	Result of 2nd Step	Result of 3rd Step	Result of 4th Step
Results		Grievance will be recorded in the in the “grievance log” within two (2) days of receipt of the complaint.	Grievance will be registered and acknowledged within five (5) working days and responded to the complainant within 30 days as of receiving the grievance	When solution is delayed, the complainant will be informed with regular updates on progress. If complainant may not agree with the solution of the problem, the grievance department or manager should arrange a meeting with complainant to reach a further agreement.	Monitoring and reporting process will be implanted after the corrective actions and consultations.

6.7.2 Grievance Form

The Client will have a communication tools such as public relation office, Project website. In addition to this, grievances can be filed through the interviews by face-to-face, on-line or telephone. Grievance forms will also be found in easily accessible places such as common usage areas in the settlements, public relation office and Project management office. The template of grievance form given in Figure 6.3

Grievance Form Registration Number:					
Registered Person:					
Settlement of Grievance:					
Registration Date:					
<u>Subject:</u>					
Information of complainant					Notification type
Name - Surname				☐ Telephone	
Telephone No				☐ Contact Office	
Address				☐ Site Visit	
					☐ Mail
					☐ Other
Information on person receiving the complaint					
Name - Surname		Date		Signature	
<u>Procedure for Corrective Action</u>					
Information on Corrective Action of Complaint					
Relevant Person		Date of Action		Signature	
Is there any feedback provided to the complainant?			Yes ☐	No ☐	
Information on person providing feedback					
Name - Surname		Date		Signature	

ACTION PLAN FOR TERMINATION	
COMPLAINTS	
1	
2	
3	
4	
5	
REINSTATEMENTS	
1	
2	
3	
4	
5	
RESPONSIBLE DEPARTMENT	
SIGN OFF DATE	
TERMINATION OF COMPLAINT	
IS THERE ANY COMPENSATION MEASURES REQUIREMENT?	1) YES 2) NO
SIGNATURE	

Figure 6.3: Template for Grievance Form

7 ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM

The purpose of the Environmental and Social Management System (ESMS) of the Mersin-Gaziantep (Başpınar) High Standard Train Project is to ensure that the environmental and social management processes to be implemented in all stages of the Project are adapted to the conditions of national legislation and international standards. The purpose of the ESMS;

- Defining the environmental and social goals of the Rönesans,
- Ensuring the achievement of environmental and social targets during both construction and operation periods,
- Creating a framework for ensuring compliance with national legislation and international standards and fulfilling the obligations given,
- Ensuring that responsibilities are assigned for the implementation of environmental and social impacts.

Determining the policies, risks, and impacts that should be in an Environmental and Social Management System are evaluated in the above titles of this report. In this context, within the scope of the planned High Standard Train Project, the policies of the Project were given, the environmental and social risks and impacts of the project during both construction, operation periods were evaluated, and certain prevention/reduction methods were shown for these risks. Apart from these, in order to manage, monitor and show these evaluations together, they have been evaluated within the scope of the Plan-Apply-Check-Take Action cycle of IFC and in the following subjects as suggested by other standards;

- Management Programs,
- Organizational Capacity and Competence,
- Emergency Preparedness and Response,
- Stakeholder Engagement,
- Monitoring and Evaluation.

Mersin-Gaziantep (Başpınar) High Standard Train Project is carried out in accordance with the legislation and standards on the issues related to the standards and obligations of the Project. The standards and conditions used in the project are given below;

- International Finance Corporation (IFC) Guidelines and Performance Standards,
- EBRD Environmental and Social Policy and Performance Requirements (PR),
- National regulations and permits, approvals,
- International conventions and protocols that Turkey is a party and
- Rönesans Environmental, Health, Safety and Social Procedures.

In addition, it has ISO 9001 Quality Management System, ISO14001 Environmental Management System and OHSAS 18001 Occupational Health and Safety Management System certifications obtained by Rönesans.

