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MINISTRY OF TRANSPORT
AND INFRASTRUCTURE

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Altyapı Yatırımları Genel Müdürlüğü

ÇINAR®
ENGINEERING
CONSULTANCY INC.



ÇUKUROVA REGION AND İSKENDERUN BAY RAILWAY CONNECTION PROJECT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT

CNR-ADN-ESIA-002

Final

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Project Location	**Adana Province – Ceyhan and Yumurtalık District, Hatay Province – Erzin District**
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ABBREVIATIONS & DEFINITIONS

ANFO	Ammonium nitrate / fuel oil
AoI	Area of Influence
BMP	Biodiversity Management Plan
CBD	Convention on Biological Diversity
CCTV	Closed-Circuit Security Cameras and Monitoring Systems
CIA	Cumulative Impact Assessment
CİMER	The Presidency's Communication Center
ÇINAR	ÇINAR Engineering Consultancy Inc.
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLO	Community Liaison Officer
CLRTAP	Convention on Long Range Transboundary Air Pollution
DAF	Eastern Anatolian Fault
DGII	General Directorate of Infrastructure Investments
DIFZ	Düziçi - İskenderun Fault Zone
DSİ	State Hydraulic Works
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EOO	Extent of occurrence
ESCP	Environmental and Social Commitment Plan
ESF	Environmental and Social Framework
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
ESR	Ecosystem Services Review
ESS	Environmental and Social Standard
EU	European Union
EUNIS	European Nature Information System
FAO	UN Food and Agriculture Organization
FIs	Financial Intermediaries
GEF	Global Environment Fund
GHG	Greenhouse gas
GIIP	Good International Industry Practices
GIS	Geographical Information Systems
GISD	Invasive Species Database
GISP	Global Invasive Species Programme
GLC	Ground level concentration
GRIIS	Global Register of Introduced and Invasive Species
GRM	Grievance Redress Mechanism
GRS	World Bank Grievance Redress Service
HHA	Household surveys
HKDYY	Regulation on Air Quality Assessment and Management

IAS	Invasive Alien Species
IBA	Important Bird and Biodiversity Area
IPA	Important Plant Area
IPF	Investment Project Financing
IUCN	International Union for Conservation of Nature
Jemirko	Turkish Association for Geological Heritage Protection
KBA	Key Biodiversity Area
KGM	General Directorate of Highways
Km	Kilometer
KP	Kilometer point
KVKBKM	Regional Council for the Conservation of Cultural Property
KVKK	Personal Data Protection Law
LM Plan	Labor Management Plan
LMP	Labor Management Procedure
LPI	Logistics Performance Index
LTV	Long Term Value
MA	Millennium Ecosystem Assessment
MGM	General Directorate of Meteorology
MoEUCC	Ministry of Environment, Urbanization and Climate Change
MTA	General Directorate of Mineral Research and Exploration
NGO	Non-governmental Organization
O.G.	Official Gazette
OEOE JV	The Supervision Consultant Company
OGT	Focus Group Meetings
OHS	Occupational Health and Safety
OIZ	Organized Industrial Zone
PIF	Project Introduction File
PIU	Project Implementation Unit
PR	Public Relations
PS	IFC Performance Standards
PTC	Positive Train Control
RAMEN	Regulation on Management of Environmental Noise
RP	Resettlement Plan
RCIAP	Regulation on the Control of Industrial Air Pollution
RLE	Red List of Ecosystems
RWIHC	Regulation on Waters Intended for Human Consumption
SEA/SH	Sexual Exploitation and Abuse / Sexual Harassment
SEP	Stakeholder Engagement Plan
SIA	Social Impact Assessment
SPA	Special Protection Area
SSC	IUCN Species Survival Commission
SSK	Social Security Insurance
STV	Short Term Value

SWQR	Surface Water Quality Regulation
SYDV	Social Assistance and Support Foundation
TAYSEB	Toros Adana Yumurtalık Free Zone
the Project	Çukurova Region and İskenderun Bay Railway Connection Sub-Project
TÜİK	Turkish Statistical Institute
VESC	Valued Environmental and Social Component
WHO	World Health Organization
WPCR	Turkish Water Pollution Control Regulation
WRI	World Resources Institute
YİMER	Foreigners Communication Center

EXECUTIVE SUMMARY

The World Bank's Board of Executive Directors approved a loan for the Türkiye Rail Logistics Improvement Project (RLIP) on 30.06.2020. The project is implemented by the Ministry of Transport and Infrastructure (MoTI) through its Directorate General of Infrastructure Investments (DGII), aims to increase rail freight efficiency in Türkiye by improving last-mile infrastructure connectivity (LMC), enhancing the operational efficiency of rail-enabled logistics centers, and strengthening institutional capacity in the rail intermodal and freight logistics sector.

Within the scope of the Çukurova Railway and İskenderun Bay Railway Connections Project ("Çukurova Sub-project" or "the Project"), which is covered within the scope of RLIP, it is planned to construct a railway connection line to the industrial facilities in Çukurova Region and İskenderun Bay – Toros, Adana, Yumurtalık Free Zone (TAYSEB) industrial centers and ports. The main purpose of the Project is to make the transportation of raw materials and products economical by making infrastructure connection between the industrial areas.

There are four connection lines and four stations planned to be implemented:

Erzin Station-TAYSEB Connection Line (Erzin-TAYSEB)

The planned line starts from the existing Erzin Station (Km: 0+000), continues parallel to the Toprakkale-İskenderun Railway Line about 1,900 m to the South, and leaving to continue to the West. Between Km: 7+000 and Km: 8+000, it passes through west of Yukarıburnaz and arrives to Toros Adana Yumurtalık Free Zone (TAYSEB). This line will be located within the borders of Adana and Hatay Provinces with a total length of 16.79 km. Two new stations are planned on this line which are Yukarıburnaz Station as Station-1 and TAYSEB Station as Station-2.

Osmaniye OIZ- Erzin Port Connection Line (OIZ-Port)

It is the line that will provide the connection between Osmaniye Organized Industrial Zone (OIZ) and Erzin Port to be constructed. In this context, the line will be located in the borders of Hatay Province. The line starting from Osmaniye OIZ and proceeding in the south-southwest direction, reaches to the port, which is not in operation, by continuing parallel to the OIZ-Port Connection Highway. The total length of the line is 13.05 km. Two new stations are planned on this line which are Osmaniye OIZ Station as Station-3 and Erzin Port station as Station-4.

Osmaniye OIZ – Yukarıburnaz Station Connection Line (OIZ-Yukarıburnaz) and Yukarıburnaz Station – Erzin Port Connection Line (Yukarıburnaz-Port)

Two connection lines are planned to be established in order to provide the connection between the Osmaniye OIZ and Erzin Port line through Yukarıburnaz Station.

The total length of all lines to be built in this project is approximately 44 km. Most of the lines planned in this project are within the boundaries of Hatay Province, only 2.5 km of the line is in Adana province.

The Project was evaluated to be exempt from Environmental Impact Assessment Regulation, which was published in the Official Gazette dated 27.07.2022 and numbered 31907 as all the lines are junction and/or connection lines.

- The risk classification of the project is "Substantial" according to the World Bank Environmental and Social Framework (ESF). As a result, although the sub-projects have an exemption on Environmental Impact Assessment (EIA) according to the national legislation, an Environmental and Social Impact Assessment (ESIA), Resettlement Plan (RP), Stakeholder Engagement Plans (SEP), and Environmental and Social Management Plan (ESMP) have been prepared in compliance with the World Bank Environmental and Social Framework (ESF), and Environmental and

Social Standards (ESSs) for the Project. Furthermore, additional 12 sub-management plans were prepared for the Project as part of the ESMP:

- Construction Impacts Management Plan (CIMP),
- Community Health and Safety Management Plan (CHSMP),
- Community Relations Management Plan (CRMP),
- Employment and Training Plan (ETP),
- Aggregate Management Plan (AMP),
- Traffic (Transportation) Management Plan (TTMP),
- Cultural Heritage Management Plan (CHMP),
- Pollution Prevention Plan (PPP),
- Waste Management Plan (WMP),
- Emergency Preparedness and Response Plan (EPRP),
- Occupational Health and Safety Management Plan (OHSMP), and
- Critical Habitat Assessment and Biodiversity Management Plan (CHA-BMP).

- The Labor Management Procedures (LMP) has also been prepared for the Project, and the Contractor will prepare a Labor Management Plan (LM Plan) in compliance with this procedure.

A contract was signed between DGII and ÇINAR Engineering Consultancy Inc. (ÇINAR) in December 2019, for preparing the ESIA Report together with ESMP and sub-management plans listed above of the Project according to the World Bank standards. The ESIA site studies were completed by ÇINAR in January and February 2020, and the ESIA Reports were disclosed in May 2020. The mentioned activities are defined as Phase-1 of the Project. During Phase-1 studies; environmental, social, and culturally sensitive areas in the project impact area were specified in the ESIA reports, and mitigation measures were proposed.

Within the framework of the Environmental and Social Commitment Plan (ESCP), the whole ESIA package was revised to align with the mitigation measures and actions specified in the ESCP. This revision process is mentioned as Phase-2 of the Project. The additional environmental, social, and ecological studies, which could not be performed due to the seasonal and Covid-19 restrictions during Phase-1, were conducted during Phase-2 and the railway route is being revised to comply with the items outlined in ESCP.

The Area of Influence (AoI) defined for the Project consists of 500-m corridor extending each side of the proposed route. According to the data of the Ministry of Agriculture and Forestry, there are shrubs, pasture areas, fallow dry agricultural areas, irrigated agricultural areas, coastal dunes, insufficient irrigated agricultural areas and abandoned lands on the construction area. The potential impacts of the Project on the existing land use characteristics, soils and geology will occur mainly during the land preparation and construction phases, due to the earthworks and construction activities that will be conducted. The operation phase of the Project will not cause any direct impacts on soils. Yet, the operation phase mitigation measures will be in place to minimize the risk of erosion and contamination.

During the construction phase of the Project, the construction activities on the railway routes and material supply activities from the quarries will be the potential sources of noise. During the operation phase of the Project, the movement of the freight trains will be the main potential source of noise. The noise modeling studies have been carried out for both the construction and operation phases. During the construction phase of the Project, the significance of the impact resulting from the increase in noise levels is assessed to be minor and after the proposed mitigation measures, the residual impact significance will be negligible. During the operation phase, the significance of the impact resulting from the increase in noise levels is assessed to be major and after the proposed mitigation measures, the residual impact significance is expected to be moderate. It should be noted that the noise level estimations were conducted by considering the worst-case scenario. The real-life results will be lower than the estimated daytime and nighttime noise levels. Therefore, the noise levels should be monitored during the operation phase with the implementation of the mitigation measures

mentioned in Section 5.2.4. Despite the application of mitigation measures, if the noise monitoring results exceed the limit values, the technical details of the proposed noise barriers should be re-evaluated and adjusted accordingly.

The potential impacts on ambient air quality during the construction phase of the Project will be due to the dust emissions that would result from the excavation and cut and fill works, material storage, unloading and transportation processes to be carried out through the construction works of the Project. During the construction phase of the Project, the significance of the impact resulting from the decrease in air quality is minor and after the proposed mitigation measures, the residual impact significance is negligible at all receptors. Since the railways will be electrified in terms of the traction system during the operational phase of the Project, the potential impacts on air quality are considered negligible.

During the construction phase of the Project, there will be no water use other than the drinking and utility water use of 140-180 Project personnel and moistening water to be used for minimizing uncontrolled dust emissions. Since there is no wastewater (sewage) system in the field of activity and its immediate surroundings, wastewater generated due to the construction activities will be collected in a septic tank that will be impervious, in accordance with “Regulation on Pit Opening Where Sewer System Construction is not Applicable” being published in Official Gazette No.13783 dated 19.03.1971. When the tanks are filled, wastewater will be removed by sewage trucks, and disposal will be provided within the scope of the protocol to be made with the municipality that has a wastewater infrastructure system.

Drinking and utility water will be needed at the stations for the staff and visitors during the operation phase. No surface water and groundwater resources will be used during the operation phase. The domestic wastewater to be generated during the operation phase will be collected in septic tanks to be built at the stations and will be transmitted to the nearest wastewater treatment plant with the sewage trucks of the relevant municipality. In addition to the domestic wastewater to be generated during the operation phase, there will be industrial effluents due to rail car maintenance and refurbishment activities.

There are many main irrigation canals, backup channels, tertiary channels, drying channels, drainage channels, and operational maintenance routes in Aşağı Ceyhan Aslantaş 3rd Stage Erzin Dörtyol Irrigation Area operated by the 6th Regional Directorate of the State Hydraulic Works (DSİ), where the project routes pass. As stated in the official letter of the 6th Regional Directorate of DSİ dated 14.11.2018 and numbered 38292074-611.99-782653, Delihalil basalts on the Project routes were declared as “Burnaz Spring Group Groundwater Reserve and Protection Area” published in the Official Gazette dated 03.06.2011 and numbered 27953. During the land preparation and construction phases as well as the operation phase, the significance of the impact on the irrigation area is moderate. As stated in the Environmental and Social Commitment Plan (ESCP) – *ESS3: Resource Efficiency and Pollution Prevention and Management* and *ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources*, the required permit has to be taken from DSİ for the sections of the project routes that fall within the Burnaz Spring Groundwater Protection Area prior to construction activities. In this context, the railway design has been revised to minimize its overlap with the Strict Protection Area, taking into consideration the topographical features. According to the revised railway line, the OIZ-Port line is no longer overlapping with the Strict Protection Area and the 2nd Degree Protection Area. Moreover, the railway section of Yukarıburnaz-Port line passes through with the Strict Protection Area was decreased from approximately 400 m to 110 m. A protection structure (129-m long bridge) was designed to facilitate the railway crossing in the Strict Protection Area, starting from KM: 1+386 to 1+515. The revised line was submitted to DSİ, and it was stated with the letter of DGII dated 20.09.2023 and numbered 1407103 that the construction and operation works will be carried out in line with the announcement conditions of the Burnaz Resource Group Groundwater Reserve and Protection Area, as published in the Official Gazette on 03.06.2011 with number 27953. The Contractor shall not carry out mobilization to Site (e.g. limited clearance for haul

roads, site accesses and work site establishment, geotechnical investigations or investigations to select ancillary features such as quarries and borrow pits) and commence any construction works unless permit is available for the existing railway alignment design from DSİ with regard to the Burnaz Springs Protected Area.

All works related to the Project, including the engineering structures on the routes passing through the irrigation area, will be conducted under the oversight of DSİ. The Design and Supervision Consultant must have the water crossing structure projects approved by DSİ. Additionally, all construction works for the approved water crossing structure projects will be executed under the supervision of the 63rd Branch Directorate of DSİ in Hatay and the ACO (Ceyhan) Branch Directorate of DSİ. Consequently, the significance of the residual impact will be minor.

There are two planned solar energy power plant projects, named Erzin-1 and Erzin-2, located in the Çukurova sub-project area. The railway route intersects the connection road of Erzin-2 solar energy power plant project. Prior to the construction works, DGII will obtain the permit from MoENR regarding the railway design at the intersection point with the connection road, and the designed transition structure.

Use of resources for the Project will be an issue mainly during the construction phase where an extensive need will be imposed for the supply of construction materials (aggregate, basalt, granite, gabbro, limestone, etc.). Thereby, material borrow pits and quarries will be used to supply the Project's construction material requirements throughout the construction activities. During the operation phase, procurement of materials would be required for the maintenance and repair works to be conducted on the railway and associated structures.

The daily activities of the personnel will result in production of various types of non-hazardous and hazardous wastes during the construction phase of the Project. The load that could be added to the existing waste disposal infrastructure capacity by the Project would be negligible during the construction phase. During the operation phase, maintenance of the Project components including railway connection lines, stations and underpasses, overpasses and bridges and their use by the staff and visitors will result in waste generation. No intensive waste generation is expected during the operation phase. Solid wastes to be generated at the stations will be collected through the solid waste collection trucks of the relevant Municipalities from the collection areas that will be located during the operation period and taken to the municipal solid waste storage facilities.

The Biodiversity Study Area defined for the Project is about 3,300 hectares. About 1,450 hectares of this area consists of natural habitats. Plantation areas and citrus fruit gardens cover a total of 865 hectares. Critical Habitat Assessment was conducted to cover the entire Biodiversity Study Area. Potential impacts on *Echinops dumanii, Astragalus antiochianus*, populations, and the dune habitats holding these populations will be avoided within the scope of Çukurova Region and İskenderun Bay Railway Connection Project. *Cyclamen persicum*, *Sternbergia pulchella,* and *Hyacinthella millingenii* species bulbs were collected and re-located for mitigation on the populations. Population of the Endangered *Acanthodactylus schreiberi* in the Biodiversity Study Area also meets Criterion 1 thresholds and triggers critical habitat. However, Project-related impact on *Acanthodactylus schreiberi*, together with *Echinops dumanii, Astragalus antiochianus* and Burnaz dune habitats, have been avoided with the changes made to the Project route.

As a result of the study in which the impact of the Project to the cultural heritage was investigated, it has been determined that there are 3 registered archaeological sites. Issus Ancient Waterway, Ancient City of Issus and Erzin Station Complex, which are registered and taken under protection by the law numbered 2863 are located within the boundaries of the Project. According to the Environmental and Social Commitment Plan (*ESCP) - ESS8: Cultural Heritage* section, it is required to revise the detailed design to avoid the impacts and obtain authority permits for Issus Ancient Waterway and Ancient City of Issus. The project route was

revised in Phase-2 to minimize the crossing points (from four points to a single point) of the railway line with Issus Ancient Waterway. A technical explanation/justification report covering the technical measures and details of the railway crossing was prepared and submitted to General Directorate of Cultural Heritage and Museums. The required permit for the Çukurova Sub-project was obtained from Adana Regional Council for the Conservation of Cultural Property (KVKBKM) with the official letter dated 23.08.2023 and numbered 4116241. The aforementioned official letter also includes the opinion of Hatay KVKBKM and the permit was granted for the proposed railway route excluding the borders of the Issus Ancient City and Issus Ancient Waterway, via this letter. This implies that the permit for Erzin Station Complex was also obtained from Hatay KVKBKM. However, Hatay KVKBKM stipulated that detailed plans and projects regarding the railway route passing through these archaeological areas, as well as the transition structures at the intersection points, should be evaluated by the Protection Board. The design details and related documents were submitted to Hatay KVKBKM by DGII on 15.02.2024. The Contractor shall not carry out mobilization to Site (e.g. limited clearance for haul roads, site accesses and work site establishment, geotechnical investigations or investigations to select ancillary features such as quarries and borrow pits) and commence any construction works unless permits are available for the existing railway alignment design from the Ministry of Culture and Tourism with regard to cultural heritage sites - ancient City of Issus, Issus waterway and historical Erzin train station.

From the design phase of the Project, for any kind of project planning, project revision and similar applications to be made in and around the ancient waterway, the Hatay KVKBKM should be consulted, and the decisions to be taken by the Conservation Board should be followed at all stages of the Project as dictated by Law No. 2863.

Both positive and negative socio-economic impacts were identified within the scope of the ESIA study. Potential positive impacts were identified on employment opportunities and procurement of goods and services, infrastructure, and social services. Negative impacts such as loss of lands and pastures, restriction of access to pastures and agricultural lands, damage on crops, fruit trees and lands, damage on irrigation systems and water resources, physical displacement and loss of house / building and other assets and businesses have also been identified. Mitigation measures were specified for each impact to minimize and/or mitigate these impacts.

The project route intersects with strategic economic and logistic areas such as ports, industrial zones, free zones, and special industrial zones, as defined above. In accordance with the opinions received from stakeholders during Phase 2 discussions, there is a general consensus that the traffic congestion on existing highways and intersection points within these intersections will increase with the project. Another perspective suggests that difficulties may arise in transitions to lands used for agriculture and grazing. It has been emphasized that it is necessary to prevent disruptions in the livelihoods of villagers who rely on agricultural production, while ensuring that their means of livelihood are not affected. It is anticipated that the increasing industrial investments in the region supported by logistics will not directly impact agricultural production. The division of lands due to the route, elevation differences that may arise due to infrastructure and superstructure works, and the creation of physical obstacles that may hinder the operation of agricultural machinery are practices that may result in loss of livelihood. In this context, one of the significant impacts that the Project may create is the potential decrease and/or losses in livelihoods based on agriculture. During the project's site activities, following mitigation measures will be implemented: (i) avoiding transitions through agricultural areas as much as possible, (ii) minimizing necessary transitions, and, in cases where it is unavoidable, and (iii) arranging these transitions in a way that minimizes harm to agricultural lands.

In line with the land acquisition requirements of the Project and for the preparation of the first Project RP document within the scope of WB ESS5, the first field survey was conducted in January-February 2020. Following the field study, DGII submitted a project revision in the area

to be used for Erzin Port Station on February 19, 2020. Due to this revision, the number of affected parcels changed. A second field survey was conducted in March 2020 to revise the RP.

A total of 133 parcels were required for the project in 2020. After the project revision, 100 of these parcels were excluded from the scope and new lands were affected. However, the project was revised again after this date and the affected lands changed. Therefore, a third field study was conducted in March 2024 and the socio-economic baseline of the Project area was completely updated.

Land acquisition requirements were tried to be minimized during the design and planning phase of the Project. Although treasury lands were used as much as possible, private land acquisition was inevitable. However, the necessity of moving the planned Erzin port towards the coast made it necessary for the Erzin port station to be built on private agricultural lands.

According to the expropriation plan updated in 2024, the number of affected parcels is 143. 51 parcels are private (47 belong to real persons, 6 to legal persons/companies) and 90 of them are public lands. An area of 1,451,707.56 m2 is needed for the construction of the project. The vast majority of public lands are industrial type lands.

In addition to all lands, structures, workplaces and residential buildings affected by the land acquisition within the scope of the Project RP, unofficial users of public lands suitable for agriculture affected by the Project land acquisition were identified within the scope of the Project RP. As a result of all these determinations, the RP of the Project in accordance with WB ESS5 was completed.

The Project RP document has prepared an Entitlement Matrix (EM) for all affected lands and PAPs. EM provides an overview of all rights under land acquisition. The Project will try to minimize involuntary resettlement and improve or at least restore the livelihoods and living standards of the displaced persons. In this context, the RP document has included mitigation measures and compensation strategies for each type of land, workplace, house, assets and each type of PAPs in detail in the RP document. The design of the Project has been finalized. However, if new land is needed after the contractor is selected, compensation will be provided according to the EM of this RP. If an unforeseen impact is encountered with the need for new land in the EM, an annex to this RP will be prepared.

According to the environmental and social impacts and risks identified during the ESIA process of the Project, an Environmental and Social Management Plan and a Resettlement Plan have been developed. Accordingly, for each environmental and social issues, mitigation measures, roles and responsibilities along with corresponding costs have been provided in Environmental and Social Mitigation Plan whereas monitoring parameters, monitoring locations, monitoring frequencies, monitoring methods, monitoring requirements, key performance indicators, reporting requirements and action specific costs have been specified in the Monitoring Plan for pre-construction, construction and operation phases of the Project. DGII is the main responsible party during the pre-construction phase while the Contractor will implement necessary actions during the construction phase under the control of EHS Specialists in DGII PIU. DGII PIU and the Contractor are obliged to carry out the relevant reporting by conducting the internal monitoring/audit activities required by the Project activities they perform. Weekly, monthly, and quarterly follow-up reports, which will be prepared following daily inspection and monitoring activities in all project areas during the construction phase, will be submitted to DGII. TCDD will be responsible for the actions identified during the operation phase. Furthermore, compliance of the activities with the WB ESF and national EHS legislation will be monitored and reported semi-annually to the WB by third party E&S monitoring consultant during the lifecycle of the Project.

1 INTRODUCTION

Among Türkiye's transportation investments, railways are the most substantial infrastructures, as highlighted by the 12th Development Plan[1] (2024-2028) prepared by the Republic of Türkiye Presidential Directorate of Strategy and Budget. The main purpose, in terms of railway transportation, is to enhance the efficiency, capacity, and safety of the railway system. This includes increasing the proportion of electrified and signaled railway lines, promoting the use of domestic means for designing and manufacturing rail system vehicles, and boosting the localization rate of critical components. The plan aims to advance the research and development, design, and production capabilities of the domestic industry, and to ensure comprehensive maintenance and repair of rail system vehicles and their sub-components, thereby contributing to the overall modernization and development of the railway transportation infrastructure in Türkiye.

During the 11th Development Plan period, studies were carried out to increase effectiveness and efficiency in transportation and logistics, reduce costs and ensure intermodal integration. The rate of electrified lines in railways has increased to 52 percent and the rate of signaled lines has increased to 58 percent, and significant modernization works are currently continuing. It is stated that the road-based system in freight and passenger transportation continued during the 11th Development Plan period, and that there is still a need to prioritize transportation investments focusing on freight transportation in order to increase road traffic safety, reduce environmental impacts, and transition to railway-connected multi-modal systems.

In this context, the following policies and measures are included in the 12th Development Plan:

- The share of railway freight transportation in manufacturing industry logistics will be increased, and connection lines will be established between production sites, ports, and logistics centers.
- High-speed train projects under construction will be completed, line capacity will be increased in bottleneck regions, and regions with high freight carrying potential will be connected to the railway network.
- Ongoing railway projects for the development of combined transportation opportunities by increasing the share of railways in freight and passenger transportation will be completed, and railway connections of important freight centers such as OIZs, ports and mines will be provided.

Türkiye's logistics objectives covered in 12th Development Plan are summarized in Table 1.

Table 1. Logistic and Transportation Sector Objectives of Türkiye

Objective	2022	2023	2028
Türkiye's Ranking in the Logistics Performance Index	38	38	25
Share of Railways in Total Freight Transport (Land Transport, %)	5.37	5.76	7.60
Railway line Efficiency (Passenger-Km + Ton-Km) / (Main Line Length)	2.41	2.77	7.0
Cargo Amount Carried by Rail (Billion, Net Ton-Km)	16.6	19.4	40.0
Electrified Line Percentage (%)	48	52	72
Signaled Line Percentage (%)	55	58	80
Connection Line Length (km, Cumulative)	439	439	608
Total Container Handling (Million TEU)	12.4	12.3	17.4
Transit Load Rate in Sea Freight Handling (million tons)	81.0	70.4	89.5
Turkish Commercial Fleet with 1000 GRT and Above Turkish Ownership (Million DWT)	39.1	41.7	57.5

[1] https://onikinciplan.sbb.gov.tr/wp-content/uploads/2023/11/On-Ikinci-Kalkinma-Plani_2024-2028.pdf

Objective	2022	2023	2028
International Airline Total Cargo Traffic (Thousand Tons)	1573	1325	3800

Source: Republic of Türkiye, Presidency of Strategy and Budget, 2023

As it is targeted with the 12th Development Plan, Transport and Logistics Master Plan[2], aims to increase the share of railways in freight transport through improvements in last kilometer connections and strengthening institutional capacity.

According to the Logistics Performance Index (LPI) tool created by the WB to help countries identify the challenges and opportunities they face in their performance on trade logistics and what they can do to improve their performance. The LPI data of Türkiye from 2014 to 2023 is presented in Table 2.

When the data of 2018 and 2023 is compared, it can be seen that the overall LPI of Türkiye ranking increased from 47 to 38, and the score increased from 3.15 to 3.4.

Table 2. Logistics Performance Index of Türkiye (2014-2023)

Sub indicators	2014		2016		2018		2023	
	Ranking	Score	Ranking	Score	Ranking	Score	Ranking	Score
Customs	34	3.23	36	3.18	58	2.71	47	3.0
Infrastructure	27	3.53	31	3.49	33	3.21	43	3.4
International Shipments	48	3.18	35	3.41	53	3.06	26	3.4
Logistics Competence	22	3.64	36	3.31	51	3.05	38	3.5
Tracking & Tracing	19	3.77	43	3.39	42	3.23	37	3.5
Timeliness	41	3.68	40	3.75	44	3.63	35	3.6
LPI	**30**	**3.50**	**34**	**3.42**	**47**	**3.15**	**38**	**3.4**

Source: https://lpi.worldbank.org/international/global

1.1 Project Background

The World Bank's Board of Executive Directors approved a loan for the Türkiye Rail Logistics Improvement Project (RLIP) on 30.06.2020. The project is implemented by the Ministry of Transport and Infrastructure (MoTI) through its Directorate General of Infrastructure Investments (DGII), aims to increase rail freight efficiency in Türkiye by improving last-mile infrastructure connectivity (LMC), enhancing the operational efficiency of rail-enabled logistics centers, and strengthening institutional capacity in the rail intermodal and freight logistics sector.

The project development object (PDO) is to reduce transport costs in selected rail freight corridors and to strengthen institutional capacity at the Ministry of Transport and Infrastructure (MoTI) to deliver rail freight connectivity and manage rail-enables logistic centers.

The project is developed around three main components:

- Component 1: Construction of Railway Branch Lines and Multimodal Connections at Priority Network Nodes,
- Component 2: Feasibility studies, detailed engineering designs, environmental and social documentation, and construction supervision for rail last-mile infrastructure connectivity at additional freight nodes,
- Component 3 – Phase 2 Covid-19 response support, institutional strengthening, capacity building, and project implementation support.

[2] https://www.uab.gov.tr/uploads/pages/bakanlik-yayinlari/20221025-2053-ulastirma-ve-lojistik-ana-plani-tr.pdf

Within the scope of the 1st Component of the Project for improving railway connections, it is planned to construct a railway connection line to the industrial facilities in Çukurova Region and İskenderun Bay – Toros, Adana, Yumurtalık Free Zone (TAYSEB) industrial centers and ports. The main purpose of the Çukurova Region and İskenderun Bay Railway Connection Sub-Project (the Project) is to make the transportation of raw materials and products economical by making infrastructure connection (such as OIZ - Port connection, OIZ - Main line connection) between the industrial areas. The railway connection line will connect the existing Osmaniye OIZ, Ceyhan OIZ and Ceyhan Energy Specific OIZ to the existing Toprakkale - İskenderun railway line at the existing Erzin Station.

The risk classification of the project is “Substantial” according to the World Bank Environmental and Social Framework (ESF). As a result, although the sub-projects have an exemption on Environmental Impact Assessment (EIA) according to the national legislation, an Environmental and Social Impact Assessment (ESIA), Resettlement Plan (RP), Stakeholder Engagement Plans (SEP), and Environmental and Social Management Plan (ESMP) have been prepared in compliance with the World Bank Environmental and Social Framework (ESF), and Environmental and Social Standards (ESSs) for the Project. Also, Labor Management Procedures (LMP) has been prepared for the Project, and the Contractor will prepare a Labor Management Plan (LM Plan) in compliance with this procedure.

The World Bank Group (WBG) General Environmental, Health, and Safety (EHS) Guidelines and Industry Sector EHS Guidelines for Railways, Toll Roads, and Electric Power Transmission and Distribution have been applied for the identification of measures to address the Environmental and Social risks. Furthermore, additional 12 sub-management plans were prepared for the Project as part of the ESMP:

- Construction Impacts Management Plan (CIMP)
- Community Health and Safety Management Plan (CHSMP)
- Community Relations Management Plan (CRMP)
- Employment and Training Plan (ETP)
- Aggregate Management Plan (AGM)
- Traffic (Transportation) Management Plan (TTMP)
- Cultural Heritage Management Plan (CHMP)
- Pollution Prevention Plan (PPP)
- Waste Management Plan (WMP)
- Emergency Preparedness and Response Plan (EPRP)
- Critical Habitat Assessment and Biodiversity Management Plan (CHA-BMP)
- Occupational Health and Safety Management Plan (OHSMP)

A contract was signed between DGII and ÇINAR Engineering Consultancy Inc. (ÇINAR) in December 2019, for preparing the Environmental and Social Impact Assessment Report together with ESMP and sub-management plans listed above of the Project according to the World Bank standards. The ESIA site studies were completed by ÇINAR in January and February 2020, and the ESIA Reports were disclosed in May 2020. The mentioned activities are defined as **Phase-1 of the Project**. During Phase-1 studies; environmental, social, and culturally sensitive areas in the project impact area were specified in the ESIA reports, and mitigation measures were proposed.

Within the framework of the Environmental and Social Commitment Plan (ESCP), the whole ESIA package has been revised and updated in line with the World Bank standards, where necessary, and this process is mentioned as **Phase-2 of the Project**. Therefore, the railway route was revised considering the issues specified in ESCP, and the studies and measurements that could not be performed due to the seasonal restrictions were carried out at Phase-2.

The comparison of railway design in Phase-1 and Phase-2 is presented in Figure 1 and Figure 2 respectively.

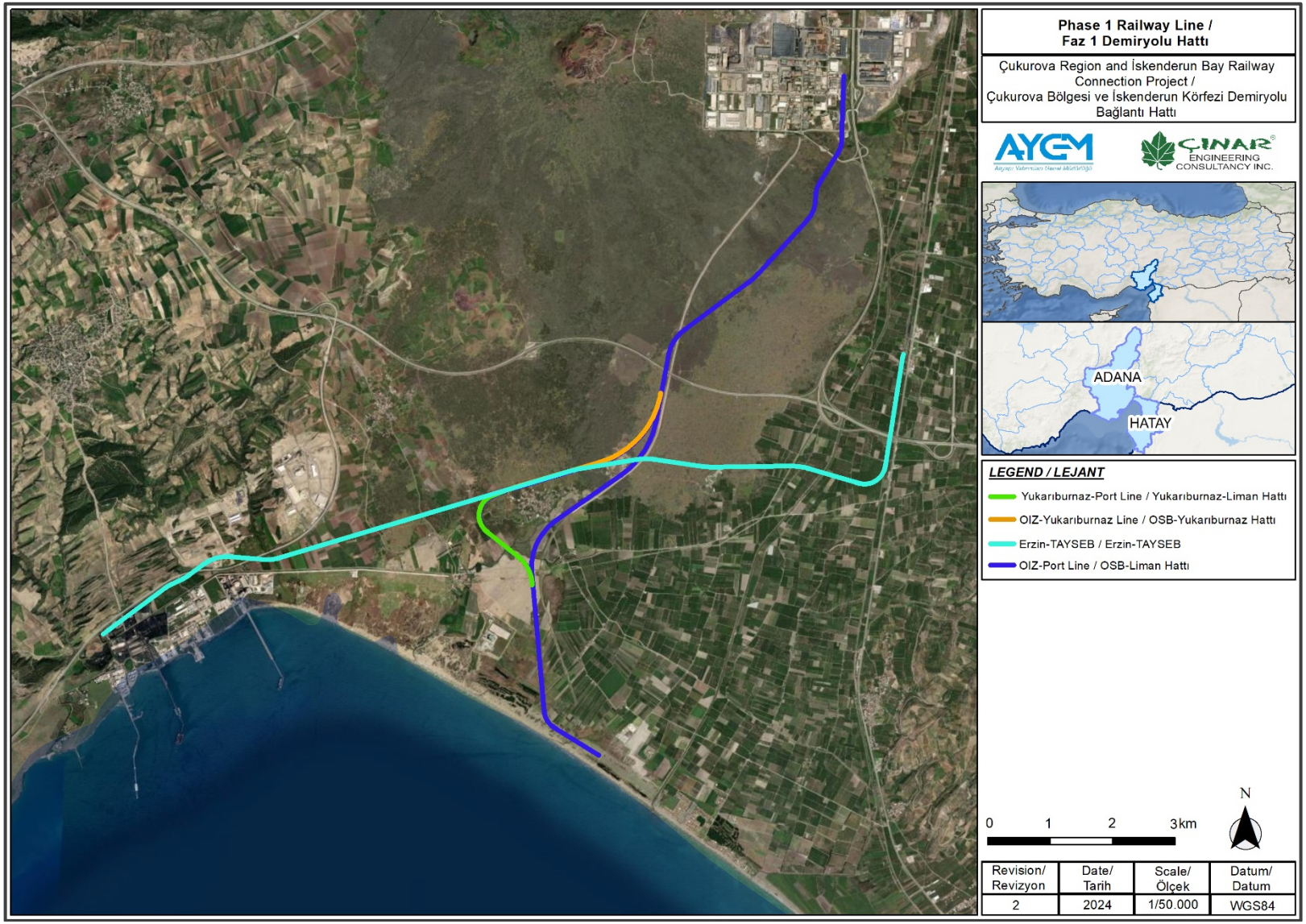


Figure 1. Çukurova Sub-Project Railway Design in Phase-1

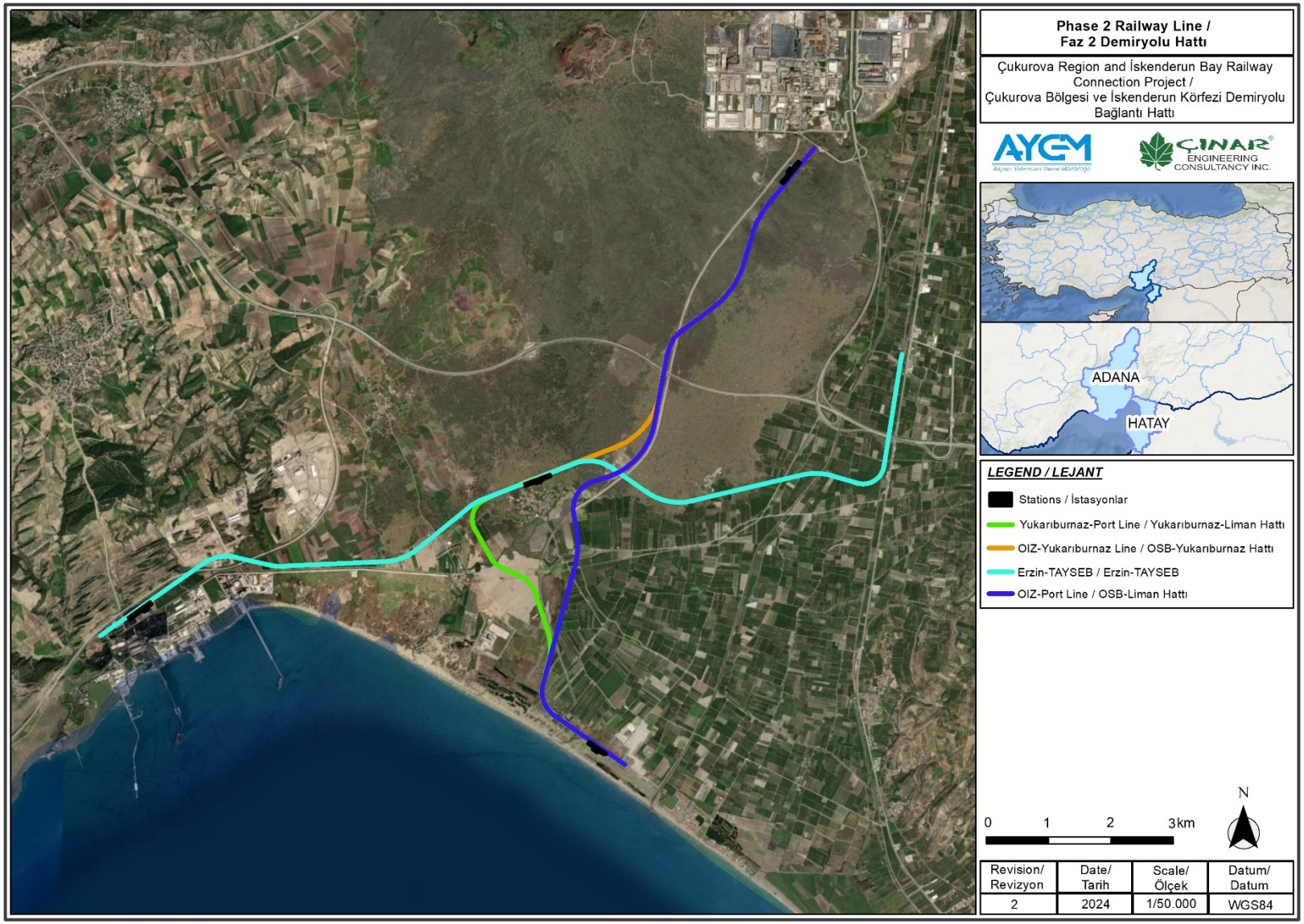


Figure 2. Çukurova Sub-Project Railway Design in Phase-2 (Revised Line)

1.2 Project Location

Çukurova Region and İskenderun Bay Railway Connection Project is located within the boundaries of Yumurtalık District in Adana Province and Erzin District of Hatay Province, in the South of Türkiye.

The project's area of influence passes through industrial lands, a coal storage facility, pasture lands, agricultural production areas, fruit orchards, and apiculture area. The closest settlement is Yukarıburnaz approximately 30 m away from the project site.

1.3 Project Owner

Directorate General of Infrastructure Investments (DGII) affiliated to the Ministry of Transport and Infrastructure (MoTI) is responsible for the implementation of the Rail Logistics Improvement Project financed by the World Bank.

DGII, through article 485 of the Presidential Decree No.1 dated July 10, 2018, has been authorized to be responsible for design and construction of public railways, logistics centers, ports, airports, as well as construction and operation of rail and road connections to major ports, airports, industrial facilities, organized industrial zones, mining areas.

DGII, with detailed, solid organizational structure and institutionalization, has 358 personnel (160 of which are technical staff) and consists of 13 departments which includes Railways Construction Department and Railways Survey Project Department. The Railways Construction Department and The Railways Survey Project Department are the main departments related to the planned projects in the context of this work. The Railways Construction Department works on the process of tender and construction of projects. The Railways Survey Project Department is responsible for survey, budget estimate, feasibility studies on technically, economically, and environmentally viable projects.

The Railway Construction Department consists 3 units: Railway Construction Unit, High Speed Train Construction Unit and External Funded Projects Unit.

The Railway Survey Department consists of 3 units: Modernization Unit, Logistics and Joint Projects Survey and Applications Unit and Railway Projects Survey and Tender Unit.

1.4 Environmental & Social Impact Assessment under National Legislation

The Project is evaluated under the Annex-1, Article 9 of the Environmental Impact Assessment Regulation, which was published in the Official Gazette dated 27.07.2022 and numbered 31907 as:

a) Construction of railway line (except connection and junction lines)

The Project was evaluated to be exempt from EIA Regulation process by the Ministry of Environment, Urbanization and Climate Change as all the lines are junction and/or connection lines.

EIA Exemption letter from Hatay Governorship Provincial Directorate of Environment, Urbanization and Climate Change numbered 26634441-220.03-E.18084 and EIA Exemption letter from Adana Governorship Provincial Directorate of Environment, Urbanization and Climate Change numbered 90438820-220.03.-E.28921 are given in Appendix-2.1.

1.5 Limitations and Uncertainties

The conditions, limitations and uncertainties affecting the studies and evaluations carried out within the scope of the Environmental and Social Impact Assessment study are as follows:

- This ESIA report was prepared based on the railway route provided to ÇINAR with the DGII's official letter dated 02.11.2023 and numbered 1498170.
- Upon the request of DGII, both Phase-1 data and the studies carried out during Phase-2, including environmental measurements, biological site surveys, and social site surveys, have been incorporated into this ESIA report.
- Project description, project route and its components presented in the Chapter 3 of the ESIA are provided by DGII. During the preparation of ESIA report, "Railway Connection Line to the Industrial Facilities in Çukurova Region and İskenderun Bay - Yumurtalık Free Zone Industrial Centers and Ports Feasibility Report" and "Railway Connection Line to the Industrial Facilities in Çukurova Region and İskenderun Bay - Yumurtalık Free Zone Industrial Centers and Ports Geologic - Geotechnic Survey Report" were used.
- The camp sites that will be used during the construction phase of the project, were not determined while ESIA was being prepared. Therefore, camp sites could not be included in the assessments for the construction phase.
- The locations, layouts and technical specifications of associated facilities such as energy transmission lines & substation, quarries and material burrow pits are not determined or finalized yet. Consequently, energy transmission lines & substation, quarries and material borrow pits are not included in the evaluations (e.g. Land Use, Air Quality). All associated facilities to be used for the Project shall comply with WBG ESF as well, and be subject to E&S assessments, management plans and instruments.

1.6 Structure of the ESIA Report

The general outlines of the ESIA report covering the important environmental and social issues related to the Project are given in Table 3.

Table 3. Structure of ESIA Report

Chapter-1	Introduction
Chapter-2	Institutional and Legal Framework
Chapter-3	Project Description
Chapter-4	Methodological Approach to Impact Assessment
Chapter-5	Environmental and Social Baseline& Impact Assessment& Mitigation Measures ▪ Physical Environment ▪ Biological Environment ▪ Socio-Economic Environment
Chapter-6	Cumulative Impact Assessment
Chapter-7	Project Alternatives
Chapter-8	Stakeholder Engagement and GM of the Project
Chapter-9	References

As part of the ESIA Study, an Environmental and Social Management Plan was also prepared, listing all of the management measures and commitments proposed in the ESIA Report and monitoring provisions and key indicators for the success of the identified implementation.

2 INSTITUTIONAL AND LEGAL FRAMEWORK

2.1 Institutional Framework

The administrative structure in Türkiye encompasses both central and local administrations. The central administrative units are represented by ministries. which extend services to local regions through their respective local branches. These branches encompass provincial organizations under the governor's jurisdiction, as well as district organizations under the oversight of district governors. Furthermore, Türkiye is comprised of various provinces, each managed by smaller local administrations that include municipalities and villages/neighborhoods. The administrative leadership within these units is vested in mayors for municipalities and mukhtars for villages/neighborhoods.

The institutional framework in Türkiye as pertains to the project is presented in Figure 3.

2.1.1 Central Administrations

Basis of central administrations is established with Ministries in Türkiye. These ministries provide services through provincial and district organizations, to local areas.

MoTI is the main central administration in scope of the Project. The national institution responsible for implementation of the Çukurova Region & İskenderun Bay Railway Connection Project is DGII under the Ministry.

The Ministry of Environment, Urbanization and Climate Change (MoEUCC) is the key authority regulating policies and procedures related to conservation and protection of natural environment, management of natural resources and sustainable cities and settlements. MoEUCC fulfills those activities with its organization structure composed of General Directorates.

The main government institutional stakeholders of the Project are listed in Table 4.

Table 4. The Main Government Institutional Stakeholders of the Project

Ministry of Environment, Urbanization and Climate Change
General Directorate of Environmental Management
General Directorate of Environmental Impact Assessment, Permit and Inspection
General Directorate of Spatial Planning
General Directorate of Protection of Natural Assets
General Directorate of Land Registry and Cadastral
General Directorate of National Estate
Ministry of Transport and Infrastructure
General Directorate of Infrastructure and Investments
General Directorate of Highways
Ministry of Agriculture and Forestry
General Directorate of State Hydraulic Works
General Directorate of Nature Conservation and National Parks
General Directorate of Water Management
General Directorate of Forestry
General Directorate of Meteorological Services
General Directorate of Agricultural Reform
Ministry of Culture and Tourism
General Directorate of Cultural Heritage and Museums

Ministry of Energy and Natural Resources
General Directorate of Energy Affairs
General Directorate of Mining and Petroleum Affairs
General Directorate of Mineral Research and Exploration
General Directorate of Turkish Electricity Transmission Corporation
Ministry of Labor and Social Security
General Directorate of Occupational Health and Safety
Ministry of Health
General Directorate of Health Affairs

2.1.2 Provincial, Regional and District Level Administrations

Administrations at provincial, regional and district levels are field organizations of ministries and related institutions.

The Project is within the scope of Adana and Hatay Governorates, Adana and Hatay Provincial Directorates of Agriculture and Forestry, Provincial Directorates of Culture and Tourism, Forestry Regional Directorates, Provincial Special Administrations, 5th Regional Directorate of the Ministry of Transport and Infrastructure and DSİ 6th Regional Directorate.

The project-specific ministries and institutions are given in Figure 3.

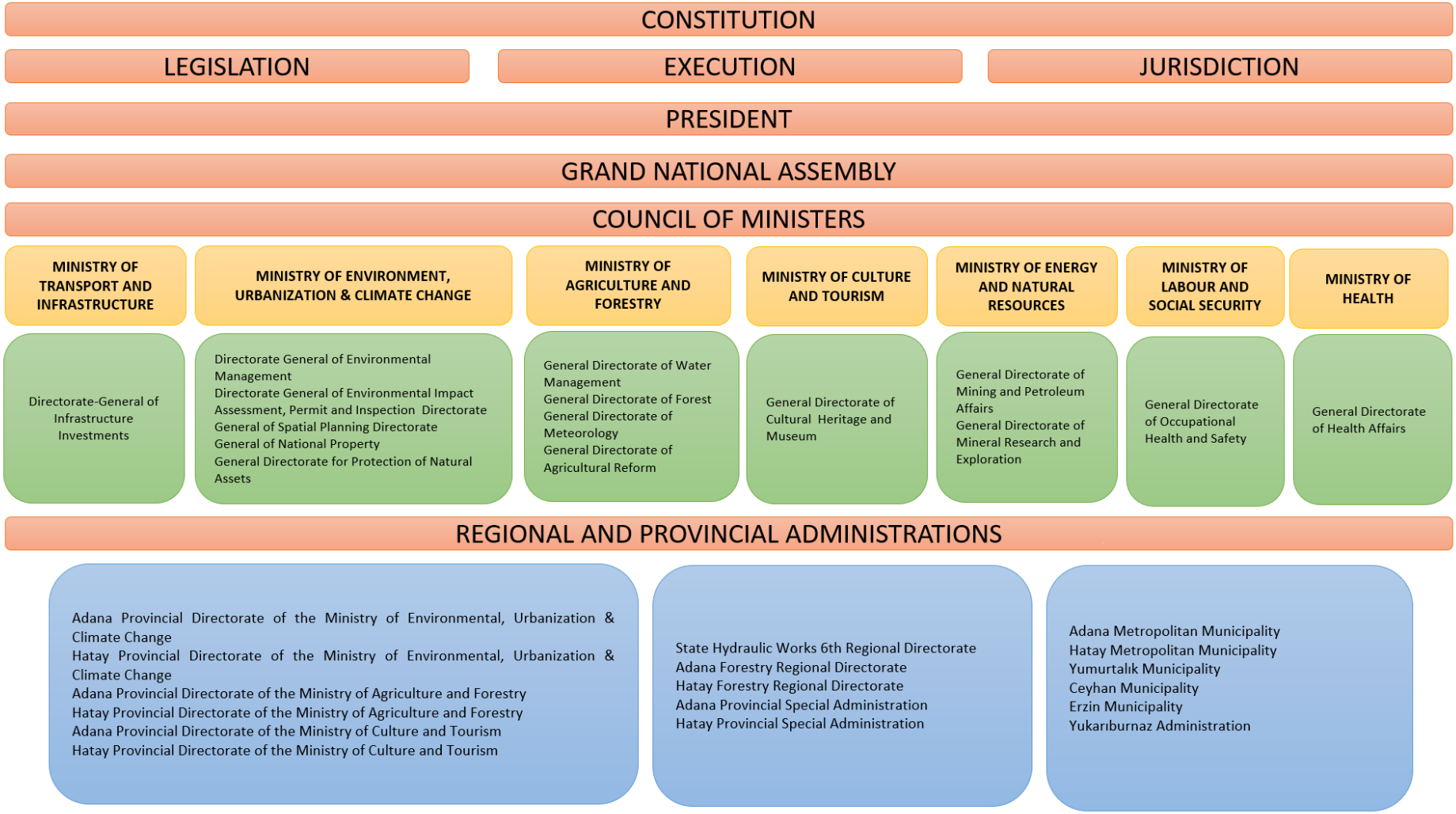


Figure 3. Regional and Provincial Administrations

2.1.3 Local Administrations

The Project is located in Adana and Hatay provinces in southern Türkiye. On the designated route, there is Yukarıburnaz settlement of Erzin district of Hatay Province. Adana and Hatay Metropolitan Municipalities, related districts and village mayors are considered as local authorities related to the project.

2.2 National Legislation

The National Legislation in relation with environmental, social, health and safety management constructing the legal basis for the Project are identified in the following sections.

2.2.1 Environmental and Social Legislation

Turkish Environmental Law No. 2872, which was issued in the Official Gazette No. 18132 on August 11, 1983, describes the fundamental principles required to protect the environment in accordance with sustainable development and sustainable environmental goals. The Environmental Law provides a legal framework for the development of environmental regulations in accordance with national and international standards.

In addition to Environmental Law and associated regulations, several laws in relation with environmental protection, pollution prevention and control, the human rights and safety are listed in Table 5.

Table 5. Highlighted Laws Covered by National Legislation

Law	Law Number
Agricultural Reform Law on Land Rearrangement in Irrigated Areas	3083
Electricity Market Law	6446
Energy Efficiency Law	5627
Expropriation Law	2942
Forestry Law	6831
Groundwater Law	167
Highway Traffic Law	2918
Labor Law	4857
Law on Conservation of Cultural and Natural Assets	2863
Law on Soil Conservation and Land Use	5403
Mining Law	3213
Municipality Law	5393
National Parks Law	2873
Occupational Health and Safety Law	6331
Pasture Law	4342
Public Health Law	1593
Settlement Law	5543

Environmental regulations, by-laws and communiques that are valid within the above-mentioned laws are listed in table below.

Table 6. Environmental Regulations, By-laws and Communiques in Türkiye

Regulation Name	Official Gazette Date	Issue
Environmental Permits and Licenses (General)		
Regulation on Environmental Impact Assessment	29.07.2022	31907
Regulation on Environmental Permits and Licenses	10.09.2014	29115
Regulation on Environmental Audit	12.06.2021	31509
Regulation Concerning Environmental Management Services	01.11.2022	32000
Law on Measures to be taken and Aids to be provided for the Disasters Effective in Public Life	15.05.1959	7269
Soil Quality		
Regulation on the Control of Soil Pollution and Contaminated Lands by Point Sources	08.06.2010	27605
Climate Change		
Regulation on Minimization of Ozone Depleting Substances	07.04.2017	30031
Regulation on Monitoring of Green House Gas Emissions	17.05.2014	29003
Land Use and Soils		
Regulation on Protection, Use and Planning of Agricultural Lands	09.12.2017	30265
Implementation Regulation of 17/3rd and 18th Articles of the Forestry Law	30.11.2021	31675
Implementation Regulation of Land Consolidation and On-Farm Development Services	07.02.2019	30679
Regulation Concerning the rehabilitation of the Lands Disturbed by Mining Activities	23.01.2010	27471
Regulation on Pastures	31.07.1998	23419
Water		
Regulation on Surface Water Quality	30.11.2012	28483
Regulation on Water Pollution Control	31.12.2004	25687
Regulation Concerned Water Intended for Human Consumption	17.02.2005	25730
Regulation on Urban Wastewater Treatment	08.01.2006	26047
Regulation Concerning Protection of Groundwater against Pollution and Deterioration	07.04.2012	28257
Monitoring of Surface and Groundwater Regulation	11.02.2014	28910
Regulation on Fishery Products	10.03.1995	22223
Regulation on Control of Pollution Caused by Hazardous Substances in and around the Water Bodies.	26.11.2005	26005
Communique on Sampling of Surface Water, Ground Water and Sediment and Biological Sampling	21.02.2015	29274
Regulation on Protection of Drinking-Potable Water Basins	28.10.2017	30224
Waste Management		
Regulation on Control of Packaging Wastes	26.06.2021	31523
Regulation on Waste Management	02.04.2015	29314
Regulation on the Control of Excavation Soil, Construction and Demolition Wastes	18.03.2004	25406
Regulation on the Control of Medical Wastes	25.01.2017	29959
Regulation on the Management of Waste Oils	21.12.2019	30985
Regulation on the Control of Vegetable Waste Oils	06.06.2015	29378
Regulation on the Control of Waste Batteries and Accumulators	31.08.2004	25569
Regulation on the Control of End-of-Life Tires	25.11.2006	26357
Regulation on Mining Wastes	15.07.2015	29417
Regulation on the Landfill of Wastes	26.03.2010	27533
Regulation on the Control of Waste Electrical and Electronic Equipment	26.12.2022	32055

Regulation Name	Official Gazette Date	Issue
Regulation on the Control of End-of-Life Vehicles	30.12.2009	27448
Regulation on Zero Waste	12.07.2019	30829
Notice on Fuel, Auxiliary Fuel and Alternative Raw Material Derived from Waste	20.06.2014	29036
Regulation on the Control of Collecting Wastes from the Vessels	26.12.2004	25682
Regulation on Recovery of Some Non-Hazardous Wastes	17.11.2011	27967
Air Quality		
Regulation on the Control of Industrial Air Pollution	03.07.2009	27277
Regulation on the Assessment and Management of Air Quality	06.06.2008	26898
Regulation on the Control of Exhaust Gas Emissions	11.03.2017	30004
Management of Chemicals		
Regulation on Classification, Labelling and Package of Materials and Mixtures	11.12.2013	28848
Regulation on Safety Information Forms on Hazardous Substances and Mixtures	13.12.2014	29204
Regulation Regarding Transport of Hazardous Materials on Highways	18.06.2022	31870
Community and Occupational Health and Safety and Labor and Working Conditions		
Regulation on Occupational Health and Safety Risk Assessment	29.12.2012	28512)
Regulation on Occupational Health and Safety Services	29.12.2012	28512
Regulation on Duties, Authority, Responsibilities and Trainings of Occupational Health and Safety Specialists	29.12.2012	28512
Regulation on Procedures and Principles of Occupational Health and Safety Training of Employees	15.05.2013	28648
Regulation on the Occupational Health and Safety Committees	18.01.2013	28532
Regulation on the Health and Safety Measures to be taken in Workplace Buildings and Additions	17.07.2013	28710
Regulation on Protection of Buildings from Fire	19.12.2007	26735
Regulation on the Emergency Cases in Workplaces	18.06.2013	28681
First Aid Regulation	29.07.2015	29429
Regulation on Protection of Workers from Dangers of Explosive Environments	30.04.2013	28633
Communique on Hazard Classes List related to Occupational Health and Safety	26.12.2012	28509
Regulation Concerning the Protection of Workers from Risks Associated with Noise	28.07.2013	28721
Regulation Concerning the Protection of Workers from Risks Associated with Vibration	22.08.2013	28743
Regulation on Health and Safety Conditions in the Use of Work Equipment	25.04.2013	28628
Regulation on Occupational Health and Safety on Construction Works	05.10.2013	28786
Regulation on Health and Safety Regarding Temporary and Time Limited Works	23.08.2013	28744
Regulation on Health and Safety Precautions Regarding Working with Chemicals	12.08.2013	28733
Regulation on Health and Safety Signs	11.09.2013	28762
Regulation on Dust Management	05.11.2013	28812
Regulation on Safety Information Forms Regarding Hazardous Materials and Mixtures	13.12.2014	29204
Regulation on Personal Protection Equipment	01.05.2019	30761
Regulation on Usage of Personal Protective Equipment in Workplaces	02.07.2013	28695
Regulation on Vocational Training of the Employees Working in Dangerous and Highly Dangerous Workplaces	13.07.2013	28706
Regulation on the Provisions of Occupational Health and Safety Training of Employees	29.12.2012	28512

Regulation Name	Official Gazette Date	Issue
Regulation on the Control of Polychlorinated Biphenyl and Polychlorinated Terphenyls	27.12.2007	26739
Regulation on Transportation of Explosives via Highways	24.04.2019	30754
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	29.09.1987	19589
Regulation on the Implementation of Law Concerning Private Security Services	07.10.2004	25606
Noise		
Regulation on Environmental Noise Control	30.11.2022	32029
Regulation on Environmental Noise Emission Caused by Equipment Used Outdoors	30.12.2006	26392
Social		
Regulation on Implementation of Resettlement Law	02.12.2007	26718
Regulation on the Implementation of Law Concerning Private Security Services	07.10.2004	25606
Law on Right to Information	24.10.2003	25269
Others		
Regulation on Traffic in Highway	18.07.1997	23053 (Duplicate)
Regulation on Railway Security	19.11.2015	29537
Regulation on Critical Duties Concerning Railway Security	31.12.2016	29935
Regulation on Earthquake Technique in Construction of Coastal and Harbor Structures, Railway and Airport	18.08.2007	26617

2.2.1.1 Environmental Impact Assessment (EIA)

An EIA is a systematic approach to figure out the favorable and adverse impacts/risks of a defined project on the environment. This process is not a decision-making process in itself; is a process that progresses in parallel with the decision-making process, and act as a supporting mechanism. It is the analysis and assessment of environmental impacts resulting from new projects and developments, including the social consequences and alternative solutions of all direct or indirect, permanent, or transient potential impacts.

EIA studies have been granted legal status through Article 10 of the Environmental Law No. 2872, which was published in the Official Gazette dated 11/8/1983 and numbered 18132 in our country. On 7 February 1993, the EIA Regulation was put into force and has undergone amendments many times to date, and it has been completely amended 8 times in total, all aimed at aligning with the European Union (EU) Legislation and the EU EIA Directive for harmonization purposes. Currently, the Environmental Impact Assessment Regulation, published in the Official Gazette dated 29/07/2022 and numbered 31907, is in force.

With the introduction of the online EIA Process Management System known as “e-ced” institutions and organizations authorized by the Ministry of Environment, Urbanization and Climate Change can now submit EIA applications through this digital platform.

The EIA process consists of three main phases;

i. Environmental baseline studies
ii. EIA Studies
iii. Establishment of environmental and social management plans, along with monitoring activities

EIA studies will commence following environmental Baseline studies. These baseline studies involve the following steps.

- Identifying facilities and settlements within the project area,
- Assessing existing environmental conditions,
- Determination of the methods and means for the determination of environmental impacts, determination of possible environmental (direct and indirect) impacts,
- Setting standards related to environmental impacts and determination of future distribution (investment and operation periods),
- Determination of analysis criteria in terms of quantity and quality,
- Determining and examining the existing transportation system,
- Taking the necessary images both in the project area and the environment in the field with the digital camera,
- Identifying and investigation of the nearest protected areas and sensitive ecosystems to the project area. In the case of presence, National Parks, Nature Parks, Wetlands Wildlife Protection Areas. Natural Heritage, Nature Conservation Areas, Reserve Areas. Biogenetic Reserves, Natural Sites and Monuments, Biosphere Archaeological, Historical, Cultural Mass, Special Environmental Protection Areas Special Protected Areas, Tourism Documents etc. in the activity area, further study should be done in this regard.

In Türkiye, the procedures for EIA studies differ based on whether the projects are listed in Annex I or Annex II of the EIA Regulation. For activities in the Annex-I list, an EIA Report is prepared. For activities in the Annex-II list, a Project Introduction File (PIF) is compiled.

A summarized representation of the EIA process in Türkiye is provided in Figure 4 .

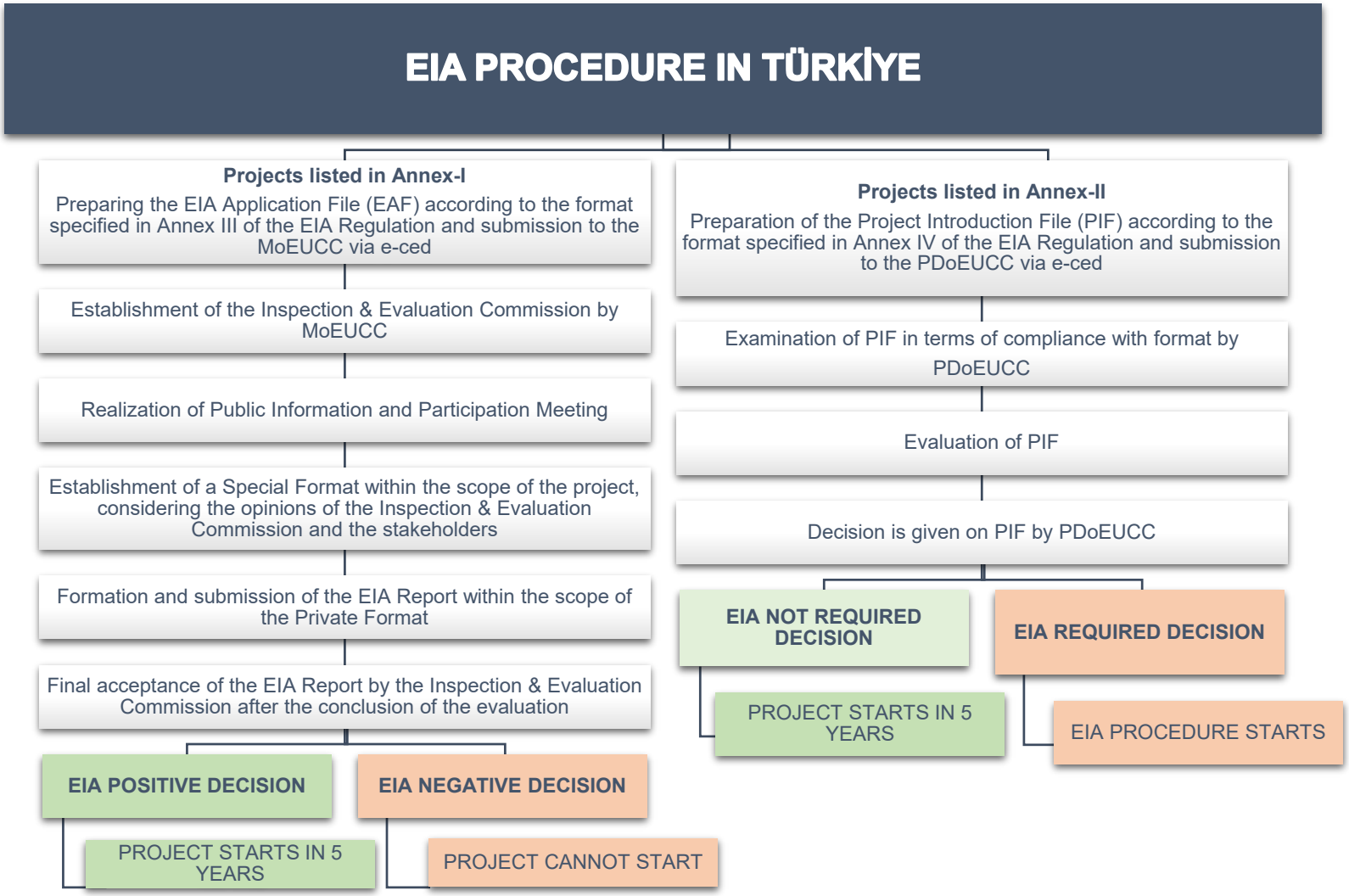


Figure 4. EIA Process in Türkiye

2.2.1.2 Biodiversity and Sensitive Areas

Article 9 of the Environment Law focuses on safeguarding the environment, with a key emphasis on preserving the rich biological variety constituting the natural surroundings, the interconnected ecosystem supporting this diversity, and the delicate zones within it. Pertinent national laws and regulations, international conventions and protocols ratified by Türkiye and international standards and guidelines in this context encompass:

International Conventions and Protocols (ratified by Türkiye)
UN Convention on Biological Diversity (CBD) and the Cartagena Protocol on Biosafety (ratified in 1997)
The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) (ratified in 1984)
The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (ratified in 1996)
The Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention) (ratified in 1994)
The Convention Concerning the Protection of World Cultural and Natural Heritage (UNESCO World Heritage Convention) (ratified in 1983)
Convention to Combat Desertification (ratified in 1998)
International Treaty on Plant Genetic Resources for Food and Agriculture (ratified in 2007)
European Landscape Convention (ratified in 2003)
Convention on the Conservation of Migratory Species of Wild Animals (CMS) / Agreement on the Conservation of Populations of European Bats (EUROBATS) (Turkey is not a party)
CBD – Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets
National Laws and Regulations
Law on National Parks (No. 2873, dated 9 August 1983)
Law on Environment (No. 2872, dated 9 August 1983)
Law on Terrestrial Hunting (No. 4915, dated 1 July 2003)
Law on Forests (No. 6831, dated 31 August 1956)
Law on Protection of Animals (No. 5199, dated 24 June 2004)
Law on Water Products (No. 1380, dated 22 March 1971)
Law on Agriculture (No. 5488, dated 18 April 2006)
Law on Veterinary Services, Plant Health, Food and Feed (No. 5996, dated 11 June 2010)
Law on the Protection of Breeder's Rights for New Plant Varieties (No. 5042, dated 8 January 2004)
Seed Law (No. 5553, dated 31 October 2006)
Law on the Conservation of Cultural and Natural Assets (No. 2863, dated 21 July 1983)
Law on Biosafety (No. 5977, dated 18 March 2010)
Regulation on the Implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (Official Gazette No. 24623, dated 27 December 2001)
Regulation on the Preservation of Wetlands (Official Gazette No. 28962, dated 4 April 2014)
Bylaw on Fisheries (Official Gazette No. 22223, dated 10 March 1995)
Regulation on the Collection, Storage and Use of Plant Genetic Resources (Official Gazette No. 21316, dated 15 August 1992)
2023-2024 Hunting Season Decision
International Standards and Guidelines
ESS 6 (2017) Biodiversity Conservation & Sustainable Management of Living Natural Resource
EU Habitats Directive (92/43/EEC)
EU Birds Directive (2009/147/EC)

2.2.1.3 Cultural Heritage

The Law on Protection of Cultural and Natural Assets was published. This law addresses various concerns related to protecting both movable and immovable cultural and natural

treasures. It has identified and defined the issues surrounding the preservation and care of these assets that require protection, as outlined in Article 6.

- Immovables built until the end of 19th century.
- Immovables that were constructed after the end of 19th century and which are stipulated to be preserved by the Ministry of Culture and Tourism due to their importance and specific properties.
- Immovable cultural assets within a protected area
- Structures, buildings or places where significant historical events took place during the Turkish Independence War or during the foundation of the Turkish republic. Also, buildings that have been used by Mustafa Kemal ATATÜRK, regardless of time and registration.

The aforementioned law specifies that if any movable or immovable assets are discovered, they should be reported to the nearest museum directorate, village headman, or local authority (Article 4).

Furthermore, it is indicated that if cultural assets, both movable and immovable, belonging to public institutions and individuals governed by private law, are already known to exist or are intended for future protection, they will be considered state property (Article 5).

Any movable items identified under the aforementioned articles and reported to the Ministry of Culture and Tourism must be organized, registered, and placed in museums by the same Ministry. This process involves sorting and registering the items based on scientific principles before being properly curated in museums (Article 25).

In addition to the Law on the Protection of Cultural and Natural Assets, some regulations have been prepared that determine the procedures for the protection, storage, and management of the mentioned cultural and natural assets. The principal decision No. 658 of the High Council for the Protection of Cultural and Natural Assets of the Ministry of Culture and Tourism dated November 5, 1999 states that the archaeological sites should be classified and protected, and the three main classes are given below.

1st Degree Archaeological Sites: Archaeological Sites that should be preserved except for scientific studies with the intention of protecting this area. Constructions are not allowed in 1st degree archaeological sites. However, some exceptional cases such as infrastructure applications, may be permitted with the approval of museum and head of the scientific excavation team.

2nd Degree Archaeological Sites: In 2nd degree archaeological areas, protection and usage conditions are determined based on the judgement of Regional Preservation Boards. Similar to 1st degree archaeological sites, constructions are not allowed. However, in exceptional conditions, these activities can be allowed with the approval of museum and head of the scientific excavation team.

3rd Degree Archaeological Sites: In 3rd degree Archaeological sites, construction is permitted in accordance with protection and usage judgement. It is stated that test excavations must be performed before construction. Results must be evaluated by relevant museum. Construction may be allowed considering existing and potential archaeological assets and regional conditions.

2.2.1.4 Land Acquisition and Resettlement

The process of expropriation the necessary lands for the railway route intended for the Çukurova Region and İskenderun Bay Railway Connections Project will follow the relevant laws and regulations, in addition to complying with the Environmental and Social Standards of the World Bank.

National Legislation Related to Expropriation

The Turkish Constitution, Article 46, under Subsection 3 of the Section 3 titled as “Social and Economic Rights and Responsibilities”, addresses expropriation issues. The article states that whenever a development project serves public interest, the government is authorized to initiate and execute an expropriation process. All hydropower, airport, highway and other roads, and similar large-scale infrastructure projects are considered to be in public interest and provide the basis for Article 46. The Article refers to the Expropriation Law.

Expropriation Law

The Expropriation Law establishes the necessary protocols to be followed when the need arises in the pursuit of public welfare.

Procedures set by the Expropriation Law that was published in the Official Gazette No. 18215 dated November 8, 1983, are explained as follows:

- The expropriation of immovable owned by real persons or legal identities subject to private law,
- The calculation of the expropriation fee,
- Registration of the immovable asset and its appurtenances in the name of the expropriation administration,
- Reclamation of the unused immovable assets, mutual rights and obligations as well as the procedures and methods for the settlement of the conflicts pertaining to them.

Pasture Law

Pasture Law regulates the identification and limitation of pastures, highlands, winter quarters, public grasslands and meadows that have been used historically (ancient use) or that have been allotted by different laws. It also governs their allocation on behalf of legal entities, as well as their usage, maintenance, and improvement. It also protects them from deterioration and ensures that the allocation purpose is changed as needed.

In accordance with this law, there are the following laws and regulations in Turkish legislation regarding pasture:

- Agricultural Law (Law No 5488)
- Pasture Regulation (Official Gazette Date: 31.07.1998 Official Gazette Number: 23419)
- Regulation on The Protection, Use and Planning of Agricultural Lands (Official Gazette Date: 09.12.2017 Official Gazette Number: 30265)

National Legislation Related to Resettlement

The expropriation of the lands will be carried out in accordance with the applicable laws and regulations.

Resettlement Law

Resettlement activities are regulated by Resettlement Law and Regulation for the Execution of Resettlement Law.

The Resettlement Law focuses on the families within the project area who applying to related governmental agencies seeking assistance for resettlement. Resettlement assistance of the government is provided for entitled families while individuals who own properties within the project zone are compensated for expropriation. According to the Article 3 of the Law, three types of resettlements can be applied as for that the choices and requests of affected families. Article 3 of the Law reads this point as follows.

Agricultural resettlement: Agricultural resettlement is implemented through providing a family with the following:

Agricultural land at the amount of envisaged in special resettlement project prepared by Ministry of Environment, Urbanization and Climate Change (MoEUCC), house, management building, animal, agricultural devices and tools, workbench and credits one or more.

Non – agricultural resettlement: This type of resettlement is implemented through providing a family with the following: building plot at the amount provisioned in special resettlement project, house, devices, tools, workbench and loans one or more.

Physical resettlement: This type of resettlement is implemented through providing construction credit support to a family within the amount of loan determined by the Ministry (MoEUCC) for the aim of re-building (moving) of villages because of unsuitability of a village centers or consolidating of villages because of dispersed settlement or villages which are fragmented as a result of disasters; after selling land (house plot) from village development areas to people in need".

2.2.1.5 Labor Law and Regulations

Occupational health and safety related issues are governed by the Occupational Health and Safety Law This law forms the basis of legal framework that determines roles, obligations and responsibilities of employers and employees providing rules of health and safety in workplaces.

Additionally, labor and worker related issues are regulated by Labor Law.

Prominent regulations covered by national legislation regarding occupational health and safety and labor and working conditions are also given in Table 5.

2.2.2 Requirements for Environmental Licenses, Permits and Approvals

Throughout the project's construction and operational phases, the required environmental permits and licenses are specifically obtained for activities listed in Annex-1 (Activities generating high levels of pollution) and Annex-2 (Activities generating pollution) of Regulation on Environmental Permits and Licenses. In accordance with regulations, "Environmental Permit" and/or "Environmental Permit and License" processes are carried out.

In the upper part of the railway route lies a section of Isos Antique City (a culturally protected area according to Turkish Law). Although, the project area of Çukurova railway has no international protection status, there are internationally protected areas close-by as Amanos Mountains, Burnaz Dunes and Sugözü-Akkum.

Forestry Law, Law on Soil Conservation and Land Use and Pasture Law are to be taken into consideration for the forest, agriculture and pasture areas located on the project route.

To complete the project with the least impact possible considering health, safety, environment and society, all procedures are to be carried out as stated in the Labor Law.

Relevant fundamental environmental permits and/or licenses are listed below.

Land Use

- Permit for the use of agricultural lands for non-agricultural purposes (Law on Soil Conservation and Land Use Law No: 5403)
- Permit for the use of pasturelands (Pasture Law No.4342)
- Land use agreements with government authorities for state owned lands (Relevant Laws according to land use type)
- Approval of Expropriation Plans (Expropriation Law, Law No: 2942)

Construction Site

- Permits and approvals for roads, railways, water bodies, canals, power supply lines, pipelines etc.
- Workplace notification for construction site
- Permit of fuel storage
- Environmental Permit for concrete structures
- Environmental Permit for asphalt structures

Water and Wastewater Management

- Water usage
- Environmental permit for wastewater discharge
- Environmental permit for package wastewater treatment plants

Wastes

- Approval of waste management plan
- Agreements with licensed waste management and disposal facilities

2.3 International Agreements, Conventions and Protocols

The legal framework that governs the Project also includes the international conventions. The following is a list of the international agreements that are pertinent to the Project and to which Türkiye is a party:

Table 7. International Agreements, Conventions and Protocols

International Agreements, Conventions and Protocols Names (Official Gazette Date, Issue)
Environment
Vienna Convention for the Protection of the Ozone Layer
Montreal Protocol on Substances Depleting Ozone Layer, including the Kigali Amendment to the Montreal Protocol
United Nations Framework Convention on Climate Change (UNFCCC) (O.G. 21.10.2003, No: 25266)
Kyoto Protocol (O.G. 17.02.2009, No: 27144)
Paris Agreement (O.G 07.10.2021, No:31621)
United Nations Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (O.G. 14.02.1998 No:23258)
Convention for the Protection of Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention) (O.G. 14.11.1980, No: 17150)
Protocol for the prevention of pollution of the Mediterranean Sea by dumping from ships and aircraft (Dumping Protocol) (O.G. 22.8.2002, No:24854)
Protocol on the Prevention of Pollution of the Mediterranean Sea by Transboundary Movements of Hazardous Wastes and their Disposal (Hazardous Wastes Protocol) (O.G. 14.1.2002, No:25346)
Protocol for the Protection of the Mediterranean Sea against Pollution from Land-Based Sources and Activities (O.G. 18.3.1987, No: 19404)
Mediterranean Sea Protocol Concerning Specially Protected Areas and Biodiversity (ratification date 6.11.1986) (O.G. 23.10.1988, No: 19968)
Convention on the Control of Transboundary Movements of Hazardous Wastes (Basel Convention) (O.G. 30.12.1993, No: 21804)
Stockholm Convention on Persistent Organic Pollutants
Convention on Long Range Transboundary Air Pollution (CLRTAP) (O.G. 23.3.1983, No: 17996)
International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (FUND)
International Convention on Civil Liability for Oil Pollution Damage
Rotterdam Convention on the Prior Informed Consent for Certain Hazardous Chemicals and Pesticides in International Trade
Minamata Convention on Mercury
Biodiversity
Convention for the Conservation of European Wildlife and Natural Habitats (Bern Convention) (O.G. 20.2.1984, No: 18318)
International Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar) (O.G. 17.5.1994, No: 21937)
Convention on Biodiversity (O.G. 27.12.1996, No: 22860)
Cartagena Protocol on Biosafety (O.G. 24.06.2003, No: 25148)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (O.G. 20.06.1996, No: 22672)

International Convention for the Protection of Birds, Paris 1959 (O.G. 17.12.1966, No: 12480)
Cultural Heritage
European Convention on the Protection of the Archaeological Heritage (O.G. 08.08.1999, No: 23780)
Convention on the Protection of the World Cultural and Natural Heritage, Paris 1972 (O.G. 14.2.1983, No: 17959)
European Cultural Convention (O.G. 17.6.1957, No: 9635)
European Charter of the Architectural Heritage (O.G. 22.07.1989, No: 20229)
Convention for the Protection of Human Rights and Fundamental Freedoms (O.G. 06.02.1972, No: 14091)
UNESCO Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property
UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage
Occupational Health and Safety
International Labor Organization Safety and Health in Construction Convention (O.G. 29.11.2014, No: 29190)
International Labor Organization Agreement on Occupational Health and Safety and Working Environment (O.G. 13.01.2004, No: 25345)
International Labor Organization Worst Forms of Child Labor Convention (O.G. 03.02.2001, No: 24307)
International Labor Organization Abolition of Forced Labor Convention (O.G. 27.01.1998, No: 23243)
International Labor Organization Minimum Age Convention (O.G. 02.06.1959, No: 10220)
International Labor Organization Right to Organize and Collective Bargaining Convention (O.G. 22.12.1992, No: 21432)
International Labor Organization Worker's Representatives Convention (O.G. 11.12.1992, No: 21432)
International Labor Organization Human Resources Development Convention (O.G. 12.12.1992, No: 21433)
International Labor Organization Employment Policy Convention (O.G. 20.11.1976, No: 15769)
International Labor Organization Social Security (Minimum Standards Convention (O.G. 10.08.1971, No: 13922)
International Labor Organization Equal Remuneration Convention (O.G. 22.12.1966, No: 12484)
International Labor Organization Discrimination (Employment and Occupation) Convention (O.G. 22.12.1966, No: 12484)
International Labor Organization Abolition of Forced Labor Convention (O.G. 21.12.1960, No: 10686)
International Labor Organization Right to Organize and Collective Bargaining Convention (O.G. 14.08.1951, No: 7884)

2.4 World Bank Environmental and Social Standards

Projects supported by the World Bank through Investment Project Financing are required to meet corresponding Environmental and Social Standards. The ten (10) Environmental and Social Standards establish the principles the project will adhere to throughout its lifecycle. It should be noted that eight[3] (8) out of the ten (10) ESSs are applicable to this project.

ESS1: Assessment and Management of Environmental and Social Risks and Impacts:

This Standard sets out Borrower's responsibilities for assessing, managing, and monitoring environmental and social risks and impacts related with each phase of the project supported by the World Bank through Investment Project Financing (IPF), so as to accomplish environmental and social results consistent with the Environmental and Social Standards (ESSs).

ESS1, paragraph 26 states that all relevant environmental and social risks and impacts as the result of the project should be covered in the assessment, including:

1. Environmental Risks and Impacts covering the following issues:

[3] ESS1, ESS2, ESS3, ESS4, ESS5, ESS6, ESS8 and ESS10

- The ones defined by Environmental Health and Safety Guidelines (EHSG)
- Community safety concerns
- Climate change and other transboundary or global risks and impacts
- Materials threat to the protection, conservation, maintenance and restoration of natural habitats and biodiversity
- Ecosystem services and the use of living natural resources (fisheries, forests etc.)

2. Social Risks and Impacts covering the following issues

- Threats to human security;
- Risks that project impacts fall disproportionately on individuals or groups who, because of their particular circumstances, may be disadvantaged or vulnerable;
- Any prejudice or discrimination toward individuals or groups in providing access to development resources and project benefits, particularly in the case of those who may be disadvantaged or vulnerable;
- Negative economic and social impacts relating to the involuntary taking of land or restrictions on land use;
- Risks or impacts associated with land;
- Impacts on the health, safety and well-being of workers and project-affected communities;
- Risks to cultural heritage.

ESS2: Labor and Working Conditions

ESS2 perceives the importance of employment creation and income generation for the aim of poverty reduction and inclusive economic growth. Borrowers can promote sound worker-management relationships and enhance the development benefits of a project by treating workers in the project fairly and providing safe and healthy working conditions.

ESS3: Resource Efficiency and Pollution Prevention and Management

ESS3 points out to the requirements to highlight resource efficiency and pollution prevention and management with a holistic approach to project implementation. The objective is to minimize pollution stemming from the project while ensuring the sustainable use of resources.

ESS4: Community Health and Safety

ESS4 emphasizes issues of health, safety, and security risks and impacts on communities resulting from project activities and the corresponding responsibility of Borrowers to avoid or minimize such risks and impacts. Borrower specifically consider people who may be vulnerable due to impacts and risks of the project.

ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement

ESS5 recognizes that physical and economic displacement, if unmitigated, may cause severe economic, social and environmental risks. Hence, involuntary resettlement should be avoided. Where unavoidable, it will be minimized and necessary measures to mitigate adverse impacts on displaced people will be carefully planned and implemented.

ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

Protection and conservation of biodiversity and sustainability of natural resources are the fundamental component of sustainable development. Biodiversity supported by ecological functions including forests should be protected.

This standard also points out to sustainable management of primary production and harvesting of living natural resources and recognizes the need to consider the livelihood of project-affected parties, including Indigenous Peoples, whose access to, or use of, biodiversity or living natural resources may be affected by a project.

ESS7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities

This standard is not relevant for Çukurova Region and İskenderun Bay Railway Connections Project as there are no Indigenous Peoples in Türkiye, who meet the definition of this standard.

ESS8: Cultural Heritage

This standard points out that cultural heritage provides continuity between tangible and intangible forms between past, present and future. ESS8 sets out measures designed to protect cultural heritage throughout the project life cycle.

ESS9: Financial Intermediaries (FIs)

Financial Intermediaries are set out to assess and manage environmental and social risks and impacts associated with project related investments or subprojects. Good environmental and social management in the subprojects the FIs finance are promoted. This standard is not relevant for the project as it does not involve any financial intermediaries.

ESS10: Stakeholder Engagement and Information Disclosure

The importance of open and transparent engagement between Borrower and stakeholders is recognized as a necessary element of good international practice. Impactive stakeholder engagement contributes to the projects in terms of improvement of environmental and social sustainability, enhancement of project acceptance and successful project design.

2.5 Other Guidelines

2.5.1 The World Bank Group Environmental, Health and Safety (EHS) Guidelines and Good Practice/Guidance Notes and Handbooks

The World Bank Group (WBG) Environment, Health and Safety Guidelines have been prepared as technical reference documents aimed at providing examples of Good International Industry Practices (GIIP), with general and industry-specific aspects.

In addition to the WBG General EHS Guidelines including the subjects of “environment”, “occupational health and safety”, “community health and safety” and “construction and decommissioning”, the WBG has also published sector specific guidelines for a variety of industries. Relevant aspects of the WBG Environmental, Health, and Safety (EHS) Guidelines are applicable to the Project and are considered in the scope of the ESIA Report. In the case project country regulations differ from the provisions of related EHS guidelines, the more stringent of the standards are required to be complied with. The World Bank Group’s sector-specific guidelines regarding the Railways are described below.

- WBG Environmental, Health, and Safety Guidelines for Railways:

This guideline prepared for railways concerns infrastructure projects to be built for passenger and cargo transportation. The guideline consists of two main parts covering the construction phase of railways and maintenance of the railway infrastructure, locomotive and engine services and other maintenance activities.

The following IFC guidance documents will be taken into consideration for the assessment and management of social and environmental aspects of the Project, where relevant:

- IFC’s Stakeholder Engagement Handbook: A Good Practice Handbook for Companies Doing Business in Emerging Markets (2007)
- IFC’s Good Practice Note on Addressing Grievances from Project-Affected Communities (2009)
- IFC’s Handbook for Addressing Project-Induced In-Migration (2009)
- IFC’s Introduction to Health Impact Assessment (2009)

- IFC and EBRD's Guidance Note on Workers' Accommodation: Processes and Standards (2009)
- IFC's Good Practice Handbook on Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets (2013)
- IFC's Environmental and Social Management System Implementation Handbook: Construction (2014)
- IFC's Environmental and Social Management System Implementation Handbook: General (2015)
- IFC's Good Practice Note on Managing Contractors' Environmental and Social Performance (2017)
- IFC's Good Practice Handbook on Use of Security Forces: Assessing and Managing Risks and Impacts (2017)

2.5.2 Canada Environmental Law and Standards

This Act, respecting pollution prevention and the protection of the environment and human health to contribute to sustainable development, is used to compare with the soil quality standards within the scope of this project. Aforementioned soil quality standards were used in the assessment of soil quality and to classify the baseline conditions in terms of soil quality. Relevant information is presented in Chapter 5.1.

2.6 Project Environmental and Social Categorization

The World Bank classifies all projects, including projects involving Financial Intermediaries (FIs), into one of four classifications: High Risk, Substantial Risk, Moderate Risk or Low Risk. In determining the appropriate risk classification, the Bank takes into account relevant issues, such as the type, location, sensitivity, and scale of the project; the nature and magnitude of the potential environmental and social risks and impacts; and the capacity and commitment of the Borrower (including any other entity responsible for the implementation of the project) to manage the environmental and social risks and impacts in a manner consistent with the ESSs. Other areas of risk may also be relevant to the delivery of environmental and social mitigation measures and outcomes, depending on the specific project and the context in which it is being developed. These could include legal and institutional considerations; the nature of the mitigation and technology being proposed; governance structures and legislation; and considerations relating to stability, conflict or security. The Bank discloses the project's classification and the basis for that classification on the Bank's website and in project documents.

Both the environment and social risks of the Project have been rated as "Substantial". Two categories of risks are recognized: (i) those that relate to the impacts of project activities; and (ii) contextual risks. The former relates to civil works related environmental disturbances, habitat degradation and land acquisition and resettlement. The latter, contextual risks, at times, could have a bearing on security to contractors and community safety. All the risks are identifiable and manageable. Environmental and social risks are limited to the impacts associated with railway construction and operation phases such as: (i) air pollution and noise from construction machinery and quarries and operation phase noise and vibration impacts, (ii) soil disturbance and loss during earthmoving, (iii) tree-cutting and loss of vegetation, pest management, (iv) waste generation and management (including hazardous waste), (v) construction camp management, (vi) community health and safety (traffic safety, earthquakes, avalanches etc.), (vii) labor and working conditions (including occupational health and safety), (viii) land acquisition induced physical and economic displacement for individuals and businesses, and (ix) potential impacts on culturally and naturally protected areas.

2.7 Gap Analysis

Major gaps between national legislation and WB ESSs are summarized in Table 8.

Table 8. Comparison Between National Legislation and WB ESSs

ESS*	Gaps between the Turkish Legislation and WB ESSs	Measures to bridge gaps/standards to be followed in this project
ESS1 **Assessment and Management of Environmental and Social Risks and Impacts**	The main gaps between the national EIA and the ESS1 are as follows: ▪ The process of integrating social impact assessment into the Turkish EIA has started in recent years. Especially with the EIA Regulation published in the Official Gazette dated 29.07.2022 and numbered 31907, social impact assessment has started to be included in Turkish EIA. Turkish EIA process is currently open for improvement but requires a fully integrated process to reach ESS1. ▪ In addition, the requirement to address cumulative impacts of other concurrent other projects is limited in Turkish EIA legislation. Under ESS1, cumulative impact assessment is in a more important position. Additionally, where the project involves specifically identified physical elements, aspects, and (associated) facilities that are likely to generate impacts, environmental and social risks and impacts have to be identified in the context of the project's area of influence under ESS1. ▪ The preparation of Environmental and Social Management Plans together with the Stakeholder Engagement Plan (during the EIA application process) has been included in Turkish legislation with the latest regulation. However, the management plans prepared are less comprehensive than the ones required under ESS1. ▪ In addition, ESS1 supports the use of an effective grievance mechanism that can facilitate early indication and prompt remediation for those who believe that they have been harmed by a client's actions. ▪ Supply chain management is also highlighted in ESS1.	According to national EIA Regulation projects are classified into two categories as Annex I and Annex II projects, which is mainly based on magnitude or capacity of planned investment, rather than associated risks and impacts. Therefore, Projects are screened with respect to Annex I and Annex II of the EIA Regulation. However, The WB classifies all projects into one of four classifications: High Risk, Substantial Risk, Moderate Risk or Low Risk by taking into consideration the type, nature, location, sensitivity and scale of the Project, proportional to the significance of the Project's potential environmental and social risks and impacts. Projects are screened on a case-by-case basis. In this respect, this project is exempt from the national EIA Regulation, but it has been determined as Substantial risk under the WB ESF. In order to address this gap, within the scope of the Project, ESMP and relevant E&S sub-management plan (including Construction Impacts Management Plan, Community Health and Safety Management Plan, Community Relations Management Plan, Employment and Training Plan, Aggregate Management Plan, Traffic (Transportation) Management Plan, Cultural Heritage Management Plan, Pollution Prevention Plan, Waste Management Plan, Emergency Preparedness and Response Plan, Occupational Health and Safety Management Plan, and Critical Habitat Assessment and Biodiversity Management Plan, Labor Management Procedure) have been prepared together with this ESIA in line with WB ESF. Moreover, SEP including GRM has also been prepared to develop a gender-sensitive grievance mechanism procedure that also includes employee complaints, where anonymous complaints can be reported, and to eliminate/close this gap.
ESS2	Turkish national laws and regulations are generally close to the requirements of ESS2 in labor and working conditions. The grievance	Labor Management Procedures has been prepared for the RLIP. Moreover, the Contractor will prepare project level Labor Management

ESS*	Gaps between the Turkish Legislation and WB ESSs	Measures to bridge gaps/standards to be followed in this project
Labor and Working Conditions	mechanism for workers is the most important gap between the national legislative requirements and ESS2. There are no specific requirements for the establishment and implementation of a grievance mechanism in Turkish national legislation. Türkiye is party to a multitude of ILO conventions, including but not limited to conventions on equal treatment of employees, gender equality, child labor, forced labor, Occupational Health and Safety (OHS), right of association and minimum wage. Accordingly, the current Turkish Labor Law (No.4857) is to large extent consistent with international requirements.	Plan including gender equality and anti-discrimination, Sexual Exploitation and Abuse/Sexual Harassment (SEA/SH), child labor, forced labor, labor rights and freedom of association. Workers will receive written contracts and be provided access to Workers' Grievance Mechanism
ESS3 **Resource Efficiency and Pollution Prevention and Management**	Most Turkish national laws and regulations are in line with European Union (EU) directives. There is no major gap between ESS3 and Turkish national legislation. National EIA process is quite successful in identifying impacts but does not require provision of a detailed overview of mitigation methods and monitoring. However, within the scope of ESS3, the client needs to consider alternatives and implement technically and financially feasible and cost-effective options to reduce project related GHG emissions during the design and operation of the project. Sub-management plans and monitoring programs have started to be integrated into Turkish legislation with the recent EIA Regulation. Furthermore, there are no major gaps between the impacts and mitigation methods in the national legislation and ESS3 on major environmental issues such as waste, air pollution, water resources, wastewater, noise level. On the other hand, ESS3 requires application of pollution prevention and control technologies and practices under the Project consistent with international good practice, as reflected in internationally recognized standards, such as the World Bank Group (WBG) Environmental, Health and Safety (EHS) Guidelines.	Sub-management plans related to environmental issues have been prepared by considering both national legislation and international standards. The relevant requirements of the WBG EHS Guidelines have been applied to the Project in accordance with the ESS3. In cases where the Turkish requirements differ from the levels and measures presented in the WBG EHS Guidelines, the more stringent one (such as the most stringent discharge and emission standards) has been applied in the project specifications.
ESS4 **Community Health and Safety**	In Turkish national legislation, the general principles of community health, safety and security are fragmented under different regulations. The general principles are like ESS4. However, social issues such as labor influx, gender impacts and violence-based risks are more prominent under the ESS4 along with cumulative assessment and communication mechanism with external stakeholders.	Community Health and Safety Management Plan has been prepared by considering both national legislation and international standards by ensuring effective implementation of Public Grievance Redress Mechanism.

ESS*	Gaps between the Turkish Legislation and WB ESSs	Measures to bridge gaps/standards to be followed in this project
ESS5 **Land Acquisition, Restrictions on Land Use and Involuntary Resettlement**	Turkish legislation on land acquisition basically corresponds to the requirements envisaged by ESS5. However, some gaps include Resettlement Plan (RP) preparation, the implementation of the plan, impact assessment on vulnerable groups, restoration of land-based livelihoods and the lack of recognition of informal land users and squatters. There are the following GAPs between Turkish national legislation and international standards on land acquisition: ▪ Buildings and structures are compensated with depreciations; therefore, full replacement cost is not provided. ▪ According to the Resettlement Law (Law No. 5543), compensation in kind cannot be made except resettlement by the state. ▪ Disclosure and stakeholder engagement, Project level grievance mechanism are not defined as a part of the land acquisition process, ▪ Entitlement defining are limited to the legal title holders of the assets or lands for National Legislation; informal, users, tenants, common land users are not defined as beneficiary and the PAPs without recognizable claims are not eligible for expropriation compensation. ▪ In Turkish Resettlement Law, the cut-off date is defined a three-year residence time limit for non-owners. ▪ Restoration of livelihoods of PAPs are not covered in national legislation and no requirements are defined for the displaced poor or other vulnerable groups to improve their socioeconomic situation.	Within the scope of the ESS5, the Project includes a Project-specific ESIA report with mitigation measures on eliminating the negative impacts that may occur on the fixed assets, agriculture and livestock livelihoods of the local people during the construction or transportation process, and a risk assessment regarding the loss of livelihood and economic displacement of the local people in accordance with the WB requirements. A Resettlement Plan has been developed including livelihood restoration plan in accordance with the potential livelihood losses caused from the Project impacts, based on the determination of livelihoods of local people, socioeconomic status of households and vulnerable groups in accordance with WB ESSs requirements.
ESS6 **Biodiversity Conservation and Sustainable Management of Living Natural Resources**	There is no gap in terms of policy level but internationally recognized areas of high biodiversity value including key biodiversity areas, important nature areas, important bird areas and important plant areas are not fully assessed/considered under national legislation. There is no requirement for habitat assessment in national legislation as well.	Biodiversity assessments made within the scope of the ESIA cover internationally recognized areas of high biodiversity value and habitat assessment and Critical Habitat Assessment and Biodiversity Management Plan has been prepared in this respect.
ESS8 **Cultural Heritage**	The national legislation covers most of the requirements of the ESS8. However, as ESS8 defines the cultural heritage covering both tangible and intangible heritage, Law No. 2863 covers mainly the movable and immovable tangible cultural and natural assets. Under ESS8, the preparation of the Chance Find Procedure is primarily expected during construction activities, especially for the protection of tangible cultural heritage. In contrast, for intangible forms such as socio-cultural aspects, the implementation of a code of conduct and providing	In terms of cultural management, intangible cultural heritage will be considered within the scope of the ESIA and Chance Find Procedure will be given as an Appendix in ESMP document.

ESS*	Gaps between the Turkish Legislation and WB ESSs	Measures to bridge gaps/standards to be followed in this project
	training to all employees become prominent compared to the national legislation.	
ESS10 **Stakeholder Engagement and Information Disclosure**	In the Turkish EIA legislation, EIA Report for the projects in the list of Annex-I will be made available to the public opinion at the headquarters of MoEUCC or provincial directorates. Following MoEUCC's final assessment of the EIA report, the Governor's Office will disclose its reasoned decision publicly. For the projects in the list of Annex-II, the final Project Introduction File (PIF) will be disclosed publicly at the Provincial Directorates. Similarly, public information and consultation meetings are held only the projects listed in Annex-I of the Turkish EIA Regulation.	SEP including GRM has been prepared. SEP/GM will also be disclosed to stakeholders within the scope of the WB requirements.

*ESS7 “Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities” and ESS9 “Financial Intermediaries (FIs)” are not applicable to this Project.

Environmental and Social Instruments to be Implemented

Since environmental and social risk categorization of the project was determined as "Substantial", the following E&S instruments have been prepared along with the preparation of the ESIA Report by considering both national legislation and international standards:

- Environmental and Social Management Plan (ESMP)
  - Construction Impacts Management Plan (CIMP)
  - Community Health and Safety Management Plan (CHSMP)
  - Community Relations Management Plan (CRMP)
  - Employment and Training Plan (ETP)
  - Aggregate Management Plan (AGM)
  - Traffic (Transportation) Management Plan (TTMP)
  - Cultural Heritage Management Plan (CHMP)
  - Pollution Prevention Plan (PPP)
  - Waste Management Plan (WMP)
  - Emergency Preparedness and Response Plan (EPRP)
  - Critical Habitat Assessment and Biodiversity Management Plan (CHA-BMP)
  - Occupational Health and Safety Management Plan (OHSMP)
- Labor Management Procedures (which will form the basis for the Labor Management Plan to be prepared by the Contractor)
- Stakeholder Engagement Plan (SEP) including Grievance Mechanism
- Resettlement Plan (RP)

Additionally, contractors and subcontractors are required to have their own ESMS and site-specific E&S management plans.

Within the scope of the project, ESHS trainings have been provided to DGII PIU for capacity improvement. During the physical disclosure of the ESIA package, project posters and leaflets have been also prepared in order to increase project awareness and inform stakeholders.

3 PROJECT DESCRIPTION

3.1 Project Route

Çukurova Region and İskenderun Bay Railway Connection Project is located within the boundaries of Yumurtalık District in Adana Province, and Erzin District of Hatay Province, in the south of Türkiye.

There are 4 lines to be implemented within the scope of the project; Erzin Station-TAYSEB Connection line, OIZ-Port line, and two (2) other connection lines named as OIZ-Yukarıburnaz line and Yukarıburnaz-Port line. The total line length is approximately 44 km with the branch lines and the detailed information on the lines is given below.

Erzin Station – TAYSEB Connection Line: The planned line starts from the existing Erzin Station (Km: 0+000), continues parallel to the Toprakkale-İskenderun Railway Line about 1,900 m to the south, and leaving to continue to the west. Between Km: 7+000 and Km: 8+000, it passes through west of Yukarıburnaz and arrives to Toros Adana Yumurtalık Free Zone (TAYSEB). This line will be located within the borders of Adana and Hatay Provinces with a total length of 16.79 km. Two new stations are planned on this line which are:

- Station-1 between Km: 7+900 and Km: 8+800 in the North of Yukarıburnaz,
- Station-2 between Km: 15+354 and Km: 16+604 (TAYSEB)

The connection between the existing Osmaniye OIZ, Yumurtalık Free Zone, Ceyhan OIZ, Ceyhan Energy Specific OIZ, and connection between existing Toprakkale-İskenderun railway line will be provided with the existing Erzin Station.

OIZ-Port Line: It is the line that will provide the connection between Osmaniye OIZ and Erzin port to be constructed. In this context, the line will be located in the borders of Hatay Province. The line starting from Osmaniye OIZ and proceeding in the south-southwest direction, reaches to the port, which is not in operation, by continuing parallel to the OIZ-Port Connection Highway. The total length of the line is 13.05 km. Two new stations are planned on this line. These are:

- Station-3 between Km: 0+150 and Km: 1+000 (Osmaniye OIZ)
- Station-4 between Km: 12+150 and Km: 12+850 (Erzin Port)

Other Connection Lines: Two connection lines are planned to be established to provide the connection between the Osmaniye OIZ and Erzin Port line through Station-1.

- OIZ – Yukarıburnaz Station Connection Line is about 8.197 km,
- Yukarıburnaz Station – Port Connection Line is about 6.101 km.

The total length of all lines to be built in this project is approximately 44 km. Most of the lines planned in this project are within the boundaries of Hatay Province, only 2.5 km of the line is in Adana province.

A map presenting the Çukurova Sub-project route and affected settlements is provided in Figure 5.

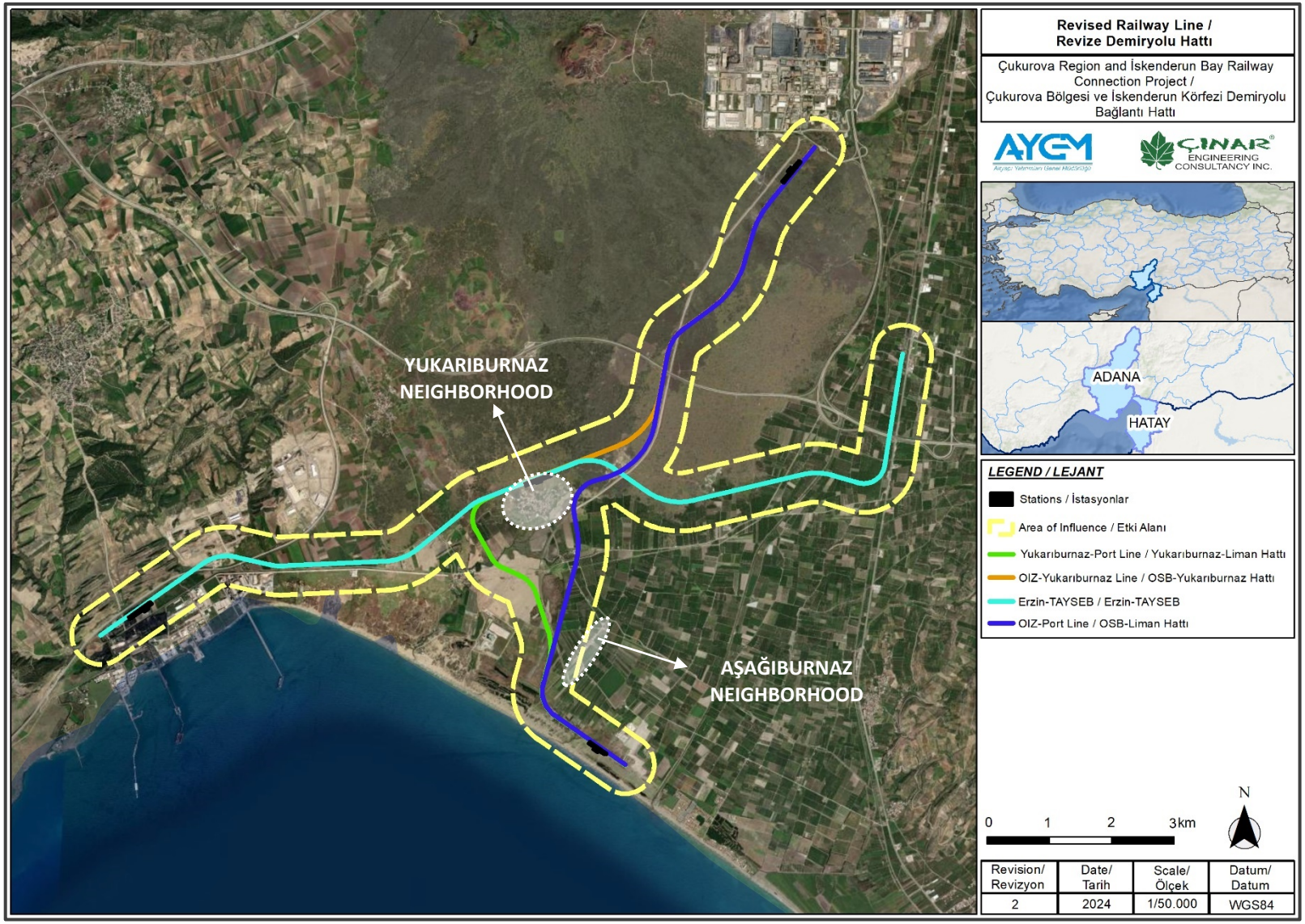


Figure 5. Revised Project Route and Area of Influence

3.1.1 Settlements Along the Route

The area of influence of the project passes from industrial facilities, a coal storage facility, pasture areas used for grazing, agricultural areas, orchards and areas used for beekeeping. The nearest settlement is Yukarıburnaz, approximately 30 m from the project site.

The location of the lines and stations within the scope of the project are given in Table 9.

Table 9. Location of Lines and Stations

Line	Length (km)	Province	Neighborhood	Stations	Station Name
1.Line / Erzin-TAYSEB Connection Line	16.79	Adana & Hatay	Erzin Station, Yukarıburnaz, CPIZ	1. Station	Yukarıburnaz
				2. Station	TAYSEB
2. Line / OIZ-Port Line	13.05	Hatay	Osmaniye OIZ, Yukarıburnaz, Aşağıburnaz	3. Station	Osmaniye OIZ
				4. Station	Erzin Port
3.Line / OIZ-Yukarıburnaz Station Line	8.197	Hatay	Yukarıburnaz	No Station	-
4.Line / Yukarıburnaz-Port Line	6.101	Hatay	Yukarıburnaz		

3.1.2 Land Use Characteristics and Land Ownership

The project area consists of state-owned treasury lands, agricultural areas, pasture areas, forest areas and private lands.

Osmaniye OIZ has facilities focusing mainly on iron and steel, chemical products and yarn production. Çukurova region is a productive and flat plain. The area of influence of the project passes from industrial facilities, a coal storage facility, pasture areas used for grazing, agricultural production areas, orchards and areas used for beekeeping.

3.1.3 Legally Protected and Internationally Recognized Areas of High Biodiversity Value

The detailed information on Legally Protected and Internationally Recognized Areas of High Biodiversity Value is provided in Section 5.7.4.

Legally protected areas of high biodiversity value around the Project route and their IUCN protected area categories are given in Table 10. Considering the distances between the railway route and the legally protected areas in the region, it is considered that there will be no Project-related impacts on these areas.

Table 10. Legally Protected Areas near the Project Route

Protected Area	IUCN Protected Area Category	Distance to the Project Route (km)
Osmaniye Zorkun Wildlife Development Area	IV	11.2
Ciftmazi Nature Park	V	14.1
Şahin Tepesi Nature Park	V	9.8
Kastabala Wetland of Local Importance	IV	16.5
Tekkoz-Kengerli Düz Nature Conservation Area	VI	17.6
Yumurtalık Lagoon Nature Conservation Area, National Park, Ramsar Site	Ia, II, VI	30.6

Internationally recognized areas of high biodiversity value around the Project route are given in Table 11, and the map presenting the protected areas and KBA's around the project area is given in Figure 6.

Table 11. Internationally Recognized Areas near the Project Route

Internationally Recognized Areas	Distance to the Project Route (km)
Burnaz Kumsalı (Dunes) Important Nature Area (INA)	0
Amanos Dağları (Mountains) Important Nature Area (INA)	4.37
Sugözü Akkum Important Nature Area (INA)	5.61
Amanos Dağları (Mountains) Important Plant Area (IPA)	9.39

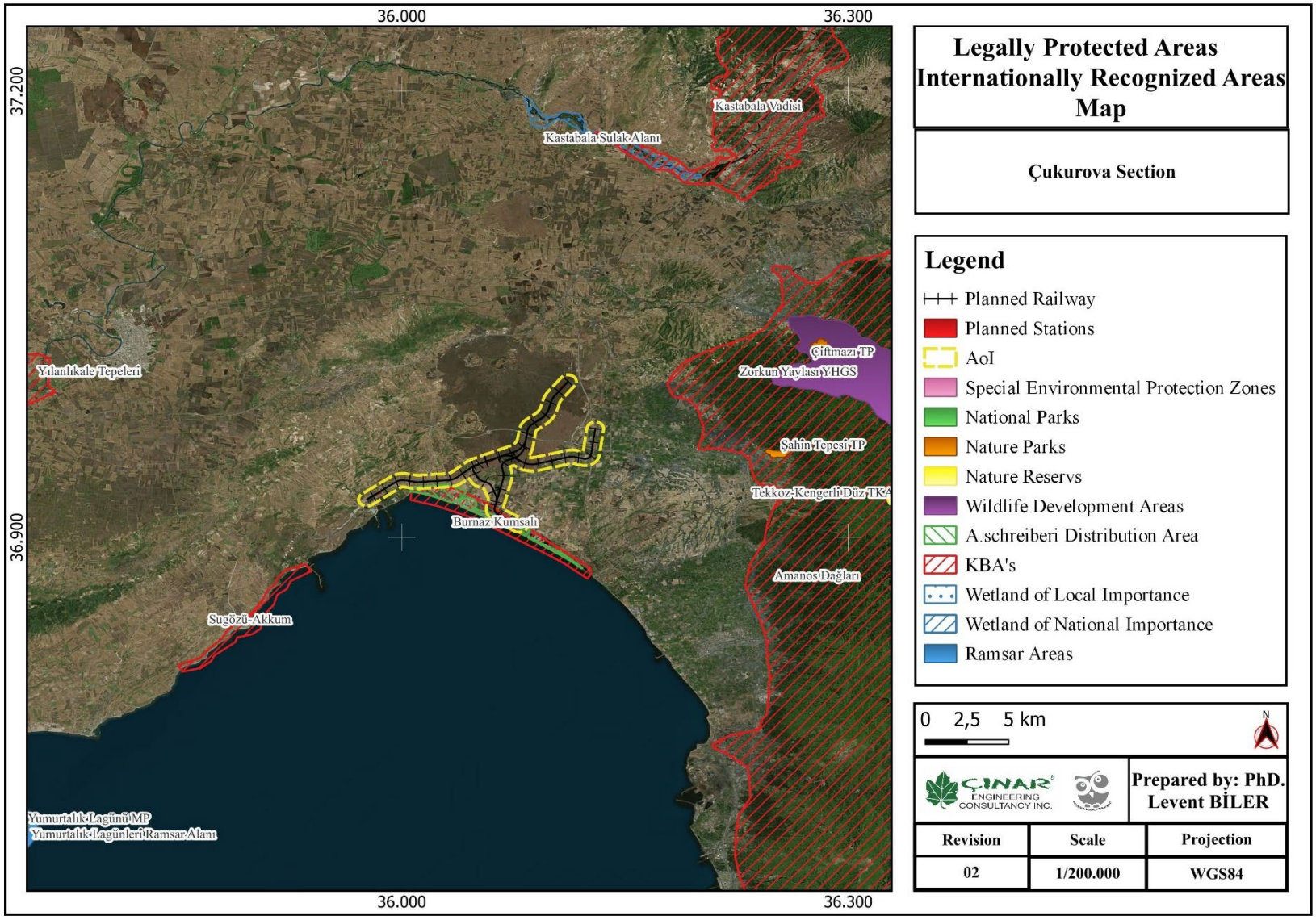


Figure 6. Protected Areas & KBA's around the Project Area

3.2 Project Components

3.2.1 Railway Connection Lines

Osmaniye OIZ - Erzin Port railway connection line (13.05 km long) with dual lines, electrical, signalization planned to be built within the scope of the project will have 2 stations (Osmaniye OIZ and Erzin Port) and the line will connect Osmaniye OIZ to Erzin Port, which is planned to be constructed.

The single-line Connection Line (Erzin Station – TAYSEB Line) which has total length of 16.79 km will start from the existing TCDD Erzin Station and continue approximately 2 km to the south and turn to the west direction. It is planned to reach TAYSEB at the 15th km through the west of Yukarıburnaz. Two station locations, namely Yukarıburnaz Station (Station-1) on the north of Yukarıburnaz and TAYSEB Station (Station-2) are planned on this line.

In addition, it is planned to establish 2 connection lines to provide connection between Erzin – TAYSEB Connection Line and OIZ – Port Line through Yukarıburnaz Station (Station-1), which is envisaged as a logistics station. Of them, the length of the OIZ - Station-1 Connection Line is approximately 8.197 km, and the length of Station-1 - Port Connection Line is approximately 6.101 km.

The design speed of the railway is 80 km/h.

3.2.2 Engineering Structures

Engineering structures planned on the project route and their properties, are given in Table 12.

Table 12. List of Engineering Structures

Line	Kilometer	Engineering Structure
1. Line / Erzin Station – TAYSEB Connection Line	0+672	Overpass
	2+698	Underpass
	3+049	Underpass
	3+154-3+250	Bridge
	3+500	Overpass
	3+714	Underpass
	3+860-3+890	Bridge
	4+414	Underpass
	4+724	Underpass
	6+100	Underpass
	6+760-6+813	Bridge
	9+270	Underpass
	10+413	Underpass
	11+470	Underpass
	11+930	Underpass
	13+735-13+855	Cut&Cover
	14+780-14+984	Cut&Cover
	15+724	Overpass
	16+303-16+333	Bridge
2. Line / OIZ – Port Line	3+982-4+138	Cut&Cover
	4+717-4+798	Cut&Cover
	6+735-6+783	Cut&Cover

Line	Kilometer	Engineering Structure
	7+585	Underpass
	7+883	Underpass
	8+733	Overpass
	10+166	Underpass
3. Line / OIZ - Yukarıburnaz	3+982-4+138	Cut&Cover
	4+717-4+798	Cut&Cover
4. Line / Yukarıburnaz - Port Line	1+386-1+515	Bridge
	1+669	Underpass

Source: Design data provided by EOOE JV

3.2.3 Construction Camp Sites

Contracted workers will accommodate in “worker camps”, meeting the requirements of labor legislation of Türkiye.

In addition, working environment, workplaces and accommodation places will be in line with all requirements covered by Article 26-28 of the *Environmental and Social Standard 2. Labor and Working Conditions, Section D: Occupational Health and Safety (OHS) requirements of The World Bank Environmental and Social Framework*.

Contractors will ensure that the accommodations provided for workers are away from hazards created by the construction work, in good hygiene standards, with fresh drinking water, clean beds, enough blankets, restrooms and showers, clean bedrooms, good illumination, lockers, proper ventilation, safe electrical installation, fire and lightening protection, separate cooking and eating areas. There will be separate facilities provided for men and women.

According to Regulation on OHS in Construction Works (Article 59-65), accommodation places for workers:

- should be non–flammable,
- should be away from hazards created by the construction work,
- have heating, cooling and ventilation systems, electrical installations and lighting systems,
- have sufficient width and sufficient number of tables and chairs, enough bedsteads, beds, blankets, a recreation room,
- have an adequate shower, toilet, washbasin and cleaning equipment etc.

As indicated in the World Bank’s Appraisal Environmental and Social Review Summary[4] (2020) for the Rail Logistics Improvement Project, the camp sites formerly utilized by the Directorate General of Highways are planned to be used during the construction phase. Nevertheless, the footprints of the camp sites are yet to be identified. The information related with relevant baseline and impacts about the camp sites will be available after the contracting company is assigned The additional studies for baseline data collection and environmental and social impact assessment for camp sites will be performed by DGII and the Contractor in line with World Bank Environmental and Social Framework requirements, and that the environmental and social impacts and respective mitigation measures will be analyzed and determined under supplementary site-specific ESMPs.

3.2.4 Other project components

[4] Appraisal Environmental and Social Review Summary (ESRS) – Rail Logistics Improvement Project – P170532 - https://documents.worldbank.org/en/publication/documents-reports/documentdetail/500511589912913671/appraisal-environmental-and-social-review-summary-esrs-rail-logistics-improvement-project-p170532

Other project components include electricity transmission lines for electrification of the railways, quarries for supply of materials and access roads.

3.2.4.1 Access Roads

As specified in the World Bank's Appraisal Environmental and Social Review Summary (2020) for the Rail Logistics Improvement Project, the project sites are already accessible through existing roads, therefore no construction of additional temporary and permanent access roads are anticipated in the scope of the Project. In case new access roads are considered necessary according to the results of the additional studies to be undertaken at the final design stage, the environmental and social impacts of the new access roads will be identified and assessed through the use of the Management of Change Process detailed as part of the ESMP in line with World Bank Environmental and Social Framework requirements, and that the environmental and social impacts and respective mitigation measures will be analyzed and determined under supplementary site-specific ESMPs.

3.2.4.2 Energy Transmission Lines

As specified in the Special Technical Specification of the Railroad Lines, for the feeding of the catenary system, there will be 1 substation and 9 traction posts on the route. There will be two 154 kV / 27.5 kV, 50 Hz single phase transformers in the substations and distribution of these transformers between phases will be provided in a balanced system. Transformers will be placed on rails to be laid on foundations. In addition, oil collection pit will be provided for each transformer. Transformer foundations will be designed to be earthquake resistant.

Even though the substation area is planned to be 70x100 m, the location of the substation area is not determined yet and will be specified based on the results of the additional studies to be undertaken at the final design stage. The Construction Contractor to be determined will perform the construction works such as excavation, control building, foundation, perimeter wall, wire fence, rail, concrete channel, stone pavement and access road for the substation. Crushed gravel with a thickness of 15 cm will be laid on the floor of the substation and the gravel will be covered with asphalt with a thickness of 15 cm. In order to prevent water accumulation in the substation area, the gravel and asphalt coating will be sloped in a herringbone pattern.

Drainage channels will be constructed in order to prevent the substation site from being affected by rainwater, and these drainage channels will be laid in a way that will surround the substation. Rainwater accumulating in the channels will be discharged out of the substation area with channels / pipes to be placed every 20 meters.

Similarly, the route and technical details of the energy transmission line that will provide energy to the substation are not determined yet and will be defined by the Contractor company assigned to the project.

The environmental and social impacts of the energy transmission line and substation (including resettlement subjects) as well as respective mitigation measures will be analyzed and determined by DGII (and Design and Supervision Consultant) under supplementary site-specific ESMPs in line with ESF requirements when the locations and technical specifications of these facilities are finalized prior to the construction activities. The operation of the energy transmission line and substation will be in line with the World Bank ESF requirements.