The implementation of this should be as important as the establishment of the Environmental and Social Management System. A management system consists of trained and committed employees who routinely follow procedures. Procedures are the way employees follow company policies step by step. Procedures form the basis for effective system development. In this context, Rönesans has procedures given in Appendix 7 about different environmental issues. These are given below;

- Air Emission and Ambient Quality
- Energy Conservation Procedure
- Wastewater and Ambient Water Quality
- Water Quality and Availability Management

- Stormwater Handling Management
- Hazardous Material Management Procedure
- Hazardous Waste Management Procedure
- Medical Waste Management
- Domestic Waste Management
- Recyclable Waste Management
- Non-hazardous Waste Management
- Construction Waste Management
- Noise Monitoring and Control
- Contaminated Land Management
- Topsoil and Subsoil Management
- Dust Control and Monitoring Management
- Spill Response Management
- Vehicle Use and Maintenance
- Fuel Handling Management
- Disease Prevention
- Emergency Management Procedure

Apart from these procedures, there is an OHS Plan and a Stakeholder Engagement Plan. In addition, the Traffic Management Plan, Biodiversity Action Plan, Cultural Heritage Action Plan will be developed and implement. Below is the figure containing the evaluation steps for IFC ESMS (see Figure 7.1).



Figure 7.1: ESMS Evaluation Steps

The scope for which Rönesans is responsible for this project, some parts of the railway construction work between Mersin and Gaziantep have been performed by former constructors. Therefore, Rönesans will work for the incomplete parts of the High Standard Railway to provide continuous and fast transportation between Mersin and Gaziantep Provinces.

Rönesans will perform rehabilitation of the existing railway lines, construction of two new lines, Electrification, Signaling and Telecommunication (EST) infrastructure, and connection of the line to the Çukurova Airport and Tarsus. In other words, Rönesans will finish off the incomplete works for the Mersin -Gaziantep High Standard Railway.

As depending on the observation during the site survey, the construction works have been started before by other companies, which were commissioned by TCDD. The Mersin-Gaziantep High Standard Train Line Project was developed by TCDD and expropriation and construction activities were started about year 2015. Other companies due to their contracts between companies and TCDD have implemented especially construction activities. In early 2020, those companies could not complete some activities and as a result, General Directorate of Infrastructure Investments awarded Rönesans to complete the Project. Within the scope of the Project, new railway lines will be constructed, existing convectional lines will be rehabilitated (some parts will be displaced), structures such as stations, viaducts/bridges, tunnels, underpasses, overpasses, culverts will be constructed, and EST system of the whole lines will be installed. Moreover, open mine operation will be carried out for material supply.

In present, many of permits have been taken, some construction activities have been completed, and some of them are still continued by different companies. Responsibilities of other companies, which are not in scope of the Rönesans and this ESIA studies, are summarized in Table 7.1.

The Rönesans Environmental Unit team will assume all responsibility for Environmental and Safety management and will be responsible for the implementation of health, safety and environmental issues required by the ESMS and for sub-employees of the Project. The roles and responsibilities of Rönesans in this project are summarized in Table 7.1 and the organizational chart created for each construction site is presented below (see Figure 7.2, Figure 7.3 and Figure 7.4).

Table 7.1: Roles of Responsibilities of Rönesans Holding for the ESMMP

Roles	Responsibilities
Regional Manager	<ul style="list-style-type: none"> Approving the implementation of policies, procedures, plans, and management processes related to health, safety, and environment
Project Manager	<ul style="list-style-type: none"> Reporting to the Regional Manager, Authorizing the implementation of Rönesans policies and procedures and the Environmental Management System, Allocating resources for the implementation of systems,
Project Purchasing Manager	<ul style="list-style-type: none"> Reporting to the Project Manager, Ensuring that the deliveries and services specified in the project are received in accordance with the Environmental and Social Management System, Ensuring the correct application of the conditions in the contracts made with the contractors. Evaluating Contractor Health Safety Environmental performance