3.2.4.3 Quarries and Material Borrow Pits

Material quarries surveys were carried out for the determination of materials to be used in railway lines (infrastructure, superstructure, engineering structures, concrete works, etc.) during the feasibility studies. Accordingly, basalts borrow quarry located 50 meters to the right side of the OIZ – Station 1 Line KM = 0+500. Assuming that an average of 4-5 meters of material will be taken, there are approximately 2,500,000 m^3 of material reserves in the quarry. The quarry material is suitable for use as fill material. It can also be used as rock fill material.

However, the mentioned area remains within the 1st Degree Protection Area on the "Burnaz Spring Group Groundwater Reserve and Protection Area" and material extraction activities are not permitted in this area. Therefore, consent of 6th Regional Directorate of State Hydraulic Works (DSİ) have to be taken in order to use the determined quarry. If the consent cannot be taken, other existing quarries (such as Yılankale (Kokartepe) Quarry) previously used by the General Directorate of Highways will be used. The material at Yılankale (Kokartepe) Quarry, which is approximately 47 km away from the Connection Line, is broken and sieved and suitable for use in subbase, subbalast, concrete aggregate and engineering structures. There are more than 1.000.000 m^3 of reserves in the quarry area. Quarry is on the treasury land, licensed on behalf of the 5th Regional Directorate of Highways and operated by a private company. Material purchase will be provided by purchasing from the private company operating the quarry. In addition, there is Badilli Quarry at a distance of 310 km from the Connection Line. In Badilli Stone Quarry, the quarry material is broken and sieved; it will be made suitable for use as ballast material. There are more than 1.000.000 m^3 of reserves in the quarry area. The quarry is licensed on behalf of the private company, and the quarry is still in operation. Material purchase will be provided by purchasing from the private company operating the quarry.

The environmental and social impacts of the quarries and material borrow pits as well as respective mitigation measures will be analyzed and determined by DGII (and Design and Supervision Consultant) under supplementary site-specific ESMPs once they are specified based on the results of the additional studies to be undertaken at the final design stage. The operation of the quarries and material borrow pits will be in line with the World Bank ESS1 and the World Bank Group Environmental, Health, and Safety Guidelines for Construction Materials Extraction.

3.3 Other Projects/Facilities with Footprints Geographically Overlapping with the Project Area

In the region, there is Erzin Port to be constructed in line with the priorities of the Turkish transport sector. The construction of Erzin Port is however not dependent on the construction of the railway network and therefore not considered as associated facility. Moreover, there is TAYSEB in the Çukurova Region, of which the footprints geographically overlap with the Project area.

3.3.1 Erzin Port

The Erzin Port, planned by Tosyalı Holding Inc., the larger producer in Osmaniye OIZ, will have an annual capacity of 10 million tons of bulk cargo, 2.5 million tons of container cargo and 300 thousand tons of fuel oil.

In this context, the "Port and Shipyard EIA Report" was submitted to the Former Ministry of Environment and Forestry and the "EIA Positive" decision was taken for the Port and Shipyard Project with the letter of the Ministry dated 05.04.2011 and numbered 29072. Currently, no investment has been made for the project with the EIA Positive Decision and no construction activity has been carried out. No construction activity will be carried out within the scope of the Port and Dredging Project in the area where the "EIA Positive" decision has been taken for the Port and Shipyard, before the completion of the EIA Process of the Planned Port and Dredging Project. As a result, "Port and Dredging Project" is planned by making changes in the Port and Shipyard Project, where the EIA Positive Decision has been taken in April 2017. In the area where EIA positive decision was taken, Tosyalı Denizcilik ve Liman İşletmeciliği A.Ş. planned to operate only the port facility.

Within the scope of the planned port facility, a hinterland area will be established, encompassing the coastal line seaside and the embankment area on the shore, where the

container, bulk dry cargo, general cargo, ore and fuel stock areas will be located. In addition, 29,222 m² west jetty and dock, 44,575 m² east jetty and dock, 46,620 m² pier will be constructed in the sea part and the port facility will cover a total area of 1,039,436 m².

In the parcel owned by Treasury in Turunçlu Village, Erzin District of Hatay Province,

- 305,108.30 m² with Easement of Convenience Agreement,
- 462,376.70 m² with Residential Usage License Agreement,

A total of 767,485 m² area is currently leased by Tosyalı Denizcilik ve Liman İşletmeciliği A.Ş. for 49 years. As the port facility will be located on an area of 1,039,436 m² in total, an additional 271,951 m² will be leased for the project.

In the Final EIA Report presented on 03.03.2017, the works and transactions carried out so far regarding the project are listed below:

- "Decision of Public Utilities" decision taken with the letter of the General Directorate of Shipyards and Coastal Structures dated 09.02.2015 and numbered 8926,
- 1/5000 scale approved zoning plan where Port and Shipyard Project area is issued,
- Geological-Geotechnical Survey Report prepared on the basis of the approved zoning plan,
- Ship Maneuver Simulation Modeling Report,
- Sea Turtles and Mediterranean Monk Seal evaluation reports,
- Revised Zoning Plan (dated 22.07.2014 and No. 35300) approved by General Directorate of Shipyards and Coastal Structures where Port and Dredging are issued
- KGM 5th Regional Directorate and Osmaniye OSB connection road approvals and connection road plan for the connection road from Osmaniye OSB to the Port and Bottom Dredging project area,
- Opinion of Hatay Governorate, Provincial Directorate of Environment and Urbanization about natural assets - natural sites in the project area.

The works to be completed after the EIA process of the project are listed below:

- Approval of Revised Zoning Plans,
- Obtaining a construction license from the relevant Municipality and informing the port authority that the construction has started,
- The Dredging Environmental Management Plan Report will be prepared and submitted to the Ministry of Environment and Urbanization, and permission will be obtained for the use of the dredging process and the dredging material dump site,
- In accordance with the Regulation on Starting Up and Operating a Workplace, obtaining Business License and sub-permits,
- Application to Environmental License on Wastewater Discharge, Noise, Environmental Permits and Waste Acceptance Facility,
- Obtaining Business Certificate
- Preparation of Emergency Response Plans,
- Permissions will be obtained such as non-agricultural use permits for agricultural lands likely to be used, etc.

Currently, the construction of the Erzin Port has not commenced; however, the construction of the connection roads and access roads to the port area were nearly completed. According to the EIA legislation in force at the time when the EIA Report was approved in 2017, it is not mandatory to conduct EIA monitoring studies throughout the construction phase of the project.

The project area does not have any natural disaster risk such as landslides and rock falls. However, a large part of Erzin Port is located in the sea and soil sediments are the dominant lithology. As a result of the calculations and observations made, the port area was evaluated as “Areas where precautions should be taken in terms of liquefaction risk: Preventive Area 1.1 (ÖA-1.1)”.

The port area is located in the 1st degree seismic zone and all planned buildings will be constructed in accordance with the "Regulation for the Structures to be built in Disaster Areas". In addition, all construction measures will be taken for the specified geological risks as stated in the results and suggestions chapters of the geological-geotechnical survey report prepared for the port area.

Regarding Sarısu Stream within the boundaries of the port area, it has been stated that surface waters related to the region are collected and generally not exposed to flooding, but under the influence of flooding in extreme possible precipitation according to official letter of 6th Regional Directorate of State Hydraulic Works (dated 20.10.2009 and No: B.12.4.İLM.031.00.01.03/9045).

In this context, according to annual flood flow data with 500 recurrences of Sarısu Stream within the port boundaries, route change was prepared and approved by the 6th Regional Directorate of State Hydraulic Works.

All measures will be taken by the port owner against the flood risk in case of extreme precipitation, the water basement level of buildings will be applied at sufficient height from the natural ground level, and no damage loss will be requested from DSİ regarding the damage that the port owner and the third parties may face due to the construction, DSİ will not be held responsible for flood losses.

In the port area, it has been determined that there are Tadpole and Green Sea Turtles in the marine zone, Soft Shell Nile Turtle in the Terrestrial Zone, and again the Soft Shell Nile Turtle in the lentic and lotic zones. Considering the IUCN and BERN Lists of the species found in the area, it is seen that all of them are protected species both at national and international level, which are highly endangered and at risk. According to the herpetofauna and hydrobiological surveys conducted between September 2022-August 2023 within the scope of the Project, the Soft Shell Nile Turtle was not observed.

Considering the risk conditions of the species, the establishment and operation of the port in the specified area without taking the measures specified in the Final EIA Report will have serious adverse impacts, especially for the Trionyx triunguis / Soft Shell Nile Turtle, which are critically endangered. The mitigation measures set out in the approved EIA report include, protection of the wetlands around the port area and its immediate surroundings (<30 m) that these species utilize, and no construction activities will be allowed during spawning period resulting in light and noise disturbance on the species, the water sources, reed and dune areas around wetlands will be protected. Doctorate level relevant biodiversity expertise is required for activities to be carried out in the zone close to these areas. During the construction and operation phases, monitoring studies will be carried out regularly and in every nesting season (during May-October) under the supervision of a doctorate level relevant biodiversity expert who has worked in the area or its immediate surroundings. All activities will be carried out under the consultancy and approval of the expert until the end of the construction and operation phases of the port.

Apart from these suggestions and practices, it is recommended to carry out the necessary studies and take precautions in line with the expert opinions in order to solve the problems that may arise regarding the subject. If the suggestions presented under this heading are implemented, the negative impacts that the facility to be established on the sea and brackish turtles will be minimized.

The provisions of the Law on the Principles of Emergency Response and Compensation of Damages in the Contamination of Marine Environment with Petroleum and Other Harmful Substances (No: 5312) and its legislations will be followed, and the Coastal Facility Risk Assessment and Emergency Response Plan will be prepared in line with the legislations by the institution authorized by the Ministry before the facility is operational. In case the risk changes at the facility, “Risk Assessment and Emergency Response Plan” will be prepared again. If the risk does not change, necessary revisions will be made and submitted for

approval. In case of any accident in the marine environment, necessary measures will be taken under this plan.

Since the port area has a flat land structure, no erosion hazard and sedimentation formation is expected. However, necessary measures must be taken against the sedimentation risk that may occur in İskenderun Bay during excavation and filling operations.

Based on the analysis of the available information regarding the management of potential environmental and social impacts associated with the construction and operation of the Port, no major environmental and social risks to the proposed Project activities are expected to be caused by the Erzin Port since the spatial extent of the overlap is limited, the construction and operation of the Port are subject to national environmental legislation and also governed by the recommendations of the EIA Study. Main monitoring parameters within the project area, such as noise level, vibration, air quality and soil quality, biodiversity will be monitored throughout the project implementation, and mitigation measures will be updated accordingly, if needed.

3.3.2 TAYSEB

The Adana Yumurtalık Free Zone which is in the same area as Toros Tarım's production and terminal facilities in Ceyhan, was founded in 1990 and is being managed and operated by Toros Adana Yumurtalık Serbest Bölgesi Kurucu ve İşleticisi A.Ş. (TAYSEB) under a thirty-year contract. Occupying 4,635 thousand m^2 of grounds and with all of its infrastructure fully completed, TAYSEB is one of Türkiye's biggest free zones.

TAYSEB was also the first free zone in Türkiye that was set up explicitly for the conduct of industrial endeavors. Owing to its convenient location on the Gulf of İskenderun and to its access to a wide range of transportation options, TAYSEB offers substantial advantages for industrial concerns that want to benefit from freezone incentives. A location immediately adjacent to the Ceyhan Specialized Energy Industry Zone, which is set to become the site of major investments in energy in the future, is yet another feature that enhances TAYSEB's appeal.

Owing especially to a surge in petrochemical and chemical industry activities in recent years, TAYSEB has become a preferred investment and production center to which both sectors are giving priority. There are currently twelve firms in the zone that are engaged in activities associated with the production, storage, importation, exportation, and trade of chemicals. Also on the horizon are a number of big-ticket investments involving the production of chemicals which currently must be imported. In the near and medium terms therefore, TAYSEB is expected to become a production center for the strategic chemicals that Türkiye needs.

TAYSEB also provides its tenants with terminal services at the Torosport Ceyhan Terminal. Major industrial establishments located in the zone are allowed to build jetties of their own (Tekfen Holding, 2016).

The geographical footprint of TAYSEB overlaps with TAYSEB Station that will be constructed in the scope of Project. TAYSEB and its tenants are subject to Turkish environmental and social regulations and there are no public sources indicating incompliance with the national regulations or major violations. Based on the analysis of available information no major environmental and social risk are expected to be caused to the project activities by the operation of TAYSEB as its environmental and social management will be in accordance with the requirements of the national environmental legislation.

3.3.3 Solar Based Renewable Energy Zones (REZ)

There are two planned solar energy power plant (SPP) projects named as Erzin-1 and Erzin-2 SPP, located in the Çukurova sub-project area. The areas shown in Figure 7 were allocated

for “Solar-Based Renewable Energy Zones (REZ)” by the Ministry of Energy and Natural Resources (MoENR).



Figure 7. Solar-Based Renewable Energy Zones

The Phase-1 railway design was overlapping with the Erzin-1 SPP project area as shown in Figure 8. During Phase-2 design studies, the railway route was revised as shown in Figure 9 to avoid REZ allocation area and a letter, dated 19.04.2023 and numbered 1106592, about the route revision was submitted to MoENR to obtain the required permit for Çukurova Sub-project.

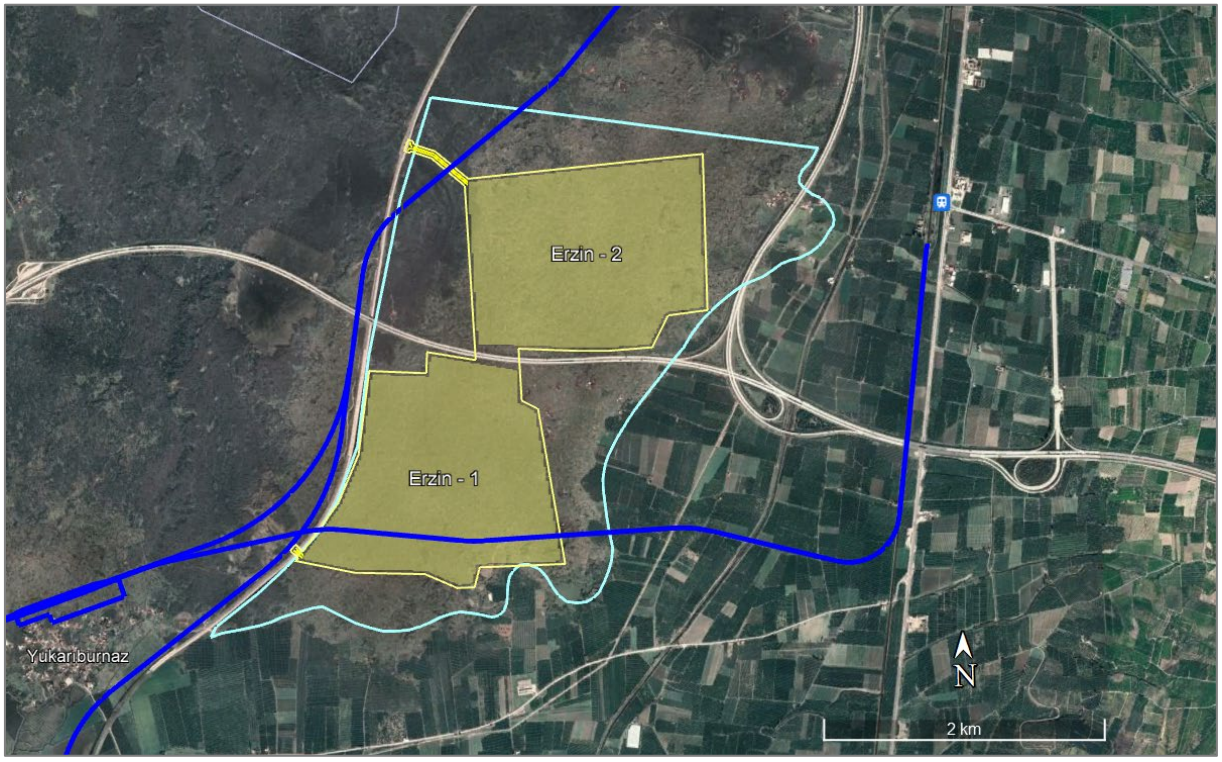


Figure 8. Phase-1 Railway Design – Overlapping Areas with SPP Projects

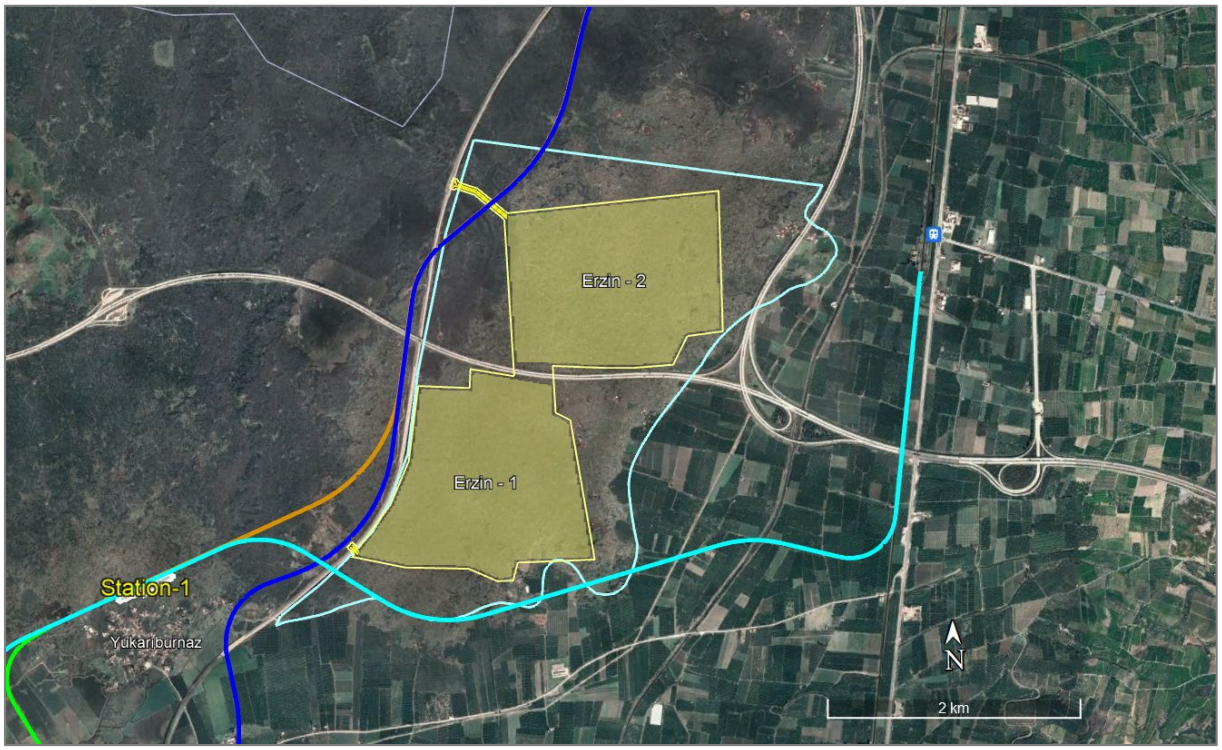


Figure 9. Phase-2 Railway Design – Overlapping Areas with SPP Projects

In the current situation, MoENR has indicated in the letter dated 11.05.2023 and numbered 188577 that the Phase-2 railway design intersects the connection road of the Erzin-2 SPP Project (see Figure 10). The letter of DGII dated 21.06.2023 and numbered 1218135 stating that the details of the railway design at the intersection point with the connection road will be completed at the final project stage submitted to MoENR. Therefore, a transition structure (an

overpass) was designed considering the connection road of Erzin-2 SPP during the final design stage and shown in Figure 11.

Prior to the construction works, DGII will obtain the permit from MoENR regarding the railway design at the intersection point with the connection road, and the transition structure designed.

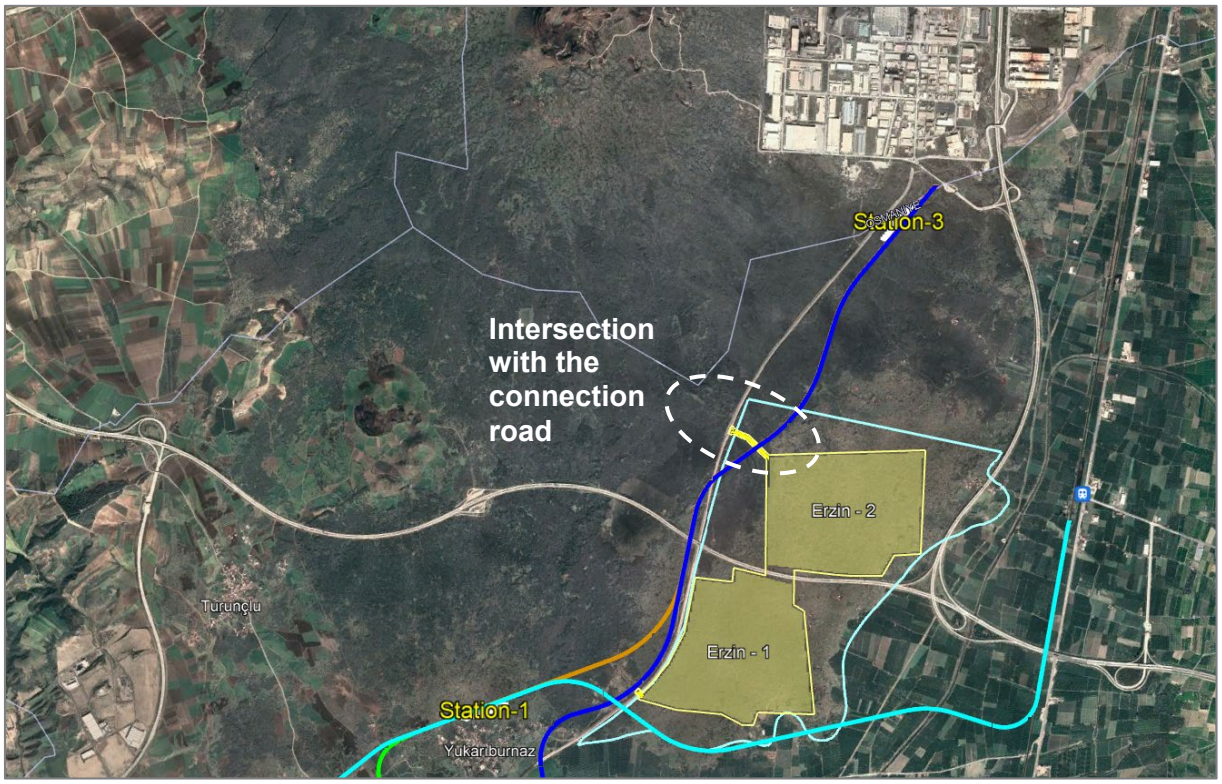


Figure 10. Railway Intersection with the Connection Road of Erzin-2 SPP

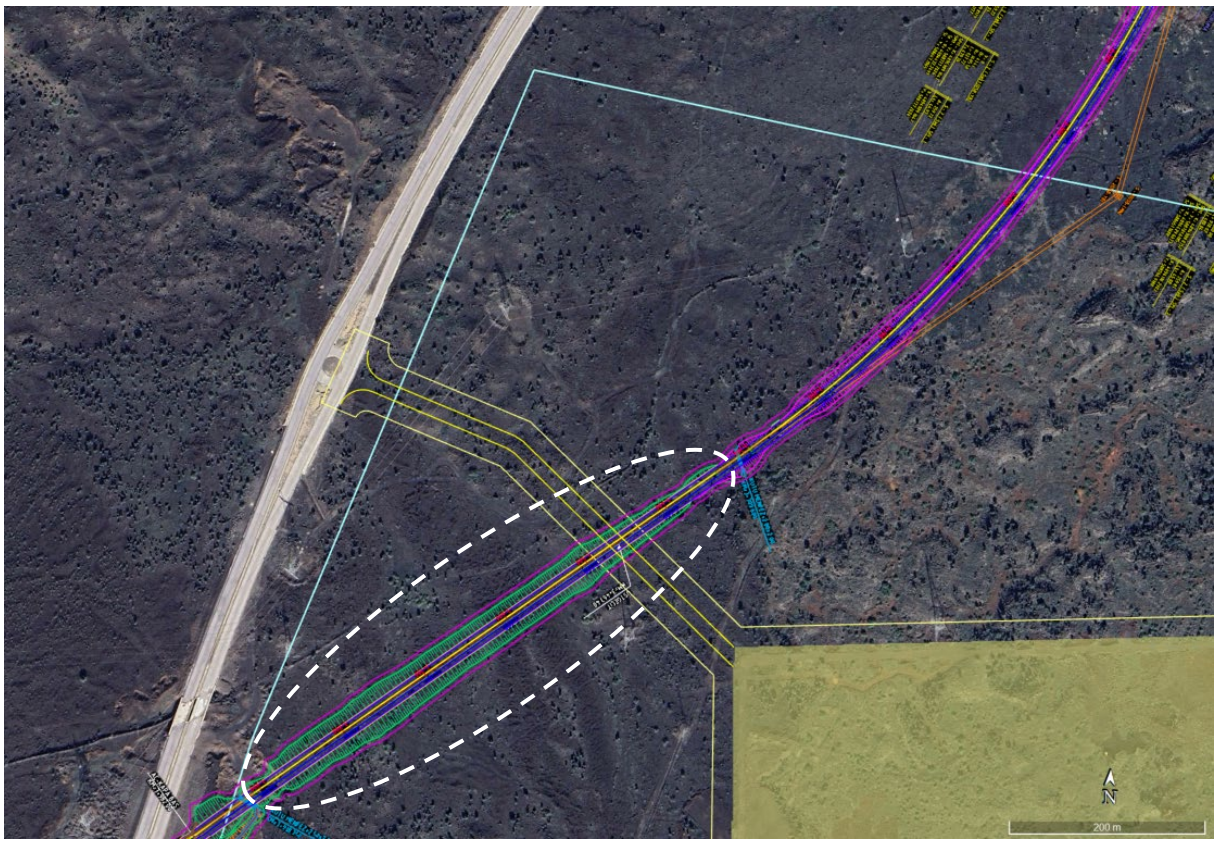


Figure 11. Transition Structure Designed for the Railway Intersection

3.4 Project Activities

3.4.1 Land Preparation and Construction Activities

The main activities to be carried out within the scope of land preparation and construction will include:

- Geodetic and topographic studies, mapping studies,
- Preparation of implementation projects and expropriation plans,
- Initial field works (root ball removal, chopping, off-site transfer etc.),
- Earthworks (excavation and fill works, soil leveling, soil compaction, soil stabilization, etc.),
- Construction of railway superstructure elements (ballast and lower ballast layers, ties and connections and railway lines),
- Rail compression, rail welding, rail stretching, rail lubrication, rail grinding, rail system switch assembly works,
- Construction of engineering structures,
- Construction of stations (all rough and fine construction works and electrical and mechanical installation works of stations),
- Electrification, signalization and telecommunication works.

3.4.1.1 Earthworks

As stated in the Geological-Geotechnical Survey Report prepared for the Project, Delihalil basalts consist of Karataş formation, Kızıldere formation and very few alluviums. Basalts that will come out from the cuts can be used in fillings. However, materials that will come out of

alluvial cuts, Karataş formation materials and Kızıldere formation materials that will come out of cuts should not be used in fillings. As a result, the cut materials that will come out of Karataş and Kızıldere formations consisting of mudstone, claystone, siltstone, sandstone, marl units, and clayey floors on the upper parts of them should not be used in fillings and should be disposed of. According to the Geological - Geotechnical Survey Report, alluvial cuts are small enough to be neglected, and the materials that will come out of these cuts should not be used in fillings and should be disposed of.

As stated in the Geological - Geotechnical Survey Report, the basalts 50 meters away from the OIZ - Station line at Km: 0+500 was determined as borrow pit. The area to the northwest of the borrow pit is also shown as a depot area. The dimensions of the depot area are 500x1000 meters. Some of this area was previously used by Directorate of Highways as a depot area. The materials that are not used in the fillings that will come out from the cuts should be properly stored on this depot area in a way that does not cause environmental pollution.

According to the Geological – Geotechnical Survey Report, there are high cuts and fills in some sections along the railway routes. The slope plan and cross sections are examined and the cut/fill lists containing the cut/fill intervals and maximum heights are prepared. Cut slopes will be created with 2y/1d slope. Basalt cuts, in some sections, was found appropriate to have a 2y/1d slope in order to have the upper levels in the form of slag and meet some of the fill material needs along all the railways routes. The fills will be formed with a 3y/2d slope with the materials to be extracted from basalt cuts and the materials to be drawn from the borrow pit consisting of basalts.

According to the Feasibility Study Report, the estimated earthworks volume along the railway routes is 1,515,190.75 m^3.

3.4.1.2 Construction Material Requirements

Materials to be required for the construction works will include concrete, aggregate, water, bitumen, additives, etc.

3.4.1.3 Use of Hazardous Substances

Ammonium nitrate / fuel oil (ANFO), an explosive consisting of ammonium nitrate and diesel fuel, can be used in the project route, where soil and rocks cannot be excavated using standard equipment. ANFO is an explosive substance obtained by mixing ammonium nitrate with fuel oil (or diesel oil) by 5-6%. It is the most consumed mixture in the world and Türkiye because it is cheaper and safer. Detonation rate reaches 4400 m / s in a blasting hole with a diameter of 250 mm. Therefore, ANFO cannot reach a constant detonation speed in holes with diameters less than 25 mm. Ideally, ANFO achieves the highest velocity of detonation in medium and large diameter (75-250 mm) holes. For ANFO to be detonated, it must be fired with a higher primer (dynamite, etc.).

During the blasting operations, firstly, the holes where explosives will be placed in the blasting area will be opened with the help of the wagon-drill tool. ANFO will be placed in a sufficient amount (depending on the rock structure in the area to be blasted) in the holes drilled. After inserting ANFO explosive material into the holes, dynamite and then delayed detonators will be placed as igniters. After the delayed detonators are placed in the holes, the tightening process will be applied to close the holes, and then detonating will be performed after the necessary safety measures are taken.

In addition to blasting materials, the fuels to be used by construction equipment and machinery constitute the remaining main hazardous materials requirement of the Project construction phase.

3.4.1.4 Construction Machinery and Equipment

Estimated type and number of main construction equipment and machinery required to complete the Project execution in time is provided in the table below.

Table 13. Main Construction Phase Equipment and Machinery Requirement

Machinery and Equipment	Number of Machinery and Equipment
Water Truck	2
Concrete Mixer	6
Concrete Pump	6
Truck	14
Pickup	10
Backhoe loader	9
Water Tanker	3
Trailer	9
Fuel Tanker	3

3.4.2 Operation and Maintenance Activities

The Project will be transferred to General Directorate of State Railways after completion of the construction.

Only freight trains will be operated on the lines to be built in the project. It is planned to run 43 freight trains on the OIZ-Port line and 53 freight trains on the Erzin-TAYSEB Connection line in 2043, which is the target year of the project. Therefore, the total number of trains on both lines is 96. It is foreseen that the trains will run 20 hours a day and their average speed will be 60 km/h.

After the completion of the construction of the railway connection lines, the Contractor will present a test program to be approved by DGII and all errors and deficiencies observed during the system control will be removed before energizing. During acceptance tests, when the system is de-energized, control of the mechanical condition and electrical openings of the tramline with pantograph at different train speeds, control of the current drawn at different train speeds and dynamic and static tests of the system according to 120 km/h speed will be performed. Due to the nature of the work, temporary acceptance can be made in parts and the system will be energized after the temporary acceptance phase. After energizing the catenary system, a trial run will be made on the line with an electric rail vehicle to observe whether the system is working properly. After the Contractor declares that the lines are ready for temporary acceptance, the Contractor will carry out the works and procedures within the framework of "Construction Works Inspection and Acceptance Regulation" and "Construction Works General Specification" by DGII. The period following the temporary acceptance of all catenary systems is called the trial operation period. The trial operation period of the system is 12 months. Final acceptance is made 12 months after the temporary acceptance of the whole system. The warranty of the system will begin after temporary acceptance and will be guaranteed for 24 months against system design defects, dysfunctional work or malfunctioning. Faults occurring within the warranty period will be reported to the Contractor as soon as possible. The contractor will intervene the malfunctions within 12 hours of the notification and make the system ready for service within 2 days at the latest.

Line Cleaning

The fact that there is no element on the line that may affect the train movement is essential for the proper operation of the railway's operational activities. Regular inspections will be carried out in order to detect and clean the stones and rock pieces that can be found on the line. In addition, especially in the autumn season, the accumulation of leaves on the railway line

caused by the defoliation from trees is one of the most important reasons for the trains to experience wheel damage. [5]. As a result of the leaves being crushed by trains and contacting with rain, a rough and teflon-like layer forms on the rails, which may pose risks such as wheel slippage and skidding. In order to prevent this situation, regular inspections will be made on the line and it will be ensured that the line is clean.

Railway Failures

On the railway route, the suitability and robustness of the rails will be regularly monitored, and the safety of the rails will be inspected by the operating personnel, especially in the culverts, which are likely to experience breakage and cracking.

General Maintenance

Maintenance work will consist of routine and heavy maintenance. The Operation and Maintenance Contractor will be responsible for routine maintenance work. All operation and maintenance work will be carried out in accordance with the Conditions of Implementation Agreement, international standards and relevant local legislation. No construction activities have been planned other than regular maintenance activities on the road during the operation period. Routine maintenance tasks will generally include:

- General maintenance tasks (e.g. garbage collection, cleaning, sweeping, protecting wall cleanliness, removal of residues, watering of any kind of plants, oil, diesel, chemicals, detergents, objects, materials or similar things on road cover, removal of damaged, defective or fuel-free vehicles, supply and renewal of all consumables during the operating period, snow removal including winter maintenance and de-icing, repair of all kinds of equipment caused by accidents, theft incidents or railway equipment maintenance and repair work, replacement of the operation equipment at the end of its life, change of equipment etc.);
- Inspections and investigations (e.g. routine visual inspections of the railway that do not require any training or equipment other than hand tools or similar non-special equipment, conducting routine, periodic or special inspections of the railway);
- Repair works (e.g. repair of holes, filling cracks on asphalt or concrete surface) or asphalt and concrete pavement maintenance including re-coating to a certain extent repair and renewal of asphalt or concrete curves to a certain extent (including poles, foundations, clamps, etc. or a certain extent of the walls.), accidents, theft or repair / replacement of metal railings, tension cable type railings or concrete / plastic barriers due to operation failure;
- Maintenance of electrical and non-electrical signs;
- Maintenance and repair of lighting equipment;
- Landscaping work (e.g. maintenance of green areas, mowing, weeding, etc.);
- Dyes;
- Maintenance and repair of mechanical and electrical systems and components, traffic and toll systems, communication systems, traffic management systems, SCADA systems etc.

3.5 Project Workforce

The categories and numbers of labor force are required during the land preparation and construction phases of the Project given in Table 14.

Table 14. Required Labor Force within the Scope of the Project

[5] http: //www.railway-technical.com/trains/train-maintenance/

Category	Labor Force
12 - 20 heavy machinery operators	▪ Excavator operators (crawler, rubber wheel, with suitable attachments according to the type of work), ▪ Loader operators, ▪ Grader operators, ▪ Cylinder operators (single bandage and tandem rollers with drum), ▪ Truck, pumper etc. drivers, ▪ Dozer operators, ▪ Paver operators, ▪ Ballast regulator operator, ▪ Buffer machine operator, ▪ Locomotive operator, ▪ Dynamic line stabilizer operator,
25 - 30 employees for railway superstructure-line works team	▪ Railway superstructure bed forming employees (lower ballast-ballast layers, regulation), ▪ Specialists of traverse-rail connection assembly and scissor placement, ▪ Scissor engine assembly's expert employees, ▪ Rail butt welding, ray aluminothermic welding specialist employees, ▪ Welding grinding, welding stripping works, ultrasonic inspection expert employees, ▪ Line field mathematics specialist employees, ▪ Line stabilization expert employees,
25-30 employees for the railway engineering structure works team	▪ Filling, cutting, compacting, soil improvement works workers (except heavy machinery operators), ▪ Experts working in explosive parts, if any, ▪ Drainage workers, slope arrangement workers (except heavy machinery operators), ▪ Engineering structure concrete - mold - iron works, insulation works workers (excluding heavy machinery operators),
30-35 employees for the station buildings construction team	▪ Rough construction workers (concrete works-formwork-reinforcement works, roof works-infill wall works etc.), ▪ Fine construction workers (insulation works, plaster works, floor coverings, paint works, assembly works, plaster, facade coating etc. works), ▪ Electrical works employees, ▪ Mechanical works, installation etc. employees,
25-30 employees for the electromechanical works team	▪ Line electrification, catenary systems and signaling works employees, ▪ Telecommunication works employees,
12 to 16 engineers and technicians	▪ Civil engineer, ▪ Geomatics engineer, ▪ Electrical and electronics engineer, ▪ Mechanical engineer, ▪ Environmental and social experts, ▪ OHS team, ▪ Construction, electricity, machine technician, ▪ Map and measurement team, ▪ Foreman,
12 to 16 administrative support staff	▪ Accountants, ▪ Employees engaged in manufacturing-field-vehicle maintenance-repair, ▪ Security guard, ▪ Secretary ▪ Refectory employee, ▪ Driver, ▪ Tea maker, cleaner etc.

Accordingly, approximately 140 - 180 personnel will be employed for land preparation and construction activities to be carried out within the scope of the project. Not more than 180

personnel are expected to be employed for land preparation and construction activities. It is estimated that most or all of the staff will be provided from the local and regional workforce.

The number of personnel foreseen to be employed during the operation phase is not determined yet.

3.6 Implementation Program

The construction of the railway route is planned to start in the second half of 2024 and will take approximately 24 months. Construction is planned to be completed by 2026.

4 METHODOLOGICAL APPROACH TO IMPACT ASSESSMENT

This Chapter presents the proposed process for undertaking an ESIA for Project and the proposed methodology to be used for the assessment of identified potential impacts, which considers both receptor sensitivity and the magnitude of the impact.

4.1 ESIA Process and Approach to the Assessment

As of October 1, 2018, all investment projects financed by the World Bank are subject to the Bank's Environmental and Social Framework (ESF). The ESF ensures that the WB and its borrowers (the beneficiary party) manage projects' environmental and social risks better and improve their development outcomes.

The ESF ensures that environmental and social risks/impacts are addressed comprehensively and systematically. The ESF has made significant progress, including extended roles for grievance mechanisms, on transparency, non-discrimination, public consultation, and accountability. The ESF aligns the World Bank's environmental and social principles with that of other development agencies.

The ESF comprises:

- The World Bank’s Vision for Sustainable Development
- The World Bank’s Environmental and Social Policy for Investment Project Financing (IPF)
- The 10 Environmental and Social Standards (ESS), which set out the requirements that apply to Borrowers

The Bank also issued the following directives in relation to the ESF:

- Bank Directive: Environmental and Social Directive for Investment Project Financing
- Bank Directive on Addressing Risks and Impacts on Disadvantaged or Vulnerable Individuals or Groups

According to the World Bank's ESF, the Project’s rating has been determined in terms of environmental and social risk as “Substantial”. Therefore, a detailed environmental and social impact assessment was conducted, and 12 additional sub-management plans were prepared according to requirements of World Bank’s ESF and relevant laws and requirements in force in Türkiye.

The site studies of the aforementioned ESIA package studies were completed in January and February 2020. The ESIA package was disclosed in May 2020[6] and an Environmental and Social Commitment Plan (ESCP) was prepared in June 2020[7]. The ESCP sets out material measures and actions, any specific documents, or plans required, as well as the timing for each of these.

The main purpose of Phase-2 studies is to comply with the provisions of any other E&S documents required under the ESF and ESCP. Accordingly, complying with the environmental and social items stated in ESCP the whole ESIA package, including the sub-management plans listed below, was revised, and updated in line with the World Bank standards.

- Environmental and Social Impact Assessment (ESIA) Report
- Environmental and Social Management Plan (ESMP)
    - Construction Impacts Management Plan (CIMP)

[6] https://aygm.uab.gov.tr/dunya-bankasi-turkiye-de-demiryolu-lojistigini-gelistirme-projesi

[7] https://aygm.uab.gov.tr/uploads/pages/dunya-bankasi-turkiye-de-demiryolu-lojistigini-gel/environmental-and-social-commitment-plan-escp.pdf

  - Community Health and Safety Management Plan (CHSMP)
  - Community Relations Management Plan (CRMP)
  - Employment and Training Plan (ETP)
  - Aggregate Management Plan (AGM)
  - Traffic (Transportation) Management Plan (TTMP)
  - Cultural Heritage Management Plan (CHMP)
  - Pollution Prevention Plan (PPP)
  - Waste Management Plan (WMP)
  - Emergency Preparedness and Response Plan (EPRP)
  - Critical Habitat Assessment and Biodiversity Management Plan (CHA-BMP)
  - Occupational Health and Safety Management Plan (OHSMP)
- Labor Management Procedures (which will form the basis for the Labor Management Plan to be prepared by the Contractor)
- Stakeholder Engagement Plan (SEP) including Grievance Mechanism
- Resettlement Plan (RP)

4.2 ESIA Methodology

The methodology to be used for characterization of environmental and social impacts/risks arising from the implementation of the Project has been developed based on the methodologies described in the UK's applicable government publications on Environmental Impact Assessment (Institute of Environmental management and Assessment-IEMA, 2011: The State of Environmental Impact Assessment Practice in the UK, Scottish Natural Heritage's (SNH) Handbook on Environmental Impact Assessment (2013) and other available guidance documents on impact assessment (Canter, 1993, Standards Association of Australia, 1999, etc.).

In accordance with good ESIA practice, significance of impacts will be determined based on the sensitivity of the receptor and the overall magnitude of the Project's impact on that specific receptor. The magnitude of the impact is determined using quantitative or, where this is not possible, qualitative methods based mainly on professional judgement. An environmental and/or social impact may be beneficial or adverse. The sensitivity of the receptor will be determined on the basis of the baseline information, which takes into consideration the public interest, designations, legal requirements, acceptability, sustainability, etc., and also where relevant, in consultation with the affected communities. The overall magnitude of the impacts will be determined as a factor of the following magnitude components. The magnitude of an impact or impact is determined by a comprehensive analysis of criteria which may encompass the following:

- Geographical extent (wide, local, or restricted)
- Reversibility (long term reversible/irreversible, medium term reversible or short term reversible)
- Duration (long-term, medium-term, or short-term)
- Frequency (continuous, recurrent, intermittent, or one-off/rare)

Criteria for magnitude factors are provided in Table 15.

Table 15. Magnitude Factors and Scales

Factor	Scales		
Magnitude	**High**	**Medium**	**Low**
Geographical extent	Wide	Local	Restricted
	Beyond 1,000 m corridor	Within 1,000 m corridor	Within the construction site
Reversibility	Irreversible/Long term reversible	Medium term reversible	Short term reversible

Factor	Scales		
Magnitude	**High**	**Medium**	**Low**
	Reversible after 30 years of operation period or irreversible	Reversible within 30 years of operation period	Reversible within 2 years of construction period
Duration	Long-term	Medium-term	Short-term
	After 30 years of operation	Within 30 years of operation	Within 2 years of construction
Frequency	Continuous/Recurrent	Intermittent	One-off/rare

General criteria to be taken into consideration when determining sensitivity of the receptor and the overall impact magnitude are provided in Table 16, whereas specific assessments and methodological variations (if any) for each environmental and/or social component are presented in relevant chapters of the ESIA Report.

Table 16. General Criteria for Identification of Receptor Sensitivity and Impact Magnitude Levels

Level	Receptor Sensitivity	Impact magnitude	
		Adverse	**Beneficial**
High	Highly important (national and international scale of importance), high rarity, potential for substitution very limited	Loss of resource and/or quality and integrity of resources; severe damage to key characteristics, features or elements.	Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality.
Medium	Moderately important (regional scale of importance) and moderate rarity, potential for substitution limited	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features and elements	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.
Low	Minor importance (local scale of importance), not rare	Some measurable change in attributes, quality, or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements	Minor benefit to, or addition of, one (may be more) key characteristics, features, or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring.
Negligible	No or very low importance and rarity	No or very minor loss or detrimental alteration to one or more characteristics, features or elements	No or very minor benefit to or positive addition of one or more characteristics, features or elements

Following the identification of receptor sensitivity and overall magnitude of an impact on that specific receptor, the significance of the impact will be determined by using a standard matrix style approach, which consists of a 4x4 matrix. The matrix and general descriptions of each significance level identified in the matrix are provided in Table 17.

Table 17. Significance Assessment Matrix

		Receptor Sensitivity			
Overall Magnitude		High	Medium	Low	Negligible
	High				
	Medium				
	Low				
	Negligible				
Major		Impacts are considered to be very important and are likely to be material in decision-making, which would be associated with sites or features of international, national or regional importance as well as local importance if the site or feature is subject to a major change. Mitigation measures are imperative to reduce the significance to lower levels before proceeding with the Project.			

Moderate	Impacts are not likely to be key decision-making factors. The cumulative impacts of such factors may influence decision-making if they lead to an increase in the overall adverse impact on a particular receptor. If possible, impact significance is to be reduced to lower levels by taking mitigation measures; otherwise, acceptance of associated risks is required for proceeding with the Project.
Minor	Impacts may be raised as local factors, which are unlikely to be critical in the decision-making process, but important in enhancing the subsequent design of the Project. Assurance of compliance with standards and safety criteria is sufficient to proceed.
Negligible	No impact or impacts are beneath the level of perception so that they are acceptable with normal operating procedures.

4.3 Area of Influence (AoI) and ESIA Study Area

World Bank Group ESS1 Guidance Note states that "where the project involves specifically identified physical elements, aspects, and facilities that are likely to generate impacts, environmental and social risks and impacts will be identified in the context of the project's area of influence (AoI)", which is defined as to encompass the following:

- The area likely to be affected by: (i) the project and the client's activities and facilities that are directly owned, operated or managed (including by contractors) and that are a component of the project; (ii) impacts from unplanned but predictable developments caused by the project that may occur later or at a different location; or (iii) indirect project impacts on biodiversity or on ecosystem services upon which Affected Communities' livelihoods are dependent.
- Associated facilities, which are facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable.
- Cumulative impacts that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted.

Selecting an AoI for a railway project in line with WBG ESSs involves a comprehensive and systematic assessment of potential impacts on the surrounding environment and communities. Based on the definition of AoI provided above, it is essential to conduct ESIA studies in areas that cover at least the AoI. This means the ESIA study area needs to be broad enough to encompass all the environmental and social impact aspects. Therefore, the study corridor defined for Çukurova sub-project consists of 500-m corridor extending each side of the proposed route. The study area can be revised and enlarged due to other separate Project facilities to be constructed, if necessary.

5 ENVIRONMENTAL & SOCIAL BASELINE, IMPACT ASSESSMENT AND MITIGATION MEASURES

Environmental and social baseline, impact assessment and mitigation measures are given in this chapter in three main sections;

- Physical Environment,
- Biological Environment, and
- Socio-Economic Environment.

Cumulative impact assessment is given in Chapter 6 as a separate section.

PHYSICAL ENVIRONMENT

The topics covered under the physical environment section are the land use, soil and geology, noise, air quality and greenhouse gas emissions, water resources, water quality and wastewater management, resource and waste management.

It should be noted that the baseline studies completed in 2020 are mentioned as Phase-1 studies (ESIA preparation phase) and the studies conducted during the ESIA package revision are mentioned as Phase-2 studies.

5.1 Land Use, Soils and Geology

5.1.1 Project Standards and Methodology

Assessment of land use, soils and geology impacts arising from the Project activities have been conducted in line with the World Bank Environmental and Social Standards, assessing the significance of impacts, considering characteristics of the baseline properties, developing impactive measures to avoid, reduce and where necessary offset significant impacts in line with the mitigation hierarchy adopted for the Project ESIA studies.

According to the data of the Ministry of Agriculture and Forestry, there are shrubs, pasture areas, fallow dry agricultural areas, irrigated agricultural areas, coastal dunes, insufficient irrigated agricultural areas, and abandoned lands on the construction area. Accordingly, the activities to be carried out under the Project will be subject to the provisions of the national laws and regulations listed below:

- Agricultural Reform Law on Land Rearrangement in Irrigated Areas
- Law on Soil Conservation and Land Use
- Pasture Law
- Expropriation Law
- Regulation on Protection of Agricultural Lands and Land Consolidation
- Governing Regulation on Soil Conservation and Land Use
- Regulation on the Control of Soil Pollution and Lands Polluted by Point Sources

Methodology

The impacts on land use, soil and geology have been assessed over the area where the construction and expropriation activities of the project will be carried out. Basic data on land use, soil and geology for the project were compiled from the following sources:

- Land Asset Data of the Ministry of Agriculture and Forestry
- Database of General Directorate of Land Registry and Cadaster
- Geographical Information System (GIS)
- Public Database:
    - General Directorate of Mineral Research and Exploration (MTA)
    - Disaster and Emergency Management Presidency (Earthquake Research Department Database)
    - Disaster and Emergency Management Presidency (Natural Disasters Database).

The significance of the impacts was assessed based on the sensitivity of the receptors and the overall magnitude of the impact as described in Section 4.2. The magnitude of the impact is determined using quantitative or, where this is not possible, qualitative methods based mainly on professional judgement.

5.1.2 Baseline Conditions

5.1.2.1 Land Use

Çukurova Region and İskenderun Bay railway connection line project is located within the borders of Yumurtalık District of Adana Province and Erzin District of Hatay Province. The railway connection lines are mostly within the boundaries of Hatay Province.

The Area of Influence (AoI) was defined as a 500-meter corridor on both sides of the proposed route, resulting in a study area covering approximately 3204.3 hectares. Within this region, there are various features including shrubs, pasture lands, fallow dry agricultural areas, irrigated agricultural zones, coastal dunes, insufficiently irrigated agricultural areas, industrial areas, and abandoned lands on or around the construction area. Data from the Ministry of Agriculture and Forestry reveals the presence of shrubs, pasture lands, non-irrigated agricultural areas, irrigated agricultural areas, coastal dunes, insufficiently irrigated agricultural zones, and abandoned lands within the AoI.

The land use distribution of AoI is given in Table 18 and land use map is presented in Figure 12.

Table 18. Land Use Distribution of AoI

Land Use Type		Total Area (ha)	Percentage (%)
Pasture Lands		1176.93	36.73
Irrigated Agricultural Areas		679.21	21.20
Non-irrigated Agricultural Areas		572.55	17.87
Insufficiently Irrigated Agricultural Areas		311.57	9.72
Coastal Dunes		183.37	5.72
Abandoned Lands		169.73	5.30
Shrubs		107.88	3.37
Industrial Areas		3.07	0.10
Total		**3204.3**	**100**

As it can be seen from Table 18, a significant part of the Project AoI is located on pasture lands (36.73%), irrigated agricultural areas (21.20%) and non-irrigated agricultural areas (17.87%).

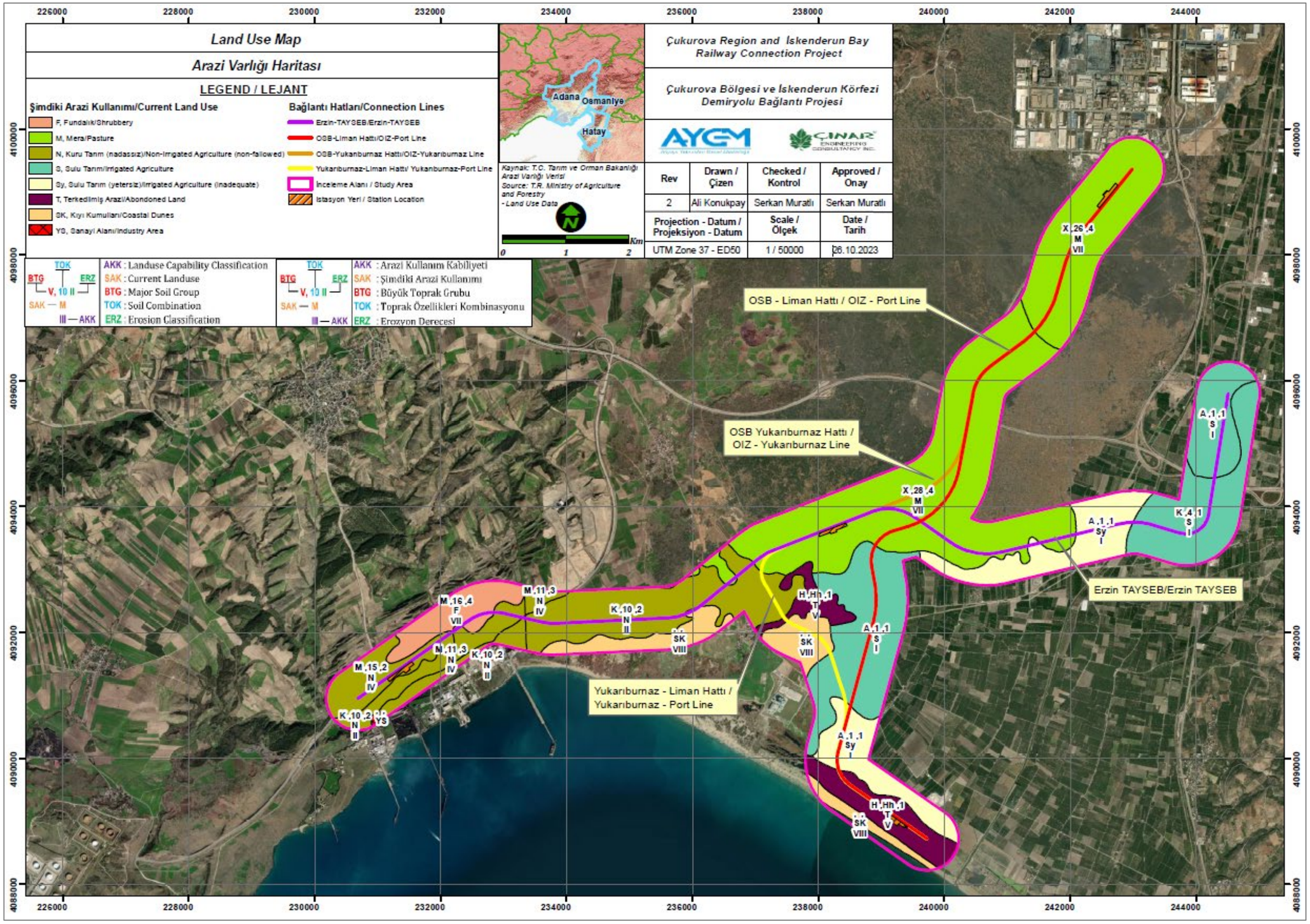


Figure 12. Land Use Map of the AoI

Land Use Capability (LUC)

Land use capability refers to the inherent potential of a piece of land to support specific human activities and land uses based on its physical, environmental, and ecological characteristics. It involves an assessment of the land's suitability for various purposes, such as agriculture, infrastructure development, conservation, or recreational use. Evaluating land use capability is essential for this project because it provides a comprehensive understanding of how the proposed railway infrastructure can be integrated into the existing landscape while respecting the natural attributes and limitations of the land. By assessing land use capability, the project can make informed decisions on land allocation, site selection, and infrastructure design to ensure that the railway corridor harmonizes with its surroundings, minimizes environmental impacts, and contributes to sustainable development. This assessment is integral to responsible land use planning and management, ensuring that the project's objectives align with the preservation of ecological integrity and the well-being of local communities. Land use capability classes that are defined by the Ministry of Agriculture and Forestry are presented in Table 19.

Table 19. Descriptions of Land Use Capability Classes

Arability	Capability Class	Description	Factors Restricting Agriculture
Agricultural lands suitable for soil cultivation	I	Soils have good drainage; they are not exposed to flood damage. They are suitable for anchor crops and other intensively grown crops. First-class lands irrigated where there is little precipitation are those that have less than 1% inclination deep, loamy structure, good water holding capacity, and moderately permeable soils.	There is no or little limitation.
	II	Second class land is a good land that can be easily cultivated only by taking some special measures.	Special mitigation measures are required for soil and water loss.
	III	The third-class land is a moderately good land for the anchor crops, which generates a lot of income by using a good crop rotation and applying appropriate agricultural methods.	Moderate inclination, excessive sensitivity to erosion, excessive wetness, shallow soil, presence of base stone, excess sandiness or graveliness, low water holding capacity and low productivity are the properties of this class of land.
	IV	With suitable ploughing, some special agricultural crops can be cultivated. Generally, it needs special care during agricultural use.	There are serious limitations related with soil depth, stone content, humidity and inclination
Agricultural lands not suitable for soil cultivation	V	This class includes soils that are even or slightly inclined, stony or very moist. These are not suitable for ploughing and cultivation. Generally, they are used for meadow or forestry area	They have weak drainage and a structure not suitable for ploughing.
	VI	This is not suitable for ploughing and cultivation. They are mostly used as pasture and forestry area.	Very serious limitations are present owing to inclination and shallow soil.
	VII	It is not economic for agricultural activities; however, it is suitable for weak pasture or afforestation areas	There are limitations owing to shallow soil, stone content, inclination and erosion.
Non-arable lands	VIII	It is not suitable for vegetation. It can be used for recreational purposes or as wildlife protection area.	These include marshland, desert, terrains containing very deep cavities, high mountainous, overly defective, stony lands.

***Source**: (Republic of Türkiye, Ministry of Agriculture and Forestry)*

The suitability of different land classes for cultivation, grazing and forestry activities is identified within the scope of the Technical Procedure on Soil and Land Classification Standards published by the former Ministry of Agriculture and Rural Services in 2008, as presented in Table 20.

Table 20. Suitable Land Uses According to the Land Use Capability Classes

Land Use Capability	——— Increase in Land Use Intensity ——►								
	Wildlife	Forestry	Grazing			Agriculture			
			Limited	Moderate	Intensive	Limited	Moderate	Intensive	Very Intensive
Class I									
Class II									
Class III									
Class IV									
Class V									
Class VI									
Class VII									
Class VIII									

Source: (Republic of Türkiye, Ministry of Agriculture and Forestry)

The distribution of land use capability classes of the Project AoI is given in Table 21. It can be seen that a significant part of the Project AoI (36.73%) is located on pasture lands which are classified as VII Class and not suitable for vegetation purposes.

Table 21. Land Use Capability Classes of the Project Study Area

Land Use Types	Capability Class	Area (ha)	Percentage (%)
Pasture Lands	VII	1176.93	36.73
Irrigated Agricultural Areas	I	679.21	21.20
Non-irrigated Agricultural Areas	II	372.47	11.62
	IV	200.08	6.24
Inadequately Irrigated Agricultural Areas	I	311.57	9.72
Coastal Dunes	VIII	183.37	5.72
Abandoned Lands	V	169.73	5.30
Shrubs	VII	107.88	3.37
Industrial Areas	-	3.07	0.10
Total		**3204.3**	**100**

5.1.2.2 Soil

5.1.2.2.1 Major Soil Groups

In the ESIA Report of the proposed project, a critical aspect of the evaluation is related to the assessment of main soil groups within a 500-meter impact area from each side along the railway route. The evaluation of main soil groups is crucial for understanding and mitigating the potential impacts of the project on soil quality and, consequently, on the broader environment and local communities.

According to the data of the Ministry of Agriculture and Forestry, the major soil type distribution of AoI is listed in Table 22 and the major soil group map is presented in Figure 13. Accordingly, 36.72% of the Project AoI is Basaltic Soils, 23.44% Alluvial Soils, 19.11% Colluvial Soils, 9.62% Brown Forest Soils, 5.72% Coastal Dunes, 5.30% Hydromorphic Soils and 0.1% Industrial Area.

Table 22. Distribution of Major Soil Groups in the AoI

Major Soil Groups		Total Area (ha)	Percentage (%)
Basaltic Soils		1176.67	36.72
Alluvial Soils		751.00	23.44
Colluvial Soils		612.25	19.11
Brown Forest Soils		308.22	9.62
Coastal Dunes		183.37	5.72
Hydromorphic Soils		169.73	5.30
Industry Area		3.07	0.10
Total		**3204.3**	**100**

Major soil groups determined within the AoI are defined in Table 23.

Table 23. Major Soil Group Description in the AoI

Soil Group	Description
Basaltic Soils (X)	These are heavy clay, dark colored soils and their profiles are not well developed. These often contain no lime. Soil reaction varies between neutral and medium calevi. Soils are relatively poor in organic matter. Since their physical properties are bad, their efficiency is mostly low. Since some of the soils are quite stony, they should be cleaned from the stones for intensive use.
Brown Forest Soils (M)	These soils were formed on the main substance with high lime content. They have poorly developed layers. Their reactions are neutral or calevous. Lime accumulation occurs in the lower parts of the subsoil. Their drainage is good.
Alluvial Soils (A)	These young soils that form on fresh sedimentary deposits have no layers or development of their layers is quite low. Yet they contain mineral layers of different characteristics. These soils are mostly under the influence of groundwater. Significant in terms of agriculture, these soils are suitable for all culture plants that the climate allows. Productivity can range from very high to very low.
Colluvial Soils (K)	These soils that form on colluvial materials, which are deposited after carried for short distances through gravity, landslide, surface runoff, or nearby streams, are young and resemble soils of higher land in the surroundings. They involve layers of various sizes of segments based on the precipitation and runoff severity, and inclination. These layers are not parallel to one another, as in alluvial soils. Their drainage is good. Soils are occasionally subject to flooding. Type of the natural vegetation depends on the climate. When irrigated, they provide good agricultural productivity.

Soil Group	Description
Hydromorphic Alluvial Soils (H)	These soils are not suitable for agriculture. Some of these soils have surface or near ground water for most of the year. In some, in wet cool seasons, the water is close to the surface, but it drops below 1 m for a short time in late summer. Some of the soils are exposed to floods. Topography is flat or concave. Surface drainage and internal drainage are very bad or no drainage. Therefore, especially the lower floors are age. The rising and lowering of the seawater cause successive oxidation and reduction in the part of the soil above it. The result is bluish-gray reduction and reddish oxidation (oxidation, rust) spots. Although the depth is high in these soils, the reduced floors limit the root zone.

Source: Republic of Türkiye, Ministry of Agriculture and Forestry

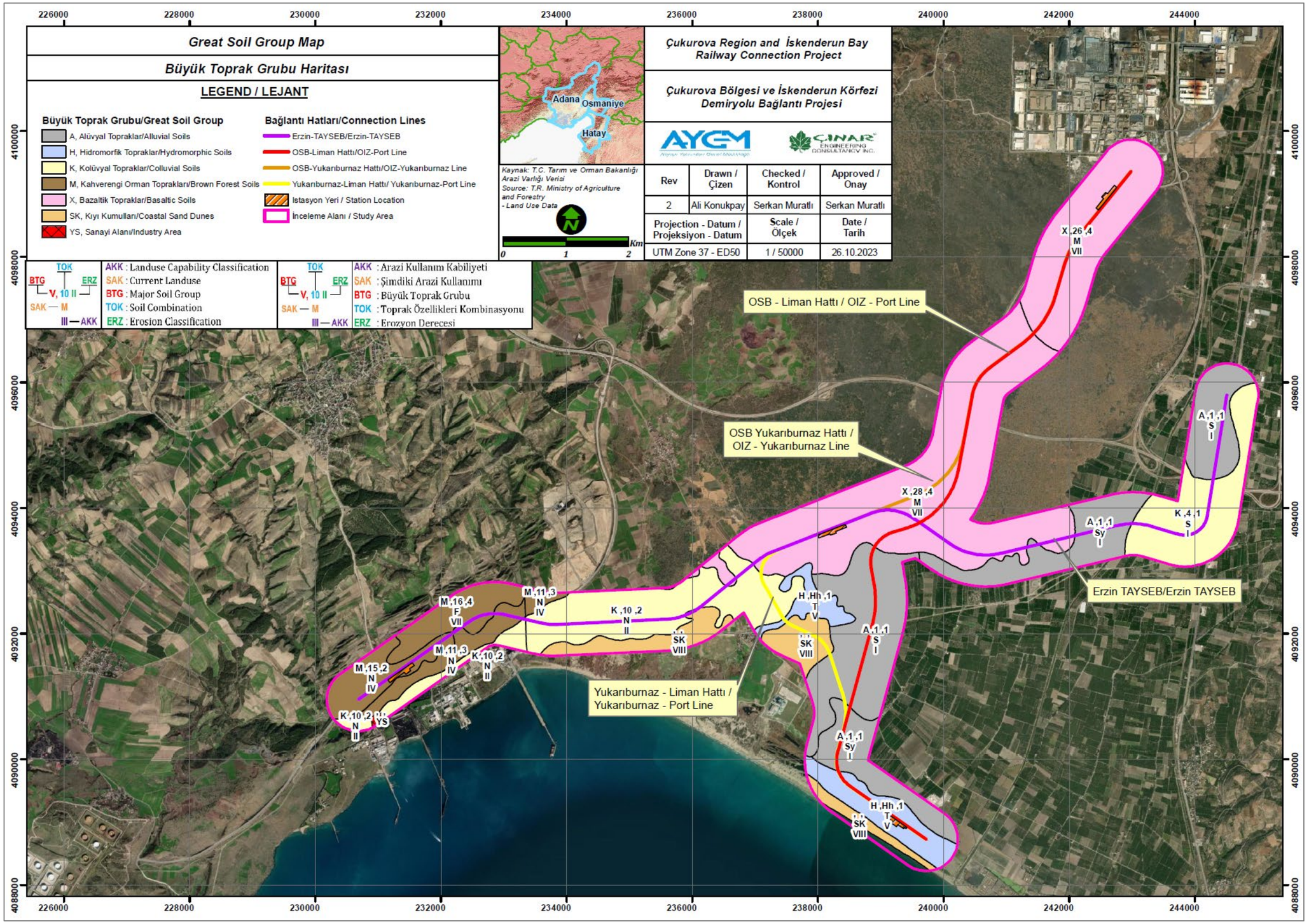


Figure 13. Major Soil Group Map of the AoI

5.1.2.2.2 Soil Erosion

Erosion is the phenomenon of soil clusters being transported by factors such as water and wind and consequently accumulating in different environments from where they belong. Soil erosion is a two-step process that involves breaking up clumps of soil into individual or portable particles and transporting them with water and air streams.

Erosion affects agricultural productivity negatively and creates a sedimentation-based pollution in the surface water basin where it is located.

Soil erosion degree in Türkiye is evaluated based on the erosion classification scheme put forward by the U.S. Department of Agriculture, adopted by several national authorities. Accordingly, the GDRS Database has a four-degree classification as the following:

- Degree 1: None or very low level of erosion
- Degree 2: Moderate level of erosion
- Degree 3: Severe level erosion
- Degree 4: Very severe erosion

According to the land asset data of the Ministry of Agriculture and Forestry, the distribution of soils on the AoI by erosion degrees is presented in Table 24. Coastal dunes (183.37 ha) and industrial area (3.07 ha) are not included in erosion degree classification distribution of AoI, and the percentages of these areas are shown under the “No Data” category.

It can be seen from Table 24, 36.22% of the AoI land is Degree 1, 14.92% is Degree 2, 2.95% is Degree 3 and 40.10% is Degree 4.

Table 24. Erosion Degree Classification of AoI

Erosion Degree	Total Area (ha)	Percentage (%)
Degree 1	1160.51	36.22
Degree 2	478.18	14.92
Degree 3	94.37	2.95
Degree 4	1284.81	40.10
No data	186.44	5.82
Total	**3204.3**	**100**

The erosion map of the project study area is presented in Figure 14.

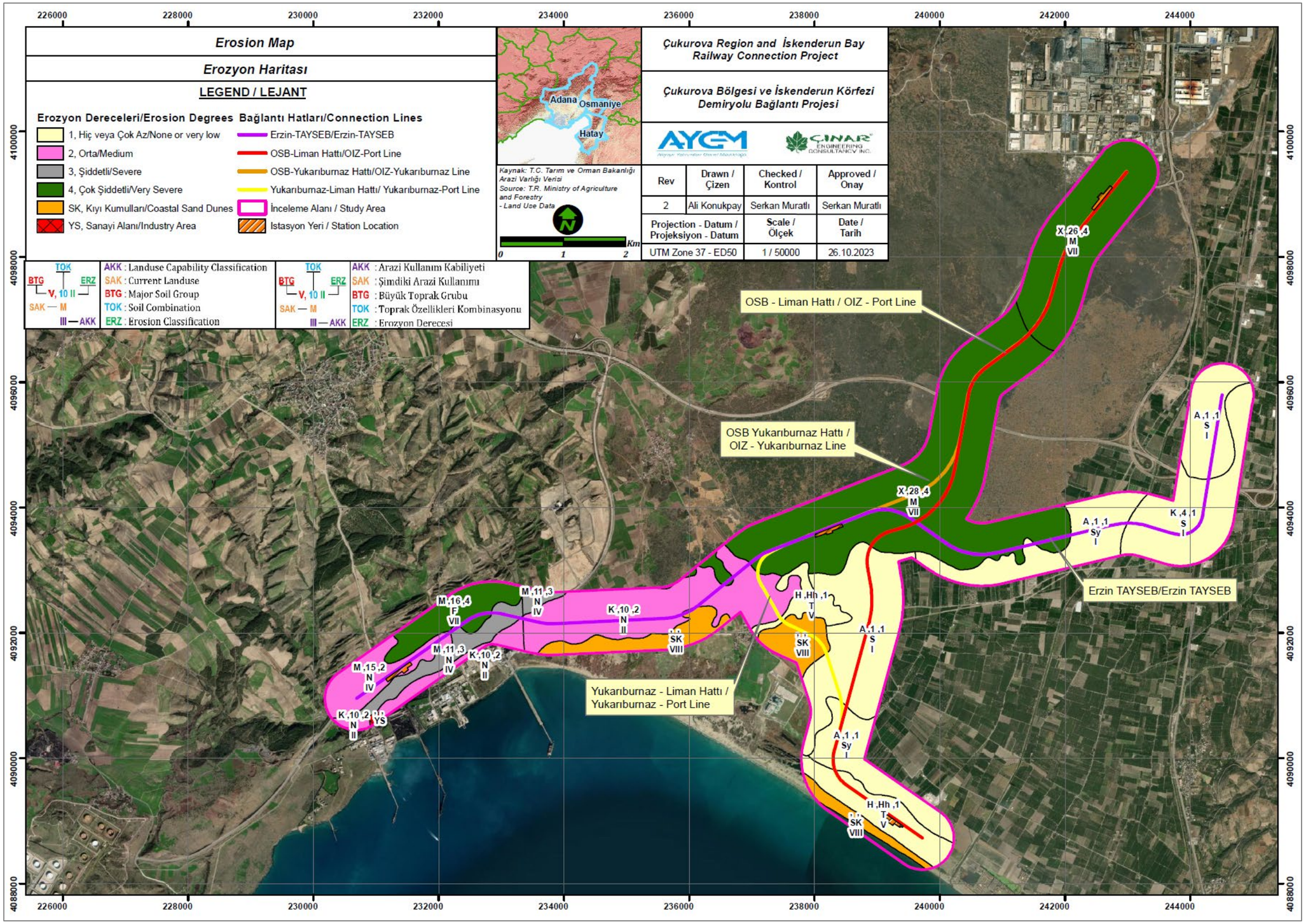


Figure 14. Erosion Map of AoI

5.1.2.2.3 Soil Quality

In order to determine the baseline soil quality around the construction area, samples had taken from four (4) points during Phase-1 studies. Two (2) additional sampling points were selected according to the revised railway line during Phase-2 studies. The soil sampling points are listed in Table 25 and shown in Figure 15.

Table 25. Soil Sampling Locations

No	Sampling Location	Sampling Date	Coordinates	
S-1	Coal Yard	21.01.2020	36 S 765988 D	4091273 K
S-2	Osmaniye OIZ	22.01.2020	37 S 243411 D	4099932 K
S-3	Yukarıburnaz	22.01.2020	37 S 238236 D	4093424 K
S-4	Erzin Port	22.01.2020	37 S 239010 D	4088846 K
S-5	Erzin Station	27.07.2023	37 S 244483 D	4095617 K
S-6	Farm	27.07.2023	37 S 241980 D	4093287 K

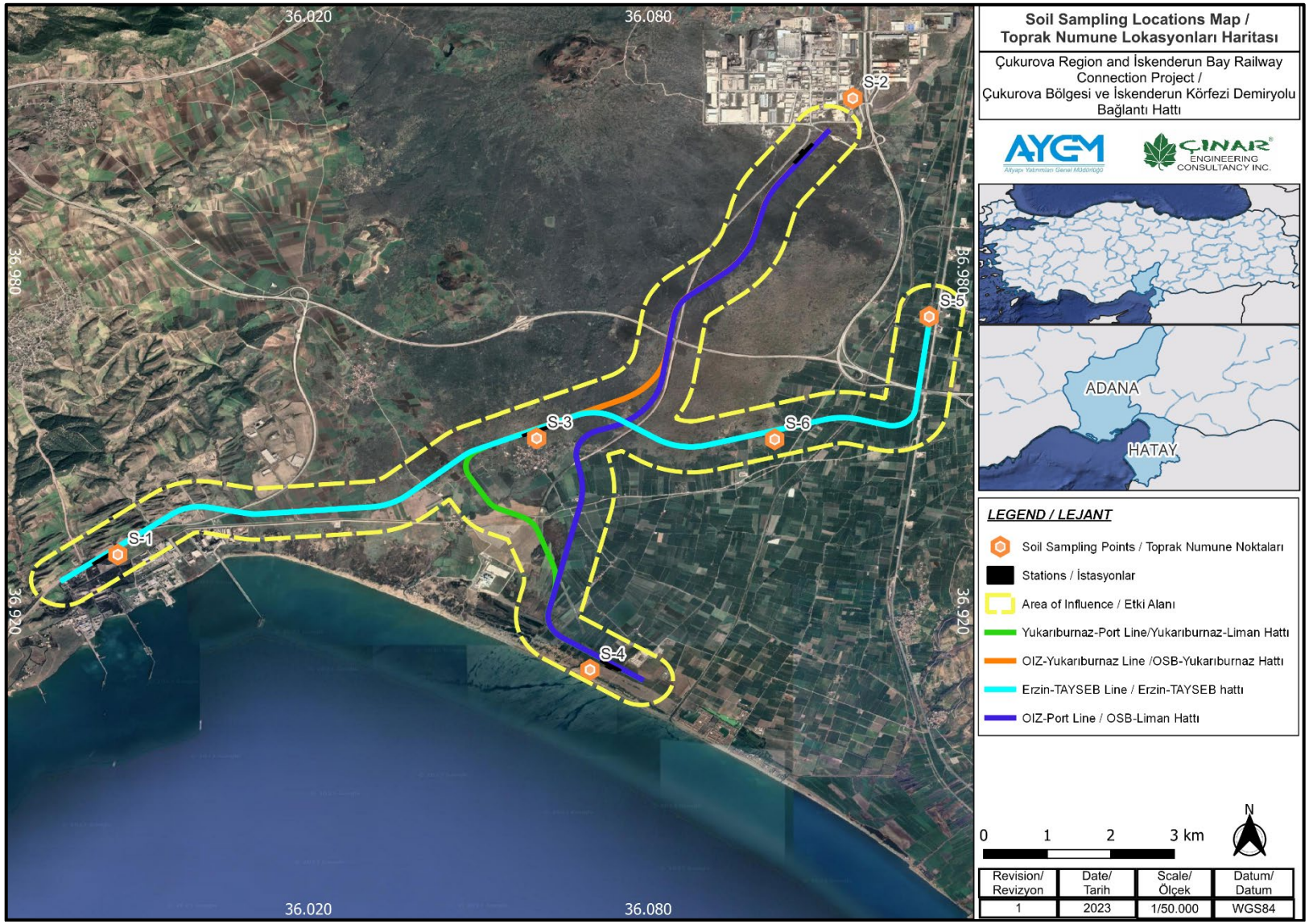


Figure 15. Soil Sampling Locations Map

While determining the parameters to be analyzed in soil samples, soil pollution indicator parameters listed in Soil Pollution Control and Point Source Contaminated Sites Regulation – Annex-2 Table-1 Pollution Indicator Parameters List were taken into consideration. According to mentioned parameters list, the industrial activity code of the Project is determined as “4920 – Freight transport by railway” and the regulatory required parameters are listed as Total Petroleum Hydrocarbons (TPH), Benzene, Toluene, Ethylbenzene and Xylenes (BTEX), and Total Volatile Organic Compounds (TVOCs).

Soil samples taken are reference samples which determine the baseline conditions of the soil. In other words, the results of the analysis of soil samples will be used as reference values after the construction phase of the project or during the operation phase, if there is a suspicion of soil pollution at the project site.

The results of the analysis of soil samples were compared with the limit values defined in the *Table-1 for the relevant pollutants in Section 15.1 of the Canadian Environmental Protection Law* in order to determine the baseline contamination status in the soil structure. Analysis results of soil samples and related limit values are given in Table 26.

Table 26. Analysis Results of Soil Samples

Parameter	Unit	S-1	S-2	S-3	S-4	S-5	S-6	Soil Quality Standards[8]			
								Agricultural Use	Use for Residential / Parking Areas	Use for Commercial Purposes	Use for Industrial Purposes
pH	-	7.35	6.67	7.45	7.32	7.52	7.75	6 – 8	6 – 8	6 – 8	6 – 8
Antimony (Sb)	mg/kg	0.146	0.213	0.094	0.056	2.46	1.17	20	20	40	40
Arsenic (As)	mg/kg	3.41	4.12	4.13	7.26	**26.1**	9.93	12	12	12	12
Copper (Cu)	mg/kg	26.3	19.6	25.5	13	13.4	7.38	63	63	91	91
Barium (Ba)	mg/kg	62.3	229	101	12.3	< 2	< 2	750	500	2000	2000
Beryllium (Be)	mg/kg	0.403	0.579	0.9	0.084	0.126	0.053	4	4	8	8
Boron (B)	mg/kg	< 2.00	< 2.00	< 2.00	< 2.00	< 2	< 2	2	-	-	-
Mercury (Hg)	mg/kg	0.37	0.66	0.149	0.196	< 0.1	< 0.1	6.6	6.6	24	50
Zinc (Zn)	mg/kg	52.3	**310**	73.3	25.4	< 0.5	< 0.5	250	250	410	410
Silver (Ag)	mg/kg	0.574	0.739	0.492	0.597	< 0.1	< 0.1	20	20	40	40
Cadmium (Cd)	mg/kg	0.236	1.2	0.294	0.069	0.065	< 0.05	1.4	10	22	22
Tin (Sn)	mg/kg	0.217	0.769	0.568	0.135	0.435	0.287	5	50	300	300
Cobalt (Co)	mg/kg	11.7	10.6	25	22.2	**48.4**	23	40	50	300	300
Lead (Pb)	mg/kg	6.39	35.5	12.7	3.96	5.94	1.48	70	140	260	600
Molybdenum (Mo)	mg/kg	0.264	0.596	0.485	0.189	0.934	0.32	5	10	40	40
Nickel (Ni)	mg/kg	**83.9**	**100**	**109**	**516**	**900**	**438**	45	45	89	89
Selenium (Se)	mg/kg	0.645	0.507	1	0.232	0.382	0.135	1	1	2.9	2.9
Thallium (Tl)	mg/kg	0.098	0.097	0.203	< 0.050	0.108	< 0.05	1	1	1	1
Titanium (Ti)	mg/kg	445	1163	3251	142	240	75.5	-	-	-	-
Uranium (U)	mg/kg	0.575	1.43	1.04	0.613	0.844	0.325	23	23	33	300
Vanadium (V)	mg/kg	54.9	36.8	82.1	25.9	15.3	7.91	130	130	130	130
Chromium (Cr)	mg/kg	56.9	**66.2**	**85.6**	**720**	**329**	**197**	64	64	87	87
Oil and Grease	%	< 0.02	< 0.02	< 0.02	< 0.02	0.022	< 0.02	-	-	-	-
BTEX	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-	-	-	-
TVOCs	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-	-	-	-
TPH	mg/kg	< 100	< 100	< 100	< 100	< 100	< 100	-	-	-	-

[8] Soil Quality Standards set by the Canadian Council of Environment Ministers for the Protection of the Environment and Human Health

As can be seen from the table above, Nickel at S-1 (Coal Yard) point, Zinc, Nickel and Chromium at S-2 (Osmaniye OIZ) point, Nickel and Chromium at S-3 (Yukarıburnaz) and S-4 (Port) points, Arsenic, Cobalt, Nickel and Chromium at S-5 (Erzin station), Nickel and Chromium at S-6 (Farm) exceed the relevant guidance values.

Nickel concentrations measured at all sampling points were observed to exceed the guidance values. Nickel is an element naturally found in the soil with the decomposition of the bedrock. Agricultural fertilizers, especially phosphates, are one of the Nickel sources in the soil. In addition, wild storage areas where wastes are randomly poured into the soil are known as one of the sources of Nickel (McGrath, 1995). Among the measured points, the highest Nickel concentration was observed at S-5 (Erzin Station). This point is surrounded by agricultural lands and the high Nickel concentration monitored here can be associated with intensive agricultural activities and fertilizer usage in agricultural activities. At other points, Nickel concentrations determined above guidance values may likewise be linked to fertilizer use. In addition, Nickel concentrations observed over the guidance values at all points sampled in the region may also indicate high baseline concentrations.

At S-2 (Osmaniye OIZ) point, all parameters exceeding the relevant guidance values are heavy metals. There are mainly steel, iron-steel, casting, fertilizer, and yarn production facilities in Osmaniye OIZ, located near the sampled point. Here heavy metals exceeding the relevant guidance values can be associated with the mentioned industrial activities in the region.

At S-2 (Osmaniye OIZ) point, one of the parameters exceeding the guidance values is Zinc. Zinc (Zn) is most commonly used in metal coatings and alloys. Zn is especially found in metal processing wastewater with silk thread, fiber production, steel industry and cooling systems that apply cathode treatment (Seven, Can, Darende, & Ocak, 2018). High Zinc values can be associated with industrial activities carried out in Osmaniye OIZ.

At S-2 (Osmaniye OIZ), S-3 (Yukarıburnaz), S-4 (Port), S-5 (Erzin Station) and S-6 (Farm) points, it was observed that the Chromium parameter was above the guidance values. Chrome has a wide range of applications such as paper industry, chemical industry, fertilizers, metal works and foundries, leather tanning, power plants. Wastewater discharge having chromium may be the cause of high levels in the soil at S-2 and S-4. In the regions where S-3, S-5 and S-6 points are located, intensive agricultural activities are carried out. Since the other activities mentioned above are not observed in the region, the high concentration of Chromium here can be associated with the use of fertilizers in the agricultural activities carried out.

The only sampling point that exceeds the guidance value for Arsenic is S-5 point. The soil receives arsenic from a variety of anthropogenic sources, including ash residue from power plants, smelting operations, mining wastes, and municipal, commercial, and industrial waste. Ash from power plants is often incorporated into cement and other materials that are used for roads and construction. Arsenic may be released from such material into soil[9]. Based on on-site observations, a waste processing facility is located at a distance of 50 meters from S-5, and the rest of the area around S-5 is mainly allocated for agricultural activities. There are also two ready-mixed concrete plants in that area. High concentration of arsenic at S-5 can be associated with waste processing plant and cement production activities.

High cobalt concentrations can occur for several reasons, both natural and human induced. While geological sources and volcanic activities are some of the natural reasons, industrial pollution, fertilizer usage, waste disposal activities and mining activities are anthropogenic reasons for high cobalt concentration in soil. The reason of high cobalt concentration at S-5 can be associated with waste processing plant, cement production activities and agricultural activities around that area.

[9] https://www.atsdr.cdc.gov/toxprofiles/tp2-c6.pdf

5.1.2.3 Regional Geology

General geology and structural geology of the project area was prepared by using the Mersin-O35 and O36 sheets of 1/100,000 scale Geological Map of Türkiye and 1987 Misis-Andırın stratigraphy and structural evolution study of Kozlu, H.

5.1.2.3.1 Geology

The oldest unit in the region is the Late Cretaceous Early Eocene-aged Dokuztekne Formation. Volcanism is active at the lower levels of this formation. During this volcanism under the sea, blocks of various ages from the environment with gravity shifts have settled in this unit. The upper levels of the formation include sandstone and clayey limestone lithologies formed in a calmer environment. From the Middle Eocene to the Lower Miocene phase, the Andirin Formation, which contains the blocks of rocks of different ages in the serpentinite matrix, which has been moved from place to place, is located. In the Early-Middle Miocene, the Karataş Formation with the flysch character was deposited. There are blocks from the older units in the Karataş Formation, and large blocks and nappe slices of the Andirin Formation.

In the eastern parts of the region, there is the Late Miocene aged Kızıldere Formation of the Amonos sequence, which outcrops in the Amonos Mountains. The rocks representing the shallow marine form the Kızıldere Formation.

The region was compressed after Miocene (Tortonian) with the impact of approximately north south directional compression tectonics and gained a position close to today.

Post tectonically; The Plio-Quaternary Hamış Formation in the delta facies is located in the region. Quaternary aged Delihalil basalt was formed as the final product of tectonic movements in the region. Caliche and alluviums seen in large areas are other Quaternary formations.

5.1.2.3.2 Structural Geology

The project area is located in one of the major tectonic regions of Türkiye. Units monitored in the region continue to provide wider outcrops towards North-NorthEast. Formations between the Taurus Troops in the Kozan-Feke-Saimbeyli regions and the West-Northwest region of the Amanos Mountains have been influenced by the compression tectonics that have survived until today and have gained their present position. Evidence of compression tectonics begins in Eocene, continues in Miocene, and after the Upper Miocene (Tortonian), the outline of the region becomes evident.

In the Norteast parts of the region, the Dokuztekne formation around Doruk-Selimiye villages is overlayed on the Karataş formation. The most important broken line in the region is the fault between the Misis Stack and Kızıldere formation, which we call the Yumurtalic Fault. This fault was observed as a high-angle reverse fault up to the Gaziantep – N36 b2 map in NE, around Yumurtalık district in the south. Although the northern block has been observed to be elevated, there is also a left directional component. Basaltic volcanism occurred in the Quaternary phase, using the Yumurtalık Fault, which attained its current position at the end of the Tortonian. There is another high angle reverse fault that starts to be observed around Karataş district in the southwest, which is damped in Delihalil region and affects only Karataş formation.

The extension of the Neogene aged tectonic lines of the Southeast Anatolian region turns into NE-SW strike strike-slip faults and thrusts in the region, and traces of all kinds of intense tectonic impacts (fault, thrust, drift) can be seen in the area. A schematic map showing important tectonic lines between the basins in the region (Kozlu, 1987) is given in Figure 16.

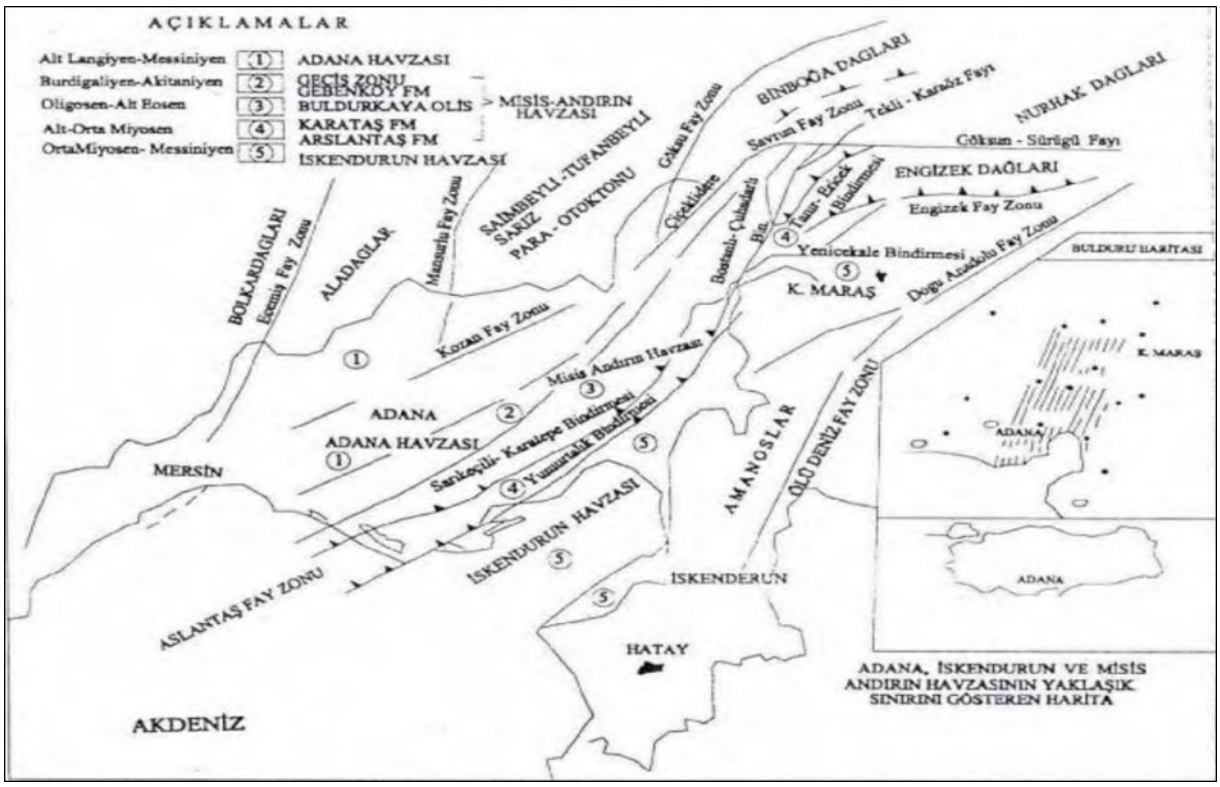


Figure 16. Schematic Map Showing Important Tectonic Lines between Basins in the Region

Source: (Kozlu, 1987)

5.1.2.4 Geology and Geotechnical Characteristics

A geological – geotechnical survey report was prepared by Temelsu Uluslararası Mühendislik Hizmetleri A.Ş. and Altaş Infrastructure International Engineering Consulting Inc. in 2019 for the project area. The geological units and their lithological features, geotechnical evaluations and disaster status observed as a result of the surface geology studies carried out within the scope of the geological – geotechnical survey report are summarized as below.

5.1.2.4.1 Stratigraphy

Units passed along the railway route, from old to young; Upper Miocene aged Kızıldere Formation, Quaternary aged Delihalil Basalt and Quaternary aged Alluvial deposits. The lithological features of these units are explained below, from old to young, and the stratigraphic column sections showing the project route and the outcropping units are given in Figure 17. The geology map of the project study area is given in Figure 18.

Neogene

Upper Miocene

Kızıldere Formation (Tmkı)

The same name has been adopted for the interlacing of conglomerate, reef limestone, which forms the lower levels of the unit located outside the study area, and for sandstone – marl alternations corresponding to the upper levels of the unit outcropping in the study area.

In the study area, there are proportional upper levels of Kızıldere formation. The sequence between Uzunkelli locality in the east of Yumurtalık district and İskenderun Bay is typical for this unit.

There are red conglomerates and reef limestones at the levels of the formation located on the western slopes of Amonos Mountains. There are sandstones and marls in general, and clayey

limestones in the study area. External view of sandstones; dark gray, brownish gray, grayish – yellowish – light yellowish – blackish gray. Its fresh surface is in shades of gray. It is very loose cement in places. Grain sizes are fine and coarse sandy. It is terrestrial and small gravelly. Pebbles are less angular and mostly derived from quartzite, quartz and ophiolites.

The maximum gravel size can sometimes reach the block size. Marls are dark gray in color. Clayey limestones are light cream colored, fragile and irregular laminated. There are plant residues at the alternation levels of clayey limestone and marls. In addition, basalt lavas were observed at intermediate levels.

The unit is located on the Amonos sequence with angular unconformity, sometimes with red pebbles and sometimes reef limestones. The upper contact of the unit cannot be seen.

The unit has been cut by the Yumurtalık fault within this study area and towards the northeast. Researchers working in the region previously stated that they could not determine their thickness precisely because of the mixed structure in the field, and suggested thicknesses between 1500-2000 meters. Considering the uncertainty of the upper boundary of the formation, approximately 1500 meters thickness is considered.

Abundant macrofossils and foraminifer species have been identified in the reefs that fall outside the study area and form the lower levels of the unit. The outcrops in the study area represent the upper levels of the unit, and somatr from these levels, and forms with marine feature, were found in places.

According to the fossil findings, the age of the unit was accepted as Late Miocene.

Quaternary

Delihalil Basalt (Qd)

Quaternary aged basalts that originate from Yumurtalık, Ceyhan, Osmaniye and Haruniye regions and are identified as Delihalil basalts, leaving the main exit center on Delihalil Tepe, in west of the study area.

Delihalil Tepe is in the form of volcanic chimney complex. The perimeter of the hill is surrounded by basaltic lava flows. Basaltic lavas and tuffs under the lavas can be studied at Arnavut Tepe and Hayıtlı Tepe, southwest of the village of Akpınar in the study area.

There are basaltic lava flows in the study area and yellow – pink colored loosely tuffs under them. The lava flows are very resistant and bear flow traces.

In the petrographic examination of the basalts, it is noticeable that they are generally in the intergranular porphyritic tissue and the ophitic (obstructive) tissue and contain abundant cooling gas cavities.

Phenocrystals are plagioclase, olivine and titanium augite. The dough consisted of titanium augite, augite and few olivine micro grains and plagioclase microlites. In the examination of tuffs under the basaltic lavas, it was observed that they consisted of limonitized microlitic textured volcanic rock fragments again in the totally dyed paste.

Delihalil basalt lavas are in the form of lava flows in the study area, in areas covering Arnavut and Hayıtlı Hills. Under the basalts, yellow-pink colored tuffs were found in places close to the bed.

The age of Delihalil basalts was considered as Quaternary.

Alluvion (Qal)

Generally, alluviums forming topographic plains; they consist of sand, gravel and shafts.

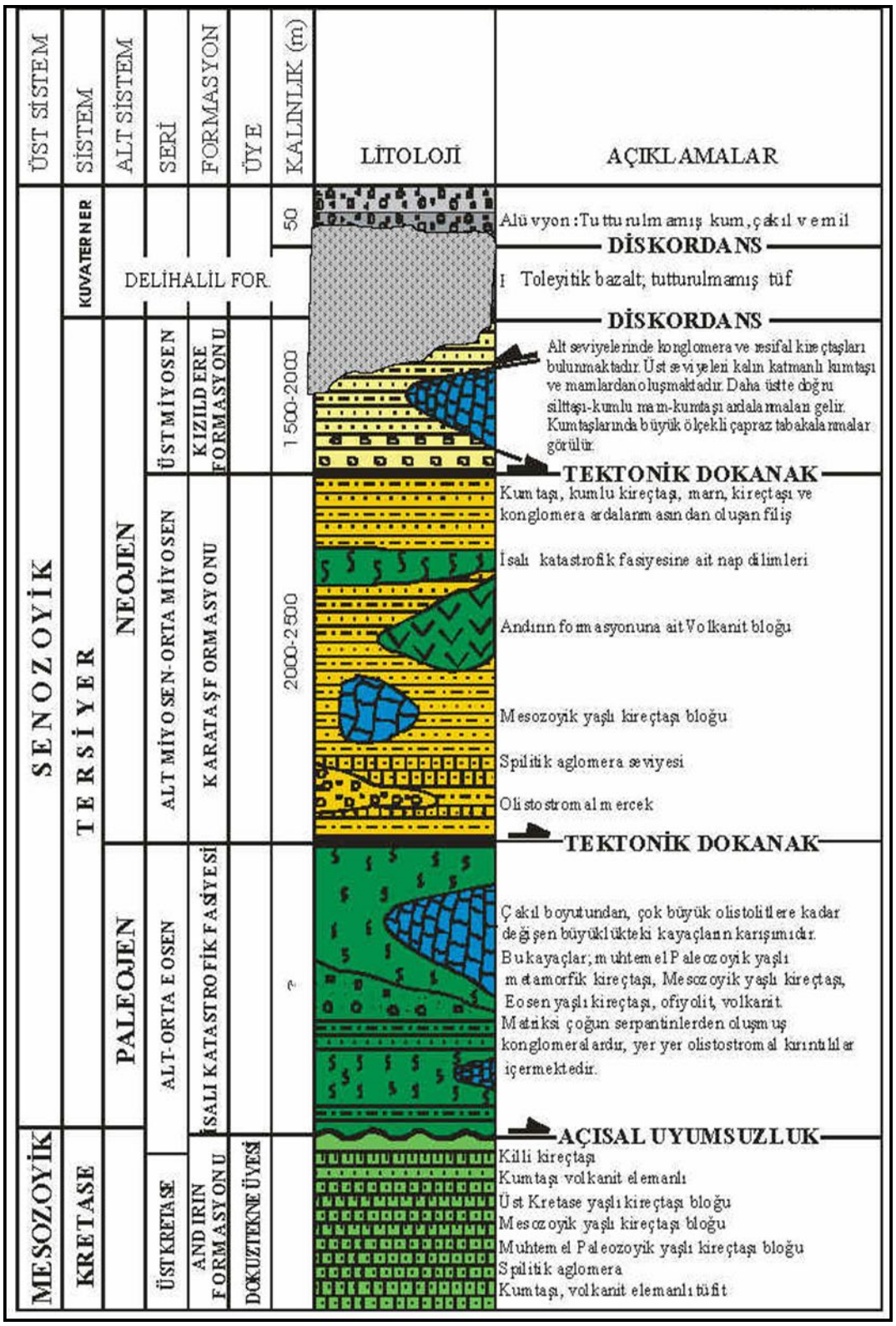


Figure 17. The Stratigraphic Column Sections of the Study Area and Surroundings

Source: Kozlu, 1987

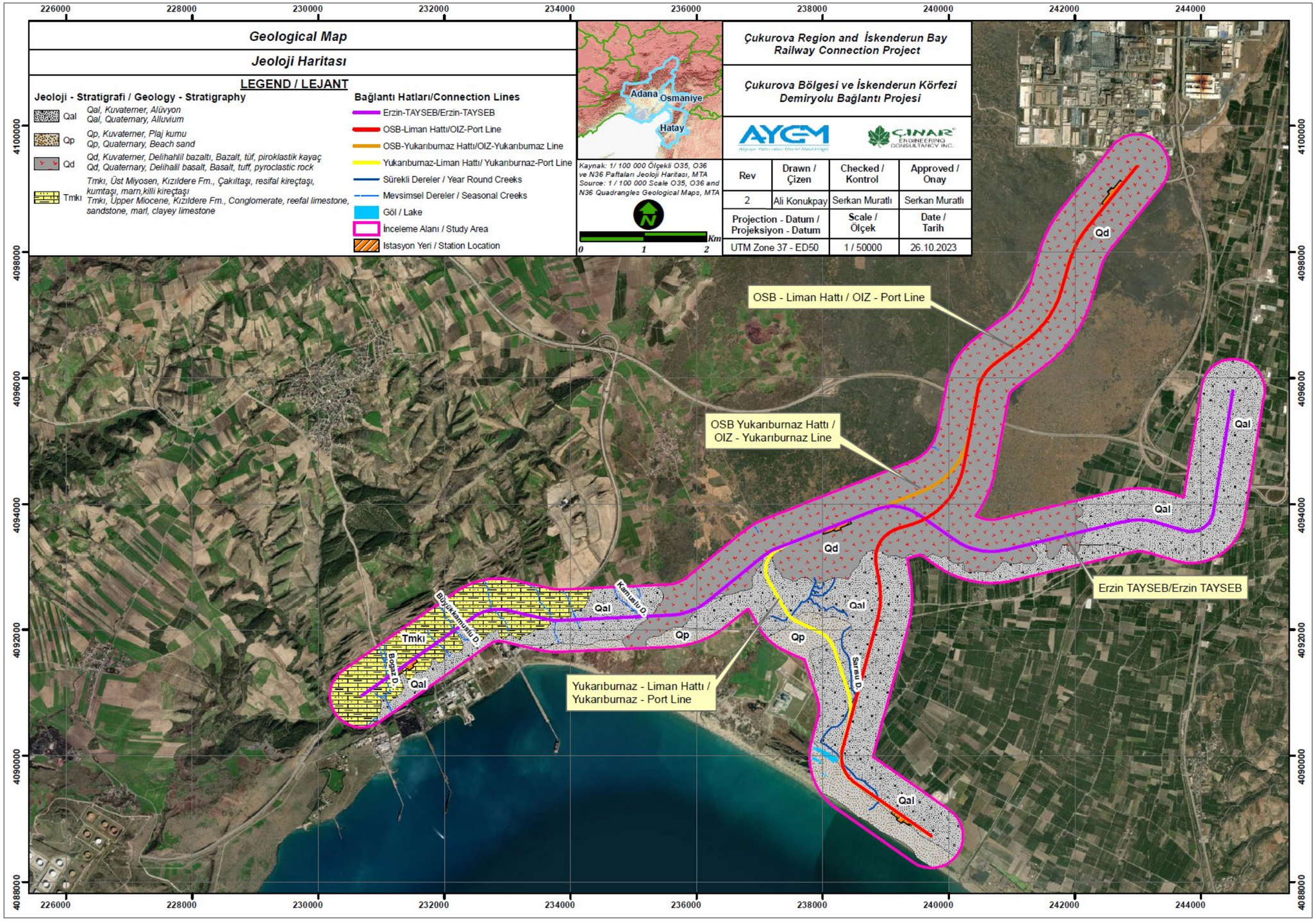


Figure 18. Geology Map of the Study Area

Source: Bilgin, A.Z., 2013; Sümengen,A., 2014; Usta,D. ve Beyazpirinç,M., 2018

5.1.2.4.2 Geotechnical Characteristics

Geological – Geotechnical Evaluation of Railway Route

Within the scope of the project, 41 basic exploration drillings on the Connection Line, with depths ranging from 10.00 to 22.62 m, on the OIZ – Port Line; a total of 25 basic exploration drillings with depths ranging from 10.00 to 20.00 m, one 14 meters deep exploration drilling on OIZ – Yukarıburnaz Line and a total of 6 basic exploration drillings with depths ranging from 10.00 to 20.00 m on Yukarıburnaz – Port Line were performed during Phase-1 studies. Apart from that, geophysical studies were carried out by using seismic, microtremor and multiple electrode methods on routes.

The aim of the drillings was to determine the vertical and lateral continuities of geological units, to determine groundwater levels, to perform on-site experiments, to determine the physical properties of the ground and rocks, and to take samples that have been abused / undisturbed. Physical and mechanical laboratory experiments were carried out on soil and rock samples.

Erzin – TAYSEB Connection Line

KM: 0+000 – 2+000

In this section, the connection line is located just to the right of the existing railway. In this interval, the connection line passes through the cuts and fills on the alluviums. Cut and Fill heights are less than 2.50 meters. In this section, 6 basic exploration drillings were performed. Basalts were cut under the alluvium in the first three drillings. According to laboratory test results; Alluviums and SPT samples consist of sandy silty clay, sandy clay silt, silty sandy gravel, pebbly silty sand grounds.

KM: 2+000 – 4+400

In this section, the connection line will pass over the filling material to be made on the alluviums. In this section, 10 basic exploration drillings were opened. According to laboratory test results; Alluviums and SPT samples consist of sandy silty clay, sandy clay silt, pebbly silty sand, sandy silty gravel. Basalts were cut under alluvial floors in other drillings except for İSK – 7 drilling.

KM: 4+400 – 11+130

The connection line will pass through the basalt in this interval with cuts and fills. In this section, 9 basic exploration drillings were opened. Basalts according to surface geology and drilling data; strength-moderate strength, partly moderately weak strength, less-medium separation, partly decomposed. Gas gaps are generally observed. Station-1 site will be designed between KM: 7+771 – 8+871. The station area is located on basalts. The engineering structures in this section are situated on basalts.

KM: 11+130 – 13+000

In this section, the connection line will pass over the filling material to be made on the alluviums. In this section, 6 basic exploration drillings were opened. Only in ISK-31 drilling, sandy silty pebble lenses were cut between sandy silty clays. In this range, there are underpasses at KM: 11+495 and according to ISK-27 drilling data on the underpass floor; 3.60 meters thick sandy silty clay on top and basalt underneath.

KM: 13+000 – 16+272.70

The connection line in this section; KM: 13+000 – 13+250 alluvium, KM: 13+250 – 16+272.70 will pass through the Kızıldere formation with cuts and fills. In this section, 11 basic exploration drillings were opened. Only İSK-32 drilling was opened in alluviums.

Kızıldere formation consists of mudstone, claystone, siltstone, sandstone, marl units. It is yellowish light brown-gray, dark greenish gray. In the lower parts, the formation is rock-like and generally weak-very weak-resistant, moderately weak-resistant, moderately-very

decomposed, and partially-less-moderately weathered. The upper parts are separated and generally consist of sandy silty clays. There are silt and pebble lenses in between.

The upper parts of the formation between KM: 13+990 - 14+255 present the appearance of blocky pebbly clayey sand. Station-2 will be situated between KM: 15+019.61 – 16+269.61. There is Kızıldere formation on the ground floor of the station area. The upper parts of the formation are separated and turned into sandy silty clay (residual ground). There are high cuts and fills in this section.

OIZ-Port Line

KM: 0+000 – 9+090

In this interval, the OIZ – Port line will pass through the cut and fill to be produced on basalts. In this section, 11 basic exploration drillings were opened. Basalts are generally blackish dark gray colored, generally gas void, and joint surfaces are very rough. It usually looks like a slag on the surface. It is durable – medium strength, partly medium weak strength, less – medium separation, partly decomposed. Station: 4 area between KM: 0+050 – 0+900 is located on basalts.

KM: 9+090 – 14+085

OIZ-Port line will pass with the fills to be produced on alluviums in this section. It will be passed by cuts at a short distance only between KM: 13+160 – 13+260. In this section, 14 basic exploration drillings were opened. Basalt was cut under alluvium in 6 drillings. According to laboratory results; Alluviums and SPT samples consist of sandy clay silty, sandy silty clay, silty clay, sandy silty gravel, silty sand, gravel silty sand.

OST-14, OSK-15, OSK-16, OSK-17 drillings opened between KM: 9+700 – 10+560, are at the upper levels of alluviums with SPT – N values on silty clayey soils 2-5 (soft – middle floor) 5-8 on gravel sand floors (loose) between. According to the drilling data, in the sections where there are engineering structures; there are alluvium at the top and basalts at the bottom.

OIZ-Yukarıburnaz Line

KM: 0+000 – 2+314.692

OSB – Yukarıburnaz Line will pass completely through the cut and fill that will be produced on basalts. In this section, 1 basic exploration drilling was opened. Basalts are generally blackish dark gray colored, generally gas void, and joint surfaces are very rough. It usually looks like a slag on the surface. It is resistant – medium strength, partly moderately weak strength, less – medium separation, partly decomposed.

Yukarıburnaz-Port Line

KM: 0+000 – 2+252.15

Yukarıburnaz – Port line will be passed through the fills to be completely produced. In this section, 6 basic exploration drillings were opened. According to drilling data there are basalts between KM: 0+000 – 0+510; and there are alluvial floors Between KM: 0+510 – 2+252.15. Basalts are generally blackish dark gray colored, generally gas void, and joint surfaces are very rough. It usually looks like a slag on the surface. Strength – medium strength, occasionally medium weak strength, less-medium separation. Alluviums, sandy silty clay between KM: 0+510 – 1+800 and KM: 1+800 – 2+252.15 consists of gravelly silty sand grounds. According to the drilling data of underpass at KM: 0+460 sits on basalts. In sections with other engineering structures; there are alluvium at the top and basalts at the bottom.

In order to determine the geotechnical properties of the geological units surfacing along the route, the following studies were conducted during geotechnical surveys:

- Geological unit boundaries were revised using the drilling data and necessary revisions were made.

- Existing highway cut / fill slopes, which cross the route and located nearby, have been studied to make use of.
- Rocks and soils were evaluated for detachability.
- Layer and joint positions of geological units were measured at points that can be measured, joint gaps, gaps, continuity, roughness, type and properties of filling material, water status were investigated.
- In order to evaluate the availability of splitting materials in fillings, research pits were opened in some splittings and samples were taken for laboratory experiments.
- Units, weathering, hardness, strength etc. of the units. Information about its features was collected.

Usability of Excavation Materials in Fills

4 research pits were opened in the cuts during Phase-1 studies to investigate the use of excavation materials in fills. Sieve analysis, limits, standard proctor and wet CBR + swelling tests have been carried out for these samples; and evaluations have been made for the use of excavation materials in fills.

As a result, in general; The Kızıldere formation, which consists of conglomerate, sandstone, marl units, is not usable in fills since it does not meet the fill material standards from the cut parts consisting of clayey floors on the upper part of them and the materials coming out of a small amount of alluvial cuts. However, only the materials that will come out of basalt cuts are in accordance with the fill material standards and can be used in fills.

Cut and Fills

There are high cuts and fills in some sections along the railway routes. Cut and fill slopes; were determined by evaluating the field observations together with the drilling data and laboratory test results and supported by stability analysis.

The fills will be formed with 3Y/2D slope with the materials to be extracted from basalt cuts and the materials to be drawn from the borrow quarry consisting of basalts. Basalt cut slopes, on the other hand, have been found suitable to be opened with 2Y/1D slopes, considering that their upper parts are in the form of slag in some places and will meet the fill need along the routes.

5.1.2.4.3 Seismicity

Movements between the Eurasian-African-Arabian plates, which are defined as the main or large plates, determine the earthquakes in Ceyhan and its vicinity. The border of the Arab and African plates with the Anatolian plate is the Bitlis Thrust Belt in Eastern Anatolia, and the other is the Cyprus Plunge-Submersion belt, which reaches the Gulf of Antalya by drawing a bow from the south of İskenderun Bay to Cyprus. The Dead Sea Fault, which separates these two different seismotectonic belts and moves left-handed, advances in the north-south direction and reaches the Cyprus arc in the northeast of İskenderun Bay. They form a triple joint known as the “Maraş Trilateral Merger” by crossing the Dead Sea Fault, Eastern Anatolian Fault and the Cyprus Arc's northeastern extension around the Maraş region in the Eastern Taurus Mountains. The movements of Arab and African plates towards the Anatolian plate create neotectonic deformations on these fault belts and the region acquires an active seismicity character.

The region covers a seismically impactive area among the active tectonic structures such as the Eastern Anatolian Fault System, Ecemiş Fault Zone and the Helen-Cyprus arc. Therefore, the seismicity of the region is controlled by the main active structures mentioned above and their branches.

The Project area was marked on Earthquake Hazard Map of Türkiye as shown in Figure 19. The project area and its immediate surroundings were examined on the interactive earthquake

hazard map published by AFAD, and the largest ground acceleration (PGA 475) for the 475 Year Repetition Period was found to be between 0.291-0.301 g.

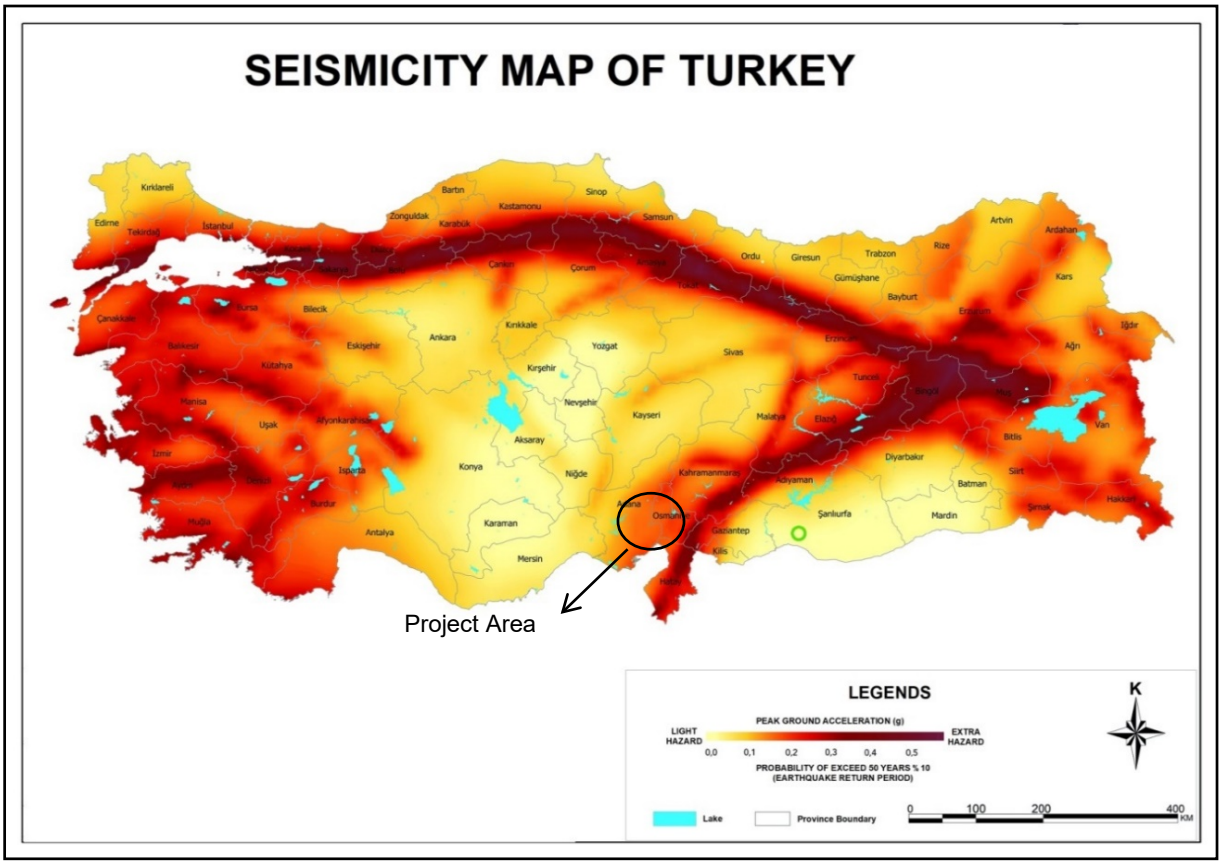


Figure 19. Earthquake Hazard Map of Türkiye

Source: AFAD, 2018, Türkiye Earthquake Hazard Map

Karataş-Osmaniye Fault Zone:

Karataş Fault extends north across the Gulf of İskenderun N40°E direction according to the Active Fault Map of Türkiye. The fault, which is observed for 64 km between Osmaniye in the east and Karataş in the west, has a left lateral strike slip character with a reverse slip component. The northern block of the fault is located morphologically higher. The 16 km part of the Karataş fault in the east is located in the Early-Middle Miocene aged Karataş formation, and the 38 km long central part is located between the Karataş formation and the Quaternary sediments and the 10 km west section corresponding to the coastal line. The fault reaching the Mediterranean in Karataş region continues from the sea floor to Cyprus according to the literature information (Yavuzoğlu, A., Özalp, S., Et al., 2016).

Yumurtalık Fault:

The Yumurtalık fault in the Sürgü-Misis fault zone borders İskenderun Bay from the north. It is located between Delihalil Quaternary Volcano and Ceyhan Delta, in the direction of K55ºE and it is 41 km long. Yumurtalık Fault, which shows left lateral strike slip character, is divided into two parts (west and east) in İncirli, with its tabbed, left and left tab structure, 2 km wide and 4 km long. Quaternary basalt outlets observed in the tab area where the fault morphology with slope slip component is clearly observed should be related to this structure. The western part (24.5-km) combines Miocene deltaic and turbiditic sedimentary units with tectonic contact. The eastern part (16.5 km), which is mostly observed in the Quaternary lava, ends in the Delihalil volcano cone (Kara, M., Elmacı, H., et al., 2016).

Düziçi İskenderun Fault:

Düziçi – İskenderun Fault Zone (DIFZ) is located between the northern and southern branches of the Eastern Anatolian Fault (DAF) Zone, one of the most important inland trans-form faults of the Eastern Mediterranean Region. The Fault Zone consists of normal faults extending parallel to the western skirts of the Amanos Mountains and inclined to the west. Düziçi-İskenderun Fault Zone (DIFZ); It consists of four segments; Düziçi, Osmaniye, Erzin and Payas segments. The Düziçi segment is a 19-km-long normal fault extending in the NW direction and inclined to the west. The segment consists of two fault sections. The eastern part of the Düziçi Fault segment forms the border between the Amanos mountains and the Düziçi Quaternary basin. Due to the current activity Osmaniye Segment, on the other hand, is a 24 km long normal fault extending in the general direction of N45°E and inclined to the NW. It consists of three fault sections separated from each other by stepwise tabs. The 11 km long eastern part of the Osmaniye segment cut Miocene clastic and carbonate rocks. The 13 km-long middle section extends between Issızca in the north and Dereobasi villages (south of Osmaniye) in the south, and mostly cuts the Quaternary sediments and Miocene aged clastic and carbonated rocks. The 4 km long western section extending in the direction of D-B around the village of Fakıbaba (south of Osmaniye) brings together the Plio-Quaternary deposits and Miocene aged, carbonated rocks (Özdemir, E., Kürçer, A., et al., 2016).

Historical Earthquakes

The historical earthquakes (Ambraseys, 1989) given below are the major and damaging ground motions that took place in the region.

13 August 1822 (M=7.4, Io=X) Afrin Earthquake

It's the largest regional earthquake that has taken place in the last five hundred years. The earthquake completely destroyed the area between Gaziantep, Antakya, İslahiye and claimed lives between 30,000 and 60,000 people. It's related with the intensive liquefaction in the Amik Plain and the İskenderun coastline.

3 April 1872 (M=7.2, Io=X) Lake Amik Earthquake

This earthquake, which is connected with the Karasu Segment of the Dead Sea Transform Fault, almost completely destroyed Antakya and Samandağ. In Antakya, which then had a population of 17,600 people, 500 people died and of the total 3003 homes, 1960 homes collapsed completely and 894 of them damaged irreparably. The damage was less severe in higher ground. In Samandağ, 2,150 homes collapsed, 300 people died and intensive liquefaction and tsunami were observed.

6 February 2023 (Mw=7.7+, Io=XI) Pazarcık (Kahramanmaraş) and (Mw=7.6+, Io=X) Elbistan (Kahramanmaraş) Earthquakes

On 06.02.2023, at 04:17 and 13:24, two earthquakes with a magnitude of Mw 7.7 and Mw 7.6 occurred in Pazarcık (Kahramanmaraş) and Elbistan (Kahramanmaraş). While the 7.7 magnitude earthquake occurred at a depth of 8.6 km, the 7.6 magnitude earthquake occurred at a depth of 7 km (AFAD, 2023).

It was the deadliest earthquake worldwide since the 2010 Haiti earthquake and one of the strongest ever felt in the Mediterranean. More than 2,100 aftershocks were recorded as a result of the earthquakes. Shallow strike-slip faulting led to the seismic pattern. More than 47,800 deaths have been confirmed as of February 20, 2023, being more than 41,100 in Türkiye and more than 6,600 in Syria.

The locations of earthquakes with a magnitude of 4.5 and greater that occurred between 1900 and 2023 within a radius of 100 km centered on the Project area are shown in Figure 20. Within the area in question, 53 earthquake records with magnitude M ≥ 4.5, which occurred between 1900-2023, were identified and the records of these earthquakes are given in Table 27.