Roles	Responsibilities
Project Human Resources Manager	<ul style="list-style-type: none"> Reporting to the Project Manager, Ensuring that the work, workforce, and business relations in the project are managed in accordance with the national legislation and international standards, Observing the availability of Human Resources management tools such as the Grievance Mechanism and communication elements in accordance with the legislation and standards, and that they are clearly explained to the employees, Communicating with the Public Relations Manager,
Chief Liaison Officer	<ul style="list-style-type: none"> Reporting to the Regional Manager, Main responsible of management of grievance mechanism, Ensuring that the management of Public Relations issues in the project is in line with the national legislation and international standards in line with the project obligations. Ensuring that resources are allocated for Health Safety Environment and Public Relations Management
Project Environment, Health and Safety Manager	<ul style="list-style-type: none"> Reporting to Project Manager, Auditing Environment, Health and Safety issues in implementation, review, update, and monitoring ESMS. Managing reporting provinces on internal Environment, Health and Safety issues for senior management Auditing contractor's compliance with project requirements on Health and Safety issues through review, contractor monitoring and reporting. Managing Environment, Health and Safety awareness trainings, If necessary, having a full medical evaluation ("suitable for the job") of the staff before starting work.
Project Environmental Engineer	<ul style="list-style-type: none"> The environmental engineer reports to the Environmental, Health and Safety Manager and Chief, Implementing the health and safety environmental policies of the project and the actions in accordance with the Environmental Management System, Creating and updating Health, Safety, Environmental Management Plan, and related documents in accordance with national legislation, international standards, Project policies and Environmental Management System
Project Civil Engineer	<ul style="list-style-type: none"> Reporting to the Project Civil Engineer, Taking part in the field during construction.
Subcontractor Health Safety Environmental Managers/Teams	<ul style="list-style-type: none"> Works under the supervision of the Environment, Health and Safety Manager, Ensuring compliance with Project Health Safety Environmental policies, Environmental Management System, and management processes, Preparing monthly Health Safety Environment review and case reports for the Project Health Safety Environment Manager

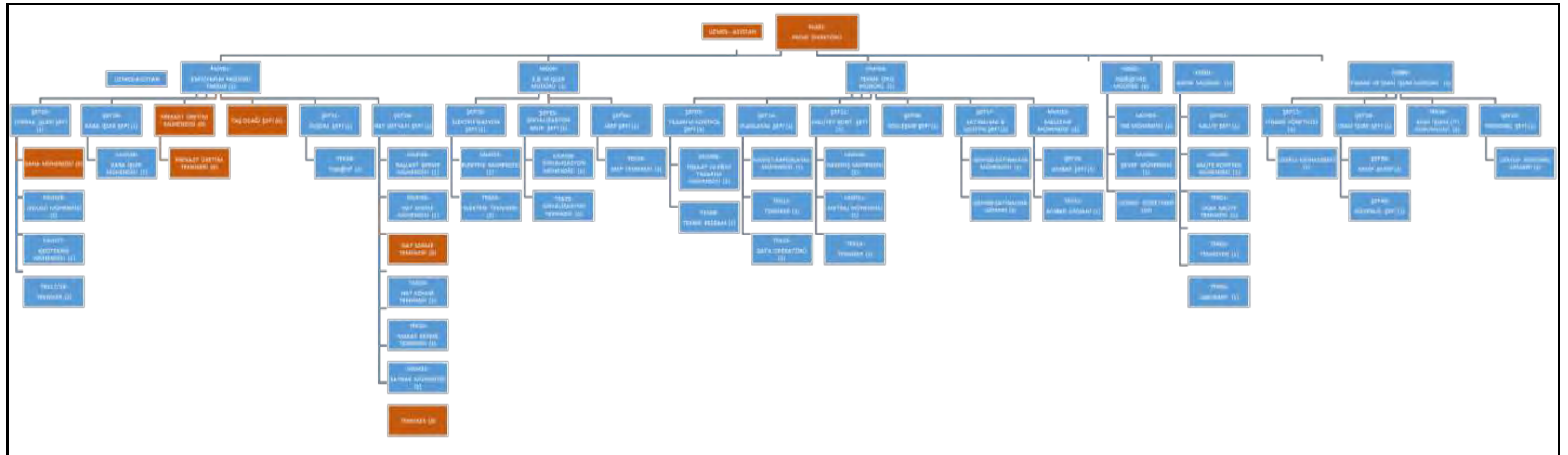


Figure 7.2: Central Construction Site (Tarsus) Organization Chart

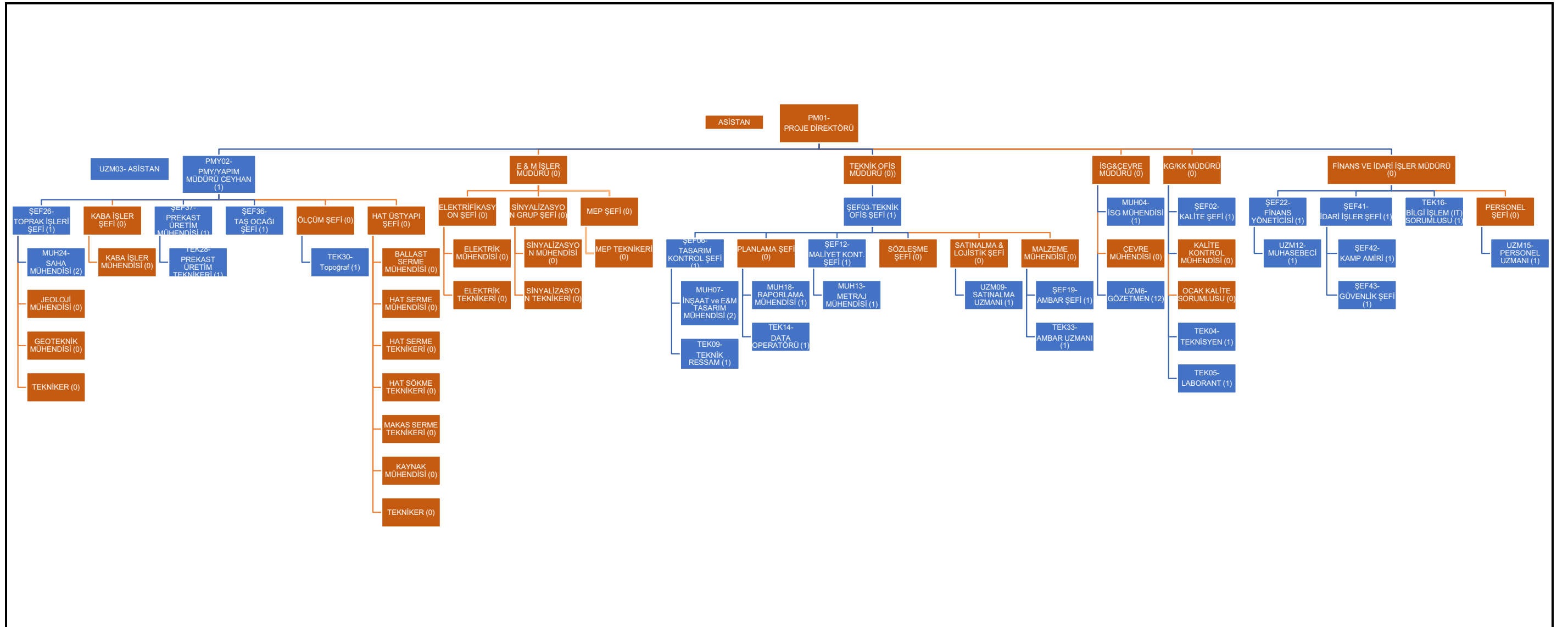


Figure 7.3: Satellite Construction Site (Ceyhan) Organization Chart

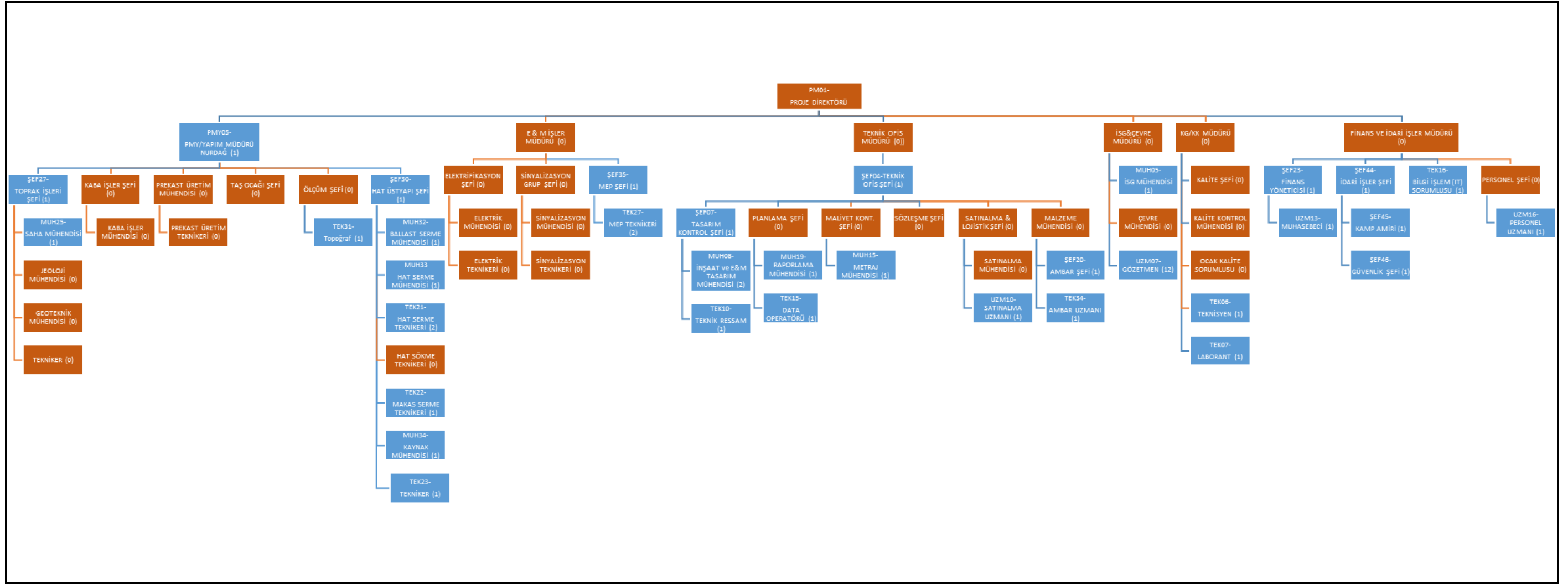


Figure 7.4: Satellite Construction Site (Nurdağ) Organization Chart

Regular monitoring and review of environmental and social elements will be carried out in the system whose roles and responsibilities are determined. The scope of monitoring is for the following purposes;

- Checking whether the elements that make up the ESMS are available,
- Checking whether procedures, plans and other documents are followed up,
- Whether the project is carried out in accordance with national legislation, regulations, and international standards,
- Checking whether the target is being progressed in line with the assessments specified in the ESIA prepared,
- Evaluation of Environmental and Social performance.

An environmental monitoring is carried out for the construction and operation phases in order to monitor certain criteria. Monitoring indicators defined as Key Performance Indicators in the IFC ESMS Guidelines are given as follows;

- Energy consumption,
- Water consumption,
- The volume of solid waste disposed of,
- Liquid waste discharge,
- Air emissions,
- Accidents (such as injuries, illness, property damage) and lightly overcome accidents,
- Lost time, injury frequency, recurrence and severity rates,
- Emergency response incidents,
- Average working hours and wages paid
- Wage levels,
- Child labor recurrence rate,
- Repetition rate of disciplinary and discrimination complaints,
- Compliance of employee demographics with access to education and jobs and wages.

The tracking chart created for the ESMS is given below (see Table 7.2). Parameters that require numerical calculations and limits such as air quality and noise in this table will be compared according to which legislation and/or standard the most stringent limit value is included.

This will be reported in cases where regulations and standards for project measurements are not met or are found to be inappropriate in project values and comparisons.