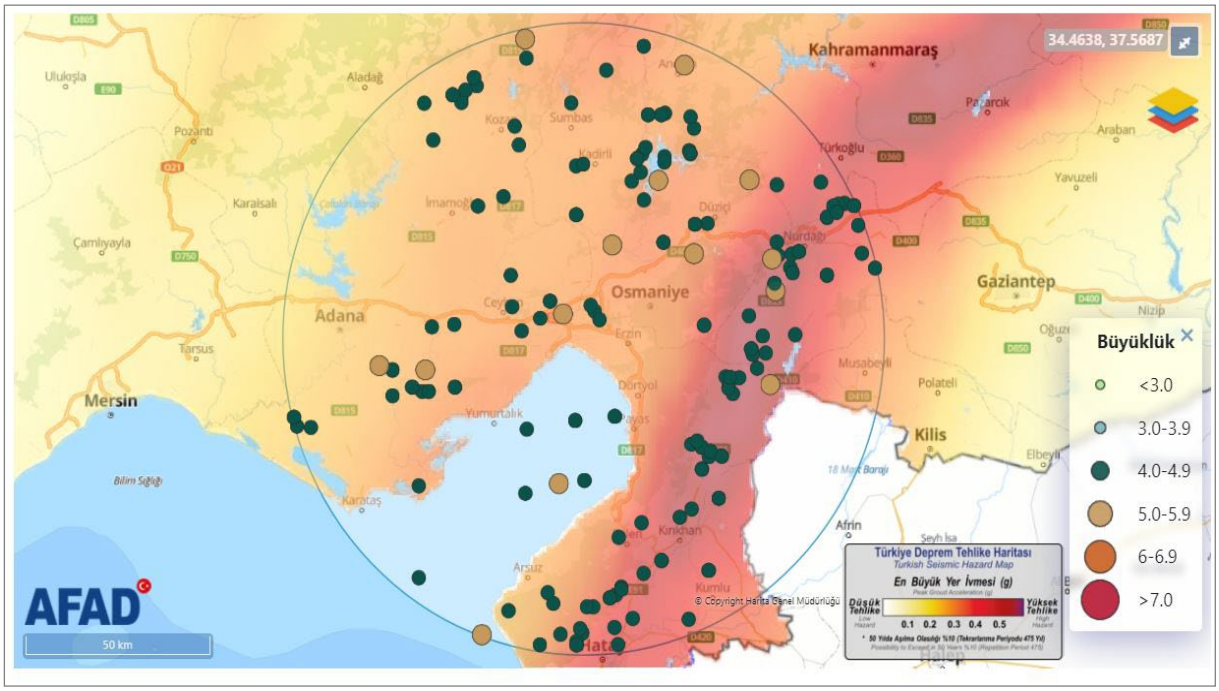


Figure 20. Earthquakes (M ≥ 4.5) that occurred within a radius of 100 km between 1900 and 2023, centered on the project area

Table 27. Earthquake Data with M≥4.5 Occurred Between 1900-2023

Date*	Latitude	Longitude	Depth (km)	Magnitude	Location
25/07/2023 08:44:49	35.884	37.634	10.38	5.5	Kozan (Adana)
07/05/2023 11:36:10	36.301	36.426	7.44	4.7	Kırıkhan (Hatay)
05/03/2023 23:49:46	36.158	36.762	5.39	4.5	Akdeniz – İskenderun Bay – [04.35 km] Payas (Hatay)
19/02/2023 07:07:40	36.835	37.236	4.98	4.5	Nurdağı (Gaziantep)
16/02/2023 22:47:50	35.752	36.253	9.26	5.1	Akdeniz – [05.64 km] Arsuz (Hatay)
13/02/2023 14:59:17	36.575	36.919	6.96	4.6	İslahiye (Gaziantep)
12/02/2023 01:29:14	36.451	36.68	5.13	4.6	Hassa (Hatay)
09/02/2023 10:18:17	36.646	37.071	10.95	4.9	İslahiye (Gaziantep)
08/02/2023 09:08:59	36.041	36.229	2.69	4.6	Antakya (Hatay)
07/02/2023 08:26:31	36.178	36.359	4.93	4.5	Antakya (Hatay)
07/02/2023 00:02:05	36.485	36.669	7.31	4.7	Hassa (Hatay)
06/02/2023 20:31:33	36.72	37.145	10.53	4.5	Nurdağı (Gaziantep)
06/02/2023 19:32:11	36.424	36.69	10.18	4.7	Hassa (Hatay)
06/02/2023 17:27:43	36.51	36.853	9.17	4.7	Hassa (Hatay)
06/02/2023 12:36:16	36.888	37.251	13.29	4.7	Nurdağı (Gaziantep)
06/02/2023 12:23:44	36.431	36.974	8.4	4.6	Merkez (Osmaniye)
06/02/2023 08:36:32	36.143	36.339	13.07	4.5	Antakya (Hatay)
06/02/2023 05:54:00	36.41	36.704	9.13	4.9	Hassa (Hatay)
06/02/2023 05:17:40	36.701	37.096	6.38	4.9	İslahiye (Gaziantep)
06/02/2023 04:58:23	36.649	37.054	10.21	5.3	İslahiye (Gaziantep)
06/02/2023 04:51:21	36.633	36.836	7	5	Hassa (Hatay)

Date*	Latitude	Longitude	Depth (km)	Magnitude	Location
06/02/2023 04:36:28	36.639	37.128	11.19	5.7	Hasanbeyli (Osmaniye)
06/02/2023 04:35:04	36.476	36.571	7	4.6	Kırıkhan (Hatay)
06/02/2023 04:23:16	36.806	37.224	7	4.9	Nurdağı (Gaziantep)
03/02/2023 14:05:08	36.403	37.208	7	4.6	Düziçi (Osmaniye)
18/12/2022 21:13:09	36.445	36.403	11.67	4.8	Kırıkhan (Hatay)
11/10/2022 18:48:46	36.291	37.309	7	5.1	Düziçi (Osmaniye)
19/08/2018 18:22:14	36.3855	37.3773	10.53	4.8	Andırın (Kahramanmaraş)
08/01/2015 20:44:46	36.8058	37.0901	8	4.6	Nurdağı (Gaziantep)
09/06/2014 06:38:34	36.0651	36.6125	20.56	4.5	Akdeniz – İskenderun Bay – [07.85 km] Arsuz (Hatay)
14/02/2014 02:33:39	36.037	36.7523	15.67	4.5	Akdeniz – İskenderun Bay – [15.15 km] Payas (Hatay)
16/09/2012 10:54:14	35.6632	37.5058	24.21	4.7	Kozan (Adana)
22/07/2012 12:26:02	36.3707	37.574	4.56	5	Andırın (Kahramanmaraş)
16/11/2010 12:50:31	36.3892	37.3708	21.22	4.7	Andırın (Kahramanmaraş)
15/11/2010 01:08:25	35.987	36.6053	24.17	5.1	Akdeniz – İskenderun Bay – [09.77 km] Arsuz (Hatay)
24/07/2009 08:48:18	35.7282	37.5455	3.93	4.5	Kozan (Adana)
17/01/2009 09:45:25	36.3067	37.1663	7.52	4.6	Merkez (Osmaniye)
14/12/2002 03:02:44	36.26	37.46	10.9	4.8	Andırın (Kahramanmaraş)
23/05/2002 04:08:03	36.2262	37.3593	14.3	4.7	Kadirli (Osmaniye)
31/10/2001 14:33:55	36.15	37.16	11.3	5	Merkez (Osmaniye)
18/10/2001 18:50:30	35.18	36.76	17.4	4.6	Karataş (Adana)
25/06/2001 16:28:49	36.4	37.14	10.9	5.1	Merkez (Osmaniye)
12/05/2000 06:02:45	35.96	37.03	11.3	4.8	Ceyhan (Adana)
04/07/1998 12:24:24	35.48	36.87	13.4	4.5	Yüreğir (Adana)
04/07/1998 05:15:47	35.44	36.88	12.3	5	Yüreğir (Adana)
28/06/1998 06:59:27	35.59	36.82	21	4.9	Yüreğir (Adana)
27/06/1998 23:50:18	35.54	36.83	26.9	4.6	Yüreğir (Adana)
27/06/1998 17:15:39	35.67	36.83	29.7	4.6	Yüreğir (Adana)
27/06/1998 16:56:52	35.58	36.87	23	5.9	Yüreğir (Adana)
13/04/1995 23:23:20	36	37	30	5	Ceyhan (Adana)
10/02/1994 08:15:22	36.04	37.23	1	4.8	Kadirli (Osmaniye)
03/01/1994 23:00:24	36.57	37.31	1	5	Düziçi (Osmaniye)
10/04/1991 04:08:43	36.3	37.46	13	4.9	Andırın (Kahramanmaraş)

**Türkiye Local Time TS*

The structures to be constructed within the scope of the Project will strictly comply with the principles of the "Regulation on Structures to be Built in Disaster Zones" of the abrogated Ministry of Public Works and Settlement published in the Official Gazette dated 14.07.2007 and numbered 26582 and the provisions of the "Turkey Building Earthquake Regulation" of the Disaster and Emergency Management Presidency, which was published in the Official Gazette dated 18.03.2018 and numbered 30364 and entered into force on 01.01.2019.

Active Fault Map of the Project Area is given in Figure 21.

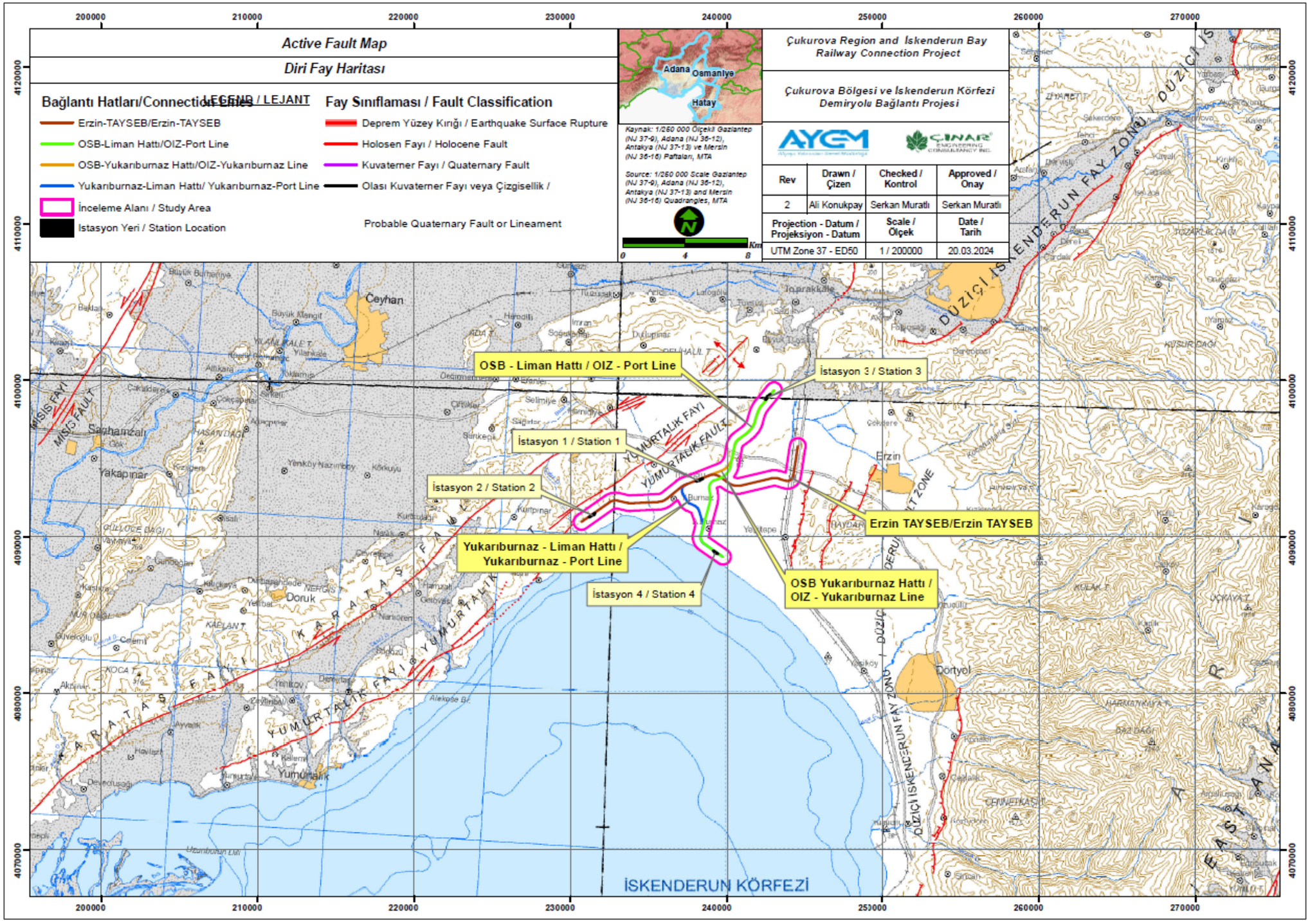


Figure 21. Active Fault Map of the Project Area

Source: Emre and Duman, 2011., Emre et.al., 2012a, 2012b, 2012c

5.1.2.4.4 Landslides

Both detailed geological and geotechnical survey reports and the online Geoscience Map Viewer of MTA was used to scan for active land slide zones around the Project area. As a result, it was identified that no active or former landslide areas exist in the entire Project vicinity. The landslide map of the project area is given in Figure 22.

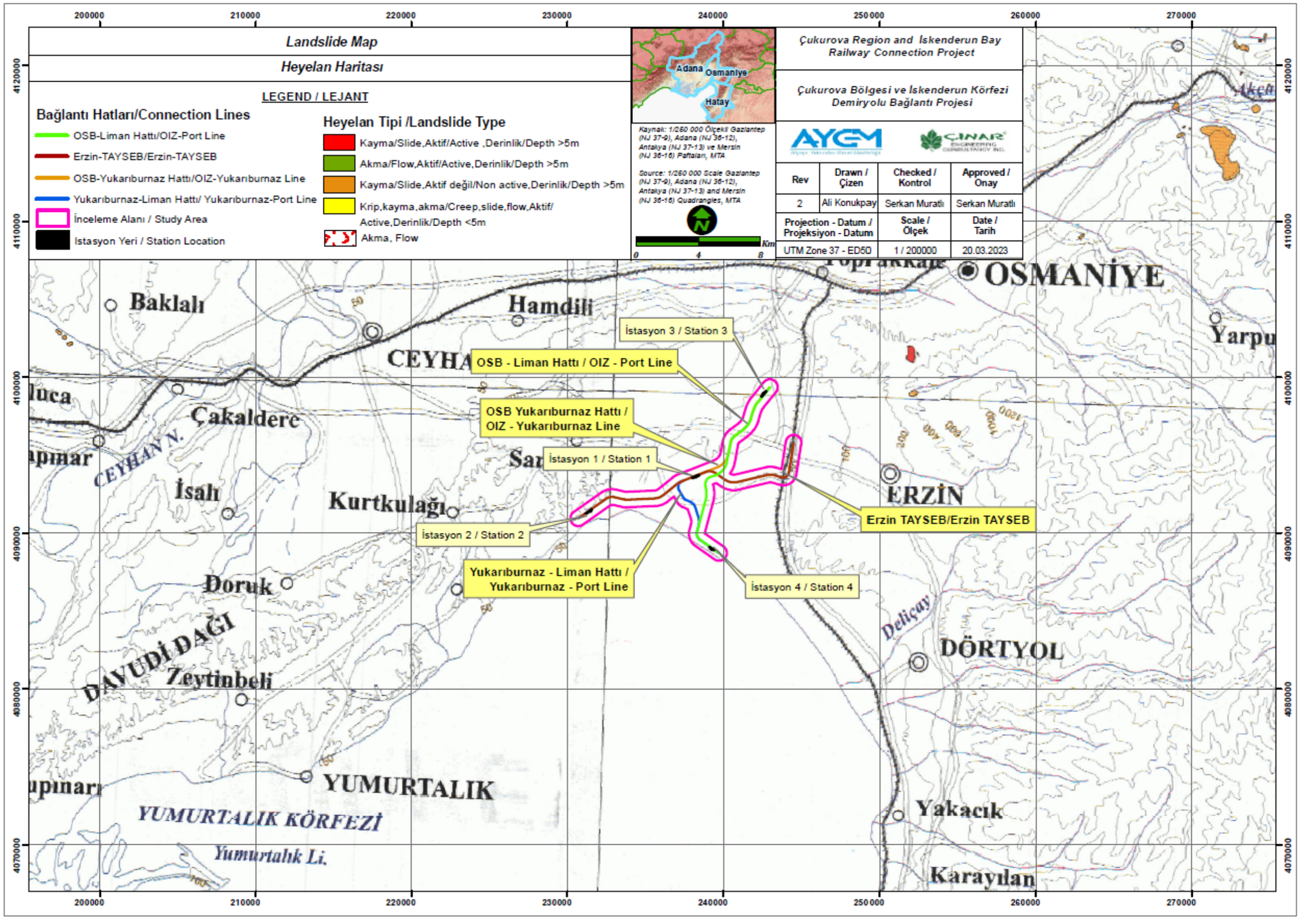


Figure 22. Landslide Map of the Project Area

Source: Duman et.al, 2009a, 2009b

5.1.2.4.5 Geosites

Turkish Association for Geological Heritage Protection (Jemirko) provides a geological heritage sites inventory.

Typical localities that explain the evolution of the Earth's crust are geological elements with a large visual side, beautiful representatives of the well-known events or processes, rare occurrences, and "geological heritage" fragments to be preserved. They can be important fossil deposit, tectonic structure, type section, ground shape, mineral community, mineral deposit, rock etc. These are always necessary for both the learning of the earth and earth science education. Geosite, with its broadest scope, is a rock, mineral, fossil community, structure, piling, landform, or terrain that expresses any geological process, event, or feature. Those with archaeological or historical value are Cultural Geosite. The area where the same or different types of geosites are collectively smaller than the pedestrian distance is the Geopark. Geo-inventory, which expresses the presence of geosite and geological heritage and its spatial distribution, is the most important data source for the planning of conservation studies and development of geotourism (https://www.jemirko.org.tr).

Information on geosites listed in the inventory of Jemirko and located Adana province, is provided in Table 28 and as can be seen, no listed geological heritage site was identified to be located on the Project area.

Table 28. Geosites in the Vicinity of the Project Area

Name	Province	Distance to the Project (km) and Direction	Description
Akyatan Lake	Adana/Karataş	63 km – SW	Akyatan lagoon-lake is a place to study today's delta and sedimentation environments. It is proposed to be a geopark.
Ceyhan River, Yumurtalık Bay South Shores, Delta Formation Areas	Adana/Yumurtalık	33.5 km – SW	Ceyhan river, Ağyatan lagoon, Yumurtalık Bay shores, Akyatan lake (small size), Avci Ali lake, Big and small old, new coastal lakes, fixed, moving old, new dunes, marches, marshy areas, abandoned streams. It is a large region with interconnected delta forms such as deposits, large and small sand islands, submarine sandsets, coastal languages, various coastal arrows, cliffs, natural embankments, grooves, ridges, crevas depots, bed edge steeples, and a wide variety of current sediments. It is not protected, it is proposed to be a geopark.
Yali Stones (Coastal Stone) is located at the streams between Muttalip Farm and Yumurtalık Port.	Adana/Yumurtalık	10.8 km-SW	They are contemporary formations of various lithological character, formed by the combination of loose materials on the shore with limestone cement. It is not protected.
Hardened Fossil Dunes, Yumurtalık District-Sultan Suleyman Tower surroundings	Adana/Yumurtalık	52 km-SW	They are hardened old fossil dunes where cementization is strong, covering 5-7m on the shore and 10-12m in height and 50-100m in width. They gained resistance against erosion as a result of calcification. It is not protected.

Source: https://www.jemirko.org.tr

5.1.3 Impact Assessment

Potential impacts of the Project on existing land use characteristics, soils and geology will occur mainly during the land preparation and construction phase, due to the earthworks and construction activities that will be conducted. Main activities to be conducted in the scope of land preparation and construction phase will include the following:

- Preparation of the topographical measurements, application designs and expropriation plans
- Construction of Access Roads
- Utility works
- Top soil stripping
- Cut and Fill Works
- Construction of Engineering Structures
- Traffic signs, marking of track and guardrail
- Service areas, parking areas
- Construction of stations and provision of infrastructure
- Electrification and signaling works

After the expropriation works are completed, the construction of the railway route components will begin with the stripping of the topsoil, completing the cut and fill operations. After these activities, land use will have both temporary and permanent impacts on soil and geology.

5.1.3.1 Land Preparation and Construction Phase

5.1.3.1.1 Land Use

There are several types of land use along the land acquisition (expropriation) corridor of the project. Some of the direct impacts of the land preparation and construction phase of the Project can be listed as the following:

- Land acquisition that will result in permanent changes in land use characteristics affecting arable lands, pastures, and other agricultural areas, potentially disrupting local farming practices and livelihood, leading to loss of income and food insecurity for farming communities relying on arable lands and pastures
- Temporary changes in land use during project construction
- Temporary changes in land use due to the areas to be used during the construction of the project (excavation storage area, construction site area, temporary access roads, etc.) (rehabilitation works will be carried out after construction activities.)
- Restriction of access in some lands
- Evacuation of residential areas
- Fragmentation of lands

Temporary land acquisition may be required for necessary excavation storage area, construction site, temporary access roads etc. that will be located outside the corridor.

The following measures will be taken to minimize impacts of the Project during the land preparation and construction phase, on adjacent lands located outside of the expropriation corridor:

- Land preparation and construction works will be conducted at designated sites that will be visibly and appropriately marked.
- Training will be provided to the construction personnel so that they maintain the pre-established construction boundaries.
- A grievance mechanism will be established to ensure any complaints/comments regarding the Project will be received and responded in a timely manner, providing solutions and taking corrective measures as appropriate.

- In case of direct or indirect damage to adjacent state- or privately-owned property as a result of Project-related activities, DGII will ensure that necessary corrective measures and compensations are taken at its own cost in line with the provisions of related authorities.
- Prior to the construction works, DGII will obtain the permit from the Ministry of Energy and Natural Resources for the railway design at the intersection point of the two planned solar power plant projects, Erzin-1 and Erzin-2, located in the project area. This permit will also cover the connection road and the designed transition structure.

5.1.3.1.2 Soils

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

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

Topsoil Stripping

Topsoil along the Project route will be stripped for land preparation and construction of the Project components, as well as the construction facilities at a depth ranging between 5 and 50 cm, depending on soil properties at the related site. As stated in the Geological – Geotechnical Survey Report prepared within the scope of the project in Phase-1, the approximate topsoil depth to be stripped from the components along the railway connection lines are presented in the table below.

Table 29. Approximate Depth of Topsoil to be Stripped along the Railway Connection Lines

Erzin-TAYSEB Connection Line	
Section	**Stripping Depth (cm)**
0+000 – 10+300	50
10+300 – 16+790	-
OIZ-Port Line	
Section	**Stripping Depth (cm)**
0+000 – 8+000	-
8+000 – 12+100	50
12+100 – 13+047	-

Earthworks

According to the Feasibility Study Report, the estimated earthwork volume projected along the railway routes is 1,515,190.75 m^3.

Soil Disturbance and Erosion

As mentioned in the WBG General EHS Guidelines for Construction and Decommissioning, soil erosion may result from soils exposure to rain and wind during first field works of soil surfaces (root removal, fragmentation, off-site transfer etc.) and earthworks (topsoil stripping, excavation and fill works, soil leveling, soil compaction, soil stabilization, etc.). Soil erosion can trigger the transport of soil through surface drainage networks, which can affect the quality of surface water resources. Soil erosion and water resources management approaches recommended in the WBG's relevant EHS Guidelines for land preparation and construction periods include:

- Under extreme weather conditions, land preparation and construction works will be altered wherever feasible to avoid risk of erosion;

- Shaping and minimizing the length and steepness of slopes;
- Mulching to stabilize the exposed areas;
- All of the disturbed sites will be re-vegetated to the most possible extent in a timely manner following the completion of stripping and excavation works;
- Erosion control measures will be implemented following the completion of excavation works, also at the culvert outlets, and slopes will be improved;
- Lining steep channels and slopes (using jute mat);
- Using settling ponds, silt fences and water treatment to prevent or reduce sediment transport outside the site and suspend land preparation and construction activities as much as possible in heavy rain and strong wind conditions;
- Depending on the potential for adverse impacts, installing free-opening structures (eg one-eyed culverts) for water crossings;
- Reducing the duration and timing of river crossing activities and avoiding these activities during critical periods of the biological cycles of flora and fauna (eg migration, spawning etc.);
- Using isolation techniques (sets or derivation) during construction activities to limit exposure of abandoned sediments to flowing water during river crossing activities;
- Take impactive short-term measures for slope stabilization and sediment control until long-term measures are implemented for the operation phase; and
- Installing adequate drainage systems to minimize and control leaks.

Soil Contamination

Soil contamination during the land preparation and construction phase of the Project may occur as a result of accidental spills and releases of hazardous materials and wastes. These accidental amounts cannot be estimated before the incident actually takes place. Management and mitigation strategies to be implemented in the event that soil contamination takes place will also vary depending on the level and extent of contamination. However, in order to develop an understanding of source-pathway-receptor relationship in case of an accidental spill or leakage, and managing the contaminated media in a timely manner is important in terms of impactive management of soil contamination. Some of the fundamental measures are listed below, to ensure that with avoidance and response measures in place, the amount of release can be taken under control before reaching substantial amounts and the significance of the spill or leakage can be kept at minimum levels, even if not considered negligible:

- Discharge of materials into soil that can cause contamination will be prohibited.
- Accidental spills and leakages will be managed through implementation of the Emergency Preparedness and Response Plan.
- Solid wastes, hazardous wastes and wastewater to be generated from land preparation and construction activities at Project sites will be further managed through implementation of the related management plans (Waste Management Plan, Pollution Prevention Plan etc.).

5.1.3.1.3 Geology

Geological and Geotechnical Risks

There are areas for high cut and fills on the project routes. These cuts and fills were evaluated as geological – geotechnically critical sections and examined in detail. Stability analyzes were carried out for fills and slopes using the results of surface geology studies, drilling studies and laboratory experiments.

SPT – N values were determined between 2 – 6 and 8 – 5 in some drillings opened in OIZ – Port Line and the ground consists of very soft – middle floor, sandy clay silty – sandy silty clays and loose silty sands. Poor ground cannot bear the fill load. Therefore, approximately OIZ – Port Line Km: 9+700 – 10+560 section is defined as a weak ground. There are basalts under the weak ground layer. Depending on the low slope and high groundwater level, in the areas with weak ground, water will form on the surface in rainy seasons.

Since the Kızıldere formation consisting of mudstone, claystone, siltstone, sandstone, marl units, which will come out of the cuts, and the cut materials made up of clay floors on the upper parts of this formation, and the materials that will come out of the alluvial cuts in a small amount do not meet the fill material standards. Only the materials that will come out of the basalt cuts comply with the fill material standards and are suitable for use as fill material.

5.1.3.1.4 Landslide Risk

There is no active or passive landslide risk around the planned project route according to land surveys conducted within the scope of geological-geotechnical survey report and Türkiye Landslide Inventory Map of MTA, Adana and Hatay Section. However, caution should be taken against landslides that may develop locally, especially in the cut process performed in clastic rocks of Kızıldere formation during the construction phase.

Seismicity Related Risks

The movements of Arab and African plates towards the Anatolian plate in the region create neotectonic deformations on these fault belts and the region acquires an active seismicity character.

Project route that is marked on the “Türkiye Earthquake Hazard Map” which was published in the Official Gazette No. 30364 dated 18.03.2018 and came in force on 01.01.2019 and renewed is given Figure 19. The routes planned in the scope of the project and its surroundings were examined on the interactive earthquake hazard map published by AFAD, and the largest ground acceleration (PGA 475) for the 475 Year Repetition Period was found to be 0.302 g.

Geosite Loss and Damage

The closest geosite is the “Yali Stones (Coastal Stone) is located at the streams between Muttalip Farm and Yumurtalık Port” and it is located 10.8 km southwest to the Project site and the project activities will not pose a risk for the area.

5.1.3.2 Operation Phase

5.1.3.2.1 Soil

Operation phase of the Project will not cause any direct impacts on soils. Yet, operation-phase mitigation measures that will be in place to minimize the risk of erosion and contamination can be listed as the following:

- Erosion control structures will be monitored and maintained regularly to ensure that they are functioning properly.
- Embankment and cutting slopes will also be checked regularly to identify and respond to any risks that may be associated with erosion, landslide, etc.

5.1.3.2.2 Geology

Geological and geotechnical risks (i.e., geotechnical risks such as stability and settlement problems, landslide and seismicity related risks) described above for land preparation and construction phase will persist during operation phase. There will be no impact on geosites during this phase as well.

5.1.4 Impact Significance and Mitigation Measures

Sensitivity/value of the associated resource/receptor was determined by considering the baseline conditions given in the previous sections and typical descriptor of defined in Chapter 4. Specific sensitivity/value criteria considered in assessing the impacts on land use and soils are provided in Table 30.

Table 30. Land Use and Soil Sensitivity/Value Criteria for Resource/Receptors

Subject	High	Medium	Low	Negligible
Arable lands	Lands having land use capability of Class I-II according to database of the Ministry of Agriculture and Forestry (agricultural lands suitable for agricultural soil cultivation)	Lands having land use capability of Class III-IV according to database of the Ministry of Agriculture and Forestry (agricultural lands suitable for agricultural soil cultivation)	Lands having land use capability of Class V-VII according to database of the Ministry of Agriculture and Forestry (agricultural lands not suitable for soil cultivation)	Lands having land use capability of Class VIII according to database of the Ministry of Agriculture and Forestry (Non-arable lands)
Topsoil	Lands having land use capability of Class I-II according to database of the Ministry of Agriculture and Forestry (agricultural lands suitable for agricultural soil cultivation) where topsoil is located	Lands having land use capability of Class III-IV according to database of the Ministry of Agriculture and Forestry (agricultural lands suitable for agricultural soil cultivation) where topsoil is located	Lands having land use capability of Class V-VII according to database of the Ministry of Agriculture and Forestry (agricultural lands not suitable for soil cultivation) where topsoil is located	Land with no topsoil
Soil (Erosion)	Soils of Degree 4: Very severe erosion risk	Soils of Degree 3: Severe erosion risk	Soils of Degree 2: Moderate erosion risk	Soils of Degree 1: None or very low level of erosion risk
Soil (Pollution)	Nationally and Internationally protected areas, areas with ecologically critical habitat status	Lands having national importance, Lands having Class I-II land use capability, residential areas	Lands having Class III-IV land use capability.	Lands having Class V-VII land use capability, industrial and mining areas.

5.1.4.1.1 Mitigation Measures to Address Geological-Geotechnical Impacts

There are high cut/fill areas on the project route. Cut and fill slopes have been defined through evaluation of the field observations along with analysis of the drilling data and laboratory test results and finalized based on seismic effect and stability analysis. According to the results of the slope analysis performed, the cut and fill slopes will be constructed along the route as follows.

Along the railway routes, all cut slopes will be constructed with 2C/1F slope. Basalt cuts are also considered appropriate to be constructed with 2C/1F slope, considering that the upper levels are in the form of clinker in some parts and meet part of the demand for fill material along all the routes of the railways.

The fills along the route will be constructed with 3C/2F slope with the materials from the basalt cuts and materials from the material borrow pits consisting of basalts.

In cut and fills with heights more than 10 meters, 5-meter-wide benches will be constructed at every 8 or 10 meters according to the maximum height. The slope ratios defined for the cut and fills, are based upon the stability analysis and no stability problems are anticipated on the railway routes. Apart from this, during the cut excavations in the construction phase, if weak zones are determined by the expert engineer, additional necessary measures will be taken at these cuts.

No area with any landslide potential was encountered during the surveys conducted along the route.

Between the kilometric points of 9 + 700 and 10 + 560 on the OIZ – Port Line, the ground was identified to be weak according to the SPT values obtained. The route will pass over the embankment to be constructed in this part. In order to carry the load of the embankment, the weak ground in this part of the route consisting of sandy clay silts (alluvium) will be gradually digged out by 2 to 4 meters, 20 meters to the left and right from the fill slopes and replaced with the rockfill materials (basalt) brought from the material borrow pits for ground improvement.

During the ground improvement works at this section of the route, after the site surveys by the expert engineer, the weak ground layer to be removed will be examined and the ground improvement depth will be redefined again, if necessary, with the approval of the supervising engineer.

In addition, since the groundwater level in this section is very close to the ground surface and the slope of the land is not high, drainage measures will be taken in order to prevent water accumulation on the surface in rainy seasons, to decrease the groundwater level and to remove it from the embankment body.

5.1.4.1.2 Mitigation Measures to Address Seismic Impact – Earthquake Impact

The railway routes planned in the scope of the Project and their immediate surroundings were examined on the interactive earthquake hazard map published by the Ministry of Interior, Disaster and Emergency Management Presidency (AFAD). According to this map, the peak ground acceleration for a 475-year return period (PGA 475) was identified as 0.302 g, which indicates that earthquakes pose a significant risk for the region.

All engineering and ground structures (cut and fills) as part of the project will be designed and constructed considering the earthquake-resistant design parameters and criteria.

5.1.4.1.3 Mitigation Measures to Address Landslide Risks

There is no active or passive landslide risks on the planned railway routes and their immediate surroundings pursuant to the site surveys conducted within the scope of the geological-geotechnical survey report for the Project route as well as Adana and Hatay Sections of Türkiye Landslide Inventory Map of the General Directorate of Mineral Research and Exploration (MTA). However, caution should be taken against the landslides that may develop locally, especially in the cut process performed in clastic rocks of Kızıldere formation during the construction phase through observing excavations and via sprayed concrete, wire mesh, rock bolt, etc.

In line with the geological-geotechnical survey studies carried out within the scope of the Project, the earthquake hazard map and landslide map developed by the relevant institutions, the information in the online databases of these institutions, and the recommendations of the experts studying in this field, the assessments of these mitigation measures and the residual impacts after implementation of these measures are performed and presented in detail in Table 31.

Table 31. Land Use, Soils and Geology Impacts, Proposed Mitigation Measures and Residual Impacts

Potential Impact Description	Project Phase	Receptor	Impact Magnitude					Sensitivity/ Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Reversibility	Duration	Frequency	Overall Magnitude				
Impacts on arable lands	Land preparation and construction	Arable lands	Restricted	Irreversible	Long-term	One-off	Medium	Medium	**Moderate**	Resettlement Plan (RP) will be implemented. Land preparation and construction works will be conducted at designated sites that will be visibly and appropriately marked. Training will be provided to the construction personnel so that they maintain the pre-established construction boundaries. A grievance mechanism will be established to ensure any complaints/comments regarding the Project will be received and responded in a timely manner, providing solutions and taking corrective measures as appropriate. DGII will ensure that necessary corrective measures are taken by the Contractor from its own budget, in case of direct or indirect damage to adjacent properties that are state-owned or private property due to project-related activities. In order to mitigate fragmentation impacts, agricultural/pasture underpasses and culverts are either available or will be constructed throughout the entire Project route. Trainings and timely and regular information sharing will be performed with community members who are using pasture land during land preparation before construction. Prior to the construction works, DGII will obtain the permit from the Ministry of Energy and Natural Resources for the railway design at the intersection point of the two planned solar power plant projects, Erzin-1 and Erzin-2, located in the project area. This permit will also cover the connection road and the designed transition structure. Strip fertile topsoil along the Project area including the railway route, quarries/material borrow sites, storage sites at a sufficient depth suitable for local soil conditions prior to construction activities. Store topsoil separately from subsoil at designated topsoil storage areas along the route and other work sites at suitable conditions so as to preserve its vegetative properties. Do not carry out stripping when soil is wet, so that soil compaction is avoided. Provide drainage at topsoil storage areas by open channels. If storage of topsoil will last longer than three months, plant upper part of fertile soil temporarily so that the organic content is conserved. Select proper species and seed mixture ratios. Apply organic or inorganic materials on the topsoil to improve quality and avoid erosion, desiccation or invasion of wild species. Reuse topsoil stored at suitable conditions for the rehabilitation of temporary construction sites after the completion of construction activities, for the finalization of side slopes and in landscape activities. Loosen topsoil to a depth of 15 cm before reinstatement (Increase depth of loosening up to 40-50 cm for compact heavy clay soils). Keep depth of topsoil for areas to be planted suitable for side slopes, shrub plantation areas, tree roots etc. Conduct grading operation in line with the natural slope and drainage conditions following the reinstatement of topsoil. Before the onset of land preparation and construction works, erosion control measures like drainage channels, settling structures, etc. will be implemented. In order to eliminate the risk of erosion in periods of excessive rainfall, the waters from the project surroundings and slopes will be separated from surface run-off by directing through temporary channels and soil embankments. Erosion control measures will be implemented following the completion of excavation works, also at the culvert outlets, and slopes will be improved.	**Minor**
		Local communities	Restricted	Irreversible	Long-term	One-off	Medium	Medium	**Moderate**		**Minor**
Impacts on pasture land	Land preparation and construction	Arable lands	Restricted	Irreversible	Long-term	One-off	Medium	Medium	**Moderate**		**Minor**
		Local communities	Restricted	Irreversible	Long-term	One-off	Medium	Medium	**Moderate**		**Minor**
Topsoil stripping	Land preparation and construction	Arable lands Pasture lands	Restricted	Irreversible	Medium-term	One-off	Medium	Medium	**Moderate**		**Minor**
		Lands with no topsoil	Restricted	Irreversible	Long-term	One-off	Negligible	Negligible	**Negligible**		**Negligible**
Soil Erosion	Land preparation and construction	Lands with Erosion Degree 4	Local	Irreversible or long-term reversible	Long-term	Intermittent	High	High	**Major**		**Moderate**
		Lands with Erosion Degree 3	Local	Irreversible or long-term reversible	Long-term	Intermittent	Medium	Medium	**Moderate**		**Minor**
		Lands with Erosion Degree 2	Local	Irreversible or long-term reversible	Long-term	Intermittent	Low	Low	**Minor**		**Negligible**

Potential Impact Description	Project Phase	Receptor	Impact Magnitude					Sensitivity/ Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Reversibility	Duration	Frequency	Overall Magnitude				
		Lands with Erosion Degree 1	Local	Irreversible or long-term reversible	Long-term	Intermittent	Negligible	Negligible	**Negligible**	Around the excavated material stored at designated storage sites, dikes will be established to prevent loss of soil. All of the disturbed sites will be restored to the most possible extent in a timely manner following the completion of stripping and excavation works.	**Negligible**
Soil Contamination	Land preparation and construction	Lands Project Personnel Local Communities	Local	Short-term reversible	Short-Term	One-off	Low	Medium	**Minor**	Discharge of materials into soil that would cause contamination will be prohibited. Accidental spills and leakages will be managed through implementation of the Emergency Preparedness and Response Plan. Solid wastes, hazardous wastes and wastewater to be generated as a result of land preparation and construction activities along the Project route will be further managed through implementation of the related management plans (Waste Management Plan, and Pollution Prevention Plan). Soil sampling will be conducted twice a year during the land preparation and construction phase, or in case of a complaint.	**Negligible**
General Geotechnical Risks	Land preparation and construction, Operation	Project personnel, Railway users	Restricted	Short-term reversible	Short-Term	One-off	Medium	High	**Major**	All slope slopes will be created with 2Y/1D slope along the railway routes. 3Y/2D slope will be created with the fills to be made along the routes, the materials to be removed from the basalt pits and the materials to be taken from the quarry consisting of basalts. In the cuts and fills with a height of H>10 meters, a 5 meter wide coat will be created in 8 or 10 meters according to the maximum height. Ground improvement will be made with rock fill material (basalt) that will be removed by digging 4 m and brought to the borrow quarry at OIZ-Port Line Km: 9 + 700-10 + 560. During the ground improvement at this intersection of the route, after the on-site determinations by the expert engineer, the weak ground layer to be removed will be checked and the ground improvement depth will be determined again, if necessary, with the approval of the control engineer. Also, in this section, the groundwater level is very close to the surface, and since the slope of the land is not too high, drainage measures will be taken in order to prevent water accumulation on the surface in rainy seasons, to decrease the groundwater level and to remove it from the filling body. Units belonging to the Kızıldere formation consisting of mudstone, claystone, siltstone, sandstone, marl units that will come out of the cuts are not in compliance with the fill material standards. Only the materials that will come out of the basalt cuts comply with the fill material standards and will be used as filling material.	**Minor**
Seismicity Related Risks	Land preparation and construction, Operation	Project personnel, Railway users	Wide	Irreversible	Long-term	Intermittent	Medium	High	**Major**	All engineering structure and superstructures (fill, cut) in the project closure will be designed and constructed taking into account the earthquake resistant design parameters and criteria. The structures planned for construction within the project will strictly comply with regulations outlined in two official publications. These include the “Regulation Regarding Buildings to be Constructed in Disaster Zones” issued by the Emergency Management Presidency of Türkiye published in the Official Gazette dated 18.03.2018, and the “Earthquake Building Regulation” of the Ministry of Public Works and Settlement, published in the Official Gazette dated 14.07.2007. ~~In the structures to be constructed within the scope of the project, Disaster and Enforcement which was published in the Official Gazette dated 18.03.2018 and numbered 30364 published in the Official Gazette dated 18.03.2018 and published in the Official Gazette dated 18.03.2018 and published in the Official Gazette of the Ministry of Public Works and Settlement dated 14/07/2007. Emergency Management Presidency of Türkiye “Earthquake Building Regulations” provisions will be strictly followed~~. Developing additional durability and structural measures in fill and cuts, by performing periodic inspection and maintenance activities along the routes, especially when necessary (especially after natural disasters-earthquakes and post-flood art structures, cracks, ruptures, sliding, sitting, deformation, etc. problems that may occur in fillings and cuts); implementation will be provided.	**Moderate**

Potential Impact Description	Project Phase	Receptor	Impact Magnitude					Sensitivity/ Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Reversibility	Duration	Frequency	Overall Magnitude				
Landslide Risk	Land preparation and construction, Operation	Project personnel, Railway users	Restricted	Short-term reversible	Short-Term	One-off	Low	Negligible	**Negligible**	During the construction phase in the cracked rocks of Kızıldere formations, special attention will be given and precautions should be taken against the landslides that may develop locally, by observing excavations, sprayed concrete, wireframe, rock bolt, etc.	**Negligible**
Loss of/ Damage to Geosites	Land preparation and construction, Operation	Geosites	Wide	-				Negligible	**Negligible**	-	**Negligible**

5.2 Noise

5.2.1 Project Standards and Methodology

Project Standards

In the scope of noise and vibration impacts, the project is evaluated according to the following international standards and national regulations.

- Environmental Noise Control Regulation (ENCR)
- WBG General EHS Guidelines – 1. Environmental – 1.7: Noise

ENCR sets different limits for specific noise sources such as industrial facilities, workplaces that broadcast music etc. The limit values stated in ENCR –Table 1 of Annex-2 are given in Table 32.

Table 32. Limit Values in Regulation on Environmental Noise Control [10]

Noise Sources	Measured Parameters	Environmental Noise Levels		
		Daytime (07.00-19.00)	Evening (19.00-23.00)	Night (23.00-07.00)
Industrial facilities, sources of transport	**$LA_{eq,5min.}$**	**65 dB(A)**	**60 dB(A)**	**55 dB(A)**
Workplaces that broadcast music	$LA_{eq\ 63\text{-}250\ Hz}$	60 dB(A)	55 dB(A)	50 dB(A)
Workplaces	$LA_{eq,5min.}$	Background + 5 dB(A)		Background + 3 dB(A)
In case of more than one workplace	$LA_{eq,5min.}$	Background + 7 dB(A)		Background + 5 dB(A)
All sources	LC_{max}	100 dB(C)		

While the ENCR establishes noise limits according to the noise sources, the WBG General EHS Guidelines on Environmental Noise Management determine noise limits based on the receptors of the noise. WBG General EHS Guidelines divides receptors into two categories as residential areas and industrial/commercial areas and divides the time periods into two as day and night-time. Limit values stated in the guideline is given in Table 33. Besides, noise impacts should not result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site. It should be noted that there are no defined limits for the construction activities within the scope of WBG General EHS Guidelines.

Table 33. Noise Limits in WBG General EHS Guidelines

Receptor	One Hour LAeq (dBA)	
	Daytime (07:00-22:00)	Nighttime (22:00-07:00)
Residential; institutional; educational	55	45
Industrial; commercial	70	70

Since the WBG EHS Guideline noise limit values established for residential areas are stricter than ENCR noise limits, the WBG EHS Guideline limit values were adopted as project standards.

Methodology

Environmental noise measurements were carried out by ÇINAR Laboratory Group Inc. (ÇINAR LAB) in accordance with TS ISO 1996-1 (Acoustics – Description, measurement, and assessment of environmental noise – Part 1: Basic quantities and assessment procedures)

[10] Table 1.1 in Annex-2 of Regulation on Environmental Noise Control

and TS ISO 1996-2 (Acoustics – Description, measurement, and assessment of environmental noise – Part 2: Determination of environmental noise levels standards). A total of 48 hours of measurements were performed at each point, with the measurements in 10-minute periods.

Noise modeling studies were carried out for both construction and operation periods. SoundPLAN 7.3 software was used in the noise modeling works carried out for both the construction and operational periods of the project. Information about the data used for noise modeling studies is given in Table 34.

Table 34. SoundPLAN Model Methodology

Model Input		Data Source
Receptors		Established from aerial photo of the surrounding area (Google Earth view) and site visits
Calculation Method	Industry	ISO 9613-2: 1996
	Air absorption	ISO 9613
Temperature (ºC)		10
Relative Humidity (%)		70
Air Pressure (mbar)		1013,3
Assessment		Lden EU (Ld & Ln)
Grid Noise Map	Grip Space (m)	10
	Height above ground	4

Noise modeling studies were carried out in two separate parts of the Project area for construction and operation periods. Information on the two segments identified is given below:

- First section - Connection Line: Km = 13+500 - 16+300,
- Second section - Connection Line: Km = 0+000 - 13+500, OIZ-Port Line, OIZ-Station Line, Station-Port Line.

Potential noise sources during the land preparation and construction phases of the project can be listed as the equipment and machinery usage within the scope of construction activities and material supply works from quarries and/or borrow pits. During the operation phase of the project, the noise that will result from the movement of the freight trains is the main source of noise.

Assumptions and Limitations

The following assumptions were made during modeling:

- During the construction phase, it was assumed that all the machinery and equipment planned to be used will operate simultaneously.
- Railway route is defined as a line noise source.
- When calculating the noise levels in the residential area affected by the project, the closest household in the residential area was taken into consideration.
- It was assumed that in the operation phase, railway will be operated throughout the day.

5.2.2 Baseline Conditions

During the Phase-1 studies, four (4) points had been selected from the noise-sensitive receptors along the railway route that might be adversely affected by construction and operation activities. Background noise measurements were conducted for 48 hours to assess hourly noise levels. L_{min}, L_{max} and L_{90} values had recorded in 10 minutes logs with L_{eq} at 4 points for 48 hours.

In order to assess the impacts of noise arising from the construction and operation activities for the revised railway line in Phase-2, three (3) additional noise measurement points were selected considering the sensitive receptors such as nearest settlement areas, and noise measurements were carried out at these points.

The noise measurement locations both for Phase-1 and Phase-2 are shown in Figure 23. The noise measurement results and details related to measurement locations (coordinates, neighborhood, receptor type etc.) are given in Table 35 regarding the time intervals specified in ENCR and WBG EHS Guidelines. As shown in the table with red color, the noise limits were exceeded in Aşağıburnaz and Yukarıburnaz neighborhoods.

The measurement results carried out during Phase-2 are all below the limits set forth by WBG EHS Guidelines and ENCR.

Table 35. Noise Measurement Results

Project Phase	Measurement Location				Date	Results (dBA)				
						Turkish Regulation (ENCR)			WBG EHS Guidelines	
	No	Coordinates (WGS 84 – UTM)	District/ Province	Neighborhood & *Receptor Type*		Day (07:00-19:00)	Evening (19:00-23:00)	Night (23:00-07:00)	Day (07:00-22:00)	Night (22:00-07:00)
Phase-1	N-1	37S 236847 D 4092583 K	Erzin/Hatay	Turunçlu-2 *Commercial*	21.01.2020	54.5	44.4	42.6	53.5	42.6
					22.01.2020	46.4	40.7	44.4	45.7	44.4
					23.01.2020	44.5	-	46.9	44.5	46.9
	N-2	37S 238054 D 4093212 K	Erzin/Hatay	Yukarıburnaz *Residential*	23.01.2020	**70.3**	52.4	**55.4**	**69.2**	**55.0**
					24.01.2020	58.1	40.2	**63.4**	**57.1**	**63.4**
					25.01.2020	57.8	-	**62.1**	**60.6**	**62.1**
	N-3	37S 238848 D 4090334 K	Erzin/Hatay	Aşağıburnaz *Residential*	25.01.2020	55.3	51.0	35.1	54.7	35.1
					26.01.2020	55.0	55.8	50.0	**55.5**	**50.0**
					27.01.2020	53.5	-	52.3	53.5	**52.3**
	N-4	37S 244909 D 4095375 K	Erzin/Hatay	Sirincir *Commercial*	25.01.2020	64.6	52.6	48.9	62.8	49.1
					26.01.2020	54.4	51.9	50.0	54.1	52.1
					27.01.2020	59.2	-	51.2	59.2	51.2
Phase-2	N-5	37S 243391 D 4096001 K	Erzin/Hatay	Erzin Station *Residential*	04-05.08.2023	49.2	45.7	44.1	50.7	44.0
					05-06.08.2023	48.3	44.8	43.8	49.3	43.1
	N-6	37S 241976 D 4093282 K	Erzin/Hatay	Karahöyük (Farm) *Commercial*	04-05.08.2023	48.4	46.6	41.2	48.7	40.2
					05-06.08.2023	47.9	45.7	40.3	47.9	39.5
	N-7	36S 765304 D 409155 K	Ceyhan/Adana	Toros Tarım *Industrial*	04-05.08.2023	50.6	48.3	44.6	50.1	43.9
					05-06.08.2023	49.9	48.1	45.3	49.0	44.3
Turkish Regulation (ENCR) Noise Limit Values						**65**	**60**	**55**	**-**	**-**
World Bank Group EHS Guidelines Environmental Noise Limit Values – Residential, institutional, educational						**-**	**-**	**-**	**55**	**45**
World Bank Group EHS Guidelines Environmental Noise Limit Values – Industrial, commercial						**-**	**-**	**-**	**70**	**70**

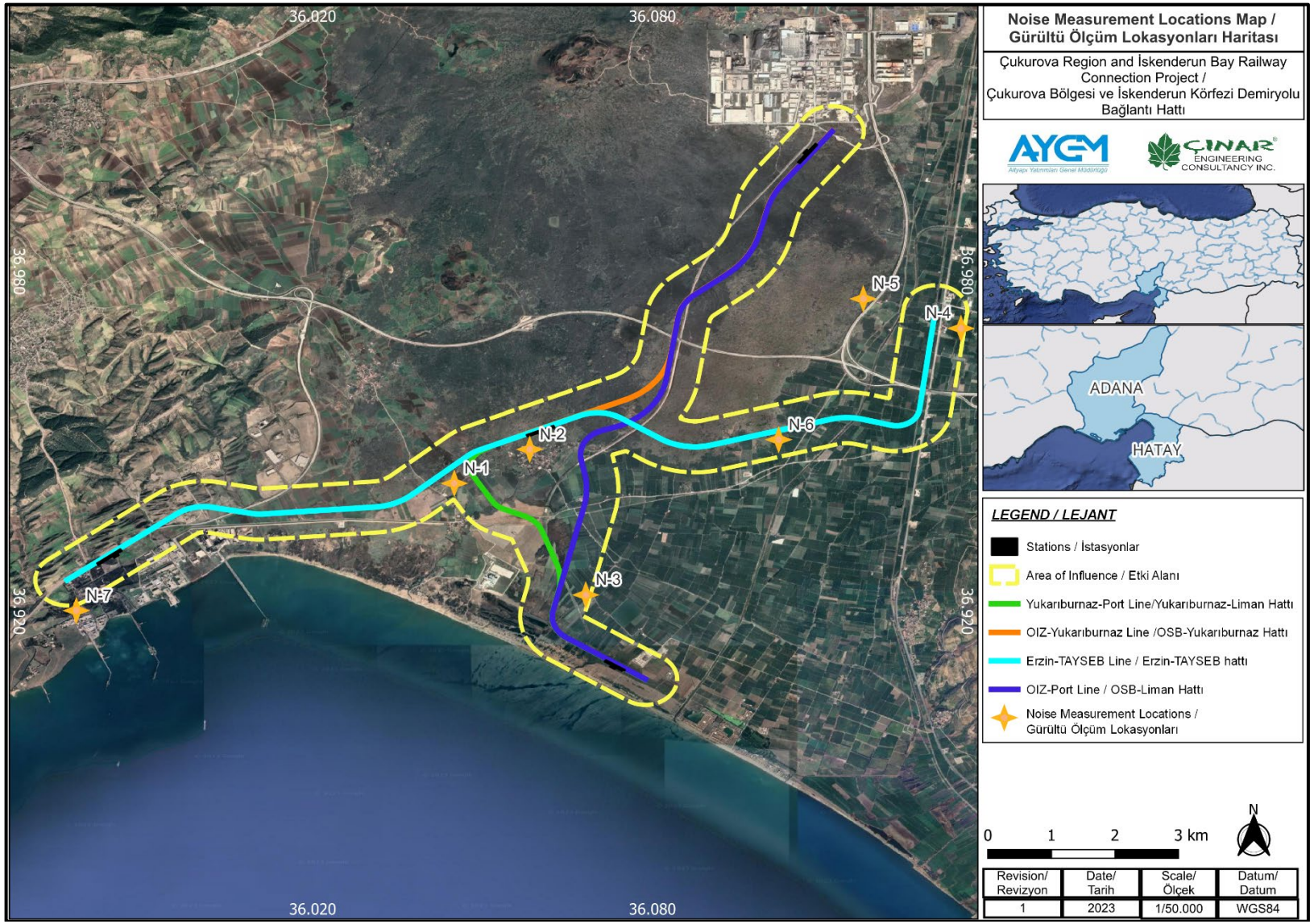


Figure 23. Noise Measurement Locations

5.2.3 Impact Assessment

5.2.3.1 Land Preparation and Construction Phase

Throughout the land preparation and construction phase, potential noise impacts are anticipated due to the heavy machine/equipment usage along the railway route. Surface leveling works, construction of the temporary facilities, construction material transportation and railway track assembly can be determined as major actions that will cause noise emissions.

It is planned to carry out the land preparation and construction works usually between 07:00 and 19:00 as a single shift in the open area. Within the scope of the project, types, and numbers of the machinery, tools, and equipment to be used during the land preparation and construction phase are given in Table 36.

Table 36. Machinery & Equipment to be Used During Land Preparation and Construction Phase

Machine and Equipment	Number Of Machine and Equipment	
	1. Section	2. Section
Water Truck	1	1
Concrete Mixer	1	5
Concrete Pump	1	5
Truck	5	9
Pickup Truck	2	8
Backhoe Loader	2	7
Water Tanker	1	2
Trailer	2	7
Fuel Tanker	1	2

The machines and equipment listed in the table above will work in a certain order and are unlikely to be in the same place at the same time. However, since noise calculations are based on the worst-case scenario, it is assumed that they all work along the route at the same time.

In the calculations, information about the noise levels of the vehicles and equipment selected as the noise source was provided from the database in the library of the program used. For the machinery and equipment that cannot be found in the said database, the data of similar machinery and equipment have been selected and used as reference.

In this context, noise levels of equipment and machinery that are taken from the library of SoundPLAN 7.3 are provided below.

Water Truck

The sound power level of the Water Truck selected from the SoundPLAN 7.3 program library is 90.8 dBA and its distribution according to the 1/1 octave frequency band is given below.

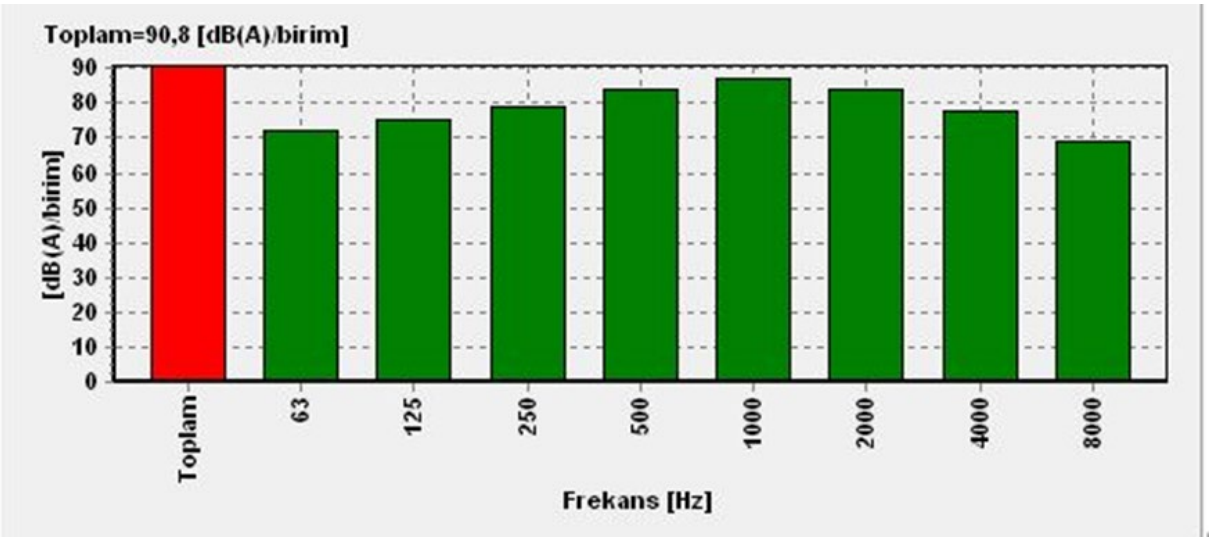


Figure 24. Water Truck Noise Level Frequency Analysis

Concrete Mixer

The sound power level of the Concrete Mixer selected from the SoundPLAN 7.3 program library is 108.0 dBA and its distribution according to the 1/1 octave frequency band is given below.

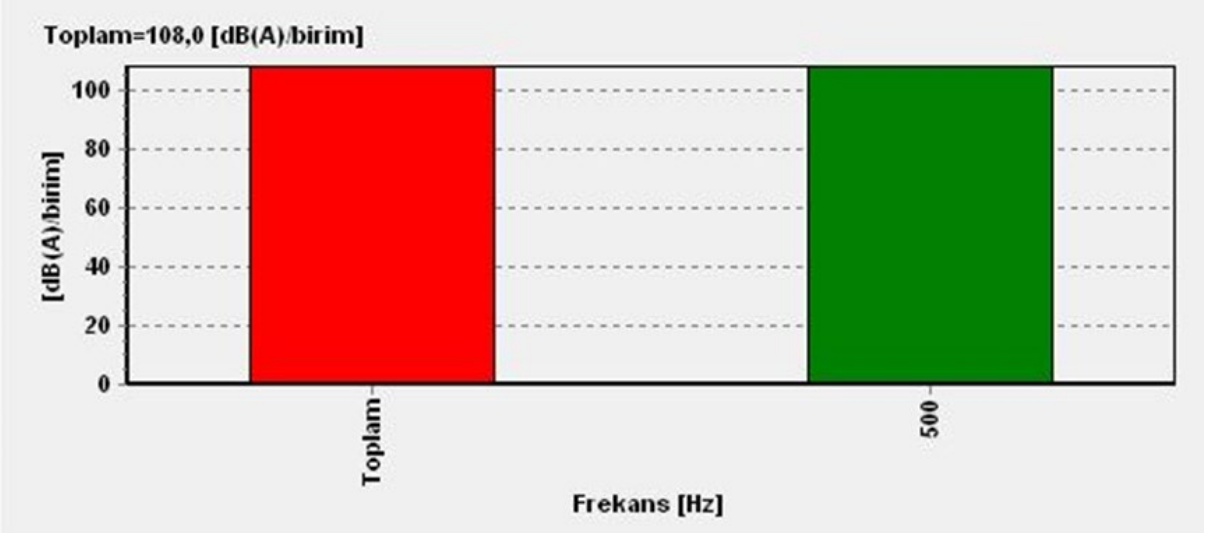


Figure 25. Concrete Mixer Noise Level Frequency Analysis

Concrete Pump

The sound power level of the Concrete Pump selected from the SoundPLAN 7.3 program library is 109.0 dBA and its distribution according to the 1/1 octave frequency band is given below.

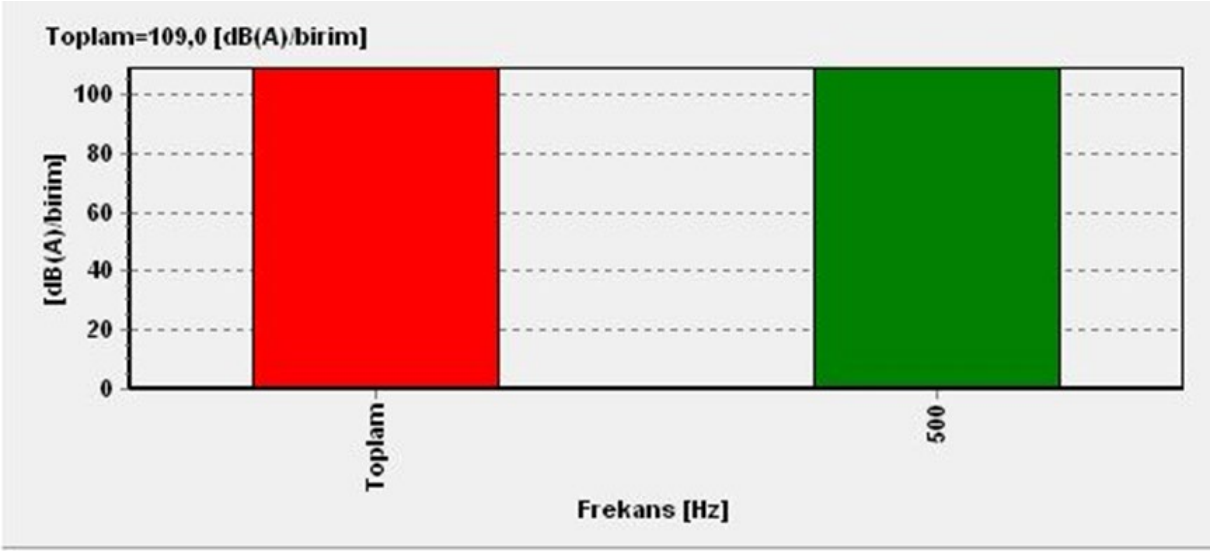


Figure 26. Concrete pump Noise Level Frequency Analysis

Truck

The sound power level of the Truck selected from the SoundPLAN 7.3 program library is 94.0 dBA and its distribution according to the 1/1 octave frequency band is given below.

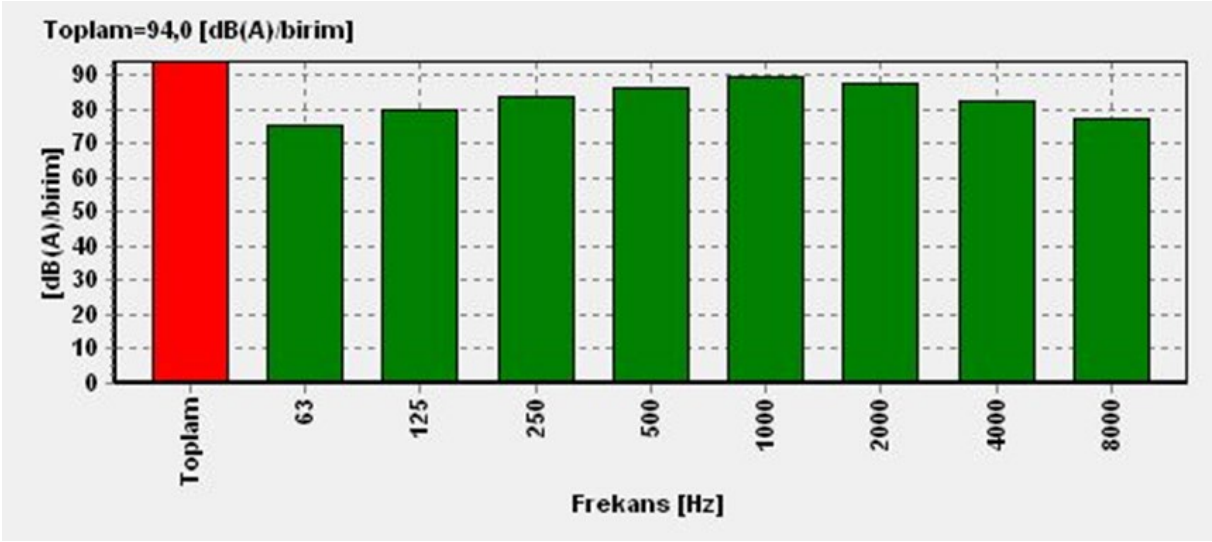


Figure 27. Truck Noise Level Frequency Analysis

Pickup Truck

The sound power level of the Pickup Truck selected from the SoundPLAN 7.3 program library is 100.1 dBA and its distribution according to the 1/1 octave frequency band is given below.

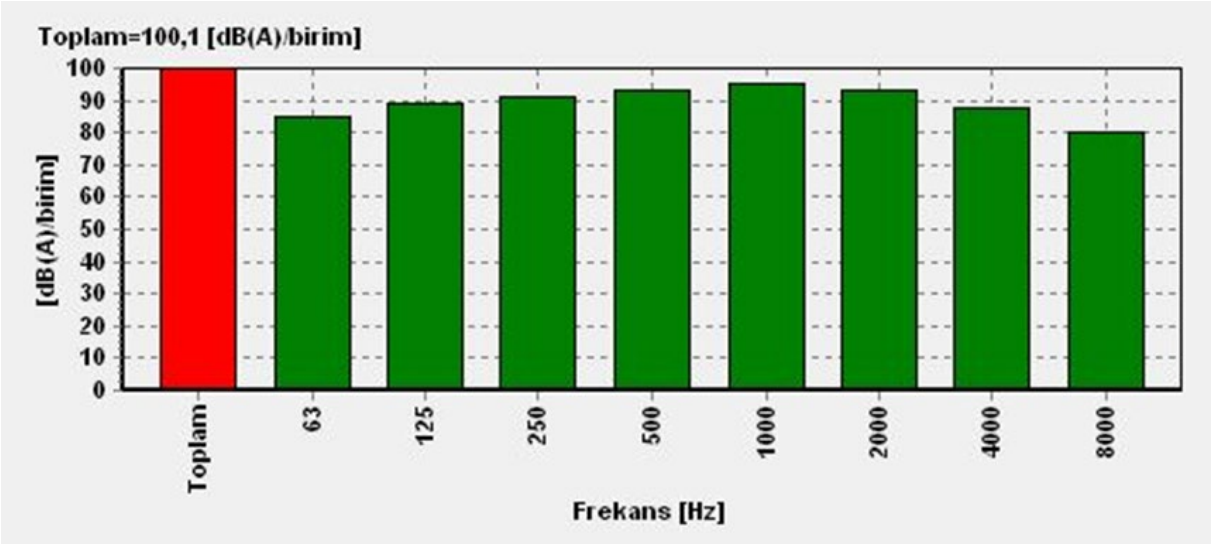


Figure 28. Pickup Truck Noise Level Frequency Analysis

Backhoe Loader

The sound power level of the Backhoe Loader selected from the SoundPLAN 7.3 program library is 105.0 dBA and its distribution according to the 1/1 octave frequency band is given below.

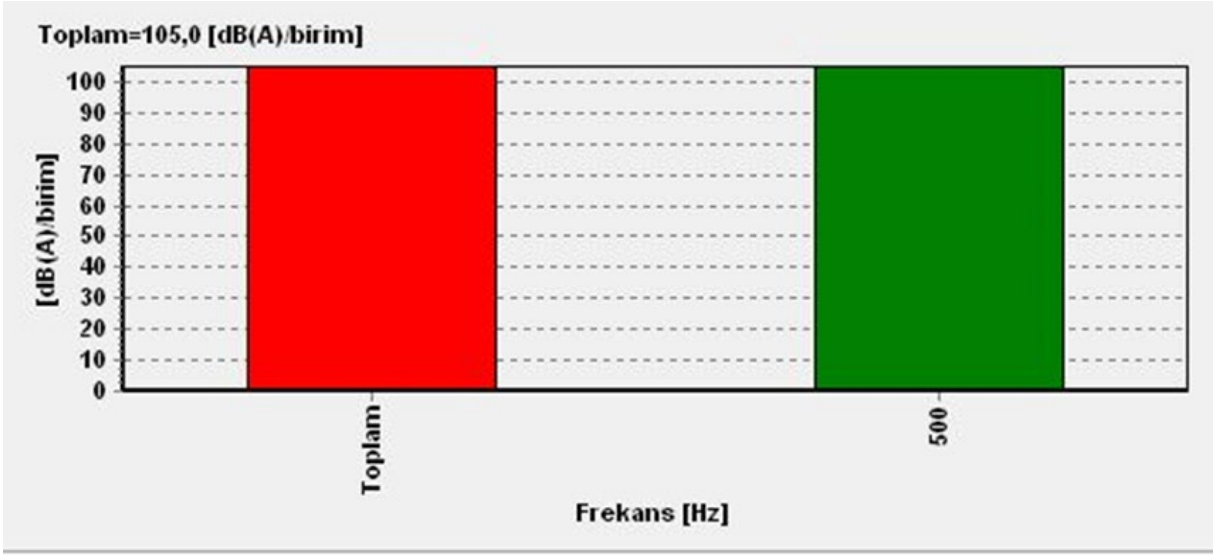


Figure 29. Backhoe Loader Noise Level Frequency Analysis

Water Tanker-Fuel Tanker

The sound power level of the Water and Fuel Truck selected from the SoundPLAN 7.3 program library is 95.8 dBA and its distribution according to the 1/1 octave frequency band is given below.

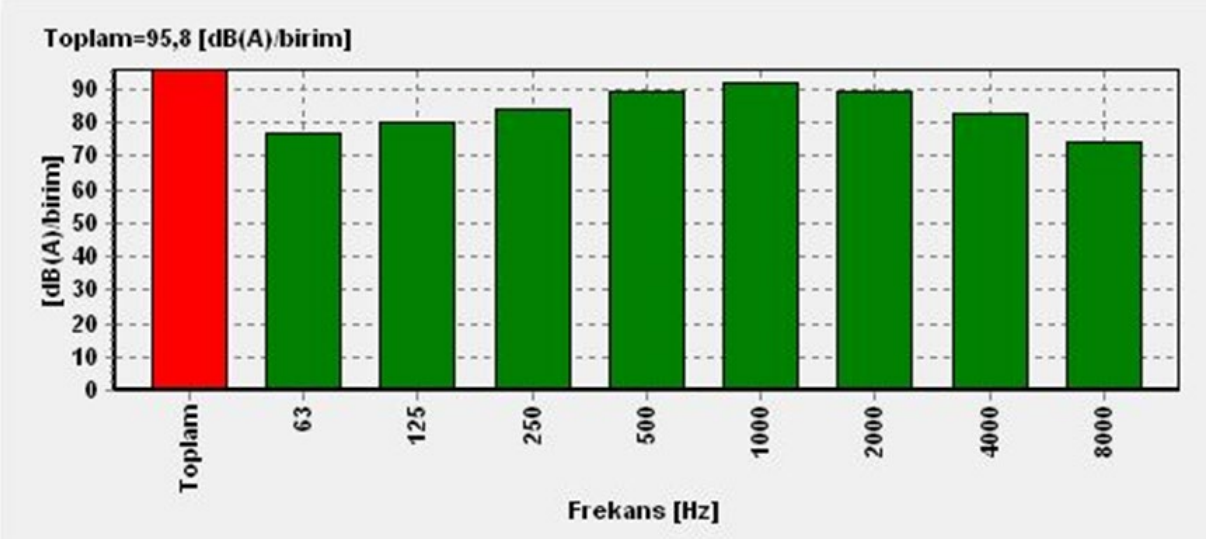


Figure 30. Water Tanker-Fuel Tanker Noise Level Frequency Analysis

Trailer

The sound power level of the Trailer selected from the SoundPLAN 7.3 program library is 123.8 dBA and its distribution according to the 1/1 octave frequency band is given below.

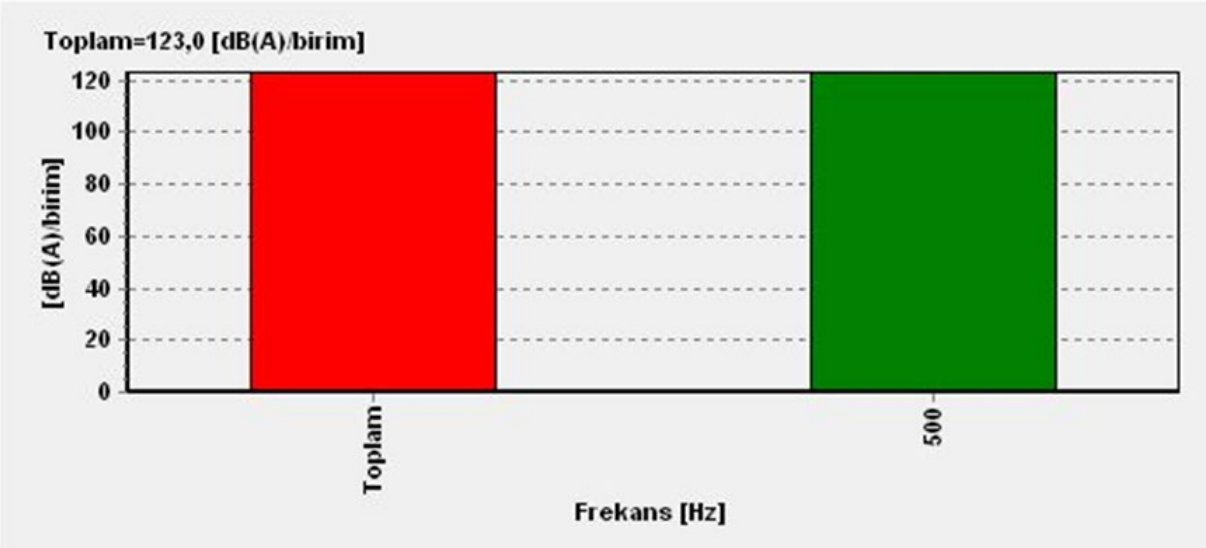


Figure 31. Trailer Noise Level Frequency Analysis

Calculation of Total Noise Level that May Occur during Construction Activities

In the model, firstly, elevation model of the natural ground was introduced which directly affects the noise distribution. In order to do so, topographical data was digitized. After that, in order to introduce the data generated to the model, digital ground model (DGM) was created. Then, the noise source was drawn by introducing the data in the software in accordance with the model standards. As a result of these studies, noise calculation area was defined, and receptor points were located. For the receptor points, noise levels arising from the machinery and equipment that will operate during the construction period and noise levels arising from the railway connection operation during the operation period were calculated.

The noise levels are modeled separately for two sections of the Project that remain in the 36 N and 37 N regions in the UTM WGS 84 projection. The noise maps created as a result of modeling studies are presented below.

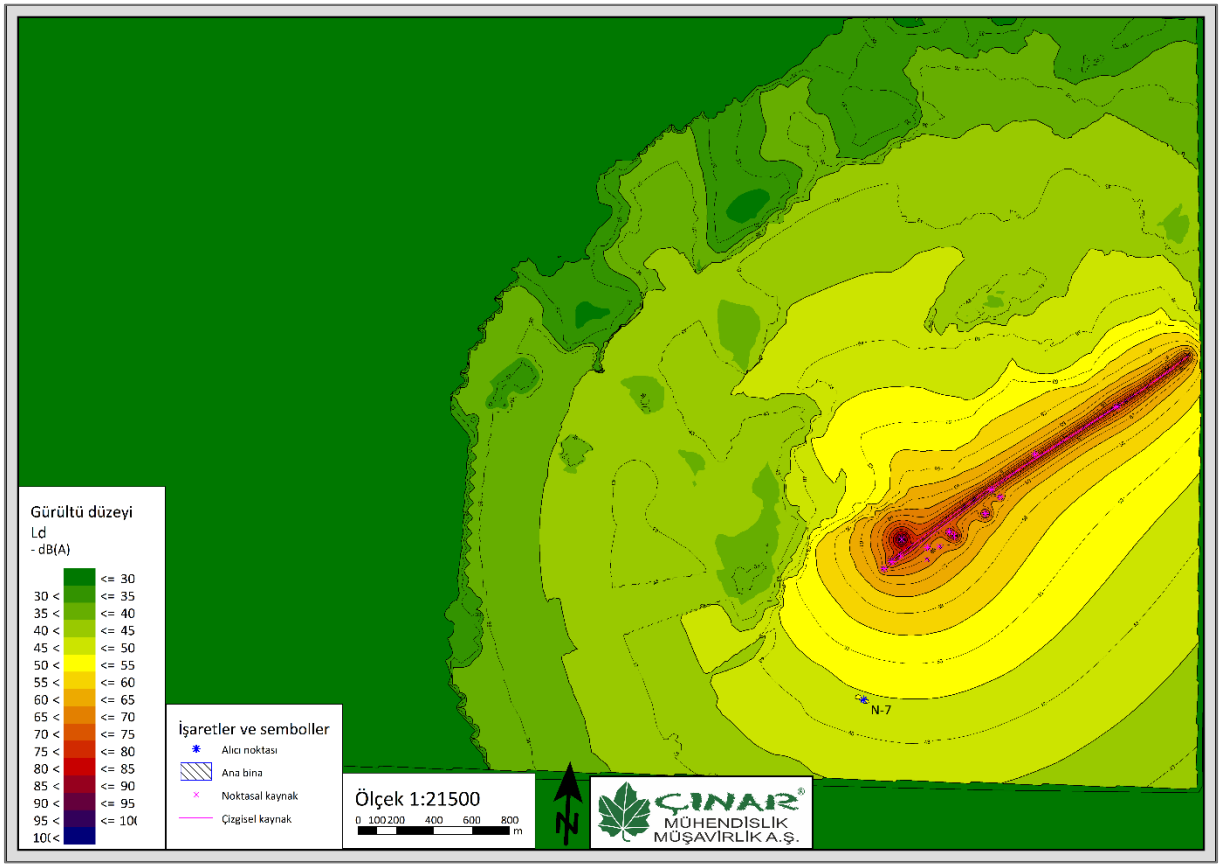


Figure 32. 1. Section Grid Noise Map (Land Preparation and Construction Phase)

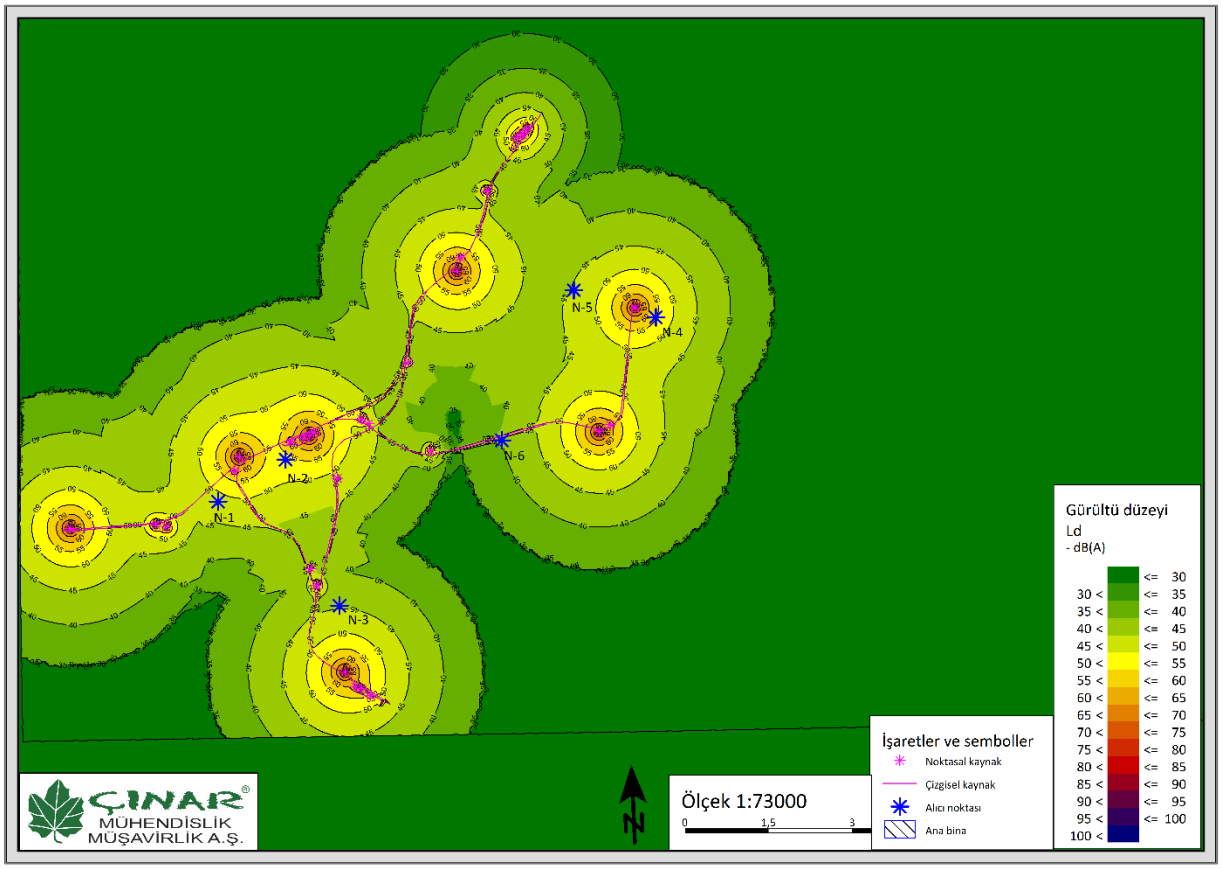


Figure 33. 2. Section Grid Noise Map (Land Preparation and Construction Phase)

It can be considered that, given the construction activities occur during daytime hours, the calculated noise values fall below the project standards as shown in Table 37.

In the calculations, a worst-case scenario was assumed where vehicles involved in land preparation and construction phases operate simultaneously. However, in reality, these vehicles are expected to work in a specific order during construction. Therefore, noise levels during the project's land preparation and construction works are anticipated to be lower than the calculated values.

Table 37. Noise Emission Values Calculated in the Receptors during the Construction Phase

No	Receptor	Zone	X (m)	Y (m)	Z (m)	L_d dB(A)	WBG EHS Guidelines Noise Limits*
N-1	Turunçlu-2	37	37236644.90	4092281.84	9.31	50.0	70
N-2	Yukarıburnaz	37	37237888.26	4092979.38	9.87	53.8	55
N-3	Aşağıburnaz	37	37238734.17	4090323.11	5.60	44.5	55
N-4	Sirincir	37	37244632.77	4095221.17	52.52	55.1	70
N-5	Erzin Station	37	37243184.34	4095772.57	50.06	47.4	55
N-6	Karahöyük (Farm)	37	37241777.19	4093148.35	20.68	37.2	70
N-7	Toros Tarım	36	36765240.16	4090142.12	16.82	52.0	70

**Noise limits were given according to the receptor types as specified in Table 35.*

5.2.3.2 Operation Phase

As the noise source, trains that will work on the main project route were selected. In the modeling studies for the operation phase, it was assumed that the trains will work 24 hours every day.

The sound power level of the Freight Train selected from the SoundPLAN 7.3 program library is 103.6 dBA and its distribution according to the 1/1 octave frequency band is given below.

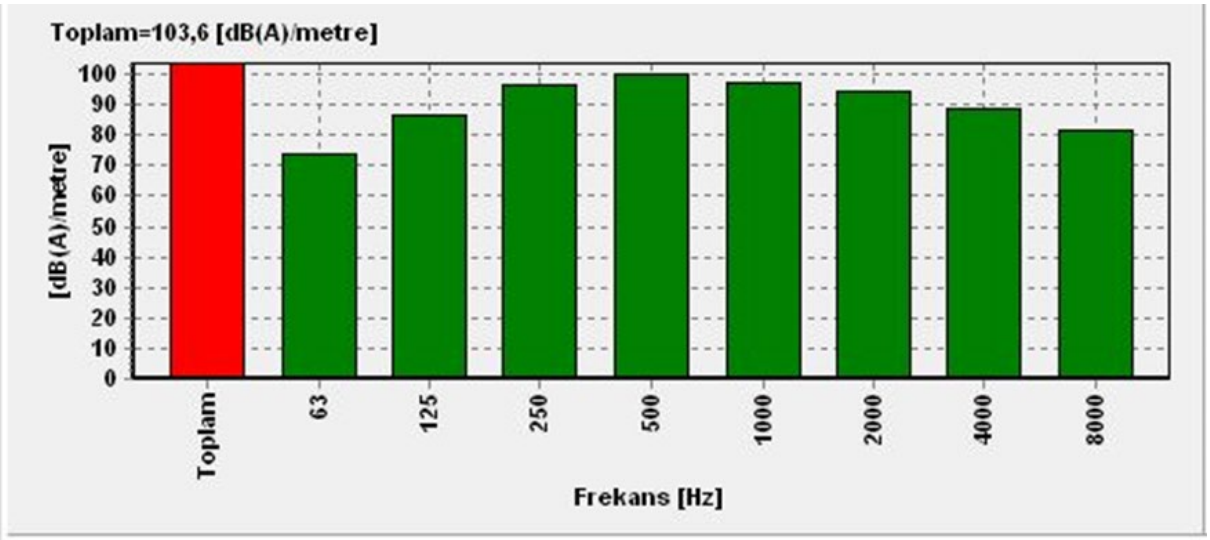


Figure 34. Freight Train Noise Level Frequency Analysis

Calculation of Total Noise Level that May Occur during Operation

The noise levels that will occur at the receptors were determined for daytime (07:00-22:00) and nighttime (22: 00-07: 00) for two separate sections of the Project remaining in the 36 N and 37 N regions of the UTM WGS 84 projection. The noise maps created as a result of modeling studies are presented below.

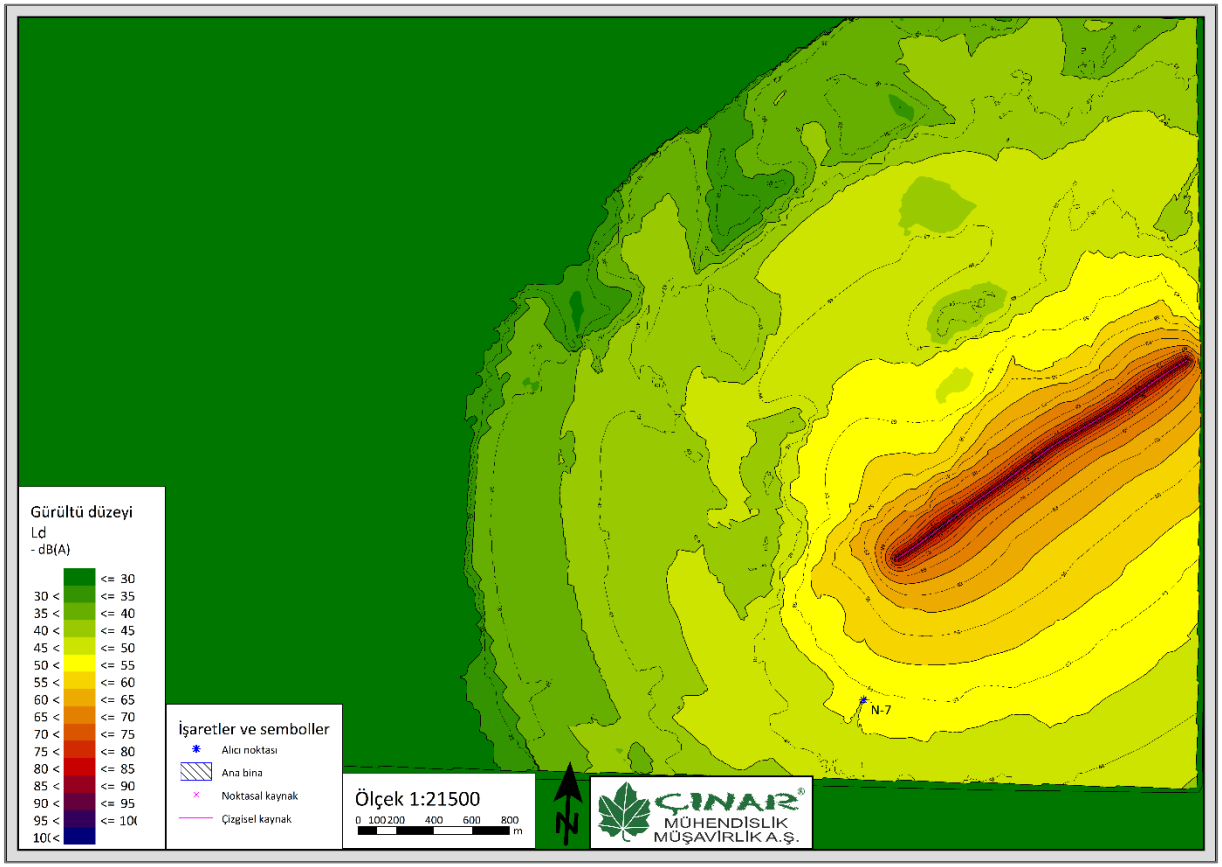


Figure 35. 1. Section Grid Noise Map (Operation Phase-Day)

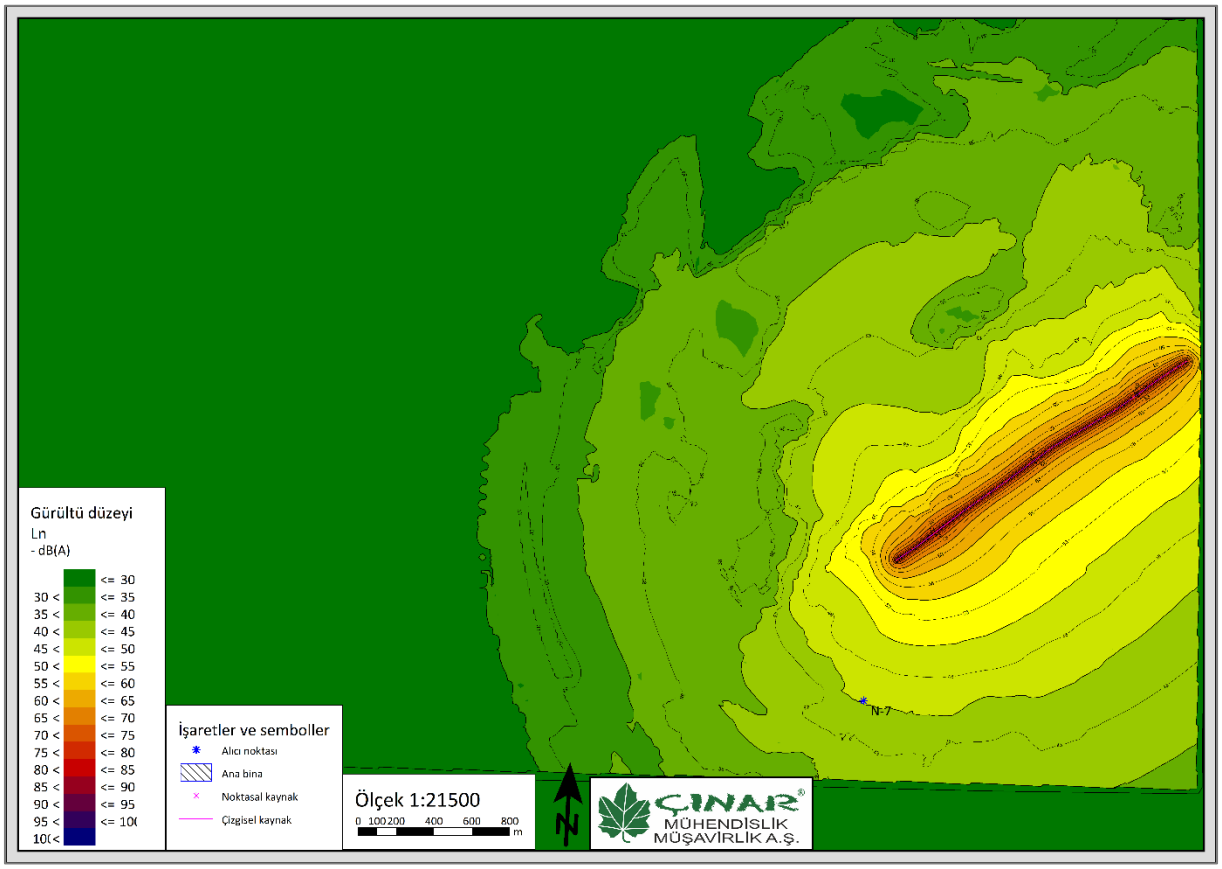


Figure 36. 1. Section Grid Noise Map (Operation Phase-Night)

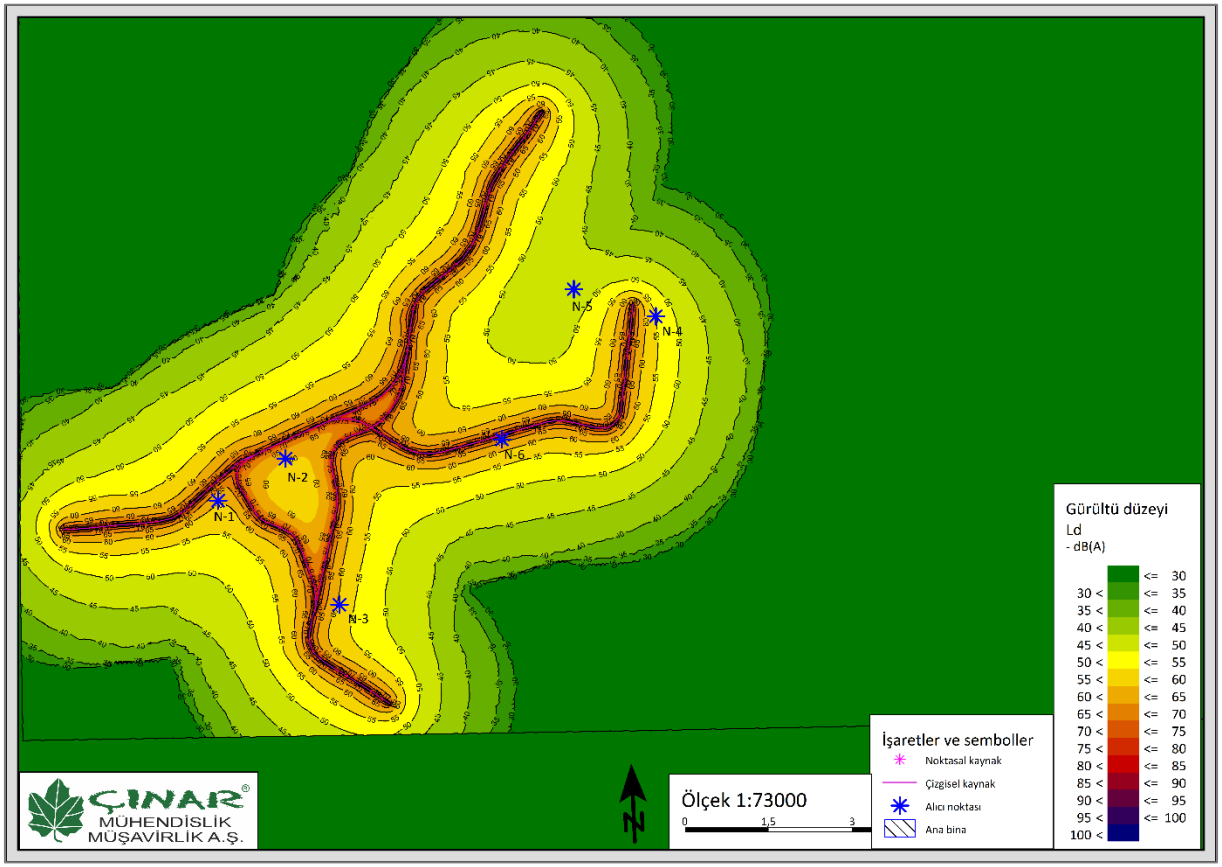


Figure 37. 2. Section Grid Noise Map (Operation Phase-Day)

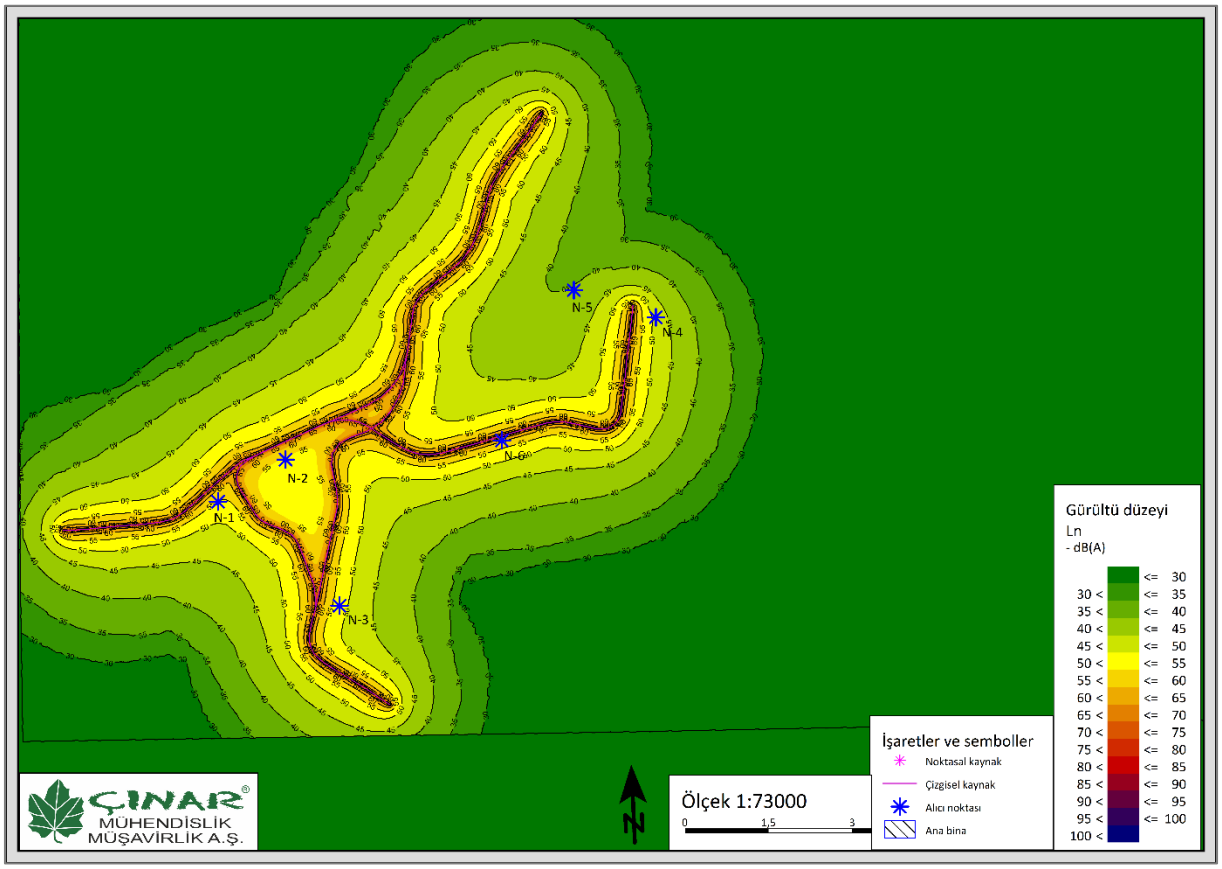


Figure 38. 2. Section Grid Noise Map (Operation Phase-Night)

The estimated noise levels of the operation phase are compared with the baseline noise level measurement results in Table 38. As can be seen from the table, the estimated noise levels at N-2 and N-3 exceed both daytime and nighttime noise limit values. Additionally, the cumulative noise values calculated for the operation phase should not exceed the background noise values by more than 3 dBA. However, the cumulative noise values calculated for daytime at N-1, N-3 and N-6 exceed the background noise values by more than 3 dBA. On the other hand, the cumulative noise values calculated for nighttime at N-1 and N-6 exceed the background noise values by more than 3 dBA.

Table 38. Noise Levels Calculated at the Receptors - Operation Phase

No	Receptor	Background Noise Level – Daytime (dBA)	Lday (dBA)	WBG EHS Guideline Daytime	Background Noise Level – Nighttime (dBA)	Lnight (dBA)	WBG EHS Guideline Nighttime
N-1	Turunçlu-2	53.5	60.7	70	46.9	54.0	70
N-2	Yukarıburnaz	69.2	**60.9**	55	63.4	**54.3**	45
N-3	Aşağıburnaz	55.5	**59.1**	55	52.3	**52.5**	45
N-4	Sirincir	62.8	55.2	70	52.1	48.6	70
N-5	Erzin Station	50.7	47.1	55	44.0	40.5	45
N-6	Karahöyük (Farm)	48.7	67.9	70	40.2	61.0	70
N-7	Toros Tarım	50.1	53.1	70	44.3	46.5	70

In the noise modeling studies, it was assumed that all freight trains would move on the railway lines at the same time as the worst-case scenario. However, during the operation phase, it will not be possible for all trains to move on the railway lines at the same time. Therefore, it is expected that noise levels will be lower than the calculated levels with modeling studies during the operational activities of the Project.

Although the baseline measurement results already exceeded the limit values at N-2 and N-3, an exemplary modeling study (Scenario-1) was conducted to demonstrate the impact of noise barrier usage at N-2. The purpose of this noise barrier implementation was to decrease daytime and nighttime noise levels at N-2 (Yukarıburnaz Neighborhood), which is the closest settlement to the proposed railway.

Figure 39 and Figure 40 present noise modeling maps showing the results with noise barriers for daytime and nighttime, respectively. The estimated noise levels with the implementation of noise barriers are given in Table 39.

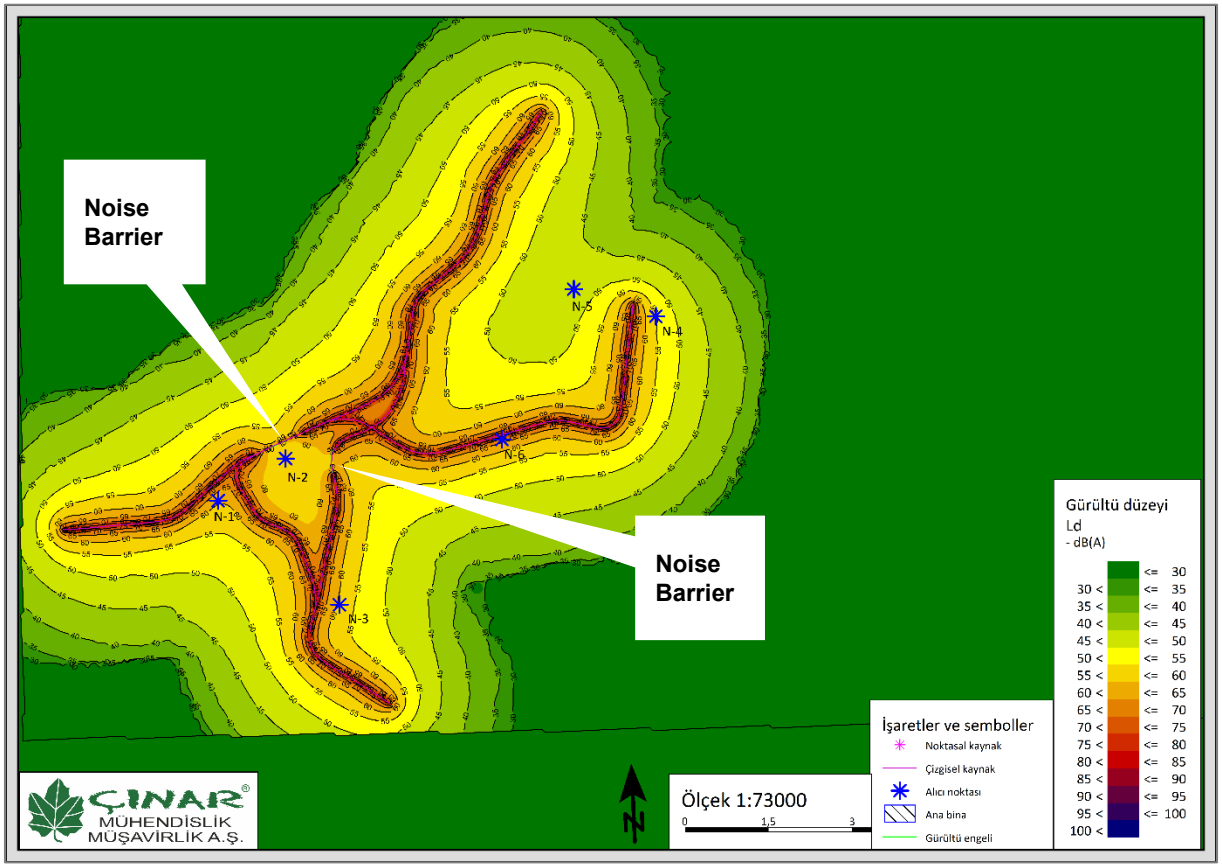


Figure 39. Scenario-1 Noise Map (Operation Phase-Day)

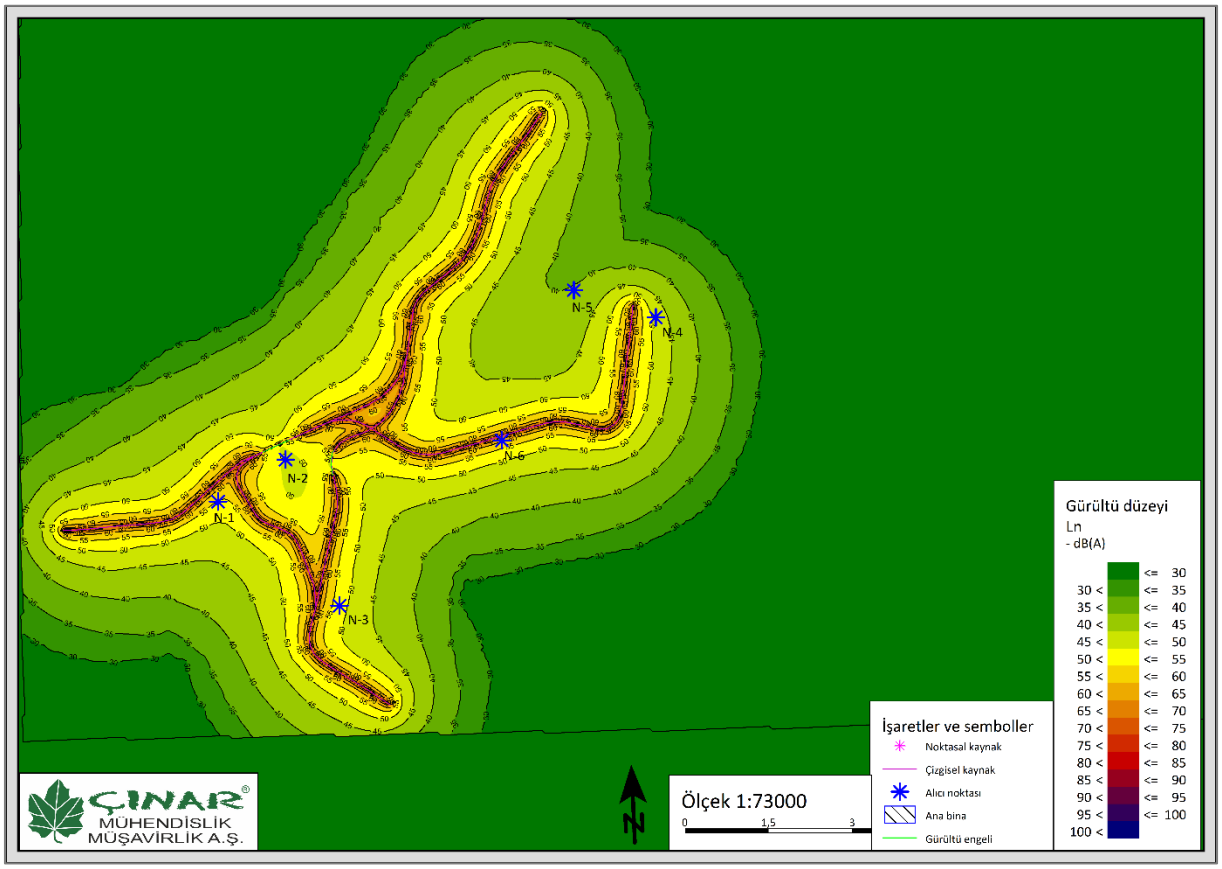


Figure 40. Scenario-1 Noise Map (Operation Phase-Night)

Table 39. Noise Levels Calculated at the Receptors - Operation Phase (with Noise Barriers)

No	Receptor	Background Noise Level – Daytime (dBA)	Lday (dBA)	WB Limit Daytime	Background Noise Level – Nighttime (dBA)	Lnight (dBA)	WB Limit Nighttime
N-1	Turunçlu-2	53.5	60.6	70	46.9	54.0	70
N-2	Yukarıburnaz	69.2	51.9	55	63.4	44.3	45
N-3	Aşağıburnaz	55.5	**59.1**	55	52.3	**52.5**	45
N-4	Sirincir	62.8	55.2	70	52.1	48.6	70
N-5	Erzin Station	50.7	47.1	55	44.0	40.5	45
N-6	Karahöyük (Farm)	48.7	67.9	70	40.2	61.0	70
N-7	Toros Tarım	50.1	53.1	70	44.3	46.5	70

The results in Table 39 demonstrate that implementing noise barriers will reduce the noise levels resulting from project operation activities.

It is important to note that these noise level estimations were conducted based on worst-case scenario. Real-life results are expected to be lower than the estimated daytime and nighttime noise levels. Therefore, the noise barrier implementation is considered as not required at the current stage of the project. To be able to assess the impact of operational activities on the receptors, the noise levels will be periodically monitored during the operational phase, and mitigation measures outlined in Section 5.2.4 will be implemented. If the noise monitoring results exceed the limit values despite the implementation of the mitigation measures listed in Table 42, or if noise-related complaints are received, the noise barrier should be installed during the operation phase.

5.2.4 Impact Significance, Mitigation Measures and Residual Impacts

Noise impact levels of construction and operation activities related to the project were evaluated according to the noise modeling results and background noise measurements. Apart from the mitigation measures developed within the scope of the ESIA Report, there are also noise reduction methods to be considered and recommended by the WBG EHS Guidelines, such as:

- Selection of equipment with lower sound power levels,
- Reducing rail roughness through design measures,
- Regular maintenance of wheels and tracks,
- Installing silencers for fans,
- Optimizing the average speed of trains by 50 km/h,
- Developing vegetative barriers to create strong vegetative areas between the noise source and receptor(s),
- Construction of noise shoulders using soil materials,
- Design and construction of noise barrier structures (e.g., panels).

As stated in the ESCP – *ESS3: Resource Efficiency and Pollution Prevention and Management,* it is required to incorporate the post-mitigation operational phase noise modeling after design of the mitigation measures (barns, noise barriers). In this context, the noise modeling studies were conducted for the operation phase by considering the worst-case scenario. The implementation of noise barriers was found to be not required as explained in Section 5.2.3 in detail.

Following procedure is developed to make sure the balance is achieved between economic and beneficial purposes of the mitigation measures;

- Mitigation measures will be considered for receptors unless the impact significance is negligible;
- For receptors with impact significance levels of “High” and distances to the railway is less than 500 meters, the construction of noise barrier structures is considered;
- For receptors with impact magnitude levels of “High” and distances to the railway between 500 and 1,000 meters, the application of noise berms and vegetation is considered;
- For every impact significance level except “Negligible”, vegetation is considered for distances greater than 1000 meters;
- For receptors whose impact levels are “Medium” and distance between the receptor and the railway less than 1,000 meters, the application of noise berms and vegetation is considered.

In addition, the following items will be considered in relation to the assessments made on the impacts of the following project on the noise levels:

- Modeling studies conducted for the impact assessment of construction and operation phases are done in accordance with the construction equipment stated in the feasibility phase.
- During the construction period, noise monitoring will be conducted to assess the effectiveness of implemented measures and identify any residual impacts. Corrective actions will be taken for any residual impacts deemed to have moderate or high significance. Noise monitoring will be conducted quarterly during the construction phase and also upon complaint.
- Noise monitoring will be conducted once every three months in the first year of operation. After one year, monitoring will be done every two years. Noise monitoring will also be conducted upon complaint.

It should also be taken into account that the modeling work and impact assessment of the operating period are carried out within the framework of the activities foreseen for 2042. For this reason, these impacts are expected to occur in 2042. Defined mitigation measures will be implemented repeatedly. In this context, following years where the project will be executed (not in the initial years of operation), noise barriers will be considered as an alternative impact mitigation measure and its application will depend on the monitoring that will be conducted to observe actual impacts.

In order to determine the background noise levels for the impact assessment, the points where noise measurements are made were selected as receptors and the impact on the change in the background noise level was defined.

Significant levels of noise levels can be expected during the material borrow area/quarry activities such as blasting, extraction and transportation of the materials. For noise emissions, the following measures must be considered if construction contractor decides to operate its own quarries and borrow sites but firstly it will be necessary to conduct an environmental impact assessment by considering the noise measurements to be carried out and the grievance(s) received (see also Table 42):

- Reduction of noise from drilling rigs by using downhole drilling or hydraulic drilling;
- Implementation of enclosure and cladding of processing plants;
- Installation of proper sound barriers and (or) noise containments, with enclosures and curtains at or near the source equipment (e.g. crushers, grinders, and screens);
- Use of rubber-lined or soundproof surfaces on processing equipment (e.g. screens, chutes, transfer points, and buckets);
- Use of rubber-belt transport and conveyors;
- Installation of natural barriers at facility boundaries (e.g. vegetation curtains or soil berms);

- Optimization of internal-traffic routing, particularly to minimize vehicle-reversing needs (reducing noise from reversing alarms) and to maximize distances to the closest sensitive receptors;
- The use of electrically driven machines should be considered;
- A speed limit for trucks should be considered;
- Avoidance of flame-jet cutting;
- Construction of berms for visual and noise screening

Moreover, to control vibration:

- Use of specific blasting plans; correct charging procedures and blasting ratios; delayed, micro delayed, or electronic detonators; and specific in situ blasting tests (the use of downhole initiation with short-delay detonators improves fragmentation and reduces ground vibrations);
- Development of blast design, including a blasting-surfaces survey, to avoid over confined charges and a drill-hole survey to check for deviation and consequent blasting recalculations;
- Implementation of ground vibration and overpressure control with appropriate drilling grids (e.g. grid versus hole length and diameter, orientation of blasting faces) and appropriate charging and stemming process of boreholes, to limit potential issues with fly rock and air blasts;
- Hydraulic hammers or other mechanical methods should be preferred to improve rock fragmentation and minimize fly-rock risks, instead of using secondary blast (plaster blasting);
- Mechanical ripping should be preferably used to avoid or minimize the use of explosives;
- Other sources of vibrations are primary crushers and plant screening equipment. Adequately designed foundations for these facilities should sufficiently limit vibrations.

The magnitude of noise impacts was assessed due to the deviation from the background noise levels and applicable standards (regulatory limits and international guidelines). As summarized in Table 40, it should be noted that the perception threshold of the human ear is about 3 dB, and a change of 5 dB clearly attracts attention. This is primarily due to logarithmic measurement metrics that are generally associated with decibels.

Table 40. Perceived Change to the Human Ear with Changes in Sound Level

Change in Sound Level	Perceived Change to the Human Ear
+1 dB	Not perceptible
+3 dB	Threshold of perception
+5 dB	Clearly noticeable
+10 dB	Twice as loud

With taking the experienced change with regard to decibel levels into consideration, the magnitude criteria to be integrated into the magnitude determination is presented in table below.

Table 41. Magnitude Criteria for Noise Impact

Impact Magnitude	Description
Negligible	Generation of noise that exceeds background noise levels up to 3 dBA
Minor	Generation of noise that does exceeds background noise levels by 5 dBA
Medium	Generation of noise that exceeds background noise levels by 5-10 dBA
High (Severe)	Generation of noise that exceeds background noise levels by 10 dBA

Table 42. Noise Impacts, Proposed Mitigation Measures and Residual Impacts

Potential Impact Description	Project Phase	Receptor	Impact Magnitude					Sensitivity/ Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Reversibility	Duration	Frequency	Overall Magnitude				
Increase in noise levels	Land Preparation and Construction	N-1 – Turunçlu-2	Local	Short term Reversible	Short-term	Intermittent	Low	Medium	Minor	▪ All construction activities will be carried out in compliance with the provisions of ENCR and noise limit values specified in the ENCR and WBG General EHS Guidelines. ▪ Project Grievance Mechanism will be implemented. If any comment related with noise is received through the Grievance Mechanism, evaluate the complaint and where necessary plan and implement corrective actions. ▪ Construction activities will be carried out during the daytime only. ▪ Machinery, equipment and vehicles with lower sound power levels and sound reduced models will be preferred, using newer and electrically driven models. ▪ Maintenance of construction vehicles will be conducted regularly by means of a regular vehicle maintenance and repair program which is also recommended by the manufacturer. ▪ Speed limitations for construction vehicles will be defined and obeyed. Relevant trainings will be conducted and instructions on the driving speed limits will be provided to drivers/operators of construction vehicles. ▪ Driving of construction vehicles through settlements will be avoided where possible. ▪ Designated site access roads will be used. Construction of access roads will be evaluated where required to avoid traffic through residential areas. ▪ Keeping the construction vehicles running will be prohibited while waiting on the construction site. ▪ Noise monitoring will be carried out quarterly during the construction phase and also upon complaint by means of noise measurements in accordance with both national legislation and the WBG EHS Guidelines. Additional noise mitigation measures (such as use of noise barrier structures/panels, etc.) will be implemented if noise measurements conducted are above noise limit values. ▪ Site personnel with necessary environmental training will be provided that aims at reducing noise caused by Project activities. ▪ When necessary, to protect the employees from the noise caused by machinery and equipment; work will be carried out in accordance with the provisions of the "Occupational Health and Safety Law No. 6331" and necessary measures (such as providing ear protection PPE) will be taken to protect workers from risks that may arise from health and safety, especially hearing risks, as a result of exposure to noise. ▪ Communities/settlements will be notified about the noise levels that may be created during construction phase due to heavy machinery use. ▪ Pollution prevention plan will be implemented.	Negligible
		N-2 – Yukarıburnaz	Local	Short term Reversible	Short-term	Continuous	Medium	High	Moderate		Minor
		N-3 – Aşağıburnaz	Local	Short term Reversible	Short-term	Intermittent	Low	Medium	Minor		Negligible
		N-4 – Sirincir	Local	Short term Reversible	Short-term	Intermittent	Low	Medium	Minor		Negligible
		N-5 – Erzin Station	Local	Short term Reversible	Short-term	Intermittent	Low	Medium	Minor		Negligible
		N-6 – Karahöyük (Farm)	Local	Short term Reversible	Short-term	Intermittent	Low	Medium	Minor		Negligible
		N-7 Toros Tarım	Local	Short term Reversible	Short-term	Intermittent	Low	Low	Negligible		Negligible
	Operation	N-1 – Turunçlu-2	Local	Medium Term Reversible	Medium-term	Intermittent	Medium	Medium	Moderate	▪ Noise monitoring will be conducted once in a three month in the first year of the operation, after one year, monitoring will be done in every two years. Noise monitoring will also be conducted upon complaint. ▪ Physical barriers, such as sound walls or acoustic fencing, along the railway corridor should be installed by TCDD to block or absorb sound waves if deems required according to the noise monitoring results and/or noise-related complaints. ▪ The use of natural barriers like earth berms or vegetation should be considered by TCDD to help reduce noise transmission. ▪ The average speed of trains should be optimized by 50 km/h ▪ Continuous welded rail should be used to reduce the noise generated by train wheels passing over joints in the track. ▪ Tracks should be maintained regularly to minimize irregularities that can contribute to increased noise levels. ▪ The use of noise-reducing track materials, such as noise-dampening rail pads, should be explored to mitigate vibrations and sound propagation. ▪ Measures should be implemented to reduce wheel and rail friction, such as applying friction modifiers or using lubricated track. ▪ It should be ensured that wheels and rails are regularly inspected and maintained to prevent excessive noise due to wear and tear. ▪ Implementing speed restrictions should be considered in sensitive areas to reduce the noise generated by trains, particularly during nighttime hours when noise impacts can be more pronounced. ▪ Regular and timely engagement with local communities, in compliance with the SEP of the Project, will be performed to understand their concerns and gather feedback on noise-related issues.	Minor
		N-2 – Yukarıburnaz	Local	Medium Term Reversible	Medium-term	Intermittent	Medium	High	Moderate		Minor
		N-3 – Aşağıburnaz	Local	Medium Term Reversible	Medium-term	Intermittent	Medium	Medium	Moderate		Minor
		N-4 – Sirincir	Local	Medium Term Reversible	Medium-term	Intermittent	Medium	Medium	Moderate		Minor
		N-5 – Erzin Station	Local	Medium Term Reversible	Medium-term	Intermittent	Medium	Medium	Moderate		Minor
		N-6 – Karahöyük (Farm)	Local	Medium Term Reversible	Medium-term	Intermittent	Medium	Medium	Moderate		Minor
		N-7 Toros Tarım	Local	Medium Term Reversible	Medium-term	Intermittent	Medium	Low	Minor		Negligible

5.3 Air Quality and Greenhouse Gas Emissions

5.3.1 Project Standards and Methodology

Air Quality

According to the methodology given in Chapter 4, generic criteria for determining the sensitivity of a receptor have been established, and the sensitivity of receptors was classified based on the importance/rarity of the concerned receptor.