Table 7.2: Monitoring Table

Environmental and Social Topic	Monitoring Parameter	Frequency of Monitoring
Top soil	✓ Amount of top soil stripped and stored	Construction Phase
	✓ Visual inspection of areas and incident investigation process for spills and leaks that could affect topsoil quality and groundwater	After Case

Environmental and Social Topic	Monitoring Parameter	Frequency of Monitoring
Surface water	<ul style="list-style-type: none"> ✓ Usage water for drainage pipes, culverts and bridges and at construction sites established for line laying, ✓ Pre-construction and post-operation analysis of surface waters 	Beginning of the contracture and construction phase
Ground water	<ul style="list-style-type: none"> ✓ Control of groundwater discharges against pollution during operation and excavation works and ensuring their effective shutting) 	Beginning of the contracture
	<ul style="list-style-type: none"> ✓ Evaluation of chemicals in groundwater 	After the completion of the works During the construction period
Air Quality	<ul style="list-style-type: none"> ✓ Dust emissions from construction sites ✓ Gas emissions 	<p>During the construction phase</p> <p>When there are complaints in the business</p>
Noise and Vibration	<ul style="list-style-type: none"> ✓ Noise and vibration measurement in noise sensitive areas at the construction site and during operation ✓ Complaint record 	<p>During the construction and operation phase</p> <p>When there are complaints in the business</p>
Wastewater	<ul style="list-style-type: none"> ✓ Registration of wastewater parameters 	<p>Construction and operation phase</p> <p>At the frequency determined by the Environmental Permit obtained in accordance with the Water Pollution Control Regulation.</p>
Waste Management	<ul style="list-style-type: none"> ✓ Waste collection, storage, transportation, monitoring of possible spills / leaks 	Daily in construction and operation phase
	<ul style="list-style-type: none"> ✓ Waste disposal documents ✓ Waste management plans ✓ Trainings 	Annual