In this context, the air quality measurement sampling points were selected based on the receptors identified within the scope of the Project. Since all of these areas are residential, their sensitivities are classified as Medium.

In accordance with the methodology described in Chapter 4, five magnitude factors are identified to determine the overall impact magnitude. One of them is the impact magnitude, which is scaled as low, medium and high. Criteria used to define the magnitude of impacts on air quality are presented in Table 43.

As shown in this table, the magnitude of impacts is determined by the percentage of exceedance of air quality standards (Project standards). The exceedance of Project Standards will be estimated by considering baseline air quality measurements and air dispersion modeling results. When the impact magnitude does not exceed the regulatory limits, then the impact magnitude will be defined as negligible.

Table 43. Criteria for Magnitude of Impacts on Air Quality

Exceedance of Project Standards (%)	Impact Magnitude
0-25	Low
25-50	Medium
50-100	High

Greenhouse Gases

Greenhouse gas emissions refer to the release of greenhouse gases (GHG) to the atmosphere. United Nations Framework Convention on Climate Change (UNFCCC) lists greenhouse gases (GHG) as below:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)
- Sulfur hexafluoride (SF_6)
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)

The Project's contribution to climate change was evaluated by calculating the expected volume of greenhouse gas (GHG) emissions. In this context, greenhouse gas emissions are calculated using the relevant approach and data (emission coefficients) within the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

5.3.1.1 National Legislation and Air Quality Standards

In Türkiye, significant strides in air management policy have been made with the adoption of the Integrated Environmental Strategy, in alignment with the European Union (EU) guidelines. As a result, Türkiye's legislation corresponds to the EU Air Quality Framework Directive, along with its associated directives, such as the Large Combustion Plants Directive, and others related to climate change. The current laws enforced in Türkiye concerning air quality and emissions from incinerators is Regulation on the Control of Industrial Regulation on Control of

Industrial Air Pollution published in the Official Gazette No. 27277 dated 03.07.2009 (Amended: OG-20/12 / 2014-29211)

The main objective of the Regulation on the Control of Industrial Air Pollution (RCIAP) is to manage emissions, which are generated from the industrial activities, in the form of smoke, dust, gas, steam and aerosols emitted into the atmosphere. Its objectives encompass managing these emissions to safeguard both people and the environment from the risks posed by contamination in the breathable atmosphere. Additionally, the regulation strives to mitigate adverse impacts that result in significant environmental damage and strained relations with neighboring countries due to air pollution, with the ultimate goal of preventing these negative consequences. Consequently, the regulation establishes specific limit values for gas contaminants and particulate matter.

Limit values to be followed between 2019 - 2023 and after 2024 are given below according to this regulation are given in Table 44.

Table 44. Air Quality Limit Values of 2019-2023 and after 2024

Parameter	Time	Unit	2019-2023	2024 and after
SO_2	Hour (cannot exceed more than 24 times annually)	$\mu g/m^3$	350	350
	LTV*		60	60
NO_2	Hour (cannot exceed more than 18 times annually)	$\mu g/m^3$	250	200
	Annual		40	40
PM_{10}	24 hour (cannot exceed more than 35 times annually)	$\mu g/m^3$	50	50
	Annual		40	40
Settled Dust	STV**	mg/m^2day	390	390
	LTV		210	210
CO	Maximum daily 8 hours average	mg/m^3	10	10
VOC	Hourly	$\mu g/m^3$	280	280
	STV		70	70
Pb	Annual	$\mu g/m^3$	0,5	0,5
CO	Maximum daily 8-hour average	mg/m^3	10	10
Cd	LTV	$\mu g/m^3$	0.02	0,02
HCl	STV	$\mu g/m^3$	150	150
	LTV		60	60
HF	Hour	$\mu g/m^3$	30	30
	STV		5	5
H_2S	Hour	$\mu g/m^3$	100	100
	STV		20	20
Total Organic Compounds (In terms of carbon)	Hour	$\mu g/m^3$	280	280
	STV		70	70

**LTV: Long Term Limit Value*
***STV: Short Term Limit Value*

5.3.1.2 International Requirements

The World Bank Group EHS Guidelines and requirements therein are applicable to the Project. According to the World Bank Group General Environmental, Health, and Safety (EHS) Guidelines for Environmental Air Emissions and Ambient Air Quality, projects that release a lot of air pollutants and could significantly affect the air quality should work on preventing or reducing these effects. This can be done by making sure that the emissions don't go beyond the limits set in the relevant national laws. If those laws don't exist, then the WHO Ambient Air Quality Guidelines should be followed.

Thus, following compliance requirement with relevant national legislation, the WBG General EHS Guidelines for Environmental Air Emissions and Ambient Air Quality refers to the WHO Ambient Air Quality Guidelines. Ambient air quality guideline values recommended by the World Bank Group EHS Guidelines are presented in Table 45.

Table 45. WBG– WHO – Ambient Air Quality Guideline Values (The World Bank Group, 2007)

Parameter	Duration	Guideline Value (µg/m^3)
SO_2	10-minute	500
	24-hour	20
NO_2	1-hour	200
	1-year	40
Particulate Matter (PM_{10})	24-hour	50
	1-year	20
Particulate Matter ($PM_{2.5}$)	24-hour	25
	1-year	10
O_3	8-hour daily maximum	100

5.3.2 Baseline Conditions

5.3.2.1 Air Quality

During the construction phase, dust emissions will arise from activities such as excavation and backfilling along the railway route, excavation for engineering structures, and material production at designated sites to provide the necessary filling and concrete aggregate materials. Additionally, emissions from vehicles used during construction will contribute to air pollution.

To assess the impacts of air pollutant emissions stemming from both construction and operation activities of the project, baseline air quality measurements were conducted at specific locations along the railway connection lines routes. These locations were selected based on their susceptibility to potential adverse effects due to construction and operational activities.

During the Phase-1 studies, four (4) sampling points were selected for particulate matter (PM_{10} and $PM_{2.5}$) measurements, six (6) sampling points were selected for passive diffusion (SO_2 and NO_2) measurements and four (4) sampling points were selected for settled dust measurements.

To be able to assess the impacts arising from the construction and operation activities for the revised railway line in Phase-2, three (3) additional measurement points were selected considering the sensitive receptors and sampling studies were conducted at these points for particulate matter, passive diffusion and settled dust. The analyses were carried out by an accredited laboratory (Çınar Laboratory Group) both during Phase-1 and Phase-2 studies. The analysis reports are given in Appendix-3.

The ambient air quality sampling points are shown in Figure 41 for PM_{10} and $PM_{2.5}$, Figure 42 for NO_2 and SO_2 and Figure 43 for settled dust. The analysis results are listed in Table 46, Table 47 and Table 48 accordingly.

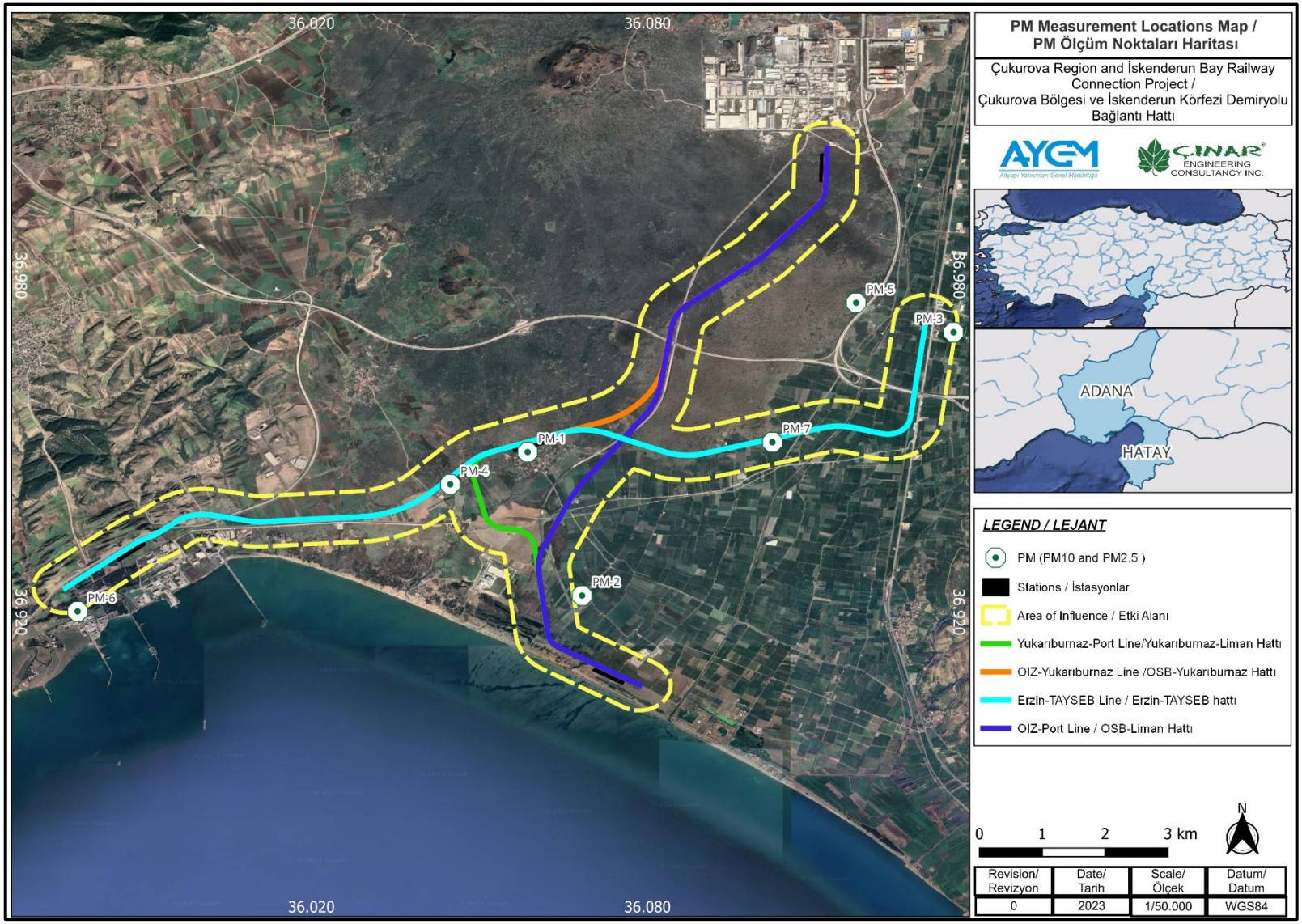


Figure 41. Ambient Air Quality Sampling Locations – Particulate Matter

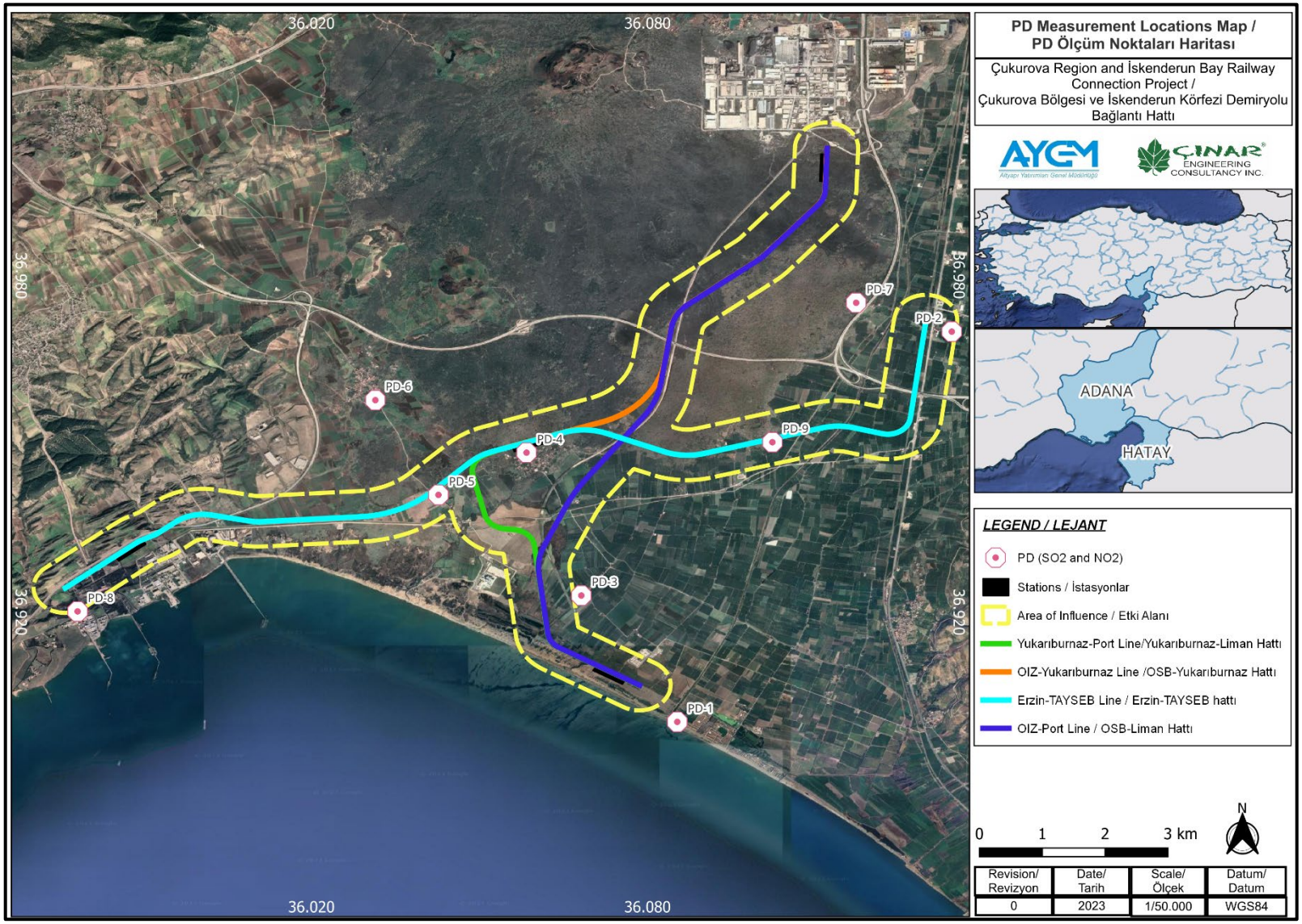


Figure 42. Ambient Air Quality Sampling Locations – Passive Diffusion

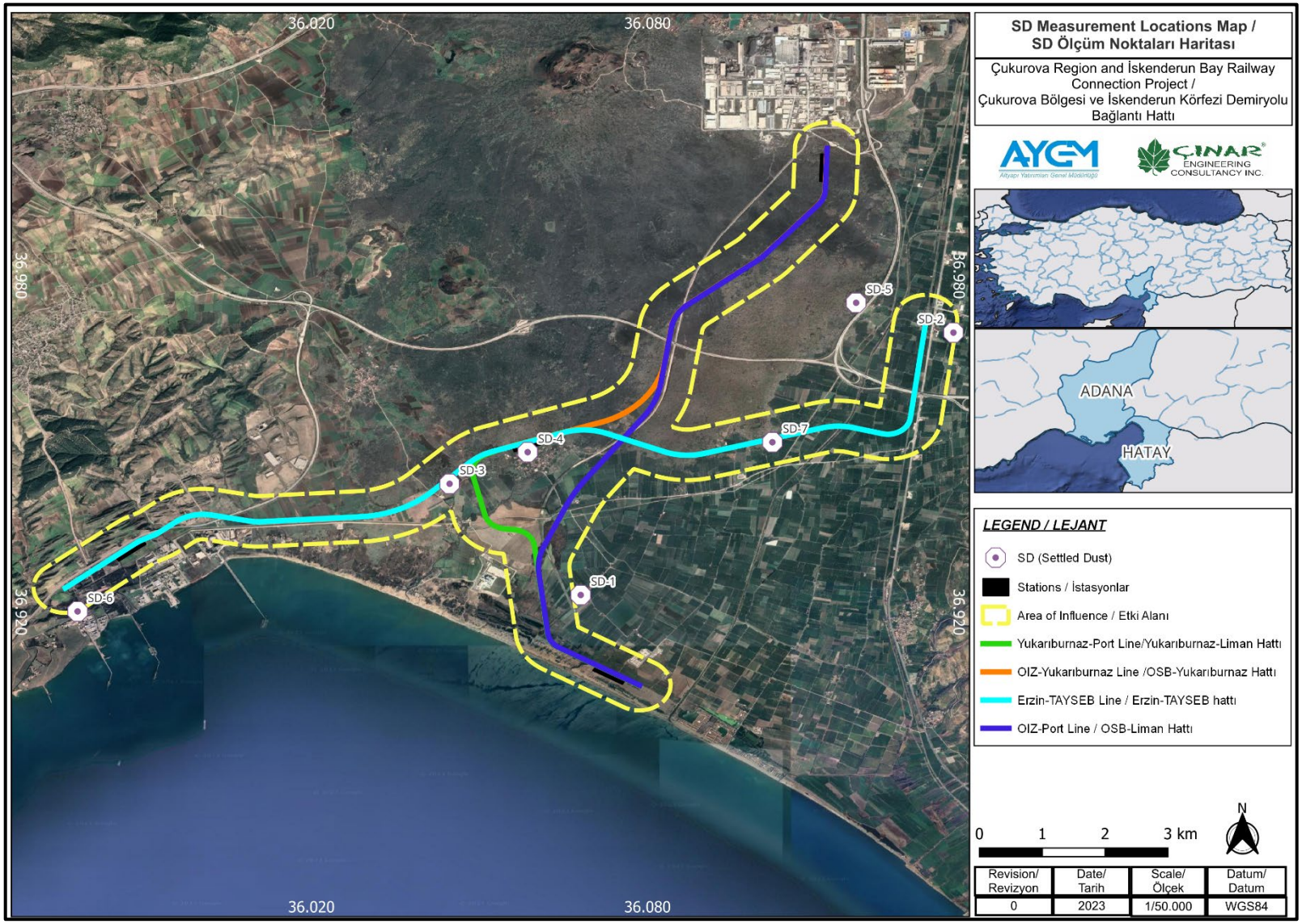


Figure 43. Ambient Air Quality Sampling Locations (Settled Dust)

Table 46. PM10 and PM2.5 Measurement Results (Particulate Matter)

Project Phase	Measurement Location				Date	Measurement Results (µg/m³)	
	No	Coordinates (WGS 84 – UTM)	District/ Province	Neighborhood		PM_{10}	$PM_{2,5}$
Phase-1	PM-1	37S 238078 D; 4093206 K	Erzin/Hatay	Yukarıburnaz	21-27.01.2020	31.79	8.08
	PM-2	37S 238856 D; 4090340 K	Erzin/Hatay	Aşağıburnaz		29.85	7.56
	PM-3	37S 244922 D; 4095369 K	Erzin/Hatay	Sirincir		30.98	7.98
	PM-4	37S 236827 D; 4092607 K	Erzin/Hatay	Turunçlu-2		31.76	7.99
Phase-2	PM-5	37S 243391 D; 4096001 K	Erzin/Hatay	Erzin Station	25-27.07.2023	30.85	20.02
	PM-6	36S 765304 D; 4090155 K	Ceyhan/Adana	Toros Tarım		23.47	20.95
	PM-7	37S 241976 D; 4093282 K	Erzin/Hatay	Karahöyük (Farm)		25.17	18.38
Turkish Air Quality Standards						**50**	**-**
WBG EHS Guidelines-WHO Ambient Air Quality Standards						**50**	**25**

Table 47. SO_2 and NO_2 Measurement Results (Passive Diffusion)

Project Phase	Measurement Locations				Date	Measurement Results (µg/m³)	
	No	Coordinates (WGS 84 – UTM)	District/ Province	Neighborhood		SO_2	NO_2
Phase-1	PD-1	37S 240294 D; 4087794 K	Dörtyol/Hatay	İskenderun Bay (Marine Resorts)	13.01.2020-02.02.2020	13,62	11,4
	PD-2	37S 244894 D; 4095384 K	Erzin/Hatay	Sirincir		<10,0	11,9
	PD-3	37S 238844 D; 4090341 K	Erzin/Hatay	Aşağıburnaz		12,41	11,0
	PD-4	37S 238060 D; 4093196 K	Erzin/Hatay	Yukarıburnaz		14,30	11,2
	PD-5	37S 236633 D; 4092403 K	Erzin/Hatay	Turunçlu-2		<10,0	12,4
	PD-6	37S 235688 D; 4094309 K	Erzin/Hatay	Turunçlu		<10,0	16,2
Phase-2	PD-7	37S 243391 D; 4096001 K	Erzin/Hatay	Erzin Station	26.07.2023-27.08.2023	8.72	8.41
	PD-8	36S 765304 D; 4090155 K	Ceyhan/Adana	Toros Tarım		11.3	2.37
	PD-9	37S 241976 D; 4093282 K	Erzin/Hatay	Karahöyük (Farm)		14.1	0.612
Turkish Air Quality Standards						**60**	**40**
WBG EHS Guidelines-WHO Ambient Air Quality Standards						**20**	**40**

Table 48. Settled Dust Measurements Results

Project Phase	Measurement Location				Date	Results (mg/m² day)
	No	Coordinates (WGS 84 – UTM)	District/ Province	Neighborhood		
Phase-1	SD-1	37S 238835 D; 4090352 K	Erzin/Hatay	Aşağıburnaz	21.01.2020 – 11.02.2020	380
	SD-2	37S 244920 D; 4095364 K	Erzin/Hatay	Sirincir		139
	SD-3	37S 236817 D; 4092617 K	Erzin/Hatay	Turunçlu-2		82
	SD-4	37S 238078 D; 4093205 K	Erzin/Hatay	Yukarıburnaz		37
Phase-2	SD-5	37S 243391 D; 4096001 K	Erzin/Hatay	Erzin Station	26.07.2023-27.08.2023	50
	SD-6	36S 765304 D; 4090155 K	Ceyhan/Adana	Toros Tarım		53
	SD-7	37S 241976 D; 4093282 K	Erzin/Hatay	Karahöyük (Farm)		38
Turkish Air Quality Standards						**390**

As it can be seen from the tables, the ambient air quality measurement results are below the limits set forth by WBG EHS Guidelines/WHO and RCIAP.

5.3.2.2 Greenhouse Gases

The transport sector accounts for more than half of global oil demand and approximately one-quarter of global CO_2 emissions stemming from fuel combustion. Thus, alterations in transportation play a pivotal role in achieving global energy transitions. Despite, while rail is among the most energy efficient modes of transport for freight and passengers, often goes overlooked in public debate. In percentages, the rail sector carries 8% of the world's passengers and 7% of global freight transport, it represents only 2% of total transport energy demand (International Energy Agency (IEA), 2019).

Today, three-quarters of passenger rail transport activity takes place on electric trains, which is an increase from 60% in 2000. The rail sector is the only mode of transport that is widely electrified today. This reliance on electricity means that the rail sector is the most energy diverse mode of transport (International Energy Agency (IEA), 2019).

The regions with the highest share of electric train activity are Europe, Japan and Russia, while North and South America still rely heavily on diesel. Passenger rail is significantly more electrified than freight in almost all regions, and regions with higher reliance on urban rail and high-speed rail are those with the largest share of passenger-kilometers served by electricity (International Energy Agency (IEA), 2019).

Approximately 7% of global freight transport activity (measured in ton-kilometers) uses rail. Transporting cargo by rail has the potential to provide the least energy- and CO2-intensive way to move freight of any land-based transport mode, but as with passenger rail, its economic and environmental benefits depend upon the long-term certainty of high throughput volumes on certain routes.

Given that rising demand for rapid delivery of high-value and lighter goods has led to an ongoing shift from rail to road, it will be a challenge for rail to maintain its current share of freight transport (International Energy Agency (IEA), 2019).

The graph showing sector-based CO_2 emissions in Türkiye are presented in Figure 44.

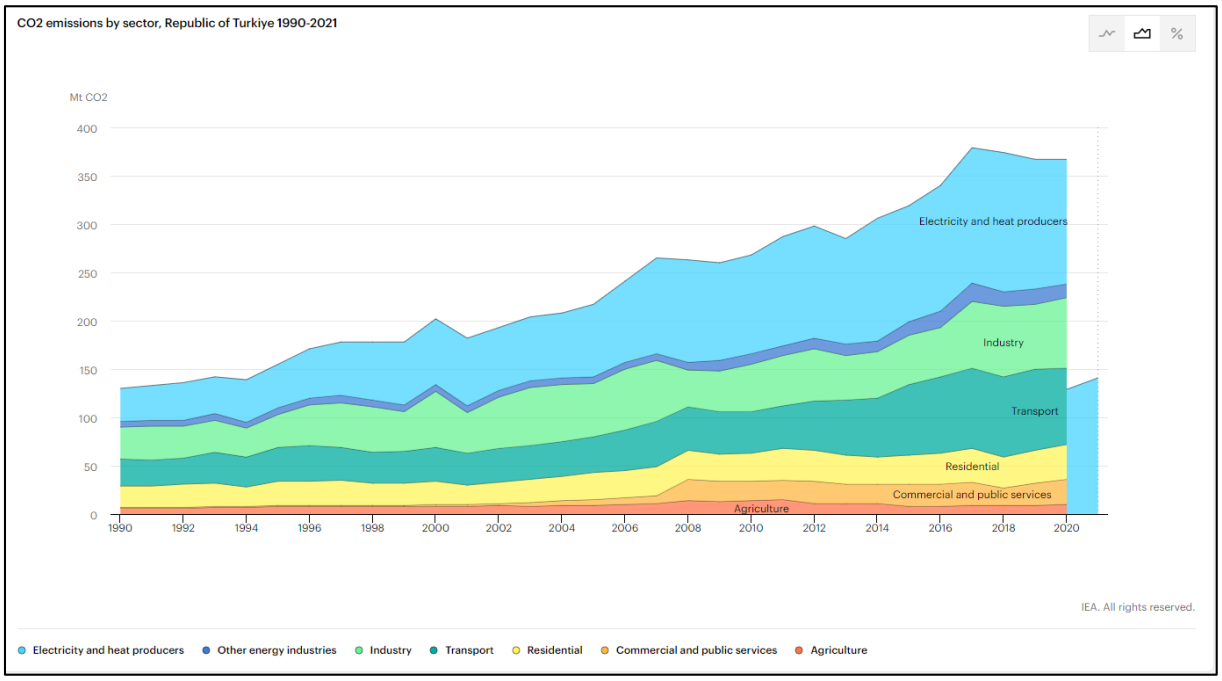


Figure 44. Sector-based CO_2 emissions in Türkiye (1990 – 2021) (International Energy Agency, 2023)

CO_2 emissions from the transport sector in Türkiye, as shown in Figure 44 and Table 49 represents a significant portion of CO_2 emissions. The distribution of CO_2 emissions within the transport sector is illustrated in Figure 45. In Türkiye, road transport accounts for the largest

share of CO_2 emissions in the sector (approximately 95% in 2020) according to TÜİK database (2022). Railways, on the other hand, represent the transportation type with the lowest CO_2 emissions, constituting only 0.4% of the sector's emissions.

Table 49. GHG emission by transport type (kilotons CO_2 equivalent)

Transport Type	Years								
	1990	1995	2000	2005	2010	2015	2018	2019	2020
Total	26.969	34.113	36.465	42.041	45.392	75.798	84.617	82.428	80.680
Airway	923	2.775	3.099	4.089	2.862	4.205	3.688	3.509	2.164
Road	24.777	29.760	31.850	35.532	39.941	69.309	78.907	76.720	76.601
Railway	721	768	713	757	517	480	435	400	323
Maritime	509	726	623	1.299	1.682	1.147	931	1.217	1.264
Other	39	83	180	364	390	656	657	581	328

Source: TÜİK, 2022

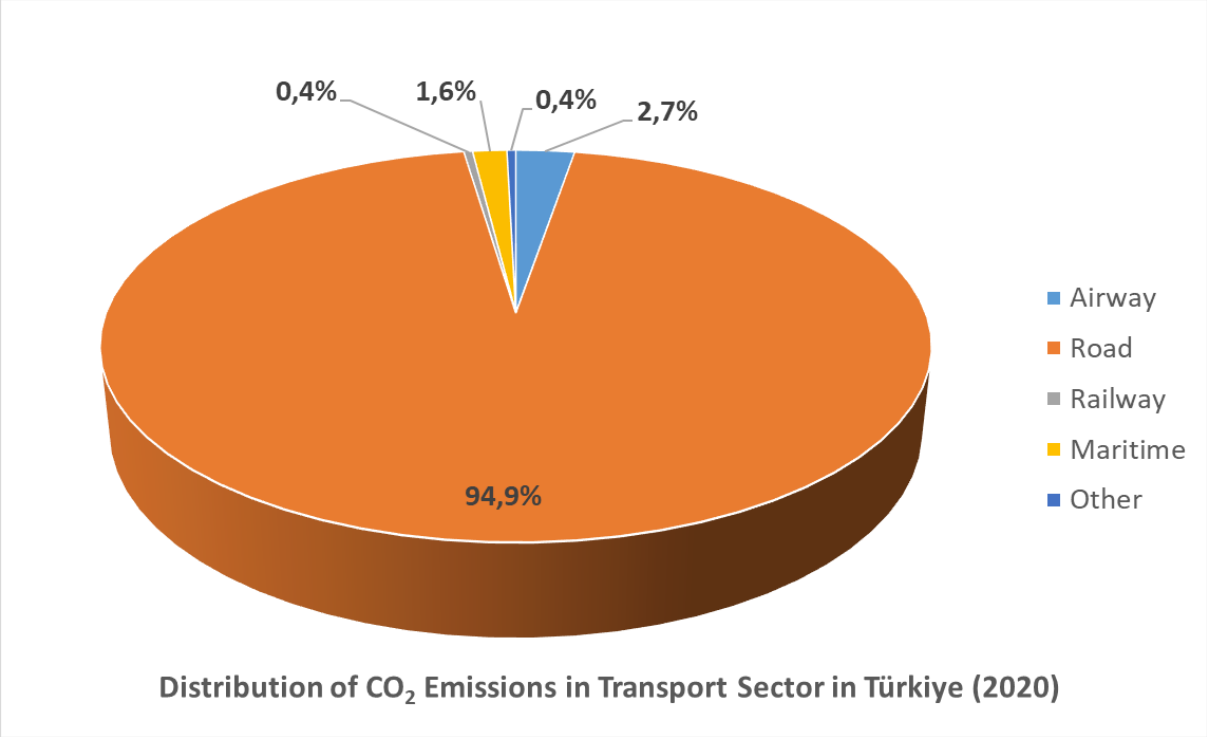


Figure 45. Distribution of CO_2 Emissions in Transport Sector in Türkiye (2020)

Source: TÜİK, 2022

5.3.3 Impact Assessment

5.3.3.1 Land Preparation and Construction Phase

5.3.3.1.1 Air Quality

Possible impacts on air quality within the project's scope are especially related to dust emissions during the construction of the railway route.

Dust formation is anticipated due to various construction activities, including excavation, fill, material storage, unloading, and transportation. The occurrence of dust formation during railway route construction heavily relies on factors such as the type of field activities, vehicle movement and speed across the work area, soil stripping, excavation, backfilling, and rehabilitation. Wind speed and its capability to carry particles to sensitive areas play crucial roles in determining the frequency and duration of potential impacts. Dust emissions increase in dry and windy conditions, while they diminish to zero if the soil and/or environmental conditions are moist.

To mitigate potential dust-related issues during the land preparation and construction phases of the project, several measures will be implemented. These include applying water at emission sources, conducting filling and unloading operations carefully to prevent tossing, using tarpaulin to cover vehicles during material transportation, and maintaining the upper part of the material at 10% humidity.

Calculation methods for potential dust emissions during land preparation and construction activities adhere to the guidelines outlined in the "Emission Factors to be Used in Dust Emission Mass Flow Calculations" of the RIAPC. Additionally, EPA emission factors (Cowherd, 1974) are also used. These emission factors encompass various aspects including excavation, fill, loading, unloading, and storage operations. Furthermore, calculations for dust emissions arising from material transportation and unloading are performed utilizing emission factors provided in the "Emission Factor Documentation (EPA, 1998)".

Table 50. Emission Factors to be used in Dust Emission Mass Flow Calculations

Operation	Emission Factor	
	Uncontrolled	Controlled
Material Removal	0,025 kg/ton	0,0125 kg/ton
Material Loading	0,01 kg/ton	0,005 kg/ton
Transport of Materials (Round-trip total distance)	0,7 kg/km	0,35 kg/km
Unloading of Materials	0,01 kg/ton	0,005 kg/ton
Storage of Materials (kg / ha-day)	5,8 (kg/ha-day)	2,9 (kg/ha-day)

In the process of calculating the total dust emission during the earthworks within the project's scope, the entire construction area along the railway routes was considered, totaling 1,735,939.65 m^2. The average excavation depth was assumed to be 1.3 m. Consequently, the total excavation volume was calculated as 2,256,721.55 m^3. With an excavation density of 1.6 tons/ m^3, an estimated 3,610,754.47 tons of excavation will be conducted. The project's construction activities are planned to span approximately 2 years, with 10-hour workdays, 305 days per year, accounting for holidays. Accordingly, it is understood from Table 50 that 591.93 tons of excavation will be generated in the land preparation and construction stages of the Project. With the assumption that all activities will be carried out in a controlled manner, hourly removal and loading emissions are calculated.

Additionally, when calculating the total dust emission amount from earthworks within the project's scope, it's considered that an average filling of 1 meter will be applied across the entire construction area along the railway routes. Consequently, the total filling volume and mass were calculated, enabling the determination of hourly discharge emissions under the

assumption of controlled hourly filling and activities. The calculated total hourly dust emission amounts to 12.64 kg/hour. The calculations consider the most unfavorable conditions and assume all construction activities occur at the same time.

In the Annex-2 of the RCIAP, it is stated that: “if the emissions caused by sources other than stacks are smaller than 1 kg/hour, it is not necessary to establish the values representing air pollution levels, air quality values obtained by measurements, calculated air pollution values and determination of total air pollution values”.

It was assumed that the dust emission that will occur during material removal, loading unloading and storage during excavation in the construction phase, will be done simultaneously (the worst-case scenario) and dust emissions were calculated accordingly as 12.64 kg/hour. Therefore, as stated in Annex-2 of the Regulation on the Control of Industrial Air Pollution (Amended R.G. 20.12.2014-29211), “Calculation of Air Pollution Contribution” is required by using an internationally accepted distribution model in the facility's impact area if the pollutant mass flow specified in the Table 2.1 of the regulation are exceeded, for new facilities to be established.

Calculation of Air Pollution Contribution

Air dispersion modeling has been conducted to assess potential dust emissions during the land preparation and construction phases.

AERMOD (AERMIC Modeling) Model, which was developed by EPA and approved by the same organization for EIA studies in the USA, was used as air distribution modeling.

In this context, “Addition Values to Air Pollution” of PM_{10} has been calculated by using AERMOD Model to determine the impacts of dust emissions on air quality and atmospheric distribution profile depending on the processes to be performed in the construction area.

Meteorological Data Used in Modeling: Meteorology stands as the most crucial factor influencing pollutant dispersion in the air. The meteorological data required for the modeling studies were gathered from the General Directorate of Meteorology, “Yumurtalık Meteorology Station”.

In order to obtain information about the general meteorological conditions in the region, averages of the data station have been investigated and the 2015 data was chosen to use in modeling as it is up-to-date. AERMOD provides the meteorological data required for the model by AERMET, the preprocessor. To be used in modeling studies; temperature, wind direction, wind speed, pressure, humidity, cloudiness, and cloud base height data were provided.

Model inputs such as wind speed, wind direction, temperature and stability class are introduced to AERMOD Model in hourly basis. Therefore, data preparation is excepted as an important step. At this stage, meteorology files to be introduced to the model were created using the AERMET Program, a pre-processor that organizes meteorology data so that it can be used in AERMOD.

Three types of data sets were used to run the AERMOD model. These are;

- Topographic data (DEM File created with AERMAP)
- Meteorological data (Profile and Surface Files created with AERMET) and
- Emission parameters

The modeling study was conducted in accordance with SKHKKY Annex-2, within a square-shaped area measuring 1 km² (1 km x 1 km). Possible pollution levels within this area were examined and the results were calculated in terms of ground level pollutant concentrations ($\mu g/m^3$).

Through the AERMAP software, which is the preprocessor of the AERMOD model; by creating 1,000 m reference points, the data file of the modeling area was created. Thus, a physical relationship is provided between the properties of the land and the distribution of air pollution.

As a result, AERMAP generates altitude data for each receiver location (grid points). Also, the dispersion model provides data to provide continuous dispersion model for air flow around elevated areas.

With this DEM file created with the help of AERMAP, in AERMOD; to determine the impacts of the planned facility on the existing air quality; A grid system was created within the study area and in this system the sides of the created square area were 1000 m.

The corner points of the squares in the grid system were defined as receptors, and the topographic elevations were determined with the help of the DEM file created. The study area was digitized with this method and used as model input.

Ground level concentration (GLC) values in the receiving environments estimated with the help of the model were calculated for 1-year modeling period.

The values obtained as a result of modeling (STV and LTV) were compared with the limit values stated in RCIAPAnnex-2 Table 2.2, according to the modeling study, average daily pollutants in the region (STV) and annual (LTV) GLC has been identified. STV, LTV, short-term and long-term limits are defined as follows in relation to atmospheric pollutants in the Regulation on the Control of Industrial Air Pollution (RCIAP):

- Short Term Value (STV): When the maximum daily average values or statistically all the measurement results are arranged according to the size of their numerical values, the value corresponding to 95% of the measurement results,
- Long Term Value (LTV): The value that is the arithmetic mean of all measurement results performed.

As a result of these comparisons, the impacts of emissions to the atmosphere on air quality were determined. Maximum GLC values, STV and LTV and UVS limit values obtained with the modeling studies are given in Table 51and Table 52.

Table 51. PM_{10} Values of Land Preparation and Construction Phase

Pollutant	Period	Model Results		RCIAP Limit Values (µg/m³)	WBG EHS Guidelines-WHO Ambient Air Quality Guideline Values (µg/m³)
		Max GLC Values (µg/m³)	Limit Value Exceedance Number		
Particulate Matter (PM 10)	24 Hours	23,07	-	50	50
	Annual	13,84	-	40	20

Table 52. Settled Dust Values of Land Preparation and Construction Phase

Emission	Average period	Max GLC Value (mg/m².day)	RCIAP Limit Value Exceedance number	RCIAP Limit Values for STV and LTV (mg/m².day)
				2019-2023
Settled Dust	Monthly	36,16	-	390
	Annual	15,71	-	210

Maps showing the 24-hour and annual PM_{10} and Settled Dust concentrations contour obtained as a result of modeling studies are given in Figure 46, Figure 47, Figure 48, and Figure 49 respectively.

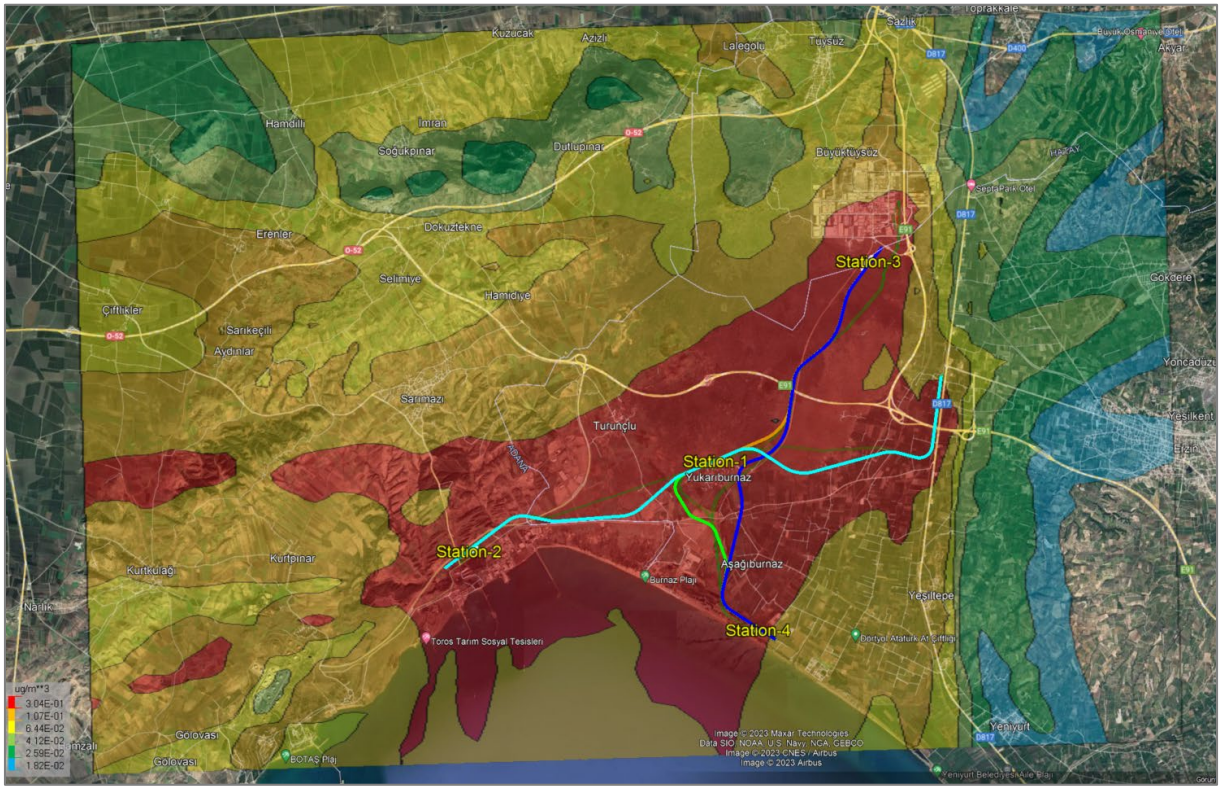


Figure 46. 24-Hour PM_{10} Concentration Contours

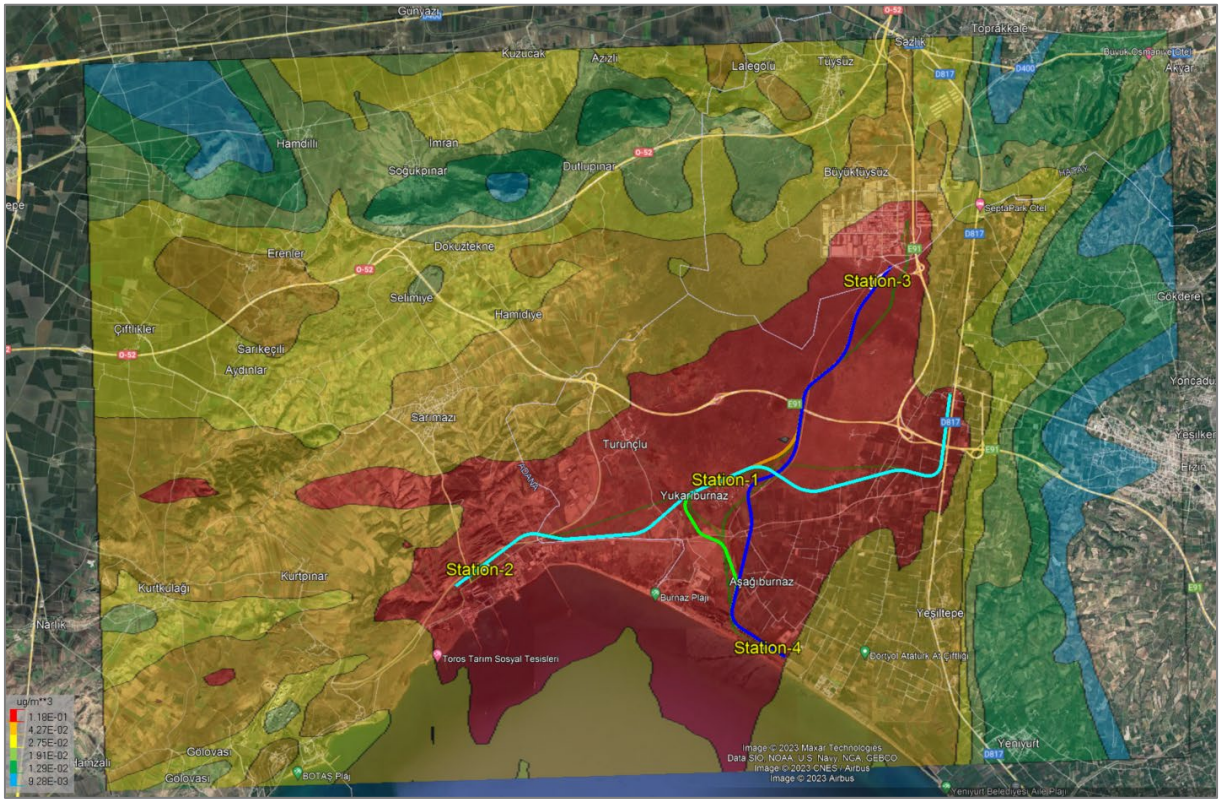


Figure 47. Annual PM10 Concentration Contours

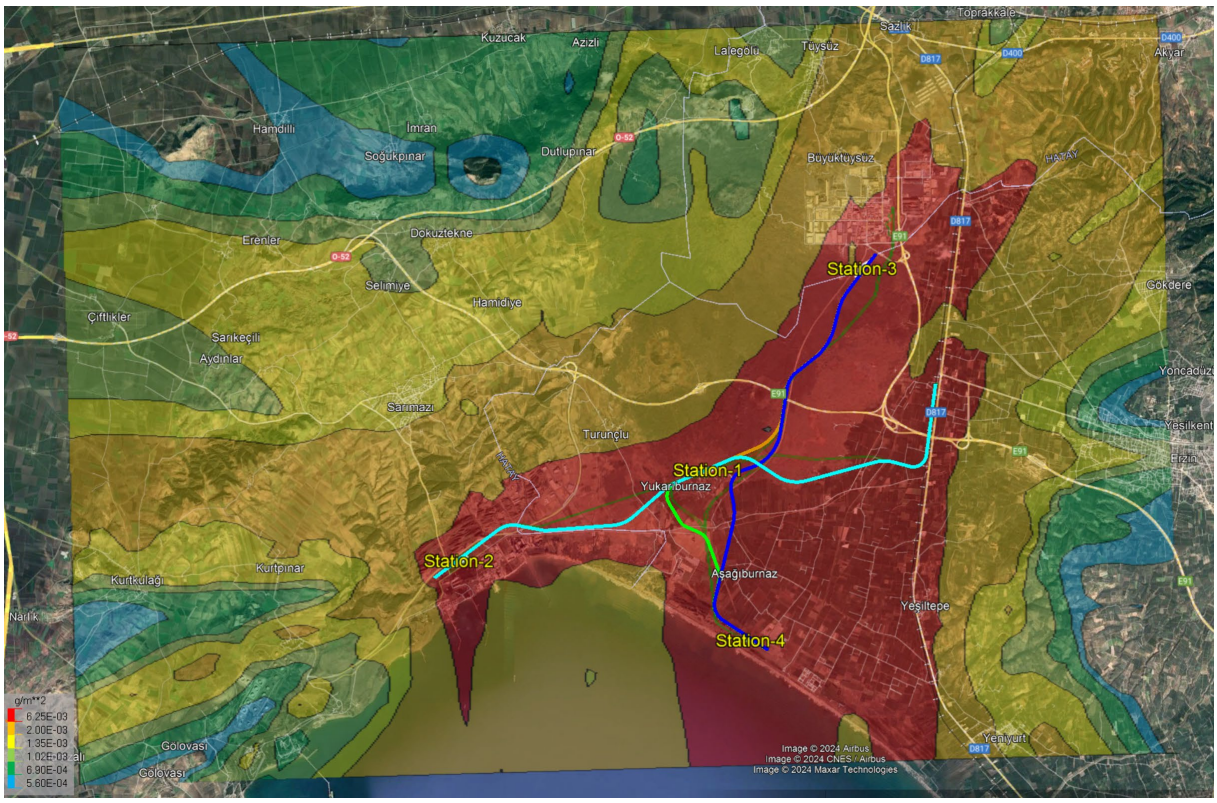


Figure 48. Monthly Settled Dust Concentration Contours

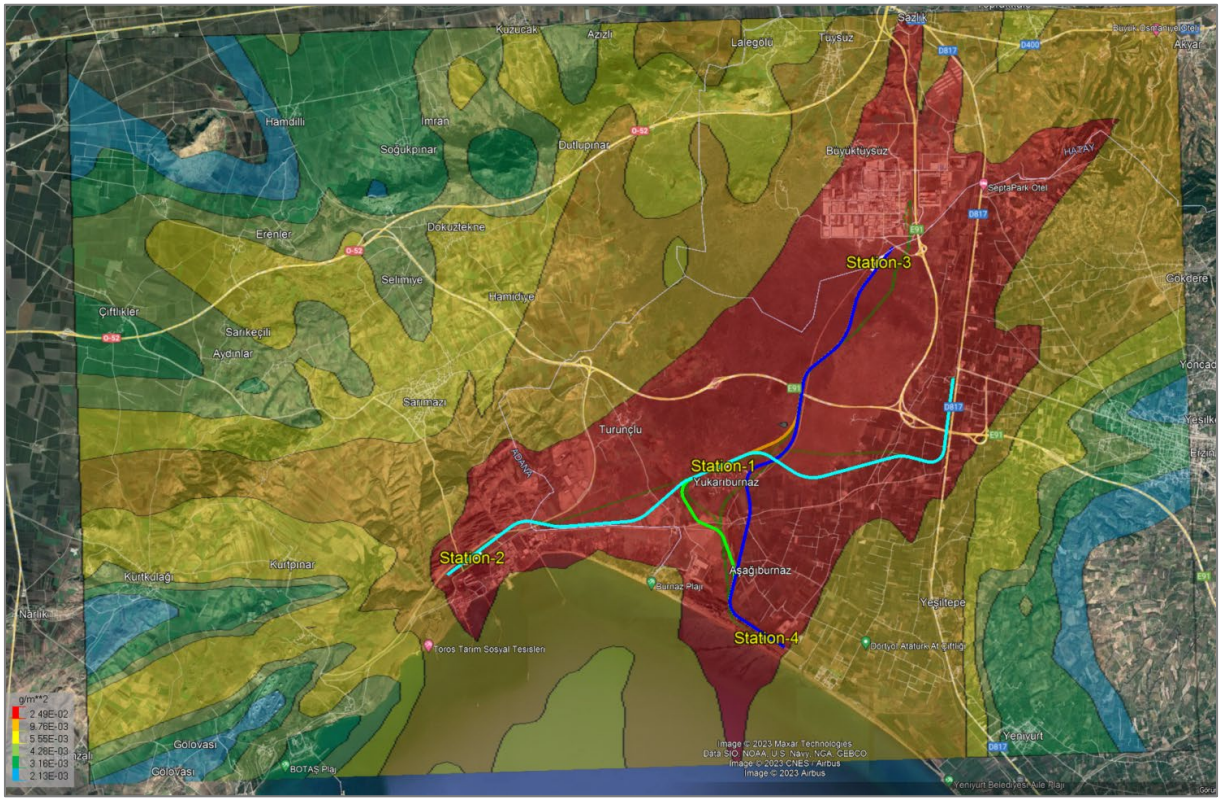


Figure 49. Annual Settled Dust Concentration Contours

The cumulative values obtained from the baseline measurement results and modeling results are given in Table 53 and Table 54 for PM10 and Settled Dust, respectively.

Table 53. PM10 Values of Land Preparation and Construction Phase in Receptor Points

ID	Location	Measurement Results (µg/m³)	Modeling Results (µg/m³)	Cumulative Value	RCIAP Limit Values (µg/m³)	WBG EHS Guidelines-WHO Ambient Air Quality Guideline Values (µg/m³)
PM-1	Yukarıburnaz	31,79	2,29	34,08	**50**	**50**
PM-2	Aşağıburnaz	29,85	0,24	30,09		
PM-3	Sirincir	30,98	0,11	31,09		
PM-4	Turunçlu-2	31,76	0,49	32,25		
PM-5	Erzin Station	30,85	0,14	30,99		
PM-6	Toros Tarım	23,47	0,35	23,82		
PM-7	Karahöyük (Farm)	25,17	0,37	25,54		

Table 54. Settled Dust Values of Land Preparation and Construction Phase in Receptor Points

ID	Location	Measurement Results (mg/m²day)	Modeling Results (mg/m²day)	Cumulative Value	Turkish Air Quality Standards (mg/m²day)
SD-1	Aşağıburnaz	380	0,227	380,2	**390**
SD-2	Sirincir	139	0,385	139,4	
SD-3	Turunçlu-2	82	0,155	82,2	
SD-4	Yukarıburnaz	37	1,040	38,0	
SD-5	Erzin Station	50	0,132	50,1	
SD-6	Toros Tarım	53	0,095	53,1	
SD-7	Karahöyük (Farm)	38	0,151	38,2	

For PM_{10}, the 24-hour limit value is 50 µg/m³ (it cannot be exceeded more than 35 times in a year) and the annual limit value is 40 µg/m³ in RCIAP - Annex-2 Table 2.2 (see Table 44). For settled dust, the monthly and annual imit values are given as 390 mg/m².day and 210 mg/m².day, respectively. Accordingly, the 24-hour and annual maximum PM_{10} values obtained from the modeling study, as well as the maximum settled dust values for monthly and annual periods, comply with the limit values. The results table displaying 24-hour and annual PM_{10} GLC values, along with the settled dust GLC values for monthly and annual periods obtained from the modeling studies and iso-concentration map formed with the GLC values, are presented above.

For PM_{10}, the 24-hour limit value is 50 µg/m³ (it cannot be exceeded more than 35 times in a year) and the annual limit value is 40 µg/m³ in RCIAP - Annex-2 Table 2.2 (see Table 44). For settled dust, the monthly and annual limit values are given as 390 mg/m².day and 210 mg/m².day, respectively.

Accordingly, the 24-hour and annual maximum PM_{10} values obtained from the modeling study, as well as the maximum settled dust values for monthly and annual periods, comply with the limit values. The results table displaying 24-hour and annual PM_{10} GLC values, along with the settled dust GLC values for monthly and annual periods obtained from the modeling studies and iso-concentration map formed with the GLC values, are presented above.

As can be seen above, the STV and LTV values obtained from the maximum GLC values obtained from the modeling studies for dust emissions likely to occur during the land preparation works comply with the limit values (STV and LTV) stated in the Table 2.2 of RCIAP.

It should be noted that the modeling studies reflect the worst-case scenario since all land preparation and construction works were assumed to be carried out at the same time on the proposed railway line. Therefore, the real-life results are expected to be lower than the modeling results during the implementation of the project.

There is no limit value for $PM_{2,5}$ according to local legislation. However, a modeling study was carried out for $PM_{2.5}$ concentrations and distribution maps were examined, and it was seen that these results were in parallel with PM_{10} emissions. For these reasons, the results and maps of the modeling study for $PM_{2,5}$ emissions are not given separately.

The model studies performed for $PM_{2,5}$ emissions will be used as reference values in the future for the cumulative assessment of $PM_{2,5}$ emissions.

Exhaust emissions will be generated from the vehicles that will operate during the construction works. Since these emissions will be of short duration and in trace amounts, baseline measurements including exhaust emission gases (e.g. SO_2 and NO_2 concentrations) were made only to obtain baseline measurement data. In the future, these data can be used as reference values to assess the SO_2 and NO_2 emission impacts of the project if need be.

5.3.3.1.2 Greenhouse Gas Emissions

Greenhouse gas formation is not expected due to tools and equipment to be used during land preparation and construction phases, as the number of planned equipment to be used is very low. Therefore, this impact is considered as negligible.

5.3.3.2 Operation Phase

5.3.3.2.1 Air & Greenhouse Gas Emissions

Since the electrical system will be used on the railway during the operational phase of the project, greenhouse gas emissions and possible impacts on air quality are considered negligible.

5.3.4 Impact Significance, Mitigation Measures and Residual Impacts

The assessment of impacts depends on the sensitivity of the recipients and the overall impact size. As detailed in ESIA Methodology section, the overall impact size is based on a number of factors such as geographic extent, duration, reversibility, frequency, and impact size. The magnitudes of the impacts in terms of air quality are based on the percentage exceeding the project standards. If the concentrations of the pollutants exceed the project standards 0-25%, 25-50% and more than 50% in a given receptor, the impact size is defined as low, medium and high, respectively. Pollutant concentration in each location was determined by the model results together with the baseline measurement results. As it can be seen from Table 53 and Table 54, the cumulative values of PM10 and settled dust do not exceed the limit values during construction phase according to the modeling results. In conclusion, the magnitude of impact is defined as "low" in construction phase and “negligible” in operation phase.

Fuel consumption during the construction phase is only required for the machinery. There will be no fuel consumption for heating and other activities. For the exhaust controls of the vehicles, provisions of “Exhaust Gas Emission Control and Gasoline and Diesel Quality Regulation” published in the Official Gazette No. 28837 dated 30.11.2013 will be complied with. In this context, fuel systems of the vehicles will be continuously controlled. Vehicles that need maintenance will be taken into maintenance, after routine checks and other vehicles will be used until their maintenance is completed. Employees will be ensured to work in accordance with the Traffic Law, and special attention will be paid to make loading according to loading standards.

To minimize the dust and impacts that may during the land preparation and construction phase of the project; measures such as irrigation at emission source, filling and unloading operations

without tossing, covering vehicles with tarpaulin during material transportation and keeping the upper part of the material at 10% humidity will be taken.

Additionally, to mitigate potential dusting issues on the land, compliance with the air quality standards pertaining to dust emissions from materials stored in open areas, as outlined in the "Emission Limits for Authorized Facilities" (Annex-1), will be ensured.

Moreover, to control, NO_2, CO and NO emissions resulting from the operation of quarries and borrow sites, following measures must be taken into consideration if construction contractor decides to operate its own quarries and borrow sites but firstly it will be necessary to conduct an environmental impact assessment:

- Alternatives to blasting, such as hydraulic hammers or other mechanical methods;
- If blasting is necessary, planning of the blasting (arrangement, diameter, and depth and direction of blast holes) should be implemented;
- The correct burning of the explosive, typically composed of a mixture of ammonium nitrate and fuel oil, should be ensured by minimizing the presence of excess water and avoiding incorrect or incomplete mixing of explosive ingredients.

Table 55 indicates air quality impacts, mitigation measures and residual impacts.

5.3.4.1 Greenhouse Gas Emissions

Although GHG emissions for the construction and operation phase of the project were anticipated to be negligible, alternatives that are technically and financially feasible and cost effective, to reduce the project-related GHG emissions, will be implemented during the construction phase of the project. In this regard, alternative fuel types, consumption of low carbon energy sources and applications aiming the reduction of fugitive emissions will be considered. Furthermore, GHG emissions will be quantified annually during the construction phase in accordance with the internationally recognized methodologies. In addition, the following measures will be applied:

- Construction activities will be carried out in line with GIIP.
- While alternative fuel and energy resources are not applicable for the construction machinery to be used in the Project, DGII will provide trainings to the operators/drivers that cover practices for reducing unnecessary equipment idling time and unnecessary operator moves/behaviors that increase fuel consumption (e.g. shifting hydraulic levers unnecessarily, use of excess horsepower).
- Fuel efficiency of construction vehicles will be optimized by implementing strategies such as speed restrictions and minimizing uphill movements whenever possible.
- DGII will ensure proper maintenance of machinery/equipment, including systematic equipment inspection, detection of potential failure and prompt correction to ensure fuel savings.
- The energy/fuel consumption of construction machinery, equipment and vehicles will be closely monitored.
- Comprehensive trainings sessions will be provided to on-site personnel, focusing on energy efficiency and best practices.

If the main contribution to greenhouse gas emissions exceeds 100,000 tons per year during the operational phase of the project, greenhouse gas emissions will be publicly reported, and an analysis of alternative options will be conducted.

Table 55. Air Quality Impacts, Mitigation Measures and Residual Impacts

Impact Description	Project Phases	Receptor	Impact Magnitude					Sensitivity/ Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Reversibility	Duration	Frequency	Overall Magnitude				
Decrease in Air Quality	Land preparation and construction	Turunçlu-2	Local	Short Term Reversible	Short-term	Continuous	Low	Medium	**Minor**	▪ Maximize the use of excavation material in fill operations. ▪ Store excess or unsuitable excavated materials at designated storage sites within the construction corridor, ensuring sufficient capacity. ▪ Ensure that all excavation activities are implemented in line with the cut and fill program to minimize excavation waste. ▪ To minimize dust and potential impacts during soil stripping, cut and fill activities in the land preparation and construction phase, take measures such as watering at emission sources, conducting filling and unloading operations without tossing, covering vehicles with tarpaulin during material transportation, and maintaining the upper part of the material at 10% humidity. ▪ Regularly moisten the project site using water trucks throughout the entire activity. ▪ Comply with the "Exhaust Gas Emission Control and Gasoline and Diesel Quality Regulation," published in the Official Gazette No. 28837 dated 30.11.2013. Perform traffic inspections, exhaust gas emission measurements, and ensure vehicles needing maintenance undergo necessary repairs after routine checks. Other vehicles will be used only after completing maintenance. ▪ Ensure that employees adhere to the Traffic Law, with particular attention to proper loading according to loading standards. ▪ Establish procedures to limit the drop height of falling materials. ▪ Apply dust suppression methods such as watering with water trucks; applying non-toxic anti dust chemicals etc. at construction sites, service roads, and quarries/material borrow sites and material storage sites. ▪ Apply water suppression, pressurized distribution or spraying systems to minimize dust where and when necessary, on paved or unpaved road surfaces. ▪ Carry out loading and unloading of materials without throwing and scattering. ▪ Cover excavated materials during transportation with nylon canvas or materials with grain sizes larger than 10 mm. ▪ Prefer local licensed quarries and material borrows sites for the reduction of transportation distance of materials. ▪ Install wind shields or barriers around material storage sites as needed to prevent the spread of dust emissions. ▪ Upgrade and maintain access roads (to construction camp sites, construction sites, quarries/material borrow sites, and material storage areas) when necessary. ▪ Whenever possible, avoid driving construction vehicles through settlements. ▪ Implement Project Grievance Mechanism. Evaluate and address any comments related to dust and air quality received through the Grievance Mechanism, and implement corrective actions as required. ▪ Implement traffic management plan and pollution prevention plan. ▪ PM_{10}, $PM_{2.5}$ and settled dust will be monitored during the land preparation and construction phase quarterly or in case of a compliant.	**Negligible**
		Yukarıburnaz	Local	Short Term Reversible	Short-term	Continuous	Low	Medium	**Minor**		**Negligible**
		Aşağıburnaz	Local	Short Term Reversible	Short-term	Continuous	Low	Medium	**Minor**		**Negligible**
		Sirincir	Local	Short Term Reversible	Short-term	Continuous	Low	Medium	**Minor**		**Negligible**
		Erzin Station	Local	Short Term Reversible	Short-term	Continuous	Low	Medium	**Minor**		**Negligible**
		Toros Tarım	Local	Short Term Reversible	Short-term	Continuous	Low	Medium	**Minor**		**Negligible**
		Karahöyük (Farm)	Local	Short Term Reversible	Short-term	Continuous	Low	Medium	**Minor**		**Negligible**

5.4 Water Resources, Water Quality and Wastewater Management

5.4.1 Project Standards and Methodology

The national legislation and international standards that will be considered for the impacts/risks related with the water resources and water quality during the project activities and will be complied are as follows:

- Turkish Water Pollution Control Regulation (WPCR)
- Regulation on Water Intended for Human Consumption (RWIHC)
- Regulation on Pits to be Built in Places where Sewer Pipeline Construction is not Possible
- Regulation on the Protection of Groundwater against Pollution and Deterioration
- Surface Water Quality Regulation (SWQR)
- Regulation on the Quality and Treatment of Water Intended for Potable Water Supply
- Communiqué on the Determination of the Protection Areas of Aquifers and Springs Supplying Drinking Water
- Chemical Parameters and Indicator Parameters – Turkish Ministry of Health, 2005
- HATSU General Directorate of Water and Sewerage Administration, Regulation on Discharge of Wastewater to the Sewerage Network
- HATSU Tariffs Regulation
- Guidelines for Drinking-Water Quality – WHO, 2017
- WB ESF – ESS1: Assessment and Management of E&S Risks and Impacts
- WB ESF – ESS3: Resource Efficiency and Pollution Prevention and Management
- WBG General EHS Guidelines – 1. Environment – 1.3 Wastewater & Ambient Water Quality
- WBG General EHS Guidelines – 1. Environment – 1.4 Water Conservation
- WBG EHS Guidelines for Railways, 2007

The limit values considered for the evaluation of the baseline conditions for potable and non-potable water (water for human consumption) are the limit values specified in RWIHC and in IFC/WHO Drinking Water Guidelines (see Table 56).

Table 56. National and International Limit Values for Water Resources

Parameter	Unit	Limit Values in RWIHC	Limit Values of WHO
Antimony	mg/L	0.005	0.020
Arsenic	mg/L	0.01	0.01
Barium	mg/L	-	0.7
Benzene	mg/L	0.001	0.01
Boron	mg/L	1	2.4
Cadmium	mg/L	0.005	0.003
Chromium	mg/L	0.05	0.05
Copper	mg/L	2	2
Cyanide	mg/L	0.05	-
Fluoride	mg/L	1.5	1.5
Lead	mg/L	0.01	0.01
Mercury	mg/L	0.001	0.006
Nickel	mg/L	0.02	0.07
Nitrate	mg/L	50	50
Nitrite	mg/L	0.5	3
Selenium	mg/L	0.01	0.04

Parameter	Unit	Limit Values in RWIHC	Limit Values of WHO
Aluminum	mg/L	0.2	-
Ammonium	mg/L	0.5	-
Chloride	mg/L	250	-
Conductivity	ljS/cm	2500	-
pH	-	6.5<pH<9.5	-
Iron	mg/L	0.2	-
Manganese	mg/L	0.05	-
Sulphate as SO4	mg/L	250	-
Sodium	mg/L	200	-
Uranium	mg/L	-	0.03

The quality of surface water resources is evaluated according to the principles of the Surface Water Quality Regulation (SWQR). The purpose of this regulation is to determine and classify the biological, chemical, physicochemical and hydro morphological qualities of surface waters, coastal and transitional waters, to monitor and maintain the balance of using water in accordance with sustainable development objectives.

SWQR evaluates surface waters in three different classes in terms of general chemical and physicochemical parameters. This classification is made by comparing the analysis result with the relevant limit value for each parameter analyzed in the sample. The water quality classes, and limit values of the parameters defined in Table-2 in SWQR Annex-5 are given in Table 57.

Table 57. Surface Water Classification and Limit Values According to the SWQR

Parameter	Unit	Water Quality*		
		Class I (High)	Class II (Good)	Class III (Medium)
Color (436 nm)	m^{-1}	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
Color (525 nm)	m^{-1}			
Color (620 nm)	m^{-1}			
pH	-	6-9	6-9	6-9
Conductivity	µS/cm	<400	1000	>1000
Oil and Grease**	mg/L	<0.2	0.3	>0.3
Dissolved Oxygen	mg/L	>8	6	<6
Chemical Oxygen Demand	mg/L	<25	50	>50
Biological Oxygen Demand	mg/L	<4	8	>8
Ammonium Nitrogen	mg/L	<0.2	1	>1
Nitrate Nitrogen	mg/L	<3	10	>10
Total Kjeldahl Nitrogen	mg/L	<0.5	1.5	>1.5
Total Nitrogen	mg/L	<3.5	11.5	>11.5
Ortho Phosphate Phosphorus	mg/L	<0.05	0.16	>0.16
Total Phosphorus	mg/L	<0.08	0.2	>0.2
Fluoride	µg/L	≤1000	1500	>1500
Manganese	µg/L	≤100	500	>500
Selenium	µg/L	≤10	15	>15
Sulfur	µg/L	≤2	5	>5

In case the wastewater is discharged to the receiving environment after treatment, the limit values specified in the Turkish Water Pollution Control Regulation (WPCR) and WBG General EHS Guidelines for Wastewater Quality given in Table 58 will be complied.

Table 58. National and International Limit Values for Treated Wastewater Discharge to Receiving Body

Parameter	WPCR Limit Values for Domestic Wastewater (2 hours composite sample)	WBG General EHS Guidelines for Wastewater Quality
BOD (mg/L)	50	30
COD (mg/L)	160	125
Total Suspended Solids (mg/L)	60	50
pH	6-9	6-9
Total Nitrogen (mg/L)	-	10
Total Phosphorus (mg/L)	-	2
Oil and Grease (mg/L)	-	10
Total Coliform Bacteria (Most Probable Number/100mL)	-	400

Methodology

Data sources used to identify the water resources that are to be managed in the scope of the Project to avoid significant impacts have been determined by using the following data sources:

- Dörtyol-Erzin Plan Hydrogeology Survey Report (1974)
- TÜİK Database
- Database of the Turkish State Hydraulic Works (DSİ)
- 1/25,000 scale topographical maps of the Project route,
- Long-term Extreme Meteorological Events Reports obtained from Yumurtalık Meteorological Station
- Data of Adana Province, Osmaniye Province and Hatay Province maps prepared in 2012 by Former Ministry of Forestry and Water Affairs, Department of Information Technology, Geographical Information Systems (GIS) Directorate., 2012;
- 'Project-Feasibility and EIA Services Work, Geological-Geotechnical Investigation Report' for the Connection Lines to the Industrial Facilities in Çukurova Region and İskenderun Bay, Yumurtalık Free Zone Industrial Centers and Ports, prepared by Ministry of Transport and Infrastructure, General Directorate of Infrastructure Investments (DGII), Temelsu Uluslararası Mühendislik Hizmetleri A.Ş. and Alttaş Infrastructure International Engineering Consulting Inc. in 2019;
- Online 'Geodata Application' database (http://www.geodata.gov.tr) of Ministry of Agriculture and Forestry
- Results of the water quality samplings, measurements and analyses conducted as part of the ESIA process.

5.4.2 Baseline Conditions

5.4.2.1 Surface Water Resources

The Project is located in Asi Basin which is one of the 25 water basins in Türkiye (Figure 50). In the Asi Basin, there are streams with continuous flow and numerous dry streams with seasonal flow that feed them, and these streams discharge directly into the Mediterranean. In addition, there are many natural lakes, ponds, dams, wetlands and lagoons, water structures and irrigation project sites in this water basin.

A great part of the Asi Basin covers Hatay province and its districts. While 46.1% of Hatay provincial territory consist of mountains, plains account for 33.5% and plateaus account for 20.4% in the province. Nur Mountains extending along the north-south orientation is the

primary mountain range in the province. The highest point of the mountain range is the Mığırtepe (2,240 m) Mountain. The height of the other main peaks is less than 2,000 m. Amanos Mountains, which are high, steep, and not easily crossed, are cut by the Asi Valley within the borders of Samandağ District.

The same mountain range continues within the borders of Yayladağı district immediately after the Asi Valley. In this area, the Ziyaret Mountain with a height of 1,235 m and the Keldağ Mountain with a height of 1,739 m appear to be the two main mountains.

The Asi River, the primary river in the Asi Basin, is fed by the springs rising in the Bekaa Valley between the Lebanon Mountains and the Anti-Lebanon Mountains. The total length of the Asi River is 386 km, and a great part of the river is within the Syrian territory. Its length in Türkiye is 88 km. Based on the “Annual Average Surface Water Potential by Basin” data prepared by DSİ, the total catchment area of the Asi Basin is 7,886.0 km^2 in 2021 and its annual average flow rate is 1.8 km^3. Based on the “Annual Groundwater Potential by Basin” data prepared by General Directorate of State Hydraulic Works, the groundwater feed and the groundwater operation reserve of the Asi Basin are 393.2 and 289.5 hm^3/year respectively in 2021.

The map showing seasonal and continuous flows, streams, natural lakes and protected areas, which are surface water resources located on and around the project area, is presented in Figure 51.

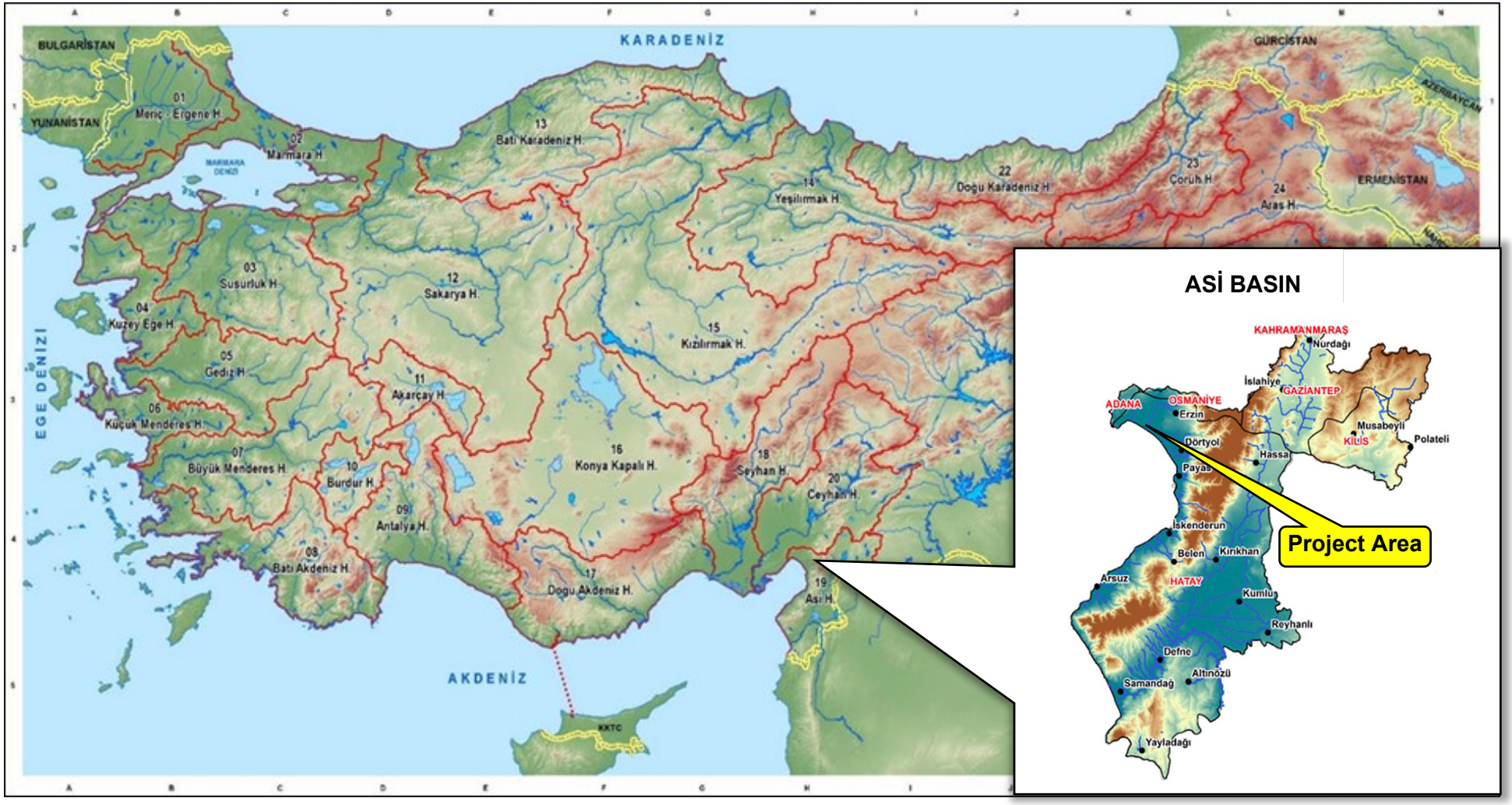


Figure 50. Water Basins in Türkiye and Asi Basin

Source: *DSİ, 2020*

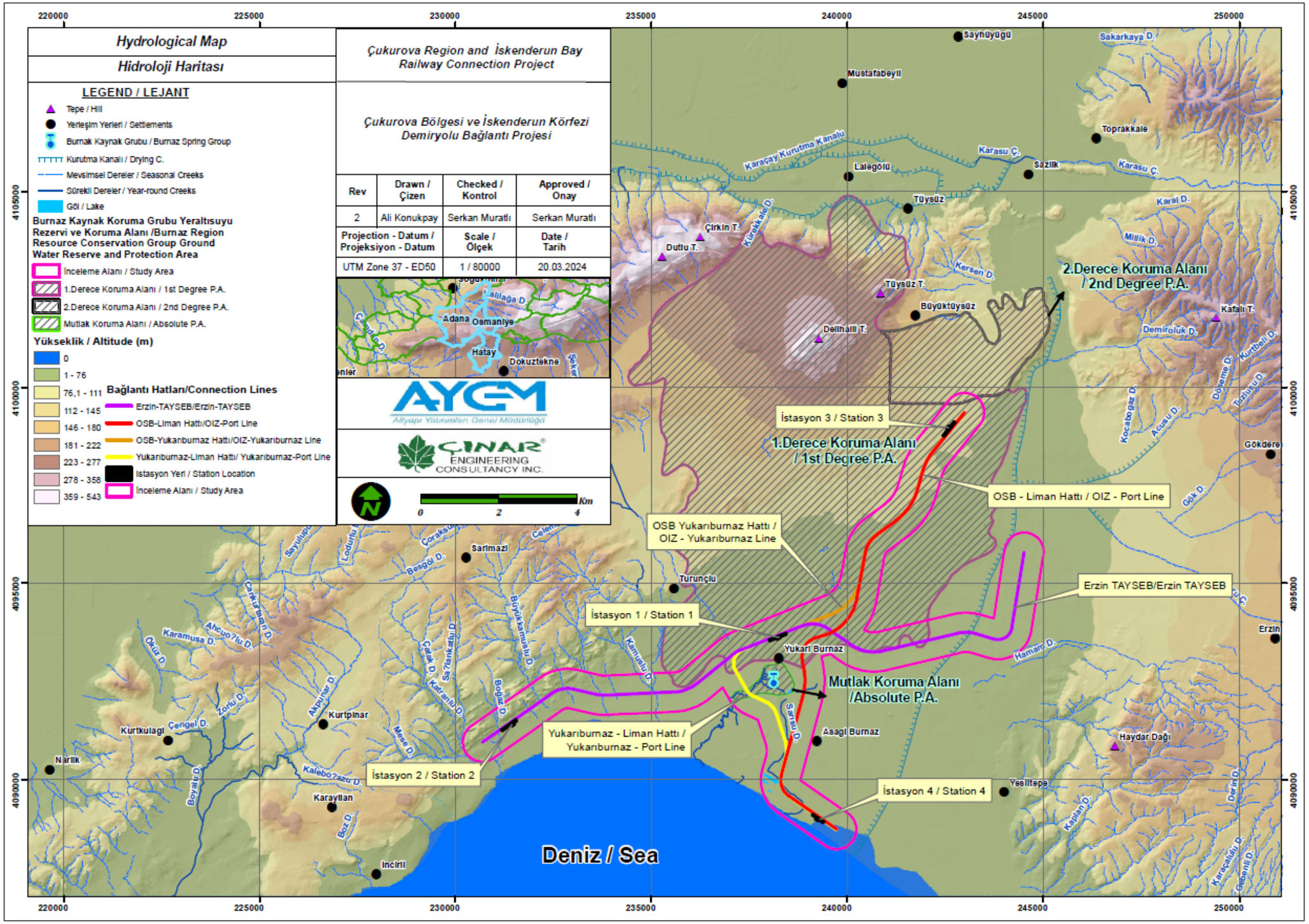


Figure 51. Hydrological Map of the Project Area

Rivers and Streams

Deli stream, Koca stream, Gönen stream, Fındık stream, Höpür stream, Muratpaşa stream, Büyükkara stream, Karasu stream are the main streams with continuous flow, fed by numerous streams with seasonal flow in the Asi Basin.

Table 59 presents information about the railway lines that cross streams.

Table 59. Rivers & Streams around the Project Area

River/Stream	Basin	Railway Line	Section
Unknown Stream with Seasonal Flow	Asi	Erzin – TAYSEB Connection Line	Kamuslu stream: 3+240 (dying canal), 11+500, 11+800
			Boğaz stream: 12+575, 12+950, 13+500, 13+815, 14+515, 15+800
Uknown Stream with Continuous Flow	Asi	OIZ-Port Line	10+390
			Sarısu stream: 12+285
Uknown Stream with Continuous Flow	Asi	Yukarıburnaz- Port Line	1+470

Natural Lakes, Wetlands, Lagoons and Marshes

Although there are natural lakes, wetlands, lagoons and marshes in Ceyhan Basin and Asi Basin, where the project area is located, the railway lines do not cross these surface water resources. The information on these surface water resources located around the project area is presented in Table 60.

Table 60. Natural Lake, Wetlands, Lagoons and Marshes in the Vicinity of the Project Area

Name	Province	Railway Line	Section	Direction	Distance (km)	Protection Status
Marsh with seasonal surface water	Hatay	Yukarıburnaz-Port	0+510 – 2+252	-	-	-
Seasonal surface water	Hatay	OIZ-Port	10+100 – 10+468	-	-	-
Marsh with seasonal surface water	Hatay	OIZ-Port	10+500	E	0.365	-
Marsh with seasonal surface water	Hatay	OIZ-Port	10+300	W	0.370	-
Marsh with seasonal surface water	Hatay	OIZ-Port	12+800	W	440	-
Akyayan Lake and small lakes around	Adana	Erzin-TAYSEB	16+000	SW	53	-
Yumurtalık Lagoon	Adana	Erzin-TAYSEB	16+000	SW	40.6	National Park
Akyatan Lake Wetland	Adana	Erzin-TAYSEB	16+000	SW	66.7	National Park, Ramsar site
Karataş Aslantaş Lake	Osmaniye	OIZ-Port	0+000	N-NE	32	National Park

Source: www.geodata.gov.tr

Dams and Ponds

Information on the dams and ponds situated around the study area are presented in Table 61. Aslantaş Dam, approximately 32 km north-northeast of the Erzin-TAYSEB Connection Line and Anlıkaş Pond approximately 38.9 km northeast from OIZ-Port line are the closest surface water resources to the project area.

Table 61. Dams and Ponds in the vicinity of the Project Area

Name	Province	Intended Use	Phase (Op/Con)*	Storage Cap. (hm^3)	Active Cap. (hm^3)	Surface Water Area (km^2)	Railway Line & Section	Direction & Distance (km)
Aslantaş Dam	Osmaniye	Irrigation, Flood control, Power, Drinking	Op	1,840.00	680.00	62.00	OIZ-Port	N-NE 33.0
Kalecik Dam	Osmaniye	Irrigation	Op	32.75	31.25	1.54	OIZ-Port	NE 36.0
Tahtaköprü Dam	Gaziantep	Irrigation, Flood control	Op	200.00	185.00	23.40	OIZ-Port 2+300	E-NE 48.5
Adana Seyhan Dam	Adana	Irrigation, Flood control, Power	Op	1,004.00	634.00	79.06	Erzin-TAYSEB 16+000	NW 58.7
Çatalan Dam	Adana	Irrigation, Flood control, Power, Drinking	Op	2,100.00	700.00	84.50	Erzin-TAYSEB 16+000	NW 68.7
Seyhan Yedigöze Dam	Adana	Irrigation, Power	Op	642.82	300.48	14.94	Erzin-TAYSEB 16+000	NW 70.3
Kozan Dam	Adana	Irrigation	Op	196.67	165.2	7.07	Erzin-TAYSEB 16+000	N 66.5
Mehmetli Dam	Osmaniye	Irrigation, Flood control	Op	65.15	52.63	3.09	Erzin-TAYSEB 13+000	N 63.6
Anlıkaş Pond	Osmaniye	Irrigation	Op	1.872	1.672	0.194	OIZ-Port	NE 38.9
Aşağı Seyhan Kılıçlı Pond	Adana	Irrigation, Flood control	Op	9.50	7.094	0.98	Erzin-TAYSEB 23+500	N-NW 41.2
Seyhan-Hakkıbeyli Pond	Adana	Irrigation	Op	7.70	5.25	1.33	Erzin-TAYSEB 16+000	N-NW 48.5
Demrek Pond	Hatay	Irrigation	Op	1.995	1.65	0.395	OIZ-Port 14+085	SE 42.5

Source: www.geodata.gov.tr
**Op: Operation*
Con: Construction

Irrigation Projects

Adana Province and Hatay Province water data maps were prepared by the Former Ministry of Forestry and Water Affairs in 2012 and according to the online geodatabase, there are a number of irrigation projects either in operation, construction and planning phases in the vicinity of the project area.

The section between KM: 0+000 and KM: 4+070 of the Erzin-TAYSEB Connection line, the section between KM: 10+600 and KM: 12+400 of OIZ-Port line and the section between KM: 1+800 and KM: 2+252.147 of Yukarıburnaz-Port line are located in Aşağı Ceyhan Aslantaş 3rd Stage Erzin Dörtyol Irrigation Area which is in operation.

In addition, as mentioned in the official letter of DSİ 6th Regional Directorate dated 14.11.2018 and numbered 782653, the proposed railway lines cross many irrigation canals, reserve canals and tertiary canals, drying canals, drainage canals and maintenance roads.

Surface Water Quality

During Phase-1 studies, five (5) sampling points near the proposed railway line was selected in order to determine the baseline quality of surface water resources. These sampling locations had been selected from areas with water crossings near the railway lines routes. To be able to assess the impacts of construction and operation activities on surface water resources, one additional point (SW-6) was selected from the Burnaz Coast where the stream flows into the sea. In addition, 3rd sampling point (SW-3) was revisited and a surface water sample was taken from this point during Phase-2 studies since sampling could not be performed at SW-3 which was dry during Phase-1.

The surface water samples were taken in accordance with TS EN ISO 5667-6 standards and analyses were carried out by ÇINAR Lab. both during Phase-1 and Phase-2 studies. The analysis reports were given in Appendix-3.

The information on the surface water sampling points is given in Table 62 and sampling points are shown in Figure 52.

Table 62. Surface Water Sampling Locations

No	Coordinates (WGS 84-UTM)	District/Province	Neighborhood	Sampling Date
SW-1	37 S 238796 D; 4088987 K	Erzin/Hatay	Aşağıburnaz	22.01.2020
SW-2	37 S 237679 D; 4092273 K	Erzin/Hatay	Yukarıburnaz	22.01.2020
SW-3	37 S 235117 D; 4091955 K	Erzin/Hatay	Erzin OIZ	27.07.2023
SW-4	36 S 766546 D; 4091754 K	Ceyhan/Adana	Yumurtalık-TAYSEB	21.01.2020
SW-5	36 S 764579 D; 4090596 K	Ceyhan/Adana	Yumurtalık-TAYSEB	21.01.2020
SW-6	37 S 236083 D; 4090331 K	Erzin/Hatay	Burnaz Coast	27.07.2023

The analysis results of surface water samples are given in Table 63.

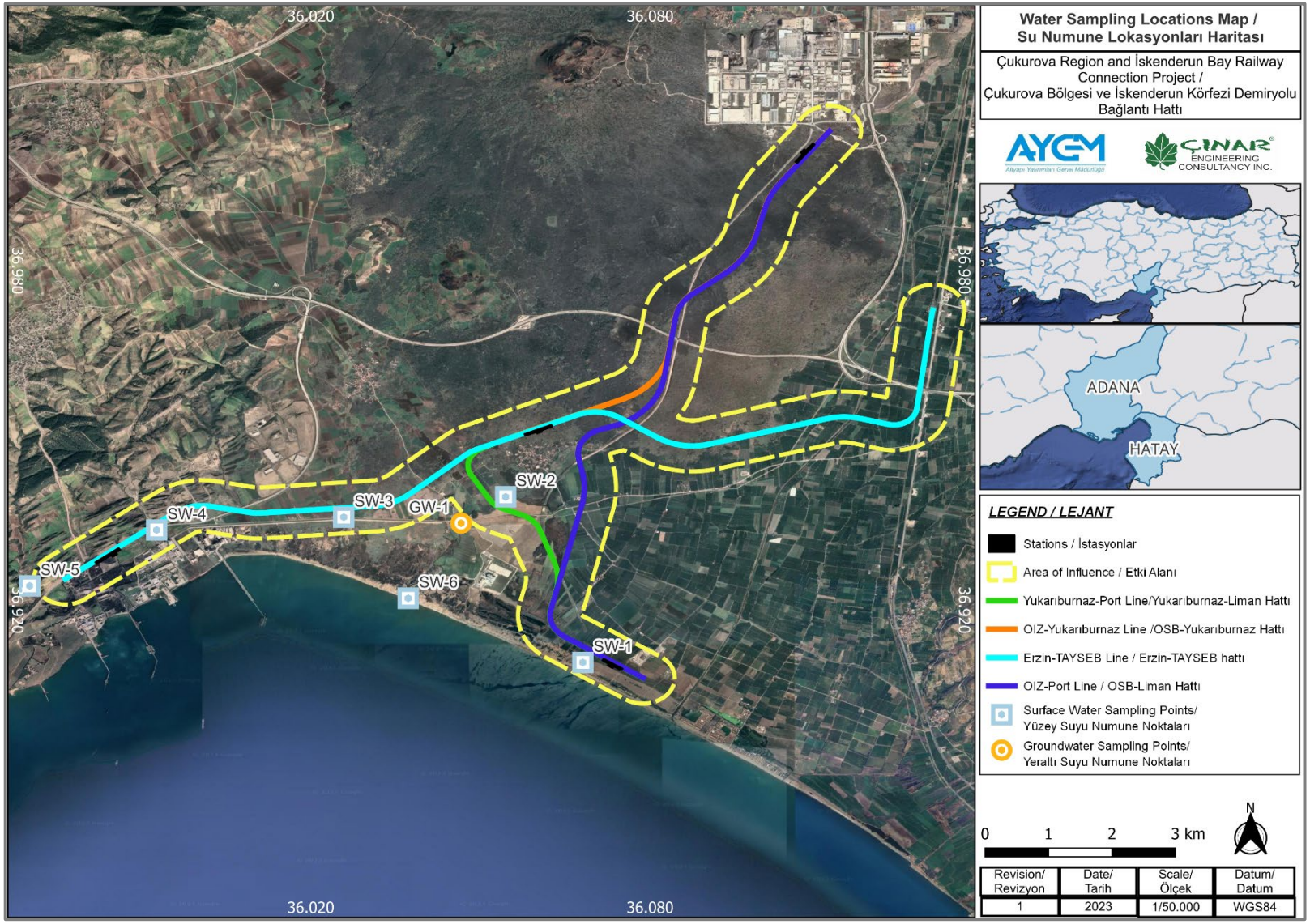


Figure 52. Water Sampling Locations

Table 63. The Analysis Results of Surface Water Samples

Parameter	Unit	Water Quality*			Analysis Results					
		Class I (Very Good)	Class II (Good)	Class III (Moderate)	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6
pH	-	6-9	6-9	6-9	8.25	8.35	8.81	7.1	8.25	7.70
Oil and Grease**	mg/L	<0.2	0.3	>0.3	-	-	-	-	-	-
Color (436 nm)	m^{-1}	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	< 0.1	< 0.1	0.3	< 0.1	< 0.1	<0.1
Color (525 nm)	m^{-1}				< 0.1	< 0.1	<0.1	< 0.1	< 0.1	<0.1
Color (620 nm)	m^{-1}				< 0.1	< 0.1	<0.1	< 0.1	< 0.1	<0.1
Conductivity	µS/cm	<400	1000	>1000	1051	746	3290	1375	1032	48200
Dissolved Oxygen	mg/L	>8	6	<6	8.69	9.01	7.0	11.49	11.17	6.73
Chemical Oxygen Demand	mg/L	<25	50	>50	10	< 10	31.1	10.5	< 10	47.5
Biological Oxygen Demand	mg/L	<4	8	>8	< 3	< 3	11.8	< 3	< 3	18.4
Ammonium Nitrogen	mg/L	<0.2	1	>1	0.081	< 0.016	15.5	0.023	< 0.016	<0.016
Nitrate Nitrogen	mg/L	<3	10	>10	4.05	8.78	1.58	18.97	13.65	6.22
Total Kjeldahl Nitrogen	mg/L	<0.5	1.5	>1.5	0.935	< 0.1	16.6	0.973	< 0.1	<0.1
Total Nitrogen	mg/L	<3.5	11.5	>11.5	4.055	8.789	19.3	19.95	13.65	6.22
Ortho Phosphate Phosphorus	mg/L	<0.05	0.16	>0.16	0.01	0.01	0.692	< 0.1	< 0.1	<0.01
Total Phosphorus	mg/L	<0.08	0.2	>0.2	0.056	0.097	1.2	0.012	0.025	0.239
Fluoride	µg/L	≤1000	1500	>1500	< 0.1	< 0.1	269	0.298	0.289	791
Manganese	µg/L	≤100	500	>500	0.037	0.026	22.4	0.005	0.006	2.76
Selenium	µg/L	≤10	15	>15	0.001	0.001	0.81	0.003	0.002	0.78
Sulfur	µg/L	≤2	5	>5	<2	<2	<2	<2	<2	<2

** (a) Purpose of use of water as per quality classes:* *Class I - Water with High Quality (implies that the status of water is "Very good");*	*1) Surface waters with a high potential of being utilized as drinking water,* *2) Water usable for recreational purposes, including those that require body contact, such as swimming,* *3) Water that can be used for trout production,* *4) Usable water for animal production and farm needs,*
Class II. - Slightly Contaminated Water (implies that the status of water is "Good");	*1) Surface waters with a high potential of being utilized as drinking water,* *2) Water usable for recreational purposes,* *3) Water that can be used for fish production other than trout,* *4) Irrigation water provided that it meets the irrigation water quality criteria determined by the legislation,*
Class III. - Contaminated water (implies that the status of water is "Moderate");	*It refers to water and industrial water that can be used for aquaculture after appropriate treatment, excluding facilities that require qualified water such as food and textiles.*
***The analysis of the "Oil and Grease" parameter cannot be determined at a level lower than 10 by the relevant laboratory. Therefore, it could not be classified.*	

According to the analysis results given in Table 63, SW-1 is classified as Class III in terms of Conductivity. The high conductivity value can be related with the sea water interference.

SW-2 is classified as Class II in terms of Conductivity, Total Nitrogen, Nitrate Nitrogen and Total Phosphorus parameters. Agricultural activities, particularly the use of fertilizers, might contribute to elevated levels of nitrogen and phosphorus, and indirectly to increased electrical conductivity due to salinity in surface water.

As mentioned at the beginning of Surface Water Quality section, SW-3 was revisited, and a surface water sample was taken from this point during Phase-2 studies. The analysis results reveal that SW-3 is classified as Class III concerning the Conductivity, Biological Oxygen Demand (BOD), Ammonium Nitrogen, Total Kjeldahl Nitrogen, Total Nitrogen, Ortho Phosphate Phosphorus and Total Phosphorus parameters. It should be noted that SW-3 is located downstream of Erzin OIZ and the operational activities within the industrial area may potentially cause adverse effects on the surface water quality in that vicinity.

According to Table 63, SW-4 is classified as Class III in terms of Conductivity, Total Nitrogen and Nitrate Nitrogen parameters. It is observed that there are agricultural lands on the upstream of the sampled point. Total Nitrogen, Nitrate Nitrogen and Kjeldahl Nitrogen parameters can be associated with agricultural activities.

SW-5 is classified as Class III regarding Conductivity, Total Nitrogen and Nitrate Nitrogen parameters. As this point is close to the shoreline, the conductivity level is high. Total Nitrogen and Nitrate Nitrogen parameters can be associated with agricultural land around the location.

SW-6 is classified as Class III regarding Conductivity, BOD and Total Phosphorus parameters. The high level of conductivity at this point can be associated with the proximity of SW-6 to the shoreline.

5.4.2.2 Groundwater Resources

According to the Geological-Geotechnical Investigation Report of the Connection Line to the Industrial Facilities, Yumurtalık Free Zone Industrial Centers and Ports in Çukurova Region and İskenderun Bay prepared by Temelsu Uluslararası Mühendislik Hizmetleri A.Ş. and Altaş Infrastructure International Engineering Consulting Inc., the Upper Miocene aged Kızıldere formation, one of the geological units where the project area is located, crops out between KM: 13+250 and KM: 16+272.70 of the Connection line. These formations; generally, includes mudstone, sandstone, siltstone, claystone, marl, sparse clayey-sandy limestone units. Also, members of these formations, claystone, marl, mudstone units are reported as impermeable-less permeable and sandstone, clayey-sandy limestone units are reported as permeable.

In addition, the Quaternary aged Delihalil basalt is exposed along the entire OIZ-Yukarıburnaz line, along the section between KM: 4+400 and KM: 11+130 of Erzin-TAYSEB connection line and along the section between KM: 0+000 and KM: 0+510 of OIZ-Port line. This basalt unit is determined to be permeable as well as conveying groundwater through well-developed fracture-crack systems with gas voids. In addition, in the mentioned geological-geotechnical survey report, it is stated that the slags in the upper parts of this basalt are highly permeable.

Groundwater resources in the mentioned basalt unit are naturally protected by the provisions of the "Burnaz Spring Group Groundwater Reserve and Protection Area Announcement" published in the Official Gazette dated 03.06.2011 and numbered 27953. According to these provisions, the proposed railway lines within the boundaries of the 1st Degree Protection Area and Strict Protection Area are given in the table below.

Table 64. Overlapping Areas Between Railway Lines and Burnaz Group Protection Area

Connection Line	Burnaz Spring Group Groundwater Protection Area		
	Strict	1st Degree	2nd Degree
Erzin-TAYSEB	-	KM: 4+230 – KM: 4+630 KM: 5+000 – KM: 5+200 KM: 5+800 – KM: 9+880	-
OIZ-Port	-	KM: 0+000 – KM: 8+100	-
OIZ-Yukarıburnaz	-	Entire line	-
Yukarıburnaz-Port	KM: 1+400 – KM:1+510	KM: 0+000 – KM: 0+840	-

As it can be seen from the table, the section between KM: 4+230 – KM: 4+630, KM: 5+000 – KM: 5+200 and KM: 5+800 – KM: 9+880 of the Erzin Station -TAYSEB connection line, KM: 0+000 – KM: 8+100 of the OIZ-port line, KM: 0+000 – KM: 0+840 of the Yukarıburnaz-Port line and entire OIZ-Yukarıburnaz line are located in Burnaz Springs 1st Degree Protection Area. In addition, KM: 1+400 – KM:1+510 of the Yukarıburnaz-Port line passes through the Strict Protection Area.

In the hydrogeological survey report prepared by DSİ in 1974 for the Dörtyol-Erzin Plain in Hatay Province, it was stated that the safe reserve of the Burnaz Springs, which are groundwater resources in this basalt unit, is 37 hm^3/year.

Other geological units where the project routes pass are Quaternary aged beach sand and alluvial deposits. Due to the fact that these units consist of gravel, clay, silt and sand in general, the units can hold, transport and transmit groundwater. In addition, a number of basic boreholes were drilled in this unit within the scope of the geological-geotechnical survey study prepared by DGII. Of these 41 wells drilled along the Erzin-TAYSEB connection line, 28 of the boreholes were drilled at a depth of 1.60-14.00 m from the surface; Out of 25 basic boreholes drilled in the OIZ-Port line, 15 of them have depths of 0.60-5.10 m and 1 of them have artesian groundwater. While groundwater was not found in the main borehole drilled in the OIZ-Yukarıburnaz line, 5 out of 6 boreholes drilled in the Yukarıburnaz-Port line encountered groundwater at a depth of 0.50-2.50 m.

Groundwater Quality

During Phase-2 studies, one (1) groundwater sample (GW-1) was taken in the vicinity of the project area to determine the baseline conditions. The sampling point was selected among the DSİ's groundwater wells considering the direction of groundwater flow in the AoI identified for the physical environment. GW-1 sampling point is shown in Figure 52 and the analysis results are listed in Table 65. Analysis results indicate that the groundwater quality is good, with no signs of contamination observed based on the parameters analyzed, as per the RWIHC limit values and WHO guidelines.

The analyses were conducted by an accredited laboratory (Çınar Lab) between 28.07.2023 and 02.08.2023 and the analysis reports are given in Appendix-3.

Table 65. Groundwater Analysis Results

Parameter	Unit	Limit Values in the RWIHC	WHO Drinking Water Guidelines	GW-1 Analysis Results
pH	-	6.5<pH<9.5	-	7.81
Conductivity	µS/cm	2,500	1,500	650
Dissolved Oxygen	mg/L	-	-	8.10
Oxygen Saturation	%	-	-	93.5
Salinity	$‰_0$	-	-	0.32
Suspended Solids	mg/L	-	-	<10
Total Cyanide (CN^-)	mg/L	0.05	-	<0.005
Sulphate (SO_4^{2-})	mg/L	250	200	29.2
Chloride (Cl^-)	mg/L	250	250	90.3
Nitrate (NO_3^-)	mg/L	50	50	36.3
Arsenic (As)	mg/L	0.01	0.01	0.001
Boron (B)	mg/L	1	2.4	0.081
Mercury (Hg)	mg/L	0.001	0.006	<0.0001
Cadmium (Cd)	mg/L	0.005	0.003	0.004
Lead (Pb)	mg/L	0.01	0.01	<0.0005
Trichloroethylene	µg/L	0.01	-	<0.1
Phosphate (PO_4^{3-})	mg/L	250	-	<0.31
Ammonium	mg/L	0.5	-	<0.021
Total Pesticide	µg/L	0.5	-	<0.005
Mineral Oil and Derivatives (TPH)	mg/L	-	-	<0.1

5.4.2.3 Flood Events near the Project Area

No flooding events are expected due to the high permeability of the basalts in the areas where the project routes pass over the Delihalil basalts. In the relatively lower elevated areas of the project routes, surface waters are taken under control with the existing drying canals. In addition, surface water accumulation can be observed after rains in winter and spring at reed and marshy areas crossed by the routes. In all routes, large stream crossings will be crossed by bridges, in areas where there are dry streams with small seasonal flows and streams with continuous flows, water flow will be provided by placing culverts.

In order to assess the project routes and the extraordinary meteorological events around it, the records of the extraordinary meteorological events (MGM, 2020) of the years of manual operation at the Yumurtalık Meteorology Station, which are being observed by the General Directorate of Meteorology (MGM), were examined. According to these records, in Yumurtalık District of Adana Province; in 1988, 1994 and 2004, 3 extraordinary meteorological events took place in total. On May 24, 1988, the hailstorm and flood damaged the agricultural products. On September 19, 1994, the storm damaged the environment, settlements and agricultural products. On May 15, 2004, the vegetable gardens were damaged due to the hailstorm.

5.4.3 Impact Assessment

5.4.3.1 Land Preparation and Construction Phase

5.4.3.1.1 Water Use

In the land preparation and construction phase of the Project, there will be no water use other than drinking and utility purposed water use of 140-180 project personnel and moistening water to be used for minimizing uncontrolled dust emissions.

Daily needs of the personnel who will work in the land preparation and construction phase of the project will be provided from the construction site to be established and within this scope calculation are made;

180 people x 217.5 L/day-capita [11]= 39.15 m^3/day

In addition, it is estimated to use approximately 5 m^3 of water per day to prevent dusting.

Drinking water that will be needed during land preparation and construction periods will be purchased from the nearest settlements and utility water will be supplied by tankers.

5.4.3.1.2 Wastewater Generation

It is planned to employ 180 people during the land preparation and construction phase, and the amount of domestic wastewater to be generated is calculated as 39.15 m^3/day on the assumption that a person's daily water use requirement will turn into 100% wastewater.

Since there is no wastewater (sewage) system in the field of activity and its immediate surroundings, wastewater generated due to land preparation and construction activities will be deposited in septic tanks that will be impervious, in accordance with “Regulation on Pit Opening Where Sewer System Construction is not Applicable” being published in Official Gazette No.13783 dated 19.03.1971. When the pits are filled, wastewater will be removed by sewage trucks, and disposal will be provided within the scope of the protocols to be made with the local public authorities that have licensed wastewater treatment plants in place with sufficient capacity. Through construction of the connection line from the existing Erzin Station to TAYSEB, Erzin Domestic Wastewater Treatment Plant with the design capacity of 5,842 m^3/day[12] operated by Hatay Water and Sewerage Authority (HATSU) and/or Yumurtalık Domestic Wastewater Treatment Plant under the responsibility of Adana Water and Sewerage Authority (ASKİ) may be utilized upon establishment of the necessary protocols with Adana and Hatay Metropolitan Municipalities. During construction of the OIZ - Port Line between Osmaniye Organized Industrial Zone (OIZ) and the new port located in the Yukarıburnaz Neighborhood as well as the other two connection lines, the Osmaniye OIZ Industrial Wastewater Treatment Plant with the design capacity of 3,600 m^3/day[13] operated by the Osmaniye OIZ Directorate and Erzin Domestic Wastewater Treatment Plant may be used after establishment of the necessary protocols with the Osmaniye OIZ Directorate and Hatay Metropolitan Municipality. These wastewater treatment plants have environmental permits and have sufficient capacity to treat wastewater generated due to the project and operate in line with environmental legislation.

On the other hand, it is planned to use an average of 5 m^3 of water per day to minimize dust emissions that will occur on the work site and on the roads. Since the water to be used in moistening processes will remain within the soil, there will not be any wastewater formation.

11 (TÜİK) 2020 According to Türkiye Municipality Water Statistics; Drinking and utility water requirement per person has been determined as 217.5 L/capita-day for average of Adana and Hatay Provinces
12 http://www.hatsu.gov.tr/icerik.php?bolum=24&no=1432
13 https://webdosya.csb.gov.tr/db/ced/icerikler/osman-ye_2018_-cdr_son-20190828111313.pdf

5.4.3.1.3 Impacts on Surface Water Flow

The list of river crossing is given in the baseline conditions. At these crossings, there are drying channels, streams and many seasonal flow stream, and if the surface waters are not crossed with suitable planned engineering structures and techniques during the construction phase, destruction may occur at surface waters and their surroundings. For this purpose, the suitable engineering structures will be designed at the crossings.

Other than this impact, the stability of cut and fills along the route may be adversely affected due to uncontrolled flowing surface waters and rising groundwater level. Especially potential flood events in case of excessive precipitation in the region should be taken under control for the protection of project route and its environment.

Impacts on Irrigation Project Areas

There are many irrigation canals, backup channels and tertiary channels, drying channels, drainage channels, operating maintenance ways in Aşağı Ceyhan Aslantaş 3rd Stage Erzin Dörtyol Irrigation Area operated by DSİ 6th Regional Directorate, where the project routes pass.

If proper engineering structures are not built in the crossing of the engineering structures belonging to this irrigation area, this may lead to the deterioration of these engineering structures and flooding.

5.4.3.1.4 Impacts on Groundwater

The construction activities on railway routes and station locations will not involve any deep excavation activity that may cause any significant impact on the groundwater resources. Construction of bridge, underpass and overpass foundations may result in interaction with groundwater. However, the area on which the foundations are to be erected will be limited, thus no significant impact would occur on the quality and quantity of groundwater. Similarly, no new quarry and borrow sites are planned to be created in the vicinity of the Project site. If not controlled immediately, accidental spills of hazardous materials such as fuel, oils, lubricants and cement may reach to the groundwater table where overburden is shallow which may result in contaminated aquifers. In addition, in case of a need, proper blasting design and management is essential to avoid any impact on groundwater resources that may be caused by potential nitrate and ammonia residues sourced from blasting operations.

As outlined in the Environmental and Social Commitment Plan (ESCP) – *ESS3: Resource Efficiency and Pollution Prevention and Management* and *ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources*, obtaining the required permit for the Burnaz Spring Groundwater Protection Area constitutes a pivotal concern for the Project. In this context, the railway design has been revised to minimize its overlap with the Strict Protection Area, taking into consideration the topographical features.

The railway sections of the Phase-1 that overlap with the Burnaz Spring Groundwater Protection Area and Phase-2 are compared in Table 66. As it can be seen from the table, OIZ-Port line is no longer overlapping with the Strict Protection Area and the 2nd Degree Protection Area. Moreover, the railway section of Yukarıburnaz-Port line passes through with the Strict Protection Area was decreased from approximately 400 m to 110 m. A protection structure (129-m long bridge) was designed to facilitate the railway crossing in the Strict Protection Area, starting from KM: 1+386 to 1+515.

Table 66. Comparison of the Overlapping Areas with Burnaz Spring Group Groundwater Protection Area

Connection Line	Burnaz Spring Group Groundwater Protection Area (Section KM)					
	Strict P.A.		1st Degree P.A.		2nd Degree P.A.	
	Phase-1 Design	Phase-2 Design (Revised)	Phase-1 Design	Phase-2 Design (Revised)	Phase-1 Design	Phase-2 Design (Revised)
Erzin-TAYSEB	-	-	4+275-11+150	4+230-4+630 5+000-5+200 5+800-9+880	-	-
OIZ-Port	9+790-10+575	-	0+814-9+625	0+000-8+100	0+000-0+814	-
OIZ-Yukarıburnaz	-	-	0+000 - 2+314 (Entire line)		-	-
Yukarıburnaz-Port	1+436-1+865	1+400-1+510	0+000-0+840		-	

The revised railway route and the technical details of the protection structure was shared with to DSİ with the official letter dated 21.07.2023 and numbered 1275604 to obtain the required permit.

It was stated by DSİ with the letter dated 18.10.2023 and numbered 3929336 that a part of the proposed railway would pass through Burnaz Group Strict Protection Area and the 1st Degree Protection Area. It is required to comply with the announcement conditions of the Burnaz Resource Group Groundwater Reserve and Protection Area, as published in the Official Gazette on 03.06.2011 with number 27953. The Contractor shall not carry out mobilization to Site (e.g. limited clearance for haul roads, site accesses and work site establishment, geotechnical investigations or investigations to select ancillary features such as quarries and borrow pits) and commence any construction works unless permit is available for the existing railway alignment design from DSİ with regard to the Burnaz Springs Protected Area.

5.4.3.2 Operation Phase

5.4.3.2.1 Water Use and Wastewater Generation

Drinking and potable water will be needed at the stations for staff and visitors. In addition, water to be used by staff and visitors will lead to domestic wastewater generation. The DGII will estimate the number of operational staff and visitors in the later stages.

Domestic wastewater to be generated will be collected in septic tanks to be built at the stations and will be transmitted to the nearest licensed wastewater treatment plants having sufficient capacity with the sewage trucks of the relevant authorities. Through construction of the connection line from the existing Erzin Station to the Toros Adana Yumurtalık Free Zone (TAYSEB), Erzin Domestic Wastewater Treatment Plant with the design capacity of 5,842 m^3/day operated by Hatay Water and Sewerage Authority (HATSU) and/or Yumurtalık Domestic Wastewater Treatment Plant under the responsibility of Adana Water and Sewerage Authority (ASKİ) may be utilized upon establishment of the necessary protocols with Adana and Hatay Metropolitan Municipalities. During construction of the OIZ - Port Line between Osmaniye Organized Industrial Zone (OIZ) and the new port located in the Yukarıburnaz Neighborhood as well as the other two connection lines, the Osmaniye OIZ Industrial Wastewater Treatment Plant with the design capacity of 3,600 m^3/day operated by the Osmaniye OIZ Directorate and Erzin Domestic Wastewater Treatment Plant may be used after establishment of the necessary protocols with the Osmaniye OIZ Directorate and Hatay Metropolitan Municipality. These wastewater treatment plants have environmental permits and have sufficient capacity to treat wastewater generated due to the project and operate in line with environmental legislation.

In addition to the domestic wastewater to be generated during the operation phase, there will be industrial effluents due to rail car maintenance and refurbishment activities. Rail car maintenance and refurbishment typically involves a high-pressure water wash which may contain residues from transported materials, paint, oil and grease, and other contaminants. Caustic solutions are often used to remove grease and dirt from axles and other metal parts. Acids and caustics may also be used for rust removal. Locomotive coolants are usually water-based with corrosion inhibitor additives.

The WBG EHS Guidelines for Railways (2007) recommends the measures listed below to prevent, minimize, or control wastewater effluents generated in the rail car maintenance areas:

- Ultrafiltration will be used to extend the life of washing solutions for aqueous parts or alternatives to water cleaning (e.g. dry cleaning by wire brush or bake oven) will be used.
- Discharge of industrial wastes to septic systems, drain fields, dry wells, cesspools, pits, or separate storm drains or sewers will be prevented.
- The wastewater from the service bays and the floor drains in maintenance areas will be kept out of the storm drains and will be collected separately.
- The effluents from the service bays and the floor drains in maintenance areas will be pretreated to reduce contaminant concentrations before collection in septic tanks. Pretreatment systems typically consist of oil / water separators, biological and chemical treatment, and activated carbon systems.

5.4.3.2.2 Impacts on Surface Water and Groundwater

The impacts on surface water and groundwater defined for land preparation and construction phase will persist during operation phase. Surface and groundwater will not be used during the project operation phase.

5.4.4 Impact Significance, Mitigation Measures and Residual Impacts

The impacts of the project on surface water resources and irrigation project sites during the land preparation, construction and operation phases of the project will be managed through the implementation of mitigation measures and the measures to be taken in accordance with the provisions specified in the legal regulations. These mitigation measures were determined within the scope of the significance assessment matrix according to the components of magnitude of impact (geographic scope, magnitude, reversibility, duration and frequency) for the receiving environment and the receptor sensitivity.

As stated in the Environmental and Social Commitment Plan (ESCP) – *ESS3: Resource Efficiency and Pollution Prevention and Management* and *ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources*, the required permit has to be taken from DSİ for the sections of the project routes that fall within the Burnaz Spring Groundwater Protection Area prior to construction activities. In this context, the railway design has been revised to minimize its overlap with the Strict Protection Area, taking into consideration the topographical features. The revised line was submitted to DSİ and it was stated with the letter of DGII dated 20.09.2023 and numbered 1407103 that the construction and operation works will be carried out in line with the announcement conditions of the Burnaz Resource Group Groundwater Reserve and Protection Area, as published in the Official Gazette on 03.06.2011 with number 27953. The Contractor shall not carry out mobilization to Site (e.g. limited clearance for haul roads, site accesses and work site establishment, geotechnical investigations or investigations to select ancillary features such as quarries and borrow pits) and commence any construction works unless permit is available for the existing railway alignment design from DSİ with regard to the Burnaz Springs Protected Area.

Additionally, the railway section that overlaps with “Yumurtalık Drinking Water Well” of ASKİ in the previous railway route was revised at the final design stage and currently, in the final design, it does not overlap with the “Yumurtalık Drinking Water Well”.

Moreover, dewatering of the quarrying pit, diamond-wire cutting, and surface water runoff can generate a wastewater discharge high in suspended solids. If the construction contractor decides to operate its own quarries and borrow sites, an environmental assessment should be conducted first and following measures must be taken into consideration to prevent or minimize the suspended sediments in discharged water;

- Adoption of settlement ponds, sumps, and lagoons designed to allow adequate retention time. Lagoons should be sealed with impervious material, as needed, and adequate maintenance programs of the settlement lagoons should be implemented, including side-slope stability, pipe cleaning/maintenance, and removal of settled materials;
- Recycling of processing / wire cutting waters;
- Construction of a dedicated drainage network;
- Settlement enhancement by using flocculants or mechanical means, particularly where limited space prevents or limits the use of lagoons;
- Installation of sediment traps along water drainages, including fascines, silt fences, and vegetation traps.

In line with the geological-geotechnical survey studies carried out within the scope of the project, the opinions received from DSİ and expert judgement, the mitigation measures and the assessments regarding the residual impacts were determined and presented in detail in Table 67.

Table 67. Potential Impacts on Water Resources, Mitigation Measures and Residual Impacts

Impact Description	Project Phase	Receptor	Impact Magnitude					Sensitivity/ Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Reversibility	Duration	Frequency	Overall Magnitude				
Wastewater Generation	Land Preparation and Construction	Construction Area	Restricted	Short-term reversible	Short-term	Intermittent	Low	Medium	Minor	Since there is no wastewater (sewage) system in the field of activity and its immediate surroundings, wastewater generated due to land preparation and construction activities will be deposited in septic tank that will be impervious, in accordance with “Regulation on Pit Opening Where Sewer System Construction is not Applicable” being published in Official Gazette No.13783 dated 19.03.1971. When the pits are filled, wastewater will be removed by sewage trucks, and disposal will be provided within the scope of the protocol to be made with the municipality that has a licensed wastewater infrastructure system.	Negligible
Wastewater Generation	Operation	Stations	Restricted	Medium-term reversible	Medium-term	Intermittent	Medium	Medium	Moderate	Since there is no wastewater (sewage) system in the field of activity and its immediate surroundings, wastewater generated due to operation activities will be deposited in septic tank that will be impervious, in accordance with “Regulation on Pit Opening Where Sewer System Construction is not Applicable” being published in Official Gazette No.13783 dated 19.03.1971. When the pits are filled, wastewater will be removed by sewage trucks, and disposal will be provided within the scope of the protocol to be made with the municipality that has a licensed wastewater infrastructure system. In addition to the domestic wastewater to be generated during the operation phase, there will be industrial effluents due to rail car maintenance and refurbishment activities. To prevent, minimize, or control the industrial effluents generated in the rail car maintenance areas; ▪ Ultrafiltration will be used to extend the life of washing solutions for aqueous parts or alternatives to water cleaning (e.g. dry cleaning by wire brush or bake oven) will be used; ▪ Discharge of industrial wastes to septic systems, drain fields, dry wells, cesspools, pits, or separate storm drains or sewers will be prevented; ▪ The wastewater from the service bays and the floor drains in maintenance areas will be kept out of the storm drains and will be collected separately; ▪ The effluents from the service bays and the floor drains in maintenance areas will be pretreated to reduce contaminant concentrations before collection in septic tanks. Pretreatment systems typically consist of oil / water separators, biological and chemical treatment, and activated carbon systems.	Minor
Impact on surface water flow/hydrological regime of the rivers to be crossed	Land Preparation and Construction and Operation	Surface water resources (Rivers/ streams to be crossed)	Wide	Irreversible / Long-term reversible	Long-term	Intermittent	Medium	Medium	Moderate	During the construction phase, surface waters will be crossed with appropriately designed art structures and techniques. In the event that it is necessary to provide road crossings on the flows and dry streams in the project site and adjacent or rehabilitation of existing bridges, the necessary projects will be made in line with the principles of 'Disaster Regulations for Highway Roadway Engineering Structures', and a hydraulic conformity opinion will be obtained from the 6th Regional Directorate. It will be built in accordance with the principles. All works related to streams will be done within the knowledge of DSİ, and construction works will be carried out under the knowledge and supervision of Hatay DSİ 63. Branch Directorate, and DSİ ACO (Ceyhan) Branch Directorate. Within the scope of the project, drainage measures (concrete underground drainage, head ditch) to be used for the control of surface waters and groundwater to ensure the stability of the cuts and fillings to be produced along the routes and to remove them from the fill body will be provided. All wastes that may arise from the project activities, excavation materials to be stored periodically / temporarily, and fuel, oil, oil, cement etc. that may be accidental. The pouring of hazardous materials into the irrigation channel with seasonal / continuous flowing streams where the project routes intersect will be taken under control immediately and surface waters will be protected against pollution. To monitor the water quality of the surface waters in the project study area, periodically at least 2 times a year (rainy and dry periods), the water sources will be evaluated at the points to be determined by taking into consideration the locations of the pollutant sources in the land preparation-construction and operation periods	Minor
Impact on irrigation project areas	Land Preparation and Construction and Operation	Irrigation Project Areas	Wide	Medium-term reversible	Long-term	Intermittent	Medium	Medium	Moderate	All works related to the irrigation project site over which the project routes pass and the transitions of the engineering structures belonging to this area will be carried out within the knowledge of DSİ, and crossing projects will be prepared and approved by DSİ. All works in the construction works of the crossing projects approved by DSİ will be carried out under the knowledge and supervision of Hatay DSİ 63. Branch Directorate, and DSİ ACO (Ceyhan) Branch Directorate.	Minor

Impact Description	Project Phase	Receptor	Impact Magnitude					Sensitivity/ Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Reversibility	Duration	Frequency	Overall Magnitude				
Impact on groundwater	Land Preparation and Construction and Operation	Burnaz Spring Group Groundwater Reserve and Protection Area and other groundwater resources	Local	Medium-term reversible	Short-term	Intermittent	Medium	High	Moderate	A bridge will be constructed to pass through the overlapping areas of the proposed railway with the strict protection area. The Contractor shall not carry out mobilization to Site (e.g. limited clearance for haul roads, site accesses and work site establishment, geotechnical investigations or investigations to select ancillary features such as quarries and borrow pits) and commence any construction works unless permit is available for the existing railway alignment design from DSİ with regard to the Burnaz Springs Protected Area. All construction works will commence after the required permit is obtained and will comply with the announcement conditions of the Burnaz Resource Group Groundwater Reserve and Protection Area, as published in the Official Gazette on 03.06.2011 with number 27953. Within the scope of the project, drainage measures (concrete underground drainage, head ditch) to be used for the control of surface waters and groundwater to ensure the stability of the cuts and fillings to be produced along the routes and to remove them from the fill body will be provided. While determining the locations of temporary fuel or oil storage areas, the locations of water resources will be taken into consideration and dangerous material spills / leaks such as fuel, oil, oil, cement etc. will be taken under control immediately. To monitor the water quality from the resources in the study area and groundwater wells, periodically at least 2 times a year (rainy and dry periods), the groundwater samples will be monitored by taking the groundwater samples at the points to be determined by considering the locations of possible pollution sources. Implementation of the Pollution Prevention Plan and Emergency Preparedness and Response Plan that covers management of hazardous and chemical substances..	Moderate

5.5 Resource and Waste Management

5.5.1 Project Standards and Methodology

In the scope of waste and resource management, the project is evaluated according to following international standards and national regulations.