Environmental and Social Topic	Monitoring Parameter	Frequency of Monitoring
Visual	✓ Evaluation of visual impact	Pre-construction and operation phase
Biodiversity	<ul style="list-style-type: none"> ✓ To ensure that construction works and are affect not all sensitive habitats adjacent to the construction sites protected in accordance with the recommendations of the flora and fauna study. ✓ Controlling the growth of local plant formations (plant density, diversity, coverage) 	Construction phase
Cultural Heritage	<ul style="list-style-type: none"> ✓ Examination of all defined cultural heritage sites ✓ Chance finding records 	Continuously throughout the construction and operation phase
Health & Safety	<ul style="list-style-type: none"> ✓ Safety barriers and signs, ✓ Following the community health and safety training program, ✓ Monitoring accidents and near-miss events, ✓ Monitoring compliance with applicable standards and national legislation for worker PPE and safety, ✓ Monitoring the number of local people employed in the project 	Before the start of the construction phase and during the construction phase
	<ul style="list-style-type: none"> ✓ Complaints from residents through the grievance mechanism. 	In case of complaint

The Environmental and Social Management System will be reviewed as necessary and in compliance with the legislation and standards when there are significant changes in the health and safety environmental conditions of the project. The responsible persons listed in the roles and responsibilities table above will be responsible for the revision and updating of this management system.

A Stakeholder Engagement Plan has been prepared for the purpose of managing relations with stakeholders, which is another requirement of the Environmental and Social Management System. During the ongoing process of the project, this plan, which includes the complaints from the stakeholders, the sharing of information, and the communication, will be updated periodically.

8 ENVIRONMENTAL BENEFITS AND ENHANCEMENTS

Mersin-Gaziantep (Başpınar) High Standard Train Project, in which environmental and social impacts are given, infrastructure, superstructure, electrification and signalization processes are under the responsibility of Rönesans, has benefits in both environmental and social issues. Mersin-Gaziantep (Başpınar) High Standard Railway Route will start from Mersin, continue with Tarsus District, Adana (city center), Ceyhan District, Osmaniye (city center), Düziçi District, Bahçe District, Nurdağ District and will end in Gaziantep. Mersin-Gaziantep (Başpınar) High Standard Railway Route is 286 km and passes through 4 different provinces and 13 different districts.

Mersin-Gaziantep High Standard Train Project was developed by TCDD and expropriation and construction activities started around 2015. Two high standard train lines have been planned between Mersin and Gaziantep provinces, especially the construction activities have been implemented by other companies due to the contracts between the companies and TCDD. In early 2020, these companies could not complete some activities and as a result, they were given to Rönesans by the General Directorate of Infrastructure Investments to complete the Project. Rönesans will complete the remaining works for the rail system and uninterrupted transportation will be provided between Mersin and Gaziantep. Considering this situation, the line will be rebuilt in some parts between Mersin and Gaziantep and the line will be rehabilitated in some parts. It is planned to construct lines and increase the load capacity and number of passengers within the scope of the Project.

6 strategic goals have been defined in TCDD Strategic Plan on the year covering 2014-2018. However, TCDD is possessed to duties of railway infrastructure provider and manager with the "Turkey Law on the Liberalization of Railway Transport" numbered 6461, which divided TCDD into two, in 2017 and rail transport companies have become companies using this infrastructure. Following this plan, a new TCDD Strategic Plan covering the years 2019-2023 was prepared.

One of the goals set in order to develop and expand the national railway network according to strategic plan covering the years of 2019-2023, is the completion of the construction of the 2028 km High Standard Railway, where freight and passenger transportation can be carried out together, and 228 km of conventional line.

Other objectives are to start the construction of High Standard Train (4488 km high standard train) lines using alternative financing models, to complete electrification (3318 km) and signaling (3019 km) studies in the lines of the network, to increase the existing line capacity, to reduce traffic congestion and delays, to reduce traffic congestion and impacts and to save energy and personnel in line sections where freight transport is intense, according to their priorities, and to extend the station road. With the High Standard Train Project planned in 2023, it is aimed to increase the passenger capacity in railway transportation from 1.3% to 3.8%. One of the goals created to ensure safe traffic and station management with effective capacity in the national railway is to make our stations accessible to everyone within the scope of the "Barrier-Free Train Project". One of the aims is to ensure the integration of the railway infrastructure with other transportation systems.

In line with the strategic plans, the construction of a High Standard Train on a 286 km route between Mersin and Gaziantep is one of the steps taken for the stated goals. Mersin, Gaziantep, Adana with a population of approximately 2 million each and Osmaniye with a population of approximately 500 thousand will occupy an important place especially in the transportation of the local people. By making it easier for passengers to reach the provinces and districts on the route, especially by reducing the travel time between Adana and Gaziantep by 1.5 hours, which is both time savings and a more comfortable journey, will be provided for passengers. In addition to passenger transportation, it will also be beneficial in terms of facilitating and accelerating the transportation of the cargo that will go from the port in Mersin to other provinces and districts and decrease the cost of transportation to Mersin. Thus, it will provide more opportunities for the execution of the works in the port.

The route from Mersin to Gaziantep runs parallel to both the highway and the state road, passing almost the same routes until reaching Gaziantep, and there are stops and stations on these routes. In this context, the passengers who want to go to residential or touristic places on this road route will use the high standard train instead of the highway, which will reduce the road traffic load on this route and have a positive effect on traffic and transportation. In addition to traffic, it is expected that these 4 cities, which have important touristic places, will attract more tourists to these provinces both from outside and from the region, since transportation will be faster and easier than by road. In this respect, attracting tourists indirectly will both bring new tourists to the region and benefit the people of the region economically.

The High Standard Train Line will also affect the 4 cities (pass through Mersin, Adana, Osmaniye, and Gaziantep) in terms of employment. It is expected that workers will be recruited to station areas in provinces and districts during the operation period. Recruitment will provide employment both for the people of the region and in general. Apart from recruitment, it will have positive effects on employment, especially in Mersin, which has an international port, and Gaziantep, which has its industry, and other provinces. With the construction of The High Standard Train, there will be an increase in industrial employment and an increase in competition among producers. In this context, the High Standard Train Project will increase employment and will benefit the people of the region and indirectly throughout the country.

The most important benefit of Mersin-Gaziantep High Standard Train to environment is to reduce the exhaust emission arising from these vehicles and the greenhouse gas emission that will be given as pollutant load to the air by reducing the vehicle load on the highways. It has been observed that there is less greenhouse gas emission effect compared to high standard trains, which significantly affects the environment and people, the CO₂ emission of vehicles on the road and the greenhouse gas effect, which is a return.

In addition to the reduction of greenhouse gas emissions, noise generation during the operation period is also less than the noise of road traffic. The Mersin-Gaziantep High Standard Train Project is an environmental project category, with a low-intensity noise generation, as well as a reduction in emissions and less air pollution compared to the pollution load in the exhaust emission of road vehicles.

As it can be understood from the social topics such as employment, transportation, and industry, which are evaluated in the Social Impact Assessment study prepared within the scope of the Project, which will benefit the people of the region and indirectly the country in general, this project will provide a significant benefit on people.

9 SUMMARY OF POTENTIAL IMPACTS AND CONCLUSIONS

An agreement was signed between TCDD and Rönesans for the High Standard Railway Construction and Electromechanical Systems Installation Project. An Environmental and Social Impact Assessment Report has been prepared for the Project to be made in line with this agreement.

Two high standard railways have been planned between Mersin and Gaziantep provinces and the construction has started but could not be completed. Rönesans will complete the remaining works for the rail system and uninterrupted transportation will be provided between Mersin and Gaziantep. In this case, the Republic of Turkey State Railways also taken into consideration, which is available even in some sections and rail transport in total by adding more lines to 2, 4 lines are planned. These lines are planned for suitable routes that will increase the load capacity of both trains and passengers.

The planned High Standard Train Project passes through the borders of 4 provinces, Mersin, Adana, Osmaniye and Gaziantep. Mersin-Gaziantep (Başpınar) route is approximately 286 km long and passes through Tırmıl Station, Karacailyas Station, Taşkent Station, Huzurkent Station, Tarsus Station, Çukurova Airport Connection, Yenice Station, Zeytinli Stop, Küçükodilli Station, Terminal Stop, Şakırpaşa Stop, Adana Station, Incirlik Station, Yakapınar Station, Ceyhan Station, Toprakkale, Osmaniye, Düziçi Stations and Bahçe Station.

The construction of the rail system is planned to be completed in 34 months, followed by a 24-month warranty period. During the construction period of the project, the maximum number of employees is 385 in March-April.