- Regulation on Waste Management
- Regulation on the Landfill of Wastes
- Regulation on Control of Packaging Wastes
- Regulation on Control of Medical Wastes
- Regulation on the Control of Waste Batteries and Accumulators
- Regulation on the Control of Waste Electrical and Electronic Equipment
- Regulation on the Management of Waste Oils
- Regulation on the Control of Waste Vegetable Oils
- Regulation on Zero Waste
- Regulation on the Control of Excavation Soil, Construction and Demolition Wastes
- Regulation on the Control of End-of-Life Tires
- Regulation on Mining Wastes
- Regulation on the Control of End-of-Life Vehicles
- Notice on Fuel, Auxiliary Fuel and Alternative Raw Material Derived from Waste
- Regulation on the Control of Collecting Wastes from the Vessels
- Regulation on Recovery of Some Non-Hazardous Wastes
- WB ESF – ESS1: Assessment and Management of Environmental and Social Risks and Impacts
- WB ESF – ESS3: Resource Efficiency and Pollution Prevention and Management
- WBG General EHS Guidelines – 1. Environment – 1.6. Waste Management
- WBG General EHS Guidelines for Construction and Decommissioning
- WBG General EHS Guidelines for Construction Materials Extraction
- WBG General EHS Guidelines for Railways

The Project will face challenges in managing resources, particularly during the construction phase, as there will be a high demand for construction materials (aggregate, basalt, granite, gabbro, limestone, etc.). Thereby, material borrow pits and quarries will be used to supply the Project's construction material requirements throughout the construction activities. During the operation phase, procurement of materials would be required for the maintenance and repair works to be conducted on the railway and associated structures.

During both the construction and operation phases of the Project, the daily activities of the personnel will produce various types of non-hazardous and hazardous wastes. Similarly, the railway maintenance and the users of the railway will also contribute to waste generation during the operation phase.

The potential impacts associated with waste generation are being addressed through the establishment of a comprehensive assessment methodology and defined of stringent standards for waste management. By adhering to this approach, the relevant impacts can be systematically identified, and appropriate measures can be executed to efficiently manage and mitigate them.

Methodology

In the ESIA, both qualitative and quantitative approaches have been utilized to assess the Project's utilization of materials and waste management. Technical information, encompassing excavation and fill volumes, construction material requirements, designed quarries and material borrow sites to be used to meet these requirements and number of personnel that will cause waste generation as a result of daily activities have been provided by DGII.

The assessment, including establishment of the baseline information, has been conducted based on the following reports, guidelines and data sources:

- Mining resource maps of material borrow sites and quarries published in the internet site of General Directorate of Mineral Research and Exploration (MTA),
- Provincial Environmental Status Reports published by the Provincial Directorates of Environment, Urbanization and Climate Change
- Waste statistics published by Turkstat (2020), and
- Environmental Indicators published by MoEUCC (2021),
- Information on waste disposal sites and their capacities published in the internet sites of the municipalities along the Project route.

Potential impacts and risks have been identified, taking into account the typical impacts/risks associated with a Project's scale and type. The significance of impacts has been assessed using professional judgment. Relevant national legislation (e.g. Waste Management Regulation) has been referenced to establish the legal responsibilities and measures required for waste management within the scope of the Project.

Project Standards

The key national legislation regarding the management of wastes in Türkiye is the Regulation on Waste Management. Alongside this, there are specific regulations in force to manage different types of wastes. These include waste streams from excavations, construction and demolitions, waste oils, packaging wastes, waste batteries and accumulators, medical wastes, waste electrical and electronic materials, and waste tires. The full list of national waste legislation that the Project will comply with is provided in Chapter 2 of this ESIA Report. Key standards or requirements defined in the national legislation regarding the management of wastes are summarized in table below.

Table 68. Key Standards/Requirements Defined in the National Waste Management Regulations

National Regulation	Standards/Requirements
Regulation on Waste Management	A Waste Management Plan will be developed and implemented to reduce waste generation at the source, encourage reuse and promote recycling of solid wastes. Different types of waste (municipal, recyclables, hazardous, etc.) are stored in separate containers. Hazardous wastes are stored in a designated temporary storage area. Closed containers are utilized to store hazardous wastes; and these containers are well-maintained, secure, and placed on an impermeable surface, such as concrete. Labels are affixed to hazardous waste containers to indicate the type, quantity, and storage date of the waste. Records of generated wastes are maintained on-site. Waste declaration forms for waste generated in the preceding year are completed and submitted to the MoEUCC in March of the subsequent year. Agreements have been established with municipalities or licensed companies for the purposes of recovery, recycling, and final disposal.
Regulation on Control of Packaging Wastes	Packaging wastes stored temporarily at a designated place separate from other wastes and chemicals. Recyclable wastes delivered to licensed recycling companies.
Regulation on the Management of Waste Oils	Characteristics of waste oils analyzed according to the parameters outlined in the Regulation on Control of Waste Oils, and the categorization of waste oils is subsequently conducted

National Regulation	Standards/Requirements
Regulation on the Control of Excavation Soil, Construction and Demolition Wastes	Store topsoil at a designated storage area separately from the coarse/excavated materials and implement necessary measures during the storage period to ensure that it can be reused in rehabilitation or landscaping activities

At the international level, the primary standard relevant to the potential impact of the Project on materials and waste is WB ESF - ESS3: Resource Efficiency and Pollution Prevention and Management, which requires;

- Development and implementation of technically and financially feasible and cost impactive measures for improving efficiency in a project's consumption of energy, water, as well as other resources and material inputs; and
- Avoidance of generation of hazardous and non-hazardous waste materials; where waste generation cannot be avoided, reduction in the generation of waste; recovery and reuse of waste in a manner that is safe for human health and the environment and finally, treatment or dispose of waste in an environmentally sound manner that includes the appropriate control of emissions and residues resulting from the handling and processing of the waste material.

Similarly, the WBG General EHS Guidelines on Environmental Waste Management (Part 1.6), also requires the establishment of a waste management hierarchy that considers prevention, reduction, reuse, recovery, recycling, removal and finally disposal of wastes.

5.5.2 Baseline Conditions

It is stipulated in the national Environmental Law No. 2872 that it is prohibited to deliver, store, transport, dispose directly or indirectly of all kinds of waste to the receiving environment, in violation of the standards and methods determined in the national legislation.

5.5.2.1 Material Requirements

According to the Procurement Strategy prepared for the Improvement of Railway Connections Project by DGII (September 2019), within the scope of the 1st Component of the Project, the railway connection lines having total length of approximately 36 km are planned to be built for industrial facilities in Çukurova Region and İskenderun Bay - Yumurtalık Free Zone. For the railway connection lines, a total length of approximately 72 km (length of the rail welded to each other), about 58,000 railway tie and about 144,000 m³ of ballasts will be provided.

According to the Procurement Strategy (September 2019), high-volume production of high-quality rails are made in Türkiye (KARDEMİR Inc. is a strategic partner of TCDD). However, demand for rail in the domestic market is considerably higher than annual rail production. For this reason, special type rails are supplied from foreign companies. In Türkiye, there are factories producing concrete tie used in the railways. Some of the signaling and electrification works in Türkiye are carried out by foreign companies.

Material quarries surveys were carried out for the determination of materials to be used in railway lines (infrastructure, superstructure, engineering structures, concrete works, etc.). Accordingly, basalts borrow quarry located 50 meters to the right side of the OIZ – Station 1 Line KM = 0+500. Assuming that an average of 4-5 meters of material will be taken, there are approximately 2,500,000 m^3 of material reserves in the quarry. The quarry material is suitable for use as fill material. It can also be used as rock fill material. However, the mentioned area remains within the 1st Degree Protection Area on the "Burnaz Spring Group Groundwater Reserve and Protection Area" and material extraction activities are not permitted in this area.

As mentioned in the Environmental and Social Review Summary (2019) document, it is planned to use existing quarries (such as Yılankale (Kokartepe) Quarry) and camping areas

previously used by the General Directorate of Highways. The Yılankale (Kokartepe) Quarry, which is approximately 47 km away from the Connection Line, the quarry material is broken and sieved; will be made suitable for use in subbase, subbalast, concrete aggregate and engineering structures. There are more than 1.000.000 m^3 of reserves in the quarry area. Quarry is on the treasury land, licensed on behalf of the 5th Regional Directorate of Highways and operated by a private company. Material purchase will be provided by purchasing from the private company operating the quarry. In addition, there is Badilli Quarry at a distance of 310 km from the Connection Line. In Badilli Stone Quarry, the quarry material is broken and sieved; it will be made suitable for use as ballast material. The reserve is more than 1.000.000 m^3 in the quarry area. The quarry is licensed on behalf of the private company, and the quarry is still in operation. Material purchase will be provided by purchasing from the private company operating the quarry.

5.5.2.2 Waste Generation Rates and Waste Management Infrastructure in the Region

Adana Metropolitan Municipality and Hatay Municipality and Türkiye's average daily waste removal values are given in Table 69. Türkiye's average daily waste generation rate is 1.13 kg per person in 2020, the average municipal waste generation value for Adana Metropolitan Municipality is 0.98 kg/day and 1.29 kg/day for Hatay Municipality.

Table 69. Municipal Waste Generation Statistics (TUİK, 2020)

Municipality	Waste Generation (kg/day/person)		
	Domestic (Non-Recyclable)*	Recyclable*	Total
Adana	0.64	0.34	0.98
Hatay	0.84	0.45	1.29
Türkiye Average	0.73	0.40	1.13

** Recyclable and non-recyclable wastes have been calculated based on the Environmental Indicators published by the Ministry of Environment and Urbanization, according to the national action plan for waste management, 35% of waste generated should be recycled and 65% landfilled by 2023* (Ministry of Environment, Urbanization and Climate Change, 2021).

Adana Metropolitan Municipality, which is located on the project route, has planned the Integrated Solid Waste Disposal Facility in 2008 and Adana Integrated Solid Waste Disposal Facility started its operations in the beginning of 2011 as a result of rehabilitation works in the area used as wild storage area for many years. As mentioned in Adana Province 2021 Environmental Status Report, disposal, composting and regular storage of domestic solid wastes, commercial and institutional domestic solid wastes at the facility and disposal of medical wastes from hospital, treatment and preventive health service units are provided. The facility has a total area of 110 ha and approximately 25 ha of this constitute the structure of the facility. 60 ha of the total area is reserved for landfill. Adana Metropolitan Municipality Integrated Solid Waste Disposal Facility brings 2,000 tons of domestic solid waste per day, collected from residential, commercial and institutions in all districts of Adana province (total 15 district municipalities). Domestic solid wastes in Çukurova, Sarıçam and Yüreğir District Municipalities are brought to the solid waste disposal facility integrated with semi-trailer trucks belonging to Adana Metropolitan Municipality and domestic wastes brought to transfer stations from Adana Metropolitan Municipality. There is a sorting unit consisting of 3 lines for mixed wastes coming to the facility. Wastes, organic waste and packaging waste (according to their type) (Adana Province Of Environment, Urbanization And Climate Change Directorate, 2022).

As mentioned in the 2021 Environmental Status Report of Hatay Province, one of the provinces on the project route, the amount of waste generated within six districts (İskenderun, Arsuz, Payas, Dörtyol, Belen, Erzin) of 15 districts of Hatay province is approximately 564 tons per day. These wastes are disposed of to the Solid Waste Landfill in Düğünyurdu, which is operated by the Körfez Solid Waste Association (Hatay Province Of Environment, Urbanization And Climate Change Directorate, 2022).

5.5.3 Impact Assessment

In general, wastes need to be properly managed to avoid/minimize potential impacts on community health, safety and environment and unbalanced loads on local waste management facilities (i.e. landfills). Assessment of the impacts and measures to be taken for the minimization of resources use and management of wastes is provided below during various phases of the Project.

5.5.3.1 Land Preparation and Construction Phase

Wastes anticipated to be generated during the land preparation and construction phase include; municipal solid waste including the recyclable (packaging) waste, excavation waste (i.e. the portion of excavation material that will not be reused on site for cut and fill works), construction waste, wood and timber scraps, and hazardous waste such as waste oils, waste vegetable oils, end-of-life tires, waste batteries and accumulators, waste electric and electronic equipment, and medical waste. Even though the number of workforce and construction machinery and equipment to be involved in the construction will be high and significant volumes of earthworks will take place, the Project will avoid and/or minimize impacts due to waste generation by complying with the requirement of national legislation and applying international standards on waste management.

Excavation and Construction Waste

During the construction phase of the Project, amount of material to be excavated from the main route and access road construction site is estimated to be 1,515,190.75 m^3. The Project will aim to maximize the use of excavated material to ensure resource efficiency, minimize amount of material to be extracted from material borrow sites and reduce associated costs. Excavated material having sufficient quality for fill operations will be reused in the construction works. According to the current design and results of the preliminary geotechnical studies, a major part (more than 88%) of the excavated materials are foreseen to be reused in fill operations, where the remaining will need to be disposed of at the storage sites as excavated material.

The Contractor Company will determine the storage areas with sufficient capacity to store all excavated material. When sufficient storage areas are identified, the Project will not have an additional impact on existing local excavation waste disposal infrastructure capacities.

In addition to excavation waste, some of the temporary structures, junk materials and some other materials such as excess, unusable concrete will constitute construction waste. Recyclable waste like cement bags, metal scraps, packaging and wooden crates, etc. will be segregated from other wastes and stored temporarily on the site for eventual recycling process. Licensed companies will be contracted to remove the recyclable waste from the construction sites.

Municipal Solid Waste (Non-hazardous)

During the construction phase, a total of 180 personnel is planned to be employed at the Project. In consideration of these peak personnel numbers and assuming that the daily municipal waste generation rate will be 1.13 kg per person, amount of waste estimated to be generated at the Project sites has been calculated. The approximate amount of total municipal waste to be generated daily has been calculated as 0.20 tons.

According to the Environmental Indicators published by the MoEUCC, 35% of generated municipal waste (by weight) would consist of recyclable waste. Therefore, the daily packaging waste that will be generated would be approximately 71.19 kg (Ministry of Environment, Urbanization and Climate Change, 2021).

Adana Metropolitan Municipality, which is located on the project route, has tendered the planning and projecting of the Integrated Solid Waste Disposal Facility in 2008 and Adana Integrated Solid Waste Disposal Facility started its operations in the beginning of 2011 as a

result of rehabilitation works in the area used as wild storage area for many years. As mentioned in Adana Province 2018 Environmental Status Report, disposal, composting and regular storage of domestic solid wastes, commercial and institutional domestic solid wastes and disposal of medical wastes from hospital, treatment and preventive health services are provided. Adana Metropolitan Municipality Integrated Solid Waste Disposal Facility brings 2,000 tons of domestic solid waste per day, collected from residential, commercial and institutions in all districts of Adana province (total 15 district municipalities). Domestic solid wastes in Çukurova, Sarıçam and Yüreğir District Municipalities are brought to the solid waste disposal facility integrated with semi-trailer trucks belonging to Adana Metropolitan Municipality and domestic wastes brought to transfer stations from Adana Metropolitan Municipality. There is a sorting unit consisting of three lines at the facility for mixed waste, organic waste, and packaging waste, categorized according to their types) (Adana Province Of Environment, Urbanization And Climate Change Directorate, 2022).

As mentioned in the 2021 Environmental Status Report of Hatay Province, one of the provinces on the project route, the amount of waste generated within six districts (İskenderun, Arsuz, Payas, Dörtyol, Belen, Erzin) of 15 districts of Hatay province is approximately 564 tons per day. These wastes are disposed of to the Solid Waste Landfill in Düğünyurdu, which is operated by the Körfez Solid Waste Association (Hatay Province Of Environment, Urbanization And Climate Change Directorate, 2022).

The amount of approximately 0.20 tons of solid waste to be generated by the Project activities per day corresponds to approximately 0.0081% of the daily total solid waste reception capacities (about 2,564 tons) of solid waste disposal facilities located in Adana and Hatay Metropolitan Municipalities. In addition, employment from the local population will be prioritized within the scope of the Project and therefore the majority of the staff will be composed of residents of the towns and neighborhoods on the Project route. The actual increase that will occur due to the Project will be even lower since the personnel employed from the local settlements contribute to the waste generation in the provinces where they already live. In addition, waste management trainings will be given to reduce the total amount of domestic waste production to be sent to the landfill site, and separate collection of packaging waste at the construction site will be encouraged. Therefore, the load that could be added to the existing waste disposal infrastructure capacity by the Project would be negligible. The impact will be temporary and will significantly decrease upon completion of the construction phase.

It should also be noted that, any amount of landfilled domestic waste has a potential to contribute to GHG emissions from the landfills. However, as the Project related landfill impact is assessed to be negligible; and since Adana province landfills are already using energy generation systems utilizing biogas, the GHG emission impact is also considered to be negligible.

Hazardous and Special Wastes

During the land preparation and construction phase of the Project, various hazardous wastes will be generated as a result of the activities/works involving use of fuels, chemicals, paints, oils, solvents, etc. If not managed properly, hazardous wastes may result in soil, surface water and groundwater contamination, as well as health and safety issues for the local communities and the Project personnel.

The following hazardous and specials wastes are anticipated to be generated as a result of the land preparation and construction activities. It should be noted that the earthworks will constitute the major part of the land preparation and construction phase and the amount of chemicals/hazardous substances to be used for the construction works are anticipated to be limited:

- Waste and materials (PPEs, rugs, clothes, etc.) contaminated with hazardous substances such as lubricants hydraulic fluids or fuels,

- The operation and maintenance of construction equipment and machinery requiring the use, storage and transfer of varying quantities of fuels and oils/lubricants,
- Solvents and paints to be used in construction activities,
- Herbicides and pesticides to be used in landscaping activities,
- Vegetable oils, batteries, electrical/electronic equipment, cables, fluorescent lamps, medical supplies to be consumed by Project personnel.
- Scrap metals and materials that contact with fuels, hazardous substances/chemicals, etc. at the workshops, laboratories, concrete plants, fuel stations, etc.,
- Waste tires and accumulators of the construction machinery.

Hazardous and special wastes need to be properly managed to avoid significant impacts on both environmental receptors and human health. The Project will fully comply with the national waste legislation and apply international waste management standards in line with a Waste Management Plan based on the waste hierarchy, thus no significant impact is anticipated due to waste generation during the land preparation and construction phase of the Project.

5.5.3.2 Operation Phase

During the operation phase, maintenance of project components including railway connection lines, stations and underpasses, overpasses and bridges and their use by staff and visitors will result in waste generation. Therefore, waste management will focus on recyclable waste and solid waste management. However, hazardous waste generated during maintenance activities should also be managed properly. Generation of the following types of wastes is anticipated during the operation phase:

- Solid waste generated at railway connection lines, stations and underpasses, overpasses and bridges and their use by staff and visitors,
- Railway litter (including illegally dumped non-hazardous waste),
- Sediment and sludge removed from storm water drainage systems, and
- Vegetation waste such as vegetation trimmings and mowed grass (non-hazardous).

No intensive waste generation is expected during the operation phase. All waste management activities will be carried out in accordance with the “Waste Management Regulation” dated 02.04.2015 and numbered 29314.

Municipal Solid Waste (Non-hazardous)

During the operation phase, solid waste will be generated due to the daily activities of the personnel to be employed at the stations. Likewise, there is solid waste generation from the visitors at the stations. In the later stages of financial modeling, the amount of waste expected to occur at each station will be calculated as soon as the number of operational staff and visitors is determined.

Solid wastes to be generated at the stations will be collected through the solid waste collection trucks of the relevant Municipalities from the collection areas that will be located during the operation period and taken to the municipal solid waste storage facilities.

In addition, visual control and periodic collection of wastes will be ensured along the railway routes, separation of these wastes according to their recyclability status, and the separation of wastes will be stored in separate containers and disposed in accordance with the Waste Management Regulation.

Hazardous and Special Waste

The limited amount of hazardous and special waste to be generated during this phase will include the following:

- Maintenance related hazardous waste (waste oils from maintenance vehicles, paint containers, hydraulic oils, packaging materials, PPEs, filters, and other material contaminated with hazardous substances, etc.),
- Removed paint materials,
- Illegally dumped hazardous waste (hazardousness to be identified by analysis),
- Landscape and vegetation related waste (herbicide and pesticide containers).

Maintenance related waste

In the operation phase, there will be waste generated from the maintenance and repair of the trains. Maintenance-repair wastes can be generally listed as follows:

Ballast Screening: In this activity, which is repeated every 5 years on average, waste generation (substance without ballast properties) is estimated.

Superstructure Renewal: Wastes that will arise from concrete sleepers (concrete blocks on which rails sit) as a result of superstructure renewal activities performed every 30 years on average.

Infrastructure Renewal: It is the work to be carried out in extraordinary situations during the operation of the railway lines, and its frequency cannot be estimated.

Accordingly, wastes listed below will be generated due to maintenance and repair works;

- Metal waste (rivets, screws, sheet-machine parts, washers, locks, etc.),
- Dust seals, electrical cables, polyethylene and polypropylene parts,
- Cab glasses and wagon woods, loading sleepers,
- Waste engine and gear oils,
- Welding and paint burrs,
- Oily cloth, gloves, etc...

The maintenance / repair work on the railway lines will be carried out at large intervals or in one-off situations.

5.5.4 Impact Significance, Mitigation Measures and Residual Impacts

The international standard to be taken into account regarding the potential impacts of material use and waste generation during the construction and operation phases of the Project is World Bank ESS 3: Resource Efficiency and Pollution Prevention and Management and this standard requires;

- With the development and implementation of technically and financially feasible and cost-impactive measures to improve the project's effectiveness in using energy, water consumption, as well as other resources and material inputs,
- Prevention of hazardous and non-hazardous waste generation; reduction of waste generation where it cannot be prevented; appropriate disposal for the environment, including the safe recovery and recycling of wastes for human health and the environment and, finally, the proper control of emissions and wastes from waste handling.

Likewise, the WBG General EHS Guidelines on Environmental Waste Management also requires establishment of a waste management hierarchy that takes into account the prevention, reduction, reuse, recycling and finally disposal.

The above-mentioned waste management hierarchy is the basis of waste management that will be implemented during the land preparation, construction and operation phases of the

Project. On this basis, the priority will be to maximize conservation of resources, to avoid waste generation or to minimize waste generation at the source where it is not possible to avoid waste generation.

It is essential that all personnel receive the necessary training during the construction phase in order to minimize waste generation and effectively implement the Waste Management Plan to be developed within the scope of the project. Any waste generated in areas where waste generation cannot be avoided will be evaluated for reuse, recycling, recovery and proper sorting depending on the type of waste. Where the reuse option on the construction site is not applicable (such as reuse of suitable excavation material in filling works), waste will be transported by licensed firms, based on the type of waste, for other reuse, recycling and recovery options. Where only another alternative is left, the last option would be to send the waste to the landfill and finally dispose of it.

A Waste Management Plan will be developed covering all land preparation, construction and operational phases of the project, and the implementation of the best practice in waste management will be regularly reviewed and renewed as necessary. Impacts associated with resource and waste management, impact significance for identified impacts, proposed mitigation measures and residual impacts are detailed below.

5.5.4.1.1 Material Use

Aggregate material will be needed during the construction phase of the Project. Thus, if construction contractor decides to operate its own quarries and borrow sites, firstly it will be necessary to conduct an environmental impact assessment that covers;

- Air Emissions (see also Section 5.3.4)
- Noise and Vibrations (see also Section 5.2.4)
- Water Use (see also Section 5.4.4)
- Waste Generation
- Land Conversion (Reinstatement) (see also Section 5.1.4)

During shoveling, ripping, drilling, blasting, transport, crushing, grinding, screening, and stockpiling) activities dust emissions are expected. To control dust emission;

- Land clearing, removal of topsoil and excess materials, location of haul roads, tips and stockpiles, and blasting should be planned with due consideration to meteorological factors (e.g. precipitation, temperature, wind direction, and speed) and location of sensitive receptors;
- A simple, linear layout for materials-handling operations to reduce the need for multiple transfer points should be designed and installed (e.g. processing plants should be preferably located within the quarry area);
- Dust emissions from drilling activities should be controlled at the source by dust extractors, collectors, and filters, and wet drilling and processing should be adopted, whenever possible;
- Dust emissions from processing equipment (e.g. crushers, grinders, screens) should be adequately controlled through dust collectors, wet processing, or water spraying. Dust control applications should consider the final use of extracted material (e.g. wet-processing stages are preferred when wet materials or high water contents would not negatively affect their final use);
- Procedures to limit the drop height of falling materials should be adopted;
- Use of mobile and fixed-belt transport and conveyors should be preferred to hauling the material by trucks through internal roads (enclosed rubber-belt conveyors for dusty materials are recommended in conjunction with cleaning devices);
- Internal roads should be adequately compacted and periodically graded and maintained;
- A speed limit for trucks should be considered;

- Water spraying and surface treatment (e.g. hygroscopic media, such as calcium chloride, and soil natural–chemical binding agents) of roadways and exposed stockpiles using a sprinkler system or a “water-mist cannon” should be implemented;
- Exposed surfaces of stockpiled materials should be vegetated.

Rock waste and removed topsoil–overburden are the main inert wastes produced by quarrying activities. Hazardous wastes may be generated from impurities and trace components included in the exploited (waste) rocks (e.g. asbestos or heavy metals or minerals that could result in acidic runoff). The recommended prevention and control methods to reduce wastes include the following:

- Operational design and planning should include procedures for the reduction of waste production (e.g. blending high-quality rock with poor rock);
- Topsoil, overburden, and low-quality materials should be properly removed, stockpiled near the site, and preserved for rehabilitation;
- Hazardous and non- hazardous waste management plans should be developed and adopted during the design and planning phase. Impacts associated with specific chemical and / or physical properties of extracted materials should be considered during the design phase, and impacts from waste rock impurities should be adequately controlled and mitigated by covering waste disposals with no contaminated soil.

Excavation activities at construction materials extraction sites often involve major topographical and land-cover changes to allow extraction activities, often including clearing of preexisting vegetation. Therefore, proper reinstatement activities should be conducted after operation of the quarry ends. Measures to have an adequate reinstatement activity includes but not limited to:

- Selection of appropriate low-impact extraction (e.g. excavation, quarrying, and dredging) methods that should result in final site contours supportive of habitat restoration principles and final land use;
- Establishment of buffer zones from the edge of extraction areas, considering the characteristics of the natural habitats and the type of extraction activities;
- To reduce the consumption of land area and, consequently, the loss of soil, preference for extraction should be given to thicker deposits (these should be exploited as far as possible and as reasonable);
- Vegetation translocation and relocation techniques should be used as necessary. Vegetation cover, such as native local plants, topsoil, overburden, or spoils feasible for sustaining growth should be removed in separate operations and segregated for later use during site reinstatement, and materials to be used for site reinstatement should be stockpiled and protected from wind and water erosion, as well as from contamination;
- During extraction, ecological niches should be preserved and protected as far as possible;
- Smaller, short-lived extraction sites should be reclaimed immediately, and larger sites with a useful lifespan beyond 3–5 years should be subject to ongoing rehabilitation; 4 Such as borrow pits.
- Management of further site development through routine topographical and land surveys;
- During reinstatement, affected land should be graded and appropriately scarified before soil layers are reapplied, sustaining vegetative regrowth where needed (the combined thickness of topsoil and the growth layer should not be less than that prevailing in the undisturbed areas);
- Affected land should be rehabilitated to acceptable uses consistent with local or regional land use plans. Land that is not restored for a specific community use should be seeded and revegetated with native species;

- Test pits, interim roads (internal and access), buildings, installations, and structures of no beneficial use should be removed, and the land should be appropriately rehabilitated. Hydrological systems should be restored to predevelopment runoff rate.

If the contractor will have the material obtained from licensed borrow pits and quarries, it will be ensured that the areas and quarries have “EIA Positive” or “EIA Not Required” decisions. Contractor will develop an Aggregate Management Plan and submit to DGII for approval. Contractor will identify potential borrow pits and quarries with indication of capacities, while providing measures for site reinstatement within the Aggregate Management Plan and supervise the implementation of the plan. Aggregate Management Plan will include mitigation measures for environmental and social risks and environmental monitoring needs.

Table 70. Resource and Waste Management Related Impacts, Mitigation Measures to be Taken and Residual Impacts

Impact Description	Project Phases	Receptor	Impact Magnitude					Sensitivity/ Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Reversibility	Duration	Frequency	Overall Magnitude				
Potential impacts that may arise due to storage of excess excavated materials	Land preparation and construction	▪ Environmental resources (soil, surface water, groundwater) ▪ Ecological receptors ▪ Community Health and Safety	Restricted	Medium-term reversible	Medium-term	Continuous	Medium	Medium	Moderate	▪ Maximize the amount of excavation use in fill works. ▪ Store excess/unsuitable excavated materials at designated storage sites located within the construction corridor and having sufficient capacity. ▪ Ensure that all excavation activities are implemented in line with the cut and fill program to minimize excavation waste.	Minor
Potential impacts of wastes (municipal solid wastes, recyclables, hazardous and special wastes), if not managed properly	Land preparation and construction	▪ Environmental resources (soil, surface water, groundwater) ▪ Ecological receptors ▪ Community health and safety ▪ Project personnel's health and safety	Wide	Medium-term reversible	Medium-term	Continuous	Medium	Medium	Moderate	▪ Develop and implement the Project-specific Waste Management Plan. ▪ Submit official waste declarations for all waste generated to the online system of MoEUCC. ▪ Ensure compliance with the requirements of applicable waste management regulations for the management of all wastes generated as a result of Project activities. ▪ Segregate wastes (i.e. hazardous/non-hazardous, recyclable/non-recyclable) and store them temporarily in designated storage areas. ▪ Ensure that the waste storage areas meet the standards specified by related legislation: o Provide adequate and appropriate storage areas. o Ensure container types, labelling, classifying, etc., within the storage areas are in in line with Project standards. o Use reinforced concrete or similar impermeable materials such as epoxy on the floors of storage areas to prevent potentials soils and groundwater contamination. o The top and four sides of the storage area will be covered to prevent the entrance of precipitation into the area. o Provide adequate ventilation in case storage of volatile wastes is required. o Establish effective drainage systems to collect any potential leaks. o Apply physical access restrictions at waste storage areas through use of gates and fences; allow only authorized persons in storage areas. o Put cautionary signage and boards with name and contact number of authorized personnel at the storage areas. o Keep absorbents, firefighting equipment, etc. ready at a close location for immediate response in case of an emergency such as spills and fires. ▪ Ensure by means of trainings and stipulations that wastes are not dumped at locations other than areas specifically designated for this purpose. ▪ Provide basic waste management trainings (e.g. waste reduction, general waste management and housekeeping) to all personnel and repeat periodically. ▪ Under no circumstances, dispose of or bury waste on site. ▪ Mark waste explosives and used explosive canisters as explosive waste and store separately in storage areas designated for this purpose, where only authorized personnel will be allowed to conduct works; these wastes will also be transported by firms with relevant licenses. ▪ Ensure contractors' and their subcontractors' full compliance with Project Standards and implementation of the Waste Management Plan and the measures identified by this ESIA.	Minor
	Operation	▪ Environmental resources (soil, surface water, groundwater) ▪ Ecological receptors ▪ Community health and safety ▪ Project personnel's health and safety	Wide	Medium-term reversible	Medium-term	Continuous	Medium	Medium	Moderate	• Develop and implement the Project-specific Waste Management Plan. • Submit official waste declarations for all waste generated to the online system of MoEUCC. • Obtain Zero Waste Certificate as appropriate.. • Conduct visual checks along the railway route to identify illegally dumped waste and litter; collect these wastes periodically, identify their characteristics (hazardous or nonhazardous) by analysis to be conducted in line with related legislation, ensure segregation based on recyclability; store the segregated litter in separate containers and dispose of the wastes in line with relevant Turkish waste management regulations. • Use lead-free paints for maintenance activities. • Collect the garbage that will be generated at the stations from the collection areas to be placed in the station and forwarding them to the landfill and solid waste storage facilities of the relevant Municipalities.	Minor
An additional burden on the region's waste management facilities	Land preparation and construction, operation	▪ Regional waste management infrastructure	Wide	Irreversible	Long-term	Continuous	Medium	Low	Minor	• Construct and utilize excavated material storage sites with an adequate number and capacity, storing all excavated materials at designated storage sites located within the construction corridor and having sufficient capacity.	Negligible

Impact Description	Project Phases	Receptor	Impact Magnitude					Sensitivity/ Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Reversibility	Duration	Frequency	Overall Magnitude				
(e.g. landfills, recovery / recycling facilities etc.)										• Execute waste recycling/recovery/disposal agreements with the authorized municipality or licensed recovery/disposal firms for the management of hazardous and non-hazardous wastes.	

5.6 Cultural Heritage

5.6.1 Methodology

Evaluating the present status of the tangible and intangible cultural heritage assets for the Project has been conducted in five different phases which are;

- Desktop Study
- Field Research
- Risk Assessment
- Impact Assessment
- Reporting

5.6.1.1 Desktop Study

Publications on archaeological, ethnographic and intangible cultural heritage related to the project area and its surroundings (project AoI) have been compiled in order to determine the potential cultural heritage impact of the project construction and operation phases. Existence of archaeological or cultural heritage which has already been recorded in the project construction areas and the project impact areas has been researched. Resources used during desktop study are as follows:

- Academic Publications
- Historical Maps
- Previous Cultural Heritage Studies and Surface Survey Results Reports.
- Inventory Records of the Ministry of Culture and Tourism[14].

5.6.1.2 Field Research

The field survey on tangible and intangible cultural heritage have been conducted separately within the scope of the Project. During Phase-1 studies, the surveys were carried on the project route, impact areas and its surroundings between 09.01.2020 and 16.01.2020 by REGIO Cultural Heritage Field Team[15].

The railway routes, the newly planned station areas and the connection roads of the project have been studied with walkover survey to identify tangible cultural heritage during the field research. During the field survey conducted along the project route to identify possible archaeological and immovable cultural assets and observe the latest conditions of registered archaeological sites, the methods of “Field (Route) Walking”, “Intensive Field Survey”, and Extensive Field Survey” were used. These studies were conducted within the 100m corridor, which encompasses the construction impact area. The details of the Field (Route) Walking, Intensive Field Survey, and Extensive Field Survey are presented in the following paragraphs:

Field Walking

The “Field Walking” was used as the main research method during the field survey conducted within the 100m corridor of the project route. The field survey was realized mainly within the project construction corridor and the area which is considered as its impact area (100 m corridor covering the 50m right and 50m left of the construction axis). During field walking, the field survey team leader walked along the main axis of the project construction corridor using a GPS device, while two specialists of the archaeology team walked at both edges of the 100m corridor. The instant communication between the members of the field team who move forward in parallel was provided by walkie-talkies. During the field walking, all archaeological traces (ceramic shards spread on the surface, architectural elements or traces, graves or traces of

[14] Decision No 1180, decision no 2237 and decision no 4456 of the Directorate of Karabük Regional Preservation Board of Cultural Assets.

[15] Senior Archaeologist H. Uğur DAĞ, Senior Archaeologist Kılıçhan SEVMEN, Senior Archaeologist Serkan AKDEMİR, Senior Archaeologist Seray AYAZ

graves, mounds, tumuli, etc.) observed on the surface were noted on the Archaeological Baseline Status Table (Appendix-5). When archaeological traces were encountered in a region, the method of Intensive Field Survey, which is defined below, was used to collect data.

Intensive Field Survey

This method was followed when an archaeological site was encountered within the boundaries of the 100m impact corridor. The aim of this method is to determine the spread of the archaeological site, identifying its association with the project route on the map, revealing the area of distribution of archaeological surface findings and completing entire documentation, which would aid in interpreting the history of the site on the basis of archaeological artefacts on the surface. During this activity, by taking sufficient number of GPS coordinates (at least four different points) from each site, surface area of the site in current geography, and its location were determined. Moreover, detailed photographs of each site were taken from different angles and archived to be used in the reports. The area was divided into 10x10 m wide squares in the north-south direction and the samples of archaeological material such as pottery, stone tool shards etc. on the surface were systematically documented (photographing, etc). During all these works, the “Archaeological Baseline Status Table” (Appendix-5), which were prepared by the research team, were filled separately for each site and all information related to the observations made in every site were recorded in this document. This document was also used as reference sources in preparation of the impact assessment report after the survey. By processing the GPS coordinates which were taken on the site (WGS 1984, 6 Degree UTM) by using Esri ArcGIS software, the locations of the sites in association with the project route and other construction impact areas were reviewed in the GIS environment and it has been used as the baseline information for impact assessment studies.

Extensive Survey

Greater part of the works for identifying the archaeological and immovable cultural assets within the 100m corridor alongside the railway route was completed by using the method of field walking. In cases when walking was not possible (private property requiring permission, restricted military zones, forested/bush lands, sunflower and grain fields etc.) the method of “Extensive Field Survey” was followed. In this method, in order to determine the presence of archaeological and immovable cultural assets, the archaeological traces on the surface were observed at the most accessible points of the areas, where the field walking could not be conducted.

Field Study for Intangible Cultural Heritage

Field studies for intangible cultural heritage were carried out by conducting face-to-face interviews in settlements in the immediate vicinity of the project. During the interviews, participants were encouraged to give their own answers without any limitation. With this method, it is aimed to explain the cultural structures of the group / individual and the behaviors and experiences that make up these structures. Within the scope of the Phase-1 studies, 37 people were interviewed. Strategically, priorities were given to people who have been living in the region for at least 3 generations and have an average age of 55 and over, who have accurate and reliable information about the history of the region. Apart from the profile in question, people who are knowledgeable about the history, traditions and customs, and geography of the region were interviewed. In addition, the observations made during the studies were used as part of field studies on intangible cultural heritage.

5.6.1.3 Risk Assessment Methodology

As mentioned above, the field studies were conducted as field walking as much as possible within the 100 m impact corridor of the railway project. However, the vegetation on the surface of the project route may have hidden some archaeological asset. Therefore, an "archaeological potential modeling" study was carried out for places where such possible chance finds could be encountered.

With the modeling study and the modeling maps (see Appendix-6) produced as the result of the study, it is intended to identify the sections likely to encounter chance finds in the construction and impact area of the project. The developed model was prepared for a 100-meter-wide corridor covering the construction and impact area of the project by using QGIS software. During the modeling study, 5 main factors were taken into consideration. These factors were: the presence of water resources and proximity to water resources, the slope of the land, the classification of the land (woodland, grassland, agricultural field, irrigated farming area, etc.), proximity to ancient roads or known archaeological sites and modern settlements. Each factor is divided into sub-factors and assigned different scores. Positive weighted values were determined as positive effect during evaluation, while negative weighted values were determined as negative effect. For example, in the land classification, the forest area category was evaluated with -2 points, while dry agricultural production land was evaluated with +2 points. Since many ancient settlements, etc. exist around modern villages or settlements, this modeling was based on the assumption of the similarity of the convenience of the present environment for settlement with the convenience of the environmental conditions in ancient times.

After determining the score values of the sub-factors, the project route and the impact corridor were divided into fields, and the points corresponding to the relevant sub-factor were summed for each field depending on the characteristics of that field and as a result, positive or negative total scores were obtained for each field.

The areas with positive scores were evaluated as "Areas with High Archaeological Potential" and the areas with negative scores as "Areas with Low Archaeological Potential". Predictive parameters and sub-categories taken into consideration in modeling and the points defined for them are given below.

Table 71. Predictive Parameters and Sub-Categories Taken into Consideration in Modeling

Predictive Parameters	Predictive Sub-category	Critical Value	Predictive Weight
Hydrology/ Proximity to Water	Stream Order 1	750 m	2
	Stream Order 2	1000 m	2
	Stream Order 3	1000 m	1
	Stream Order 4	1000 m	2
	Stream Order 5	1500 m	-1
	Stream Order 6	1750 m	-2
	Lake/Sea Order 7	2 km	3
Slope	Slope	0-10	0
	Slope	10-90	-5
Land Classification	Patch Agriculture	Yes	2
	Fruit Tree Grove	Yes	2
	Arable Non-Irrigated	Yes	2
	Arable Irrigated	Yes	-2
	Forest Area	Yes	-2
	Grasslands	Yes	-2
	Barren Land	Yes	-2
	Wetlands or Water	Yes	-4
	Industry/Built Area	Yes	-4
	City Area	Yes	-4
	Proximity to wetlands	1 km	2
Proximity to Rural/Ancient Roads and Settlements	Proximity to Rural/Ancient Roads and Settlements	0-1 km	2
Proximity to Modern Settlements	Proximity to Modern Settlements	0-2 km	2

5.6.1.4 Impact Assessment Methodology for Tangible Cultural Heritage

The impact of construction activities on the identified areas are evaluated based on "Guidance on Heritage Impact Assessments for Cultural World Heritage Properties" document prepared by ICOMOS and adopted by the Ministry of Culture and Tourism for its use to properly assess the impact of construction activities on cultural sies. In line with the document, the archaeological and tangible cultural assets identified in the area are classified based on their level of importance.

Table 72. Example Guide for Assessing Value of Heritage Assets

Value	Criteria According to ICOMOS (2011)	Criteria According to Turkish Law	ESS8 Requirements, sections C &D)
Very High	Sites of acknowledged international importance inscribed as WH property.	Tangible cultural heritage: 1st Degree Archaeological Sites (registered) Tangible cultural heritage: 2nd Degree Archaeological Sites (registered) or other sites depending on their value	Section C: Legally protected cultural heritage areas, Section D: Provisions for specific types of cultural Heritage (Built heritage, Movable cultural heritage, Natural features with cultural significance)
	Individual attributes that convey outstanding universal value (OUV) of the WH property.		
	Assets that can contribute significantly to acknowledged international research objectives.		
	Sites or structures of acknowledged international importance inscribed as of universal importance as WH property.		
	Individual attributes that convey OUV of the WH property.		
	Other buildings or urban landscapes of recognised international importance.		
High	Nationally- designated Archaeological Monuments protected by the State Party's laws		
	Undesignated sites of the quality and importance to be designated.		
	Assets that can contribute significantly to acknowledged national research objectives.		
	Nationally- designated structures with standing remains.		
	Other buildings that can be shown to have exceptional qualities in their fabric or historical associations not adequately reflected in the listing grade.		
	Conservation Areas containing very Important buildings.		
	Undesignated structures of clear national importance.		
Medium	Designated or undesignated assets that can contribute significantly to regional research objectives.	Tangible cultural heritage: 3rd Degree Archaeological Sites (registered) and Archaeological sites presently unknown or unregistered archaeological sites or other sites (Unregistered Bridge, Cistern etc.) depending on their value (if present)	
	Designated buildings. Historic (unlisted) buildings that can be shown to have exceptional qualities or historical associations.		
	Conservation Areas containing buildings that contribute significantly to its historic character.		
	Historic townscapes or built-up areas with important historic integrity in their buildings or built settings.		
Low	Designated or undesignated assets of local importance.		
	Assets compromised by poor preservation and/or poor survival of contextual associations.		
	Assets of limited value, but with potential to contribute to local research objectives.		
	"Locally Listed" buildings.		
	Historic (unlisted) buildings of modest quality in their fabric or historical associations.		
	Historic Townscape or built-up areas of limited historic integrity in their buildings or built settings.		
Negligible	Assets with little or no surviving archaeological interest.	Unregistered potential archaeological sites	
	Buildings or urban landscapes of no architectural or historical merit; buildings of an intrusive character.		
Unknown	The importance of the resource cannot be ascertained. Buildings with some hidden (i.e. inaccessible) potential for historic significance.		

Assessment of the magnitude of impact is based on an understanding of how, and to what extent, the Project would impact on archaeology and cultural heritage receptors. Table below presents a description of the impact magnitude for archaeology and cultural heritage receptors based on ICOMOS (2011).

Table 73. Change / Impact Assessment Chart

Impact Grading	Archaeological Attributes	Built Heritage or Historic Urban Landscape attributes	Historic landscape attributes
Major Change	Changes to attributes that convey OUV of WH properties.	Change to key historic building elements that contribute to OUV, such that the resource is totally altered.	Change to most or all key historic landscape elements, parcels or components; extreme visual effects; gross change of noise or change to sound quality; fundamental changes to use or access; resulting in total change to historic landscape character unit and loss of OUV.
	Most or all key archaeological materials, including those that contribute to OUV such that the resource is totally altered.	Comprehensive changes to the setting.	
	Comprehensive changes to setting.		Change to many key historic landscape elements, parcels, or components; visual change to many key aspects of the historic landscape; noticeable differences in noise or sound quality; considerable changes to use or access; resulting in moderate changes to historic landscape character.
Moderate Change	Changes to many key archaeological materials, such that the resource is clearly modified.	Changes to many key historic building elements, such that the resource is significantly modified.	
	Considerable changes to setting that affect the character of the asset.	Changes to the setting of an historic building, such that it is significantly modified.	
Minor Change	Changes to key archaeological materials, such that the resource is slightly altered.	Change to key historic building elements, such that the asset is slightly different.	Change to few key historic landscape elements, parcels, or components; slight visual changes to few key aspects of historic landscape; limited changes to noise levels or sound quality; slight changes to use or access; resulting in limited change to historic landscape character.
	Slight changes to setting.	Change to setting of an historic building, such that it is noticeably changed.	
Negligible Change	Very minor changes to key archaeological materials or setting.	Slight changes to historic building elements or setting that hardly affect it.	Very minor changes to key historic landscape elements, parcels or components; virtually unchanged visual effects; very slight changes in noise levels or sound quality; very slight changes to use or access; resulting in a very small change to historic landscape character.
No Change	No change.	No change to fabric or setting.	No change to elements, parcels or components; no visual or audible changes; no changes in amenity or community factors.

The general impact assessment of the archaeological and tangible cultural assets within the project impact area has been made by considering “scale and severity of impact” and “value of the archaeological and tangible cultural asset” (Table 74).

Table 74. General Impact Assessment Matrix

Value of Archaeological or Immovable Cultural Heritage	SCALE & SEVERITY OF CHANGE/IMPACT				
	No Change	**Negligible change**	**Minor change**	**Moderate change**	**Major change**
For Word Heritage List Properties **VERY HIGH** – Attributes Which Convey Outstanding Universal Value	**SIGNIFICANCE OF EFFECT OR OVERALL IMPACT (EITHER ADVERSE OR BENEFICIAL)**				
	Neutral	Slight	Moderate/ Large	Large/ Very Large	Very Large
For Other Cultural Heritage Assets	**SIGNIFICANCE OF IMPACT (EITHER ADVERSE OR BENEFICIAL)**				
Very High	Neutral	Slight	Moderate/ Large	Large/ Very Large	Very Large
High	Neutral	Slight	Moderate/ Slight	Moderate/ Large	Large/ Very Large
Medium	Neutral	Neutral/Slight	Slight	Moderate	Moderate/ Large
Low	Neutral	Neutral/Slight	Neutral/Slight	Slight	Slight/ Moderate
Negligible	Neutral	Neutral	Neutral/Slight	Neutral/Slight	Slight

5.6.1.4.1 Impact Assessment Methodology for Intangible Cultural Heritage

Assessment of the impact of the project on intangible cultural heritage has been conducted in the Project Area and its vicinity in compliance with international standards and local legislation. Findings of the ICH studies conducted within the project are presented below.

In line with the ICOMOS Guidelines, sensitivity of intangible cultural assets and the magnitude of impact of the Project on those (if present) will be identified with respect to the criteria stated below.

Table 75. Criteria for the Sensitivity of Intangible Cultural Heritage Receptors and Magnitude of Impact

Value Level	Criteria	Magnitude Level	Criteria
Very High	Areas associated with Intangible Cultural heritage activities as evidenced by the national register. Associations with particular innovations, technical or scientific developments or movements of global significance. Associations with particular individuals of global importance.	**Major Change**	Major changes to area that affect the ICH activities or associations or visual links and cultural appreciation.
High	Nationally designated areas or activities associatedwith globally important Intangible Cultural Heritage activities. Associations with particular innovations, technical or scientific developments or movements of national significance. Associations with particular individuals of national importance.		
Medium	Areas associated with Intangible Cultural heritage activities as evidenced by local registers. Associations with particular innovations or developments of regional or local significance. Associations with particular individuals of regional importance.	**Moderate Change**	Considerable changes to area that affectthe ICH activities or associations or visual links and cultural appreciation.
Low	Intangible Cultural heritage activities of local significance. Associations with particular individuals of local importance. Poor survival of physical areas in which activities occur or are associated.	**Minor Change**	Changes to area that affect the ICH activities or associations or visual links and cultural appreciation.
Negligible	Few associations or Intangible Cultural Heritage vestiges surviving.	**Negligible Change**	Very minor changes to area that affectthe ICH activities or associations or visual links and cultural appreciation.
Unknown	Little is known or recorded about Intangible Cultural Heritage of the area.	**No change**	No change

5.6.1.5 Reporting

During all studies, all data collected for tangible and intangible cultural assets are evaluated in different mapping and analysis platforms[16] and the reporting was completed by considering geographical positioning of tangible and intangible cultural assets and by developing mitigatory actions for protection/salvation of these assets.

The data collected during field research (between 09th and 16th of January 2020) related to the intangible cultural heritage, conducted through face-to-face interviews with the local residents, has been transcribed. The transcribed data was later analyzed to evaluate the effects of the project on intangible assets and the analysis is included in the phase-1 ESIA.

[16] QGIS.

5.6.2 Project Standards

In Türkiye, movable and immovable cultural and natural assets are protected and should be conserved as per the “Law on Preservation of Cultural and Natural Assets”, 2863 (amended by law numbered 3386), published in the Official Gazette numbered 18113 and dated 23 July 1983.

According to the Law, essential assets which are identified as cultural and natural heritage under legal protection are defined as follows:

- Natural and immovable cultural assets belonging to 19th Century and before;
- Any immovable cultural asset constructed after the end of the 19th Century but categorized as “a significant asset which requires preservation” by the Ministry of Culture and Tourism;

Immovable cultural assets located within the Protection Sites (in the Law, Protection Sites are defined as ancient sites and ruins which reflect the main social, economic or architectural characteristics of their era. Protection Sites may also be locations where fundamental historical events took place or areas containing considerable natural or cultural assets with natural or cultural features requiring preservation); structures, buildings or places that have witnessed significant historical events during the Turkish Independence War or the foundation of the Turkish Republic, regardless of time and registration; and all dwellings and buildings that have been used by Mustafa Kemal ATATÜRK without considering their time of construction or status of registration.

In addition to the Law on Preservation of Cultural and Natural Assets, some regulations govern the procedures about the protection and preservation of cultural and natural assets. The most predominant one being the Principal Decision (No. 658, issued 5 November 1999) which states that all archaeological sites need to be classified and protected according to their significant features. Three main categories are determined relevant to archaeological sites as:

- **1st Degree Archaeological Sites:** Areas requiring highest level of protection. They should be preserved except for scientific excavations. The area should be free of any type of buildings and construction. All kinds of construction, excavation, and modification activities are prohibited. However, for exceptional cases such as the necessity for essential infrastructure construction, Regional Preservation Boards may permit such activities based on the approval of the relevant museum and the head of the scientific excavation team.
- **2nd Degree Archaeological Sites**: Areas requiring medium level of protection. They should be preserved based on the conditions of protection and utilization set by the Regional Preservation Boards. Additional construction is prohibited. As the 1st Degree Sites, for exceptional cases such as necessity for infrastructure construction among others, Regional Preservation Boards may permit such activities based on the approval of the relevant museum and the head of the scientific excavation team.
- **3rd Degree Archaeological Sites:** Lowest level of protection area. Construction is permitted based on the decisions of Regional Preservation Boards. Before applying for a construction permit, test pit excavations should be conducted, and the outcomes of these excavations should be reviewed by the relevant museum and, if present, the head of the scientific excavation team. Reviews should be submitted to Regional Preservation Boards. The Boards may ask for extension of the coverage of test pits before taking any decision.

The Intangible Cultural Heritage which are located within the borders of the Republic of Türkiye, is officially protected by "Law No. 5448 on 19/01/2006 on the Law on the Approval of the Convention for the Protection of the Intangible Cultural Heritage". The intangible cultural heritage legally protected by the relevant law is defined as follows:

- Any cultural value created by public in oral cultural environments and included in folklore research; verbal expressions and cultural traditions such as oral traditions, performing

arts, social practices, rituals and festivals, popular knowledge, practices related to the universe and nature, tradition of handicrafts and production processes.

In addition to the laws and regulations described above, the guidelines given below, and the guiding principles of international organizations have been taken into consideration during the work carried out:

- WB ESF - ESS 8: Cultural Heritage
- Guidance on Heritage Impact Assessments for Cultural World Heritage Properties, ICOMOS 2011.

5.6.3 Baseline Conditions

The total railway length of the project planned to be constructed in Adana Province- Ceyhan District and Yumurtalık District, and Hatay Province-Erzin District is approximately 44 km. (Figure 53).

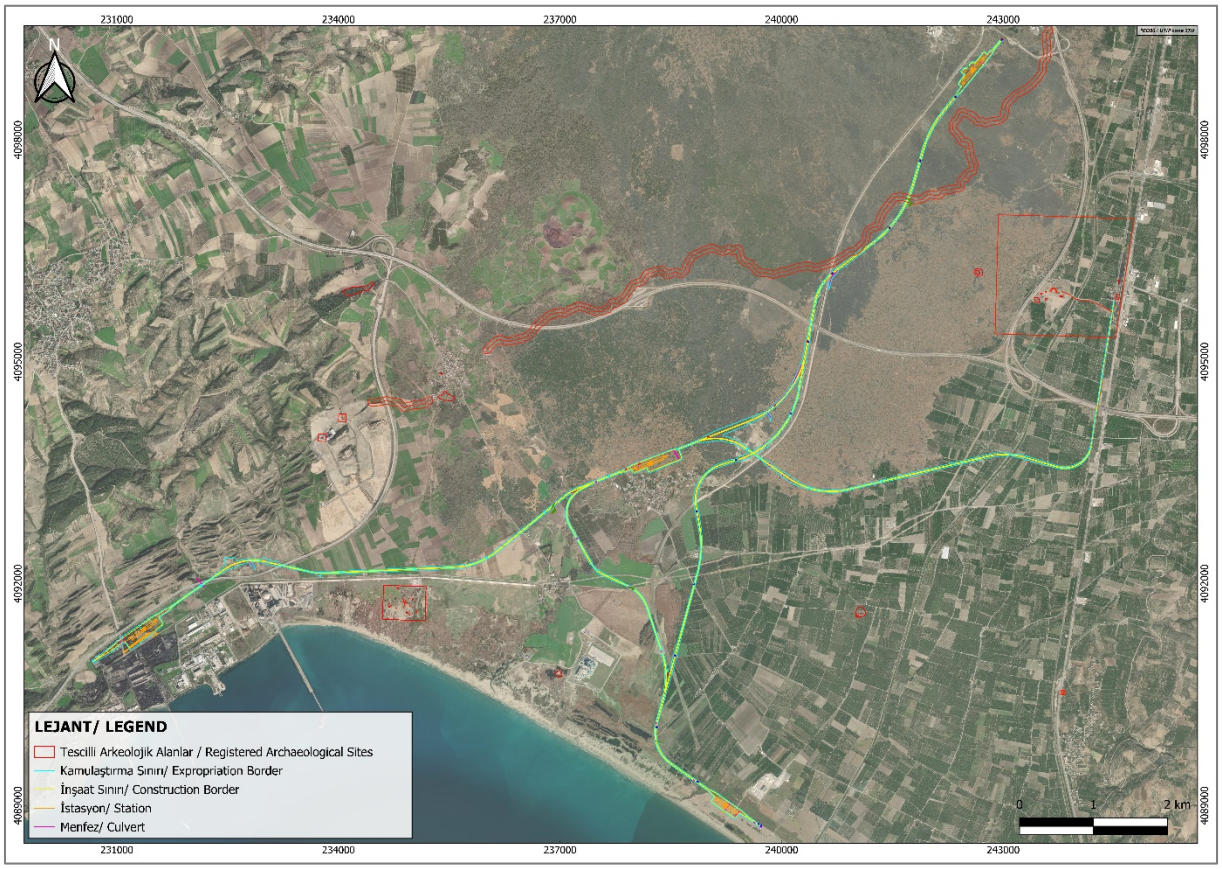


Figure 53. Railway Lines in Çukurova Sub-Project

5.6.3.1 Archaeological and Historical Background

5.6.3.1.1 Background for Tangible Cultural Heritage

Çukurova, formed by the widest and most fertile plains of Anatolia, forms the southern part of the Neogene Adana Basin. Surrounded by the Taurus Mountains in the north, Amanos Mountains in the east and the Mediterranean in the south, the western border of the region is determined by the Ecemiş fault line[17]. The plain formed by the common delta of the Tarsus (Cydnus), Seyhan (Sarus) and Ceyhan (Pyramus) rivers and named as the Aeolian[18] plain in

[17] Şenyurt vd. 2006:12; Gürbüz 1992:212.

[18] Şenyurt vd. 2006:12; Magie 1950: 271.

ancient sources is located in the southwest of the region. The southern part of the basin, which is entirely called the Adana Plain, is called Çukurova, while the northern part is called Yukarı Ova (Anavarza). The Misis (Cebelinur) Mountains separate the two plains. This topography was called Ovalık Kilikya (Cilicia Pedias or Campestris[19]) in ancient times.

Ovalık Kilikya, which has the appearance of a closed basin at first due to the mountains surrounding it, breaks this closed basin appearance as it is located on important roads connecting Central Anatolia to Syria and Mesopotamia. One of the most important of these roads is the road that descends from Taurus Mountains to Tarsus via Gülek Passage (Pylai Kilikias[20]), reaches to Kinet Huyuk, which was localized as the ancient Issus[21] through Misis (Mopsuhestia), and connects to Syria and Mesopotamia through the Belen Pass (Syriai Pylai) [22] in Amanos Mountains (Figure 54). This road has a route crossing the protected archaeological sites such as Karanlık Kapı 1st and 3rd Degree Archaeological Site which is located close to project licence area and Muttalip Huyuk in Toros Gübre premises.

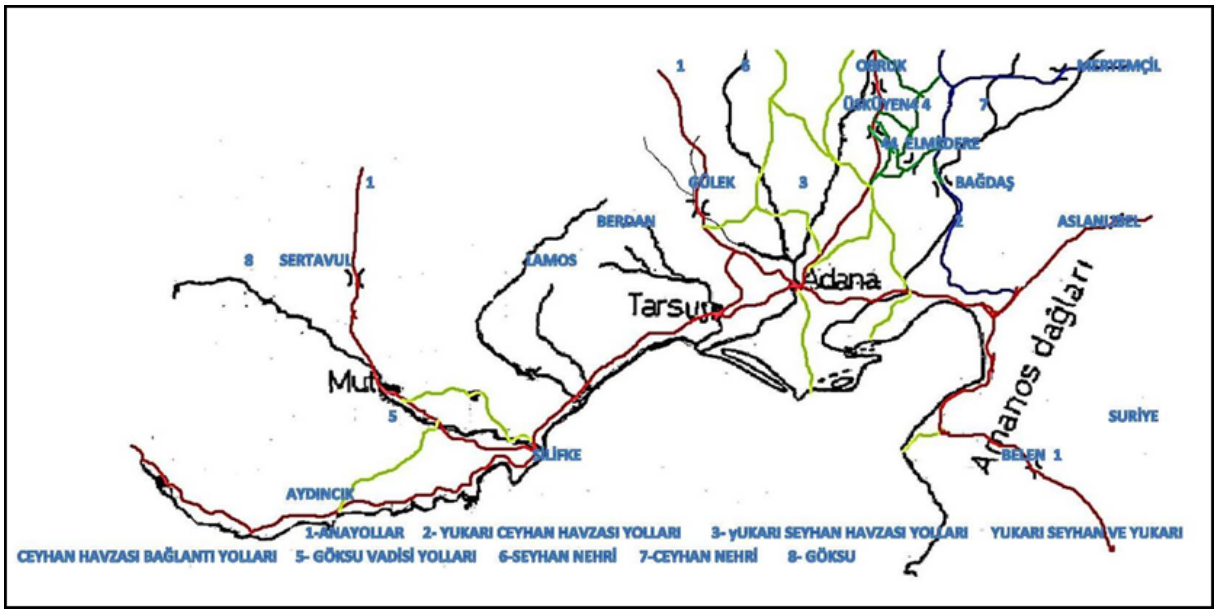


Figure 54. Ancient Period Roads of Clicia Region

Starting from the ancient city of Soli / Pompeiopolis to the foothills of the Amanos Mountains, Ovalık Kilikya has attracted human communities from prehistoric times thanks to its fertile soil and water resources.

The Neolithic Period is the period seen in Anatolia between 9500 BC and 5500 BC and is called the "New Stone Age". Important residential areas of this period close to the project area are Tarmil (Tırmıl), Tatarlı, Şamsı, Tömük (Elvanlı), Yunus, Kinet, Kabarsa and Çavuşlu Huyuks (Table 76, Figure 55).

The Chalcolithic Period (5500 BC- 3200 BC) was experienced after the Neolithic period in Ovalık Kilikya. Anazarbos (Anazarva), Aigaea (Yumurtalık), Hierapolis-Kastabala (Osmaniye), Mopsuestia-Misis (Yakapınar), Domuz Tepe, Sirkeli Huyuk, Tülek Huyuk, Boyalı Huyuk, Adatepe Necropolis, Adatepe Huyuk, Kinet Huyuk, Tatarlı Huyuk ve Muttalip Huyuk in Toros Gübre can be listed among the important settlements of this period, close to the project area limits. (Table 76, Figure 55).

After the Chalcolithic Period, Bronze Age was experienced in Anatolia (3200 BC-1200 BC). It is known from the excavations and field surveys that large settlements were established in

19 Strabon XIV: 5.1.

20 Şenyurt vd. 2006:16; Hild-Hellenkemper 1990: 387.

21 Şenyurt vd. 2006:16; Gates 1999: 304.

22 Strabon XIV: V.1; Erzen 1940:14-16,27-29.

Ovalık Kilikya, as in other parts of Anatolia. In this period when bronze, obtained by mixing tin and copper, began to be used in metal tool making. Yarım Huyuk, Tülek Huyuk, Boyalı Huyuk, Maltepe Huyuk, Sirkeli Huyuk, Çatalhöyük, Sarı Huyuk, Kameroğlu Huyuk, Adatepe Huyuk, Adatepe Necropolis, Karahöyük, Yunus Huyuk, Muttalip Huyuk and Kinet Huyuk can be listed among the Bronze Age settlements close to the project site.

In the middle of the 2nd Millennium BC, the Kizzuwatna Kingdom dominated the region, and until it was annexed to the Hittite Empire in the 1350s BC, it emerged as an independent kingdom between Hittite and Mitanni, a Hurri kingdom. Among the important settlements in the region belonging to this period are; Karatepe-Aslantaş Huyuk, Pasgüden Huyuk, Hacılar Huyuk, Yarım Huyuk, Adatepe Necropolis, Adatepe Huyuk, Bakırlı Çiftlik Huyuk, Bozhöyük, Muttalip Huyuk, Sirkeli Huyuk and Ertekin Bey Huyuk.

The first millennium BC is known as the “Iron Age”. In this period when iron became widespread in making tools, the impacts of the Late Assyrian Empire (858 BC-612 BC) and the New Babylonian State (626 BC-539 BC) are observed while the existence of city states belonging to the Late Hittite period is also known. Karatepe, Sirkeli Huyuk, Tatarlı Huyuk, Tülek Huyuk, Boyalı Huyuk, Maltepe Huyuk, Muttalip Huyuk and Botaş Huyuk are among the most important settlements of this period.

The region also hosted events that changed the course of history. Important settlements and necropolises from the Hellenistic and Roman periods are also known in the region which was the scene of the Battle of Issus in 333 BC, between Alexander the Great, the king Macedonia and Persian King Darius III. Yüceören, Hierapolis-Kastabala, Anavarza (Anazarbos), Flaviopolis (Kadirli), Domuztepe, Neronias/Irenepolis (Düziçi), Sarımazı OIZ, Babilik, Misis-Yakapınar (Mopsouhestia), Kurtkulağı Ölçü Tepesi, Maltepe Huyuk, Kabaktepe, Botaş Huyuk, Muttalip Huyuk, Tülek Huyuk, Boyalı Huyuk, Gökdere, Kurtpınarı, Yumurtalık (Aegeai), Karanlık Kapı, Erzin (Epiphaneai), Baias (Payas) are some of these settlements.

Many settlements in the region were rebuilt during the Roman period. Sarımazı OIZ, Babilik, Kurtkulağı Ölçü Tepesi, Kabaktepe, Tülek Huyuk, Muttalip Huyuk, Boyalı Huyuk, Gökdere, Yüceören, Sokuluk, Kurtpınarı, Botaş Huyuk, Su Gözü, Gölovası, Turunçlu Building Ruins belong to some of these settlements (Table 76, Figure 55). Roads connecting these settlements to the inner regions were also built during the Roman period. One of these roads is Aleppean Road. The road is partly within the borders of Ceyhan Petrochemical Industrial Zone. It is known that, after crossing the southern shore of Pyramos (Ceyhan River) from the ancient bridge in Misis (Yakapınar), the road reaches Tardequieia, which was established as a road station 15 Roman miles away and localized in the village of Kurtkulağı, and from there to Muttalip Huyuk via Karanlıkapı.

In this period, besides the roads, it is known that important aqueducts were built to meet the water needs of the increasing population in the Roman period. Fresh water from the water source in the Amanos Mountains was brought from Epiphaneia to the Genoese port city on the seafront in Burnaz and, as it was cliamed, to Ayas (Yumurtalık). The known length of the waterway on a land of volcanic basalt stones reaches 30 km. One branch of the mentioned Ancient waterway is considered to be the Kurtpınar Ancient Waterway within the project licence area.

After the Roman Empire was divided into two in 375, the Cilicia Region remained under the rule of Eastern Rome. Throughout the Medieval Ages the region was ruled by Byzantines, Arabs, Thessalonians, Armenians, Mamluk State, Ramazanoğulları, respectively. The region came under Ottoman rule in 1517. There are many historical buildings and settlements belonging to these periods in the region. Medieval Turkish Cemetery, Kazankaya Tepesi, Kurtkulağı Mosque, Kurtkulağı Caravansary, Yılankale, Sirkeli Huyuk and Yumurtalık Kalesi are among them (Table 76, Figure 55). After a short time remaining in the French occupation zone during the Turkish War of Independence, the region first became a sovereign stated and annexed to the Republic of Türkiye on 23 June 1939.

Table 76. Archaeological Sites around the Project Area

No	Name of the Archaeological / Immovable Cultural Heritage	Province	District	Nearest Distance to Project Expropriation Area (km)	HISTORICAL PERIODS												
					Paleolithic Period	Neolithic Period	Chalcolithic Period	Early Bronze Age	Middle Bronze Age	Late Bronze Age	Iron Age	Hittite Period	Hellenistic Period	Roman Period	Byzantine Period	Ottoman Period	Early Republican Period
1	Sarımazı OIZ 3rd Degree Archaeological Site	Adana	Ceyhan	0,15													
2	Dutlupınar Tepeüstü Settlement	Adana	Ceyhan	9,45													
3	Dutlupınar 1st Degree Archaeological Site	Adana	Ceyhan	9,50													
4	Soğukpınar Necropolis	Adana	Ceyhan	9,9													
5	Kuzucak Quarry	Adana	Ceyhan	10,86													
6	Davultepe Necropolis	Adana	Ceyhan	8,49													
7	Babillik Ancient Aqueduct	Adana	Ceyhan	6,7													
8	Kurtkulağı Ölçü Tepesi 1st Degree Archaeological Site	Adana	Ceyhan	9,5													
9	Kabaktepe Archaeological Site	Adana	Ceyhan	7,5													
10	Adatepe Necropolis	Adana	Ceyhan	13,1													
11	Adatepe Hoyuk	Adana	Ceyhan	12,2													
12	Yunus Hoyuk	Adana	Ceyhan	14,8													
13	Kazankaya Hill	Adana	Ceyhan	7,2													
14	Muttalip Hoyuk	Adana	Ceyhan	0,5													
15	Kurtkulağı Caravansary	Adana	Ceyhan	8,1													
16	Kurtkulağı Mosque	Adana	Ceyhan	8,2													
17	Tülek Hoyuk	Adana	Ceyhan	9,1													
18	Boyalı Hoyuk	Adana	Ceyhan	7,6													
19	Yeşiltepe 3rd Degree Archaeological Site	Hatay	Erzin	3,03													
20	Gökdere Archaeological Site	Adana	Ceyhan	5,3													
21	Maltepe Hoyuk	Adana	Ceyhan	5													
22	Yüceören Necropolis	Adana	Ceyhan	5,4													
23	Sugözü 1st Degree Archaeological Site	Adana	Yumurtalık	12,7													
24	Gölovası 3rd Degree Archaeological Site	Adana	Yumurtalık	8,5													
25	Gölovası Hoyuk	Adana	Yumurtalık	9,5													
26	Kinet Hoyuk	Hatay	Dörtyol	8,9													

No	Name of the Archaeological / Immovable Cultural Heritage	Province	District	Nearest Distance to Project Expropriation Area (km)	HISTORICAL PERIODS												
					Paleolithic Period	Neolithic Period	Chalcolithic Period	Early Bronze Age	Middle Bronze Age	Late Bronze Age	Iron Age	Hittite Period	Hellenistic Period	Roman Period	Byzantine Period	Ottoman Period	Early Republican Period
27	Tüpraş Tarlası 1st Degree Archaeological Site	Hatay	Dörtyol	8,1													
28	Tigem Mosaic Area	Hatay	Erzin	2,6													
29	Karahöyük 1st Degree Archaeological Site	Hatay	Erzin	1,5													
30	Yanık Değirmen Ancient Settlement	Hatay	Erzin	1,3													
31	Adsız Harabeler 1st Degree Archaeological Site	Hatay	Erzin	0,23													
32	Turunçlu Ancient Building Remains	Hatay	Erzin	0,59													
33	Karanlık Kapı 1st and 3rd Degree Archaeological Site	Adana	Ceyhan	0,81													
34	Medieval Turkish Cemetery	Adana	Ceyhan	3													
35	Babillik Necropolis Area	Adana	Ceyhan	5,9													
36	Botaş Hoyuk	Adana	Ceyhan	6,9													
37	Kurtpınarı Necropolis Area	Adana	Ceyhan	5,6													
38	Sokuluk Flat Settlement	Adana	Ceyhan	5,7													
39	Çamdan Dağı Necropolis Area	Adana	Ceyhan	9,6													
40	Delihalil Archaeological Site 1	Osmaniye	Toprakkale	4,1													
41	Delihalil Archaeological Site 2	Osmaniye	Toprakkale	3,5													
42	Kabirliktepe Ancient Settlement	Osmaniye	Toprakkale	2,7													
43	Kürek Castle	Osmaniye	Toprakkale	6													
44	Harmupkayası Hilltop Settlement	Osmaniye	Toprakkale	4,6													
45	Yağankaş Rock-Cut Tombs and Waterway Remains	Osmaniye	Toprakkale	4,2													
46	Toprakkale Aqueduct	Osmaniye	Toprakkale	4,1													
47	Ancient City of Issus	Hatay	Erzin	0													
48	Yeşilkent 3rd Degree Archaeological Site	Hatay	Erzin	7,44													
49	Kuzuculu 3rd Degree Archaeological Site	Hatay	Erzin	8,97													
50	Kuzuculu 1st - 2nd Degree Archaeological Site	Hatay	Erzin	8,97													
51	Issus Ancient Waterway	Hatay-Osmaniye	Erzin-Toprakkale	0													

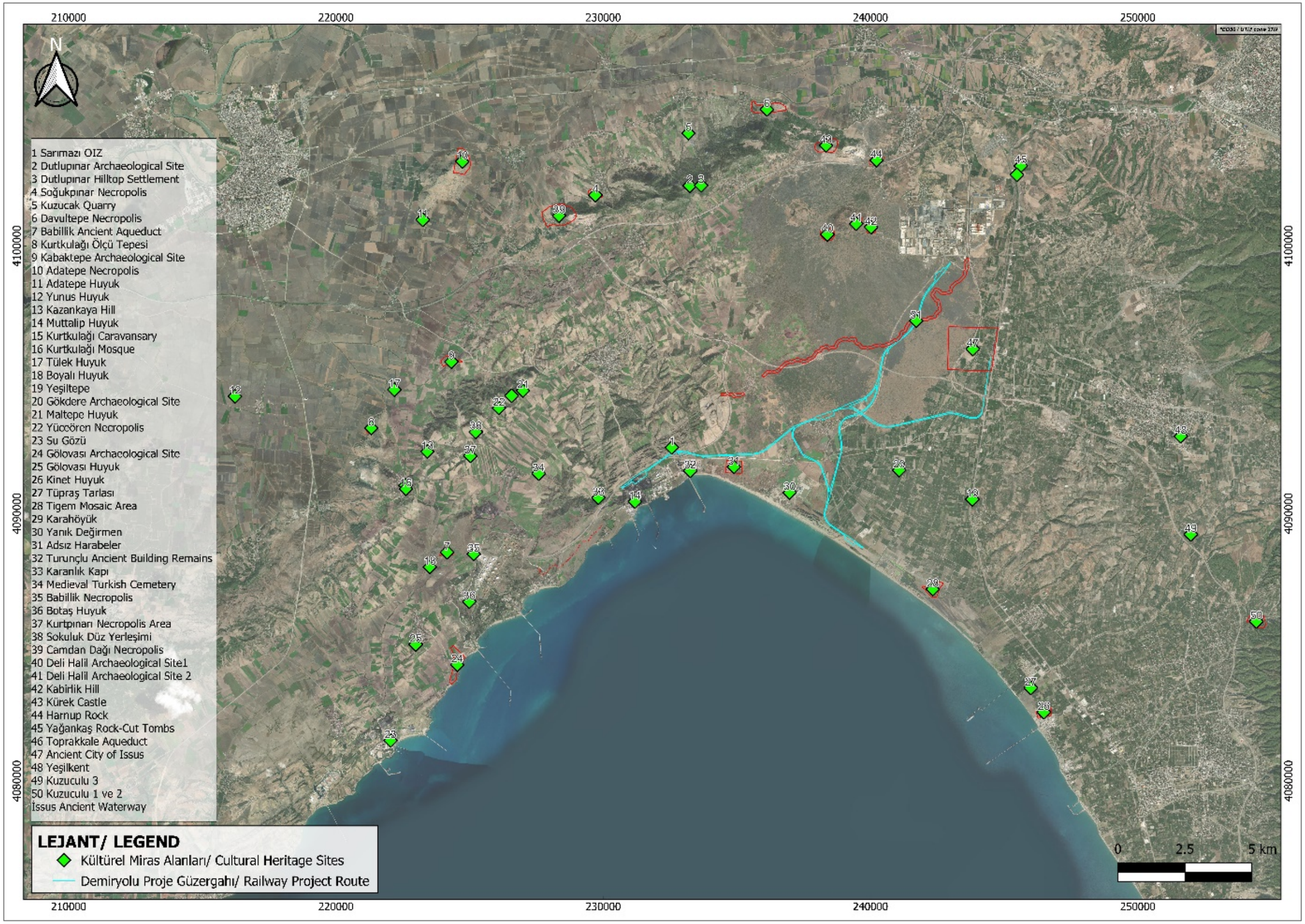


Figure 55. Archaeological / Historical Sites Located on the Project Routes and Its Vicinity

5.6.3.1.2 Background for Intangible Cultural Heritage

UNESCO defines intangible cultural heritage as traditions or life experiences such as oral traditions, performing arts, social practices, rituals, celebration events, knowledge and practices about nature and the universe, or knowledge and skills related to the production of traditional arts, which we inherit from our ancestors and will pass on to our future generations.

Most of the local people living in the project impact area are Yoruk. Turkmens living in nomadic life in Anatolia and Thrace were called "Yoruk". Yoruks are nomadic Turkmens who live in plateaus in summer, "güzlük" in fall and "kışlak" in winter, as groups of small and large by dealing with animal husbandry. The settlement of the Turkmens to present-day Çukurova took place after 1800s[23]. Turkmen tribes living in the region are Avşarlar, Ceritler, Karakoyunlu, Karahacılı, Tekeli, Aydınlı, Tecirli, Bozdoğanlar, Honamlı etc. Today, Yoruks continue to practice their own culture, despite the transition from nomadic to settled lifestyle. However, the developments in the field of science and technology in the last century and the impact of the sedentary culture have led to the gradual forgetting of the Yoruk culture. Apart from the Yoruks, Abazins and Crete immigrants were also found in the settlements in the study area. It is also known that Noghais, Tatars and Balkan immigrants live in the region.

After the 1877-78 Russian War, the Crimea, Abazins and Papaks started to come to the region and were placed in Çukurova by the Ottoman State during the Balkan War[24,25]. On the other hand, the Nogai settled in the region after the Russian pressures following the Crimean War of 1853-1856[26]. At the end of the 19th century, many Yoruk tribes settled on the plains and established villages[27]. When the demography of the region is analyzed, the majority of Yoruk population is prominent[28]. This broad cultural quality is reflected in traditions, dances and food.

The traditions of the people living around the project route is visible in the rituals of birth, circumcision, farewell rituals for military service, marriage and death, which are the transition periods of life. These stages, which are important for people, are integrated with the sedentary culture of the region. In Turkish folk culture, tombs, grand trees, springs are considered sacred. These places have been perceived as holy places by people in search of solutions to problems encountered in life[29]. In our research area, it was determined that places which are considered sacred are visited, wows are made, and animals are sacrificed in order to have children. Hosting dinners called "toy" and the loud announcement of the gifts the boy's house purchased while marrying; giving gifts called "okuntu" along with invitation cards before circumcision ceremonies and weddings; and attaching a red flag to tombstones are examples of these traditions.

The transition periods of life, which starts with birth and ends with death, have local customs in the region. The protection and survival of festivals, agriculture, animal husbandry, historical buildings and the natural environment are the issues that the local people pay attention to.

Finally, the cultural qualities of the region are as remarkable as its natural structure and history. The multicultural character of the region, as Greek, Christian, Turkish and Muslim customs are intertwined over time, is reflected in life, such as traditions, dances, food and the transition periods of life.

Above, an evaluation of intangible cultural heritage elements for the Eastern Mediterranean Region in general is presented.

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[23] Cin, Firdevs, Ceyhan Yörüklerinde Halk Kültürü Araştırmaları, Çukurova Üniversitesi Sosyal Bilimler Enstitüsü, Adana, 2004: 8.

[24] October 8, 1912- Jul 18, 1913

[25] Muradiye Malı. Sirkeli, Yassıca

[26] Mangıt, Mercimek, Toktamış Villages

[27] Karakayalı, Burhaniye, Kösreli, Dokuztekne, Sanmazı tribes

[28] Adana City Yearbook, 1991: p. 25

[29] January, 1992: 11

Within the scope of the field study (CLS 2024), no intangible cultural heritage items were found within the Project Impact Area during the interviews with the Mukhtars. However, Mukhtars also stated that the population of villages and neighborhoods increased during the summer and harvest periods, that relatives and fellow citizens came together during religious holidays to celebrate Eid, and that charity days were held through collective work. Although these days do not have a clear date, these events are mostly held in village squares and common areas of villages used as recreation areas. Headmen stated that the Project would not have any impact on the observance of customs and traditions regarding these events and special days.

5.6.4 Overall Assessment

5.6.4.1 Overall Assessment of Tangible Cultural Heritage

During the cultural heritage desktop studies, it was realized that there are three (3) registered archaeological sites on the railway project route. These areas are Issus Ancient City, Issus Ancient Waterway and Erzin Train Station (Figure 56).

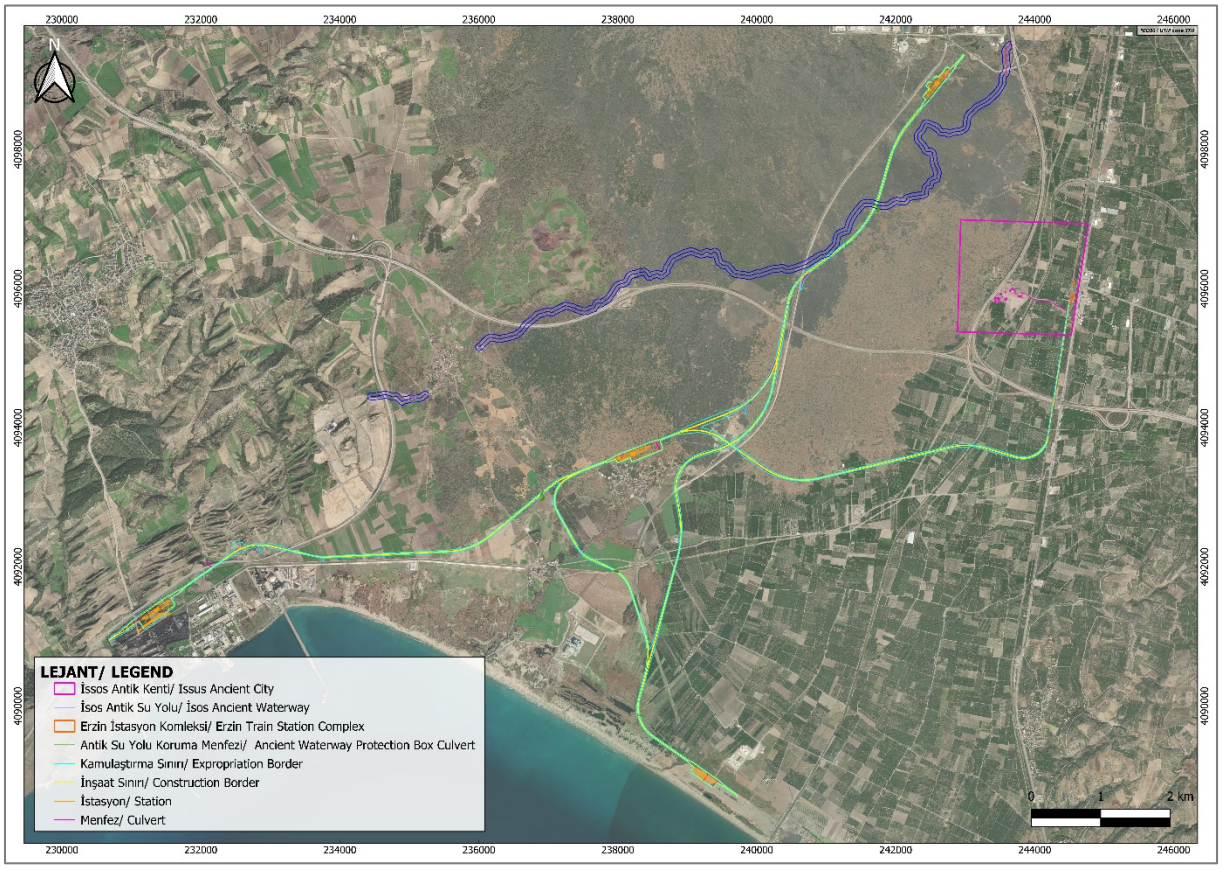


Figure 56. Archaeological Sites on the Project Route and Impact Corridor

The ancient city of Issus (Epiphaneia) is one of the most important registered archaeological sites in the impact area of the Çukurova Sub-project. According to ancient sources, the city was established in the Hellenistic Period in Ovalık Kilikya. (Figure 56, Figure 57, Figure 58). In this period, Antakya was made the capital of Seleucid State by Macedonian commander Seleukos and the city of Issus was rebuilt. The city later passed under the domination of the Romans and experienced its brightest period. Many ruins from the Hellenistic, Roman and Byzantine periods are still visible on the ground in the Ancient City of Issus, which continues to exist as an important junction in sea and land trade[30]. The ceramic pieces identified and

[30] Tempesta, 2005:84

documented in the settlement area are dated to the Late Roman Period and Late Antiquity. The city corresponds to 0 + 000 - 0 + 470 km points of Branch Line. This part of the project is within the boundaries of the registered sites of the Ancient City of Issus.

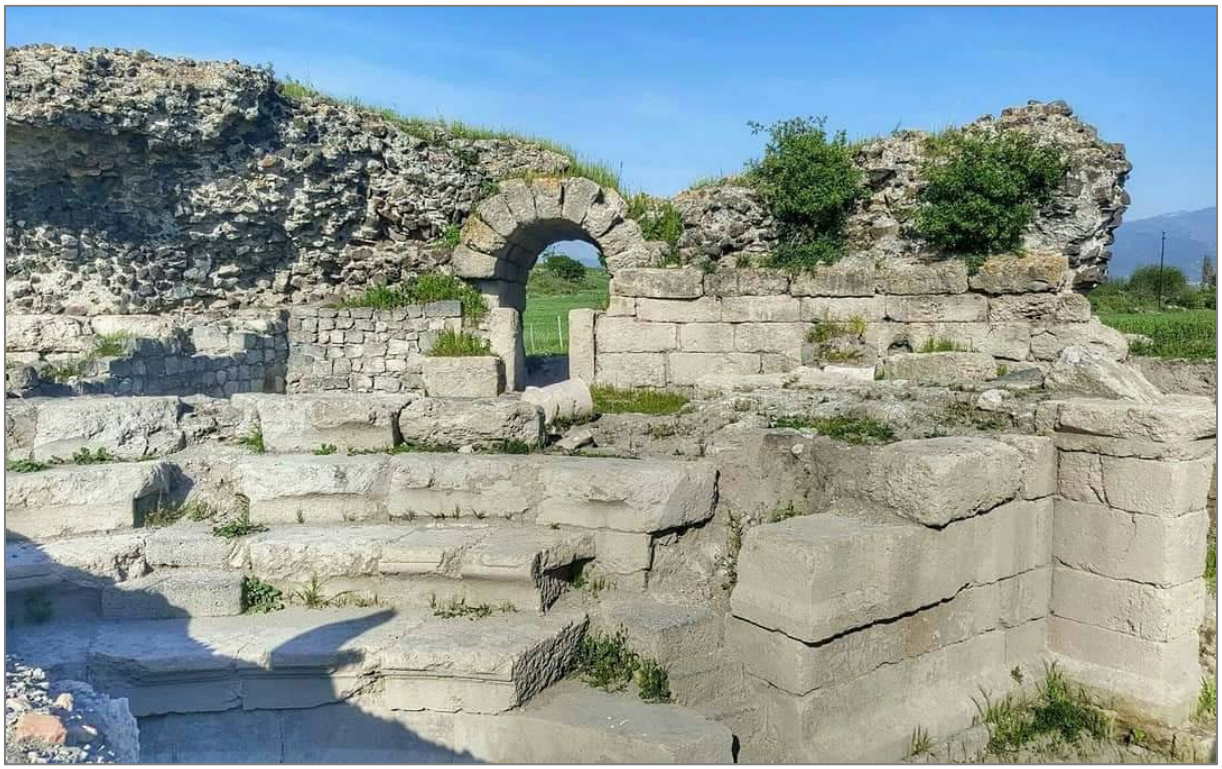


Figure 57. The Ancient City of Issus

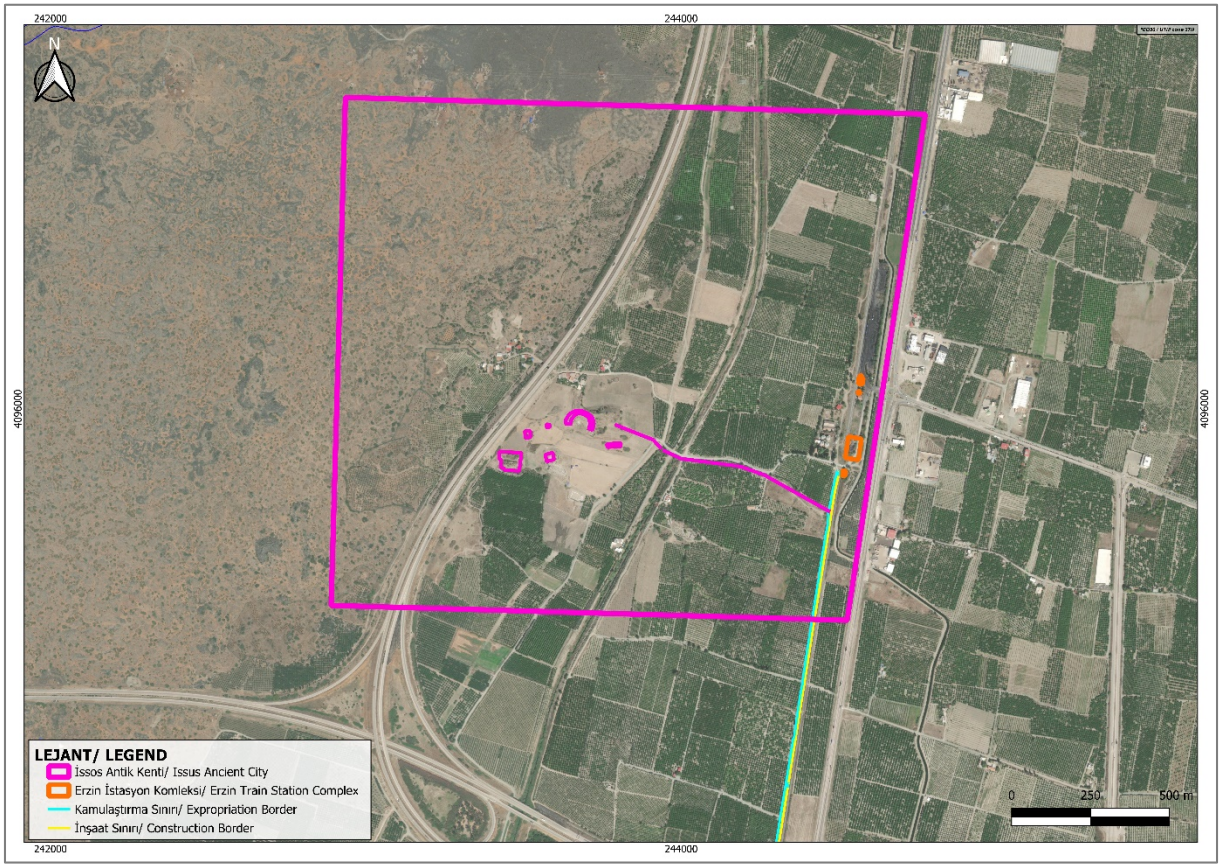


Figure 58. Proposed Route with Issus Ancient City and Erzin Train Station Complex

Another registered archaeological asset on the railway project route, which may be adversely affected by the project construction, is the Issus Ancient Waterway, which is approximately 30 kilometers long (Figure 59). The general material of the architectural structure is mortar and rough stones (Opus Caementicium). The mortared rough stones used in the building contain volcanic natural soil. The use of the water system consisting of these mortared stone walls is quite common in the Roman states. In order to seal the walls, the inner parts of the channel that are in contact with water were plastered with mortar. It is possible to see this mortar in the part of the waterway remaining in the project license area. Although they dry late, the materials with this structural feature are very strong[31]. Due to the difference of elevation in the land, the waterway is in the form of a aqueduct in some sections (Figure 60), and a mortar, rubble stone braided and possibly closed channel in other sections. Since such ducts are usually made on slopes that are not too steep, they are covered with plate stones or mortar mesh systems in accordance with the elevation of the slope. Against natural disasters such as landslides, the aqueducts prevent the accumulation of soil or stones on the channel thanks to the elevation adapted to the slope.

[31] Vann 1976, 169.

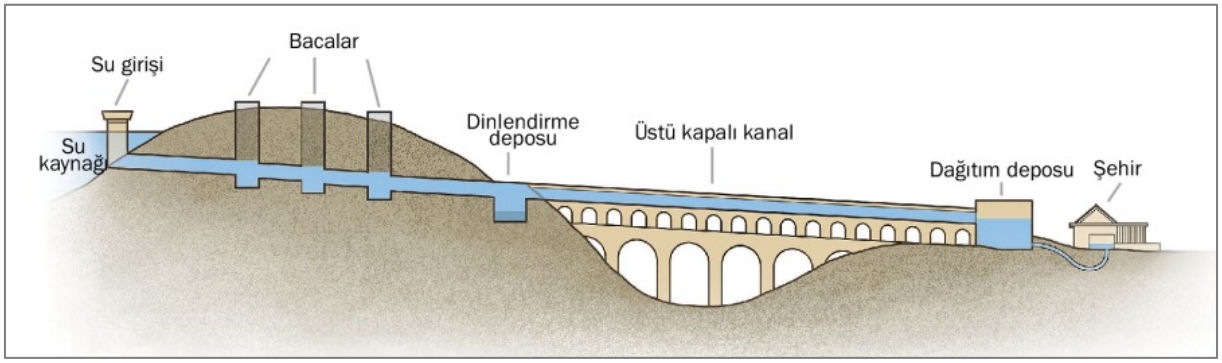


Figure 59. Ancient Water Transport System[32]



Figure 60. Issus Ancient Waterway Arches

[32] https://slideplayer.com/slide/9648332/

According to the Phase-1 design of the Çukurova Region and İskenderun Bay Railway Connection Project, the Issus Ancient Waterway intersected with the Osmaniye OIZ- Erzin Port Line at 4 different locations. However, the railway route was revised during Phase-2, and in the current situation the ancient waterway intersects with the railway route at a single point (Km: 2+550). Furthermore, the project route between Km: 3+400 and Km: 3+600, passes within the ancient waterway protection border. In conclusion, the planned project will not have a direct negative impact on the ancient waterway (Figure 61).

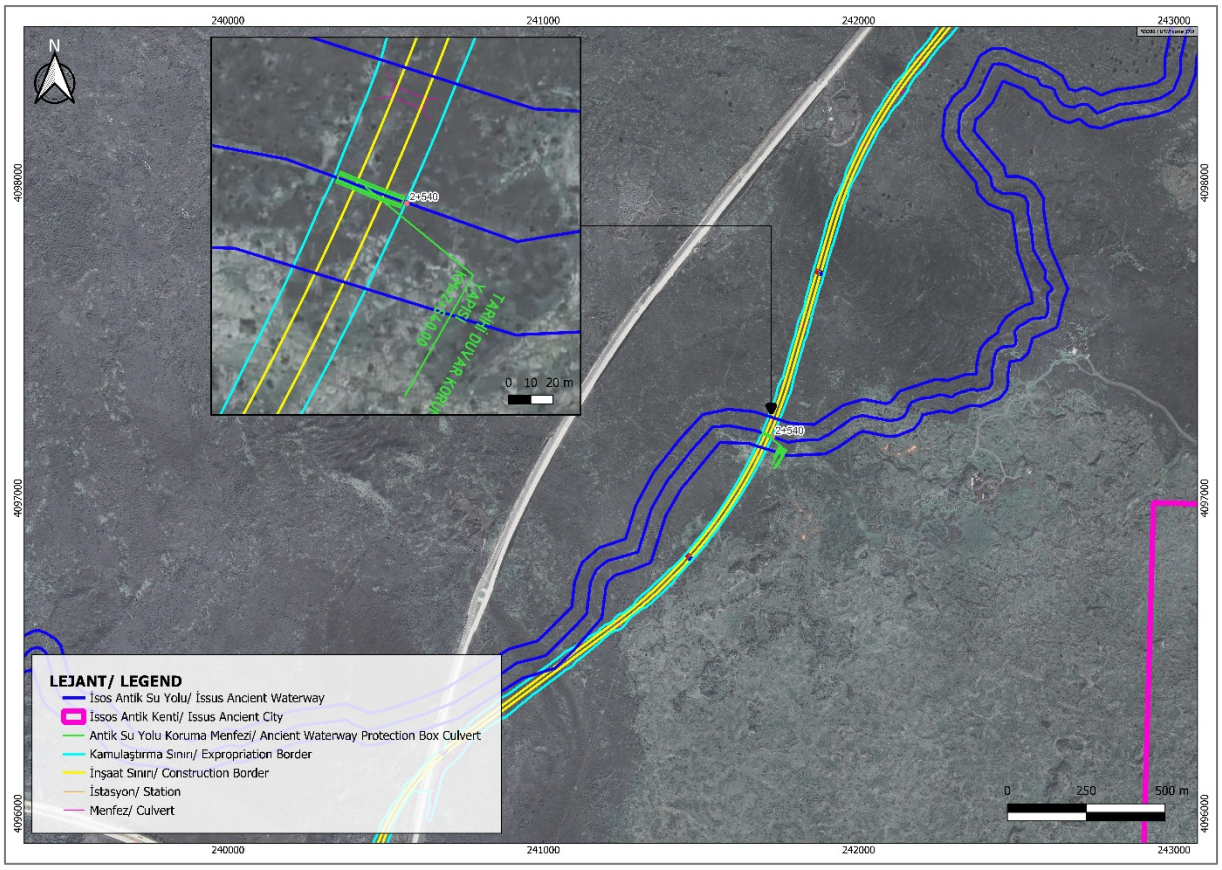


Figure 61. Issus Ancient Waterway and Project Route

Another immovable cultural heritage asset that remains in the project impact area is the historical Erzin Train Station Complex. Built as an example of Ottoman-Arab architecture in the early 1900s, the complex was registered and taken under protection by the Adana Cultural Heritage Preservation Regional Board as an immovable cultural asset (Figure 62).



Figure 62. Erzin Train Station Complex

Apart from the above-mentioned, one archaeological site (Çatakpınar Archaeological Site) and two potential archaeological sites were identified on the project impact corridor during the field studies conducted within the scope of the project for Phase-1 Project Route. The railway section which is related to these three archaeological sites has been excluded from the scope of the Project in the designed Phase-2 project route. Therefore, these areas are not included in the updated impact assessment study's scope. The potential negative impacts of the project on these archaeological sites have been eliminated via Phase-2 Project route revisions.

As a result of desk and field studies, it has been identified that there are three registered cultural assets that need to be protected in the project route and impact corridor (Table 77).

Table 77. List of Tangible Cultural Assets on the Railway Route and Its Vicinity

No	Name of the Area	Province	District/ Neighborhood	Distance to Expropriation Limit (m)	Registration Decision
1	Issus Ancient City 1st Degree Archaeological Site	Hatay	Erzin/Yeşilkent	0	Registration Decision could not be found.
2	Issus Ancient Waterway	Hatay	Erzin/Turunçlu	0	Adana Cultural Heritage Preservation Regional Board decision dated 28.05.1999 and numbered 3414
3	Erzin Train Station Complex	Hatay	Erzin	0	Registration Decision could not be found.

5.6.4.2 Overall Assessment of Intangible Cultural Heritage

Field studies for intangible cultural heritage have been carried out for Phase-1 with qualitative interview technique in 6 settlements in the immediate vicinity of the project route. 37 people were interviewed within the scope of the study. Of these participants, 3 people live in Kurtpınarı, 10 people in Kurtkulağı, 4 people in Sarımazı, 4 people in Yukarıburnaz, 4 people in Aşağıburnaz, and 12 people in Turunçlu (see Table 78 and Figure 63). Field studies were conducted during Phase 1. Since the project area did not change significantly, additional field studies related to intangible cultural heritage were not conducted during Phase-2.

The information of the rural settlements included in this study are as follows;

Table 78. Settlement Information Included in the Study

Province	District	Neighborhood	Distance to Project License Area (km)
Adana	Ceyhan	Kurtpınarı	4,1 km
Adana	Ceyhan	Kurtkulağı	7,9 km
Adana	Ceyhan	Sarımazı	4,1 km
Hatay	Erzin	Yukarıburnaz	0,3 km
Hatay	Erzin	Aşağıburnaz	0,6 km
Hatay	Erzin	Turunçlu	2,1 km

Kurtpınarı, Kurtkulağı, Sarımazı, Yukarıburnaz and Aşağıburnaz settlements located at a close distance to the project route are inhabited by Yoruks. Unlike all these settlements, Cretan immigrants live in Turunçlu settlement. All the local people living in the region speak Turkish, but Turunçlu people also speak Crete among themselves. Except for the Turunçlu people, the people of all other settlements are Sunni Muslims. The people of Turunçlu are Bektashi.

Within the scope of oral traditions passed from generation to generation, the people of the five settlements in the field of study know the stories of their ancestors who went to the Battle of Çanakkale, and the heroic stories of the militia who defended the national independence against the French occupation during the Turkish War of Independence. It was also informed by the local people that in Kurtkulağı Village there is a mansion that was seized and turned into a French Hospital. In Turunclu settlement, people know the stories of their ancestors migrating from Crete. Apart from heroic and immigration stories, other oral traditions (such as fairy tales, lullabies, legends, beliefs, idioms, proverbs, folk songs, poems, etc.) are maintained.

In the interviews, it was determined that some customs belonging to the turning points of life (birth, circumcision, military service, wedding and death) still live in the region. These are briefly composed of the following traditions and practices:

Birth: In pre-natal traditions, warm soil (or heated pot / heated cere or heated tile) is wrapped around the abdomen and groin to eliminate the infertility of women without children. When the time of birth is approaching the bed for the mother to lie down; clothes and the crib for the baby are prepared. The umbilical cord is cut, the honey with salt is prepared and the whole body of the baby is soaked in saltwater for a brief period and the baby is immediately washed with warm water and powdered. Salting is done more carefully in the mouth, armpits and feet, it is believed that when these parts are well salted, they will not smell when the baby grows up. After the baby's umbilical cord is cut, it is buried in places such as schools, hospitals etc. depending on the profession expected for the baby. When babies are born, a white lamp is lit in the room where the mother and baby sleep and a yellow muslin is covered over the cradle to prevent the baby from infant jaundice.

Circumcision: While circumcision was formerly made by circumcisers and celebrated with circumcision feasts in the village, circumcision is performed in hospitals today. The circumcised

child is guided by a car convoy and a special circumcision suit is dressed. Care is taken that the child is circumcised before starting primary school.

Military Service: A little entertainment is organized for those who will go to the military. A flag is hung on the candidate soldier's house and henna is applied in his hands. In order for the soldier not to forget his home and to return safely, he is asked to lick the pacifier which he used as a baby and to bite a bagel. The pacifier and the bagel are hung on the wall and they remain there until he returns home. The candidate for the military is sent with a convoy on his journey.

Wedding: Marriages in the region are arranged with advice of the elderly (matchmaking). Love marriages are also allowed. It is preferred for girls to marry from the age of 18 and for men from the age of 20-22. Generally, the age limit for marriage is considered to be 30. Betrothal ceremony is called "küçük tatlı" ("small dessert"). Today, there is no tradition of bride wealth. In the past, carpets were woven as dowry in Sarımazı, but today young people do not continue this tradition. Traditional handicrafts such as cross stitch crochet of cotton or wool still continued to be made. Prior to the wedding, together with the invitation cards, gifts called "okuntu" such as shalwars, carpets, muslins and socks are given to the guests according to their degree of closeness. During the wedding, a flag is hung on the wedding house. The flag is hung after the prayer on Friday, one day before the wedding, after eating the so-called "ağız tadı" (gusto which also means, enjoyment, harmony). Weddings take 3 days. Before the wedding, the animals are butchered and the main wedding dishes such as soup, tandoor kebab, analı kızlı (kind of soup made of meat and wheat), mantı (kind of ravioli), beans, rice pilaf, and ashura are prepared. Neighbors and relatives help with cooking. In addition to these traditions, some of which have disappeared in time, local folk dances are played in weddings in the region, such as oyun havası (traditional dance music) and çiftetelli (a folk dance performed in Turkey and the Balkan countries) etc. Musical instruments such as traditional drums and flutes (davul&zurna) are among the main traditional musical instruments used in weddings.

Death: The chin and toes of the deceased are tied. An iron knife is put on the abdomen after bathing of the dead is completed. The obituary is announced to the neighbors by the relatives through the mosque. Condolence reception takes 7 days. Food is brought to the funeral home by relatives and neighbors for seven days and shared with visitors.



Figure 63. Interviews in Turunçlu Settlement Village Coffeehouse

In addition to the traditions of the turning points of life mentioned above, it was determined that some customs were also kept alive in the celebration of religious feasts in the region. Preparations for religious feasts begin on the day of Arefe when cemetery visits are made, and refreshments are prepared for the guests coming during the feast. Generally, kömbe fort the feats is made, and holiday clothes are purchased for everyone, especially children. After the feast prayer, neighbors, relatives and friends pay visits to see each other. Newroz Festival is also celebrated in the region to meet the arrival of spring. While Newroz used to be celebrated collectively with a picnic at the seaside as festive, it has lost its former importance today. The “Cretan Festival” is held in the first week of September in Turunçlu settlement.

In addition, within the scope of traditional folk beliefs; vows are made to entombed saints. These sacred areas are visited for requests such as recovery from illness, having a job or childe, having fortune, a safe return from the military. For this purpose, mostly “Topçu Dede Türbesi” (Topçu Dede Tomb) is visited. Topçu Dede Türbesi is located on Esbak Mountain in Kurtkulağı settlement. Its distance to the project route is about 4.86 km. It was determined that the tomb would not be affected by the construction activities of the railway project. People living in Kurtkulağı and Kurtpınar go to the nearby Kazankaya Hill and tie cloth to the wish trees. The hill in the Kurtkulağı District is approximately 2,75 km from the project route. It has been determined that the hill will not be affected by the construction activities of the railway project. There is no wish tree tradition in other settlements. It has been observed that customs such as evil eye beads and pouring lead to repel evil eye continue. In Sarımazı settlement, large and small cattle skull sare hung on fences which indicates the garden boundary in order not to touch the evil eye, which have been seen in Anatolia since the Neolithic period.

As part of traditional medicine and healing practices, gentian is collected from the nearby mountains in all settlements. Yellow centaury oil, which is formed by dipping in olive oil, is applied to wounds, burns and rashes. In traditional folk medicine, bonesetters and healers, for umbilical hernia, are visited. It is believed that skin eruption[33] treatment passes by praying. Healers continue their tradition by lending a hand to one of their relatives before they die. Also, the people of the region stated that they took precautions by spreading salt which was chanted by a healer called “Yılancı Hacı” living in Hatay/Dörtyol in order to keep snakes and scorpions away from their homes until the healer’s death in 2009. In diseases such as flu and pneumonia, cupping treatment is still preferred. In Turunçlu settlement, healers are called “sınıkçı”.

The public economy based on local production and consumption, which is followed by local people to maintain their lives, in animal husbandry and agriculture performed traditionally based on the knowledge obtained from ancestors. As an agricultural product; wheat, sunflower, corn, peanut, watermelon, tangerine, and orange are produced in most of the farms. In addition to these products, olive cultivation is made in Sarımazı settlement. There are Agricultural Credit Cooperative branches for farmers in all settlements. During the interviews, it was found that traditional games such as tipcat, hide-and-seek, a sound, marble and leapfrogging were widely played by children in the past but today, these games were mostly replaced by computer games.

Within the scope of traditional handicrafts, cross stitch crochet of cotton and wool still continue. In addition, sewing courses are opened periodically in some settlements. According to the traditional architecture of the region, houses built using stone, wood and adobe together are no longer built. Single or double story buildings, mostly made of reinforced concrete, form today's architecture.Traditional culinary culture consists of kömbe, börek (a general name for filled pastries in various shapes), bayram çöreği (a sweet pastry), analı kızlı (a kind of soup made of wheat and meat), sıkma (pastry filled with inced tomatoes and onions and served for breakfast), tırşik (soup of a local herb - arum maculatum), kebab, semolina halva, tulumba and hamur kızartma tatlısı (syrup-soaked pastries) çökelek (cottage cheese), tomato paste, pepper, jam and butter are made for the winter (Figure 64).Bringing people from different

[33] Shingles

geographies and cultural structures in the past and having them resettled in this region exhibits itself in the local dishes of the villages in the region. It is observed that in Turunclu settlement where Cretan immigrants are living, a diet based on seafood and vegetables (chicory, mustard, zucchini flower, bostan, mushroom, nopitaraca) has been adopted, whereas in other 5 settlements where Yoruks are located, meat-based diet is common.

As a result of the studies, it has been assessed that the project will not have any negative impact on intangible cultural heritage. The preparation of social investment projects for rural tourism, including various projects including the ancient city of Issus (Epiphaneia), which is within the project impact area, and their implementation together with the local actors in the region with the financial support of the railway project, may create added value in the protection of cultural heritage and economic development in the region.)



Figure 64. Making Çökelek and Tereyağı from Traditional Culinary Culture-Yukarıburnaz

5.6.5 Impact Significance, Mitigation Measures, and Residual Impacts

During all studies, all data collected for tangible and intangible cultural assets are evaluated within the project expropriation area and impact corridor. Data on tangible and intangible cultural assets were evaluated in different mapping and analysis platforms[34] and the assessment was completed by considering geographical positioning of tangible and intangible cultural assets and by developing mitigatory actions for protection/salvation of these assets.

The data collected related to the intangible cultural heritage during interviews has been transcribed after face-to-face interviews with local residents. The transcribed data was later analyzed to evaluate the effects of the project on intangible assets and the analysis has been reported.

Within the framework of the ESCP, the whole ESIA package has been revised to align with the mitigation measures and actions specified in the ESCP. According to the *ESCP - ESS8: Cultural Heritage* section, it is required to revise the detailed design to avoid the impacts and obtain authority permits for Issus Ancient Waterway and Ancient City of Issus.

Issus Ancient Waterway

Issus Ancient Waterway is a well-preserved archaeological culture asset in its original form. According to the cultural heritage impact assessment study conducted by REGIO, a route revision was recommended during Phase-1 for the railway design at four (4) intersection points with the Issus Ancient Waterway.

During Phase-2 studies, a site visit was conducted to the Çukurova Project Area with the participation of ÇINAR, DGII, REGIO and authorities from Hatay Regional Council for the Conservation of Cultural Property (Hatay KVKBKM) on 12-13-14.07.2023. The project route was revised as shown in Figure 61 to minimize the crossing points (from four points to a single point) of the railway line with Issus Ancient Waterway.

A technical explanation/justification report covering the technical measures and details of the railway crossing was prepared and submitted to General Directorate of Cultural Heritage and Museums. According to this report, the intersection with Issus Ancient Waterway at Km 2+550 will be protected by using a concrete conservation structure (box culvert). Railway will be built in a way that passes over this concrete structure. And in the railway section which runs parallel to the ancient water way within the protection area of “Issus Ancient Water Way” (Km 3+400 and Km: 3+600), a retaining (protection) wall will be built around the railway route with the purpose of mitigating the impacts of the project on the water way. In this section, the purpose is to protect the ancient water way with this protection wall.

The required permit for the Çukurova Sub-project was obtained from Adana KVKBKM with the official letter dated 23.08.2023 and numbered 4116241 (see Appendix-7).

The opinion of Hatay KVKBKM is still awaited. The Contractor shall not carry out mobilization to Site (e.g. limited clearance for haul roads, site accesses and work site establishment, geotechnical investigations or investigations to select ancillary features such as quarries and borrow pits) and commence any construction works unless permits are available for the existing railway alignment design from the Ministry of Culture and Tourism with regard to cultural heritage sites - ancient City of Issus, Issus waterway and historical Erzin train station.

Ancient City of Issus & Erzin Station Complex

Another registered archaeological site that may be affected by the Project activities in Çukurova Sub-project Area is Issus Ancient City. 0+000-0+470 kilometer points of the Junction Line traverse the borders of the Issus Ancient City. Moreover, there is another registered cultural heritage in this section, namely “Erzin Station Complex[35] (Station Building-Logistics

[34] ESRI ArcGIS
[35] https://korumakurullari.ktb.gov.tr/TR-133282/idari-yapilar.html

Management Building)". According to the opinion of Hatay KVKBKM in the letter dated 23.08.2023 and numbered 4116241, constructing the Çukurova sub-project railway route outside the borders of 1st Degree Archaeological Site of Issus Ancient City and the Issus Ancient Waterway does not violate the provisions of Law No. 2863. With this letter, the permit for Erzin Station Complex was obtained from Hatay KVKBKM.

The permit for Issus Ancient City is still awaited. The Contractor shall not carry out mobilization to Site (e.g. limited clearance for haul roads, site accesses and work site establishment, geotechnical investigations or investigations to select ancillary features such as quarries and borrow pits) and commence any construction works unless permits are available for the existing railway alignment design from the Ministry of Culture and Tourism with regard to cultural heritage sites - ancient City of Issus, Issus waterway and historical Erzin train station.

Mitigation Measures

The technical explanation/justification report expressed that the below listed mitigation measures will be taken during all land preparation, construction, and operation phases to be carried out as part of the project:

- Contractor shall conduct the works in the area of influence defined in the ESIA during the construction phase of the project. At least one archaeologist (Cultural Heritage / Archaeological Monitoring Expert) shall be present at the site during any construction activities that require physical intervention to the soil. All activities that require physical intervention to the soil shall be monitored and reported by these experts.
- During the construction phase of the project, all personnel on duty especially in excavation/filling works (including heavy construction equipment operators and assistant teams) shall receive training by cultural heritage/archaeological monitoring expert(s) about protection of Cultural Heritage and alternative works shall be conducted to raise awareness before the initiation of site works. These works will be recorded and archived. Works will be repeated periodically in line with a time schedule.
- During the construction phase of the project, below listed works will not be allowed in anyway in the vicinity of Issus Ancient Water Way and within the borders of Issus Ancient City:
    - Blasting,
    - Camp site construction for the accommodation of workers,
    - Concrete plant construction,
    - Explosive material warehouse construction,
    - Service road construction,
    - Fill material extraction and storage,
    - Waste collection center establishment,
    - Chemical material storage,
    - Opening of water wells and other drilling activities.
- As part of the project, an "Explosion Excavation Design Based on Risk Analysis" report shall be commissioned in case an explosion is planned within 1 km of the archaeological sites.
- During the construction phase of the project, Hatay KVKBKM will be informed in advance in case of situations that require excavation works 1.5 meters or more in depth in the vicinity of Issus Ancient Water Way and within the borders of Issus Ancient City. If required, these excavations will be conducted under supervision of expert archaeologist assigned by the project and in coordination of Hatay KVKBKM.
- In case a cultural heritage is encountered as a chance find during any works in the site, the works shall be immediately stopped as per the 4th Article of the Law no. 2863 and the closest Local Authority or Museum Directorate shall be informed. Following the reviews of the relevant Museum Directorate, necessary arrangements will be implemented, such as determining the boundaries of the archaeological / cultural

heritage / area, measures to be taken for its protection, and informing the employees to prevent any physical intervention.

- In case any remains/finds are revealed during the works, all works in the site shall be stopped and Chance Find Procedure presented in the Cultural Heritage Management Plan shall be implemented.
- During construction works, Hatay KVKBKM shall conduct "Vibration Measurement and Test" and report these as frequently as it deems necessary and at the locations of its choosing.
- "Survey" and survey related other documentation (aerial photos, orthophotograph, GIS database, 3D scanning, etc.) will be prepared for the sections of Issus Ancient Water Way which intersect with the Projects.
- If required by the Hatay KVKBKM, the contractor will prepare "Consolidation, restorations, Conservation Reports" and will make the implementations accordingly.
- If required by the Hatay KVKBKM, scientific archaeological "Drill Excavations" will be conducted under the supervision of Hatay KVKBKM before the required physical works to be conducted inside the archaeological sites.
- If required, the costs of all mitigation methods committed above shall be financed by the Project.
- For all additional project designs, project revisions and construction implementations to be conducted at the ancient water way and the surrounding area (including implementations designed as protection measures), the opinion of Hatay KVKBKM shall be requested as per the Law no. 2863 and the planned works shall be conducted in line with the related decisions of the Conservation Board.

Evaluation of Impacts on Cultural Assets

Areas that are located within the project route's construction site and that may be directly and negatively impacted by the project activities as well as the potential negative impact of construction activities on these areas are presented in an extensive way in Table 79.

When the general assessment of potential negative impacts of the project on the identified areas are reviewed, it was determined that the impacts of the Çukurova Sub-project on the cultural areas was identified as "Slight".

Table 79. Impact Assessment Table

Name of the Area	Province	District/ Neighbourhood	Registration Status	Distance to the Project Site (m)	Scale and Severity of Change / Impact	The Value of Cultural Heritage	General Impact
The Ancient City of Issus 1st Degree Archaeological Site	Hatay	Erzin/ Yeşilkent	Registered	0	Negligible Change	High	Slight
Issus Ancient Waterway	Hatay	Erzin/ Turunçlu	Registered	0	Negligible Change	High	Slight
Erzin Station Complex	Hatay	Erzin/ Yeşiltepe	Registered	0	Negligible Change	High	Slight

As a result of field surveys and archaeological excavations in the region where the railway project route is located, many archaeological sites have been identified. For this reason, it should be kept in mind that while planning all kinds of activities (opening service roads, determining the locations of sand and quarries, excavation storage area), archaeological sites that have not yet been identified can be found outside the archaeological sites[36] mentioned in the report.

For this reason, an "Archaeological Potential Modeling Study" was reconducted for the Draft-final project route prior to the field walkover survey. Model Maps for Estimating Archaeological

[36] Chance Find

Potential related to this modeling study was prepared and presented in Appendix-6. The probability of archaeological or immovable cultural heritage assets calculated according to the results of these assessments is given in Table 80 on the basis of mileage intervals. The areas identified as “Very High, High and Medium Risk” in the Table 80 constitute the sections of the project route that are “likely to encounter chance finds”.