Within the scope of the Project, 21 stations with a length of 19,010 m, 35 viaducts/bridges with a length of 4528 m, 3 tunnels (NATM & cut and cover) with a length of 1520 m, 61 subways and overpasses with a length of 2740 m, 190 culverts with a length of 5350 m are constructed. In addition, 22,080,000 m³ excavation, 950,000 m³ concrete, 206,000 m piles, 561 km of line laying, 266 switches, 10,188 catenary poles for electrification and 2100 km of cables for signaling operations are produced.

Air quality, visual impact, water quality, noise, vibration and physical impacts, biodiversity, ecosystem services and living natural resources, cultural heritage and archaeology, waste and wastewater, traffic and transport impact, resources efficiency and pollution prevention and control, occupational health, safety and security, community health and safety, assessments were made within the scope of the project and the results were included in the report. In addition to these assessments, social impact assessment, stakeholder engagement, environmental and social management system, environmental benefits and enhancements were also made.

The domestic water that will be needed for the personnel working within the scope of the project will be met from the existing infrastructure systems. Necessary procedures and permissions will be obtained for connection to the infrastructure system. Drinking water will be supplied from the market. The daily water consumption used for the project in total is 326,865 L/day. In this context, the water consumption load increase in the region due to the project is 0.023%. In line with the planning, field studies and analyzes were carried out to examine groundwater and surface waters for monitoring. As a result of analysis and calculations, the project is not expected to have a negative impact on water resources. When a negative impact is observed, mitigation measures will be taken.

The number of vehicles to be used in construction operations on the Mersin-Gaziantep (Başpınar) train line route to be built by Rönesans is 758. Greenhouse gas emissions are expected to be released into the ecosystem from these tools. In addition to vehicles, greenhouse gas emissions are expected to occur due to the use of electricity and vehicle use during the operating period. The amount of greenhouse gas emission to be emitted from construction and operation periods will decrease by the amount of CO₂ and the amount of greenhouse gas emission resulting from the intensive use of the highway will decrease. This is seen as one of the advantages of the project.

An Archaeological Evaluation Report has been prepared to investigate whether cultural heritage and archaeological sites are affected. As a result of this study, it was decided to define 6 areas as sensitive buyers. These areas are Sirkeli Mound, Kamışlı Mound, İslahiye Cultural Region, Misis Antique City, The ancient City of Neronias and Dülük Plain. The project is not expected to have a negative impact on these areas. If any cultural heritage and/or archaeological site is encountered during the construction or operation of the project, the relevant places will be reported, and necessary precautions will be taken.

The domestic solid waste load that will arise from the Mersin-Gaziantep (Başpınar) High Standard Railway Line construction and operation was calculated as 1,459 kg/day and the packaging waste load as 0.2918 kg/day. The wastes generated on the route of the project are temporarily stored and sent to the waste storage areas of the relevant municipalities for disposal. The total amount of domestic wastewater to be formed from the construction sites is 266,805 liter/day. In addition, the wastewater load to be caused by the operation will vary according to the number of passengers and voyages to use. Industrial wastewater will not be generated, only domestic wastewater will be generated. The wastewater generated will be given to the network line of the relevant municipality. When a negative impact is observed or expected to occur, necessary mitigation methods will be applied.

The effect of the traffic load in the Mersin-Gaziantep (Başpınar) High Standard Railway Route construction and operation on the existing road traffic and transportation was examined and the daily number of vehicles on the existing highway was calculated from the 2019 Volume Maps of the General Directorate of Highways. According to calculations, the vehicles to be used in the project during the construction period are expected to increase the state road traffic load by 0.15% and the highway traffic load by 0.11%. Considering these rates, the number of vehicles to pass through the state road and highway and the total number of vehicles planned to be used in the project, the project is not expected to have a negative impact on traffic and transportation. Any measures to be taken to ensure traffic safety will be under the responsibility of the construction contractor during the construction phase and the operating contractor during the operation phase.

Rönesans has a "Manual for Health Safety & Environment" management plan, which it has created within the scope of Occupational Health and Safety. In the activities carried out in line with this plan, responsible persons are appointed, and management is ensured by taking necessary OHS measures.

Social assessment studies were carried out through desktop studies and field surveys to understand the current socio-economic conditions and the opinions of the affected communities about the project. The assessment of the results of social studies, with possible impacts and related mitigation measures, is given in ESIA Report Section 5.

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