Table 80. Risk Levels of the Areas where Archaeological Potential Modeling was Conducted

Project	Section Code		Line Name	Risk Level
Çukurova Region and İskenderun Bay Railway Connection Project	Section-1	Section 1/A	OIZ - Port Line	Medium
		Section 1/B	OIZ - Port Line	Medium
		Section 1/C	OIZ - Port Line	Medium
		Section 1/D	OIZ - Port Line	Medium
		Section 1/E	OIZ - Port Line	Medium
		Section 1/F	OIZ - Port Line	Low
	Section-2	Section 2/A	Erzin - TAYSEB Line	High
		Section 2/B	Erzin - TAYSEB Line	High
	Section-3	Section 3/A	Erzin - TAYSEB Line	Medium
		Section 3/B	Erzin - TAYSEB Line	Medium
		Section 3/C	Erzin - TAYSEB Line	Low
		Section 3/D	Erzin - TAYSEB Line	Low
	Section-4	Section 4/A	OIZ Yukarıburnaz Line	Low
		Section 4/B	Erzin - TAYSEB Line	Low
		Section 4/C	Erzin - TAYSEB Line	High
	Section-5	Section 5/A	Erzin - TAYSEB Line and OIZ Port Line	Medium
		Section 5/B	OIZ - Port Line	High
		Section 5/C	OIZ - Port Line	High
	Section-6	Section 6/A	Erzin - TAYSEB Line and OIZ Yukarıburnaz Line	High
		Section 6/B	OIZ - Yukarıburnaz Line	Very High
		Section 6/C	OIZ - Yukarıburnaz Line	Very High
		Section 6/D	OIZ - Yukarıburnaz Line	Very High
		Section 6/E	OIZ - Yukarıburnaz Line	High
	Section-7	Section 7/A	Erzin - TAYSEB Line	High
		Section 7/B	Erzin - TAYSEB Line	Very High
		Section 7/C	Erzin - TAYSEB Line	Very High
		Section 7/D	Erzin - TAYSEB Line	Very High
		Section 7/E	Erzin - TAYSEB Line	Very High
		Section 7/F	Erzin - TAYSEB Line	High
		Section 7/G	Erzin - TAYSEB Line	Medium

For the reasons stated above, "Cultural Heritage Management Plan (CHMP)" and the "Chance Find Procedure (CFP)” have been prepared and annexed to the ESMP, which will be included in the bidding documents for all construction contracts under the project. The subcontractors will prepare a more detailed “Cultural Heritage Management Plan” and “Chance Find Procedures” and follow it throughout the project.

According to the results of desktop studies and site surveys, no negative impact is predicted on the intangible cultural heritage elements due to Project activities for all settlements in the work area.

BIOLOGICAL ENVIRONMENT

5.7 Project Standards and Methodology

ESIA biodiversity studies within the scope of Çukurova Region and İskenderun Bay Railway Connection Project have been conducted in line with provisions of WB ESS6 and based on previously published scientific work, reports on habitats and species, field surveys and expert judgement. Methodologies applied by field experts targeting different animal and plant groups considered priority habitats of the area, species of high conservation concern and also protected areas.

5.7.1 Project Standards

The legal framework on biodiversity conservation and assessment applicable to the Project is given below.

International Conventions and Protocols (ratified by Türkiye)

- UN Convention on Biological Diversity (CBD) and the Cartagena Protocol on Biosafety (ratified in 1997)
- The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) (ratified in 1984)
- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (ratified in 1996)
- The Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention) (ratified in 1994)
- The Convention Concerning the Protection of World Cultural and Natural Heritage (UNESCO World Heritage Convention) (ratified in 1983)
- Convention to Combat Desertification (ratified in 1998)
- International Treaty on Plant Genetic Resources for Food and Agriculture (ratified in 2007)
- European Landscape Convention (ratified in 2003)
- Convention on the Conservation of Migratory Species of Wild Animals (CMS) / Agreement on the Conservation of Populations of European Bats (EUROBATS) (Türkiye is not a party)
- CBD – Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets

Main National Laws and Regulations

- Law on National Parks (No. 2873, dated 9 August 1983)
- Law on Environment (No. 2872, dated 9 August 1983)
- Law on Terrestrial Hunting (No. 4915, dated 1 July 2003)
- Law on Forests (No. 6831, dated 31 August 1956)
- Law on Protection of Animals (No. 5199, dated 24 June 2004)
- Law on Water Products (No. 1380, dated 22 March 1971)
- Law on Agriculture (No. 5488, dated 18 April 2006)
- Law on Veterinary Services, Plant Health, Food and Feed (No. 5996, dated 11 June 2010)
- Law on the Protection of Breeder's Rights for New Plant Varieties (No. 5042, dated 8 January 2004)
- Seed Law (No. 5553, dated 31 October 2006)
- Law on the Conservation of Cultural and Natural Assets (No. 2863, dated 21 July 1983)
- Regulation on the Implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (Official Gazette No. 24623, dated 27 December 2001)

- Regulation on the Preservation of Wetlands (Official Gazette No. 28962, dated 4 April 2014)
- Bylaw on Fisheries (Official Gazette No. 22223, dated 10 March 1995)
- Regulation on the Collection, Storage and Use of Plant Genetic Resources (Official Gazette No. 21316, dated 15 August 1992)
- 2022-2023 Hunting Season Decision

Main National Strategy Documents

- 11th Development Plan (2019-2023)
- National Biodiversity Action Plan (2018-2028)
- EU Integrated Environment Strategy (2007-2023)

National Guidelines

Protected Areas

- Important Bird Areas (IBA's) of Türkiye (Magnin and Yarar, 1997)
- Key Biodiversity Areas (KBA's) of Türkiye (Eken et al., 2006)
- 122 Important Plant Areas (IPA's) of Türkiye (Ozhatay et al., 2008)

Flora

- Flora of Türkiye and East Aegean Islands (Davis, 1965-1988)
- Turkish Plant Names (Baytop, 1994)
- Red Data Book of Turkish Plants (Ekim et al., 2000)

Fauna

- Pocket Book of Birds of Türkiye
- General and Turkish Zoogeography (Demirsoy, 2002)

International Standards and Guidelines

- ESS 6 (2017) Biodiversity Conservation & Sustainable Management of Living Natural Resource
- EU Habitats Directive (92/43/EEC)
- EU Birds Directive (2009/147/EC)

5.7.2 Methodology for Biodiversity Studies

5.7.2.1 Flora, Habitat and Ecosystems

Data on flora and vegetation were acquired via standardized quadrate method (Sutherland, 2006) to estimate population abundance (number), density, frequency and distributions.

Floristic list was given according to the phylogenetic order in the Flora of Türkiye in the form of Pteridophyta, Gymnospermae, and Angiospermae, and families under each group were sorted in accordance with the phylogenetic order in the Flora of Türkiye. Species were given with their auteur names and if any, names in Turkish, English, phytogeographical region, whether it is endemic or not, danger categories of endemic and rare species, elevations they grow within the habitat, their habitat, and abundance of each species within the area were given respectively.

Plants collected from the study area were determined using relevant floras, the work Flora of Türkiye and the East Aegean Islands (Davis, 1965-1988) being the first. In order to determine endemic species and endangered species although they are not endemic, Red Book of Turkish Plants (Ekim et al., 2000) was taken as reference. Since Red Book of Turkish Plants was prepared in accordance with the criteria of IUCN 1994, danger categories were revised in accordance with IUCN 2001.

Endemic, rare species and species under international preservation, as well as significant habitats were determined within the determined species. Areas where endangered species concentrates along the line and sensitive ecosystems were reported including reasons and such areas were referred as "Ecologically Sensitive Areas." Because such areas are highly sensitive to deterioration either due to rare species they contain or to the fact that necessary measures were not taken. Additional information was given on what kind of measures need to be taken in these determined areas, when should the construction be carried out in order to minimize impact, and whether there are species requiring collecting seeds or to make translocation.

Seed Collection and Translocation

The literature surveys and the baseline studies indicate that *Sternbergia pulchella* population on the existing Project route consists of 100 individuals, which corresponds to about 20% of its known population in Türkiye.

According to the final design of the Project, *Sternbergia pulchella* specimens' bulbs were collected and translocated to avoid being impacted by project activities. Endemic *Alopecurus adanensis* was not observed during field surveys. Therefore, no mitigation was described for *Alopecurus adanensis.*

Previously prepared reports were revised by comparing the determined species with previous studies. If the presence of an endemic or rare species is detected, necessary precautions and information about the species was given in detail.

5.7.2.2 Mammals

Although small terrestrial mammals are abundant, they are hardly observed, their prints are hardly seen, and species are determined with difficulty. However, they can be caught easily with traps at a sufficient number (e.g., standard Sherman live animal trap). Species specific to habitat types shall be determined by setting live animal traps at sufficient number, in order to represent habitat types.

Observation method is suitable for medium and large mammals: especially (i) direct observation and (ii) excretion analysis, prints, or identifying other signs.

Priority aim in site studies shall be to find out species diversity in locations to be determined according to habitat types along the line.

Monitoring studies for mammals were performed due to the breeding periods by walking 500 m - 2 km direct transects to be determined in different habitats. It is possible to find different habitat types even in such an area of 1 km^2. In such cases, sampling areas of 20 x 50 m (2500 m^2) was determined in areas where different features are found within a larger area, and inside of these areas was walked by minimum 30 minutes to record all mammal traces (nest, excretion, food remnants, physically seeing the animal, etc.). Species were tried to be determined by photo trap method at appropriate areas in potentially critical habitats.

According to previous surveys and literature there are no breeding areas determined for mammals. Previously prepared reports were revised by comparing the determined species with previous studies.

5.7.2.3 Amphibians

Within the scope of the Project, determination of the Amphibian species within the project area and impact area contained three main techniques for surveying.

Visual search of water body and surrounding area

During the daytime, at any water body in project area, the water body edge and surrounding terrestrial habitat were walked and looked for Amphibians in the water – including tadpoles and newt efts. The amphibians can travel several hundred meters away from the water body;

therefore, they were searched far away from the water body and under refugia such as logs and large stones. Amphibians' calling is species-specific. Therefore, species identification can be made from the Amphibian calling. If an Amphibian call is heard during the herpetological survey, the species were also be identified from calling.

Netting in pond

Netting can be useful for detecting: Adult newts, frog and toad tadpoles. A net was used with a rigid frame and a mesh of approximately 2 mm. The net was sweep in a strong agitating motion through vegetation at the water body edge every two meters. The animals were avoided to be touched and they were quickly released back into the water after they are photographed.

Night Survey

Some Amphibians are nocturnal and most active after dark, and advertising calling is more frequent at night. A powerful torch (lights) is an effective way to spot them in open water. A powerful torch in the range of 500,000 to 1 million candlepower was used. The waterbody was searched by torchlight from the banks.

Previously prepared reports were revised by comparing the determined species with previous studies. If the presence of an endemic or rare species is detected, necessary precautions and information about the species was given in detail.

5.7.2.4 Reptiles

Reptiles are ectothermic like Amphibians. This means they require an external ‘boost’ to their body temperature to become fully active. Reptiles achieve this effect by positioning themselves in places of increased warmth. This can involve ‘basking’ on a heat gathering surface in the sunshine (in the open or amongst some vegetation) or under objects (refugia) that absorb heat. Much of this behavior occurs during the morning and late afternoon but potentially at any time of the day depending on season and weather patterns. This presents us with an opportunity to lead to their discovery.

The best survey timing vary with location, weather patterns and species, but generally reptiles are active from March to October. The best time to survey is a mixture of time of year, time of day and weather conditions. The reptiles may appear near hibernation sites if conditions are suitable in March and April. Late August to late September can be useful for seeing juvenile animals. July and early August are generally less useful months for surveying due to the days being hotter (even reptiles can get too hot and seek shade). Time of day: In late June, when the weather is generally warmer, reptiles may be found earlier in the morning and later in the afternoon. Weather conditions: peak air temperature is between 9-20°C. Bright sunshine is favorable on cooler days and hazy or intermittent sunshine is favorable when warmer. Rain or wind is unsuitable. Also, weather sequence is important: a hot spell after several days of cold weather or showery weather after a prolonged dry period are favorable.

Reptile habitat generally has open aspect areas, is well drained and south facing, is mostly sunny, sheltered and relatively undisturbed. Therefore, grasslands, open woodland, forests, sand dunes, disused corners/edges of allotments, road and rail verges/embankments garden walls were searched. However, under refugia such as logs, and large stones were checked. Each sampling location was searched about 30-90 minutes in duration. For each sampling points, identified species were recorded. Also, species’ photos were taken when it was possible.

Previously prepared reports were revised by comparing the determined species with previous studies. If the presence of an endemic or rare species is detected, necessary precautions and information about the species was given in detail.

5.7.2.5 Birds

The Çukurova project is located on the main migration bird route. Observations were performed using point and line transects method. In addition to determination of bird species by observation during the field studies, the existence of habitats eligible for preferences of birds such as mud flat and rocky places, bird traces (nests-fledglings, feathers, claw prints, vomits and excretions, identifiable bone parts), and feeding signs were utilized in determining bird species.

Previously prepared reports were revised by comparing the determined species with previous studies. If the presence of an endemic or rare species is detected, necessary precautions and information about the species was given in detail.

5.7.2.6 Invertebrates

Insects live in asocial, semi-social or social groups, and organize their lives in line with their ecological acquisition. This should be taken into account in activities to be carried out in areas where insects are found. If insects perceive a life-threatening response from their ecological acquisition, or when their habitats deteriorate, these creatures can leave their ecological habitat. Insects consisted of a wide variety of groups. Each group (generally Lepidoptera, Odonata, Hymenoptera, Diptera) according to its own biological needs; They should be investigated by taking into account their feeding, habitat, reproductive and socializing behaviors. Also, their impacts on ecosystem services were also evaluated.

At the evaluation stage, suggestions were presented by making a two-step evaluation.

- Interaction with insects during the activity;
- Interaction with insects was evaluated after the activity.

The status of the insects' diversity criteria and risk categories are only applied according to IUCN and NRL for butterflies. IUCN only includes two main orders of insects Lepidoptera and Odonata. Turkish National Red List for Butterflies includes only Butterfly species.

Planning of Field Studies

For the surveys to be done, it is necessary to carry out field studies in three seasons (spring, summer and autumn) for insects. For beekeeping field surveys were carried out for all seasons, as wintering activities was also important for sustainable beekeeping. Before starting the field surveys, the area was studied and the possible locations for surveys were determined. For each location a pre-determined time period (like an hour) spent for determination of insect biodiversity. Photographing of insects, habitat types, population density were among the parameters to be taken.

Data collecting

- Evaluation of literature and study records;

The studies conducted up to the study of the insect species living in the designated research area were compiled and the data related to the insect species living in the field were collected based on the literature records and suggestions were provided for the later stages of the study. The activity area and the ecological impact limits of the area were evaluated seasonally in terms of nutrition, habitat, reproduction and social behavior.

- Habitat assessment;

With the start of the surveys, determination of the general habitat types (EUNIS) in the area by evaluating the habitats seasonally. Depending on the habitats, insect species likely to be present in each habitat type were identified.

- Gathering information by interviewing local people living in the project area and surroundings;

During the surveys, information were collected from the local people about the area types and their populations by questionnaire or one-to-one interviews.

- Interim evaluation;

The information obtained as a result of the literature, habitat assessment and interviews with local residents were evaluated; A general evaluation was made on the insect species and populations of the area. As a result of this evaluation, the areas, species and populations to be concentrated were determined. As a result of these determinations, the activity plan was revised to determine how the area, species and populations will be affected and how the negative effects will be minimized. Most of the data was obtained through the observation (and photographing), no sampling (by hand or catching by insect trap) of the individuals, nest, different developmental stages of the species if possible were also recorded in the areas.

- Sampling of insect species and Observation;

No sampling was carried out during field studies. All data are based on the insect groups that were encountered in the area, especially butterflies (Lepidoptera), bees (Hymenoptera), dragonflies (Odonata), flies (Diptera), were documented by photographing. During the observations, the coordinates of the location where a species was determined were recorded with GPS. For collecting the insect necessary equipment (forceps, nets, aspirators, etc.) was used. After photographing and recording the individual insects, they were released back to its habitats.

- Ecosystem Services:

Methodological researches in beekeeping

The beekeeping activities in the project area and its surroundings was investigated both at the provincial and district level, and the beekeeping potential was evaluated. In the study area and its environs if there were hives to be encountered, information on beekeeping activities and potential was obtained by contacting the beekeeper and the importance of the area in terms of beekeeping activities was studied.

- Analysis / evaluation;

Analysis and evaluation of the study area in terms of biological needs of insects were done seasonally. The following evaluations were made to determine the seasonal use of insects and the seasonal distribution of populations.

a) Do insects use the work area continuously or intermittently?
b) Do populations of insects change seasonally?
c) Do the insect species' existences differ due to the climatic changes in the area?
d) Do any of insects' groups provide ecosystem services (especially beekeeping potential)?

After determining the data in these four items, the interaction states of the insect's species determined to live in the area during and after the activity were determined.

- Identification of vulnerable or threatened species;

The species determined in the study area were categorized according to their affects; Vulnerable and/or threatened species, if any, were identified according to internationally signed criteria (BERN, IUCN, etc.).

- Mitigation measures:

In general, or in special cases, possible risks, adverse effects and threats arising from the project were determined for insect species whose presence was determined in the area. Measures, remediation and protection measures were identified and recommended against these adversities.

Post-study

After surveys, changes in the species, population and behaviors of invertebrates can be determined and the forecasts to be taken in possible situations are determined.

Species to be monitored were suggested to the practitioner by determining the invertebrate species that was the basis for monitoring specifically for the project implementation planned in the field in the long term.

5.7.2.7 Aquatic Habitat

Possible aquatic habitat crossings were monitored, and habitat structures were determined. During monitoring studies;

- Broad site/crossing point description, including details on whether the watercourse has been engineered or whether it is natural,
- Water chemistry information (if possible, using a hand-held water chemistry meter),
- Flow types (% of each type present),
- Water depth,
- Substrate types (% of each type present),
- Neighboring land use,
- Bank cover/characteristics,
- Fish habitat presence, including potential spawning areas,
- Instream vegetation (type and % cover),
- Photographs will be taken at each crossing point location and upstream/downstream (so minimum three photographs at each location),
- Notes will be taken on any visible poor water quality/pollution evidence; and
- Any flora/fauna will also be noted.

Phytoplankton, zooplankton, benthic and fish species were studied and given in detail.

5.7.3 Biodiversity Study Area

In order to identify impacts of the Project on biodiversity and to conduct critical habitat assessment, in line with the provisions of the World Bank ESS6, the larger ESIA study area, which consists of a 500-m corridor extending on each side of the proposed route was considered as the Biodiversity Study Area.

Some of the studies carried out within the scope of Phase 1 were not carried out during the periods when animals and plants were seen, and further studies were proposed in this respect. For this reason, Phase 2 studies were conducted covering all biodiversity issues and appropriate seasons.

In Phase 2 of the Project biodiversity field surveys covered the entire Biodiversity Study Area, in addition to which reference areas outside the Project footprint, and habitats with similar ecological features and carrying capacities were also considered.

In Phase 2 of the Project detailed flora and fauna sampling surveys were conducted at 8 Locations for Flora, 22 Locations for Invertebrates, 16 Locations for Herpetofauna, 9 Locations for birds, 22 Locations for Mammals, 5 Locations for Bats, and 10 Locations for Hydrobiological sampling Locations within the Biodiversity Study Area. These sampling points were selected considering habitat characteristics, as well as habitat preferences of flora and fauna species. Natural habitats and species that are of high conservation concern (CR, EN, VU, NT and those that require special conservation measures) were prioritized during the field surveys. Ornithological surveys were conducted at vantage points, representing different habitats, and also along transect lines. A map showing sampling/vantage points is presented in figure below.

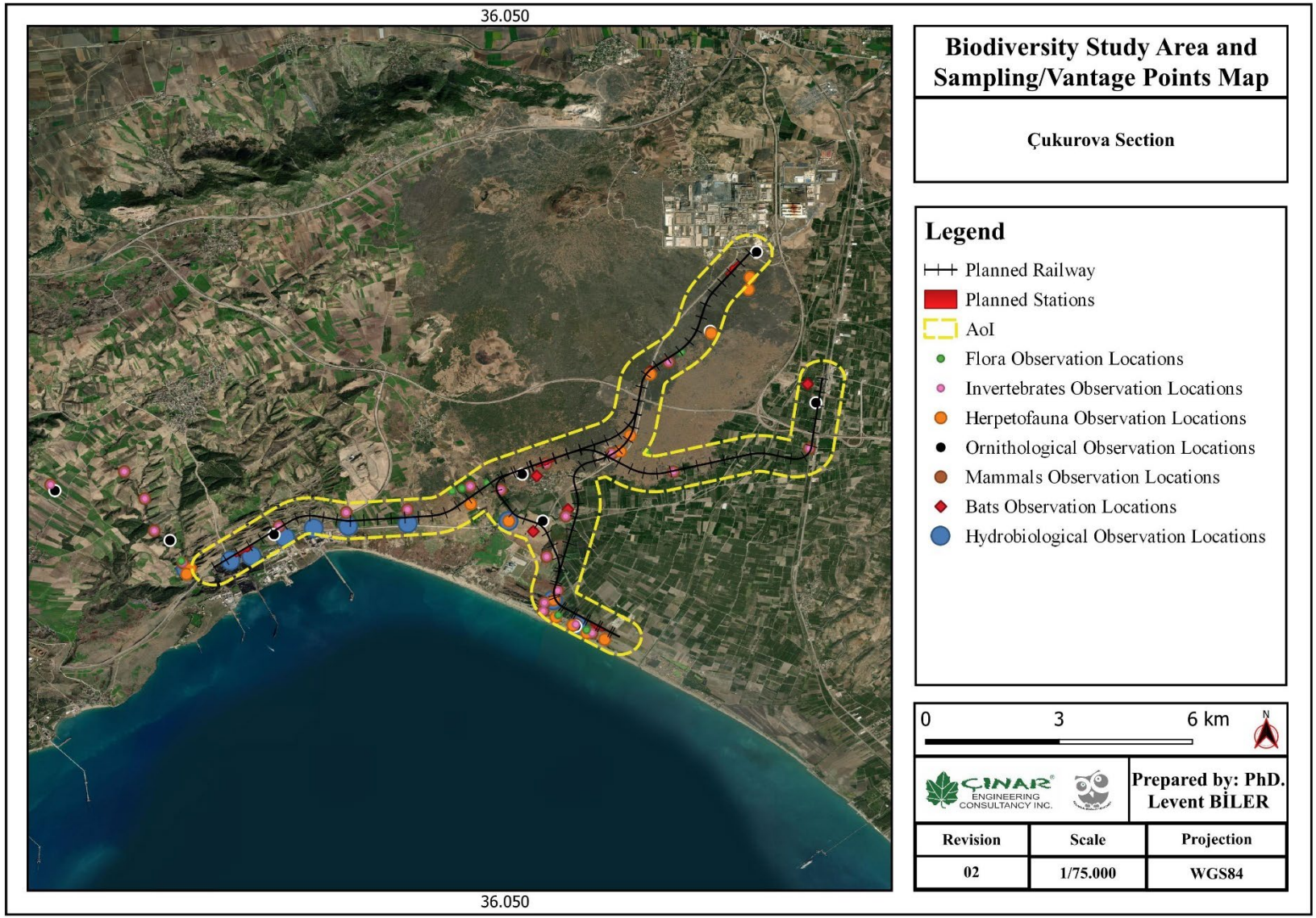


Figure 65. Biodiversity Study Area and Sampling/Vantage Points

5.7.4 Protected Areas

The World Bank ESS6 identify two different types of protected areas; Legally Protected and Internationally Recognized Areas of High Biodiversity Value. Legally Protected Areas as defined by ESS6 are those that meet the definition: “A clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.”, while Internationally Recognized Areas of high biodiversity value include World Heritage Natural Sites, Biosphere Reserves, Key Biodiversity Areas, Important Bird Areas, Alliance for Zero Extinction Sites and Ramsar Wetlands of International Importance, among others. When a project is located within a legally protected or internationally recognized area, ESS6 sets requirements in addition to those that are related to critical habitat. Accordingly, it is required to;

- demonstrate that the proposed development in such areas is legally permitted,
- act in a manner consistent with any government recognized management plans for areas
- consult protected area sponsors and managers, affected communities, indigenous peoples and other stakeholders on the proposed project, as appropriate; and
- implement additional programs to promote and enhance conservation aims and impactive management of the area.

In line with this approach, areas that have been designated a status under the Turkish protected area system, as well as areas designated as Key Biodiversity Areas (KBAs), Important Bird and Biodiversity Areas (IBAs) and Important Plant Areas (IPAs) were screened for the purpose of this ESIA.

5.7.4.1 Legally Protected Areas

The International Union for Conservation of Nature (IUCN) proposes the following definition for a protected area (IUCN, 2017), which today is widely used around the globe, and recognized as the definition of legally protected areas by ESS6:

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

Legally protected areas constitute an integral part of biodiversity conservation efforts, as well as ecosystem services provided by ecological functions they convey. In Türkiye, Ministry of Agriculture and Forestry is the main official body responsible for development and implementation of national biodiversity conservation policies, action plans, designation of conservation areas, and many other related tasks conducted by its central and local directorates within the Ministry’s organizational structure. IUCN Protected Area Management Categories (Dudley et al.,2013) were adopted to restructure the Turkish Protected Area System in 2006 through the Biodiversity and Natural Resource Management Project undertaken by the Ministry’s General Directorate of Nature Conservation and National Parks (Thomas, 2006). The IUCN Protected Area Management Categories provide a global framework and is recognized by the Convention on Biological Diversity, with an initial objective of creating a common understanding of protected areas within and between countries. Categorization is done according to the primary management objectives for a protected area, based on the principles listed as the following:

- assignment to a category is a not a commentary on management impactiveness,
- the categories systems are international; national names for protected areas may vary, and
- all categories are important; and gradation of human intervention is implied.

Accordingly, legally protected areas in Türkiye, were re-classified under the 6 protected area management categories defined by the IUCN Guidelines, which identify the main reasons for management as the following:

- **I** Strict protection [Ia) Strict nature reserve and Ib) Wilderness area]
- **II** Ecosystem conservation and protection (i.e., National park)
- **III** Conservation of natural features (i.e., Natural monument)
- **IV** Conservation through active management (i.e., Habitat/species management area)
- **V** Landscape/seascape conservation and recreation (i.e., Protected landscape(seascape)
- **VI** Sustainable use of natural resources (i.e., Managed resource protected area)

Legally protected areas around the Project route and their IUCN protected area categories are given in Table 81, and a map showing the locations of the protected areas with respect to the Project route is presented in Figure 66. Considering the distances between the railway route and the legally protected areas in the region, there will be no Project-related impacts on these areas.

Table 81. Legally Protected Areas near the Project Route

Protected Area	IUCN Protected Area Category	Distance to the Project Route (km)
Osmaniye Zorkun Wildlife Development Area	IV	11.2
Ciftmazi Nature Park	V	14.1
Şahin Tepesi Nature Park	V	9.8
Kastabala Wetland of Local Importance	IV	16.5
Tekkoz-Kengerli Düz Nature Conservation Area	VI	17.6
Yumurtalık Lagoon Nature Conservation Area, National Park, Ramsar Site	Ia, II, VI	30.6

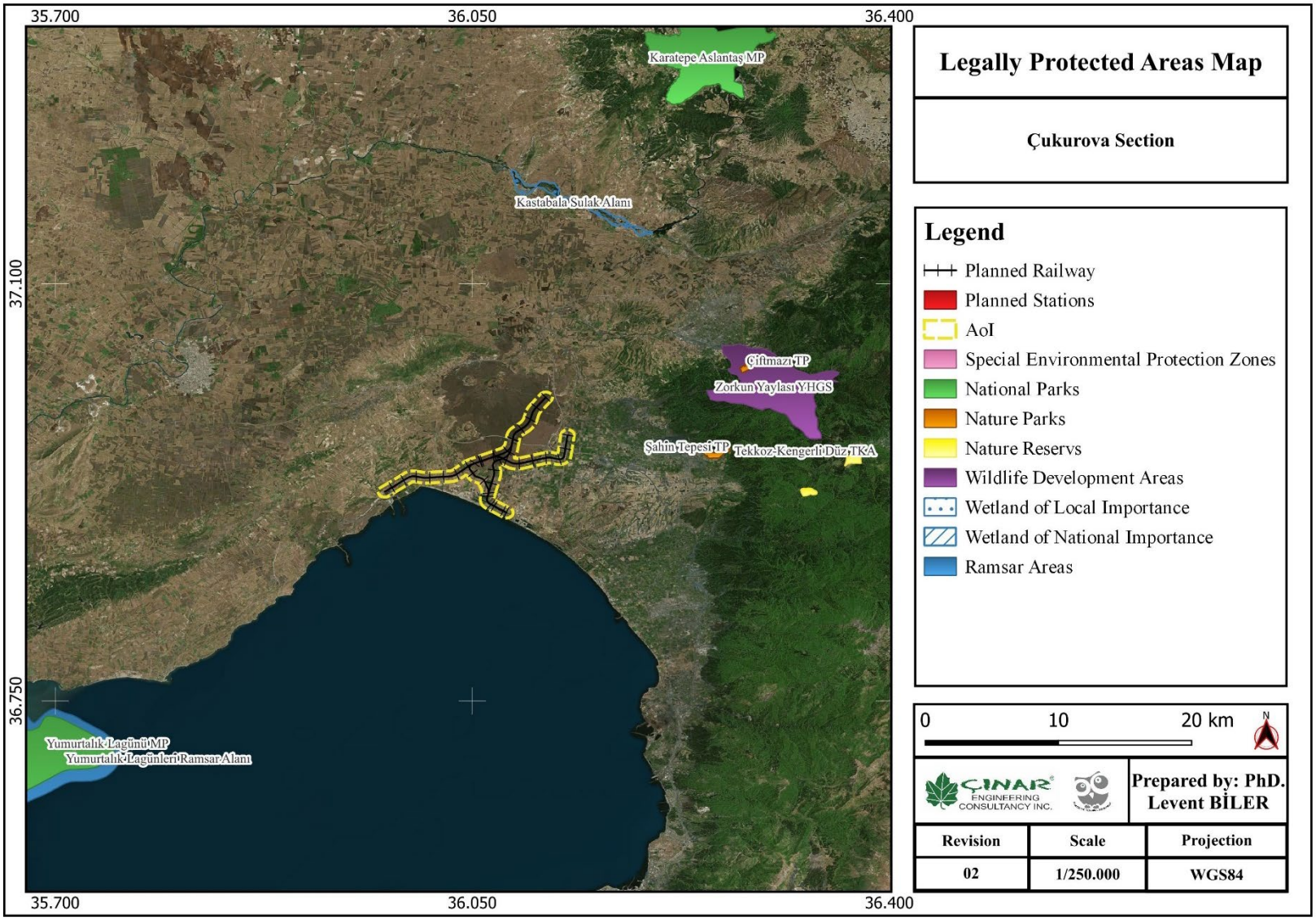


Figure 66. Legally Protected Areas

5.7.4.2 Internationally Recognized Areas of High Biodiversity Value

ESS6 defines Internationally Recognized Areas of High Biodiversity Value as “areas of recognized importance to biodiversity conservation but are not always legally protected”. Internationally Recognized Areas of high biodiversity value as per ESS6 include World Heritage Natural Sites, Biosphere Reserves, Key Biodiversity Areas, Important Bird Areas, Alliance for Zero Extinction Sites and Ramsar Wetlands of International Importance, among others. Guidance Note 6 also addresses that internationally recognized areas of high biodiversity value will often qualify as critical habitat; for instance, areas that meet the criteria of the IUCN’s Protected Area Management Categories Ia, Ib and II, or the majority of Key Biodiversity Areas (KBAs), which encompass, among others, Important Bird and Biodiversity Areas (IBAs).

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

Doğa Derneği, published an inventory on Key Biodiversity Areas (KBAs) in Türkiye in 2006 in collaboration with then the Ministry of Environment and Forestry, integrating survey results across the country with expert opinions (Eken et al., 2006). The preparation of the inventory was the first time the KBA approach was applied at a national scale, which was based on principles developed by BirdLife International for bird species in their “Important Bird Areas” studies. One of the fundamental functions of the inventory is defined as “providing resource for areas and species that should be worked upon to reach zero extinction”.

Burnaz Kumsalı (Dunes) is one of the KBAs identified by the inventory, which covers the 14-kilometer coastline and its associated habitats within Erzin district boundaries. The OIZ-Port connection line passes along terrestrial boundary of KBA in the north-south direction. A 6-kilometer section of the KBA is intensely used as a beach. Starting from the coastline, there are dunes, dune grassland, ponds that have been formed due to water extraction and reedbeds in the KBA.

Burnaz Dunes meets the KBA criteria for an endemic reptile species that only inhabits coastal dunes and some inland habitats in Cyprus, Syria, Lebanon, Israel and Türkiye. *Acanthodactylus schreiberi* – İskenderun lizard is listed as Endangered (EN) according to the IUNC Red List criteria.

To conserve the species and its habitats in Türkiye, a Species Action Plan covering 2015-2020 was prepared by Hatay Branch Office of the General Directorate of Nature Conservation and National Parks, based on studies conducted by ÇINAR (DKMPGM, 2005). The Action Plan provides estimations on the population size of the species, and its population distribution and range between Adana Yumurtalık Free Zone and Aşağıburnaz village. The Plan also includes the current threats that the lizard is facing in Türkiye, and actions to be taken to ensure conservation of its population. Threats that are of high significance were identified as changing land use to agricultural land, stubble fire, pollution due to construction wastes, urbanization and construction of new plants and roads, and the fact that local people do not know much about the importance of the species.

There are also two regional endemic species that are categorized as Critically Endangered (CR) by the Red List, which are not included in the KBA inventory but identified during ESIA studies; *Echinops dumanii* and *Astragalus antiochianus*. The natural distribution is for both species are coastal dunes and dune heaths. Their populations are also continuously threatened by anthropogenic impacts.

Burnaz Dunes KBA has no legal protection status, and there are no national/regional strategy documents, management plans, or action plans prepared for the area. In order to appoint an

IUCN protected area management category to the KBA within the scope of the ESIA process, existing information on the biodiversity value of the area and land use characteristics were utilized. Considering its habitat characteristics and species it supports, which are endemic and threatened by extinction, Burnaz Dunes KBA has been assessed to be a Category Ia: Strict nature reserve as per IUCN protected area management categories.

The main objective of Category Ia is to conserve regionally, nationally or globally outstanding ecosystems, species (occurrences or aggregations) and/or geodiversity features. Use and impacts are strictly controlled and limited to ensure protection of the conservation values. Such protected areas can serve as reference areas for scientific research and monitoring.

At the scoping phase of the ESIA studies, it was identified that the port connection line of the Project was planned to pass through the dune habitat. The General Directorate of Infrastructure Investments (DGII) was informed about the conservation priorities for Burnaz Dunes and *Acanthodactylus schreiberi*. In line with the mitigation hierarchy, in order to avoid potential impacts of the Project, alternative routes were considered by the DGII and the line was redesigned so that it does not pass through the dune habitat. Although Burnaz KBA has been assessed as part of the ESIA as it is located within the Biodiversity Study Area, there will be no Project-related impacts on the dune habitats and species populations they support. Details on the redesign is detailed in Project Alternatives section of this ESIA Report, where Route Selection and Optimization are discussed.

Photographs of Burnaz Dunes and *Acanthodactylus schreiberi* are provided in Figure 67, while a map showing the updated route assessed in this ESIA Report, KBA boundaries and the distribution of İskenderun lizard defined in the Action Plan is presented in Figure 68.



Figure 67. Burnaz Dunes Key Biodiversity Area and *Acanthodactylus schreiberi*

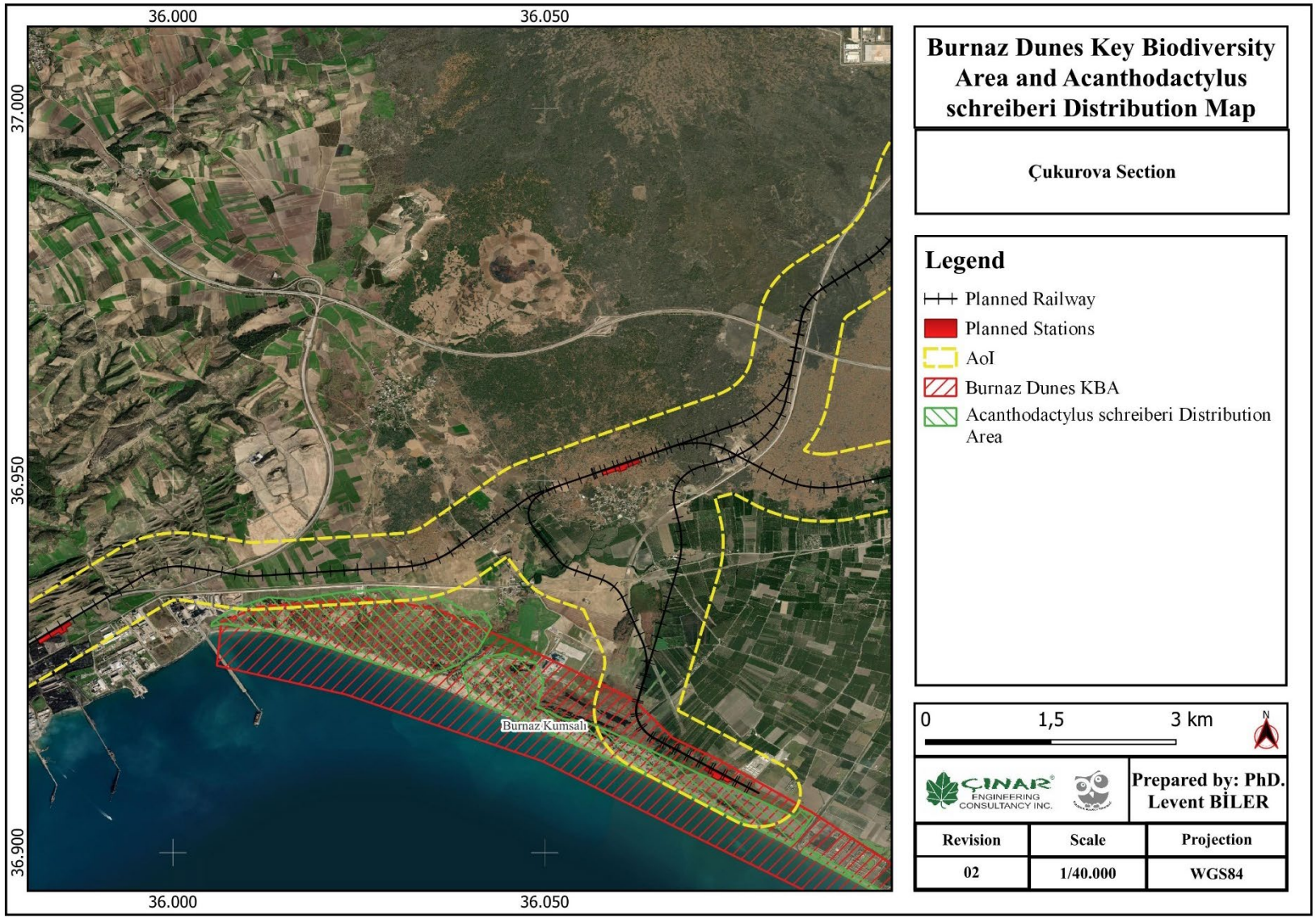


Figure 68. Burnaz Dunes Key Biodiversity Area and *Acanthodactylus schreiberi* Distribution Map

5.8 Baseline Conditions

Çukurova Region and İskenderun Bay Railway Connection Project route starts from Osmaniye industrial zone and is divided into two branches in Yukarıburnaz village; the first being connected to Erzin railway, while the second branching further in the south.

Baseline studies conducted in the Biodiversity Study Area as shown in Figure 65 rely on previously conducted studies, literature information on habitats and species, as well as direct observations and Project-specific data collected on site by field experts. Field methodologies developed by each of these experts and study results are presented in the previous sections. Some of the general methodologies for field surveys can be listed as the following:

- In determining sampling/vantage points, locations that represent different habitat types and those that had been identified to be significant to species were considered.
- Some of the flora and fauna species were recorded through direct observations.

5.8.1 Habitat Classification

The European Nature Information System (EUNIS) puts forward a system for identification and classification of European habitat types. Classification area is quite large including the entire European mainland and seas including islands that are close to the mainland (except for Cyprus, Iceland and Greenland), EU states' archipelagos (Canary Islands, Madeira Islands and Azore Islands) and the European mainland to the west of Ural Mountains that cover Türkiye and the Caucasus. The main objective of the EUNIS habitat classification is to create a European reference set of habitat types including a description of all types and hierarchical classification.

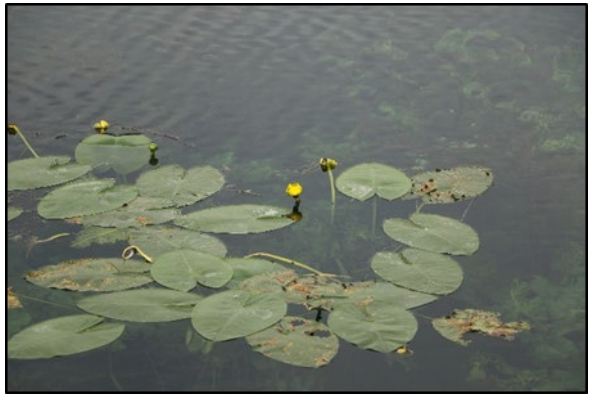
Habitats within the Biodiversity Study Area were evaluated in accordance with the EUNIS classification, which is useful in terms of not only relating the national classifications to international level, but in terms of corresponding EUNIS habitats to habitats listed in Annex I of Habitats Directive for "designation of special areas of conservation" and the European Red List of Habitats (Janssen, 2016) for the critical habitat assessment.

Natural habitat types of the Biodiversity Study Area, characteristic plant species of these habitats, related EUNIS codes, corresponding Habitat Directive Annex I habitats and Natura 2000 codes, as well as the European Red List categories are presented in Table 82. In addition to habitats explained in the table there are also modified and artificial habitats that can be listed as; G2.8: Highly artificial broadleaved evergreen forestry plantations, J1.2: Residential buildings of villages and urban peripheries, J1.4: Urban and suburban industrial and commercial sites still in active use, J1.6: Urban and suburban construction and demolition sites, J2.6: Disused rural constructions, J2.7: Rural construction and demolition sites, J4.2: Road networks, J4.3: Rail networks, J5.4: Highly artificial non-saline running waters and J6.1: Waste resulting from building construction or demolition.

Photographs of the natural and modified EUNIS habitat types of the Biodiversity Study Area are presented in Figure 69. and a map showing the habitats is provided in Figure 70.

Table 82. Habitats of the Biodiversity Study Area

EUNIS Habitat Type	Habitats Directive Annex I	Habitat Characteristics
B1.4: Coastal stable dune grassland (grey dunes)	2130: Fixed coastal dunes with herbaceous vegetation (grey dunes)	• Found near the port connection line • Coastal dunes in the area are at their climax phase and are quite healthy. Dominant species are; *Euphorbia paralias, Eryngium maritimum, Thymelaea hirsuta, Helianthemum stipulatum.* • There is also regional endemic *Echinops dumanii* inhabiting the area.
B1.5: Coastal dune heaths	2100 – Proposed Natura 2000 Code	• This habitat represents the sand hills behind the dunes. • Dominant species are; *Myrtus communis, Erica manipuliflora, Pistacia lentiscus, Thymelaea hirsuta* and *Helianthemum stipulatum.* • There are also regional endemic species of *Echinops dumanii ve Astragalus antiochianus.*
C1.2: Permanent mesotrophic lakes, ponds and pools	3130: Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoeto-Nanojuncetea	• Represents the permanent ponds at the Biodiversity Study Area. • *Nuphar lutea* (Yellow water lily) has good populations in the ponds.
C3.2: Water-fringing reedbeds and tall helophytes other than canes	3210: Fennoscandian natural rivers	• Dominant species of this habitat representing pond and stream banks are species with high water demand like *Arundo donax, Phragmites australis, Lythrum salicaria, Epilobium parviflorum.*
D5.1: Reedbeds normally without free-standing water	-	• This habitat is observed in areas with high water table at the inner sections of the coastal dunes. • Characteristic species of the habitat are species with high water demand; *Phragmites australis, Cladium mariscus, Bolboschoenus maritimus, Juncus acutus, Juncus effusus, Juncus littoralis, Cyperus rotundus, İmperata cylindrica, Elymus hispidus.*
F5.2: Maquis	-	• Covers very limited areas in the Biodiversity Study Area.
F6.2: Eastern garrigues	-	• Garrigues are the most widespread habitat type in the area. Dominant buckthorns are *Paliurus spina-christii* and *Zizyphus lotus.* • There are also species like *Urginea maritima, Asphodelus aestivus* and *Cyclamen persicum* in areas of volcanic rocks.
G2.9: Evergreen orchards and groves	-	• One of the widespread modified habitats of the area, where the main produce are *Citrus limon* (lemon), *Citrus paradisi* (grapefruit), *Citrus reticulata* (clementine), *Citrus sinensis* (orange) and *Olea europaea* (olive).
I1.3: Arable land with unmixed crops grown by low-intensity agricultural methods	-	• Limited within the Biodiversity Study Area, agricultural land is used for crops and vegetables.

		
B1.4: Coastal stable dune grassland (grey dunes)	B1.5: Coastal dune heaths	C1.2: Permanent mesotrophic lakes, ponds and pools
		
C3.2: Water-fringing reedbeds and tall helophytes other than canes	D5.1: Reedbeds normally without free-standing water	F5.2: Maquis

		
F6.2: Eastern garrigues	G2.9: Evergreen orchards and groves (Orange)	G2.9: Evergreen orchards and groves (Olive)

Figure 69. Habitats of the Biodiversity Study Area

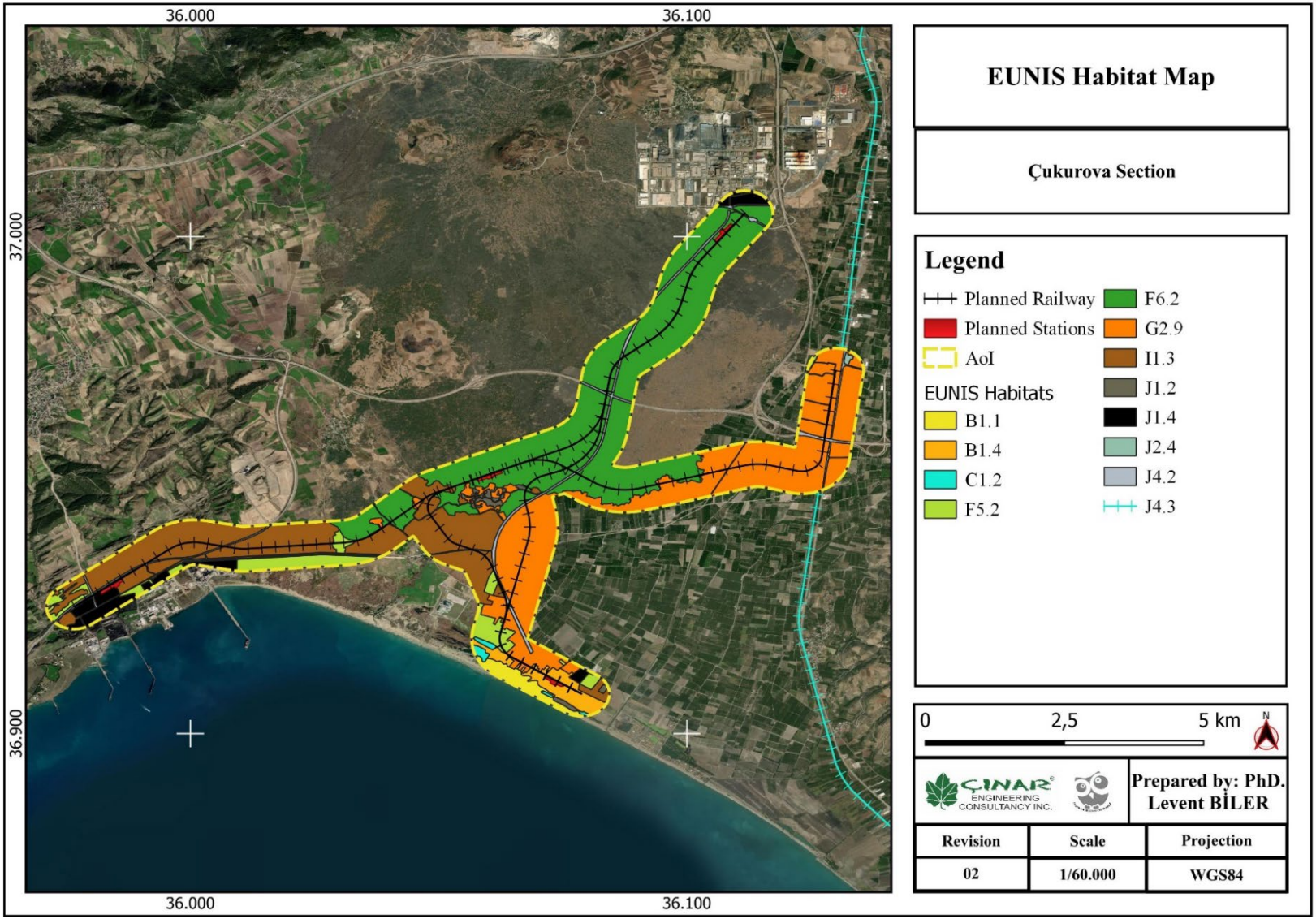


Figure 70. Habitat Map

5.8.2 Terrestrial Flora

In order to determine the flora species distributed in the area within the Aol, field surveys were carried out between 04-05.04.2023, 22-23.12.2023 for Çukurova Section. The daily activity reports of the site surveys are given in Appendix-4.

To identify the flora composition of the Biodiversity Study Area, first sampling points representing different habitat types in the area were determined during the scoping phase of the ESIA process and revision process. For assessment of Project-related impacts, field surveys were conducted on each side of the 1.000-meter corridor. At each of the sampling locations, habitats were studied in detail, and flora species were identified based on related findings and observations.

As the Project route is located in the Mediterranean Region of Türkiye, it is under the influence of the Mediterranean climate, where the vegetation also presents regional characteristics. The Biodiversity Study Area is naturally composed of maquis, garrigue, coastal dune heath and grassland, riparian and reedbed habitats. There are also intense agricultural areas, which are used to grow citrus fruits and olives.

Natural habitats of the Biodiversity Study Area have populations of natural shrubs like *Phillyrea latifolia, Paliurus spina-christii, Zizyphus lotus, Olea europaea, Quercus coccifera.* There are also cultivated plants of *Citrus limon* (lemon), *Citrus paradisi* (grapefruit), *Citrus reticulata* (clementine), *Citrus sinensis* (orange), *Olea europaea* (olive), *Zea mays* (corn), *Phaseolus vulgaris* (green bean), *Lycopersicum esculentum* (tomato), *Capsicum annuum* (pepper), *Solanum tuberosum* (potato), *Solanum melongena* (eggplant), and *Cucurbita pepo* (zucchini).

As a result of the studies carried out in the project area, 318 species and subspecies taxa belonging to 74 families were identified from the area (see Table 83). Of these detected species, 3 are regional endemic (*Echinops dumanii*, *Astragalus antiochianus*, *Alopecurus adanensis*), and 3 are on the CITES Appendix 1 List (*Cyclamen persicum*, *Sternbergia pulchella*, *Hyacinthella millingenii*). The endemic *Echinops dumanii*, *Astragalus antiochianus*, *Alopecurus adanensis* species are distributed only in the dunes of the Eastern Mediterranean coast and the coastal part of the Çukurova region in Türkiye. *Cyclamen persicum*, *Sternbergia pulchella*, *Hyacinthella millingenii* species, which are rare but not endemic, also spread only in the Eastern Mediterranean coastal regions in Türkiye.

Three of these species are regional endemics; *Echinops dumanii, Astragalus antiochianus, Alopecurus adanensis,* and another three are rare species; *Cyclamen persicum, Hyacinthella millingenii* and *Sternbergia pulchella*. Endemic species of *Echinops dumanii, Astragalus antiochianus* and *Alopecurus adanensis* are only found in Eastern Mediterranean coastal dunes and coasts of Çukurova region. Range of these species is in continuous decline due to impacts on coastal dunes. Therefore, although species populations are in good condition, due to increasing habitat loss, populations are in decline as well. The Red List category for all three species is “Critically Endangered”.

Populations of *Echinops dumanii* and *Astragalus antiochianus* in the dune habitats were identified during the field surveys. With the change in the Project route, any potential direct impacts on these populations have been avoided. *Alopecurus adanensis* record in the area, on the other hand, is based on previous surveys. The distribution area of *A. adanensis* does not coincide with the footprint of the project. *A. adanensis* was not observed during field surveys. Therefore, no mitigation was described for *A. adanensis*. Therefore, no impact is expected.

Cyclamen persicum, Hyacinthella millingenii and *Sternbergia pulchella* are not endemic but rare species that are also found in coastal areas of the Eastern Mediterranean. *Cyclamen persicum* is distributed in local populations along the Mediterranean and Aegean coasts of Türkiye and is listed in the App-I of CITES and was assigned as Vulnerable based on expert

judgement. *Sternbergia pulchella* is also distributed in Syria and Lebanon, besides Türkiye. The first time it was recorded in Türkiye was in 2020 near Osmaniye. The Biodiversity Study Area is the second known locale of the species. The Red List category for the species was assigned as Endangered based on expert judgement, considering its current population status and anthropogenic impacts that its habitats are facing. The native range of *Hyacinthella millingenii* is South Türkiye, Cyprus. It is a bulbous geophyte and grows primarily in the subtropical biome. *Hyacinthella millingenii* is Vulnerable according to IUCN Red List Category.

The seeds of endemic *Astragalus antiochianus* were collected and brought to Çınar for necessary actions (see Figure 71) in August 2023. The seeds will be extracted after drying the plant. Some of the extracted seeds will be delivered to the relevant gene bank.

Echinops dumanii were not at seed stage. Therefore, the seeds of these species could not be collected. Additionally, with the latest revision in the route, the project has moved away from the salt marsh habitat. However, if there will be any activity within the salt marsh habitat, the contractor will collect the seeds of the species, plant them in alternative habitats, and ensure the seeds reach the gene bank.

Photographs of endemic and rare species are presented in Figure 71. , and a list of all flora species identified at the Biodiversity Study Area are given in Table 83.



Echinosp dumanii (regional endemic)



Astragalus antiochianus (regional endemic)



Alopecurus adanensis (regional endemic)



Sternbergia pulchella (rare)



Cyclamen persicum (CITES Appendix I)



Hyacinthella millingenii (IUCN: VU)

Figure 71. Endemic and Rare Plant Species

Table 83. Flora Species Identified at the Biodiversity Study Area

	Family	Species	Phytogeografic Zone	Endemism		T.C.	BERN		CITES		Habitat												Abundance				
				R	W		Anx1	Anx2	Anx1	Anx2	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5
	PTERIDOPHYTA																										
1	EQUISETACEAE	*Equisetum ramosissimum* Desf.	Wide spread												x									x			
2	HYPOLEPIDACEAE	*Pteris vittata* L.	Wide spread													x								x			
3	SINOPTERIDACEAE	*Cheilanthes fragrans* (L.) Sw.	Wide spread													x	x							x			
4	ASPLENIACEAE	*Ceterach officinarum* DC.	Wide spread													x	x							x			
	SPERMATOPHYTA																										
	GYMNOSPERMAE																										
5	CUPRESSACEAE	*Cupressus sempervirens* L.	Plantation																**x**					**x**			
6	PINACEAE	*Pinus brutia* Ten.	Mediterrenian																**x**							**x**	
7		*Pinus pinea* L.	Plantation																**x**						**x**		
8	EPHEDRACEAE	*Ephedra campylopoda* C.A. Meyer	Wide spread													**x**	**x**		**x**					**x**			
	ANGIOSPERMAE																										
	DICOTYLEDONES																										
9	ANACARDIACEAE	*Pistacia lentiscus* L.	Mediterrenian									**x**				**x**	**x**								**x**		
10	APIACEAE	*Torilis leptophylla* (L.) Reichb.	Mediterrenian											x	x									x			
11		*Torilis arvensis* (Huds.) Link.	Wide spread											**x**	**x**									**x**			
12		*Eryngium maritimum L.*	Wide spread								x													x			
13		*Eryngium creticum* Lam.	Wide spread													x	x							x			
14		*Eryngium falcatum* Delar	Mediterrenian													x	x		x					x			
15		*Berula erecta* (Hunds.)Coville	Wide spread											x										x			
16		*Daucus carota* L.	Wide spread											x										x			
17		*Caucalis platycarpus* L.	Wide spread													x	x							x			
18		*Turgenia latifolia* (L.) Hoffm.	Wide spread													x	x		x					x			
19	APOCYNACEAE	*Nerium oleander* L.	Mediterrenian											x										x			
20		*Vinca herbacea* Waldst.& Kit	Wide spread													x	x							x			
21		*Trachomitum venetum* (L.) Woodson	Mediterrenian											x										x			
22	ARISTOLOCHIACEAE	*Aristolochia parvifolia* Sibth. & Sm.	Mediterrenian													x	x							x			
23	ASCLEPIADACEAE	*Cionura erecta* (L.) Griseb.	Mediterrenian										x											x			
24		*Cynanthum acutum* L. subsp. *Acutum*	Wide spread										x											x			
25	BORAGINACEAE	*Echium plantagineum* L.	Wide spread													x	x							x			
26		*Echium angustifolium* Miller	Wide spread										x											x			
27		*Anchusa aggregata* Lehm.	Mediterrenian									x	x											x			
28		*Buglossoides arvensis* (L.) Johnston	Wide spread													x	x							x			
29		*Heliotropium hirsutissimum* Grauer	Mediterrenian													x	x							x			
30		*Lithodora hispidula* (Sm.) Griseb. Subsp. *Hispidula*	Mediterrenian																x				x				
31	BRASSICACEAE	*Erophila verna* (L.) Chevall. Subsp. *Praecox* (Stev.) Walters	Wide spread													x	x							x			
32		*Descurainia sophia* (L.)	Wide spread																	x				x			
33		*Hirschfeldia incana* (L.) Lag.-Foss.	Wide spread													x	x			x				x			
34		*Cardaria draba* (L.) Desv. Subsp. *Draba*	Wide spread																	x				x			
35		*Clypeola jonthlaspi* L.	Wide spread													x	x							x			
36		*Eruca sativa* Miller	Wide spread												x					x				x			
37		*Biscutella didyma* L.	Wide spread													x	x							x			
38		*Arabis verna* (L.) DC.	Wide spread										x			x	x							x			
39		*Neslia apiculata* Fisch.	Wide spread													x	x							x			
40		*Capsella bursa-pastoris (*L.) Medik.	Wide spread										x		x	x	x							x			
41		*Sisymbrium officinale* (L.) Scop.	Wide spread												x					x				x			
42		*Cakila maritima* Scop.	Wide spread									x												x			
43		*Thlaspi perfoliatum* L.	Wide spread												x	x	x							x			
44	CAMPANULACEAE	*Michauxia campanuloides* L'Herit. Ex Aiton	Mediterrenian																x					x			
45	CAPPARACEAE	*Capparis spinosa* L. Var. *Spinosa*	Wide spread														x							x			
46	CARYOPHYLLACEAE	*Minuartia hamata* (Hausskn.) Mattf.	Wide spread													**x**	**x**						**x**				

	Family	Species	Phytogeografic Zone	Endemism		T.C.	BERN		CITES		Habitat												Abundance				
				R	W		Anx1	Anx2	Anx1	Anx2	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5
47		*Minuartia mediterranea* (Ledeb.) K. Maly	Mediterrenian													x	x							x			
48		*Saponaria glutinosa* Bieb.	Wide spread												x								x				
49		*Vaccaria pyramidata* Medik. Var. *Grandiflora* (Fisch. Ex DC.) Cullen	Wide spread																	x				x			
50		*Silene vulgaris* (Moenc) Garcke var. *vulgaris*	Wide spread																	x				x			
51		*Silene dichotoma* Ehrh	Wide spread																	x				x			
52		*Silene kotschyi* Boiss. Var. *maritima*	Wide spread								x	x												x			
53		*Silene colorata* Poiret	Wide spread								x	x												x			
54		*Dianthus strictus* Banks. & Sol. Var. *strictus*	Wide spread													x	x							x			
55		*Agrostemma githago* L.	Wide spread																	x				x			
56	CHENOPODIACEAE	*Chenopodium foliosum* (Moench) Aschers	Wide spread												x									x			
57		*Salsola ruthenica* Iljin	Wide spread								x	x												x			
58	CISTACEAE	*Cistus creticus* L.	Wide spread												x	x	x								x		
59		*Cistus salviifolius* L.	Wide spread													x	x								x		
60		*Helianthemum stipulatum* (Forsk.) Christensen	Mediterrenian									x													x		
61		*Helianthemum salicifolium* (L.) Miller	Wide spread													x	x							x			
62		*Tuberaria guttata* (L.) Fourr. Var. *Plantaginea* (Willd.)Gross.	Wide spread													x	x							x			
63		*Fumana thymifolia* (L.) Verlot var. *thymifolia*	Wide spread													x	x							x			
64	COMPOSITAE (ASTERACEAE)	*Anthemis tinctoria* L. var. *tinctoria*	Wide spread													x	x							x			
65		*Inula viscosa* (L.) Aiton	Mediterrenian												x									x			
66		*Aster subulatus* Michaux	Wide spread												x									x			
67		*Bellis perennis L.*	Wide spread													x	x							x			
68		*Senecio vernalis* Waldst. Et Kit	Wide spread													x	x			x				x			
69		*Atractylis cancellata* L.	Mediterrenian													x	x							x			
70		*Xeranthemum annuum* L.	Wide spread													x	x							x			
71		*Cichorium intybus* L.	Wide spread											x		x	x							x			
72		*Carduus pycnocephalus* L.	Wide spread											x										x			
73		*Carduus nutans* L. sensu lato	Wide spread											x										x			
74		*Onopordum acanthium* L.	Wide spread													x	x							x			
75		*Silybum marianum* (L.) Gaertner	Wide spread																	x				x			
76		***Echinops dumanii* C. Vural**	**Mediterrenian**	**x**		**CR**					**x**	**x**													**x**		
77		*Echinops viscosus* DC. Subsp. *Bithynicus* (Boiss.) Rech. Fil.	Wide spread													x	x							x			
78		*Conyza bonariensis* (L.) Cranquist	Wide spread												x									x			
79		*Cardopodium corymbosum* L.	Mediterrenian												x									x			
80		*Logfia arvensis* (L.) Holub.	Wide spread													x	x							x			
81		*Lapsana communis* L.	Wide spread												x	x	x							x			
82		*Centaurea calcitrapa* L. Ssp. *Calcitrapa*	Wide spread										x											x			
83		*Centaurea iberica* Trev. Ex Sprengel	Wide spread										x											x			
84		*Centaurea babylonica* (L.) L.	Mediterrenian																	x				x			
85		*Carthamus glaucus* Bieb. *Subsp. Glaucus*	Mediterrenian																		x			x			
86		*Carlina vulgaris* L.	Mediterrenian												x						x			x			
87		*Cirsium vulgare* (Savi) Ten.	Wide spread												x									x			
88		*Sonchus asper* (L.) Hill. Subsp. *Glauco-escens* (Jordon) Ball.	Wide spread												x									x			
89		*Crepis sancta* (L.) Babcock	Wide spread													x	x							x			
90		*Scolymus hispanicus* L.	Mediterrenian																		x			x			
91		*Scolymus maculatus L.*	Wide spread																		x			x			
92		*Crupina crupinastrum* (Moris) Vis.	Wide spread													x	x							x			
93		*Picnomon acarna* (L.) Cass.	Wide spread													x	x							x			
94		*Aetheorhiza bulbosa* (L.) Cass. Subsp. *Microcephala* Rech. Fil.	Mediterrenian													x	x		x					x			
95		*Ptilostemon diacantha (Lab.) Greuter subsp. Turcicus Greuter*	Wide spread													x	x							x			
96		*Koelpinia linearis* Pallas	Iran-Turan													x	x		x					x			
97		*Notobasis syriaca* (L.) Cass.	Mediterrenian																		x			x			
98		*Pallenis spinosa* (L.) Cass.	Mediterrenian													x	x							x			

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				R	W		Anx1	Anx2	Anx1	Anx2	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5
99		*Xanthium strumarium* L. subsp. *Cavanillesii* (Schouw) D. Löve & P. Dansereau	Wide spread								x	x			x										x		
100	CONVOLVULACEAE	*Convolvulus arvensis* L.	Wide spread																	x				x			
101		*Ipomea stolonifera* (Cyr.) J. F. Gmelin	Mediterrenian								x	x												x			
102	CRASSULACEAE	*Umbilicus horizontalis* (Guss.) DC. Var. *intermedius* (Boiss.) Chamberlain	Wide spread													x	x							x			
103	CYNOCRAMBACEAE	*Theligonum cynocrambe*L.	Wide spread													x	x							x			
104	DIPSACACEAE	*Scabiosa argentea* L.	Wide spread													x	x		x					x			
105		*Scabiosa atropurpurea* L. Subsp. M*aritima* (L.) Arc.	Wide spread													x	x							x			
106	ERICACEAE	*Erica manipuliflora* Salisb.	Mediterrenian									x													x		
107		*Arbutus unedo* L.	Wide spread													x							x				
108	EUPHORBIACEAE	*Mercurialis annua L.*	Wide spread													x	x			x				x			
109		*Euphorbia rigida* Bieb.	Mediterrenian													x	x							x			
110		*Euphorbia falcata* L. Subsp. *Falcata* var. *Falcata*	Wide spread													x	x								x		
111		*Euphorbia paralias* L.	Wide spread								x	x												x			
112		*Euphorbia apios* L.	Mediterrenian													x								x			
113		*Euphorbia peplis* L.	Mediterrenian								x	x												x			
114		*Euphorbia palustris* L.	Europe-Siberia												x									x			
115		*Chrozophora tinctoria* (L.) Rafin	Wide spread																	x				x			
116	FABACEAE	*Acacia farnesiana* (L.) Willd.	Plantation																	x				x			
117		*Prosopis farcta* (Banks & Sol.)	Wide spread																	x				x			
118		*Spartium junceum* L.	Mediterrenian													x	x							x			
119		*Calicotome villosa* (Poiret) Link	Mediterrenian													x	x		x								x
120		*Anthyllis tetraphylla* L.	Mediterrenian													x	x		x					x			
121		*Hippocrepis unisiliquosa* L. subsp. *Unisiliquosa*	Wide spread													x	x							x			
122		*Coronilla scorpioides* (L.) Koch	Wide spread													x	x							x			
123		*Coronilla varia* L.	Iran-Turan													x	x							x			
124		*Hymenocarpus circinnatus* (L.) Savi.	Wide spread													x	x		x					x			
125		*Astragalus stella* Gouan	Mediterrenian									x				x								x			
126		*Astragalus hamosus* L.	Wide spread													x	x							x			
127		***Astragalus antiochianus* Post**	**Mediterrenian**	**x**		**CR**						**x**													**x**		
128		*Astragalus gossypinus* Fischer	Mediterrenian																**x**					**x**			
129		*Lathyrus cicera* L.	Wide spread													**x**	**x**							**x**			
130		*Lathyrus sativus* L.	Wide spread													**x**	**x**			**x**							
131		*Medicago minima* (L.)Bart. Var. *Minima*	Wide spread													x	x							x			
132		*Medicago orbicularıs* (L.) Bart.	Wide spread													x	x		x					x			
133		*Medicago x varia* Martyn	Wide spread																	x				x			
134		*Melilotus alba* Desr.	Wide spread												x									x			
135		*Pisum sativum* L. Subsp. *Elatius* (Bieb.) Aschers. & Graebn. Var. *Elatius*	Mediterrenian													x	x							x			
136		*Trifolium resupinatum* L. var. *resupinatum*	Wide spread												x									x			
137		*Trifolium stellatum* L. Var. *Stellatum*	Wide spread													x	x							x			
138		*Trifolium campestre* Schreb.	Wide spread													x	x							x			
139		*Trifolium physodes* Stev. Ex Bieb. *Pyhsodes*	Wide spread													x	x		x					x			
140		*Trifolium arvense* L. subsp. *Arvense*	Wide spread													x	x		x					x			
141		*Trifolium cherleri* L.	Mediterrenian													x	x							x			
142		*Trifolium purpureum* Lois. Var. *purpureum*	Wide spread												x					x				x			
143		*Trigonella spicata* Sibth.&Sm.	Mediterrenian													x	x							x			
144		*Trigonella brachycarpa* (Fisch.) Moris	Iran-Turan													x	x							x			
145		*Trigonella spruneriana* Boiss. Var. *Spruneriana*	Iran-Turan													x	x							x			
146		*Trigonella monantha* C.A. Meyer subsp. *Monantha*	Iran-Turan													x	x							x			
147		*Vicia cracca* L. Subsp. *Stenophylla* Vel.	Wide spread													x	x										
148		*Psoralea bituminosa* L.	Mediterrenian													x	x							x			
149		*Ononis spinosa* L.subsp. *leiosperma* (Boiss.) Sirj.	Mediterrenian												x									x			

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				R	W		Anx1	Anx2	Anx1	Anx2	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5
150		*Scorpiurus muricatus* L. Var. *Subvillosus* (L.) Fiori	Mediterrenian													x	x							x			
151	FAGACEAE	*Quercus coccifera* L.	Mediterrenian									x				x	x									x	
152	GENTIANACEAE	*Blacstonia perfoliata* (L.) Hudson subsp *perfoliata*	Wide spread												x									x			
153		*Centaurium erythraea* Rafn subsp. *Erythraea*	Wide spread												x	x								x			
154	GERANIACEAE	*Erodium ciconium* (L.) L'Herit	Wide spread																	x				x			
155		*Geranium lucidum* L.	Wide spread												x	x								x			
156		*Geranium molle* L. Subsp. *Molle*	Wide spread													x	x							x			
157	LAMIACEAE	*Melissa officinalis* L.subsp. *inodora* (Bornm.) Bornm.	Mediterrenian												x									x			
158		*Teucrium scordium* L. subsp. *Scordioides* (Schereber) Maire & Petit.	Europe-Siberia												**x**									**x**			
159		*Teucrium polium* L.	Wide spread								**x**	**x**				**x**	**x**							**x**			
160		*Lavandula stoechas* L. susp. *Stoechas*	Mediterrenian													**x**	**x**							**x**			
161		*Prunella vulgaris* L.	Europe-Siberia											**x**										**x**			
162		*Satureja hortensis* L.	Wide spread									**x**		**x**										**x**			
163		*Sideritis montana* L. Subsp. *Remota* (d'Urv.) P.W. Ball ex Heywood	Wide spread													**x**	**x**		**x**					**x**			
164		*Sideritis perfoliata* L.	Mediterrenian																**x**					**x**			
165		*Stachys annua* (L.) subsp. *Annua* var. *annua*	Wide spread								**x**													**x**			
166		*Mentha longifolia* (L.) Hudson	Wide spread												**x**									**x**			
167		*Origanum vulgare* L.	Wide spread													**x**	**x**							**x**			
168		*Marrubium vulgare* L.	Wide spread													**x**	**x**							**x**			
169		*Molucella spinosa L.*	Wide spread													**x**	**x**							**x**			
170		*Salvia viridis* L.	Mediterrenian								**x**	**x**												**x**			
171		*Micromeria myrtifolia* Boiss. & Hohen	Mediterrenian													x	x							x			
172		*Phlomis longifolia* Boiss. & Bl. Var. longifolia	Mediterrenian													x	x							x			
173		*Thymbra spicata* L. Var. *Spicata*	Mediterrenian													x	x							x			
174	LAURACEAE	*Laurus nobilis* L.	Wide spread													x	x								x		
175	LINACEAE	*Linum nodiflorum* L.	Mediterrenian													x	x							x			
176		*Linum tenuifolium* L.	Wide spread													x	x							x			
177	LORANTHACEAE	*Viscum album* L. subsp. Album	Wide spread																	x				x			
178	LYTHRACEAE	*Lythrum salicaria* L.	Europe-Siberia												x									x			
179	MALVACEAE	*Malva sylvestris* L.	Wide spread												x									x			
180		*Malva neglecta* Wallr.	Wide spread													x	x							x			
181		*Althaea cannabina* L.	Wide spread												x									x			
182	MORACEAE	*Ficus carica* L. Subsp. *Carica*	Plantation													x	x							x			
183		*Morus alba* L.	Plantation																	x				x			
184	MYRTACEAE	*Myrtus communis* L.	Wide spread										x												x		
185		*Eucalyptus cameldunensis* Dehnh.	Plantation												x					x					x		
186	NYMPHAEACEAE	*Nuphar lutea* (L.) Sm.	Wide spread											x										x			
187	OLEACEAE	*Jasminum fruticans* L.	Mediterrenian													x	x							x			
188		*Olea europaea* L.var. *sylvestris*	Mediterrenian													x	x								x		
189		*Olea europaea* L.var. *europaea*	Plantation															x									x
190		*Phillyrea latifolia* L.	Mediterrenian													x	x		x								x
191		*Fontanesia phillireaoides* Labill. Subsp. *Phillireaoides*	Mediterrenian													x	x								x		
192	ONAGRACEAE	*Epilobium parviflorum* Schreber	Wide spread												x									x			
193	OROBANCHACEAE	*Orobanche caryophyllacea* Smith	Wide spread													x								x			
194	PAPAVEARACEAE	*Papaver rhoeas* L.	Wide spread																	x				x			
195	PLANTAGINACEAE	*Plantago maritima* L.	Wide spread												x									x			
196		*Plantago lanceolata* L.	Wide spread												x									x			
197	PLUMBAGINACEAE	*Plumbago europea* L.	Europe-Siberia													x	x							x			
198	POLYGONACEAE	*Polygonum cognatum* Meissn.	Wide spread												x									x			
199		*Polygonum billardii* All.	Wide spread												x									x			
200		*Polygonum equisetiforme*Sibth.&Sm.	Wide spread									x	x											x			
201	PORTULACACEAE	*Portulacca oleracea* L.	Wide spread																	x				x			
202	PRIMULACEAE	*Anagallis arvensis* L. Var. *caerulea* (L.) Gouan	Wide spread												x					x				x			

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				R	W		Anx1	Anx2	Anx1	Anx2	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5
203		***Cyclamen persicum*** Miller	**Mediterrenian**						**EK1**							**x**	**x**							**x**			
204	RANUNCULACEAE	*Clematis vitalba* L.	Wide spread												x									x			
205		*Anemone coronaria* L.	Mediterrenian													x	x							x			
206		*Ranunculus chius* DC.	Wide spread													x	x							x			
207		*Ranunculus arvensis* L.	Wide spread															x		x				x			
208		*Ranunculus repens* L.	Wide spread															x		x				x			
209		*Ranunculus constantinopolitanus* (DC.) d'Urv.	Wide spread																	x				x			
210		*Ranunculus rionii* Lagger	Wide spread														x							x			
211		*Ranunculus ficaria* L. subsp. *Ficariiformis* Rouy & Fouce	Wide spread													x	x							x			
212	RHAMNACEAE	*Paliurus spina-christi* Miller	Wide spread													x	x										x
213		*Zizyphus lotus* (L.) Lam.	Mediterrenian													x	x								x		
214		*Rhamnus oleoides* L. subsp. *Graecus* (Boiss.Rreut.) Holmboe	Mediterrenian								x					x	x							x			
215	ROSACEAE	*Potentilla recta* L.	Wide spread													x	x							x			
216		*Sarcopoterium spinosum* (L.) Spach	Wide spread													x	x							x			
217		*Sanguisorba minor Scop. Subsp. Muricata (Spach)Brig*	Wide spread												x	x	x							x			
218		*Prunus spinosa* L. var. *dasyphylla* (Schur) Domin	Wide spread													x	x							x			
219		*Rosa canina* L.	Wide spread														x							x			
220		*Rubus canascens* DC. Var. *Canascens*	Wide spread												x									x			
221		*Rubus discolor* Weihe & Nees	Wide spread												x									x			
222	RUBIACEAE	*Callipeltis cucullaria* (L.) Steven	Iran-Turan													x	x							x			
223		*Cruciata taurica* (Pallas ex Willd.) Ehrend.	Iran-Turan													x	x							x			
224		*Galium fissurense* Ehrend.& Schönb. -Tem.	Iran-Turan												x		x							x			
225		*Galium verum* L. subsp. *Verum*	Europe-Siberia												x									x			
226		*Rubia tinctorum* L.	Iran-Turan													x	x							x			
227		*Sherardia arvensis* L.	Mediterrenian													x	x		x					x			
228	RUTACEAE	*Citrus limon* (L.) Burm.f.	Plantation															x									x
229		*Citrus paradisi* Macfad.	Plantation															x									x
230		*Citrus reticulata* Blanco	Plantation															x									x
231		*Citrus sinensis* (L.) Osbeck	Plantation															x									x
232	SANTALACEAE	*Osyris alba* L.	Mediterrenian													x	x							x			
233	SCROPHULARIACEAE	*Veronica bozakmanii* M.A. Fischer	Iran-Turan													x	x							x			
234		*Veronica arvensis* L.	Wide spread													x	x							x			
235		*Veronica triloba* (Opiz) Kerner	Wide spread													x	x							x			
236		*Veronica anagallis-aquatica* L.	Wide spread												x									x			
237		*Verbascum cheiranthifolium* Boiss. Var. Cheiranthifolium	Wide spread										x			x								x			
238		*Verbascum sinuatum L.*	Mediterrenian										x			x								x			
239		*Scrophularia scopolii* (Hoppe ex) Pers var. Scopolii	Wide spread													x	x							x			
240		*Linaria simplex* (Willd.) DC.	Mediterrenian													x	x							x			
241		*Parentucellia latifolia* (L.) Caruel *subsp. Latifolia*	Mediterrenian													x	x							x			
242		*Kickxia lanigera* (Desf.) Hand.- Mazz.	Wide spread													x	x							x			
243	SIMAROUBACEAE	*Ailanthus altissima* (Miller) Swingle	Wide spread															x						x			
244	SOLANACEAE	*Mandragora autumnalis* Bertol	Mediterrenian													x	x							x			
245		*Datura stramonium* L.	Wide spread										x		x									x			
246	STYRACACEAE	*Styrax officinalis* L.	Wide spread													x	x		x					x			
247	TAMARICACEAE	*Tamarix tetranda* Pallas ex Bieb	Wide spread										x		x										x		
248	THYMELAEACEAE	*Thymelaea hirsuta* (L.) Endl.	Mediterrenian										x											x			
249	URTICACEAE	*Urtica dioica* L.	Europe-Siberia															x		x				x			
250		*Parietaria lusitanica* L.	Mediterrenian													x	x							x			
251	VALERIANACEAE	*Valerianella balansae* Mathews	Wide spread													x	x							x			
252	VERBANACEAE	*Phylla nodiflora*(L.) Greene	Wide spread												x									x			
253		*Vitex agnus-castus* L.	Mediterrenian										x		x									x			
254	ZYGOPHYLLACEAE	*Tribulus terrestris* L.	Wide spread															x		x				x			
	MONOCOTYLEDONES																							**x**			

	Family	Species	Phytogeografic Zone	Endemism		T.C.	BERN		CITES		Habitat												Abundance				
				R	W		Anx1	Anx2	Anx1	Anx2	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5
255	**AMARYLLIDACEAE**	***Sternbergia puchella* Boiss. & Blanche**	**Mediterrenian**			**VU**												**x**						**x**			
256		*Sternbergia colchiciflora* Waldst.& Kit.	Wide spread														x							x			
257	ARACEAE	*Arum dioscoridis* Sm. Var. *syriacum* (Blume) Engler	Mediterrenian													**x**	**x**							**x**			
258		*Arisarum vulgare* Targ.-Tozz. Subsp. *Vulgare*	Mediterrenian													**x**	**x**							**x**			
259	CYPERACEAE	*Cladium mariscus* (L..) Pohl.	Wide spread												**x**									**x**			
260		*Bulboschoenus maritimus* (L.) Palla var. *maritimus*	Wide spread									**x**			**x**										**x**		
261		*Carex otrubae* Podp.	Europe-Siberia												**x**									**x**			
262		*Cyperus capitatus* Vandelli	Wide spread								**x**	**x**													**x**		
263		*Cyperus rotundus* L.	Wide spread												**x**									**x**			
264	DIOSCEREACEAE	*Tamus communis* L. subsp. *Communis*	Mediterrenian												**x**									**x**			
265	GRAMINEAE (POACEAE)	*Poa bulbosa* L.	Wide spread													x	x							x			
266		*Lagurus ovatus* L.	Wide spread									x								x				x			
267		*Digitaria sanguinalis* (L.) Scop.	Wide spread												x									x			
268		*Bracypodium sylvaticum* (Hudson) P. Beauv.	Wide spread												x									x			
269		*Elymus hispidus* (Opiz) Melderis subsp. *Hispidus*	Wide spread												x									x			
270		*Koeleria cristata* (L.) Pers.	Wide spread													x								x			
271		*Cynosurus effusus* L.	Mediterrenian													x	x							x			
272		*Chrysopogon gryllus* (L.) Trin. Subsp. *Gryllus*	Wide spread													x	x								x		
273		*Themeda triandra* Forsskal	Wide spread													x	x								x		
274		*Bromus arvensis* L.	Wide spread													x	x							x			
275		*Bromus tectorum* L	Wide spread									x				x	x			x				x			
276		*Dactylis glomerata* L. subsp. *Hispanica* (Roth) Nyman	Mediterrenian													x	x							x			
277		*Briza humilis* Bieb.	Wide spread													x	x							x			
278		*Lolium perenne* L.	Wide spread													x	x							x			
279		*Apera intermedia* Hackel	Iran-Turan													x	x							x			
280		*Alopecurus arundinaceus* Poiret	Europe-Siberia												x									x			
281		***Alopecurus adanensis* M. Doğan**	**Mediterrenian**	**x**		**CR**						**x**								**x**				**x**			
282		*Cynodon dactylon* (L.) Pers. Var. *dactylon*	Wide spread												**x**									**x**			
283		*Polypogon monspeliensis* (L.) Desf.	Wide spread												**x**									**x**			
284		*Phleum bertolonii* DC.	Mediterrenian												**x**									**x**			
285		*Arundo donax* L.	Wide spread										**x**		**x**	**x**											**x**
286		*Phragmites australis* (Cav.)Trin. Ex Steudel	Wide spread												**x**	**x**											**x**
287		*Saccharum ravennae* (L.) Muray	Wide spread												**x**	**x**								**x**			
288		*Imperata cylindrica* (L.) Raeuschel	Wide spread												**x**	**x**								**x**			
289		*Sporobolus virginicus* (L.) Kunth	Wide spread												**x**	**x**								**x**			
290		*Avena sativa L.*	Wide spread														**x**	**x**						**x**			
291		*Psilurus incurvus* (Gouan) Schinz & Thell	Wide spread														**x**	**x**						**x**			
292		*Melica minuta* L.	Mediterrenian														**x**	**x**						**x**			
293		*Psilurus incurvus* (Gouan) Schinz & Thelll.	Wide spread														x	x						x			
294		*Pennisetum orientale* L.C.M. Richard	Iran-Turan														x	x						x			
295		*Piptatherum miliaceum* (L.) Cosson subsp. *Thomasii* (Duby) Freitag	Wide spread														x	x						x			
296		*Stipa bromoides* (L) Dörfler	Mediterrenian														x	x						x			
297		*Trachynia distachya* (L.) Link	Mediterrenian														x	x						x			
298	IRIDACEAE	*Crocus cancellatus* Herb.	Mediterrenian													x								x			
299	JUNCACEAE	*Juncus acutus* L.	Wide spread												x	x									x		
300		*Juncus littoralis* C.A. Meyer	Mediterrenian												x	x								x			
301		*Juncus capitatus* Weigel	Wide spread												x	x									x		
302		*Juncus effusus* L.	Wide spread												x	x									x		
303	**LILIACEAE**	***Hyacinthella millingenii* (Post) Feinbrun**	**Mediterrenian**			**VU**											**x**	**x**						**x**			
304		*Smilax aspera L*	Mediterrenian														x	x						x			
305		*Ruscus aculeatus* L. var. *angustifolius* Boiss.															x	x						x			
306		*Asphodelus aestivus* Brot.	Mediterrenian														x	x						x			
307		*Allium junceum* Sm. subsp. *junceum*															x	x						x			

	Family	Species	Phytogeografic Zone	Endemism		T.C.	BERN		CITES		Habitat												Abundance				
				R	W		Anx1	Anx2	Anx1	Anx2	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5
308		*Urginea maritima* (L.) Baker	Mediterrenian													x	x										x
309		*Colchicum stevenii* Kunth	Mediterrenian													x								x			
310		*Asparagus acutifolius* L.														x	x							x			
311		*Asparagus officinalis* L.														x	x							x			
312		*Asparagus acutifolius* L.	Wide spread													x	x							x			
313		*Ornithogalum narbonense* L.	Mediterrenian													x	x							x			
314		*Muscari comosum* (L.) Miller	Mediterrenian													x	x							x			
315		*Scilla autumnalis* L.	Mediterrenian													x	x							x			
316		*Gladiolus illyricus* W. Koch	Mediterrenian													x	x							x			
317	POTAMOGETONACEAE	*Potamogeton pectinatus* L.	Wide spread											x	x									x			
318	THYPHACEAE	*Thypa angustifolia* L.	Wide spread											x	x									x			

Description	
Endemism	**Habitat Classification**
R: Regional Endemic	**1: B1.4:** Coastal stable dune grassland (grey dunes)
W: Wide spread endemic	**2: B1.5:** Coastal dune heaths
T.C. :Threat Category (According to IUCN)	**3: C1.2:** Permanent mesotrophic lakes, ponds and pools
EX : Extinct	**4: C3.2:** Water-fringing reedbeds and tall helophytes other than canes
EW : Extinct in the Wild	**5: D5.1:** Reedbeds normally without free-standing water
CR : Critically Endangered	**6: F5.2:** Maquis
EN : Endangered	**7: F6.2:** Eastern garrigues
VU : Vulnerable	**8: G2.9:** Evergreen orchards and groves
NT : Near Threatened	**9: G3.F:** Highly artificial coniferous plantations
LC : Least Concern	**10: I1.3:** Arable land with unmixed crops grown by low-intensity agricultural methods
DD : Data Deficient	**11: J1.4:** Urban and suburban industrial and commercial sites still in active use
	12: J4.2: Road networks

According to the surveys performed in the area *Cyclamen persicum*, *Sternbergia pulchella*, and *Hyacinthella millingenii* species bulbs were collected and re-located (see Figure 72) in April 2023. 131 bulbs of *Cyclamen persicum,* 33 bulbs of *Sternbergia pulchella,* and 185 bulbs of *Hyacinthella millingenii* were collected and re-located for in-situ protection. Re-location areas were selected according to habitat needs of each species.

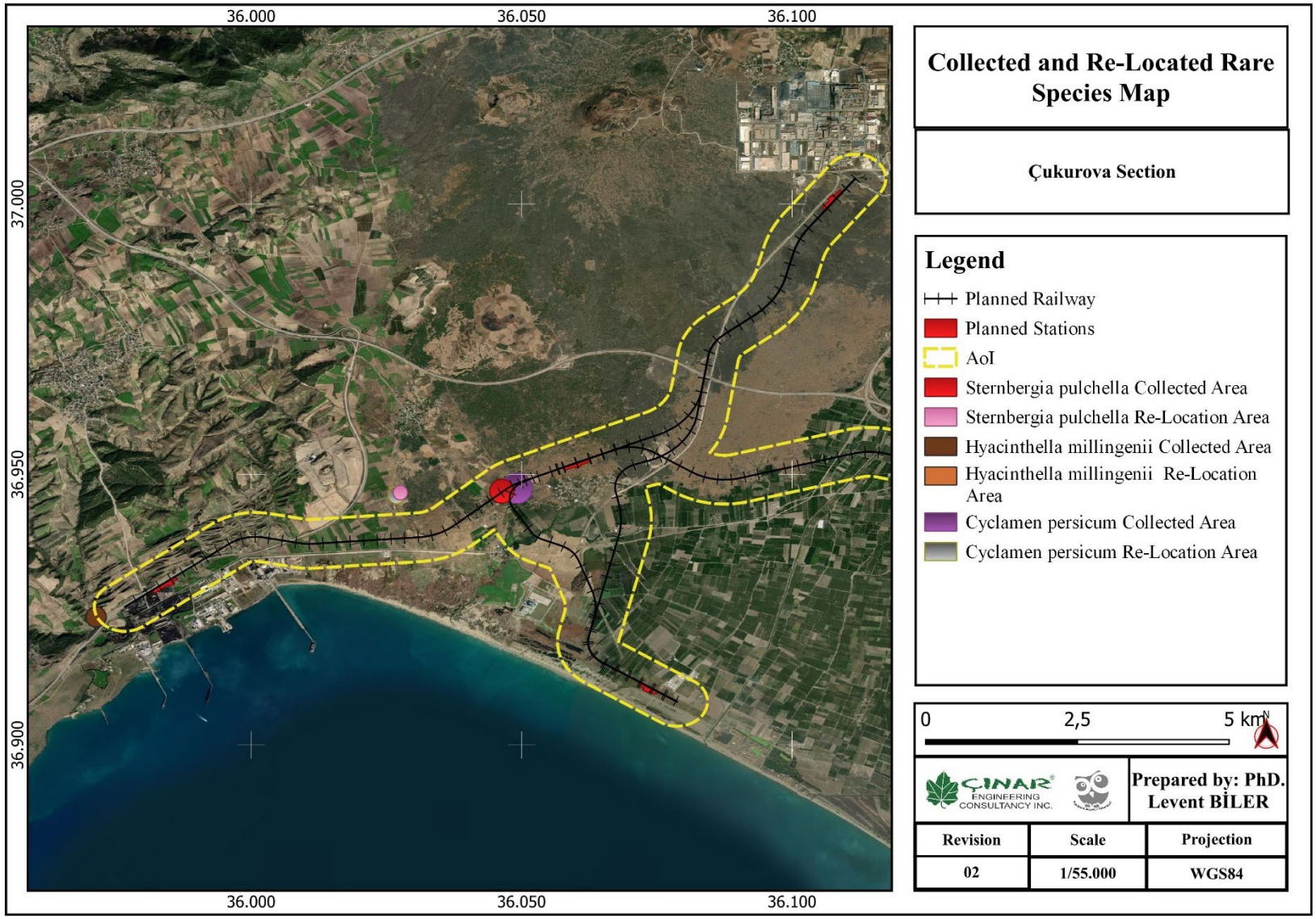


Figure 72. Collected and Re-Located Rare Species Map

5.8.3 Fauna

5.8.3.1 Invertebrates

The scope and the methodology used during the field surveys were given above. The daily activity reports of the site surveys are given in Appendix-4.

Insects live in asocial, semi-social or social groups, and organize their lives in line with their ecological acquisition. This should be taken into account in activities to be carried out in areas where insects are found. If insects perceive a life-threatening response from their ecological acquisition, or when their habitats deteriorate, these creatures can leave their ecological habitat. Insects consisted of a wide variety of groups. Each group (generally Lepidoptera, Odonata, Hymenoptera, Diptera) according to its own biological needs; They should be investigated by taking into account their feeding, habitat, reproductive and socializing behaviors. Also, their impact on ecosystem services were also evaluated.

At the evaluation stage, suggestions should be presented by making a two-step evaluation.

1. Interaction with insects during the activity,
2. Interaction with insects should be evaluated after the activity.

Field surveys were conducted between 8-9.10.2022 and 29.04-02.05.2023. Surveys were performed at 22 locations (see Figure 73). During field survey each location is visited and spent equal amount of time to observe invertebrate species and if possible, the pictures were taken with a Canon N70 digital camera. 57 different insects were observed belonging to 8 insect orders. Among the recorded species 19 butterfly species and 13 dragonfly species were observed (see Table 84). Based on the IUCN categories all species observed in 22 locations are not threatened. They are all in LC “Least concern” risk category.

Table 84. Observed Invertebrate Species at Çukurova Section

Species	Turkish Name	English Name	Loc 1	Loc 2	Loc 3	Loc 4	Loc 5	Loc 6	Loc 7	Loc 8	Loc 9	Loc 10	Loc 11	Loc 12	Loc 13	Loc 14	Loc 15	Loc 16	Loc 17	Loc 18	Loc 19	Loc 20	Loc 21	Loc 22
Hymenoptera																								
Apis mellifera	Balarısı	Honeybee	x	x	x	x	x	x	x	x		x			x	x	x		x	x	x	x	x	x
Polistes gallicus	Avrupa kağıt yaban arısı	European paper waps						x			x									x	x			
Xylocopa pubescens	Marangoz arı	Carpenter bee							x															
Xylocopa violaceae	Marangoz arı	Carpenter bee														x								
Vespula sp.	Yaban arısı	Wasps				x																		
Diptera																								
Asilidae spp.	Hırsız sinek	Robber fly						x		x					x									
Helophilus trivittatus		Tiger hoverfly						x																
Eristalis tenax	Arı sineği	Hover fly													x	x		x						
Lucilia sericata	Ölü sineği	Blow fly										x				x								
Orthoptera																								
Orthoptera spp	Çekirgeler	Grasshoppers											x											
Locusta migratoria	Çöl çekirgesi	Locust													x	x								
Odonata																								
Sympetrum fonscolombii	Kırmızı damarlı yusufçuk	Red veined darter	x					x								x	x							
Sympetrum striolatum	Büyük taş bakiresi	Common darter			x																			

Species	Turkish Name	English Name	Loc 1	Loc 2	Loc 3	Loc 4	Loc 5	Loc 6	Loc 7	Loc 8	Loc 9	Loc 10	Loc 11	Loc 12	Loc 13	Loc 14	Loc 15	Loc 16	Loc 17	Loc 18	Loc 19	Loc 20	Loc 21	Loc 22
Platycnemis pennipes	Mavi tüy bacaklı	Blue featherleg			x				x															
Aeshna isosceles	Avcı yusufçuk	Hawker Dragonfly							x										x	x				
Ischnura elegans	Mavi kuyruklu kızböceği	Blue tailed damselfly			x															x	x			
Libellula pontica		Red chaser							x															
Libellula fulva	Cüsseli yusufçuk	Scarce chaser																			x			
Orthetrum taeniolatum		Small skimmer							x	x	x													
Orthetrum brunneum	Güney çalıbakiresi	Southern skimmer										x								x				
Sympetrum danae	Siyah yusufçuk	Black darter																		x				
Trithemis annulata	Menekşe damlası	Violet dropwing			x		x					x			x		x	x	x					
Coenagrion syriacum		Syrian bluet			x																			
Cercion lindenii		Goblet-marked damselfly			x														x					
Hemiptera																								
Hemiptera spp.		True bug	x	x	x	x			x		x					x							x	x
Eurydema ornata	Lahana kokulu böceği	Shield bug									x	x			x									x
Pentatomidae	Koku böceği	Stink bug							x															
Cercopis arculata	Şeytan tükürüğü	Spittle bug												x		x								
Mantodea																								

Species	**Turkish Name**	**English Name**	**Loc 1**	**Loc 2**	**Loc 3**	**Loc 4**	**Loc 5**	**Loc 6**	**Loc 7**	**Loc 8**	**Loc 9**	**Loc 10**	**Loc 11**	**Loc 12**	**Loc 13**	**Loc 14**	**Loc 15**	**Loc 16**	**Loc 17**	**Loc 18**	**Loc 19**	**Loc 20**	**Loc 21**	**Loc 22**
Mantis religiosa	Peygamber devesi	Praying mantis						x	x															
Coleoptera																								
Coccinella sempempunctata	Uğur böceği	Ladybug				x	x			x	x					x			x					x
Blaps tibialis	Karafatma	Darkling beetles		x			x									x								
Curculionidae spp.	Hortumlu böcek					x		x	x		x													
Larinus onopordi	Hortumlu böcek	Globe thistle capitulum weevil								x	x			x										
Lixus pulverulentus	Hortumlu böcek	Yellow weevil									x													
Tropinata hirta	Baklazınnı	Flower chafers							x							x								
Oxythyrea cinctella		Chasfer beetle							x	x	x			x										
Scarabeaidae spp.	Bok böceği	Dung beetle											x											
Calomera concolor	Kaplan böceği	Tiğer beetle																x						
Lepidoptera																								
Utetheisa pulchella	Güzel benekli ayı güvesi	Harlequin moth	x	x		x								x	x		x							
Chilades trochylus	Mücevher kelebeği	Grass jewel butterfly	x																					
Polyommatus icarus	Çokgözlü mavi	Common blue				x																	x	
Lycaena thersamon	Küçük ateş kelebeği	Lesser fiery copper		x		x			x															

Species	Turkish Name	English Name	Loc 1	Loc 2	Loc 3	Loc 4	Loc 5	Loc 6	Loc 7	Loc 8	Loc 9	Loc 10	Loc 11	Loc 12	Loc 13	Loc 14	Loc 15	Loc 16	Loc 17	Loc 18	Loc 19	Loc 20	Loc 21	Loc 22
Lycaena tityrus	İsli Bakıre kelebeği	Sooty copper							x								x						x	
Pelopidas thrax	Beyaz çilli kara zıpzıp	Millet skipper			x				x	x	x	x												
Zizeeria karsandra	Karsandra	Dark grass blue			x	x																		x
Leptotes pirithous	Mavi zebra	Zebra blue			x					x	x		x											
Carcharodus lavantherae	Mermer zıpzıpı	Marbled skipper				x																	x	
Carcharodus alceae	Hatmi zıpzıpı	Mallow skipper				x			x		x			x										
Melitaea trivia	Güzel İparhan	Lesser spotted fritillary		x										x	x		x	x	x		x		x	
Coleas crocea	Sarı azamet	Dark clouded yellow																x						
Pierisbrassicae	Büyük Beyaz Melek	Large White							x		x													
Pieris rapae	Küçük beyaz	Small white			x				x			x				x							x	x
Vanessa cardui	Diken kelebeği	Painted lady				x		x						x	x	x	x						x	x
Pyrgus melotis	Ege zıpzıpı	Aegean skipper			x																			
Pontia edusa	Yeni Benekli Melek	Eastern Bath White						x	x														x	
Tauricus balkanicus	Balkan kaplanı	Little Tiger Blue						x																
Zygaena filipendulae		Burnet Moths											x											

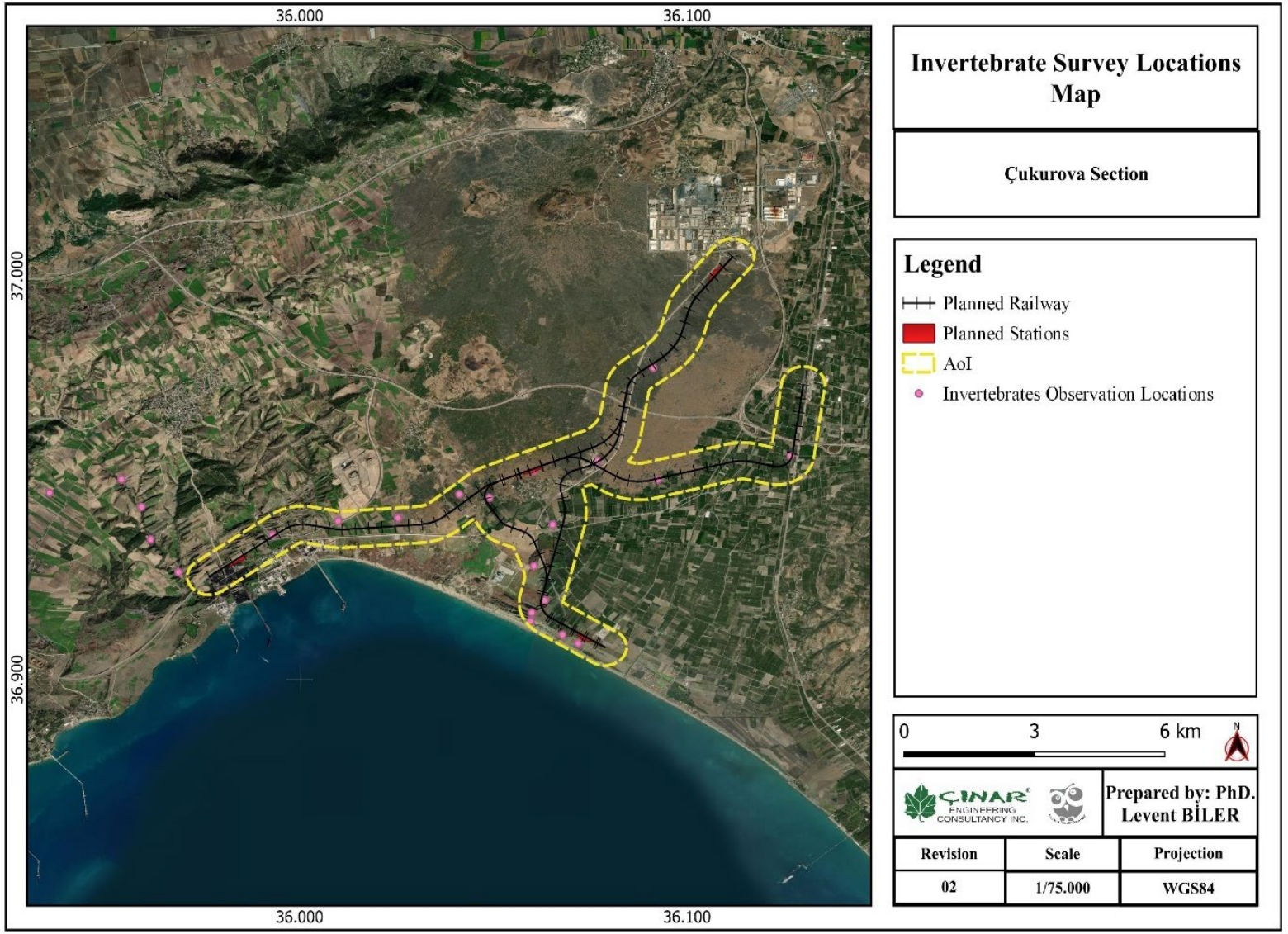


Figure 73. Invertebrate Survey Locations Map

5.8.3.2 Amphibian and Reptile Species

In order to determine the herpetofauna species distributed in the area within the Aol, field surveys were carried out between 01-02.10.2022 and 01-02.05.2023 for Çukurova Section. The daily activity reports of the site surveys are given in Appendix-4.

Field surveys were performed at 16 locations (see Figure 74). As a result of the field observation studies carried out on the Çukurova line, 22 herptile species were identified in total, including 4 amphibians, 3 turtles, 9 lizards, and 7 snake species. The detailed data on observed species are given in Table 85.

As a result of the field surveys *Testudo graeca* (IUCN:VU), *Trionyx triunguis* (IUCN:VU) and *Acanthodactylus schreiberi* (IUCN:EN) were identified as trigger species. *Testudo graeca* is widespread in Türkiye, but is under threat. *Acanthodactylus schreiberi* is distributed only at the Burnaz Coast. Therefore, the species is under threat. However, according to the surveys and changes in the railway route, it is anticipated that there will be no impact on the habitat of the *Acanthodactylus schreiberi* as a result of the Project's removal from the dune habitat (redesign of the railway route so that it does not pass through the dune habitat), which is identified as Critical Habitat. The Nile softshell turtles (*Trionyx triunguis*) are commonly found in brackish water, as well as in freshwater reaching seas and sometimes in the sea. This species is distributed across Turkey, Egypt, Syria, Lebanon, Israel and Greece. There is only one record of this species on Kos Island, Greece and the biggest population can be found in Turkey. According to the herpetofauna and hydrobiological surveys conducted between September 2022-August 2023 within the scope of the Project, the Nile (African) softshell turtle was not observed in the biodiversity study area, but iincluded from literature data.

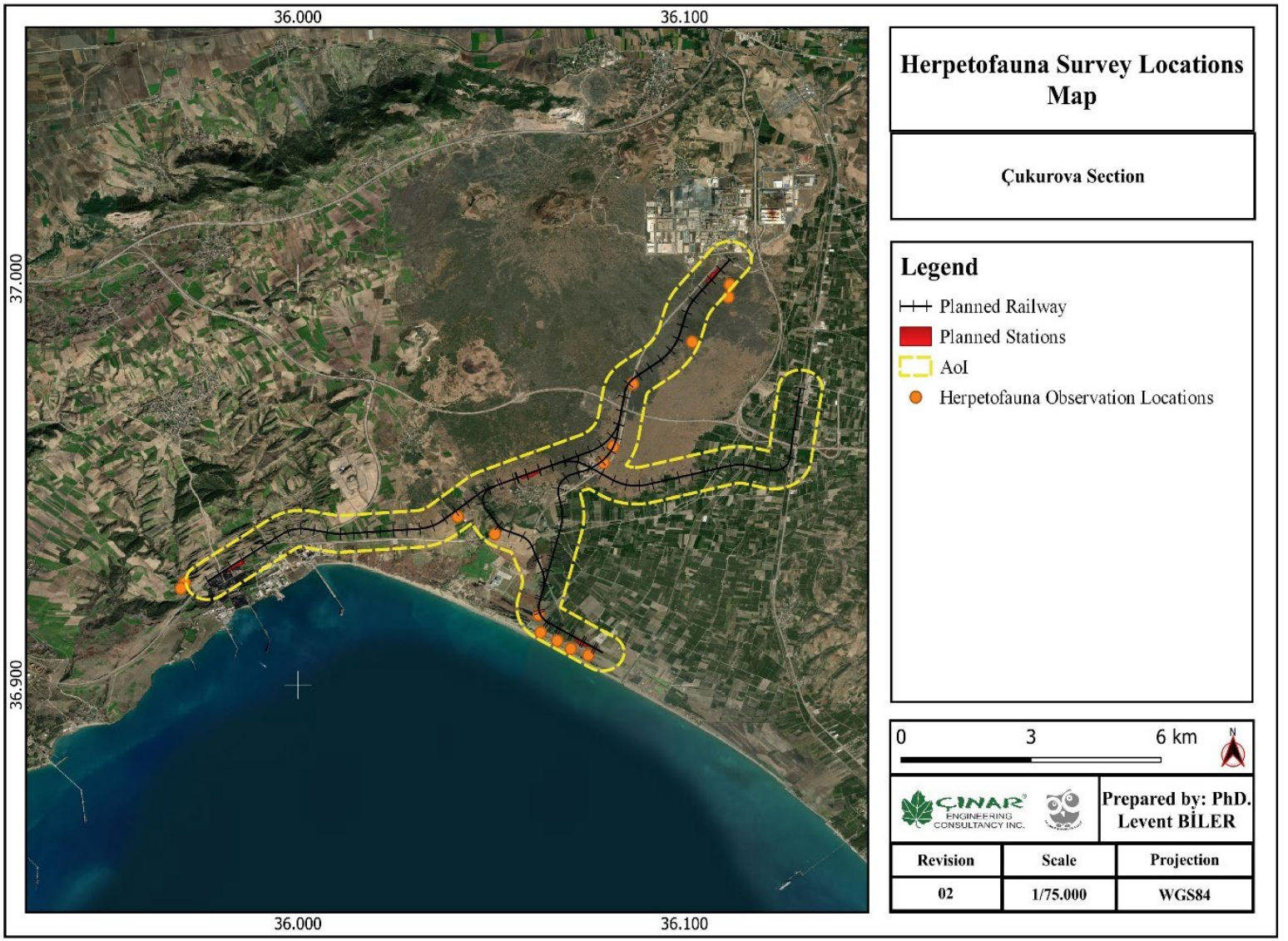


Figure 74. Herpetofauna Survey Locations for Çukurova Section

Table 85. Detailed data on Amphibia and Reptile Species Determined in Çukurova Section

Family	Common Name	Scientific name	Endemizm	IUCN	CITES	BERN	MAF	CHC	OT
Bufonidae	European Green Toad	*Bufotes viridis*	-	LC	Unlisted	II	Unlisted	Unlisted	Direct Observation
Hylidae	Savigny's Treefrog	*Hyla savignyi*	-	LC	Unlisted	III	Unlisted	Unlisted	Literature+questionary
Ranidae	Marsh Frog	*Pelophylax ridibundus*	-	LC	Unlisted	III	Unlisted	Unlisted	Direct Observation
Salamandridae	Southern Banded Newt	*Ommatotriton vittatus*	-	LC	Unlisted	III	Unlisted	Unlisted	Literature
Geoemydidae	Balkan Pond Turtle	*Mauremys rivulata*	-	Unlisted	Unlisted	III	UP	Unlisted	Direct Observation
Testudinidae	Greek Tortoise	*Testudo graeca*	-	VU	II	II	UP	Unlisted	Direct Observation
Gekkonidae	Mediterranean Thin-Toed Gecko	*Mediodactylus orientalis*	-	Unlisted	Unlisted	III	Unlisted	Unlisted	Direct Observation
Trionychidae	African Softshell Turtle	*Trionyx triunguis* - VU II II UP	Unlisted	Literature					
Agamidae	Starred Agama	*Laudakia stellio*	-	LC	Unlisted	II	UP	Unlisted	Direct Observation
Anguidae	European Glass Lizard	*Pseudopus apodus*	-	LC	Unlisted	II	UP	Unlisted	Direct Observation
Lacertidae	Schreiber's Fringe-Fingered Lizard	*Acanthodactylus schreiberi*	-	EN	Unlisted	III	UP	Unlisted	Direct Observation
Lacertidae	Anatolian Lizard	*Apathya cappadocica*	-	LC	Unlisted	III	UP	Unlisted	Direct Observation
Lacertidae	Snake Eyed Lizard	*Ophisops elegans*	-	LC	Unlisted	II	UP	Unlisted	Direct Observation
Lacertidae	Lebanon Lizard	*Phoenicolacerta laevis*	-	LC	Unlisted	III	UP	Unlisted	Direct Observation
Scincidae	Bridled Mabuya	*Heremites vittatus*	-	LC	Unlisted	III	UP	Unlisted	Direct Observation
Scincidae	Golden Grass Mabuya	*Heremites auratus*	-	LC	Unlisted	III	UP	Unlisted	Direct Observation
Colubridae	Large Whip Snake	*Dolichophis jugularis*	-	LC	Unlisted	II	UP	Unlisted	Literature+questionary
Colubridae	Levantine Dwarf Racer	*Eirenis levantinus*	-	LC	Unlisted	III	UP	Unlisted	Direct Observation
Colubridae	Dahl's Whip Snake	*Platyceps najadum*	-	LC	Unlisted	II	UP	Unlisted	Literature+questionary
Psammophiidae	Eastern Mentpellier Snake	*Malpolon insignitus*	-	LC	Unlisted	III	UP	Unlisted	Literature+questionary
Natricidae	Dice Snake	*Natrix tessellata*	-	LC	Unlisted	II	UP	Unlisted	Literature+questionary
Typhlopidae	European Blind Snake	*Xerotyphlops vermicularis*	-	LC	Unlisted	III	UP	Unlisted	Direct Observation
Viperidae	Blunt-Nosed Viper	*Macrovipera lebetinus*	-	LC	Unlisted	II	UP	Unlisted	Literature+questionary

IUCN Red List: DD= Data Deficit, NE= Not Evaluated, LC=Least Concern, VU= Vulnerable, EN=Endangered, CR=Critically Endangered

MAF: Ministry of Agriculture and Forestry
OT: Observation Type

CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora)
Appendix-I: species, which are under the threat of extinction. Trade in the specimens of these species is not allowed except in extraordinary circumstances
Appendix-II: species, which are not threatened with extinction but trade in specimens is restricted to prevent utilization incompatible with their survival
Appendix-III: species for which other parties of CITES is applied for assistance in controlling trade and which are conserved at least in one country

BERN: Bern Convention
Appendix II: List of strictly protected fauna species
Appendix III: List of protected fauna species

CHC: 2021-2022 Decisions of Central Hunting Commission
Appendix -I (species protected by the CHC)
Appendix -II (species allowed to be hunted for some time)

5.8.3.3 Bird Species

Field surveys for the ornithological assessments within the scope of the project has been conducted on 26-27.12.2022 and 17-18.04.2023 in Çukurova sub-project area. 9 observation locations were selected (see Figure 75).

In Çukurova a total of 108 bird species have been identified during the field studies in October, December 2022 and April 2023 (see Table 86). Eurasian Curlew and Northern Lapwing are listed as “NT-Near Threatened” and Red-footed Falcon is listed as “VU-Vulnerable” according to the IUCN Red List criteria. Rest of the species have the “LC-Least Concern” Criteria. 27 species are listed in Annex-1 of Birds Directive. These species are: Glossy Ibis, Little Egret, Great White Egret, Purple Heron, Squacco Heron, White Stork, Western Marsh Harrier, Hen Harrier, Long-legged Buzzard, Lesser Spotted Eagle, Short-toed Snake Eagle, Ruff, Wood Sandpiper, Northern Lapwing, Kentish Plover, Black-winged Stilt, Black Francolin, Mediterranean Gull, Slender-billed Gull, Sandwich Tern, Common Kingfisher, Peregrine Falcon, Merlin, Red-backed Shrike and Rüppell’s Warbler. According to the Birds Directive, for all species listed Annex-1 the member states must conserve their most suitable territories in number and size as Special Protection Areas.

According to the BERN Convention, 74 bird species are listed in Annex-2, which are listed as the strictly protected fauna species, and 30 bird species are listed in Annex-3, which are listed as protected fauna species.

Among the important and conservation priority species the Black Francolin, Red-backed Shrike, Western Marsh Harrier and Rüppell’s Warbler are breeding in the area. Black-winged Stilt, Long-legged Buzzard, Kentish Plover, Lesser Grey Shrike, Masked Shrike are possible breeders, while other species are migratory species using the area as staging and refueling sites.

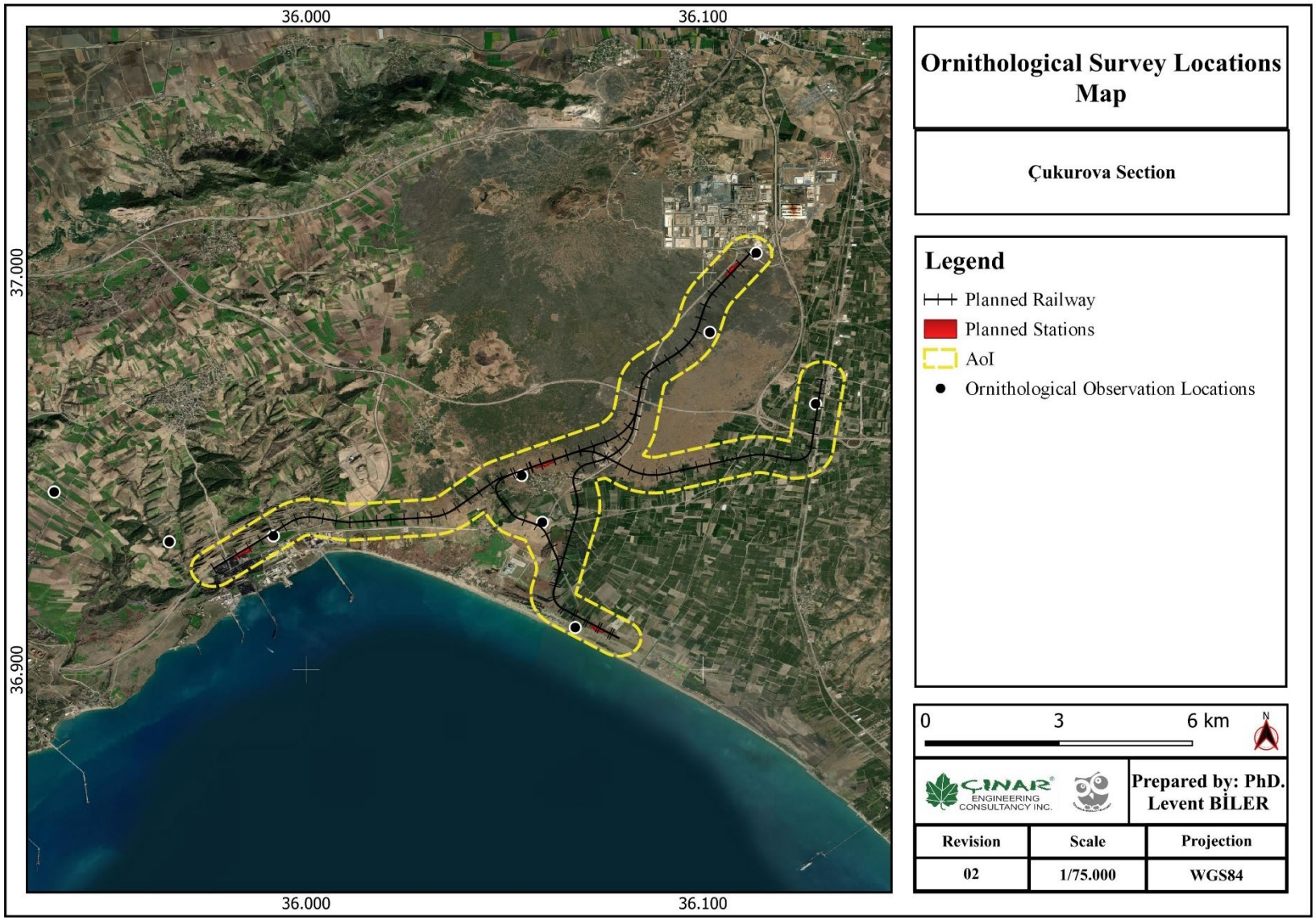


Figure 75. Ornithological Observation Locations for Çukurova Section

Table 86. List of bird species identified at Çukurova Section

No	Family	Scientific name	English name	Turkish name	IUCN	BERN	Bird Directive
1	Podicipedidae	*Tachybaptus ruficollis*	Little Grebe	Küçük batağan	LC	Annex-3	
2	Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant	Karabatak	LC	Annex-3	
3	Threskiornithidae	*Plegadis falcinellus*	Glossy Ibis	Çeltikçi	LC	Annex-2	Annex-1
4	Anatidae	*Anas crecca*	Eurasian Teal	Çamurcun	LC	Annex-3	
5	Anatidae	*Spatula clypeata*	Northern Shoveler	Kaşıkgaga	LC	Annex-3	
6	Ardeidae	*Egretta garzetta*	Little Egret	Küçük ak balıkçıl	LC	Annex-2	Annex-1
7	Ardeidae	*Ardea alba*	Great White Egret	Büyük ak balıkçıl	LC	Annex-2	Annex-1
8	Ardeidae	*Ardea cinerea*	Grey Heron	Gri balıkçıl	LC	Annex-3	
9	Ardeidae	*Ardea purpurea*	Purple Heron	Erguvani balıkçıl	LC	Annex-2	Annex-1
10	Ardeidae	*Bubulcus ibis*	Cattle Egret	Sığır balıkçılı	LC	Annex-2	
11	Ardeidae	*Ardeola ralloides*	Squacco Heron	Alaca balıkçıl	LC	Annex-2	Annex-1
12	Ciconiidae	*Ciconia ciconia*	White Stork	Leylek	LC	Annex-2	Annex-1
13	Accipitridae	*Circus aeruginosus*	Western Marsh Harrier	Saz delicesi	LC	Annex-2	Annex-1
14	Accipitridae	*Circus cyaneus*	Hen Harrier	Gökçe delice	LC	Annex-2	Annex-1
15	Accipitridae	*Accipiter nisus*	Eurasian Sparrowhawk	Atmaca	LC	Annex-2	
16	Accipitridae	*Buteo buteo*	Common Buzzard	Şahin	LC	Annex-2	
17	Accipitridae	*Buteo rufinus*	Long-legged Buzzard	Kızıl şahin	LC	Annex-2	Annex-1
18	Accipitridae	*Clanga pomarina*	Lesser Spotted Eagle	Küçük orman kartalı	LC	Annex-2	Annex-1
19	Accipitridae	*Circaetus gallicus*	Short-toed Snake Eagle	Yılan kartalı	LC	Annex-2	Annex-1
20	Scolopacidae	*Calidris alba*	Sanderling	Ak kumkuşu	LC	Annex-2	
21	Scolopacidae	*Calidris alpina*	Dunlin	Karakarınlı kumkuşu	LC	Annex-2	
22	Scolopacidae	*Calidris minuta*	Little Stint	Küçük kumkuşu	LC	Annex-2	
23	Scolopacidae	*Tringa ochropus*	Green Sandpiper	Yeşil düdükçün	LC	Annex-2	
24	Scolopacidae	*Tringa glareola*	Wood Sandpiper	Orman düdükçünü	LC	Annex-2	Annex-1
25	Scolopacidae	*Tringa nebularia*	Common Greenshank	Yeşilbacak	LC	Annex-3	
26	Scolopacidae	*Actitis hypoleucos*	Common Sandpiper	Dere düdükçünü	LC	Annex-3	
27	Scolopacidae	*Arenaria interpres*	Ruddy Turnstone	Taşçeviren	LC	Annex-2	
28	Scolopacidae	*Numenius phaeopus*	Whimbrel	Sürmeli kervançulluğu	LC	Annex-3	
29	Scolopacidae	*Numenius arquata*	Eurasian Curlew	Kervançulluğu	**NT**	Annex-3	
30	Charadriidae	*Charadrius hiaticula*	Common Ringed Plover	Halkalı cılıbıt	LC	Annex-2	
31	Charadriidae	*Charadrius alexandrinus*	Kentish Plover	Akça cılıbıt	LC	Annex-2	Annex-1

No	Family	Scientific name	English name	Turkish name	IUCN	BERN	Bird Directive
32	Charadriidae	*Charadrius leschenaultii*	Greater Sand Plover	Büyük cılıbıt	LC	Annex-2	
33	Charadriidae	*Charadrius dubius*	Little Ringed Plover	Halkalı küçük cılıbıt	LC	Annex-2	
34	Charadriidae	*Pluvialis squatarola*	Grey Plover	Gümüş yağmurcun	LC	Annex-3	
35	Charadriidae	*Vanellus vanellus*	Northern Lapwing	Kızkuşu	**NT**	Annex-3	Annex-1
36	Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt	Uzunbacak	LC	Annex-2	Annex-1
37	Phasianidae	*Francolinus francolinus*	Black Francolin	Turaç	LC	Annex-3	Annex-1
38	Rallidae	*Rallus aquaticus*	Water Rail	Sukılavuzu	LC	Annex-3	
39	Rallidae	*Gallinula chloropus*	Common Moorhen	Sutavuğu	LC	Annex-3	
40	Rallidae	*Fulica atra*	Eurasian Coot	Sakarmeke	LC	Annex-3	
41	Laridae	*Ichthyaetus melanocephalus*	Mediterranean Gull	Akdeniz martısı	LC	Annex-2	Annex-1
42	Laridae	*Ichthyaetus ichthyaetus*	Pallas's Gull	Büyük karabaş martı	LC	Annex-3	
43	Laridae	*Chroicocephalus ridibundus*	Black-headed Gull	Karabaş martı	LC	Annex-3	
44	Laridae	*Chroicocephalus genei*	Slender-billed Gull	İncegagalı martı	LC	Annex-2	Annex-1
45	Laridae	*Larus michahellis*	Yellow-legged Gull	Gümüş martı	LC	Annex-3	
46	Laridae	*Thalasseus sandvicensis*	Sandwich Tern	Karagagalı sumru	LC	Annex-2	Annex-1
47	Alcedinidae	*Alcedo atthis*	Common Kingfisher	Yalıçapkını	LC	Annex-2	Annex-1
48	Alcedinidae	*Halcyon smyrnensis*	White-breasted Kingfisher	İzmir yalıçapkını	LC	Annex-2	
49	Alcedinidae	*Ceryle rudis*	Pied Kingfisher	Alaca yalıçapkını	LC	Annex-2	
50	Meropidae	*Merops apiaster*	European Bee-eater	Arıkuşu	LC	Annex-2	
51	Upupidae	*Upupa epops*	Eurasian Hoopoe	İbibik	LC	Annex-2	
52	Apodidae	*Apus apus*	Common Swift	Ebabil	LC	Annex-3	
53	Strigidae	*Athene noctua*	Little Owl	Kukumav	LC	Annex-2	
54	Falconidae	*Falco tinnunculus*	Common Kestrel	Kerkenez	LC	Annex-2	
55	Falconidae	*Falco peregrinus*	Peregrine Falcon	Gök doğan	LC	Annex-2	Annex-1
56	Falconidae	*Falco columbarius*	Merlin	Boz doğan	LC	Annex-2	Annex-1
57	Falconidae	*Falco vespertinus*	Red-footed Falcon	Ala doğan	**VU**	Annex-2	Annex-1
58	Alaudidae	*Galerida cristata*	Crested Lark	Tepeli toygar	LC	Annex-3	
59	Alaudidae	*Alauda arvensis*	Eurasian Skylark	Tarlakuşu	LC	Annex-3	
60	Cettiidae	*Cettia cetti*	Cetti's Warbler	Kamışbülbülü	LC	Annex-2	
61	Cisticolidae	*Cisticola juncidis*	Zitting Cisticola	Yelpazekuyruk	LC	Annex-2	
62	Cisticolidae	*Prinia lepida*	Graceful Prinia	Dikkuyruklu ötleğen	LC	Annex-2	
63	Columbidae	*Columba livia*	Rock Dove	Kaya güvercini	LC	Annex-3	

No	Family	Scientific name	English name	Turkish name	IUCN	BERN	Bird Directive
64	Columbidae	*Streptopelia decaocto*	Eurasian Collared Dove	Kumru	LC	Annex-3	
65	Columbidae	*Spilopelia senegalensis*	Laughing Dove	Küçük kumru	LC	Annex-3	
66	Corvidae	*Pica pica*	Eurasian Magpie	Saksağan	LC	-	
67	Corvidae	*Corvus cornix*	Hooded Crow	Leş kargası	LC	-	
68	Fringillidae	*Fringilla coelebs*	Common Chaffinch	İspinoz	LC	Annex-3	
69	Fringillidae	*Chloris chloris*	European Greenfinch	Florya	LC	Annex-2	
70	Fringillidae	*Carduelis carduelis*	European Goldfinch	Saka	LC	Annex-2	
71	Fringillidae	*Spinus spinus*	Eurasian Siskin	Karabaşlı iskete	LC	Annex-2	
72	Fringillidae	*Serinus serinus*	European Serin	Küçük iskete	LC	Annex-2	
73	Hirundinidae	*Hirundo rustica*	Barn Swallow	Kır kırlangıcı	LC	Annex-2	
74	Hirundinidae	*Riparia riparia*	Collared Sand Martin	Kum kırlangıcı	LC	Annex-2	
75	Hirundinidae	*Cecropis daurica*	Red-rumped Swallow	Kızıl kırlangıç	LC	Annex-2	
76	Laniidae	*Lanius collurio*	Red-backed Shrike	Kızılsırtlı örümcekkuşu	LC	Annex-2	Annex-1
77	Laniidae	*Lanius minor*	Lesser Grey Shrike	Karaalınlı örümcekkuşu	LC	Annex-2	Annex-1
78	Laniidae	*Lanius nubicus*	Masked Shrike	Maskeli örümcekkuşu	LC	Annex-2	Annex-1
79	Laniidae	*Lanius senator*	Woodchat Shrike	Kızılbaşlı örümcekkuşu	LC	Annex-2	
80	Motacillidae	*Anthus pratensis*	Meadow Pipit	Çayır incirkuşu	LC	Annex-2	
81	Motacillidae	*Anthus spinoletta*	Water Pipit	Dağ incirkuşu	LC	Annex-2	
82	Motacillidae	*Motacilla flava*	Western Yellow Wagtail	Sarı kuyruksallayan	LC	Annex-2	
83	Motacillidae	*Motacilla alba*	White Wagtail	Ak kuyruksallayan	LC	Annex-2	
84	Motacillidae	*Anthus cervinus*	Red-throated Pipit	Kızılgerdanlı incirkuşu	LC	Annex-2	
85	Muscicapidae	*Erithacus rubecula*	European Robin	Kızılgerdan	LC	Annex-2	
86	Muscicapidae	*Phoenicurus ochruros*	Black Redstart	Kara kızılkuyruk	LC	Annex-2	
87	Muscicapidae	*Saxicola rubetra*	Whinchat	Çayır taşkuşu	LC	Annex-2	
88	Muscicapidae	*Saxicola rubicola*	European Stonechat	Taşkuşu	LC	Annex-2	
89	Muscicapidae	*Oenanthe oenanthe*	Northern Wheatear	Kuyrukkakan	LC	Annex-2	
90	Muscicapidae	*Monticola solitarius*	Blue Rock Thrush	Gökardıç	LC	Annex-2	
91	Muscicapidae	*Cercotrichas galactotes*	Rufous-tailed Scrub Robin	Çalıbülbülü	LC	Annex-2	
92	Paridae	*Parus major*	Great Tit	Büyük baştankara	LC	Annex-2	
93	Passeridae	*Passer domesticus*	House Sparrow	Serçe	LC	-	
94	Passeridae	*Passer hispaniolensis*	Spanish Sparrow	Söğüt serçesi	LC	Annex-3	
95	Phylloscopidae	*Phylloscopus collybita*	Common Chiffchaff	Çıvgın	LC	Annex-2	

No	Family	Scientific name	English name	Turkish name	IUCN	BERN	Bird Directive
96	Pycnonotidae	*Pycnonotus xanthopygos*	White-spectacled Bulbul	Arapbülbülü	LC	Annex-2	
97	Remizidae	*Remiz pendulinus*	Eurasian Penduline Tit	Çulhakuşu	LC	Annex-3	
98	Sturnidae	*Sturnus vulgaris*	Common Starling	Sığırcık	LC	-	
99	Acrocephalidae	*Acrocephalus scirpaceus*	Eurasian Reed Warbler	Saz kamışçını	LC	Annex-2	
100	Acrocephalidae	*Iduna pallida*	Eastern Olivaceous Warbler	Ak mukallit	LC	Annex-2	
101	Locustellidae	*Locustella luscinioides*	Savi's Warbler	Bataklık kamışçını	LC	Annex-2	
102	Sylviidae	*Curruca communis*	Common Whitethroat	Akgerdanlı ötleğen	LC	Annex-2	
103	Sylviidae	*Curruca ruppeli*	Rüppell's Warbler	Karaboğazlı ötleğen	LC	Annex-2	Annex-1
104	Sylviidae	*Sylvia atricapilla*	Eurasian Blackcap	Karabaşlı ötleğen	LC	Annex-2	
105	Turdidae	*Turdus merula*	Common Blackbird	Karatavuk	LC	Annex-3	
106	Turdidae	*Turdus philomelos*	Song Thrush	Öter ardıç	LC	Annex-3	
107	Emberizidae	*Emberiza calandra*	Corn Bunting	Tarla kirazkuşu	LC	Annex-3	
108	Emberizidae	*Emberiza melanocephala*	Black-headed Bunting	Karabaşlı kirazkuşu	LC	Annex-2	

5.8.3.4 Mammal Species

The scope and the methodology used during the field surveys were given above. The daily activity reports of the site surveys are given in Appendix-4.

Surveying and monitoring animal communities in terrestrial ecosystems is an important component element in an ecosystem structure; due to the fact that they are in a permanent and close contact with most important man-made factors that has an impact on the environment.

Monitoring of wildlife in an environment includes routine surveillance over the major taxonomic groups of animals distributed in the project region (invertebrates, amphibian, reptiles, birds and mammals), parameters of inhabitation, state and size of population, population distribution at the studied territory, dominant population have been determined. During field survey reproduction and biodiversity criteria's have been applied and national and international criteria of nature protection, (IUCN, BERN, CITES, Natura 2000-attached at the end of introduction), endemism status and EUNIS codes have been updated.

Data was gathered at the project area; its impact are and at the terrestrial ecosystem in which the project site is found and also conversations were made with the local residents and hunters. Moreover, former studies about the terrestrial invertebrates and vertebrates at the project site and ecosystem areas in which the project site is included were evaluated. The diversity in species points out the existence of convenient habitats for the vertebrate's species at the project site. These habitats are generally agricultural lands, deciduous and evergreen forest lands, rocky areas, maquis, river and creek banks and residential areas. Habitat types were classified according to EUNIS Habitat Directive habitat types.

Field surveys were conducted on 8-9.10.2022 and 27.04.2023-02.05.2023. Surveys were performed at 22 locations (see Figure 76). According to the location of the Project site, general habitat types, general distribution of species in Türkiye, literature data and our experiences along project site 29 probable mammal species (except bats) were listed for the Project site (see Table 87). Among these species 1 specie is in "VU", 1 specie in "NT", 1 species in "DD", 25 species in "LC", and 1 species in "NE" category according to the IUCN.

Additionally, bat survey was performed by Assistant Assoc. Dr. Serdar Gözütok and M.Sc.c. Mehmet Gül using Pettersson model D240x bat-corder in May 2023. 5 observation locations were selected in the Çukurova Section (see Figure 77). According to the survey 22 bat species were recorded at 5 observation locations. Among these species 18 species were in "LC", 2 species were in "NT" and 2 species in "VU" category according to the IUCN. Recorded bat species were added to Table 87.

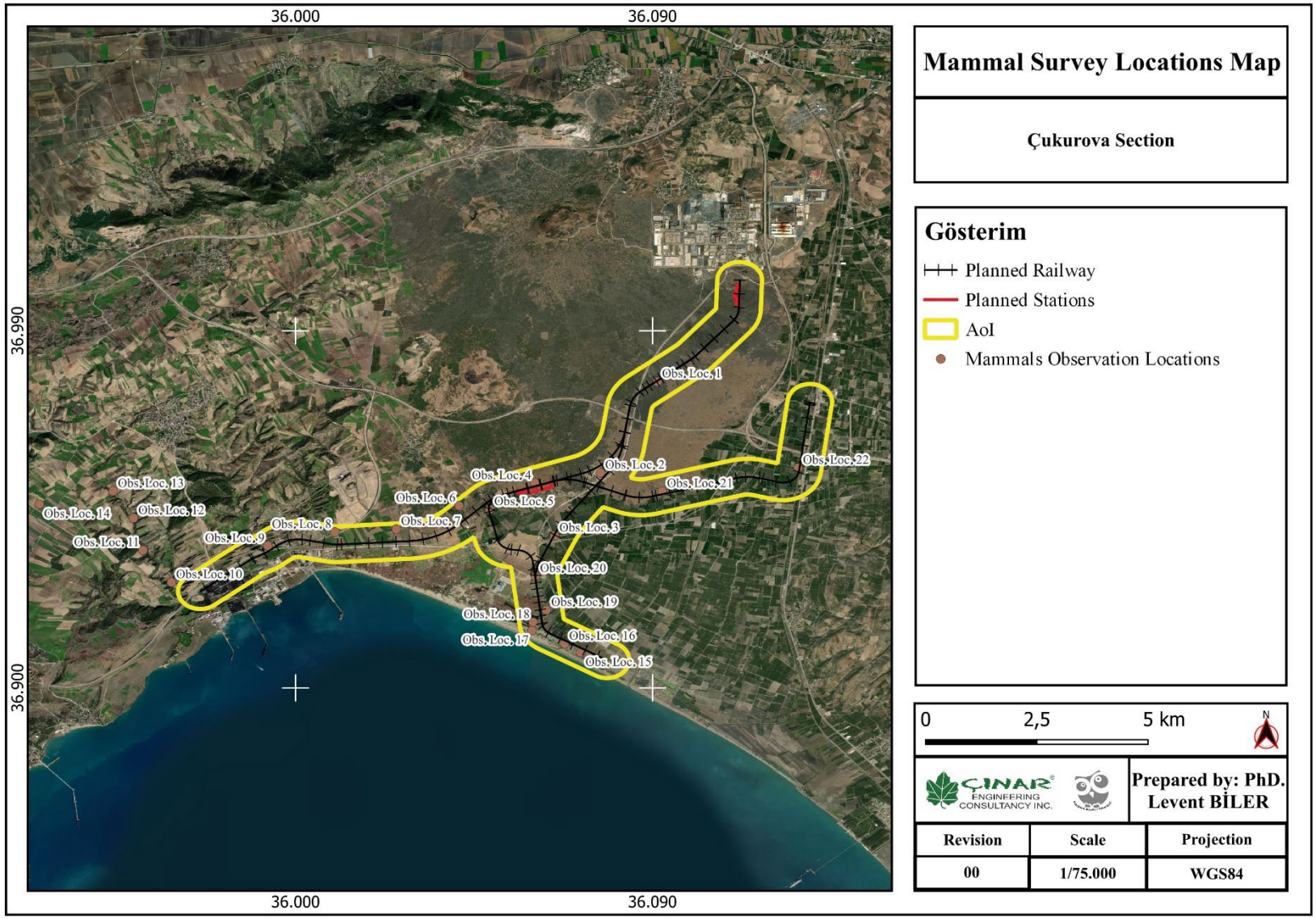


Figure 76. Mammal Observation Locations for Çukurova Section

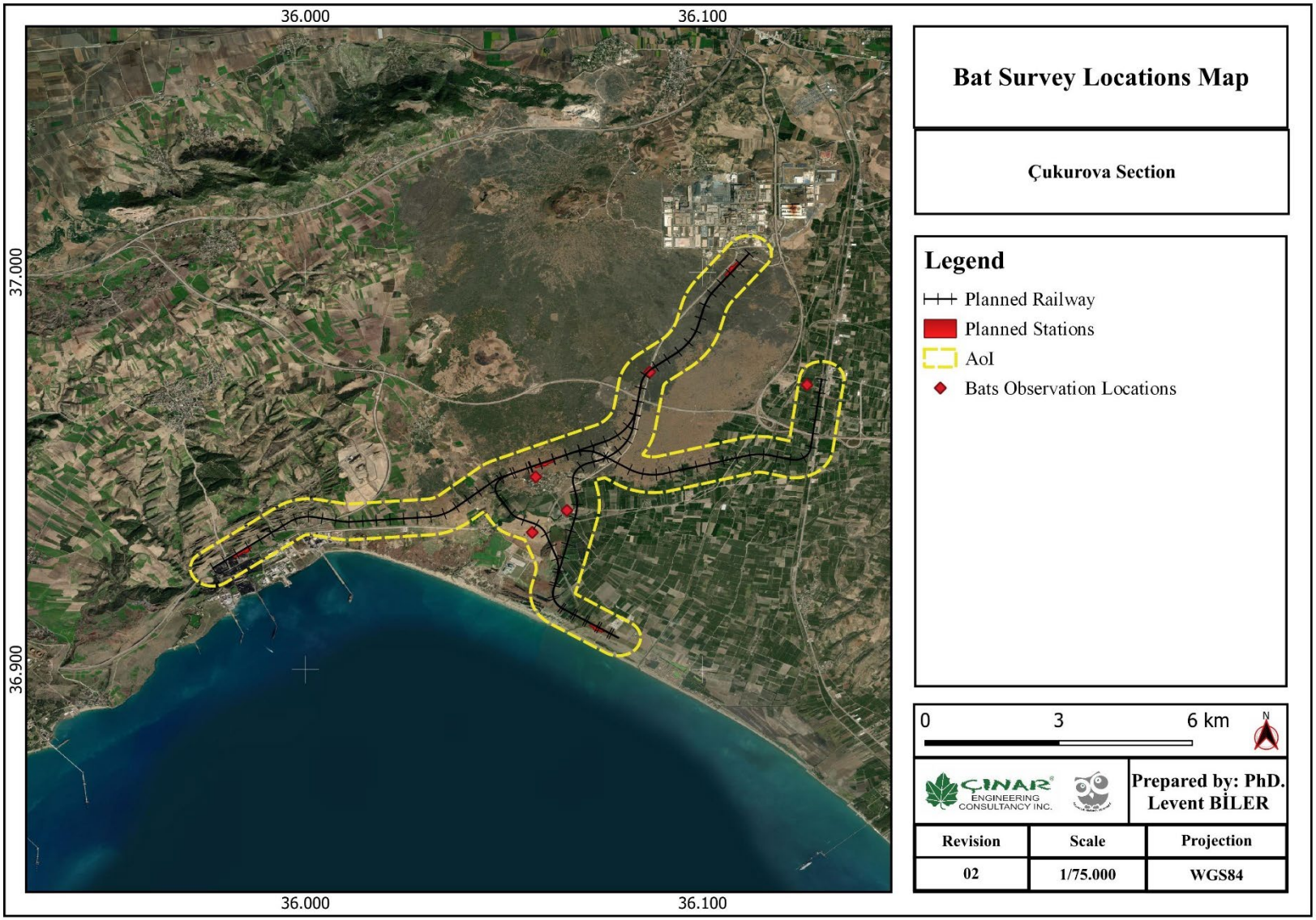


Figure 77. Bat Observation Locations

Table 87. List of mammal species at Çukurova Section

Family	Species	Turkish Name	Common Name	Endemism	IUCN	CITES	BERN	MAK	EU Habitat Directive	Observation Location
Canidae	*Canis aureus*	Çakal	Golden Jackal		LC	III		Ann-II	Ann-V	All
Canidae	*Vulpes vulpes*	Kızıl Tilki	Red Fox		LC			Ann-II		All
Cricetidae	*Cricetulus migratorius*	Cüce Avurtlak	Migratory Hamster		LC					All
Cricetidae	*Microtus hartingi*	Harting'in Tarlafaresi	Harting's vole		NE					1-14, 19-22
Erinaceidae	*Erinaceus concolor*	Kirpi	Southern White-Breasted Hedgehog		LC					All
Gliridae	*Dryomys nitedula*	Hasancık	Forest Dormouse		LC		Ann-III		Ann-IV	2, 4-6, 10-13
Herpestidae	*Herpestes ichneumon*	Kuyruksüren	Egyptian Mongoose		LC			Ann-I	Ann-V	9-13, 15-20
Hystricidae	*Hystrix indica*	Oklukirpi	Indian Crested Porcupine		LC					1,2,4-6,9-13
Leporidae	*Lepus europaeus*	Yabani Tavşan	European Hare		LC		Ann-III	Ann-II		1-6, 9-13, 21
Molossidae	*Tadarida teniotis*	Buldog Yarasa	European Free-Tailed Bat		LC		Ann-II			4
Muridae	*Apodemus flavicollis*	Sarıboyunlu Ormanfaresi	Yellow-Necked Mouse		LC					1-14,19-22
Muridae	*Apodemus mystacinus*	Kaya Faresi	Broad-Toothed Field Mouse		LC					1,2,4,5,6,21
Muridae	*Apodemus witherbyi*	Orman Faresi	Steppe Field Mouse		LC					All
Muridae	*Meriones tristrami*	Anadolu Çölfaresi	Tristram's Jird		LC					1-14,18-22
Muridae	*Mus domesticus*	Ev faresi	House Mouse		LC					All
Muridae	*Mus macedonicus*	Sarı Evfaresi	Macedonian Mouse		LC					All
Muridae	*Rattus norvegicus*	Göçmen Sıçan	Brown Rat		LC					All
Muridae	*Rattus rattus*	Sıçan	House Rat		LC					All
Mustelidae	*Lutra lutra*	Su Samuru	Eurasian Otter		NT	I	Ann-II		Ann-II, IV	15-18
Mustelidae	*Martes foina*	Kaya Sansarı	Beech Marten		LC	III/NC	Ann-III	Ann-II		1-6, 9-13, 2-22
Mustelidae	*Meles meles*	Porsuk	Eurasian Badger		LC		Ann-III	Ann-I		1-6, 9-14, 21
Mustelidae	*Mustela nivalis*	Gelincik	Least Weasel		LC		Ann-III	Ann-I		All
Mustelidae	*Vormela peregusna*	Alaca Sansar	Marbled Polecat		VU		Ann-II			1,2,4-6,9-13,21
Pteropodidae	*Rousettus aegyptiacus*	Mısır Meyve Yarasası	Egyptian Fruit Bat		LC					4
Sciuridae	*Sciurus anomalus*	Sincap	Caucasian Squirrel		LC		Ann-II			4-6, 10-13
Soricidae	*Crocidura leucodon*	Çiftrenkli Beyazdişli Böcekçil	Bicolored Shrew		LC		Ann-III			All
Soricidae	*Crocidura suaveolens*	Küçük Beyazdişli Böcekçil	Lesser White-Toothed Shrew		LC		Ann-III			All
Soricidae	*Neomys teres*	Kafkasya Su Böcekçili	Transcaucasian Water Shrew		LC		Ann-III			3, 9, 10, 11, 15, 16, 18
Soricidae	*Suncus etruscus*	Cüce Böcekçil	White-Toothed Pygmy Shrew		LC		Ann-III			3, 9, 10, 11, 15, 16, 18
Spalacidae	*Nannospalax ehrenbergi*	Filistin Körfaresi	Palestine Mole Rat		DD					2-14, 19-22
Suidae	*Sus scrofa*	Yabandomuzu	Wild Boar		LC		Ann-III	Ann-II		All
Vespertilionidae	*Barbastella barbastellus*	Basıkburunlu Yarasa	Barbastelle		NT		Ann-II		Ann-II	3
Vespertilionidae	*Eptesicus serotinus*	Geniş Kanatlı Yarasa	Serotine		LC		Ann-II			3

Family	Species	Turkish Name	Common Name	Endemism	IUCN	CITES	BERN	MAK	EU Habitat Directive	Observation Location
Vespertilionidae	*Hypsugo savii*	Savi Cüce Yarasası	Savi's Pipistrelle		LC		Ann-II			2,3
Vespertilionidae	*Myotis bechsteinii*	Büyük Kulaklı Yarasa	Bechstein's Myotis		NT		Ann-II			2
Vespertilionidae	*Myotis capaccinii*	Uzun Ayaklı Yarasa	Long-Fingered Bat		VU		Ann-II			4
Vespertilionidae	*Myotis daubentonii*	Fare Kulaklı Su Yarasası	Daubenton's Myotis		LC		Ann-II			2
Vespertilionidae	*Myotis myotis*	Büyük Fare Kulaklı Yarasa	Greater Mouse-Eared Bat		LC		Ann-II			2,3
Vespertilionidae	*Myotis mystacinus*	Bıyıklı Siyah Yarasa	Whiskered Myotis		LC		Ann-II			1,2
Vespertilionidae	*Myotis nattereri*	Saçaklı Yarasa	Noctule		LC		Ann-II			2,3,4
Vespertilionidae	*Nyctalus lasiopterus*	Büyük Akşamcı Yarasa	Giant Noctule		VU		Ann-II			2,3
Vespertilionidae	*Nyctalus leisleri*	Küçük Akşamcı Yarasa	Lesser Noctule	+	LC		Ann-II			2,3,4
Vespertilionidae	*Nyctalus noctula*	Bayağı Akşamcı Yarasa	Noctule		LC		Ann-II			1,2,3,4
Vespertilionidae	*Pipistrellus kuhlii*	Beyaz Şeritli Yarasa	Kuhl's Pipistrelle		LC		Ann-II			2,3,4
Vespertilionidae	*Pipistrellus nathusii*	Sert Derili Yarasa	Nathusius' Pipistrelle		LC		Ann-II			2,3,4
Vespertilionidae	*Pipistrellus pipistrellus*	Bayağı Cüce Yarasa	Common Pipistrelle		LC		Ann-III			1,2,3,4
Vespertilionidae	*Plecotus auritus*	Kahverengi Uzun Kulaklı Yarasa	Brown Big-Eared Bat		LC		Ann-II			2,3,4
Vespertilionidae	*Plecotus austriacus*	Gri Uzun Kulaklı Yarasa	Gray Big-Eared Bat		LC		Ann-II			2,3,4
Vespertilionidae	*Plecotus kolombatovici*	Balkan Uzunkulaklı Yarasası	Kolombatovic's Long-Eared Bat		LC		Ann-II			2
Vespertilionidae	*Plecotus macrobullaris*	Uzunkulaklı Kafkas Yarasası	Mountain Long-Eared Bat		LC		Ann-II			2,4
Vespertilionidae	*Vespertilio murinus*	Çift Renkli Yarasa	Particoloured Bat		LC		Ann-II			1,2,3

5.8.3.5 Hydrobiology

Within the scope of the project site surveys were conducted between 1-2.10.2022 and 1-2.05.2023 for Çukurova Section. The daily activity reports of the site surveys are given in Appendix-4.

The specific objectives are to:

- Visit each watercourse where in-channel works are to take place;
- Whilst at each watercourse, the following information will be collected
  - Broad site/crossing point description, including details on whether the watercourse has been engineered or whether it is natural
  - Water chemistry information (if possible, using a hand-held water chemistry meter)
  - Flow types (% of each type present)
  - Water depth
  - Substrate types (% of each type present)
  - Neighboring land use
  - Bank cover/characteristics
  - Fish habitat presence, including potential spawning areas
  - Instream vegetation (type and % cover)
- Photographs will be taken at each crossing point location and upstream/downstream
- Notes will be taken on any visible poor water quality/pollution evidence; and
- Any flora/fauna will also be noted.

The survey was designed to corroborate desk study findings about the general aquatic ecology sensitivity across the Project, as well as to identify any specific features/habitat characteristics that would be at risk due to the increased impact levels expected at the locations during the in-channel works.

Hydrobiological surveys were performed at 10 Locations (5 Locations were dry, therefore no survey was performed at these locations) at Çukurova Section (see Figure 78). According to the surveys at Location 2, Location 3, Location 4, Location 5, and Location 6 no flow was observed. Surveys were performed at Location 1, Location 7, Location 8, Location 9, and Location 10.

At each location physio-chemical analyses and hydrobiological surveys were performed. The hydrobiological surveys included phytoplankton, zooplankton, benthic, and fish surveys. The results were summarized in Table 88. A total of 23 phytoplankton, 22 benthic, and 4 fish species were observed.

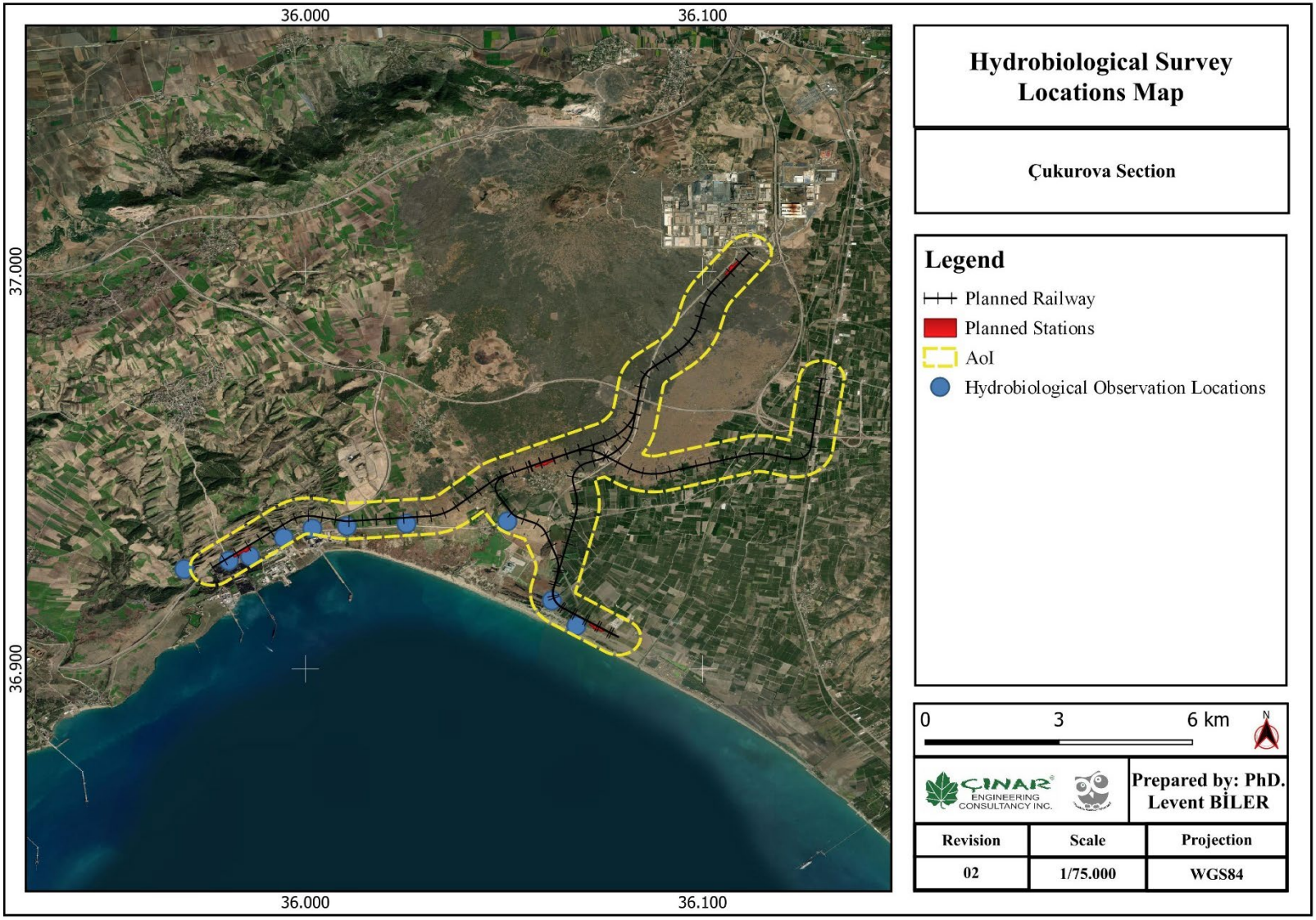


Figure 78. Hydrobiological Survey Locations at Çukurova Section

Table 88. Physio-Chemical Results

Location No	Conductivity	Temperature	Alkalinity	pH	Dissolved Oxygen
1	750	19.5	366	7.98	0.37
7	3080	20.6	1673	8.86	1.7
8	794	20.4	389	8.00	0.39
9	965	20.9	475	8.55	0.47
10	873	20.8	428	8.31	0.43

Table 89. Phytoplankton Results

	Location No				
	1	7	8	9	10
Cocconeis placentula	X		X		X
Diatoma anceps		X	X		X
Licmophora ehrenbergii		X	X		X
Thalassiothrix mediterraena			X	X	X
Anabaena affinis	X		X	X	X
Merismopedia elegans			X	X	X
Microcystis aeruginosa	X			X	X
Microcystis incerta		X		X	
Synechocystis sp	X	X		X	
Ankistrodesmus falcatus				X	
Monoraphidium contortum		X	X		X
Scenedesmus quadricauda		X	X		X
Chroococcus chroococcoides			X		X
Merismopedia glauca	X		X		X
Oscillatoria limosa		X	X		X
Fragilaria cratonensis				X	X
Ankistrodesmus spiralis	X			X	X
Chlamydomonas globosa				X	
Monoraphidium graffiti		X	X	X	
Pyramimonas orientalis			X		
Scenedesmus opoliensis	X				X
Scenedesmus subspicatus		X		X	X
Peridinium aciculiferum	X				

Table 90. Benthic Results

	Location No				
	1	7	8	9	10
Tubificoides swirencowi Jarošenko, 1948	X		X		X
Echinogammarus foxi (Schellenberberg, 1928)		X	X	X	X
Chironomus anthracinus Zetterstedt, 1860	X	X	X		X
Melanopsis praemorsa (Linnaeus, 1758)		X	X		X
Peregriana peregra (Müller, O. F., 1774)			X		X
Gyraulus sp.			X		X
Theodoxus sp.	X		X		X
Chironomus sp.		X	X	X	X

	Location No				
	1	7	8	9	10
Gyraulus piscinarum (Bourguignat, 1852)		X	X	X	
Theodoxus anatolicus (Récluz, 1844)	X	X	X	X	
Ecrobia ventrosa (Montagu, 1803)				X	X
Pusillina radiata (Philippi, 1836)				X	X
Melanoides tuberculata (Müller, O. F., 1774)				X	X
Tubificoides swirencowi Jarošenko, 1948		X	X	X	X
Nereis sp.	X	X	X	X	X
Oligochaeta sp.		X		X	X
Asellus aquaticus (Linnaeus, 1758)					
Valvata sp.			X		
Valvata macrostoma Mörch, 1864)	X	X	X	X	X
Potamopyrgus antipodarum (Gray, 1843)		X	X	X	X
Atyaephyra sp.		X	X	X	X
Valvata macrostoma Mörch, 1864	X			X	

Table 91. Fish Results

	Location No					Common Name	Endemic	IUCN	Bern	CITES
	1	7	8	9	10					
Chelon auratus				X	X	Golden Grey Mullet	-	LC	-	-
Gambusia holbrooki				X	X	Mosquitofish	-	LC	-	-
Aphanius mento					X	Iridescent Toothcarp	-	LC	-	-
Oncorhynchus mykiss		X				Rainbow Trout	-	NE	-	-

5.8.4 Invasive Alien Species

The Convention on Biological Diversity (CBD) defines invasive alien species (IAS) as “species whose introduction and/pr spread outside their natural past or present distribution threatens biological diversity. IAS occurs in all taxonomic group of organisms; including animals, plants, fungi and microorganisms, and can affect all types of ecosystems. Invasion by alien species is reported to have caused significant degradation with negative impacts on biological diversity and people’s livelihoods according to IUCN, which requires that all projects that may provide a key pathway for invasive species are screened for their potential to accidentally introduce invasive alien species. In line with provisions of ESS6 and PS6, projects that potentially cause introduction of alien species are subject to a risk assessment. Once established, eradication of IAS requires more effort and resource allocation, prevention is the first step in management.

The Global Invasive Species Programme (GISP) is an international partnership working to address the global threat of IAS, with the main objective of conserving biodiversity and sustain livelihoods by minimizing the spread and impact of invasive alien species with the implementation of Article 8(h) of the CBD. Furthermore, managed by the IUCN’s Species Survival Commission, there is an Invasive Species Database (GISD), which currently works on establishing a Global Register of Introduced and Invasive Species (GRIIS) to develop country-wise validated, verified and annotated inventories of introduced and invasive species.

Türkiye has a wide marine IAS dataset, while studies on terrestrial ones have been rather limited. With funding from the Global Environment Fund (GEF), a GEF VI project addressing invasive species threats at key marine biodiversity areas is being implemented by the General Directorate of Nature Conservation and National Parks (GEF, 2020). The project started in 2018, was planned to be completed in four years. The objective of the project is to ensure resilience of marine and coastal ecosystems through strengthened capacities and investment in prevention, detection, control and management of IAS. In line with the most recent European Union legislation (1143/2014) on IAS, which requires a mandatory response by all member states to the threats that invasive species pose to biodiversity and ecosystem services, a similar project will be undertaken also for inland water and terrestrial ecosystems.

Studies that have already been conducted reveal an estimated 1.5% of plant species in Türkiye being exotics (Arslan et al. 2015), although a comprehensive list of alien plants is still lacking. Türkiye is a member of EPPO, an intergovernmental organization responsible for cooperation in plant health within the Euro-Mediterranean region, which aims to protect plants by developing international strategies against the introduction and spread of pests and by promoting safe and impactive pest control methods through A1 and A2 lists of pests recommended for regulation. Arslan et. al. (2015) also report that species that have been recorded in the EPPO list of invasive alien plants that are present in Türkiye are; *Acroptilon repens, Ailanthus altissima, Ambrosia artemisiifolia* (*A. elatior*), *Carpobrotus edulis, Cortaderia selloana, Cyperus esculentus, Paspalum distichum* (*P. paspalodes*), *Oxalis pes-caprae* and *Sicyos angulatus*, while *Azolla filiculoides* and *Rhododendron ponticum* are listed in the EPPO Observation List of Invasive alien plants and *Miscanthus sinensis*, listed in the EPPO Alert List, are also recorded in the Turkish flora (Arslan et al., 2015).

Project biodiversity studies led by field experts did not yield any data on presence of IAS. However, given the datasets in Türkiye are still limited, and considering general risks associated with railways in terms of introduction and spread of IAS, necessary measures will be taken as per ESS6. International guidelines and best practices will be followed to avoid intentional or accidental introduction of alien or non-native species, and if introduced necessary strategies and procedures will be developed to eradicate IAS.

An “Invasive Alien Species Procedure (CNR-ZNG-AND-IASMP-001)” was prepared and given as Appendix-3 of CHA-BMP (CNR-AND-CHA-BMP-002) for control and management of IAS.

5.8.5 Critical Habitat Assessment

5.8.5.1 Critical Habitat Concept

As stated by ESS6, habitats constitute “a terrestrial, freshwater or marine geographical unit or airway that supports assemblages of living organisms and their interactions with the non-living environment”. To meet ESS6 requirements, clients would have different obligations for different kinds of habitats. This enables to provide a better understanding of specific species and habitat requirements and establish meaningful management units to define a mitigation strategy. These habitat types are; modified, natural and critical, which can be a subset of natural or modified habitats. These habitat types refer to the biodiversity value of a given area, as determined by species, ecosystems and ecological processes, and are required to be identified within a project’s area of influence (AoI) to define habitat-specific ESS6 requirements accordingly.

Modified habitats, in the most general sense, are those that have been subject to some form of alteration, often resulting in agricultural land. Despite the fact that some modified habitats might lose all of their natural characteristics, it is still required to minimize further impacts. Natural habitats are composed of plant and/or animal species that are mostly of native origin, where human activity has not been significant enough to modify ecological functions and species composition within. In areas of natural habitat mitigation measures are required to be designed to achieve no net loss of biodiversity.

Critical habitats are those that are of high biodiversity value. Both natural and modified habitats may contain high biodiversity values qualifying as critical habitat. While habitat types are defined by the degree of human-induced modification, this is not necessarily an indicator of the biodiversity value of a habitat as per ESS6.

Critical habitat criteria as put forward by ESS6 that forms the basis of critical habitat assessment are as follows:

Criterion 1: Critically Endangered (CR) and/or Endangered (EN) species

Criterion 2: Endemic or restricted-range species

Criterion 3: Migratory or congregatory species

Criterion 4: Highly threatened and/or unique ecosystems

Criterion 5: Key evolutionary processes

ESS6 requires the Borrower (clients) not to implement any project activities in areas of critical habitat unless all of the following are demonstrated:

- No other viable alternatives within the region exist for development of the project in habitats of lesser biodiversity value;
- All due process required under international obligations or national law that is a prerequisite to a country granting approval for project activities in or adjacent to a critical habitat has been complied with;
- The potential adverse impacts, or likelihood of such, on the habitat will not lead to measurable net reduction or negative change in those biodiversity values for which the critical habitat was designated;
- The project is not anticipated to lead to a net reduction in the population of any Critically Endangered, Endangered, or restricted-range species, over a reasonable time period;
- The project will not involve significant conversion or significant degradation of critical habitats. In circumstances where the project involves new or renewed forestry or agricultural plantations, it will not convert or degrade any critical habitat;
- The project’s mitigation strategy will be designed to achieve net gains of those biodiversity values for which the critical habitat was designated; and

- A robust and appropriately designed, long-term biodiversity monitoring and evaluation program aimed at assessing the status of critical habitat is integrated into the Borrower's management program.

It should also be noted that Critical Habitat Assessment is independent of a project's potential impacts on biodiversity value within its AoI or an extended area. The outcome of the Critical Habitat Assessment does not indicate a particular impact associated with project activities or requirement for a mitigation measure. Rather it provides a thorough analysis of the existing biodiversity value in a given area and informs the applicability of ESS6 requirements. For the project-related impacts a mitigation hierarchy is to be applied and measures are required to be defined for different phases of a project.

5.8.5.2 Critical Habitat Methodology

In order to identify the statuses of species that have been identified based on literature data and assessed through expert judgement, besides the IUCN Red List of Threatened Species utilized to determine endangered and critically endangered species, other criteria were also used in critical habitat assessment, wherever applicable. In determining "highly threatened and unique ecosystems", IUCN Red List categories for ecosystems were used as the main reference.

Since international, even European biodiversity assessments do not always cover Turkish habitats and species, experts' judgment was often consulted to interpret data. Since international, even European biodiversity assessment do not always cover Turkish habitats and species, experts' judgment was often consulted to draw conclusions on the current statuses of biodiversity components. Local expert judgment was also referred to due to the fact that there are no officially established or widely accepted national evaluations on threat and conservation statuses of habitats and species in Türkiye.

Criterion 1: Critical (CR) and/or Endangered (EN) Species

Species threatened with global extinction and listed as Critically Endangered (CR) and Endangered (EN) on the IIUCN Red List are considered as part of Criterion 1. Critically Endangered species face an extremely high risk of extinction, while Endangered species face a very high risk of extinction in the wild.

Quantitative data on potential critical habitat triggering species' populations were assessed based on the Guidance Note (GN) 6 (2019) thresholds, which not only consider global conservation priorities but also nationally or regionally significant concentrations of species. Accordingly;

(a) areas that support globally-important concentrations of an IUCN Red-listed EN or CR species (≥0.5% of the global population AND (≥5% reproductive units of a CR or EN species);

(b) areas that support globally important concentrations of an IUCN Red-listed Vulnerable species, the loss of which would result in the change of the IUCN Red List status to EN and meet these thresholds;

(c) as appropriate, areas containing important concentrations of a nationally or regionally listed EN or CR species, trigger designation of critical habitat.

In determining CR and EN species at the Biodiversity Study Area, the IUCN Red List of Threatened Species, European Red Lists, and the only IUCN correspondence in Türkiye; the Red Data Book of Turkish Plants have been utilized as the main references. Regional statuses of species, supported by expert judgment on species' current population trends in Türkiye, have also been assessed.

Criterion 2: Endemic and/or Restricted-Range Species

The updated version of the GN 6 (2019) defines the term endemic as restricted-range, which refers to a limited extent of occurrence (EOO) as such:

- For terrestrial vertebrates and plants, a restricted-range species is defined as those species which have an EOO less than 50,000 km^2.
- Form marine systems, restricted-range species are provisionally being considered those with an EOO of less than 100,000 km^2.
- For coastal, riverine and other aquatic species in habitats that do not exceed 200 km width at any point, restricted-range is defined as having a global range less than or equal to 500 km linear geographic span.

An area can be designated as critical habitat, if it holds ≥10 percent of the global population size and ≥10 reproductive units of an endemic and/or restricted-range species. Terrestrial and freshwater species identified at the Biodiversity Study Area were assessed with respect to their EOOs and population sizes, based on the IUCN Red List, IUCN European assessments, and expert judgment.

Criterion 3: Migratory or Congregatory Species

Migratory species are defined as any species of which a significant proportion of its members cyclically and predictably move from one geographical area to another (including within the same ecosystem). Congregatory species are those, whose individuals gather in large groups on a cycyle or otherwise regular and/or predictable basis according to PS6. The thresholds are as the following:

(a) areas known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle.

(b) areas that predictably support ≥10 percent of the global population of a species during periods of environmental stress.

The significant groups of migratory and congregatory species that are potential critical habitat triggers in the area are birds. Migration and breeding surveys were performed and assessments for Criterion 3 has been made in the following sections.

Criterion 4: Highly Threatened or Unique Ecosystems

To identify highly threatened or unique ecosystems, World Bank requires the Client to use the IUCN Red List of Ecosystems (RLE) where formal assessments have been performed, and if not to use assessments using systematic methods at the national/regional level, carried out by government bodies, recognized institutions and/or other relevant qualified organizations. The thresholds are:

(a) areas representing ≥5 percent of the global extent of an ecosystem type meeting the criteria for IUCN status of CR or EN.

(b) other areas, not yet assessed by IUCN, but determined to be of high priority for conservation by regional or national systematic conservation planning.

As Burnaz Dunes KBA has been appointed the IUCN Protected Area Management Category Ia, it meets critical habitat criteria. "Coastal stable dune grassland" and "coastal dune heath" habitats have been assessed as potential critical habitat triggers as per Criterion 4.

Criterion 5: Key Evolutionary Processes

Evolutionary processes are defined as structural attributes of a region, such as its topography, geology, soil, temperature, and vegetation and combinations of these variables can influence evolutionary processes that give rise to regional configurations of species and ecological properties. The significance of structural attributes in a landscape that may influence evolutionary processes are required to be determined on a case-by-case basis, and determination of habitat that triggers this criterion will rely on scientific knowledge.

Examples to spatial features associated with evolutionary processes can be listed as; landscapes with high spatial heterogeneity, ecotones, edaphic interfaces, connectivity between habitats, and sites of demonstrated importance to climate change adaptation either for species or ecosystems.

The Biodiversity Study Area is not associated with key evolutionary processes. Neither it hosts flora and/or fauna species that have distinct evolutionary histories with populations that show proven phylogenetic divergence from other species' other known populations.

5.8.5.3 Critical Habitat Triggering Biodiversity Features

Criterion 1: Critical (CR) and/or Endangered (EN) Species and Criterion 2: Endemic and/or Restricted-Range Species

CR, EN, VU and endemic species that were identified during the site surveys and are also presumed present based on literature data were assessed against the IUCN Red List, European Red Lists, and The Red Data Book of Turkish Plants, in terms of their global and regional threat statuses. To reach an understanding on the current statuses of species in the area, expert judgement was also consulted. Endangered and endemic species that are potential critical habitat triggers are presented in Table 92.

Table 92. Potential Critical Habitat Triggering Taxa as per Criterion 1 and 2

Biodiversity Feature	IUCN Red List Category	Endemic / Restricted-Range
Plants		
Echinops dumanii	CR	Endemic
Astragalus antiochianus	CR	Endemic
Alopecurus adanensis	CR	Endemic
Sternbergia pulchella	EN	-
Cyclamen persicum	VU	-
Hyacinthella millingenii	VU	-
Reptiles		
Acanthodactylus schreiberi	EN	Endemic
Testudo graeca	VU	-
Trionyx triunguis	VU	-
Birds		
Falco vespertinus	VU	-
Mammals		
Vormela peregusna	VU	-
Lutra lutra	NT	-
Myotis bechsteinii	NT	-
Nyctalus lasiopterus	VU	-
Barbastella barbastellus	NT	-
Myotis capaccinii	VU	-
Nyctalus leisleri	LC	Endemic

Biodiversity Feature	IUCN Red List Category	Endemic / Restricted-Range
IUCN Category: **CR: Critically Endangered** **EN: Endangered** **VU: Vulnerable** **NT: Near Threatened** **LC: Least Concern**		

According to Table 92, 17 species were evaluated as potential critical habitat triggering species.

The endemic *Echinops dumanii* (IUCN: CR) population in the Biodiversity Study Area was identified to be about 150 individuals, which represents 5-10% of its known population in Türkiye. Since the Biodiversity Study Area holds more than 0.5% of the species' global population, the dune habitats are designated as critical habitat for *Echinops dumanii.* However, due to the route change, there will be no Project-related impacts on the dune habitats and species populations, which area was determined as Critical Habitat due to *Echinops dumanii. Astragalus antiochianus,* and *Acanthodactylus schreiberi*.

The endemic *Astragalus antiochianus* (IUCN: CR) population was identified to be about 200 individuals, which represents 2-3% of its known Türkiye population. Therefore, it meets Criterion 1 numerical thresholds. However, due to the route change, there will be no Project-related impacts on the dune habitats and species populations, which area was determined as Critical Habitat due to *Echinops dumanii. Astragalus antiochianus,* and *Acanthodactylus schreiberi*.

The endemic *Alopecurus adanensis* species has not been observed/identified within the Project area and Biological Study Area. The distribution area of this species is outside the Project footprint. Therefore, this species does not meet the Critical Habitat Criterion. The species is represented by 100 individuals outside the Biological Study area. This constitutes 2-3% of the Turkish population.

The rare species *Sternbergia pulchella* has been assessed to be Endangered, based on expert judgement within the scope of the ESIA studies. The population of about 100 individuals identified on the Project route is one of the two known locations of the species and represents about 20% of its population in Türkiye. IUCN's global population assessment on the species estimates that there is a total of 4500-5000 individuals scattered across Türkiye, Syria and Lebanon. Yet, due to lack of adequate data on the species, and precise locations of the populations outside Lebanon, it is categorized as Data Deficient by the Red List. While the population of *Sternbergia pulchella* identified along the project route represents approximately 2% of its global population, it has not been designated as Critical Habitat due to several factors beyond population percentage alone. According to Criterion 1, Critical Habitat may be triggered if a site supports more than 0.5% of a species' global population, particularly for species assessed as Endangered. However, the Critical Habitat designation also requires the site to play a pivotal role in sustaining the species' overall viability, such as supporting critical life cycle stages or being essential for the species' recovery and survival on a broader scale. For *Sternbergia pulchella*, although this population is significant within Türkiye, it is not confirmed to be crucial for the species' regional or global persistence. Additionally, the species is categorized as Data Deficient (DD) on the IUCN Red List, indicating gaps in population and habitat data, particularly outside Lebanon. Without precise information on the distribution and viability of other populations in the species' range (including unknown populations in Syria and Turkey), it remains uncertain whether this population segment is essential for species resilience. Furthermore, appropriate mitigative measures, such as bulb translocation and

conservation monitoring outside the Area of Influence (AoI), have been implemented to reduce any adverse impacts on this local population, supporting conservation goals without necessitating Critical Habitat designation.

The rare species *Cyclamen persicum* has been assessed to be Vulnerable, based on expert judgement within the scope of the ESIA studies. The second known locality of this species is the project area and the habitats in which they spread are extremely sensitive. The Biodiversity Study Area does not hold significant population of these species based on expert judgement. The loss of these habitats will not cause a change in the Red List category and therefore available data suggest that these Vulnerable species do not trigger Critical Habitat Criterion. In order to reduce the pressure on the species and the population, the bulbs of *Cyclamen persicum* were collected and transported to areas outside the AoI. These areas will be monitored to achieve biodiversity conservation.

The rare species *Hyacinthella millingenii* has been assessed to be Vulnerable within the scope of the ESIA studies. The second known locality of this species is the project area and the habitats in which they spread are extremely sensitive. The Biodiversity Study Area does not hold significant population of these species based on expert judgement. The loss of these habitats will not cause a change in the Red List category and therefore available data suggest that these Vulnerable species do not trigger Critical Habitat Criterion. In order to reduce the pressure on the species and the population, the bulbs of *Hyacinthella millingenii* were collected and transported to areas outside the AoI. These areas will be monitored to achieve biodiversity conservation.

Population of the Endangered *Acanthodactylus schreiberi* in the Biodiversity Study Area meets Criterion 1 thresholds and triggers critical habitat. The Burnaz Dunes are the only habitat for *Acanthodactylus schreiberi* in Türkiye. Therefore, the dune habitat is considered as Critical Habitat. In line with the mitigation hierarchy, in order to avoid potential impacts of the Project, alternative routes were considered by the DGII and the line was redesigned so that it does not pass through the dune habitat. Although Burnaz KBA has been assessed as part of the ESIA as it is located within the Biodiversity Study Area, there will be no Project-related impacts on the dune habitats and species populations they support.

Although the *Testudo graeca* species is classified as Vulnerable by the IUCN, it has a wide distribution throughout Türkiye. Simultaneously, agricultural activities put pressure on the species. The species was discovered in the Project area, specifically in the Burnaz Springs section. Because of its widespread distribution in Türkiye, the species does not meet the Critical Habitat Criterion. However, in order to ensure the species' survival and continuity, it must be transported prior to the studies. Necessary precautions, which were listed in the BMP will be implemented.

The vulnerable species *Trionyx triunguis* was not observed during field surveys in the Biodiversity Study Area. The *Trionyx triunguis* is a fresh and brackish water species distributed in lentic ecosystems of Africa and the eastern Mediterranean. It has also regularly been recorded in coastal waters. In the eastern Mediterranean *Trionyx triunguis* has been recorded in coastal and brackish waters of Greece, Turkey, Syria, Lebanon, Israel and Egypt, with the largest reproduction areas being found in Turkey and Israel. The distribution area of this species is outside the Project footprint. Therefore, this species does not meet the Critical Habitat Criterion.

Falco vespertinus is listed as Vulnerable according to the IUCN. *Falco vespertinus* is a bird of prey. This bird is found in eastern Europe and Asia although its numbers are dwindling rapidly due to habitat loss and hunting. It is migratory, wintering in Africa. In the Project area, *Falco*

vespertinus finds less stopover habitats during its migratory journey between breeding grounds in Eastern Europe and wintering areas in Southern Africa. The population size of *Falco vespertinus* is significantly smaller compared to its global population. The global population of Red-footed Falcons is estimated to be between 300,000 to 800,000 individuals. In contrast, the population size in Turkey is much smaller and is primarily composed of migratory individuals passing through the country during their migration between breeding grounds in Eastern Europe and wintering areas in Southern Africa. Therefore, this species does not meet the Critical Habitat Criterion.

The vulnerable species *Vormela peregusna*, a small carnivorous mammal known for its distinctive marbled coat is distributed outside the Biodiveristy Study Area. This region's semi-arid landscapes, comprising open fields, grasslands, and sparse woodlands, provide essential foraging and denning opportunities for the species. However, *Vormela peregusna* faces numerous threats, including habitat loss due to agricultural expansion, urban development, and infrastructure projects. Additionally, the use of pesticides in agricultural areas reduces the availability of prey, such as small mammals and insects, which are vital for the polecat's diet. Therefore, this species does not meet the Critical Habitat Criterion. The available data indicates that these VU species do not trigger critical habitat because, based on expert judgement, the biodiversity research region does not include a significant population of these species and project actions will not alter their threat categories. Additionally, this species will not be directly impacted by the Project because of the shift in the railway line.

The Near Threatened Eurasian Otter (*Lutra lutra*) relies on the freshwater ecosystems. The region's rivers, streams, and wetlands provide essential resources for the otter, including clean water, abundant fish populations, and dense riparian vegetation for shelter and breeding. The lakes in the Burnaz Dunes outside the Biodiversity Study Area are important locations for the *Lutra lutra*. Therefore, this species does not meet the Critical Habitat Criterion.

The bat species *Myotis bechsteinii* (IUCN: NT), *Nyctalus lasiopterus* (IUCN: VU), *Barbastella barbastellus* (IUCN: NT), *Myotis capaccinii* (IUCN: VU), and *Nyctalus leisleri* (IUCN: LC, endemic) were identified in garden surroundings. There were no nesting areas for the bat species in the Project route. Therefore, it has been evaluated that the bat species will not be affected by the planned railway. Therefore, this species does not meet the Critical Habitat Criterion.

As a result of the evaluations made, the Criterion evaluations of the triggering species are listed in the table below.

Table 93. Triggering species evaluation

Biodiversity Feature	IUCN Red List Category	Endemic / Restricted-Range	Criterion
Plants			
Echinops dumanii	CR	Endemic	Criterion 1
Astragalus antiochianus	CR	Endemic	Criterion 1
Reptiles			
Acanthodactylus schreiberi	EN	Endemic	Criterion 1
IUCN Category: **CR: Critically Endangered** **EN: Endangered**			

A Critical Habitat Map showing the locations of Triggering Species is presented in Figure 79. The Critical Habitat is specified according to *A. schreiberi*. The railway line will not pass through

the Critical Habitat and no project-related activities will be performed in the Critical Habitat Area to avoid impacts on species and habitats.

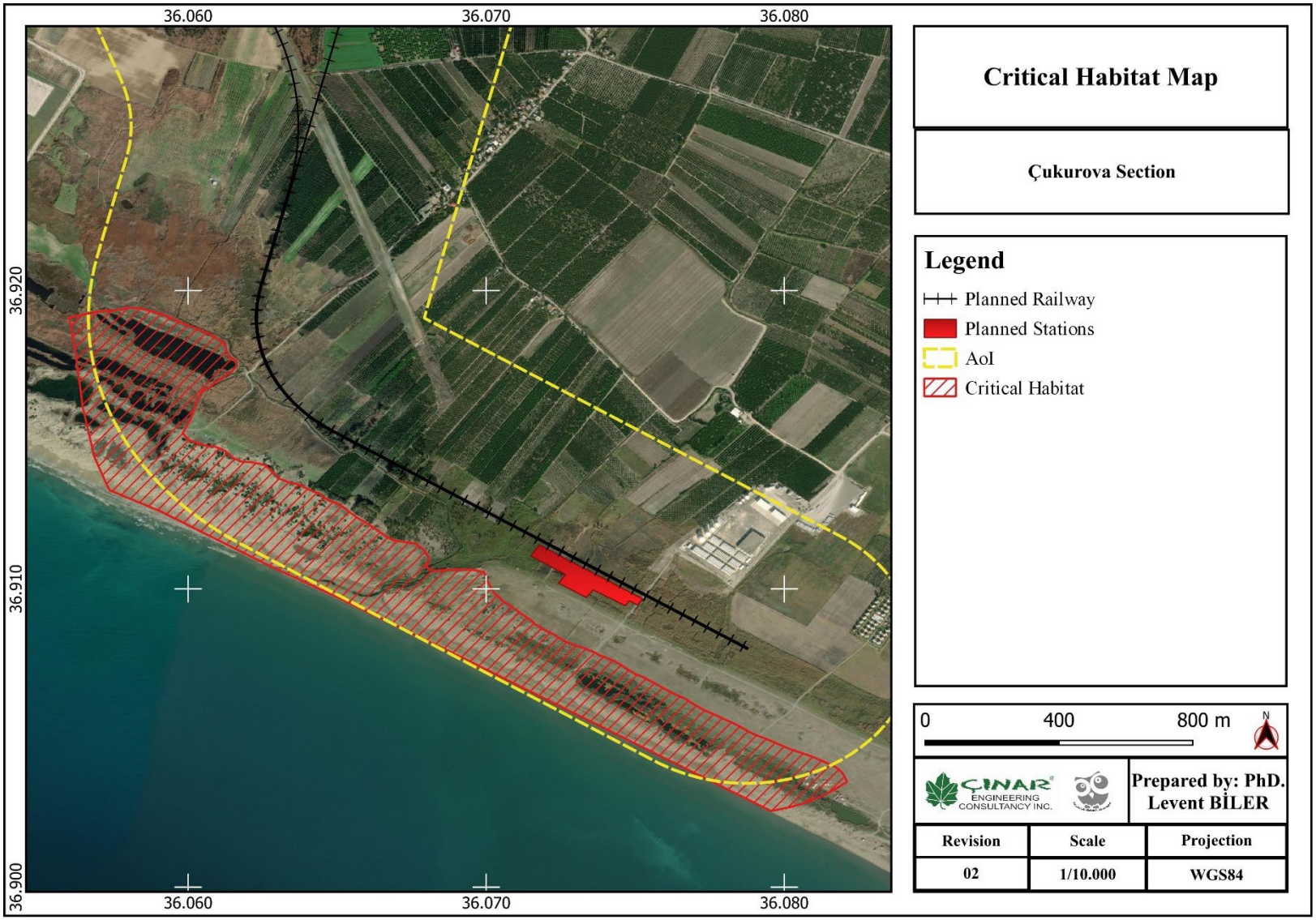


Figure 79. Critical Habitat Map

Criteria 3: Migratory or Congregatory Species

The study area and AoI does not meet the critical habitat criteria according the “Criterion 3: Migratory or congregatory species” based on direct observations. The Çukurova area locates on one of the major flyways of soaring birds and also for most of the species using the Black Sea-East Mediterranean Flyway. Actions for migratory birds are considered within the scope of the BMP, which is prepared separately.

The potential triggering species Red-Footed Falcon (*Falco vespertinus*) was evaluated according to Criteria 3. The Biodiversity Area does not regularly support migratory or congregatory species at any point in their lifecycle. Additionally, it does not sustain more than 10 percent of the global population of any species during periods of environmental stress. Therefore, this species do not trigger Critical Habitat Criteria 3.

Criterion 4: Highly Threatened or Unique Ecosystems

Coastal and terrestrial habitats identified in the Biodiversity Study Area were first evaluated in terms of their corresponding EUNIS codes and Habitats Directive Annex I statuses. Then, those that are potential critical habitat triggers were assessed against the European Red List of Habitats. Considering the current statuses of habitats in Türkiye, and major threats they are facing, based on expert judgment, a national assessment in line with the Red List criteria (Janssen, 2016) was also made and presented in Table 94.

Table 94. Potential Critical Habitats as per Criterion 4

Habitat Description	European Red List		National Assessment	
	Category	Criterion	Category	Criterion
B1.4: Coastal stable dune grassland (grey dunes)	EN	B1, B2	EN	B1
B1.5: Coastal dune heaths	-	-	EN	A3, CD1
C1.2: Permanent mesotrophic lakes, ponds and pools	NT	CD1	LC	-

Coastal stable dune grassland (grey dunes)” has been assessed to be Endangered (Janssen, 2016), due to its extent of occurrence (B1), extent of occupancy (B2) and reduction in its abiotic and/or biotic quality (CD1) both at the European and Turkish scales.

“Coastal dune heaths” habitat in the area is different than the European B1.5 habitats in terms of its species composition. However, considering it should be evaluated with habitats of the same class, it has been considered as a Habitats Directive provisional Annex I habitat. Since the European Red List does not provide an assessment for this habitat in Türkiye, the habitat has been assessed at the national scale. Based on present and future (next 50 years) reduction in its quantity (A2b) and reduction in the habitat’s abiotic and/or biotic quality (CD1) it is categorized as Endangered. It has not been possible to identify how much of the global extents of these two habitats are represented in the area. However, considering their relatively narrow range and threats they have been facing, the dune habitats in the Biodiversity Study Area have been designated as critical habitat.

In line with ESS6 provisions, and following the mitigation hierarchy, potential impacts on critical habitat have been avoided within the scope of the Project. Alternative routes were considered by the DGII and the railway line was redesigned so that it does not pass through the critical habitat. Besides, no project-related activities will be performed in the critical habitat area to avoid impacts on species and habitats. Therefore, it expected that there will be no Project-related impacts on the critical habitat and species populations it supports.

Although “Permanent mesotrophic lakes, ponds and pools” does not meet Criterion 4 thresholds, it is still considered as priority habitats as natural habitats supporting significant assemblages of flora and fauna, as well as ecosystem functions. Potential impacts of the Project on natural habitats are further discussed in line with the mitigation hierarchy.

5.8.6 Ecosystem Services Review

The Millennium Ecosystem Assessment (MA) was initiated with the support of the UN in 2001 to assess how changes in ecosystems impact human well-being and what actions are needed to be enhanced to ensure sustainable use of ecosystems and their contribution to human life. The MA involved knowledge and expertise of over a thousand experts worldwide to publish its synthesis reports linking biodiversity to ecosystem services, as well as to human well-being and development needs. These reports, reflecting consensus view of a large body of social and natural scientists, provide a widely accepted definition and categorization of ecosystem services (MA, 2005).

ESS6 also recognize the importance of maintaining benefits that people, including businesses, derive from ecosystems. ESS6 defines ecosystem services as “the benefits that people derive from ecosystems”. Project development must therefore be balanced and the potential for utilizing the multiple economic, social and cultural values of biodiversity and living natural resources should be assessed in an optimized manner. The four broad categories of ecosystem services that the MA puts forward, as recognized by ESS6 can be listed as the following, with definitions widened by the World Resources Institute (WRI), in its report entitled “Weaving Ecosystem Services into Impact Assessment: A Step-by-Step Method” (Landsberg et al., 2013):

- Provisioning services; are goods or products obtained from ecosystems, such as food, timber, fiber and freshwater.
- Regulating services; are the contributions to human well-being arising from an ecosystem’s control of natural processes, such as climate regulation, disease control, erosion prevention, water flow regulation, and protection from natural hazards.
- Cultural services; are the non-material contribution of ecosystems to human well-being, such as recreation, spiritual values, and aesthetic enjoyment.
- Supporting services; are the natural processes, such as nutrient cycling and primary production that maintain other services.

In line with the provisions of the ESS6, interaction of the Project with ecosystem services and benefits derived from ecosystem services are assessed in this section of the ESIA biodiversity studies. In addition to biodiversity studies, socio-economic findings of the ESIA which are detailed, have also been used.

Guidelines developed by the WRI provide a useful tool to incorporate evaluation of ecosystem services into the Project ESIA studies. The first step in the Ecosystem Services Review (ESR) is identifying ecosystem services based on the following criteria:

- Impact: Direct impact on a particular ecosystem service caused by project activities that also impacts the community,
- Dependence: Project’s dependence on the ecosystem service for its operations
- Relevance to Affected Community: Ways in which livelihood, health, safety or culture of a community will be impacted,
- Management Control: The project’s control over the ecosystem service in question,

Socio-economic and biodiversity studies conducted within the scope of the ESIA process identify relevant ecosystem services as explained in Table 95.

Table 95. Ecosystem Services

Ecosystem Service	Sub-Category	Ecosystem Service on the Project Route	Status
Provisioning Services			
Food	Crops	Grains	Mostly for household consumption.
		Vegetables	
	Livestock	Large / small cattle	

Ecosystem Service	Sub-Category	Ecosystem Service on the Project Route	Status
		Poultry	Livestock is a significant source of income at all of the settlements that have been subject of the Social Impact Assessment (SIA).
		Grazeland	
		Fisheries	50 households in Kurtpınar village are involved in fisheries.
	Apiculture		One household interviewed within the scope of the SIA has beehives.
	Wild food	Citrus fruits	The most significant produce in terms of income generation (citrus fruits generating the most)
		Olives	
		Mushroom, herbs	Mostly for household consumption.
Biological raw material	Timber and other wood products	Firewood	Derived from the forest for household consumption.
Freshwater	Agricultural irrigation		99% of citrus fruit production depends on drip irrigation.

The second step in ESR is to identify ecosystem services for which the Project impacts could affect the ability of others to derive benefits, those that are significant to beneficiaries' livelihoods, health, safety or culture, and finally ecosystem services that have no viable alternatives.

Accordingly, ecosystem services relevant to the Project that are explained in Table 95, have been further assessed to determine which are priority ecosystem services. The decision tree developed by the WRI (Landsberg et al., 2013), as presented in Figure 80 provides a useful tool to prioritize relevant ecosystem services according to potential project impacts on beneficiaries.

Assessment of each identified ecosystem service according to the decision tree yielded priority ecosystems as listed in Table 96, which also shows how the decision tree has been implemented to prioritize relevant ecosystem services.

A detailed assessment on significance of ecosystem services in terms of livelihoods, and Project-related impacts is provided in Socio-Economic Environment.

It has been identified that the most significant impacts on ecosystems with the implementation of the Project will incur as the loss of citrus fruit orchards and as impacts on water resources. Loss of olive gardens and grazeland on the route, and restriction of access to grazelands have also been assessed as priority ecosystem services.

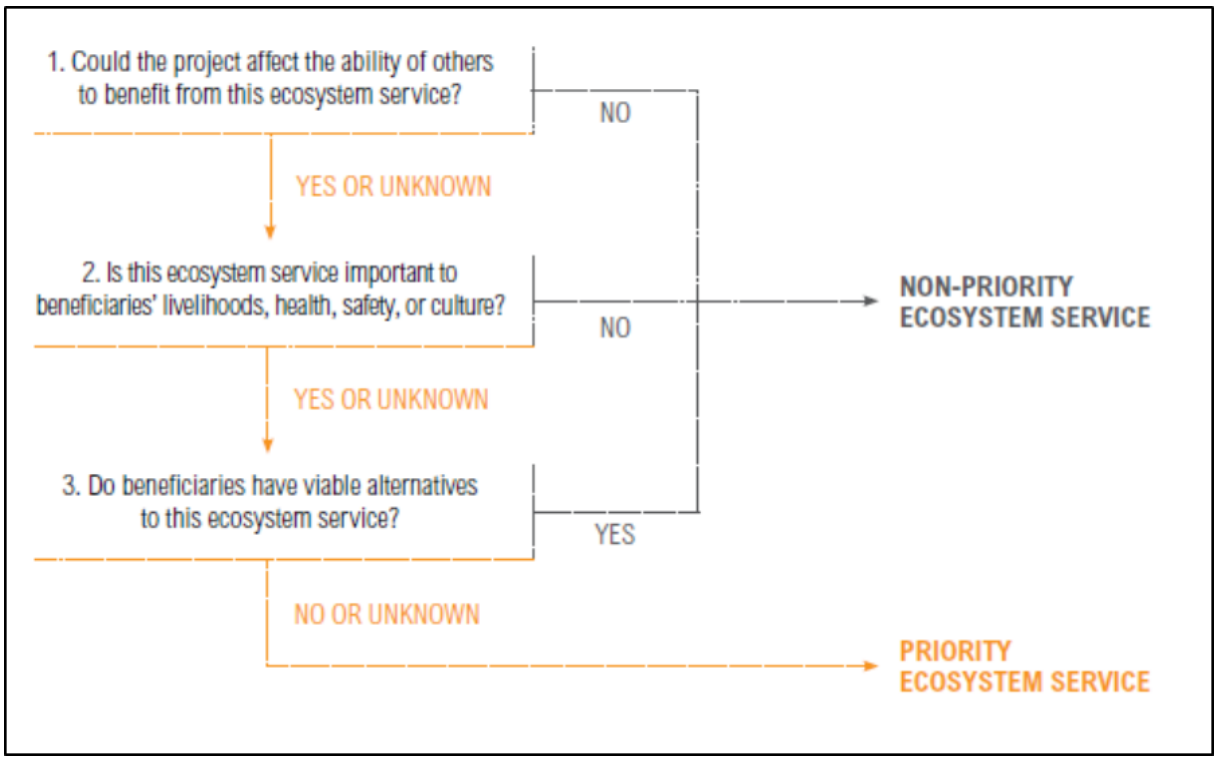


Figure 80. Decision Tree to Prioritize Ecosystem Services

Table 96. Prioritization of Relevant Ecosystem Services

Ecosystem Service	Decision-Tree Question			Decision
	1	2	3	
Grains	Yes	No	-	Non-priority service
Vegetable gardens	Yes	No	-	Non-priority service
Large/small cattle	No	-	-	Non-priority service
Poultry	No	-	-	Non-priority service
Grazeland	Yes	Yes	Unknown	Priority service
Apiculture	No	-	-	Non-priority service
Mushroom, herbs	Yes	No	-	Non-priority service
Citrus fruits	Yes	Yes	Unknown	Priority service
Olive	Yes	Unknown	-	Potential priority service
Firewood	Yes	No	-	Non-priority service
Agricultural irrigation	Yes	Yes	Unknown	Priority service

Loss of land and immovables due to expropriation, which also include citrus fruit orchards and the irrigation system, will be assessed in further detail within the scope of the Resettlement Plan (RP). Income losses of households who benefit from non-priority ecosystem services, and those who use treasury land, village legal entity, or public land like grazeland and forests, will also be assessed in the RP, which will provide detailed mitigation and compensation measures.

5.9 Impact Assessment

The impacts of railways on wildlife are convert a strip of land into an area where fast-moving trains can collide with and kill or injure animals. Railways also emit noise, light and chemical pollution (Dorsey et al. 2015), and can act as barriers to movement.

Railways are known to have a negative impact on ecosystems during the construction phase (e.g. laying of tracks and erecting buildings, bridges and other infrastructure) and in the operational phase (e.g. running of trains, maintenance of tracks, etc.).

Impacts of railway lines contains:

1. Direct loss of habitat

The construction of new railways destroys or damages vegetation such as trees, shrubs and grasses; this vegetation may provide valuable habitat for wildlife and endemic plant species. The degree of impact is likely to be proportional to the width and length of the disturbance corridor.

2. Degradation of habitat quality

The condition of wildlife habitats adjacent to railways often suffers as a result of construction activities such as trenching and digging and the presence of construction camps. Impacts typically include invasion by exotic weeds, and pollution due to liquid or solid wastes or emissions. The effects of heavy metals such as lead from motor vehicle on trees and soils, and numerous chemical elements arising from roads, vehicles, fuels and corrosion, and wear and tear of vehicle components, are recognized impacts. In addition, the habitat may become less attractive to wild animals due to noise, lights or human presence.

Likewise, railways may pollute water and air, cause noise, act as a source of garbage and human wastes, and facilitate the spread of invasive species within wildlife habitats. Altered drainage patterns and pollution or sedimentation of aquatic ecosystems can also lead to degradation of habitats.

Disturbance from poorly-supervised construction workers could pose additional threats of unauthorized activities.

Water, land and air pollution may adversely impact the general health and fertility of wild animals (and livestock). Trains transporting petroleum products, compressed/ liquefied gases, chemicals and other toxic or hazardous materials are akin to factories in their potential impacts.

3. Noise-induced physiological and behavioral changes

The impact of noise on wild animals is a contentious issue: Berthoud (2003) reported that, in general, wild animals seem to adapt well to the frequent passing of trains. Hanson (2008) refers to the debate between the sceptics on the one hand, who hold that habituation to transportation noise is common among wild animals, and the environmentalists on the other hand, who insist that loud noise interferes with the communication systems of wild animals, brings out a 'flight or fight' response, and interferes with the behavior of both predator and prey. He points out that research has been inconclusive regarding effects on wild animals from transportation noise sources. According to Parris (2015), if the noise is loud enough and present for long it can have serious and significant impacts.

4. Habitat loss and fragmentation

Railway lines dissect contiguous habitat patches, resulting in smaller patch sizes and higher edge-to-interior ratios, making them increasingly vulnerable to outside disturbance. The fragmentation of habitat into spatially isolated parts is a major cause of the decline of biodiversity, e.g. habitat loss and fragmentation of amphibian populations worldwide has led to a substantial decline in their numbers during the last century (Stuart et al. 2004).

Habitat fragmentation has become a global issue associated with most linear forms of infrastructure development, including road and rail. The fragmentation process initiates a

shrinking in available habitat, which in turn leads to a progressive reduction in species diversity in the landscape, with consequent isolation of species. The contraction in available habitat together with isolation becomes the most important impact (Harris 1984).

5. Rail avoidance

Repeated disturbances along railway corridors may deter animals from using habitats in their vicinity. Avoidance of habitats close to transport corridors may vary diurnally, seasonally and in relation to traffic in these corridors (Brumm 2004; Slabbekoorn & Ripmeester 2008; Kociolek et al. 2011).

6. Injury and mortality

Rail induced mortality is probably the most acknowledged effect on wildlife: kills ranging from those of snakes to small rodent to deer, to large cats and mega herbivores such as elephant are a common view along on the rail tracks (Singh et al. 2001; Williams et al. 2001; Roy et al. 2009; Sharma 2009; Joshi 2010; Rangarajan et al. 2010).

7. Barrier to movement

Railways can serve as a corridor for species moving across landscapes, they may restrict, inhibit or prevent the movement of species. This barrier effect on wildlife results from a combination of factors, from traffic noise, train movement, pollution and human activity to physical hindrances and traffic mortality (Trocme et al. 2003).

A railway line can act as a strong barrier on a number of counts: the embankment may be too high to climb, constructed of material (e.g. loose gravel or large stones) that cannot be navigated by some species, or present a visual barrier that discourages crossing by species used to long lines of sight. The railway tracks themselves may deter passage, and traffic movement or volumes may hinder or prevent crossing by many species.

The rate of animal movement through road or rail corridors may be lower than in intact natural habitat. Linear infrastructure thus acts as a filter to movement in that corridor, affecting its so-called 'permeability'.

5.9.1 Land Preparation and Construction Phase

The most significant impact of the Project on biodiversity during its land preparation and construction phase will be habitat loss and fragmentation, and the barrier impact the two impacts bring about. Populations of flora species will be directly impacted, while fauna species' habitat use capabilities will be reduced.

When distribution of a particular population is divided by a railway, part of the habitat is lost, and the rest might be destructed. The small, isolated patches that are formed as a result of fragmentation may not have sufficient capacity to maintain viable populations. Activities to be realized during the land preparation and construction phase may present physical barriers limiting animals' movement between areas where they feed and have access to water, and their breeding sites.

Mitigation measures proposed at this stage are targeted at flora and fauna species that are known to be inhabiting the area from literature records, habitat suitability and surveys, and have been assessed based on expert judgement.

The World Bank Group Environmental, Health, and Safety Guidelines for Railways (2007), proposes the following measures to be implemented to minimize impacts of railway construction on biodiversity:

- Avoid fragmentation or destruction of critical habitats;
- When rail crossings of watercourses are unavoidable, maintain water flow and fish access by utilizing appropriate methods;
- Minimize the clearing of riparian vegetation during construction;

- Avoid construction activities during the breeding season and other sensitive seasons or times of day, especially where critically endangered or endangered species are concerned;
- Avoid the introduction of invasive species during reinstatement activities, preferably through the use of native plant species

Potential environmental impacts associated with the land preparation and construction phase of the Project, might also disturb flora and fauna species, based on the magnitude of impacts and sensitivity of the biodiversity receptors. Mitigation measures to be taken to minimize impacts on air, soil and water quality and regarding control of noise and vibration are provided in the related chapters of this ESIA Report. Principles and implementation strategies with respect to control and management of environmental impacts that have been developed in line with the national legislation, and international standards and guidelines are provided both for land preparation and construction, and operation phases of the Project as part of the ESMP.

There are no foreseen Project-related impacts on critical habitat triggering grey dune and dune heath habitats, and the *Echinops dumanii, Astragalus antiochianus* and *Acanthodactylus schreiberi* populations they hold. Land preparation and construction activities will be limited to pre-designated working areas avoiding any potential impact on critical habitat. In natural habitats, where impacts cannot be avoided, temporary impacts resulting from land preparation and construction activities will be controlled in line with the best practices and risks on biodiversity will be minimized. Changes in biodiversity features will be monitored in line with the provisions of ESS6, where monitoring results will be used to develop additional measures and management strategies through implementation of an adaptable management approach.

5.9.2 Operation Phase

Although the most significant impacts of railways are noted as habitat loss and fragmentation, the newly formed sets around the routes passing through different habitats form important green corridors. Vegetation management constitutes an integral part of railway operation and maintenance, and is important not only in terms of fire control, visibility, falling trees and leaves, but also for maintaining biodiversity. Railway corridors can provide opportunities for flora and fauna species that are already under the pressure of urbanization, through newly formed habitats and interactions between these corridors and adjacent habitats (Borda-de-Agua et al., 2017).

Regular maintenance of vegetation along rights-of-way may involve the use mechanical and manual methods, as well as herbicides. Vegetation maintenance beyond that which is necessary for safety, may remove unnecessary amounts of vegetation, resulting in loss of successional species and an increased risk of invasive species (the World Bank Group, 2007).

The World Bank Group (2007) recommends the following measures to be taken to prevent and control impacts from right-of-way vegetation maintenance:

- Within the scope of an integrated vegetation management,
  - the track areas should be kept completely clear of vegetation, and
  - from the edge of the track area to the boundary of the right-of-way, vegetation should be structured with smaller plants near the line and larger trees further away from the line to provide habitats for a wide variety of plants and animals,
- Native species should be planted, and invasive plant species removed,
- Railways should be designed and maintained to discourage plant growth in the track area (e.g. providing lateral barriers to plant migration and ensuring rapid drainage of the track area),
- Biological, mechanical, and thermal vegetation control measures should be used where practical, and use of chemical herbicides on the bank beyond the transition area should be avoided (approx. 5 meters from the track),
- Maintenance clearing in riparian areas should be avoided or minimized.

In line with the World Bank Group Environmental, Health, and Safety Guidelines for Railways, herbicides for the Project will be used following the manual on pesticides prepared by the World Health Organization (WHO) and the UN Food and Agriculture Organization (FAO). Accordingly, necessary trainings should be provided to the Project personnel both on use of herbicides, and also on biodiversity features in the area.

The barrier impact of the railways that start off during the land preparation and construction phase, continues through the operation and maintenance phases. Although limited when compared to impacts of highways, animal mortality due to collision, electrocution, wire strikes and rail embankment are the most obvious impacts of operation-phase impacts (Dorsey et al., 2015). Collision is a significant risk factor for mammals and birds, while smaller animals have been reported to die due to embankment (Budzic ve Budzic, 2014).

For those animals that approach the railways to use the newly formed habitats, it is possible to lower the mortality risk by taking measures to limit their passages. Fencing, sound signals/barriers, chemical repellents, lights and reflectors, and physical barriers such as trees and noise barriers, can be impactive in lowering mortality rates. These measures, however, also carry the risk of increasing the barrier impact. To prevent such measures to enhance the barrier impact, physical barriers and fences should not be placed randomly along the right-of-way. Instead, appropriate locations where collision risk is higher should be determined prior to construction. When fencing is used, it is also crucial to provide escapes.

Structures like bridges and culverts that can be part of the Project design, can also serve as wildlife passages, although their original purposes might be different. In some cases, it is possible to transform these structures into wildlife passages, or design new ones for wildlife. Significant locations for animal passages and adequacy of planned structures should be determined based on habitat use of fauna features, which will be identified prior to construction. This should be assessed during pre-construction phase with the coordination of DGII. In determining the need and location for new passages, socio-economic impacts should also be considered. Passages that will also enable human and cattle passage and provide access to grazelands should be identified through consultations within the scope of the Stakeholder Engagement Plan (SEP) and addressed through an integrated approach.

5.9.3 Mitigation Hierarchy

In line with the provisions of ESS6, biodiversity impact assessment has been conducted following the mitigation hierarchy. The main objective of biodiversity studies undertaken within the scope of the Project is to develop and implement mitigation measures and actions in order to achieve no net loss in natural habitats and species of high conservation concern, and net gains in critical habitat.

The theoretical framework for the mitigation hierarchy that has been implemented in biodiversity studies is presented in Figure 81. To reach habitat and species conservation targets in line with the ESS6 requirements, the mitigation hierarchy approach has been adopted. Following the implementation of the mitigation hierarchy, and after appropriate avoidance, minimization and restoration measures are taken, biodiversity offsets may be considered to compensate for significant residual impacts targeting measurable conservation outcomes as net gains in critical habitats within the scope of the Project’s ESMP.

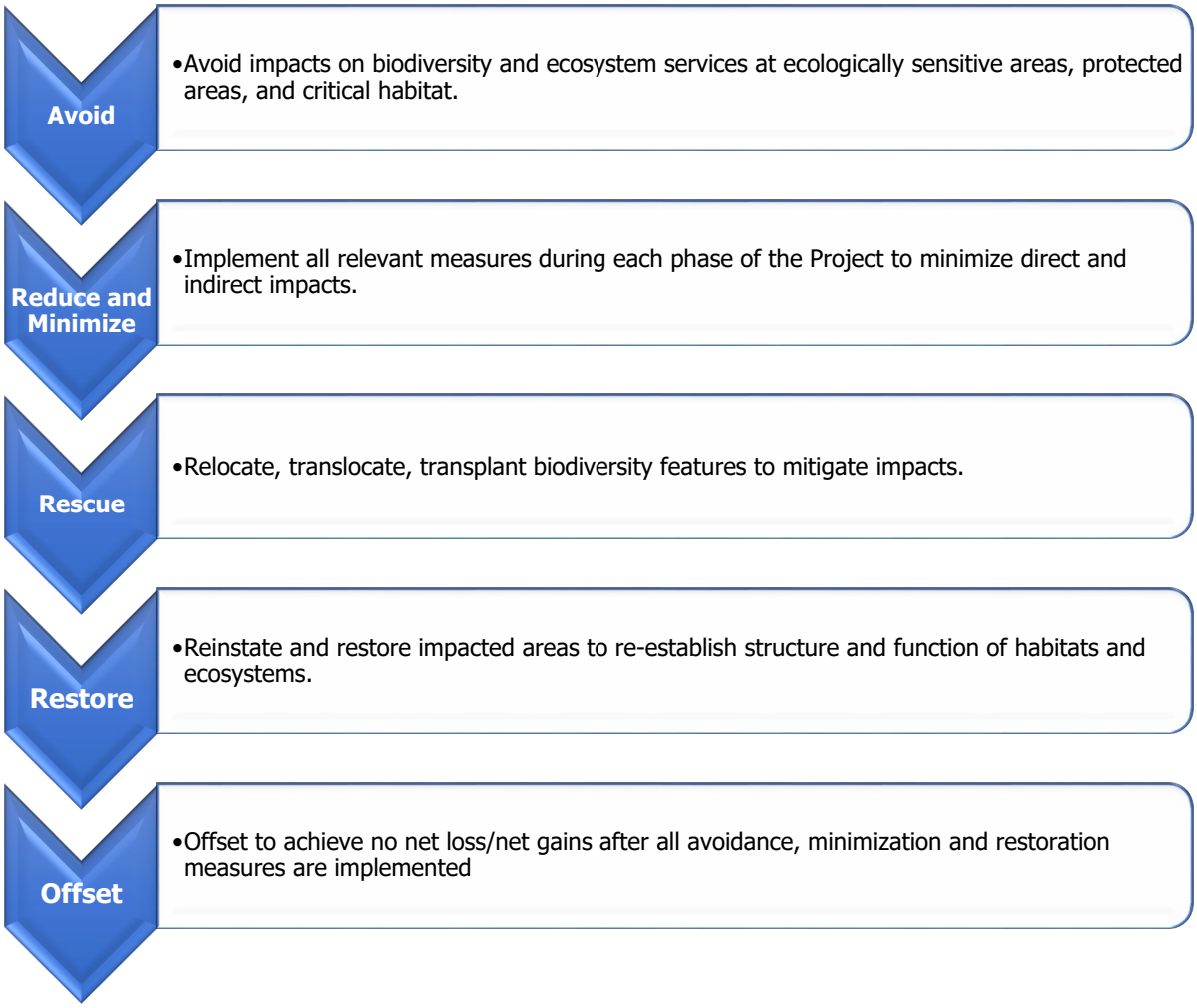


Figure 81. The Mitigation Hierarchy

5.9.4 Receptor Sensitivity

As a result of the baseline and critical habitat studies conducted within the scope of ESIA, different sensitivity criteria have been developed for habitats and species. The sensitivity of a biodiversity receptor has been determined based on its intrinsic value and susceptibility attributing to its uniqueness, extent, conservation status, endemism, abundance and resilience. Sensitivity criteria used for the Project biodiversity impact assessment are given in Table 97.

Table 97. Sensitivity Criteria for Biodiversity Receptors

Sensitivity	Biodiversity Receptors		
	Habitats	Flora	Fauna
High	Critical and natural habitats that are listed as CR, EN, VU according to the RLE that require longer periods of time to recover (more than 10 years)	Local endemic species and/or those that are listed as CR, EN, VU, NT according to the Red Data Book of Turkish Plants or local endemic species that have not been evaluated according to the Red List criteria yet	Endemic species and/or species of high conservation concern (CR,EN,VU, NT)

Sensitivity	Biodiversity Receptors		
	Habitats	Flora	Fauna
Moderate	Priority habitats listed under Annex I of the Habitats Directive that are of regional significance that can recover in medium-term (5-10 years)	Regional endemic species and/or those that are listed as CR, EN, VU, NT according to the Red Data Book of Turkish Plants	Habitats Directive Annex II/IV species and/or species that are of regional or local significance whose populations may be in decline
Low	Natural habitats that recover in shorter periods of time (1-5 years)	Widespread endemic species and/or those that are listed as LC according to the Red Data Book	Widespread species with relatively higher populations and larger range
Negligible	Modified and artificial habitats	Non-endemic widespread flora species	Vagrant species / accidental records

Receptors that are subject to the impact assessment and their associated sensitivity levels determined applying the above criteria are provided in Table 98. Flora and fauna species that are of high conservation concern have been identified as those that are listed as CR, EN, VU and NT according to the Red List, and those that require specific measures to be conserved.

Table 98. Biodiversity Receptor Sensitivity

Biodiversity Receptor	Sensitivity Level
Critical Habitat	
B1.4: Coastal stable dune grassland (grey dunes)	High
B1.5: Coastal dune heaths	
Acanthodactylus schreiberi	
Echinops dumanii	
Astragalus antiochianus	
Natural Habitats	
C1.2: Permanent mesotrophic lakes, ponds and pools	Moderate
C3.2: Water-fringing reedbeds and tall helophytes other than canes	Low
D5.1: Reedbeds normally without free-standing water	
F5.2: Maquis	
F6.2: Eastern garrigues	
Flora and Fauna Species of High Conservation Concern	
Endemic and/or CR, EN, VU, NT flora species	Moderate
Endemic and/or CR, EN, VU, NT fauna species	

5.10 Impact Significance, Mitigation Measures, and Residual Impacts

Biodiversity impact assessment for Çukurova Region and İskenderun Bay Railway Connection Project was undertaken according to the methodology presented above. Accordingly, magnitude of each impact was estimated as a factor of the foreseen geographic extent, duration, and frequency of the impact.

The grey dune and dune heath habitats, as well as *Echinops dumanii, Astragalus antiochianus* and *Acanthodactylus schreiberi* populations they support, all of which trigger critical habitat, will not be impacted due to foreseen Project activities. In line with the provisions of ESS6, following the mitigation hierarchy, potential impacts of the Project on critical habitat have been avoided.

Biodiversity Study Area defined for the Project is about 3,300 hectares. About 1,450 hectares of this area consists of natural habitats. Plantation areas and citrus fruit gardens cover a total of 865 hectares. Natural habitats on the Project route, which will be directly impacted, correspond to 52 hectares, which is about 4% of the natural habitat extent along the Project route. “F6.2: Eastern garrigues” habitat has the largest extent within the Biodiversity Study Area, covering of about 1140 hectares. It is estimated that 4.4% of the habitat will be directly impacted by the Project activities. Project-related impacts on the most sensitive habitat after the grey dunes and dune heaths; the water-dependent 1C1.2: Permanent mesotrophic lakes, ponds and pools” will also be avoided.

Due to the route change endemic and rare species and habitats will not be harmed. Especially the dune habitat is declared as “Critical Habitat”.

To reduce the impacts on reptile species, especially *Testudo graeca* fencing and turtle stuck will be installed.

During field surveys bulbs of *S. pulchella, C. persicum*, and *H. millingenii* species were collected and re-located to suitable habitats (see Figure 72).

Since the project area is on the bird migration route, it is necessary to monitor the migratory birds, especially during migration periods. Especially the Burnaz Springs area is important and constitutes a suitable habitat for bird species due to the existing water source. Since the Project footprint is not included in an important migration resting or breeding area, the project area has not been defined as Critical Habitat, but monitoring in the migration periods will help to determine the status and the indirect Project related affects to the area, if any.

In the assessment of Project-related potential impacts on biodiversity receptors addressed in the ESIA Report, the mitigation hierarchy presented in Figure 81 has been implemented in line with the ESS6. Definition of impacts, factors defined by the impact assessment methodology, related mitigation measures and significance of residual impacts are presented in Table 99.

Table 99. Impacts on Biodiversity Receptors, Mitigation Measures and Significance of Residual Impacts

Impact Description	Project Phase	Receptor	Impact Magnitude						Receptor Sensitivity	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Magnitude	Reversibility	Duration	Frequency	Overall Magnitude				
Habitat loss / fragmentation	Land preparation and construction	Critical habitat: Grey dunes (B1.4)	-	-	-	-	-	-	High	**No impact (Avoided)**	▪ The Project personnel will be informed on the sensitivity of the habitats and the Directorate General of Infrastructure Investments (DGII) will train internal staff to be able to provide advice to contractors with input and advice, if required, and enable an informed overview of the biodiversity input from the contractors. Workers will be made aware of the ecological sensitivities of the areas and will be trained in mitigation for unforeseen events, including the presence of uncommon habitats and species. Health and safety recommendations regarding poisonous or otherwise dangerous plants or animals will also be provided by Biodiversity Specialists through toolbox talks and trainings. Emergency numbers will be provided in case of attacks or injuries that may occur by wildlife. ▪ Indirect impacts on the grey dune and dune heath habitats, as well as *Echinops dumanii*, *Astragalus antiochianus and Acanthodactylus schreiberi* populations they support, and also on the mesotrophic lake habitat will be avoided in line with the related environmental management plans (waste management plan, pollution prevention plan). ▪ Biodiversity Management Plan (BMP) will be implemented. ▪ No project related activities will be performed in the defined Critical Habitat and necessary precautions (such as marking the critical habitat, fencing or any other as appropriate) will be taken in this respect. Storage of any project related waste and/or machinery in Critical Habitat will be avoided. ▪ Statuses of habitats and associated species populations will be monitored throughout land preparation and construction. Where necessary, habitat and species-specific measures will be developed and implemented with an adaptable management approach. ▪ *Acanthodactylus schreiberi* will be collected by a herpetofauna team and re-located to a suitable habitat to avoid affect on its population if observed in the construction area.	**No impact (Avoided)**
		Critical habitat: Coastal dune heaths (B1.5)	-	-	-	-	-	-	High	**No impact (Avoided)**		**No impact (Avoided)**
		Natural habitats: Ponds (C1.2)	-	-	-	-	-	-	Moderate	**No impact (Avoided)**		**No impact (Avoided)**
		Sternbergia pulchella, Cyclamen persicum, and *Hyacinthella millingenii* population	Limited	-	-	-	-	-	High	**No impact (Avoided)**	▪ *Sternbergia pulchella, Cyclamen persicum, and Hyacinthella millingenii* population were determined in and outside the AoI. In order to reduce the pressure on the species and the population, *Sternbergia pulchella* specimen bulbs (33 bulbs), *Cyclamen persicum* specimen bulbs (131 bulbs), and *Hyacinthella millingeni* specimen bulbs (185) were collected and re-located to areas outside the AoI in April 2023 for in-situ protection. The re-located specimen will be monitored every year in April.	**No impact (Avoided)**
		Natural habitats: Reedbeds (C3.2)(D5.1), maquis (F5.2), Eastern garrigues (F6.2)	Limited	Low	Irreversible	Long-term	One-off	Medium	Low	**Moderate**	▪ Land preparation and construction activities will be limited to designated work areas. ▪ Impacts on natural habitats outside the Project route will be prevented. ▪ Vegetation clearance at reedbed habitats will be minimized. ▪ There will be no tree cutting/vegetation clearance other than in areas required for the Project. ▪ Mitigation measures related to land use and soil quality will be taken in line with the related management plans ensuring conservation of natural habitats. ▪ Statuses of habitats and associated species populations will be monitored throughout land preparation and construction. Where necessary, habitat and species-specific measures will be developed and implemented with an adaptable management approach. ▪ The Project personnel will be informed on the sensitivity of natural habitats and species, conservation priorities. Any direct impact on plant and animal species will be prevented.	**Minor**
		Fauna species of high conservation concern	Limited	High	Irreversible	Long-term	One-off	Medium	Medium	**Moderate**	▪ In setting up a schedule for land preparation activities, breeding seasons of animals will be considered to prevent direct mortality and also conserve the next generation of their populations in the area. ▪ The Project-related impacts on air, soil and water in natural habitats will be avoided. ▪ In line with the characteristics of the target species, it will be decided in consultation with experts whether passages planned within the scope of the Project would be sufficient for wildlife. ▪ Where necessary, in order to ensure no net loss in populations of fauna species new structures will also be considered in areas that are identified to be significant for animal passages. Passages that will also enable human and cattle passage and provide access to grazelands will be identified through consultations within the scope of the Stakeholder Engagement Plan (SEP). ▪ In order to minimize animal mortality, locations along the route where animal passage will be prevented and methods that will be used to prevent passage of target species (fencing, sound signals, chemical repellents, lights and reflectors, etc.) will also be identified. ▪ To reduce the impacts on reptile species, especially *Testudo graeca* fencing and turtle stuck will be installed. ▪ If any bird nest is encountered during the work, the work in that area will be restricted and after the chicks fly out of the nest, the nest will be moved to a suitable place and the work will continue. ▪ Bird migration monitoring will be performed.	**Minor**
Use of machinery and equipment		*Natural habitats* *Flora and fauna species of high conservation concern*	Limited	Low	Reversible	Short-term	Intermittent	Negligible	Moderate	**Minor**	▪ Trainings will be organized for the Project personnel to inform them about the on-site speed limits and also importance of animal passages. ▪ Machinery and equipment that arrive in work areas will be checked for presence of invasive alien species. ▪ All machinery and equipment will be subject to regular maintenance and will not be used out of purpose. ▪ Use of machinery and equipment will be limited to designated work areas. Impacts related to noise and vibration will be controlled in line with the Project standards.	**Negligible**
Indirect impacts (dust, air emissions,		Natural habitats	Limited	Low	Reversible	Short-term	Intermittent	Negligible	Moderate	**Minor**	▪ In order to control dust emissions, vegetation clearance will only be undertaken in pre-determined activity areas, and habitats will be rehabilitated upon completion of construction activities. All related dust suppression measures will be taken to ensure prevention of indirect impacts on biodiversity features.	**Negligible**

Impact Description	Project Phase	Receptor	Impact Magnitude						Receptor Sensitivity	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Magnitude	Reversibility	Duration	Frequency	Overall Magnitude				
noise, waste, and impacts on water and soil quality)		Flora and fauna species of high conservation concern									▪ On-site speed limits will be enforced to avoid direct mortality of animals. ▪ There will be no direct discharge into water resources. ▪ Project-related wastes will be collected at designated waste storage areas, and periodically removed from work areas. ▪ Hunting of fauna species will be prohibited. In case of illegal hunting activities, authorities will be notified. ▪ Solid wastes and wastewater that will result from land preparation and construction activities of the Project will be managed through implementation of the related management plans.	
Invasive alien species		Natural habitats Flora and fauna species of high conservation concern	Local	Low	Reversible	Medium-term	Intermittent	Low	Moderate	**Minor**	▪ Natural vegetation will be conserved to the best possible extent during land preparation, and native species will be used in restoration after completion of the construction phase. ▪ Vehicles and equipment entering the site will be checked for invasive alien species. If identified, necessary measures will be taken in line with the Project standards to eradicate the species. ▪ Instead of using herbicides, which would destroy the natural vegetation and enable introduction of invasive alien species, different vegetation management methods will be considered as appropriate spatially and temporally. ▪ The separately prepared Invasive Alien Species Procedure will be implemented. ▪ During the land preparation and construction phase biodiversity monitoring studies, potential for presence of invasive alien species in the area will also be monitored.	**Negligible**
Habitat loss / fragmentation	Operation	Natural habitats	Limited	Medium	Irreversible	Long-term	One-off	Medium	Moderate	**Moderate**	▪ Natural habitat will be restored upon completion of construction activities, enabling species to re-inhabit these areas. ▪ Statuses of habitats and associated species populations will be monitored throughout operation phase. Where necessary, habitat and species-specific measures will be developed and implemented with an adaptable management approach. ▪ To establish coherence between newly formed and natural habitats, conserve fauna species, prevent introduction of invasive alien species, and ensure secure transportation, integrated vegetation management strategies will be developed and implemented. ▪ Critical Habitat Monitoring will be performed and reported.	**Minor**
Habitat loss / displacement		Flora and fauna species of high conservation concern	Limited	Medium	Irreversible	Long-term	One-off	Medium	Moderate	**Moderate**	▪ Animal mortality will be kept under control through implementation of methods to prevent animal passage and strategies related to use of existing passages / construction of new ones, based on habitat use of target species that will be identified pre-construction and monitored throughout construction. ▪ In order to prevent animals being attracted to vegetation along the route, to limit the time animals spend near the railway, and increase their visibility and also vision, appropriate vegetation schemes will be implemented within the scope of the integrated vegetation management. ▪ Bird migration monitoring will be performed. ▪ *Sternbergia pulchella*, *Cyclamen persicum*, and *Hyacinthella millingenii* re- located populations will be monitored and reported.	**Minor**
Indirect impacts (dust, air emissions, noise, waste, and impacts on water and soil quality)		Natural habitats Flora and fauna species of high conservation concern	Limited	Low	Reversible	Medium-term	Intermittent	Medium	Moderate	**Moderate**	▪ Use of chemicals for maintenance will be limited. ▪ Wastes will be recycled and disposed on a regular basis to prevent pollution of receiving environment due to operational activities. ▪ Noise barriers will be used to minimize impacts on animals. ▪ Measures to minimize risk of erosion will be taken within the scope of integrated vegetation management. ▪ Necessary measures will be taken to minimize risk of erosion during integrated vegetation management. To identify and respond to any hazard related to erosion, landslide, etc., verges and sloped will be checked periodically. ▪ Solid wastes, hazardous wastes, and wastewater that will result from operation activities will be managed through implementation of related management plans (Waste Management Plan, Water and Wastewater Management Plan, etc.).	**Minor**
Invasive alien species		Natural habitats Flora and fauna species of high conservation concern	Local	Low	Reversible	Medium-term	Intermittent	Low	Moderate	**Minor**	▪ To avoid development of alien species along the railway route, natural plants will be used in restoration, and regular maintenance will continue throughout the operation phase. ▪ To take necessary measures against the risk of invasive alien species being transferred by the trains, there will be periodical controls and if identified, necessary measures will be taken in line with the Project standards to avoid spread of invasive alien species. ▪ During the operation phase biodiversity monitoring studies, potential for presence of invasive alien species in the area will also be monitored.	**Negligible**

SOCIO-ECONOMIC ENVIRONMENT

5.11 Project Standards and Methodology

Phase-I ESIA Studies (2020)

The ESIA for the project was prepared and approved for the first time following the initial field survey conducted in January-February 2020.

The ESIA for the project was prepared and approved for the first time following the initial field survey conducted in January-February 2020. Phase 1 ESIA field studies were conducted by ÇINAR Consulting in January and February 2020 and the first ESIA Reports were prepared in May 2020. Following the Phase 1 studies, Phase-II ESIA Studies were revised and updated based on the field studies conducted in 2023 and 2024. The descriptions of these studies are given below.

The interviews conducted as part of the field studies utilized semi-structured questionnaires, household survey questionnaires and mukhtar interview forms (see Appendix-7). In almost every interview, an assessment was carried out concerning the level of project awareness, potential positive and negative impacts, and the repercussions of the earthquake on the region. Similar attention was directed toward livelihoods, with a particular emphasis on workforce considerations, regional sensitivities, and trends. Furthermore, the semi-structured questionnaires were tailored for each stakeholder by incorporating sections aligned with their specific interests. For instance, stakeholders related to agriculture were given prominence in discussions concerning agricultural labor, whereas those engaged in planning participated in deliberations regarding regional development and progress. Similarly, stakeholders currently active within industrial and manufacturing sectors engaged in discussions regarding potential project impacts on the transportation of raw materials and goods. Consultations were primarily held with regional sub-representatives of the relevant ministry, port administrators, and other pertinent stakeholders, addressing matters concerning the intersection between railway transportation and industry.

A methodology predicated on the aggregation of data from various sources was employed to unveil the socio-economic characteristics of settlements adjacent to the railway route and stations, as well as to evaluate potential socio-economic impacts of the Project, particularly in the region and nearby settlements. The study's sources of quantitative and qualitative data encompass:

- Desk-based studies incorporating indicators from the TurkStat and ABPRS,
- Official correspondences, and
- Field studies (including household surveys, focus group meetings, mukhtar interviews, etc.).

During the meetings with the headmen (**mukhtar interviews**), an attempt was made to gather general information about the settlements. The settlement interview, in general, encompasses aspects such as the demographic profile and social structure, migration movements, vulnerable groups, existing infrastructure, educational opportunities, health services, economic activities, forest use, expropriation and cadastre, land ownership, cultural heritage, and inquiries aimed at eliciting the viewpoints of the mukhtars regarding the project.

The **household survey** aimed to collect information about the overall socio-economic status of households in the research area and their general perspectives and anticipations concerning the project. The household survey typically encompassed aspects such as the demographic profile of households, the status of infrastructure and housing, income-generating activities, land availability; access to services such as education and healthcare, issues within the region, and inquiries intended to gauge their opinions regarding the project.

Focus group meetings (FGMs), a qualitative research technique, are conducted with various interest groups in the region to gather information and opinions through group dynamics. In these meetings, discussions revolve around several key aspects, including:

- Anticipations concerning the positive or negative impacts of the project on social services and infrastructure,
- Foreseen effects of the project on the settlement's economy, encompassing both positive and negative impacts on employment and livelihoods,
- The potential influence of the project, whether positive or negative, on the quality of life within the settlement,
- Specific topics of interest and the information that stakeholders desire to acquire about the project.

In-depth interviews are conducted with stakeholders who could potentially experience direct or indirect effects from the project. These interviews serve as a crucial means to gather their opinions and recommendations, which play a pivotal role in the assessment of social impacts.

In the course of the survey conducted for Phase 1, a diverse array of data was collected from various sources concerning the socio-economic condition of the region, employing the aforementioned data collection methodologies.

Phase-II ESIA Studies (2023, 2024)

Subsequently, the project was revised, and field studies for revision of the approved ESIA document were carried out in January 2023, and with the completion of the impact assessment studies, the ESIA report was updated. During the update of the ESIA report the following tasks were completed:

- The methodology of revision studies of the ESIA was included,
- Review of available documents and Project specific documents,
- Review of the secondary data and official data on the Project's AoI,
- Review of the data available at the database of Turkish Statistical Institute (TurkStat) and the Address Based Population Registration System (ABPRS),
- Official information from the District Directorates of the institutions, and
- Stakeholder interviews, meetings, household surveys.

Subsequent to the research undertaken during the initial phase, the widespread Covid-19 pandemic and the earthquake centered in Kahramanmaraş on February 6, 2023, which notably affected settlements within the project's area of influence (AoI), necessitated the revision of the data acquired through fieldwork. Furthermore, owing to modifications introduced to the project route, a comprehensive reassessment employing both qualitative and quantitative research approaches became imperative.

In line with the commitments in the project’s Environmental and Social Commitment Plan (ESCP), the entire ESIA package has been revised to align with the mitigation measures and actions specified in the ESCP. This revision process has mentioned as Phase-2 of the Project. The additional environmental, social, and ecological studies, which could not be performed due to the seasonal and Covid-19 restrictions during Phase-1, were conducted during Phase-2 and the railway route was revised to comply with the items outlined in ESCP. In line with these changes a field visit was conducted in May 2023, during which potential stakeholders were met. Among these stakeholders are the envisaged users of the connected port and administrators of the organized industrial zone. After establishing initial contact with these stakeholders in May 2023 for Phase 2 activities, they were reconvened during the stakeholder engagements conducted in August 2023. Almost all stakeholders encountered during both the previous period and recent research have participated in face-to-face discussions.

Phase-II ESIA Studies: Field Studies

In addition to the data collection techniques utilized during Phase-I, the following additional tasks were also carried out in March 2024.

- Review of available updated documents and Project specific revised documents,
- Review of the secondary data and official data on the Project's AoI including;
    - Population and demography,
    - Economy and Employment,
    - Poverty and unemployment data
    - Infrastructure,
    - Reports on the socio-economic change of the region after the earthquake,
    - Gender indicators
    - Findings regarding vulnerable groups (seasonal workers, Syrians)
- Review of the data available at the database of TurkStat and the ABPRS,
- Official information from District Directorates of the Institutions,
- Quantitative and qualitative fieldwork.

Phase II field study was carried out by a field team of five (5) people. In support of this team, during the field process, two (2) researchers supported the progress in the field by making appointments by phone and administered surveys by phone to people who could not be interviewed in the field, who did not live in the Project area, but were affected by the Project acquisition.

The list of all parcels affected within the scope of the Project was provided by the Project. Since the list of parcels identifies the PAPs directly affected by the project due to land acquisition in settlements, this same list is also used as a reference to guide the sampling for the ESIA field study.

Within the scope of this field study, qualitative and quantitative research methods were used together, and primary and secondary data were evaluated together.

In this context, Mukhtar surveys, Community Level Surveys (CLS) and Project-affected PAPs and Household Level Surveys (HH Surveys) which are presented in the Annexes, were carried out in all affected settlements.

Phase-II ESIA Studies: Sampling, Data Collection and Analysis

The total population of Aşağıburnaz, Hürriyet, Sarımazı, Turunçlu, Türkmen, Büyük Tüysüz, Yukarıburnaz is 10,195 according to official records. This population corresponds to approximately 2000 households (Please see: 1.2. Baseline Conditions). However, as stated during the evaluation of the Project population and demographic data, the population living in the region has migrated to other cities, container cities, and the neighborhood populations have become places where very few households live.

In addition to this population data, the number of households directly affected by the land acquisition of the Project was determined by determining the private land owners/users and arable public land users affected by the land acquisition.

The target number of households for the survey was determined as a full census. Within this scope, the users of 47 private lands and additionally the shareholders and users of 16 public arable lands were interviewed and the number of households was reached as 35. These numbers are the figures obtained by reaching all households living in the affected settlements and affected by land acquisition during the field study with the help of Mukhtar and taking their phone numbers. The households that could not be reached are the families that migrated after the earthquake and started living in other cities.

Details are provided in the Numbers of household surveys (see Table 100).

Table 100. Numbers of household surveys

Settlement	Private lands				Public lands			Total		
	# of parcels owned by real persons	# of parcels owned by legal entities	# of owners	# of Household survey	# of parcels	# of public land users identified[37]	# of Household survey with users of public lands	# of parcels	# of owners/users	# of survey
Aşağıburnaz	18	0	48	10	4	1	4[38]	22	49	12
Hürriyet	14	0	342[39]	7	11	5	3	25	347	10
Sarımazı	1	4	6	0[40]	37	0[41]	0	42	6	0
Turunçlu	2	0	8	1	15	2	3	17	10	4
Türkmen / Büyük Tüysüz	0	0	0	0	1	0	0	1	0	0
Yukarıburnaz	11	0	61	2	22	8	8	34	69	9
Total	**47**[42]	**4**	**465**	**20**	**90**	**16**	**16**	**143**	**481**	**35**[43]

Source: March 2024 Project Field Study

In addition, for ESIA, an additional ESIA survey was conducted on 12 households that were not affected by the land acquisition process but would be exposed to the potential social and environmental impacts of the Project. These data are shown in the Information on the Conducted Surveys on March 2024 table.

The sample method followed was carried out within the demographic and social situation determined by the current vulnerable situation of the region, the loss of the majority of the population, the fact that the population living within the AoI is still not settled and the conditions for out-migration.

With the help of in-depth interviews with the Mukhtars of these settlements and representatives of Project-affected households living in these settlements, all land acquisition lists were examined. It was aimed to conduct full census interviews with all PAPs whose parcels were affected and living in the visited settlements and the households affected by land acquisition, and field work was carried out in this context. Based on this list, the villages of Aşağıburnaz, Hürriyet, Sarımazı, Turunçlu, Türkmen, Büyüktüysüz, Yukarıburnaz were visited within the scope of field work as settlements directly affected by the Project.

37 Also not a private land owner/user

38 3 informal users are also private land users.

39 There are many shareholders on the title deed but not in the settlement and/or on the land. For these lands, owner-users in the settlement and on the land were reached within the scope of the RP field study.

40 Industrial area; not arable. Owners are one affected private land are investors, not local people.

41 Industrial area; not arable.

42 14 out of 47 parcels have ongoing court cases, the deeds are passive and no information on the owner/shareholders is available. "Passive" means that information about the parcel cannot be accessed from the parcel information system and therefore the owners cannot be identified at the moment in the scope of RAP study.

43 3 of PAPs both private land owner/user and public land user at the same time

Within the scope of the ESIA study, the PAPs and the mukhtars of the affected settlements, whose categories are given below, were interviewed.

- All PAPs including;
  - (Questionnaire) Directly affected (informal and formal users/owners) by the land acquisition (full list is available in the Annex-1 of the Resettlement Action Plan),
  - (Questionnaire) PAPs who were among the people who were stated by the mukhtars to be affected by their residences or agricultural/commercial activities (due to dust, traffic, etc.)
  - (Questionnaire) Individuals still living in the affected settlements after the earthquake
  - (Questionnaire) PAPs affected not only by land acquisition but also by the Project activities in these 7 settlements
  - (Questionnaire) PAPs living close to the Project area of influence,
- (Mukhtar Questionnaire) Mukhtars of the settlements within the AoI,

During the sampling identification process, information was also obtained from the Mukhtars of settlements within the AoI, as they were consulted as resource persons to help reach individuals who could potentially be affected by the Project.

The interviews held as a result of the determination of the ESIA sample and the strategy for land acquisition of the Project are presented in the table below.

As shown in Table 101a survey was conducted covering total of 47 households across 6 settlements for the RP and ESIA revision study. Of these, 35 surveys were conducted with households listed as affected parcels, as provided by the DGII, while the remaining 12 surveys were conducted with households identified based on guidance received from the mukhtars to include those potentially affected by the project due to land acquisition. Through the surveys conducted with 47 households, a total of 190 household members were reached. In addition, in-depth surveys were conducted with the mukhtars of each of the 6 settlements.

Table 101. Information on the Conducted Surveys on March 2024

	Total ESIA household surveys	ESIA household surveys	Land acquisition+ESIA household HH surveys	Mukhtar in-depth interviews
Aşağıburnaz	18	1	12	1
Hürriyet	14	2	10	1
Sarımazı	1	4	0	1
Turunçlu	2	1	4	1
Türkmen / Büyük Tüysüz	0	0	0	1
Yukarıburnaz	12	4	9	1
Total	47	12	35	6

As a result of the survey interviews, edits, coding, and initial evaluations, the data was entered into the SPSS database, completed over five days by a team of four. This process finalized the data transfer for analysis.

Phase-II ESIA Studies: Limitations and Constraints

The most important limitation in the field work was the current fragile situation of the region, the loss of the majority of the population, the fact that the population living within the area of influence has not yet become settled, and the demographic and social situation determined by the conditions for out-migration.

The reason why interviews could not be conducted with all affected PAPs is that a large part of the population in the earthquake region migrated to other settlements, and a large part of

the remaining population started living in temporary container cities. Therefore, information such as how many people live in the AoI and its population cannot be officially accessed yet.

After the earthquake, many households moved, the names on the lists of people affected by the Project land acquisition changed or settled in temporary tents/container houses. Therefore, during the field study, the number of PAPs continuing to live in the Project-affected settlements was lower than expected. At the time of the field study, even official and updated information on the population of the settlements had not yet been verified. There are many temporary settlement areas in the region and many households live temporarily in other settlement areas, in tent cities. The field work was carried out to ensure that the maximum number that could be reached under these force majeure conditions was reached. Limitations and Constraints can be summarized as follow.

The sample method approach is followed during the site visit due to the region is still in a scattered state after a major destruction, the losses of which have not been replaced.

The current vulnerable situation of the region is one of the main limitations which contains the loss of the vast majority of the population, the population living in the AoI is still not resettled, and the non registered emigration of the population.

Therefore, due to the field research, sampling studies conducted in the emergency situation and disaster area, Project sampling has been done with considering the land acquisition lists provided by the Project to guide the sampling for the ESIA field study.

Social Impact Assessment

The social impact assessment considered the significance level of the potential impact, the likelihood and magnitude of the environmental or social impact, its geographical scale and duration depending on the sensitivity of key receptors and sources.

The components and criteria for assessing impacts are presented in Table 102.

Table 102. Impact Assessment Components

Intense of the Impact:	
5.	Very frequent effect (at least 2-3 times a week)
4.	Frequent effect (at least once a week)
3.	Moderately occurring effect (at least once a month)
2.	Rarely occurring effect (once in 2-3 months)
1.	Rare effect (1 time in 6 months)
Receiver Sensitivity:	
5.	Sensitive receiver/ cannot return to its current state when exposed to adverse influence
4.	Vulnerable receiver/adverse impact needs additional support/ additional measures to return to current situation
3.	Sensitive receiver that may be adversely affected by long-term or cumulative adverse impacts
2.	Not a sensitive receiver, impacts can be eliminated by applying mitigation measures
1.	Not sensitive receiver
Impact Duration:	
5.	The impact that becomes permanent once it occurs
4.	Long-term impact (impact will last at least 6 months when it occurs)
3.	Medium-term impact (impact will last 3-6 months when it occurs)
2.	Short term impact (impact will last 1-3 months when it occurs)
1.	Temporary impact (impact will last in a week when it occurs)
Area of influence:	
5.	Regional and wider impact (50 km + impact area)
4.	Impact extending to the provincial level/regional border (30-50 km diameter)
3.	The impact extends to the district level (the impact occurs within a diameter of 10-30 km)

2.	Impact occurring within Project AoI (maximum 10 km diameter)
1.	Footprint: only the impact on the footprint of Project activities (Project footprint)
Effectiveness of mitigation measures:	
4.	Completely eliminates negative effects
3.	Significantly reduces negative impact
2.	Can reduce the negative impact under control and monitoring
1.	It is insufficient against negative effects

Magnitude of residual impact (MoI): MoI describes the level at which the total impact obtained by multiplying the coefficients of all impact components reaches after the application of the developed mitigation measures.

The magnitude of the residual impact is as follows (MoI):

- Very high ($16 > x \geq 20$)
- High ($12 > x \geq 16$)
- Medium ($8 > x \geq 12$)
- Low ($4 > x \geq 8$)
- Negligible ($0 > x \geq 4$)
- None (0)

Assessment approach: Based on the evaluation method above, if the magnitude of the remaining impact is "none", it is evaluated that the Project does not have any negative impact on the relevant impact issue. In this case, where the Project creates potential benefits or positive impacts, improvement measures have been developed to further improve or sustain these impacts.

5.12 Baseline Conditions

5.12.1 Demography and Administrative Structure

Türkiye has constituted seven geographical regions, 81 provinces, 922 districts, 32,240 quarters, 18,275 villages, 23,822 affiliated settlements and 1,391 municipalities in accordance with administrative structure under local authority units[44]. In this structure, Hatay and Adana are provinces, Erzin and Ceyhan are districts and Sarımazı, Turunçlu, Aşağıburnaz, Yeşiltepe and Yukarıburnaz are quarters, which are in east of the Mediterranean Region.

With the Municipal Law No. 6360 on "The Establishment of Fourteen Metropolitan Municipalities and Twenty-Seven Districts and Amendments at Certain Law and Decree Laws" the villages and small towns converted into a quarter by the Law published in the Official Gazette issue dated 16/10/2020 and they gained the status of a rural quarter. According to the law, the status of Hatay Municipality has been transformed as metropolitan municipality[45]. As a result, Hatay Metropolitan Municipality and Erzin Municipality are placed as municipalities.

The Nomenclature of territorial units for statistics (NUTS) classification is a hierarchical system for dividing up the economic territory of the European Union (EU) and the United Kingdom (UK) for the purpose of the collection, development and harmonization of European regional statistics, socio-economic analyses of the regions[46].

- NUTS 1: major socio-economic regions
- NUTS 2: basic regions for the application of regional policies
- NUTS 3: small regions for specific diagnoses

To meet the demand for statistics at a local level, Eurostat maintains a system of Local Administrative Units (LAUs) compatible with NUTS. These LAUs are the building blocks of the NUTS and comprise the municipalities and communes of the European Union[47].

The use of NUTS in Türkiye has started within the scope of the National Programs for the Adoption of the European Union Acquis (NPAA)[48], adopted by the decision of the Council of Ministers dated March 19, 2001, and the Accession Partnership Document adopted at the Environmental Council dated March 8, 2001, prepared by the European Commission. Within this framework, Statistical Regional Units were defined in Türkiye with the study started in 2001 under the coordination of the under secretariat of State Planning Organization (DPT) and the Turkish Statistical Institute, and this classification entered into force by the Decision of the Council of Ministers dated August 28, 2002[49].

Turkish Statistical Institute[50] gives annual population statistics by ABPRS[51] at the last of January of each year. Establishment of ABPRS was completed in 2007 and transferred to the Ministry of Interior Ministry of Interior General Directorate of Civil Registration and Nationality (GDCRN). The Population Registration Law No. 5490 of 25 April 2006 and the Turkish

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44 Republic of Türkiye Ministry of Interior Inventory of Local Authority Units https://www.e-icisleri.gov.tr/Anasayfa/MulkiIdariBolumleri.aspx. Access date: August, 2023.

45 The Establishment of Fourteen Metropolitan Municipalities and Twenty-Seven Districts and Amendments at Certain Law and Decree Laws. https://www.mevzuat.gov.tr/mevzuatmetin/1.5.6360.pdf. Access date: August, 2023.

46 European Commission, Eurostat. NUTS - Nomenclature of Territorial Units for Statistics. https://ec.europa.eu/eurostat/web/nuts/background. Access date: August 2023.

47 European Commission, Eurostat. LAU - Local Administrative Units. https://ec.europa.eu/eurostat/web/nuts/local-administrative-units. Access date: February 2023.

48 Republic of Türkiye Ministry of Foreign Affairs Directorate for EU Affairs. National Programmes for the Adoption of the Acquis. https://www.ab.gov.tr/194_en.html. Access date: August 2023.

49 Republic of Türkiye Ministry of Industry and Technology General Directorate of Development Agencies. Classification of Statistical Regional Units in Development Planning. https://ka.gov.tr/sayfalar/kalkinma-planlamasinda-istatistiki-bolge-birimleri-siniflandirmasi--24. Access date: August 2023

50 Turkish Statistical Institute Main Page. https://www.tuik.gov.tr/Home/Index. Access date: February 2023

51 Turkish Statistical Institute, Address Based Population Registration System. https://biruni.tuik.gov.tr/medas/?kn=95&locale=en Access date: August 2023

Statistical Law No. 5429 of 18 November 2005 have constituted the legal base. The Population Registration Law charged Turkish Statistical Institute (TurkStat) for establishing the ABPRS, and charged Ministry of Interior, the GDCRN for updating and maintenance of the system[52].

Türkiye NUTS includes 12 regions, 26 subregion, 81 provinces and 922 districts. According to this classification, location of AoI is illustrated step by step in the following (see Table 103):

- TR, State, Türkiye
- TR6, NUTS 1 Region, Mediterranean
- TR62, NUTS 2 Sub region, Adana Sub region, Adana, Mersin
- TR621, NUTS 3 Province, Adana Province
- Subprovince Level, Ceyhan District
- LAU, Ceyhan Municipality
- TR63, NUTS 2 Sub region, East Mediterranean, Hatay, Kahramanmaraş, Osmaniye
- TR631, NUTS 3 Province, Hatay Province
- Subprovince Level, Erzin District
- LAU, Erzin Municipality

The other settlements, which are quarters as administratively, also place as quarters in accordance with NUTS.

Table 103. Population of Regions in 2022

Region Code	Region	Total Population	Female	Male
TR	Türkiye	85,279,553	42,575,441	42,704,112
TR6	Mediterranean Region	11,020,550	5,489,272	5,531,278
TR62	Adana, Mersin Sub-Region	4,190,538	2,094,441	2,096,097
TR621	Adana province	2,274,106	1,136,651	1,137,455
TR63	Hatay, Kahramanmaraş, Osmaniye Sub Region	3,422,884	1,695,828	1,727,056
TR631	Hatay Province	1,686,043	838,915	847,128

The project area is located in Adana, Hatay and Osmaniye provinces, which are mapped to TR62 (Adana) and TR63 (Hatay and Osmaniye) subregions according to Türkiye Statistical Regional Units Classification system. The population distribution of the regions and provinces in the study area as of 2022 is presented in Table 104. The high population rates of province and district centers are due to the transformation of villages into neighborhoods with the Metropolitan Municipality Law No. 25531. Although the affected settlements appear as neighborhoods in the population registration system, they maintain their rural characteristics in terms of lifestyle.

[52] Internal Migration Statistics, Release Date :28 December 2022, Number: 45869. Analytical Framework, Concepts, Definitions, and Classifications. https://data.tuik.gov.tr/Bulten/Index?p=Internal-Migration-Statistics-2021-45869. Access date: August 2023

Table 104. Population of Province, District, Town and Village

Region Code	Region	Total Population	City Center	Town and Villages	Ratio of City Center to Total Population (%)	Ratio of Town & Villages to Total Population (%)	Annual Population Growth Rate (‰)
TR	Türkiye	85,279,553	79,613,279	5,666,274	93.4	7.1	7.1
TR6	Mediterranean	11,020,550	10,708,864	311,686	97.2	2.9	12.0
TR62	Adana, Mersin	4,190,538	4,190,538	-	100.0	-	8.6
TR621	Adana	2,274,106	2,274,106	-	100.0	-	4.7
TR63	Hatay, Kahramanmaraş, Osmaniye	3,422,884	3,303,016	119,868	96.5	3.6	8.2
TR631	Hatay	1,686,043	1,686,043	-	100.0	-	9.1

Source: TurkStat 2023

5.12.1.1 District Level Population Change

When the population graph in ten years of the Ceyhan district of Adana is examined, a stable increase can be observed until the year 2020. Starting from the year 2020, a significant decrease in population becomes noticeable (see Figure 82). Due to its rural characteristics, the Ceyhan region relies primarily on agriculture and livestock as its main sources of livelihood. In addition, among the reasons for the observed population decrease as of 2020, the employment changes resulting from the industrialization in the region can be cited.

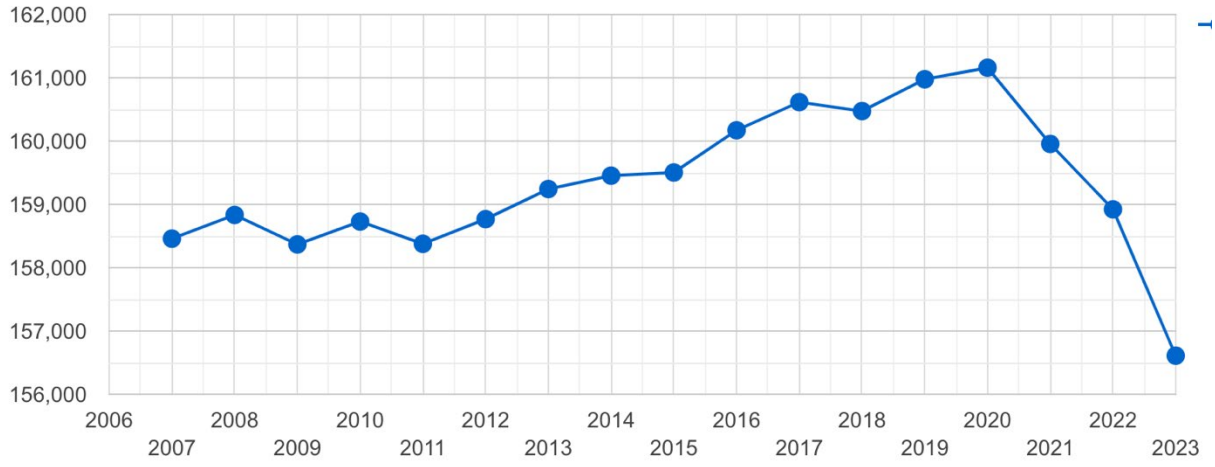


Figure 82. Ceyhan District Population Change Graph

Source: Turkstat 2023 & https://www.nufusu.com/

When the 10-year change graph of the population of Erzin is examined, nonlinear changes depending on the years are observed in the registered population of the region. However, following the earthquake February 2023, population of Erzin has increased because there are no damaged buildings in the district (see Figure 83).

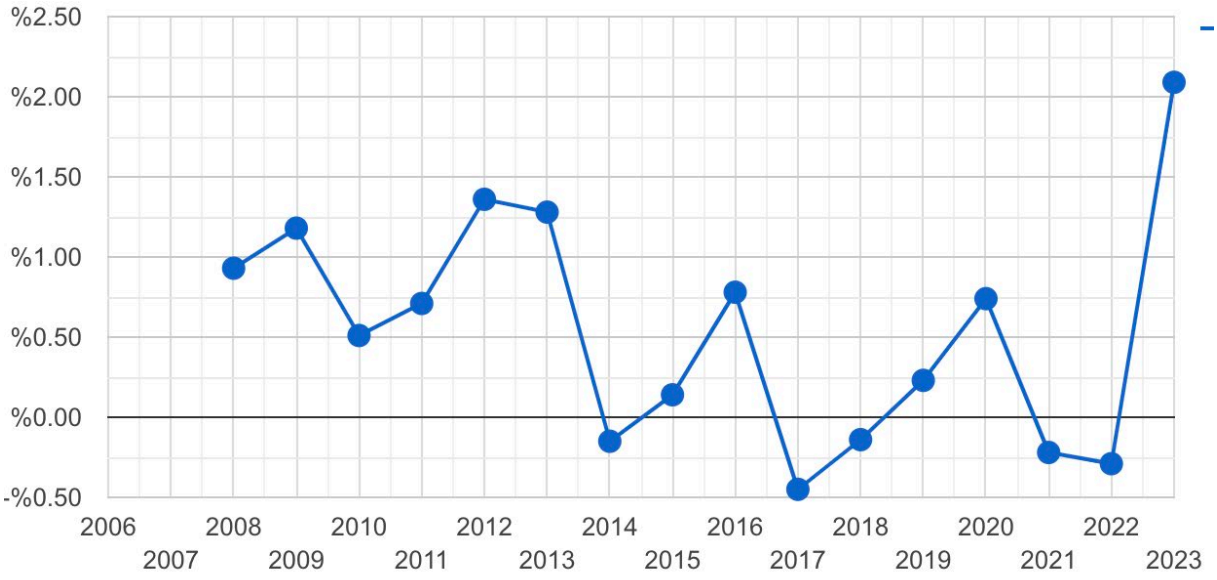


Figure 83. Erzin District Population Change Graph

Source: Turkstat 2023 & https://www.nufusu.com/

The population of Toprakkale district has increased steadily since 2013. It is seen that the investments and job opportunities in the province and district are attracting the population to itself (see Figure 84).

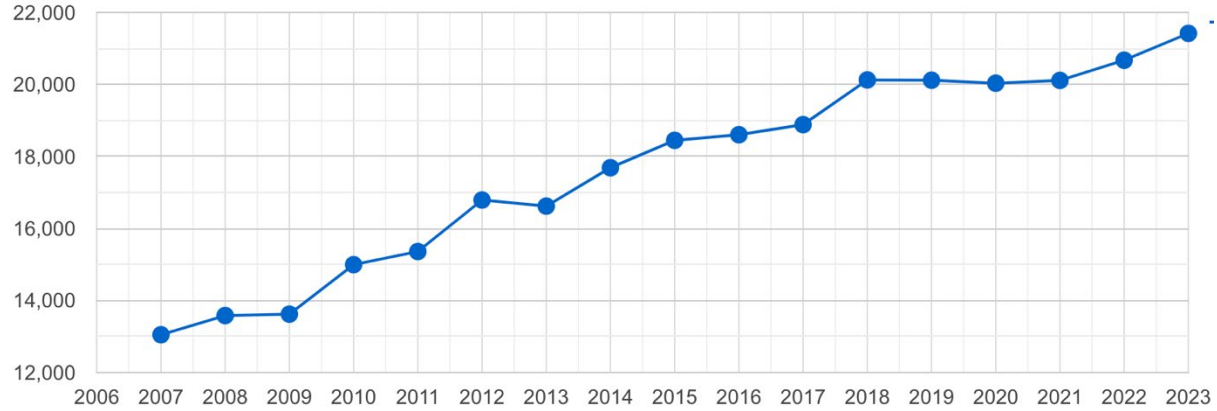


Figure 84. Toprakkale District Population Change Graph

Source: Turkstat 2023 & https://www.nufusu.com/

Table 105. Population of the Settlements in the Study Area by Years

Province	District	Settlement	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Adana	Ceyhan	Sarımazı	3,884	3,790	3,763	3,717	3,646	3,568	3,553	3,501	3,472	3,380	3.457
Hatay	Erzin	Aşağıburnaz	256	259	242	252	272	280	265	259	256	273	276
		Turunçlu	592	607	587	576	576	562	557	539	559	543	572
		Yeşiltepe	1,126	1,141	1,174	1,167	1,282	1,267	1,248	1,278	1,306	1,284	1.264

Province	District	Settlement	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
		Yukarıburnaz	625	634	653	650	628	596	620	626	636	622	638
Osmaniye	Toprakkale	Büyüktüysüz	2,198	2,985	3,629	3,683	3,795	4,169	4,123	3,854	3,711	4,171	3.988

Source: Turkstat 2024

The average size of households in the project impact area provinces is given in Table 106.

It has been observed that the average size of households in the provinces in the project impact area are close to each other.

Table 106. Average Size of Households by Provinces

Provinces	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Total	**4,0**	**4,0**	**3,8**	**3,8**	**3,7**	**3,6**	**3,6**	**3,5**	**3,5**	**3,4**	**3,4**	**3,4**	**3,3**	**3,2**	**3,2**
Adana	4,2	4,2	4,1	4,1	4,0	3,9	3,9	3,8	3,8	3,7	3,7	3,6	3,6	3,5	3,4
Hatay	4,4	4,4	4,3	4,3	4,2	4,1	4,0	4,0	3,9	3,9	3,9	3,8	3,7	3,6	3,5
Osmaniye	4,4	4,4	4,3	4,2	4,1	4,0	3,9	3,9	3,8	3,7	3,6	3,6	3,5	3,5	3,4

Source: Turkstat 2024

According to the results of the survey conducted of households in the Project affected settlements in 2024 the average household size is 4,5. Household sizes according to the settlements located in the Project AoI is given in Table 107.

Below, data obtained from household survey interviews conducted in the settlements affected by the Project are presented. It has been observed that the average size of households in the Project impact area settlements is higher than the average size of the provinces in the Project impact area.

Table 107 Household Sizes in the AoI

			Household size									Total
			2	3	4	5	6	7	8	10	20	
Settlement	Yukarıburnaz	Count	3	3	2	3	1	1	0	0	0	13
		%	23,1%	23,1%	15,4%	23,1%	7,7%	7,7%	0	0	0	100
	Aşağıburnaz	Count	1	2	3	4	0	1	1	0	0	12
		%	8,3%	16,7%	25	33,3%	0	8,3%	8,3%	0	0	100
	Sarımazı	Count	1	0	1	2	0	0	0	0	0	4
		%	25	0	25	50	0	0	0	0	0	100
	Hürriyet	Count	1	2	4	1	2	0	0	1	1	12
		%	8,3%	16,7%	33,3%	8,3%	16,7%	0	0	8,3%	8,3%	100
	Turunçlu	Count	3	0	1	0	1	0	0	0	0	5

			Household size									Total
			2	3	4	5	6	7	8	10	20	
		%	60	0	20	0	20	0	0	0	0	100
Total		Count	9	7	11	10	4	2	1	1	1	46
		%	19,6%	15,2%	23,9%	21,7%	8,7%	4,3%	2,2%	2,2%	2,2%	100

Source: Turkstat,2024

5.12.2 Population Change in the Project Provinces

The project impact area is an area that experienced great migration after the February 2023 earthquake. After this date, the population dynamics of the region have changed, vulnerable groups have increased and living conditions have deteriorated.

Based on these effects, population change, and migration data were evaluated in this section in order to evaluate the Population Influx effects of the Project.

Migration dynamics, an important component of population change, were evaluated through annual population growth and population rate data, and then presented at the Project AoI level.

The populations of provincial/district centers and towns/villages and their annual population growth rates by province are shown in Table 108.

Table 108. Migration Statistics in Adana, Hatay and Osmaniye in Last Five Years

Provinces	Total		Province and district centers		Towns and villages		Annual population growth (‰)	rate[(1)]
	2021	2022	2021	2022	2021	2022	2020-2021	2021-2022
Total	**84 680273**	**85 279 553**	**78 908 631**	**79 613 279**	**5 771 642**	**5 666 274**	**12,7**	**7,1**
Adana	**2 263 373**	**2 274 106**	2 263 373	2 274 106	-	-	2,1	4,7
Hatay	**1 670 712**	**1 686 043**	1 670 712	1 686 043	-	-	6,8	9,1
Osmaniye	**553 012**	**559 405**	432 445	439 537	120 567	119 868	8,1	11,5

Source: TurkStat 2024

Due to its geographical location, Hatay is among the areas with the highest number of Syrian refugees. In terms of the number of Syrian refugees, Adana and Osmaniye follow respectively. Figure 85 shows the distribution of Syrian refugees in the cities in Türkiye, including Adana, Hatay and Osmaniye.

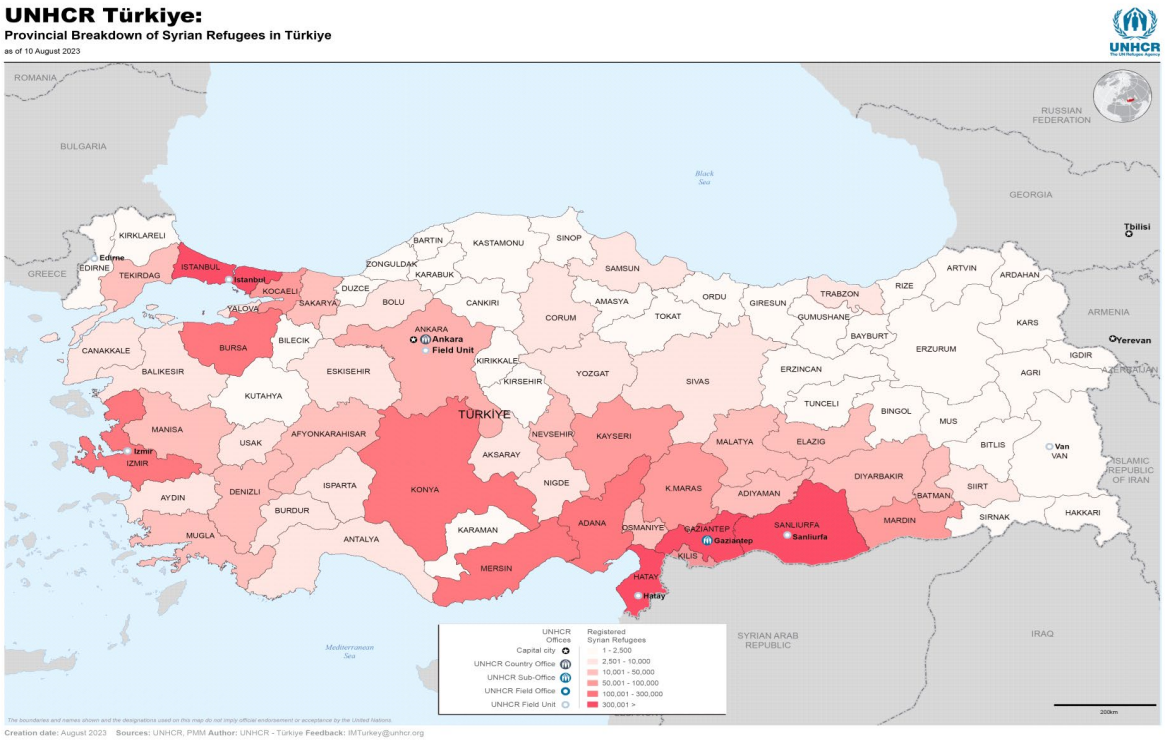


Figure 85. Syrian Refugees Population Changes in the Project AoI Settlements

During the interviews held within the AoI within the scope of the project, it is seen that the majority of the project affected individuals within the Project AoI were born in the districts and provinces within the Project AoI.

According to the data, the provincial centers included in Project AoI are receiving population migration. However, Project AoI settlements do not receive population migration from outside (see Table 109 and Table 110).

Table 109 Birth Places of the PAPs

		Birth place																			Total
Settlement		Borm in the AoI	Adana Merkez	Antakya	Ceyhan	Kayseri	Dörtyol	Edirne	Elbistan	Erzin	Gaziantep	Hassa	İskenderun	Kayseri	Kırıkhan	Kozan	Niğde	Osmaniye	Payaz	Sarımazı	
Yukarıburnaz	#	0	0	0	0	2	22	0	0	25	0	0	0	0	0	0	0	2	0	0	51
	%	0	0	0	0	3,9	43,1	0	0	49	0	0	0	0	0	0	0	3,9	0	0	100
Aşağıburnaz	#	2	2	0	0	0	15	0	0	24	1	1	1	2	1	1	0	5	1	0	56
	%	3,6	3,6	0	0	0	26,8	0	0	42,9	1,8	1,8	1,8	3,6	1,8	1,8	0	8,9	1,8	0	100
Sarımazı	#	0	0	0	12	0	0	0	0	1	0	0	0	0	0	0	1	0	0	2	16
	%	0	0	0	75	0	0	0	0	6,3	0	0	0	0	0	0	6,3	0	0	12,5	100
Hürriyet	#	1	1	1	0	0	2	1	2	42	0	0	1	0	0	0	0	1	0	0	52

		Birth place																				Total
Settlement		Borm in the Aol	Adana Merkez	Antakya	Ceyhan	Kayseri	Dörtyol	Edirne	Elbistan	Erzin	Gaziantep	Hassa	İskenderun	Kayseri	Kırıkhan	Kozan	Niğde	Osmaniye	Payaz	Sarımazı		
	%	1,9	1,9	1,9	0	0	3,8	1,9	3,8	80,8	0	0	1,9	0	0	0	0	1,9	0	0		100
Turunçlu	#	0	0	0	2	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0		15
	%	0	0	0	13,3	0	0	0	0	86,7	0	0	0	0	0	0	0	0	0	0		100
Total	#	3	3	1	14	2	39	1	2	105	1	1	2	2	1	1	1	8	1	2		190
	%	1,6	1,6	0,5	7,4	1,1	20,5	0,5	1,1	55,3	0,5	0,5	1,1	1,1	0,5	0,5	0,5	4,2	0,5	1,1		100

Source: 2024 HH Survey

Table 110 Change in the population of the settlement in the last 5 years

Settlement		Change in the population of the settlement in the last 5 years			Total
		Increased	Decreased	Not changed	
Yukarıburnaz	Count	0	0	1	1
	%	0	0	100	100
Aşağıburnaz	Count	0	1	0	1
	%	0	100	0	100
Sarımazı	Count	0	0	1	1
	%	0	0	100	100
Hürriyet	Count	0	0	1	1
	%	0	0	100	100
Turunçlu	Count	1	0	0	1
	%	100	0	0	100
Total	Count	1	1	3	5
	%	20	20	60	100

Source: 2024 HH Survey

Evaluations regarding seasonal labor obtained from Mukhtar in-depth interviews of the settlements in the Project impact area are given.

According to the interviews with the Mukhtars, the reason for the population increase in the settlements within the project impact area was the retiring population returning to their hometowns,

It was explained as people coming from earthquake cities and settling after the earthquake.

The main reason for the population decrease is explained as the migration of the young population to big cities to find work.

Another situation affecting the population of the Project impact area is those who come to work in the settlements in the Project impact area as seasonal workers. Citrus harvest is the job that requires the most labor force in this region, and seasonal agricultural workers work in these jobs from March to December. This temporary population is the Syrian population and the low-income and disadvantaged agricultural worker population coming from Diyarbakır, Urfa and Adana. The proportion of children and women is also high in this population.

This population change reveals that a population with a high concentration of vulnerable groups comes to the Project impact area, especially in the spring, summer and autumn months, and that the proportion of vulnerable groups is higher in the region during these months.

Based on the statements of the mukhtars, agricultural workers come to Aşağıburnaz and Hürriyet neighborhoods within the Project AoI and work in agricultural activities carried out in these neighborhoods during the agricultural season. The workers who come to Project AoI to work in agricultural work are workers from the Syrian population and Diyarbakır, Urfa and Adana.

5.12.3 Education

General Turkstat data and 2024 household survey results also reveal the conditions regarding the educational status of the region. The data are presented in Table 111 and Table 112.

According to the data, Project AoI shows that women's education attendance rate is lower and women's education level is lower than men.

Table 111 Education Data of the Project Provinces

	General Total			Illiterate			Literate without a diploma			Primary school			Primary education			Lower secondary			Upper secondary school			Universities and other higher educational institutions			Master +		
Province name	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
Adana	2 064 253	1 029 847	1 034 406	58 508	9 215	49 293	220 032	95 594	124 438	442 636	190 822	251 814	134 855	81 405	53 450	377 214	204 993	172 221	477 414	264 281	213 133	301 657	156 384	145 273	38 556	20 816	17 740
Hatay	1 518 232	761 448	756 784	25 397	5 252	20 145	193 959	79 211	114 748	369 111	171 098	198 013	106 015	59 273	46 742	289 139	155 442	133 697	290 027	161 836	128 191	192 306	101 373	90 933	21 310	12 310	9 000
Osmaniye	508 767	256 068	252 699	18 660	3 013	15 647	52 501	24 399	28 102	105 598	44 834	60 764	33 614	19 413	14 201	95 693	52 046	43 647	114 923	65 042	49 881	71 331	38 489	32 842	7 430	4 383	3 047

Source: TurkStat 2024

Table 112 Education Level of the PAPs surveyed during the ESIA field studies in the AoI

			Education Level					Total
			A child who has not yet completed a level of education	Uneducated adult	Primary or secondary school graduate,	High school graduate	Graduated from a University	
	Yukarıburnaz	Count	9	6	23	8	5	51
		%	17,6	11,8	45,1	15,7	9,8	100
	Aşağıburnaz	Count	6	6	21	13	7	53
		%	11,3	11,3	39,6	24,5	13,2	100
	Sarımazı	Count	3	0	10	3	0	16
		%	18,8	0	62,5	18,8	0	100
	Hürriyet	Count	8	0	10	19	14	51
		%	15,7	0,0	19,6	37,3	27,5	100
	Turunçlu	Count	2	0	9	3	1	15
		%	13,3	0	60	20	6,7	100
Total		Count	28	12	73	46	27	186
		%	15,1	6,5	39,2	24,7	14,5	100

Source: 2024 HH Survey

There are primary schools in the centers of Aşağıburnaz, Yukarıburnaz and Turunçlu. Two primary schools in Sarımazı and one primary school in Büyüktüysüz continue education. Turunçlu Primary School is one of the central schools where students from surrounding villages receive education. Children over primary school age continue their education with transportation to Erzin.

In Yukarıburnaz, primary and secondary school children continue their education through bussed education.

When evaluated in general, mobile training constitutes a significant proportion of the training activities within Project AoI. Within the Project AoI, transportation is provided to schools in Erzin district via bussed education.

In addition, some of the students in the settlement go to high schools in Erzin, Osmaniye and Gaziantep.

Students within Project AoI attend various schools in Osmaniye, as well as Büyüktüysüz and Toprakkale, for secondary and high school education. Additionally, some Project affected children also attend high schools in Osmaniye.

These data are important to reveal that student shuttle mobility is intense in the Project impact area. In this sense, traffic safety and sustainability of education within the scope of traffic, public health and safety within the scope of the Project have also been considered as an important evaluation issue.

5.12.4 Healthcare

Healthcare services in Türkiye are primarily provided through the country's public healthcare system, which is administered by the Ministry of Health.

The healthcare system in Türkiye, under the responsibility of the Ministry of Health, is structured to offer comprehensive and easily accessible healthcare services to the populace. This system encompasses diverse care tiers, ranging from primary health care to specialized medical services.

As of last update in September 2021, the healthcare system in Türkiye, under the responsibility of the Ministry of Health, is designed to provide comprehensive and accessible healthcare services to the population. The system includes various levels of care, from primary healthcare to specialized medical services.

Primary Healthcare: The primary healthcare system forms the foundation of healthcare services in Türkiye. It encompasses local health centers and family health centers. These centers provide basic medical services, preventive care, health education, vaccinations, maternal and child health services, and treatment for common illnesses. They also serve as the initial point of contact for patients seeking medical care.

Hospitals: Türkiye has a network of public and private hospitals that offer a wide range of medical services. Public hospitals are under the Ministry of Health's jurisdiction and provide services based on patient needs, including emergency care, surgeries, specialized treatments, and inpatient care. Public hospitals often offer services at little to no cost for citizens and residents.

Specialized Medical Services: Public hospitals in Türkiye offer specialized medical services across various disciplines, such as cardiology, oncology, neurology, orthopedics, and more. These services are available in larger hospitals and university hospitals.

Emergency Medical Services: Emergency care is provided in public hospitals and emergency departments. Ambulance services are available to transport patients in need of urgent medical attention.

Pharmacies: Pharmacies are readily available throughout Türkiye. Pharmacists provide prescription medications and over-the-counter drugs, as well as guidance on medication use. Pharmacies are an important part of the healthcare system, offering accessibility to medications and medical advice.

Healthcare facilities near Project AoI are shown in Figure 86.

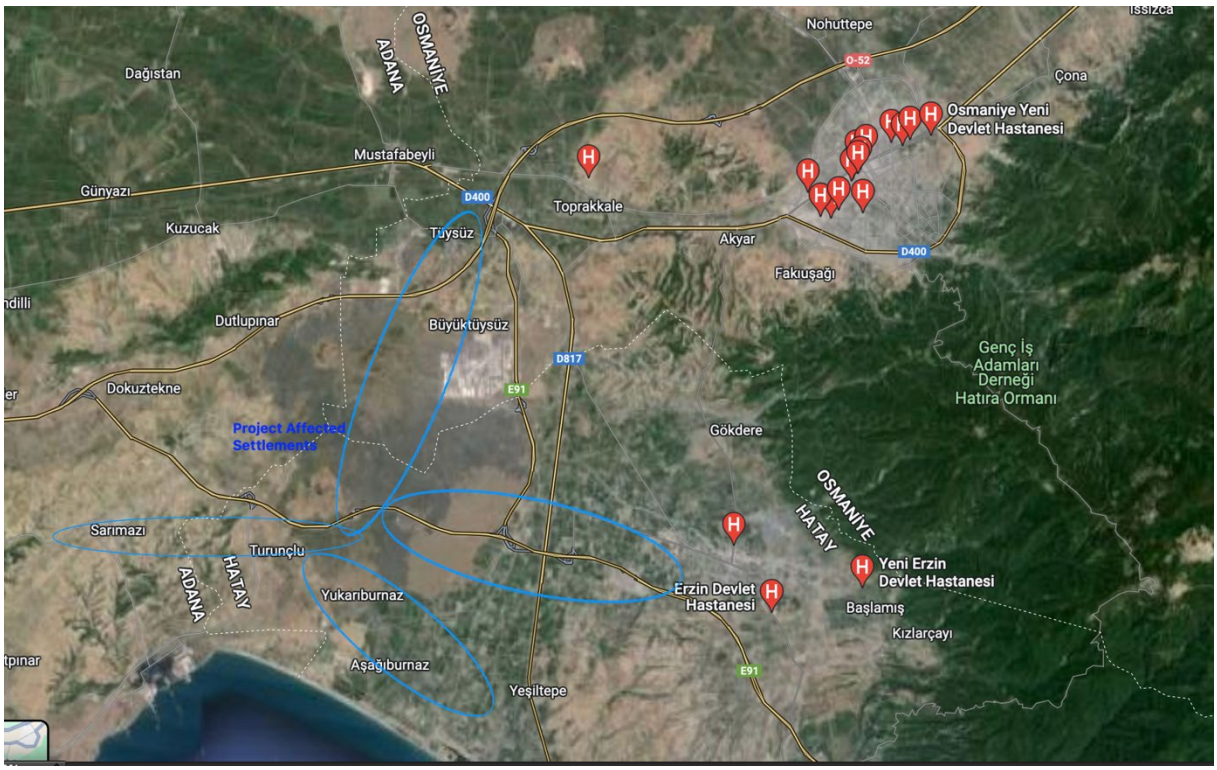


Figure 86 Healthcare facilities near Project AoI

5.12.5 The Infrastructure Services

In rural areas of Türkiye, technical infrastructure encompasses a range of essential systems and facilities that support the daily life and development of communities. Countryside regions frequently enjoy access to fundamental communication services, such as landline telephones and mobile networks. Internet connectivity, including broadband access, might be accessible but could be limited when compared to urban locales. Ongoing efforts are aimed at bridging this digital divide and enhancing access to online services. The presence of local government offices and services plays a pivotal role in tending to the needs of these communities, encompassing administrative tasks, documentation, and access to government programs.

Essential roads connecting these outlying areas to districts and city centres are vital for efficient transportation. In more distant zones, transportation might depend on unpaved roads or pathways. Public transportation alternatives might be less frequent and comprehensive in contrast to urban settings. The presence of electricity is vital for fostering development in these areas.

Electricity distribution networks span across numerous parts of the countryside, although some remote sites might depend on alternate energy sources like solar panels or generators. Rural areas often boast water supply systems that provide clean water to households. Nevertheless, the quality and availability of water can vary. Sanitation facilities and sewage systems might be less advanced in villages or in smaller localities such as "hamlets".

Recognizing the significance of agriculture in rural areas, infrastructure pertaining to farming, irrigation, and agricultural processing takes on great importance. This includes access to agricultural machinery, storage facilities, and markets.

Within rural communities, communal spaces like community centers or mosques often serve as social activity and event hubs. While the reach of internet access is expanding into these areas, it might not achieve the same level of ubiquity or speed as in urban settings.

In the interviews with AoI Mukhtars (Mukhtar Surveys, 2024), it was stated that the electrical infrastructure in the settlements was sufficient, but after the earthquake, outages and infrastructure problems occurred. Although these problems are seen throughout the earthquake region, intensive improvement and reconstruction activities in infrastructure and superstructure are continuing in the region.

In addition to wood and coal, heating in the region is also provided by electricity and solar energy at the household level.

Telecommunication and internet infrastructure is accessible in all settlements (see Table 113).

Table 113. Infrastructure Services

			Will the project have an impact on infrastructures?		
			Yes	No	Total
Settlement	Yukarıburnaz	Count	4	9	13
		%	30,8%	69,2%	100
	Aşağıburnaz	Count	8	4	12
		%	66,7%	33,3%	100
	Sarımazı	Count	2	2	4
		%	50	50	100
	Hürriyet	Count	11	1	12
		%	91,7%	8,3%	100
	Turunçlu	Count	2	3	5
		%	40	60	100
Total		Count	27	19	46
		%	58,7%	41,3%	100

Source: 2024 CLS Survey

According to the results of interviews with mukhtars and PAPs, local people expect a negative impact on infrastructure services. This is because the entire infrastructure in the region has been damaged, weakened and in many places inadequate due to the earthquake. Therefore, it has been stated that the fragile infrastructure services cannot handle an additional load. If the Project puts pressure on the infrastructure services that have been weakened and become fragile due to the earthquake, it is expected that the Project may have a negative impact on these services. However, it is important to take precautions in advance to quickly eliminate any interruptions that may occur during construction activities and to avoid any interruptions or access problems that will disrupt the daily life of the local people, and the Project will need to be defined and implemented within the mitigation measures.

Domestic use and drinking water are sufficient in the region, and improvement and reconstruction works are carried out by the relevant institutions in the places damaged after the earthquake in the Project Impact Area settlements.

Although irrigation and potable water resources are sufficient in the project impact area, the regional and provincial reports on the water, due to the infrastructure aging, corrosion of water

pipes over time, usage reveal thar usage inefficiency due to water losses in the region is very high[53].

While evaluating data on irrigation infrastructure in the project impact area, Asi Basin[54] and Ceyhan Basin[55] land use data and risks were also evaluated.

Project mainly located in Asi Basin and a part of the Project AoI is located in the Ceyhan Basin.

Map of the Asi Basin is given in Figure 87.

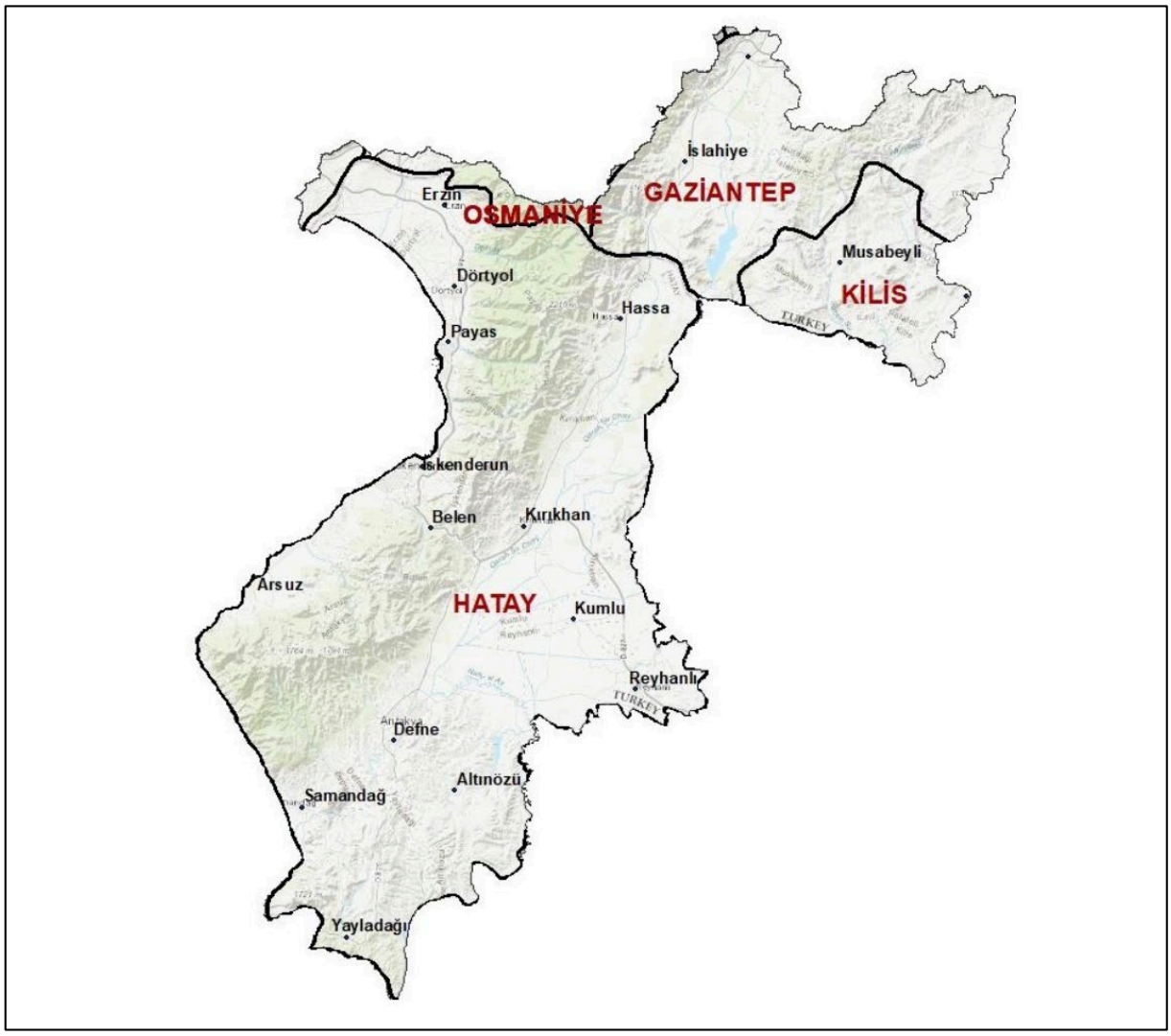


Figure 87 Map of the Asi Basin[56]

Water resources in the Project impact area provide an important baseline within the scope of the Project's potential impacts on ecosystem services and infrastructure:

53 https://www.dogaka.gov.tr/assets/upload/dosyalar/yer-sis-tr63-bolgesi-degerlendirme-raporu.pdf

54 https://www.tarimorman.gov.tr/SYGM/Belgeler/Ta%C5%9Fk%C4%B1n%20Y%C3%B6netim%20Planlar%C4%B1%2026.12.2022/ASI_Yonetici_Ozeti_v2.pdf

55 https://www.tarimorman.gov.tr/SYGM/Belgeler/Ta%C5%9Fk%C4%B1n%20Y%C3%B6netim%20Planlar%C4%B1/3)%20CEYHAN%20%20HAVZASI%20TA%C5%9EKIN%20YONETIM%20PLANI.pdf

56 https://www.tarimorman.gov.tr/SYGM/Belgeler/Ta%C5%9Fk%C4%B1n%20Y%C3%B6netim%20Planlar%C4%B1%2026.12.2022/ASI_Yonetici_Ozeti_v2.pdf

The only river whose source is not in Turkey but whose tributaries are in Turkey is the Asi River. Irrigation and drinking water supply projects and hydroelectric energy production projects are carried out by the General Directorate of DSI in the Asi River Basin. In addition, there are water transfer projects outside the basin and other irrigation projects that significantly affect the water balance. These opportunities can also be considered as important opportunities in supplying the water needed by the Project.

While the Ceyhan Basin is located within the borders of the provinces of Kayseri, Osmaniye, Sivas, Adıyaman, Gaziantep, Malatya, Adana, Hatay, Kahramanmaraş, a part of the Project AoI is located within the Ceyhan Basin shown in Figure 88.

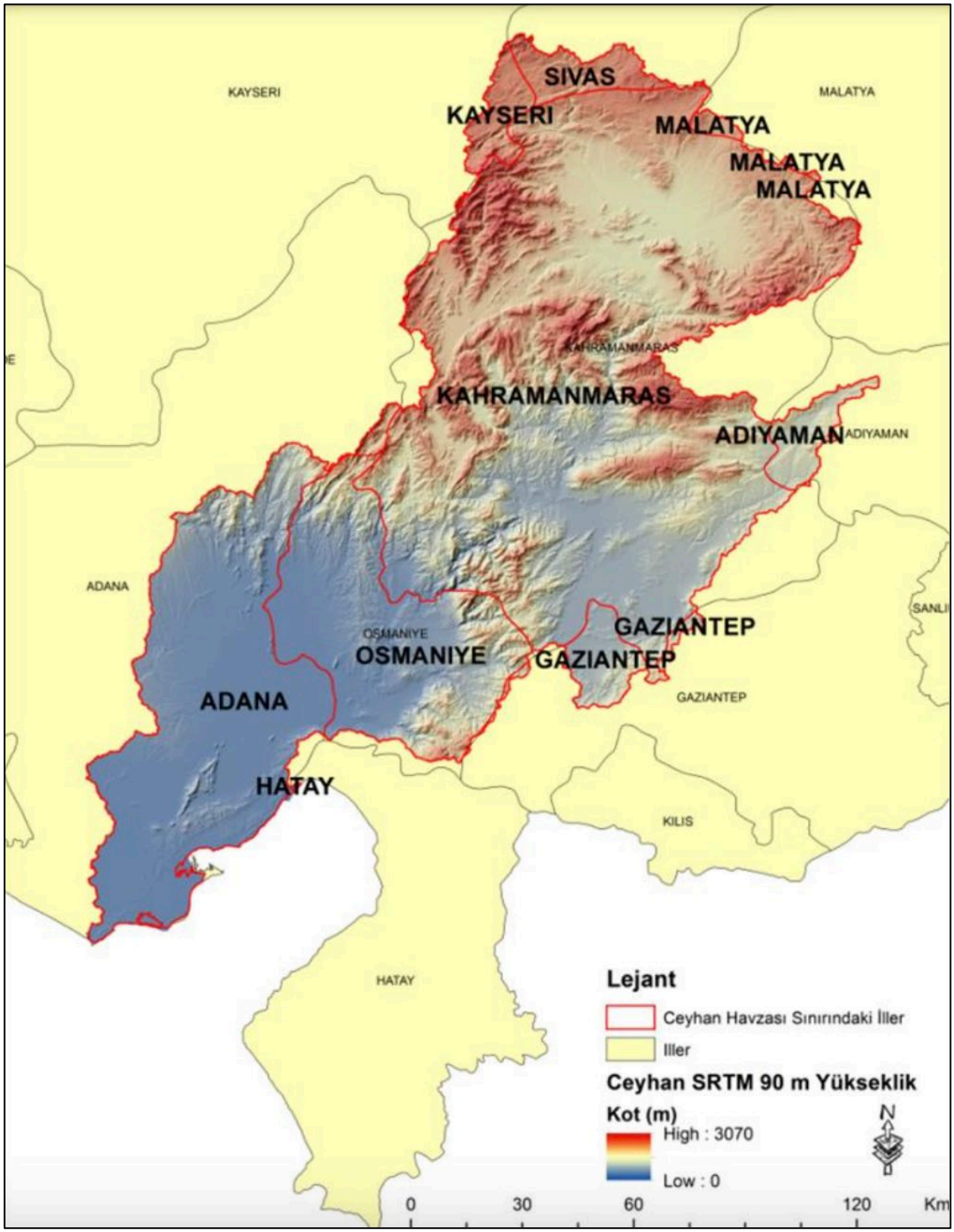


Figure 88 Ceyhan Basin

Source: CEYHAN BASIN FLOOD MANAGEMENT PLAN[57]

Agricultural activities and irrigated agriculture are intense in the Ceyhan Basin and Asi. However, since the majority of the irrigation systems infrastructure is designed according to

57 https://www.tarimorman.gov.tr/SYGM/Belgeler/Ta%C5%9Fk%C4%B1n%20Y%C3%B6netim%20Planlar%C4%B1/3)%20CEYHAN%20%20HAVZASI%20TA%C5%9EKIN%20YONETIM%20PLANI.pdf

the open channel system, it has brought about many problems regarding agricultural irrigation. First of all, water losses in open channels are quite high. Leakage losses are high due to evaporation from the canal water surface, leakage at the canal connection points, losses resulting from the breakage of canals and canals, aging of the canals and insufficient maintenance and repair. Combined with the fact that evaporation losses are quite high, especially in July and August, when water consumption is at its highest, irrigation efficiency decreases by half.

In addition, damage to irrigation residues and dams occurred after the February 2023 Kahramanmaraş earthquake. Rehabilitation projects are intensively carried out in the region to repair these damages.

5.12.6 Land Use

5.12.6.1 General assessment on the Land Use

Project land need is explained in the RP of the Project. The Project components require permanent expropriation (mostly partial) from which the ownership rights of the land are obtained.

According to updated expropriation plan in 2024, there are 143 affected parcels.

When this information and Project land acquisition needs are evaluated together, according to the Hatay Province 1: 100,000 Scale Zoning Plan (2021) decisions, it is anticipated that Erzin district will continue its economic and spatial interactions with both İskenderun and Dörtyol districts. In addition, Erzin land distribution has also been evaluated.

Erzin agricultural lands and forest areas constitute approximately 80% of the total land area, while meadow areas are limited to only 0.62%.

The land use distribution of lands in the Project AoI (Erzin lands) is as follows:

- Pasture Lands
- Irrigated Agricultural Areas
- Non-irrigated Agricultural Areas
- Inadequately Irrigated Agricultural Areas
- Coastal Dunes
- Abandoned Lands
- Shrubs
- Industrial Areas

5.12.6.2 Land Need and Land Acquisition of the Project

Land need and project land acquisition according to the settlements are given in Table 114.

Table 114 Affected lands per settlements

Settlement	Private lands			Public lands		Total		
	# of parcels owned by real persons	# of parcels owned by legal entities	# of owners	# of parcels	# of public land users identified	# of parcels	# of owners/users	Size (m2)
Aşağıburnaz	20	0	48	3	1	23	49	200260.85
Hürriyet	14	0	342	11	5	25	347	531489.39
Sarımazı	1	4	6	37	0	42	6	245140.45

Settlement	Private lands			Public lands		Total		
	# of parcels owned by real persons	# of parcels owned by legal entities	# of owners	# of parcels	# of public land users identified	# of parcels	# of owners/users	Size (m2)
Turunçlu	3	0	8	15	2	18	10	126628.50
Türkmen / Büyüktüysüz	0	0	0	1	0	1	0	13629,41
Yukarıburnaz	13	0	61	21	8	34	69	409068.63
Total	51	4	465	88	16	143	481	1.451.707,56

Land acquisition for the project has been undertaken by the DGGI and Project specific RP document has been prepared to addresses the gaps between Turkish legislation and WB ESS5 regarding project land acquisition and compensation and specifies how such gaps shall be bridged and ensure that compensation to PAPs comply with requirements of ESS5, and that no undue deductions from compensation amounts be carried out.

Incompatibilities between national valuation practices and international standards arising from the existing Expropriation Law exist. These gaps and the ESS% requirements that the RP document will meet are set out in detail in the Project RP document. Based on the evaluations and analyzes contained in this document, the following compensations will be provided from the RP fund:

- Depreciation deductions on buildings and other structures,
- Debris fee deductions in buildings and other structures,
- Reflecting the cost of cutting trees to the tree owner,
- Loss of livelihood in cases where the project has significant impacts on livelihoods,
- Loss of time in the process of preparing new land or business,
- Temporary income losses resulting from access barriers to areas used by the community.

As a result of the project land acquisition, all users (including tenants and informal users) are listed, as well as the owners of the acquired lands.

Within the scope of the project, all PAPs on the affected parcels have been identified. In the RP document, especially PAPs whose lands are a source of income have been identified. Based on these losses, the following information was obtained, and a parcel-based Asset Inventory was prepared. All these prepared studies are presented as Project RP document and its annexes.

5.12.6.3 Affected Lands and Land Based Livelihoods

Within the scope of the project, 51 private lands and 90 public lands will be expropriated due to land needs.

According to the updated expropriation plan in 2024, there are 143.

It is planned to acquire a total of 1,451,707.56 m2 of land. All of these lands are agricultural lands. It has been determined that olives and citrus fruits are produced on public lands affected by the project. Informal user identification has been carried out on all public lands. RP

document of the Project provides further details. For this reason, the impacts on agricultural livelihoods are evaluated in the next heading.

Affected Pasturelands and Animal Husbandry

Two pastures are affected by the land acquisition of the project (see Table 115). Pasture areas are large and the impact rate is not high.

Table 115 Affected pasturelands

Province	District	Settlement	Block	Parcel	Size (m²)
HATAY	ERZİN	HÜRRİYET	639	508	13661032
HATAY	ERZİN	YUKARIBURNAZ	585	1	5615619

The total number of animals in PAS, the number of households engaged in livestock farming and the number of households selling animals are shown in Table 116. It represents the number of households and animals that access barriers have the potential to affect.

Table 116 Number of households engaged in livestock farming

Province	District	Settlement	# of households have cattle	# of cattles	# of households sell cattle	# of households have small cattle	# of small cattles	# of households sell small cattle
Hatay	Erzin	Hürriyet	50	300	40	45	4500	40
Adana	Ceyhan	Sarımazı	10	100	10	30	3000	30
Hatay	Erzin	Turunçlu	5	50	5	20	5000	15
Hatay	Erzin	Yukarıburnaz	5	30	5	3	500	3
Hatay	Erzin	Aşağıburnaz	13	60	13	2	1000	2
Total			**83**	**540**	**73**	**100**	**14000**	**90**

Source: RP preparation field study - CLS, 2024

Livelihood restoration measures on the subject are defined within the scope of the Project RP.

Affected Structures

Within the scope of the ESIA/RP surveys, 8 land owners/users declared that there were houses/dwellings on the affected lands, and 22 land owners/users declared that there were non-residential and non-commercial structures. It was stated that in the scope of HLS, there was a commercial building on one of the lands. In addition, workplaces affected by the project were not included in the household survey and in-depth interviews were conducted.

There are houses on the lands affected by the project, but since these houses are outside the expropriation boundary, there is no physical resettlement impact.

RP of the Project has the further details on the affected structures.

RP including LRP document covering the entire land requirement and impacts of land acquisition. Within the scope of the project, will try to minimize adverse resettlement impacts and improve or at least restore livelihoods and living standards of displaced persons.

The Entitlement Matrix presented in the RP/LRP document aims to ensure the restoration of all these impacts resulting from land acquisition. Livelihood Restoration Measures, Livelihood restoration instruments and Livelihood restoration program are also developed and presented in the document.

5.12.7 Transportation and Traffic

During the construction phase of the project, state roads, intercity access roads and connection roads of related facilities will be used. Based on this need, the traffic volume map showing the

daily number of vehicles and vehicle types of the State roads, which has been evaluated in detail in the Traffic Management Plan of the Project.

Based on the below given data, traffic density in the region is intense both in highways and in state roads. Especially after the 2023 Kahramanmaraş earthquake, damage to the roads, road renovation works, and intense infrastructure and superstructure improvement and construction works in the region increase heavy vehicle traffic and general traffic in the region.

Activities related to the construction phase will require the movement of trucks entering and exiting the Project area to transport machinery, equipment, building material (e.g. concrete, building materials) and personnel. Existing roads will be used during transportation.

It is important to take the necessary precautions to reduce the risks of accidents that may occur in this process, to prevent traffic pressure and to disrupt daily life by closing the roads.

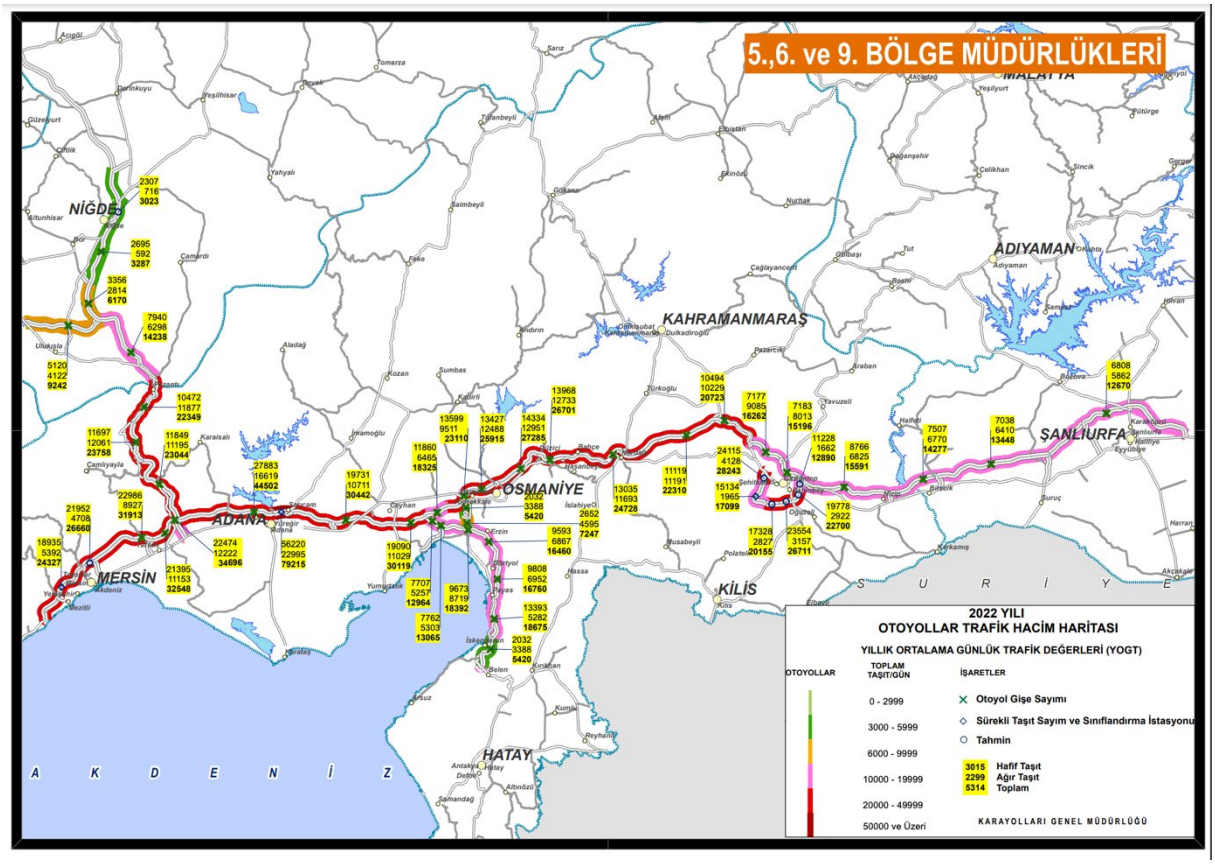


Figure 89 Highways Traffic Volume Map[58]

58 https://www.kgm.gov.tr/Sayfalar/KGM/SiteTr/Trafik/TrafikHacimHaritasi.aspx

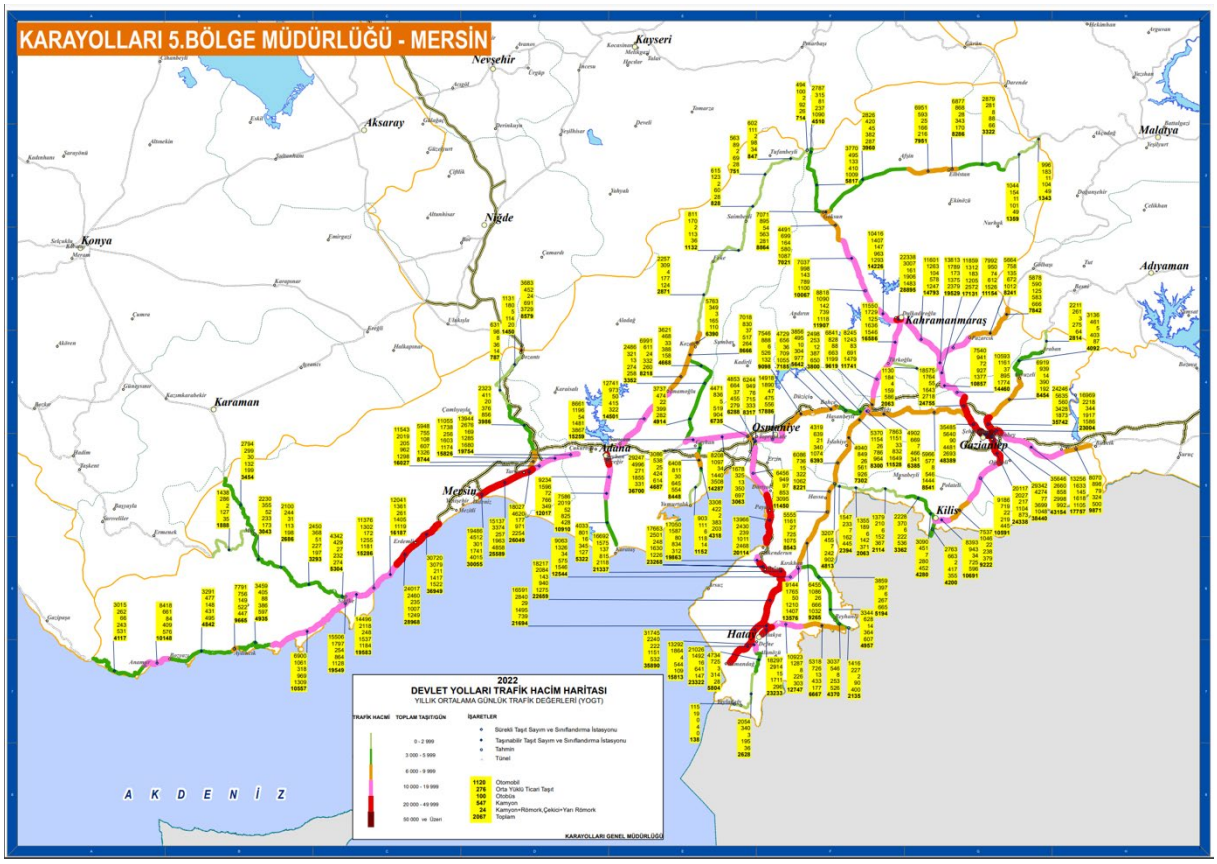


Figure 90 State Roads Traffic Volume Map[59]

Concerns on the traffic issue were also expressed in the interviews held in the settlements within the Project AoI. 80% of the interviewed household representatives (i.e. 37 persons) expected that the Project will have an impact on traffic density, and all of them think that there will be a traffic impact that will negatively affect daily life. In this regard, it is envisaged that ensuring traffic safety, especially on the connection roads of settlements and village/neighborhood roads, will be one of the most important community health and safety issues.

Assessment of these risks and measures to reduce impacts according to impact size are set out in section 5.13 Impact Assessment and Mitigation Measures.

PAPs opinion on the impacts of the Project on traffic are given in Figure 91.

59 https://www.kgm.gov.tr/Sayfalar/KGM/SiteTr/Trafik/TrafikHacimHaritasi.aspx

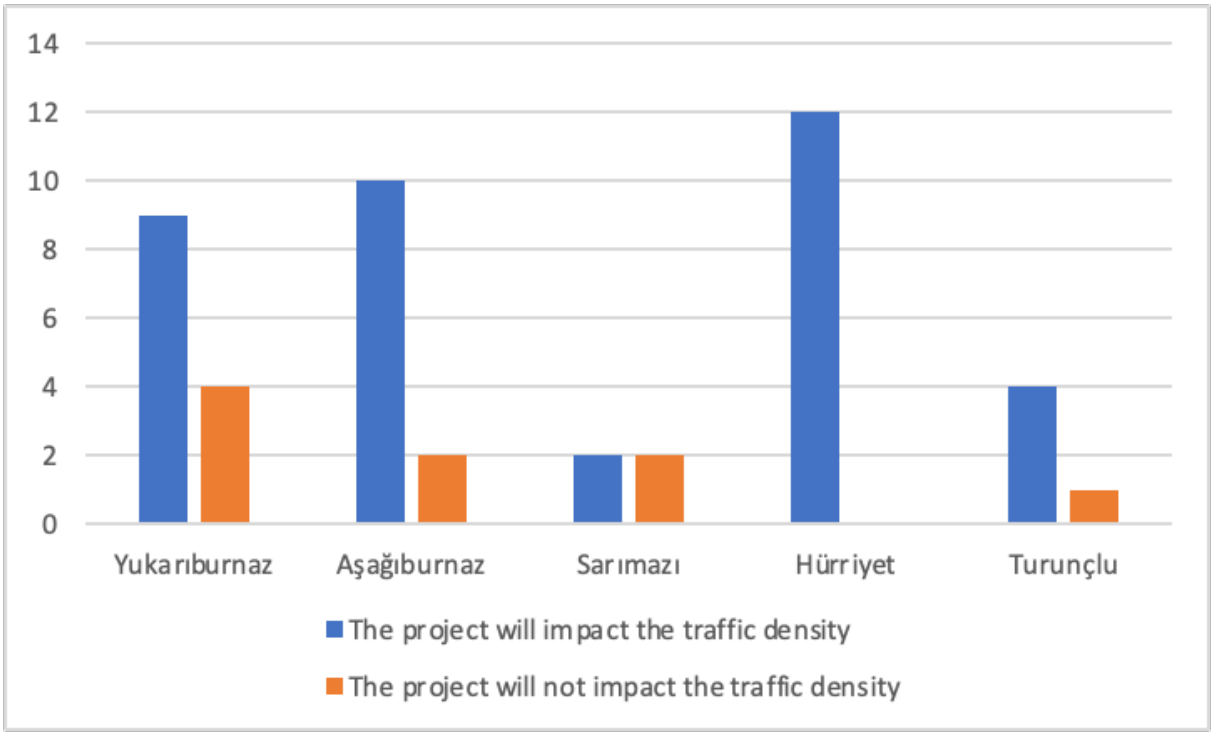


Figure 91 PAPs opinion on the impact of the project on traffic density

Source: 2024 HH Survey

The majority of household representative PAPs interviewed within the scope of the Project ESIA stated that the Project would have negative effects on traffic density and slowing down of traffic due to heavy vehicle traffic.

In line with the opinions of PAPs, it is anticipated that the Project will cause traffic to slow down due to heavy vehicle traffic during the construction phase. Among the other traffic safety risks caused by the Project, the increase in accident risks that will occur at the points where the Project transportation roads intersect with the village connection roads, pedestrian safety and CHS risks such as dust etc. due to traffic are seen as potential risks within the scope of the Project.

When the views of PAPs were evaluated, it was observed that concerns about traffic impact, dust and accident risks caused by traffic in settlements such as Hürriyet neighborhood where animal husbandry activities are intense have increased. Concerns about the negative impact on the continuation of animal husbandry livelihood activities on lands and pastures are reflected in the data. In addition, rural settlements with dirt roads and low quality (Yukarıburnaz, Aşağıburnaz, Hürriyet) stated that they expected a higher level of traffic impact compared to other areas with better-structured roads.

5.12.8 Economy

Economic Overview of Hatay: Hatay's economic history was closely intertwined with agriculture until 1960. This period witnessed the operation of diverse factories producing cotton, soap, oil, textiles, leather goods, furniture, and agricultural tools. The post-1960 era marked a shift towards factories producing motor vehicles, oil, diesel, air filters, brake linings, packaging materials, and vehicle body workshops. More recently, factories emerged producing electrical instruments, car spare parts, trailers, tankers, as well as brick, tile, and cement products. The largest iron and steel factory in Türkiye, located in Payas, spans 15 million square meters and employs around 20,000 people. Hatay's industrial landscape includes food and beverage production, furniture, wood products, plastics, rubber, and non-metallic goods. Machinery,

metal products, textiles, clothing, and leather items significantly contribute to employment and economic value.

Economic Progression in Erzin: Hatay's economic history has seen significant changes. Initially reliant on agriculture, it shifted to a diverse industrial landscape after 1960. Factories produced a range of goods from cotton to motor vehicles. Recently, industries for electrical instruments, car parts, construction materials, and more have emerged. The largest iron and steel factory in Türkiye, located in Payas, covers a vast area and employs thousands. Hatay's industrial sectors include food, furniture, plastics, rubber, and non-metallic goods, with machinery, metal products, textiles, and leather items contributing significantly to employment and value.

Industrial Development in Erzin: Erzin's economic history has evolved from agricultural reliance to a diverse industrial landscape. The area's factories produce a wide array of goods, from textiles to electrical instruments, car parts, and construction materials. The largest iron and steel factory in Türkiye, in Payas, employs a substantial workforce. Industries encompass food, beverages, furniture, plastics, rubber, and non-metallic goods. Machinery, metal products, textiles, clothing, and leather items are also significant contributors to employment and economic value.

Adana's economy has evolved from traditional agriculture to a diverse industrial landscape, driven by historical significance and strategic location near transportation routes. While agriculture was historically vital, industrialization introduced factories producing goods, including machinery, textiles, and food products. Adana's rich soils supported crops like cotton, citrus fruits, and vegetables, contributing to economic stability. Modernization and technological advancements improved agricultural efficiency. Despite industrial diversification, agriculture remains crucial, combining tradition with innovation for substantial contributions to the region's identity and economic prosperity.

Economic Progression in Ceyhan District: Ceyhan District's economic history has undergone significant shifts, transforming it into a key regional center in Türkiye. Historically focused on agriculture, the district transitioned to industrialization and diversification. Factories in textiles, food processing, and small-scale manufacturing emerged, boosting employment opportunities. Ceyhan's strategic location near transportation routes and ports played a crucial role in its growth. Infrastructure improvements further enhanced economic potential. Its emergence as an energy hub, with proximity to pipelines and a Mediterranean port, attracted investments and generated employment. Beyond agriculture and industry, Ceyhan diversified into tourism, services, and technology, enhancing its economic vibrancy.

In conclusion, the economic histories of Hatay, Ceyhan District, and Erzin reflect transitions from traditional agriculture to diverse industries. These areas have embraced modernization, strategic development, and diversification, contributing to their economic vibrancy and adaptability in a changing economic landscape.

5.12.8.1 Agriculture and Forestry

Hatay and Erzin

- Hatay is a significant player in Türkiye's agricultural scene, contributing to various crops and 25% of national fresh fruit and vegetable exports.
- The province's vast agricultural land and favorable conditions enable year-round cultivation and off-season harvesting.
- Diverse crops like wheat, cotton, vegetables, olives, and citrus are cultivated through intensive farming practices.
- Forests in Hatay have transformed due to human influence, leading to the emergence of maquis vegetation and garig communities.
- Preserved regions feature mixed forests while the Amanos Mountains have Black Sea plant species.

- Erzin's forests serve as ecosystems for various species, shaped by both climate and human actions.
- Sustainable management practices balance economic and ecological needs, offering timber products and contributing to climate change mitigation and soil protection.
- Efforts focus on biodiversity enhancement and collaboration for conservation.
- On January 8, 2018, the Erzin-Dörtyol plain was designated as the Great Plain Protection Area through a decision made by the Council of Ministers.

Adana and Ceyhan

- Agriculture in Adana plays a pivotal role due to traditional cultivation methods and abundant water resources.
- Cotton, citrus fruits, vegetables, cereals, and livestock farming contribute significantly.
- Technological advancements and modern practices have enhanced Adana's agriculture.
- Ceyhan's historical agriculture relied on traditional methods and fertile lands.
- Changes like industrialization and modernization transformed Ceyhan's agriculture to meet market demands.
- The district's location and access to transportation routes played a role in its agricultural growth.
- Diversification into organic and sustainable practices has made Ceyhan's economy more adaptable.
- Forestry in Adana and Ceyhan contributes to the environment and supports a variety of plant and animal species.
- Sustainable management practices aim to balance economic needs and ecological preservation, offering timber products and aiding carbon sequestration and soil protection.
- Collaborative efforts are crucial for successful conservation.

In conclusion, these regions in Türkiye have seen shifts in their agricultural and forestry practices over time, balancing economic demands with environmental conservation through sustainable management.

According to the agricultural production related results of the survey in the scope of Phase 1, 2020 are as in following;

The cultivation of vegetables within the settlements under investigation primarily serves household consumption purposes. Wheat cultivation occupies a prominent position within the regional agricultural landscape. It is noteworthy that alongside wheat, olive production constitutes a significant aspect of agricultural activities. Pertaining to the agricultural landscape, data sourced from the Erzin District Directorate of Agriculture and Forestry delineates the array of crops cultivated and their corresponding acreage distribution, as tabulated below (see Table 117).

Table 117. Crops and Cultivation Areas Planted in Erzin (2019)

Crops	Cultivation Area (da)	Crops	Cultivation Area (da)
Cereal Products		Greenhouse Products	
Wheat	3,500	Watermelon	1,000
Barley	200	Tomato	3
Corn	850	Banana	45
Oil Seed Plants		Fruit Products	
Cotton	550	Avocado	39
Peanut	350	Plum	25
Sunflower	2,650	Peach	25
Legumes		Apricot	45

Crops	Cultivation Area (da)	Crops	Cultivation Area (da)
Pea	700	Olive	19,150
Beans (Fresh)	850	Orange	32,250
Vegetable Products		Mandarin	67,561
Okra	65	Grapefruit	1,000
Eggplant	75	Lemon	658
Lettuce	60	Pomegranate	27
Parsley	200	Fodder plant	850
Dill	225	-	-
Onion	45	-	-

***Source**: Erzin District Directorate of Agriculture and Forestry*

The predominant crops cultivated in the vegetable gardens include Wheat, Pepper, Eggplant, and Sunflower (see Table 118). Evidently, this production is primarily intended for household consumption. In fact, households emphasize that their agricultural endeavors are geared towards self-sustenance rather than income generation. Certain households do report the sale of sunflower and corn abroad, while others mention utilizing crops like wheat and barley for animal feed purposes.

As indicated by the findings of the household survey, approximately 71.7% of respondents possess fruit-bearing or yield trees. Notably, Olive, Mandarin, Orange, and Lemon stand out as the predominant planting products cultivated in the region. In terms of the average number of trees per household, Mandarin/Orange ranks highest with an average of 409.92 trees, followed by 214.9 Olive trees, 200 Plum trees, and 140.1 Lemon trees per household.

Table 118. Main Agricultural Products Grown in Settlements in the Study Area

Settlement	Main	Second	Third	Fourth
Aşağıburnaz	Wheat	Melon/Watermelon	Tomato	Corn
Yukarıburnaz	Wheat	Citrus	Olive	
Yeşiltepe	Citrus	Olive		
Turunçlu	Wheat	Barley	Bean	Chickpea
Sarımazı	Citrus	Olive	Wheat	Sunflower
Büyüktüysüz	Wheat	Barley	Sunflower	Olive

***Source**: SIA Studies, Mukhtar Interviews, 2020*

In addition to agriculture, certain settlements in the region engage in livelihood activities related to forestry due to their proximity to forested areas. Among the study area's settlements, Sarımazı is particularly close to the forest. Forest-related activities that generate or support income include working as a forest laborer, collecting firewood, gathering and selling forest products, and allowing animals to graze. The forest's role in the sample is more connected to firewood collection than economic activity. Notably, 42 respondents did not answer the question, and 78.9% stated that they do not utilize the forest for these purposes.

According to the economy related results of the survey in the scope of Phase 1, 2020 are summarized as in below paragraphs:

The study area's economy is driven by agriculture and livestock, serving subsistence and commercial needs. Livestock, particularly fattening, contributes to income for about 12.4%. Erzin specializes in citrus production, exporting mainly to Russia, Arabian, and European countries. Industrial work, especially in OIZ, attracts migrants. Aşağıburnaz and Yukarıburnaz rely on citrus, olive, wheat, corn, and tomato sales. Yeşiltepe's economy involves agriculture, labor, and retirement, with citrus and olives as primary products. Turunçlu relies on wheat, barley, sunflower, and dry farming. Sarımazı cultivates citrus, olive, wheat, sunflower, and barley without irrigation.

Mukhtar meetings highlight agriculture, livestock, and transportation as primary income sources, with industrial jobs as secondary. Workers and retirees comprise nearly half the sample. Unemployment is at 20%, while those without income, including non-working housewives, make up 25.7%. In some households, no one works in 32.7%, and 26.5% struggle to find jobs.

Paid labor (34.5%) and retirement income (31%) are primary sources. Other main sources include Trade/Artisan/Trade Income (8%), Seasonal Work, and Salaried Work (both 3.5%). 61.1% have secondary income, with 44.3% from agricultural side jobs. Agriculture contributes 56.96% to total income. Retirement (12.66%) and livestock sales (10.13%) also play roles.

41.6% perceive economic struggle, 51.3% manage moderately, and 7.1% have more than enough income. Economic sufficiency perceptions remain consistent between groups. Respondents predict worse economic situations compared to the past (58.4%) and a gloomier future (44.2%), indicating a lack of confidence in an improved economic outlook.

5.12.8.2 Husbandry

Traditional livelihood practices like agriculture and husbandry are struggling to generate sufficient income due to rising essential costs, particularly fuel. This trend affects household incomes, not just locally but nationwide. Consequently, many farmers and livestock workers are considering abandoning these traditional income sources, leading to a decline in such activities. Simultaneously, new job opportunities could enhance household income. However, this could lead to a reduction in local livelihood activities, impacting local product production capacity. Additionally, lower-income individuals may transition from the low-income group to the low-middle-income category, affecting both less educated and vulnerable populations.

The ESIA&RP field study found widespread poultry farming in the settlements. There are approximately 12,600 small cattle and 1,270 cattle in the study area. Around 52.2% of households engage in livestock activities. Of these, 15.9% raise cattle, while 10.6% raise small cattle, with more emphasis on the latter. Poultry production is common, with 40.7% of households involved. Additionally, 0.9% of respondents practice beekeeping.

Livestock care occurs mainly in barns (35.62%) and poultry houses (42.47%). Production is primarily for household consumption, including milk, honey, cheese, butter, and eggs. Some surplus products are sold in markets, with different rates for each product. For example, 55% of households consume their milk, 35% sell it in public markets, and 10% sell to merchants/factories. Cheese production is mainly for household consumption (52.9%), while 47.1% is market oriented. Similarly, 77.8% of butter is consumed at home, and 22.2% is sold locally. Egg production is primarily for household use (86.4%), with the remainder sold in the market. The study highlights the prevalence of small-scale, subsistence-oriented livestock and poultry farming practices in the Project Area of Impact.

5.12.8.3 Livelihoods in the Project AoI Settlements

When Household's main sources of income are evaluated, the livelihood sources of the households in the Project impact area are as follows;

- Agriculture (crop production)
- Livestock (animal production)
- Pension
- Paid, salaried work
- Business and self-employment income
- Paid works
- Self-employed
- Temporary/precarious day works
- Social assistance.

When the main source of income of Yukarıburnaz and Aşağıburnaz villages is agriculture (crop production), in Sarımazı, agricultural activities come after retirement income and monthly salary jobs (see Table 119).

Table 119 Household's main sources of income

			What are your household's main sources of income?					Total
			Agriculture (crop production)	Pension income	Paid works	Temporary works	Social assistance	
Settlement	Yukarıburnaz	Count	9	1	1	2	0	13
		%	69,2	7,7	7,7	15,4	0	100
	Aşağıburnaz	Count	12	0	0	0	0	12
		%	100	0	0	0	0	100
	Sarımazı	Count	0	1	1	1	1	4
		%	0	25	25	25	25	100
	Hürriyet	Count	10	0	2	0	0	12
		%	83,3	0	16,7	0	0	100
	Turunçlu	Count	2	2	0	1	0	5
		%	40	40	0	20	0	100
Total		Count	33	4	4	4	1	46
		%	71,7	8,7	8,7	8,7	2,2	100

Source: 2024 HH Survey

When secondary and tertiary income sources are evaluated, pension income and self-employed jobs come to the fore (see Table 120 and Table 121). In addition, agricultural activities are considered among the supporting income activities.

The main products produced within Project AOI are listed as follows by the Households living in the AoI.

- Citrus
- Olive
- Barley
- Sunflower
- Wheat
- Pepper
- Sweetcorn
- Pea
- Peanut
- Bean

Table 120 Household's secondary sources of income

			What are your household's secondary sources of income?						Total
			Agriculture (crop production)	Livestock (animal production)	Pension	Paid, salaried work	Self-employed	Rent earn	
Settlement	Yukarıburnaz	Count	3	1	7	1	1	0	13
		%	23,1	7,7	53,8	7,7	7,7	0	100
	Aşağıburnaz	Count	0	0	4	1	3	1	9
		%	0	0	44,4	11,1	33,3	11,1	100
	Sarımazı	Count	1	0	0	0	0	0	1
		%	100	0	0	0	0	0	100
	Hürriyet	Count	2	0	7	2	0	0	11
		%	18,2	0	63,6	18,2	0	0	100
	Turunçlu	Count	2	0	2	0	0	0	4
		%	50	0	50	0	0	0	100
Total		Count	8	1	20	4	4	1	38
		%	21,1	2,6	52,6	10,5	10,5	2,6	100

Source: 2024 HH Survey

Table 121 Household's tertiary sources of income

			What are your household's tertiary sources of income?						Total
			Agriculture (crop production)	Livestock (animal production)	Pension	Paid, salaried work	Self-employed	Rent earn	
Settlement	Yukarıburnaz	Count	1	2	0	0	2	1	6
		%	16,7	33,3	0	0	33,3	16,7	100
	Aşağıburnaz	Count	0	0	3	0	1	0	4
		%	0	0	75	0	25	0	100
	Hürriyet	Count	0	1	0	2	2	0	5
		%	0	20	0	40	40	0	100
	Turunçlu	Count	1	0	0	2	0	0	3
		%	33,3	0	0	66,7	0	0	100
Total		Count	2	3	3	4	5	1	18
		%	11,1	16,7	16,7	22,2	27,8	5,6	100

Source: 2024 HH Survey

When Livelihoods in the Project AoI Settlements were evaluated, it was seen that PAPs in Yukarıburnaz and Aşağıburnaz villages were engaged in animal husbandry (see Table 122). It is not stated that livestock farming is a source of income in other villages.

Table 122 Engagement in the husbandry activities

			Engagement in the husbandry activities		
			Yes	No	Total
Settlement	Yukarıburnaz	Count	4	9	13
		%	30,8%	69,2%	100
	Aşağıburnaz	Count	1	11	12
		%	8,3%	91,7%	100
	Sarımazı	Count	0	4	4
		%	0	100	100
	Hürriyet	Count	0	12	12
		%	0	100	100
	Turunçlu	Count	0	5	5
		%	0	100	100
Total		Count	5	41	46
		%	10,9%	89,1%	100

Source: 2024 HH Survey

Main expenditure items of the annual household income according to the settlements are given in Table 123.

The main expenses are agricultural expenses (fuel oil, fertilizer, feed, etc.). Nutrition expenses are the second expense item.

Table 123 Main expenditure items of the annual household income

			What are the main expenditure items of the annual household income?					Total
			Nutrition expenses	Agricultural expenses (fuel oil, fertilizer, feed, etc.)	Agriculture, trade and industry investments	Health and personal care expenses	Educational expenses	
Settlement	Yukarıburnaz	Count	3	10	0	0	0	13
		%	23,1	76,9	0	0	0	100
	Aşağıburnaz	Count	2	9	1	0	0	12
		%	16,7	75	8,3	0	0	100
	Sarımazı	Count	3	0	0	1	0	4
		%	75	0	0	25	0	100
	Hürriyet	Count	2	9	0	0	1	12
		%	16,7	75	0	0	8,3	100
	Turunçlu	Count	1	4	0	0	0	5
		%	20	80	0	0	0	100

		What are the main expenditure items of the annual household income?					Total
		Nutrition expenses	Agricultural expenses (fuel oil, fertilizer, feed, etc.)	Agriculture, trade and industry investments	Health and personal care expenses	Educational expenses	
Total	Count	11	32	1	1	1	46
	%	23,9	69,6	2,2	2,2	2,2	100

Source: 2024 HH Survey

5.12.9 Vulnerable Groups

In accordance with the World Bank ESFs, vulnerable populations potentially impacted by the project and facing relative disadvantages compared to other individuals or groups.

A significant number in Sarımazı rely on Social Assistance and Support Foundation (SYDB) assistance. Yeşiltepe has a higher proportion of elderly individuals needing care, with past land expropriations affecting households. Yeşiltepe's residents are disproportionately impacted, given their lands' primary exposure. Previous projects and Free Zones also affect Sarımazı. Project impacts on similar groups are expected, but exact numbers are uncertain. Büyüktüysüz, affected by OIZ, houses many, yet private lands there aren't involved (see Table 124).

- Elderly people in need of care and social assistance,
- Disabilities (Mental and Physical),
- Women who have lost their husbands/divorced,
- Home-bound due to chronic illness,
- Illiterate adult,
- Refugee/migrant,
- Earthquake victim[60],
- Seasonal agricultural workers, including Syrian refugees.
- PAPs who don’t know Turkish

The settlements with the highest Earthquake victim rate are Yukarıburnaz, Aşağıburnaz and Turunçlu.

The settlements where vulnerable groups with Disabled (Physical/Mental) are located are Aşağıburnaz, Sarımazı, Hürriyet neighborhoods.

The settlements where elderly people need care and social assistance are Yukarıburnaz, Aşağıburnaz and Sarımazı.

The settlements with the highest female head of households’ ratio are Yukarıburnaz, Aşağıburnaz and Hürriyet.

60 - “Earthquake victim” describes the groups that lost their jobs, homes, a significant part of their livelihood, and their relatives due to the earthquake after February 2023 and became disadvantaged for many reasons after the earthquake.

Table 124 Vulnerable groups in the Project AoI

			Vulnerability							Total
			Elderly people in need of care and social assistance	Disabled (Physical/Mental)	Unemployed (even though they are looking for a job)	Women head of households	People who are homebound due to chronic illness	Illiterate adult	Earthquake victim	
Settlement	Yukarıburnaz	Count	1	0	2	2	0	5	3	13
		%	8	0	15	15	0	39	23	100
	Aşağıburnaz	Count	3	2	2	3	1	5	2	18
		%	17	11	11	16,5	5,5	28	11	100
	Sarımazı	Count	2	2	0	0	0	0	0	4
		%	50	50	0	0	0	0	0	100
	Hürriyet	Count	0	3	2	1	1	0	0	7
		%	0	42,9	28,6	14,3	14,3	0	0	100
	Turunçlu	Count	0	0	0	0	0	0	4	4
		%	0	0	0	0	0	0	100	100
Total		Count	6	7	6	6	2	10	9	46
		%	8,3	19,4	16,7	11,1	5,6	16,7	22,2	100

Source: 2024 HH Survey

5.12.10 Labor and Working Conditions

The labor force participation, unemployment and employment data of the provinces and districts within the study area are shown in table below. It is seen that the employment rate in the TR 63 Region is 37,5% and 40,6 in %TR62 region (see Table 125).

Unemployment rates are 13,4% and 15,2% in the region.

Table 125. Unemployment and employment status of the non-institutional population

Years	Labour force participation rate **(%)**	Unemployment rate **(%)**	Employment rate **(%)**	Not in labour force
Total				
ANNUAL	**49,3**	**13,2**	**42,8**	**31 706**
TR62 *(Adana, Mersin)*	46,9	13,4	40,6	1 614
TR63 *(Hatay, Kahramanmaraş, Osmaniye)*	44,2	15,2	37,5	1 339

Source: TurkStat 2021

The majority of the workforce in Adana is in the service sector with 58.26%. Similarly, in Hatay province, the majority of the workforce is in the service sector with 56.64%. When the spatial distributions of regional labor force participation rates are examined, it is seen that Hatay is among the sub-regions with the lowest rate. Hatay, together with Van and Mardin sub-regions,

are the regions where the share of the workforce in the total population is the lowest. When we look at the Gaziantep sub-region, the average age of the registered workforce is low and the level of educated workforce is also quite low. Hence, the region lags behind in terms of qualified workforce and the low level of education has a negative impact on the participation rates in registered employment[61].

5.12.10.1 Economic Participation of Women in the AoI Settlements

When the participation of women in social and economic life data is assessed, it is seen that women's employment participation rates are much lower than men (see Table 126).

Table 126 Economic Participation of Women

	Labour force participation rate			Employment rate			Unemployment rate		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
TR Türkiye-Türkiye	**53,1**	**71,4**	**35,1**	**47,5**	**65,0**	**30,4**	**10,4**	**8,9**	**13,4**
TR62 (Adana, Mersin)	**52,1**	71,2	33,4	**45,7**	64,0	27,8	**12,3**	10,1	16,9
TR63 (Hatay, Kahramanmaraş, Osmaniye)	**49,6**	69,8	30,9	**42,4**	61,7	24,5	**14,6**	11,7	20,7

Source: TurkStat 2023

In addition to the low female employment rate in the whole employement[5] ratio, the female employment rate is also low in agriculture and animal husbandry.

This is because, although women define themselves as housewives, women are unpaid family workers in all households engaged in agriculture and animal husbandry.

While men are responsible for taking animals to graze and selling animal products, women are responsible for milking the animals, cleaning the milking equipment, caring and feeding the animals in the barn, and obtaining additional products such as yoghurt and cheese from the obtained milk. Although women are engaged in labor-intensive work related to animal husbandry, they see these jobs as a part of their housework and define these jobs as housework.

Table 127 can also be seen from the working status data in Project AoI.

[61] https://dergipark.org.tr/en/download/article-file/2486099

Table 127 Working status in the Project AoI

			Working status of the household members							
			Paid	Self-employment,	Farmer	Housewife	Unemployed	Retired	student, child	Total
Settlement	Yukarıburnaz	Count	1	7	6	18	3	6	10	51
		%	2	13,7%	11,8%	35,3%	5,9%	11,8%	19,6%	100
	Aşağıburnaz	Count	1	5	9	17	2	7	12	53
		%	1,9%	9,4%	17	32,1%	3,8%	13,2%	22,6%	100
	Sarımazı	Count	1	1	0	3	0	1	8	14
		%	7,1%	7,1%	0	21,4%	0	7,1%	57,1%	100
	Hürriyet	Count	9	3	4	10	2	7	16	51
		%	17,6%	5,9%	7,8%	19,6%	3,9%	13,7%	31,4%	100
	Turunçlu	Count	2	1	2	5	0	2	3	15
		%	13,3%	6,7%	13,3%	33,3%	0	13,3%	20	100
Total		Count	14	17	21	53	7	23	49	184
		%	7,6%	9,2%	11,4%	28,8%	3,8%	12,5%	26,6%	100

Source: 2024 HH Survey[62]

In addition to the low female employment rates within the Project AoI, female employment decreased even further after the earthquake. The reason for this is revealed in TEPAV's research as follows:

> *The share of women's employment is below the Turkish average in all provinces in the region, and women's employment has shrunk to a greater extent after the earthquake, especially in the districts where the damage was high. According to March 2023 SSI data, the share of female employment in the provinces where the research was conducted is 27.8 percent, below the Turkish average (33.6 percent). Post-earthquake workforce losses were higher for women than for men, and the most obvious example of this was in Hatay, with a decrease of over 70 percent in the female workforce, and therefore the employment share of female employees decreased by 6.7 points. In the meetings held with the Metropolitan Municipality and its subsidiaries, the authorities*

[62] Within the scope of the project, 47 household surveys were conducted. Demographic assessments were provided on 190 family members within the scope of these households. This number may decrease depending on the answers given to the questions during the survey. In this table, data from 46 households and 186 household members are presented.

confirmed the great losses in women's employment and stated that their female employees were not called back to work due to the housing problem[63].

The following highlights of the report's findings regarding workforce and employment after the earthquake are also important for the Project[64]:

- Projects that provide job guarantee to those who volunteer to receive vocational training and obtain a certificate to work in sectors with employment gaps are important.
- Waste and construction recycling are activities that intensified in the region after the earthquake.
- It is important to cooperate with women's cooperatives to support and/or increase women's employment.

5.12.10.2 Risks Related to Human Trafficking and Forced Labour in Project AoI

Due to the location of the project, Adana, Mersin, Osmaniye and Hatay can be considered as provinces where Syrian and other immigrant populations are densely populated and therefore there are groups at risk of being victims of human trafficking. As a similar issue, forced labor, as a form of human trafficking, refers to the usurpation of personal freedom and coercion to work. Forced labor through confiscation of foreign passports, debt, threats and violence is another form of human trafficking. Forced prostitution among women, abuse and forced labor of children, and forcing men to work in inhumane conditions are common within the scope of this human rights violation. Within the scope of the Project, measures and control mechanisms will be implemented to prevent the emergence of forced labor in provinces with high risk levels.

5.12.10.3 Risks Related to Child Labor

Agriculture is the sector where child labor is most common in Turkey. 30.8% of working children are in agriculture, 23.7% in industry and 45.5% in service sector. 66.0% of working children work in a regular workplace, 30.4% work in the field-garden, 3.0% work in a mobile, non-fixed workplace or market place, and 0.5% work at home. When the provinces where the project is located are evaluated, it can be stated that the risk is high in Adana and Osmaniye provinces due to the intense temporary agricultural work.

In the affected settlements whose Mukhtars were interviewed in the region, it was observed that seasonal agricultural workers stayed and worked in the settlements of Hatay Erzin. Seasonal agricultural come to work for the seasonal agricultural works in Aşağıburnaz and Hürriyet Neighborhoods.

According to the Mukhtar interviews, it was stated by the Hürriyet Mukhtar that all the workers arriving from September to December was Syrian.

Asağıburnaz Mukhtar stated that the majority of the workers arriving from September to December was Syrian.

It has been stated that the proportion of women and children among these seasonal agricultural workers is high. For this reason, it can be stated that the risks of child labor and forced labor increase in the region, especially during the period when agricultural activities are intense.

Considering these assessments and within the scope of the project, the following risks may exist regarding child labor;

- Employing child workers in subcontracted jobs,

63 https://www.tepav.org.tr/upload/mce/2023/deprem_bolgesinde_surdurulebilir_is_gucu_istihdami_ihtiyaclar_ve_firsatlar.pdf

64 https://www.tepav.org.tr/upload/mce/2023/deprem_bolgesinde_surdurulebilir_is_gucu_istihdami_ihtiyaclar_ve_firsatlar.pdf

- Employment of children in works such as agriculture and commerce carried out within the family,
- Employment of children in productions made in the household on a piece-by-piece basis,
- Including children in the recruitment of unskilled workers living or traveling as nomads,

Employing children under the age of 18 in hazardous work.

5.13 Impact Assessment and Mitigation Measures

Regarding to the Social Baseline and Project Components, Project impacts are assessed including the mitigation and improvement measures need to be taken according to specific baseline conditions and the receptors of the Project Area of Influence.

5.13.1 Population Change

Population projections for the project area are presented under the title of Socio-Economic Environment. In this Chapter, the expected impacts on the population in the vicinity of the project area will be assessed.

5.13.1.1 Land Preparation and Construction Phase

It is anticipated that the project workforce profile will predominantly consist of male workforce. However, considering that the Project is a temporary and short-term construction project during the operation process, this population migration impact is not expected to be high.

The primary anticipated influence on the population during the land preparation and construction phase revolves around the surge in population attributed to the workforce engaged in construction activities. This effect engenders economic dynamism, albeit concurrently exerting strain on existing infrastructure and resources. The socio-cultural impacts of population growth resulting from personnel employed in construction activities have the potential for social conflict. A general overview of the potential social impacts associated with land preparation and construction activities of railway line projects:

Such projects wield the potential to generate a diverse array of social impacts, in particular related to influx of labor force during construction efforts.

A labour influx that may occur during construction activities for the Project affected settlement may disrupt the balance of social and economic life against the local people. These effects may negatively affect women's participation in social life, cause inflation that may increase the cost of living, and affect the demographic structure. At the same time, construction activities provide temporary employment options for the local people. Increased income and rising living standards provide positive results for households that have access to these opportunities. The potential impacts on the population that may occur within the scope of the project can be listed as follows:

The most important of these effects will be an increased gender imbalance of the population in the communities near camp areas in Project impact area. Since the majority of workers are expected to be men, the labor influx affecting settlements where the female population is already currently quite low may create gender instability.

The fact that the ratio of male employees is very high compared to females may reveal inequalities in women's participation in social life and use of public spaces and/or may cause gender-based security problems, causing women to feel less safe in social and daily life

The emergence of gender-based violence (GBV) and sexual harassment and abuse (SHA) cases may increase due to the uncontrolled population coming to the Project area due to the influx of workers and job opportunities in the region. It can lead to an increase in social conflict,

criminal activity, including gender-based violence, forced labor, human trafficking and illegal acts.

5.13.1.2 Operation Phase

No negative impact is expected from the Project on population influx during the operation process.

Mitigation Measures

Establishing grievance mechanisms accessible to both workers and local households is crucial. This mechanism fosters trust and minimizes conflict by adeptly addressing disputes.

Integrating social dynamics insights into laborer orientation is recommended. Providing knowledge of local culture and promoting nonviolent communication aids interactions. Informing workers about project environmental and social policies enhances communication with local communities. Engaging local communities in employment not only enhances project reception but also mitigates potential socio-cultural conflicts due to population growth. Aligning external laborers' cultural attributes with the region's culture promotes a harmonious environment for construction. Prioritizing local businesses in procurement amplifies local benefits and bolsters project perception. In this context, the following actions will be taken and priorities will be provided:

- People and settlements whose livelihoods are affected by the Project's Associated Facility activities will be given priority in Project employment and service procurement.
- Accommodation conditions of the camp site to be established on the Project route by the Contractor for workers will be provided in accordance with WB/IFC and EBRD standards.
- In order to limit the interaction of non-local workers coming to work on the project, the basic needs of the workers will be met in the camping areas-accommodation areas.

The imperative of addressing gender-based violence and instances of sexual harassment and abuse underscores the need for supplementary measures. The Workers' Code of Conduct will be prepared and applied to all workers and subcontractors, including the following;

- GBVH issues,
- violent behavior and physical aggression,
- Intentional damage to the property and interests of others or the environment,
- violating provisions aimed at preventing the spread of sexually transmitted diseases and AIDS,
- harm or damage to the environment, population or property,
- drug use, including the use of cannabis, entering local people's property without the permission of land owners or users.
- The Code of Conduct will identify non-compliance that requires disciplinary action, and will include that repeated non-compliance may result in immediate dismissal, or depending on the risks these situations may pose.

In addition to the CoC, the following measures will be provided.

- Prioritizing gender sensitivity in the recruitment of Community Liaison Officer(s) for on-site roles.
- Ensuring comprehensive awareness and, when necessary, training for CLO(s) concerning GBV/SHA concerns.
- Integrating GBV considerations into the training of Project workers, encompassing dimensions of socio-cultural consciousness, nonviolence, and the multifaceted dynamics of GBV. This training should encompass:
- Articulation of violence against women within the framework of national and international sociopolitical mandates.

- Exploration of diverse manifestations of violence (physical, sexual, economic, emotional) as shaped by social contexts.
- Equipping workers with an understanding of national legal provisions that criminalize sexual harassment and gender-based violence, subject to legal proceedings. The Project should uphold regulations concerning drug abuse and smuggling that are deeply intertwined with societal dynamics.
- Establish a Complaint Mechanism (GM) that ensures universal accessibility, ensures anonymity and confidentiality while protecting the confidentiality of personal information, and provides a separate channel for processing GBV/SEA related complaints.

Conduct focused group meetings in settlements to inform women about GM, ensure their meaningful participation in stakeholder engagement processes, and strengthen their access to external grievance mechanisms.

These sessions should cover:

- Articulation of women's rights and entitlements within a broader sociopolitical context.
- Provision of strategies for self-protection and empowerment in scenarios of violence and sexual abuse.
- Provision of emergency contact information for immediate intervention.
- Dissemination of details about accessible institutions and organizations offering multifaceted support, acknowledging their socio-structural significance.
- Exposition of the operational architecture and privacy policy of GM, reflecting the symbiosis between administrative mechanisms and individual privacy within the broader sociocultural milieu.
- The consistent reiteration of the privacy policy of GM across all informational materials resonates with broader sociopolitical efforts toward transparency and accountability.

5.13.2 Infrastructure

5.13.2.1 Land Preparation and Construction Phase

The construction phase can have various physical impacts on roads, such as accelerated wear due to heavy construction vehicles. Local residents might find these changes uncomfortable. It's crucial to repair road damage and address wear. Accidents involving construction vehicles can also cause damage to structures and natural elements. Contracts should include provisions for compensation in such cases. Construction activities may disrupt infrastructure services like water, electricity, and the Internet temporarily. Planning to minimize disruptions and notifying stakeholders through media and announcements is vital. In cases of sudden and prolonged disruptions, community-level compensation practices should be developed, which could involve supporting other village needs like social facilities and road repairs.

In situations where there is the potential for access routes within these zones to be impaired or entirely halted, the associated costs should be included in the Livelihoods Restoration Plan and Land Acquisition Budgets. These costs should be scaled in proportion to the level of economic activity and the magnitude of their impact on households.

General outputs of the FGMs which are carried out in the Phase 1 ESIA studies are given in below in accordance to the settlements;

Yukarıburnaz. During the construction phase, the passage of earthmoving trucks might affect the school road, posing a potential danger for children taking alternative routes. There is no impact expected. Due to the absence of sewerage infrastructure, potential challenges arising from population growth might arise, warranting the implementation of security measures. Additionally, there is a need for the development of sewerage infrastructure. It is anticipated

that there will be no adverse effects. The project is expected to yield positive outcomes if there are no negative impacts on the existing infrastructure.

Turunçlu. Passing trucks could pose risks to children, especially considering the proximity of the school to the main road. Dust and pollution emanating from excavation trucks could be problematic, suggesting a need to avoid using the village road for these vehicles. Concerns exist about electrical interruptions due to previous instances when electricity was disrupted during the establishment of other factories. Similar issues could arise, affecting water and internet connectivity since they are linked to electricity. Despite the absence of a sewage system, the project is not expected to exert an impact. Ensuring the safety of children and adhering to security measures for earthmoving trucks is crucial. Internship opportunities for high school and university students are anticipated.

Aşağıburnaz. The choice of construction roads will determine the potential impact, with no positive or negative effects currently foreseen. Construction vehicles should avoid passing through the village. While any potential benefits of the project would be welcomed, prior experiences have left doubts about such prospects.

5.13.2.2 Operation Phase

The projected effects on infrastructure during the operational phase of the project are mostly positive, despite identified shortcomings in various areas like roads, sewage, and waste systems within the project area. Stakeholders collectively anticipate that the project will boost regional investment and improve quality of life.

Mitigation Measures

To address the challenges posed by construction-related disruptions, several strategies can be employed. Firstly, establishing alternative routes and effectively communicating these changes to stakeholders through local media and corporate channels is essential for positive stakeholder engagement. When choosing roads for construction, prioritizing routes that bypass settlements and minimize interactions with adjacent road networks is recommended.

Moreover, recognizing the potential abrasive impact of construction on roads, it's important to consider feedback from affected parties and implement necessary maintenance and repair measures to mitigate negative consequences on daily life and economic activities. Construction vehicle accidents can also lead to physical damage, necessitating the inclusion of compensatory provisions within subcontractor agreements to address such incidents and damaged assets.

In cases where construction activities might disrupt infrastructure services like water, electricity, and internet, a comprehensive strategy is required to minimize socio-economic repercussions. This includes proactive planning to avoid service interruptions and timely notifications to stakeholders through local media and official communications. Additionally, preparing compensation mechanisms at the community level is advised for abrupt and prolonged service disruptions.

Highlighted below are notable aspects in the Livelihood Restoration Plan and Land Acquisition Budgets within transitional zones comprising agricultural lands, encompassing both direct and indirect fiscal implications:

- The integration of tailored provisions designed for the loss of agriculturally designated lands, such as olive groves, holds potential within the process.
- Varying approaches could encompass the transportation or re-plantation of perennial trees producing citrus fruits.
- The financial estimation of costs arising from the loss of single-year crops and arid agricultural zones is contingent upon regional soil yield conditions, spanning rural, semi-aquatic, and dry-wetland landscapes, thereby warranting inclusion within the Livelihoods Restoration Plan and Land Acquisition Budgets.

- The consideration of potential loans targeted for utilization by small and medium-sized agricultural enterprises is deemed prudent.
- Financial deliberations should extend to constructions owned by these enterprises, encompassing spaces for parking, vehicle equipment, storage, and related infrastructure.
- Temporary housing and security structures catering to seasonal agricultural laborers, facilitating the processing of products like citrus fruits and bananas, necessitate meticulous financial assessment.
- Private structures situated around agricultural regions should not be overlooked.
- The incorporation of costs associated with retaining unofficial caretakers responsible for safeguarding citrus and banana fields is warranted.
- The interplay of feed crops in supporting animal husbandry and income generation, in conjunction with the resultant loss of income in animal husbandry, should be acknowledged.
- Losses incurred in grazing areas vital to small livestock farming across rural and arid terrains merit monetary valuation.
- The criticality of budget allocation for utilities, lighting, insulation, cladding materials, and structural components within enclosed production spaces is underscored.
- The consideration of annual turnover losses borne by large-scale enterprises is of significance.
- Proactive communication, particularly during the pre-construction phase, ensuring a minimum two-day notice for activities proximate to settlements is pivotal.
- The initiation of the resettlement process prior to land acquisition is recommended.
- Adequate advance notice, a minimum of two days prior, is essential, particularly concerning pre-construction preparations in the vicinity of public beaches.
- Proactive communication, at least two days ahead of construction commencement, is imperative to address potential environmental pollution concerns within the region

5.13.3 Economy and Employment

5.13.3.1 Land Preparation and Construction Phase

Areas affected by Project land acquisition and Project impacts have been addressed in the previous section and in the Project's RP/LRP document, with specific impacts of the Project's land preparation and construction phase on the local economy and way of life. Land acquisition has transformational effects, especially over the long term, on the local economy and way of life. Basic changes that land preparation and construction activities will bring about with cumulative effects include: The narrowing of the areas where livestock activities will be conducted, the increase of the feed costs of the livestock activities, and the switching to new livelihoods. The contraction of agricultural activity areas, the increase of agricultural costs, and the switching to new livelihoods.

In order to reduce these impacts, measures will be taken to ensure that the Project's livestock and agricultural activities continue regularly, by leaving the passageways and routes open (described in detail in the Project's RP) that the local people are accustomed to using to facilitate passage to pastures and lands.

Other effects on the local economy and way of life are caused by the land preparation and building phases. One of them is the advantages brought about by the acquisition of the supplies and services required for the building. Positive indirect effects on the economy include spending on products and services by construction workers who will have more money to spend and will be able to spend more money locally.

Project stakeholders' information activities, which will aim at ensuring inclusive access to the project opportunities, will be implemented and monitored in accordance with the Project's SEP document and RP document in this process. The main contractor of the project is responsible

for providing information locally, and Borrower is responsible for ensuring that the mitigation measures ensuring an inclusive approach are implemented.

In the face of the goal of increasing women's employment and ensuring an equal working environment, discrimination is a risk that should be constantly monitored and may arise from many reasons. The Project aims to ensure social inclusion and gender equality of vulnerable groups and to eliminate potential risks throughout the life of the Project, in line with WB ESS2, national and international objectives. During the work process, employment conditions will be prepared for the recruited personnel, defining the job requirements and the qualifications of the sought-after personnel in a non-discriminatory, fair, understandable and clear manner. In order to ensure that the job opportunities and benefits created within the scope of the project are equally beneficial, it will be ensured that the vulnerable groups and women are informed at a sufficient level, primarily PAPs within the Project AoI. For providing equal opportunities to women, in the selection of new employees, evaluation is made based on the level of knowledge and experience required by the job, evaluation measurements and competency assessments. During the work process, employment conditions will be prepared for the recruited personnel, defining the job requirements and the qualifications of the sought-after personnel in a non-discriminatory, fair, understandable and clear manner.

5.13.3.2 Operation Phase

These impacts are known to be transient throughout the land preparation and construction phases. The project's long-term repercussions appear as direct and indirect effects during the operating phase. No negative effects are expected during the operation process.

5.13.4 Child Labor

DGII is subject to the relevant laws, regulations and agreements. In this context, DGII and all contractors working under it are subject to the Labor Law and ILO agreements to which Turkey is a party. All contractors within the scope of the project are obliged to prohibit child labor, forced labor and ensure equal treatment and gender equality for employees. These include the ILO agreements listed under the following headings: freedom of association, child labor, forced labor, equal treatment of employees and gender equality[65].

Regulations on civil servants and workers' labor laws do not allow precarious informal employment.

Employment of Child Labor is prohibited according to Turkish law, its commitments to ILO conventions, and according to ESS2. In this context, the personnel files and identity information of all employees will be kept within the scope of the Project and it will be stated in the contracts of all workers and sub-contractors that child labor is prohibited. Project LMP will be implemented in this context. In addition, Contractor will be prepared own LM Plan in line with Project LMP.

Within the scope of the project, the risk of child labor and forced labor will be managed with contracts made with main contractors and subcontractors, working conditions regulations and necessary measures.

2.2.1.5 Labor Law and Regulations, 2.3 International Agreements, Conventions and Protocols and Occupational Health and Safety requirements will be implemented to prevent child labor and forced labor and will be regularly monitored by DGII.

Table 8. Measures to bridge gaps/standards for the ESS2 Labor and Working Conditions

to be followed in this project.

65 https://www.ilo.org/sites/default/files/wcmsp5/groups/public/@europe/@ro-geneva/@ilo-ankara/documents/genericdocument/wcms_645630.pdf

Labor Management Procedures has been prepared for the RLIP. Moreover, the Contractor will prepare project level Labor Management Plan including gender equality and anti-discrimination, Sexual Exploitation and Abuse/Sexual Harassment (SEA/SH), child labor, forced labor, labor rights and freedom of association. Workers will receive written contracts and be provided access to Workers' Grievance Mechanism

5.13.5 Discrimination

The goals of the Ministry of Transport and Infrastructure are to implement policies aimed at increasing the participation of groups requiring special policies, especially women and the disabled, in the workforce and employment.

Some improvements provided to public employees in Türkiye in recent years for will be beneficial in preventing discrimination:

- Establishment of a Public Personnel Advisory Board, which allows consultation on general issues concerning public personnel,
- To increase the compulsory employment rate of disabled people in public institutions,
- Banning the night duty for pregnant personnel, increasing the free maternity leave period and ensuring that male personnel also benefit from this right,
- The introduction of paid companionship permits for civil servants to accompany their relatives in need of treatment may be an example of this positive trend (State Personnel Presidency).

Discrimination is prohibited according to Turkish law, its commitments to ILO conventions, and according to ESS2. In this context, code of conducts of all workers and sub-contractors addressed the non-discrimination. Project LMP will be implemented in this context.

5.13.6 Right of Association

Steps have been taken in recent years about the association of civil servants in Türkiye. Developments in favor of civil servants are as follows:

- Expanding the association and joining union members rights of civil servants, removing the year requirement to become a union founder, and pave the way for candidate civil servants to become union founders,
- Forgiveness of disciplinary offenses of civil servants and other public officials,
- Replacing the collective bargaining system without binding with collective bargaining system (State Personnel Presidency).

Mitigation Measures

- The employment procedures and human resources policy will be designed in accordance with the OHS Law No. 6331, WB ESS2 and all Project personnel will be trained and briefed on OHS, the LMP icl. Workers' GM, and ESS2 rules.
-
- The location and standards of the accommodation of the workers will be designed and managed to meet the standards described in WB ESS2.
- Workers must be able to maintain a good standard of hygiene and contamination and the spread of diseases which are arising from insufficient sanitary facilities must be avoided.
- Sufficient medical facilities should be reached to sustain workers' health and adequate responses should be ensured in the matter of health emergency situations.
- Worker Grievance Mechanism should be established and be provided to workers to report their grievances.

- All Project employees will sign a written employment contract that includes a description of the terms of employment, wages, working hours, rights and duties, Code of Conduct.
- In addition to the regular salary, employees are provided with overtime, holidays, weekends, etc. Specific working conditions or absence periods will be defined and necessary information will be provided in writing.
- In addition to the regular salary, employees are paid overtime, holidays, weekends, etc. or to be paid as compensation for certain working conditions, such as periods of absence.
- Employees are given rest periods specified in the law regarding working hours, weekly rest and annual holidays.
- Employment of Project workers will be based on the principles of non-discrimination and equal opportunity. There will be no discrimination with respect to any aspect of the employment relationship, such as recruitment, salary, working and employment conditions, access to training, promotion or termination of employment. Recruitment procedures are transparent, open to the public, and will not discriminate on the grounds of ethnicity, race, religion, gender, disability, political beliefs, or any other grounds contained in the Labor Law.
- Records will be kept of workers working in tasks with an increased risk of injury and harm to health.
- The minimum working age will be 18.
- The Project has a Workforce Management Procedure that will form the basis for the creation of the Contractor's own Workforce Management Plan. The Contractor Workforce Management Plan will cover all these risks regarding Labor and define the necessary measures for social compliance, and will be implemented by the Contractor within the scope of the Project and monitored by Borrower.
- Project workers will comply with the LMP and also national laws prohibiting and sexual harassment and sexual exploitation and abuse.
- Project personnel will be trained according to the LMP.
- Legal notice periods will be followed.
- Local recruitment will be given priority.

The Contracts of the Construction (CoC) Workers must include sanctions for noncompliance, including specific policies related to gender-based violence, sexual exploitation and sexual harassment (e.g., termination).

A copy of the CoC shall be displayed in a location easily accessible to the community and program affected people.

Contractors must address the risk of gender-based violence, through:

- Mandatory training and awareness-raising for the workforce about refraining from unacceptable conduct toward local community members, specifically women. Training may be repeated;
- Informing workers about national laws that make sexual harassment and gender-based violence a punishable offense which is prosecuted;
- Adopting a policy to cooperate with law enforcement agencies in investigating complaints about gender-based violence.

Employers are obliged to provide adequate personal protective equipment free of charge to workers, including community workers.

5.13.7 Impacts on Livelihoods in the Project AoI

The project's RP document aims to identify gaps between Turkey's legislation and WB and to align these gaps with international commitments in line with WB standards. Based on this

approach, the RP defines measures and practices according to Project commitments regarding Project entitlement, compensation rights, and land user status.

The Resettlement Plan (RP) has been prepared to minimize the physical and economic resettlement impacts of the land acquisition process required for the construction of the Project.

Regardless of land acquisition impacts, ESIA also assessed impacts on local people's livelihoods. The source of these impacts is the activities to be carried out within the scope of Project construction activities, heavy debris and negative effects that may occur due to dust on the Project vehicle passage routes.

Within the scope of these effects following impacts have been considered;

- Restriction of passages to the lands and pastures,
- Access to Ecosystem Services and sustainability problem,
- Decrease in productivity of agricultural activities due to dust effect.;
- Restriction of passages to the lands and pastures,
- Access to Ecosystem Services and sustainability problem,
- Decrease in productivity of agricultural activities due to dust effect.

All (6.1%) of the households engaged in animal husbandry in the Yukarıburnaz, Aşağıburnaz, Hürriyet, Turunçlu neighborhoods use pastures. PAPs interviewed in Yukarıburnaz Village and the Mukhtars stated that pasture areas will be affected and access roads to pastures will be affected. All detailed assessments are given in the RP/LRP of the Project.

However, in the Yukarıburnaz, Aşağıburnaz, Hürriyet and Turunçlu neighborhoods, people benefit from the forests around the village/neighborhood to collect mushrooms, medicinal plants or buy wood (%14,7 of the households). PAPs living in Yukarıburnaz, Aşağıburnaz and Turunçlu neighborhoods stated that their access to these areas would be negatively affected.

Mitigation Measures

- RP/LRP document will be implemented.
- During the design and implementation phase of the project construction works, technical and feasible measures will be explored to provide access to pastures, forests and agricultural lands, and proper passages will be provided to restore access.
- In case of restrictions on passage to areas where agricultural and livestock activities are carried out, information meetings will be held for local people on the duration, reason and alternative crossings of these restrictions, and they will be announced to the villages with written posters.
- Complaints or concerns of the local people will be proactively responded to in order to prevent the food production process from being disrupted, with regular consultation meetings during the months when agricultural activities are busy, and relevant units and project employees will be informed on this issue.
- The Grievance Mechanism which has been already developed for the Project in the early phase of the Project will be strengthened and will be put in operation along the entire line and in the entire Project area, all complaints will be recorded and resolved in accordance with the GM procedure.

5.14 Impact Significance and Residual Impacts

Impact Significance and Residual Impacts are summarized via Table 128.

Table 128. Impact Significance and Residual Impacts

Potential impact	Phase	Intense of the Impact	Receiver sensitivity	Impact duration	Area of influence	Impact value		Effectiveness of mitigation measures	Magnitude of residual effect	
Population Change	Construction Phase	2	4	3	2	11	Medium	5	2,8	Negligible
	Operation Phase	0	0	0	0	0	None	3	0,0	None
Impacts on Infrastructure	Construction Phase	3	3	3	1	10	Low	5	2	Negligible
	Operation Phase	0	0	0	0	0	None	3	0,0	None
Economy and Employment	Construction Phase	4	4	4	3	15	High	3	5,0	Low
	Operation Phase	0	0	0	0	0	None	3	0,0	None
Impacts on increase in traffic and accidents	Construction Phase	5	4	4	3	16	Very high	3	5,3	Low
	Operation Phase	0	0	0	0	0	None	3	0,0	None
Access to Project Site and Safety	Construction Phase	3	3	3	1	10	Low	5	2	Negligible
	Operation Phase	0	0	0	0	0	None	3	0,0	None
Impacts on Livelihoods in the Project AoI	Construction Phase	4	4	4	3	15	High	3	5,0	Low
	Operation Phase	0	0	0	0	0	None	0	0,0	None

5.15 Occupational Health and Safety

5.15.1 Project Standards

The national legislation and international standards that will be considered for the impacts/risks related with OHS issues during the project activities and will be complied are as follows:

- Regulation on Occupational Health and Safety Risk Assessment
- Regulation on Occupational Health and Safety Services
- Regulation on Duties, Authority, Responsibilities and Trainings of Occupational Health and Safety Specialists
- Regulation on Procedures and Principles of Occupational Health and Safety Training of Employees
- Regulation on the Occupational Health and Safety Committees
- Regulation on the Health and Safety Measures to be taken in Workplace Buildings and Additions
- Regulation on Protection of Buildings from Fire
- Regulation on the Emergency Cases in Workplaces
- First Aid Regulation
- Regulation on Protection of Workers from Dangers of Explosive Environments
- Communique on Hazard Classes List related to Occupational Health and Safety
- Regulation Concerning the Protection of Workers from Risks Associated with Noise
- Regulation Concerning the Protection of Workers from Risks Associated with Vibration
- Regulation on Health and Safety Conditions in the Use of Work Equipment
- Regulation on Occupational Health and Safety on Construction Works
- Regulation on Health and Safety Regarding Temporary and Time Limited Works
- Regulation on Health and Safety Precautions Regarding Working with Chemicals
- Regulation on Health and Safety Signs
- Regulation on Dust Management
- Regulation on Safety Information Forms Regarding Hazardous Materials and Mixtures
- Regulation on Personal Protection Equipment
- Regulation on Usage of Personal Protective Equipment in Workplaces
- Regulation on Vocational Training of the Employees Working in Dangerous and Highly Dangerous Workplaces
- Regulation on the Provisions of Occupational Health and Safety Training of Employees
- Regulation on Transportation of Explosives via Highways
- WBG General EHS Guidelines for Construction and Decommissioning
- WBG General EHS Guidelines for Railways

5.15.2 Impact Assessment

Two main indicators of working life are occupational accidents and occupational diseases. Work accident rates have declined significantly over the past 40 years in Türkiye. But the work accident rate is still high in Türkiye. According to the Occupational Health and Safety Profile Report (2016)[66], the distribution of worker deaths in 2014 by field of activity is as follows:

- Production, manufacturing, processing, storage: 105,538
- Excavation, construction, repair, demolition: 19,177
- Movement, sports, artistic activity: 6.672
- Service provided to the business and/or the public; intellectual activity: 4,592
- Agriculture, forestry, gardening, fish farming, working with live animals: 1,300

66 International Labour Organization. (2016). Occupational Health and Safety Profile Turkey. https://www.ilo.org/sites/default/files/wcmsp5/groups/public/@europe/@ro-geneva/@ilo-ankara/documents/publication/wcms_498829.pdf

- No information: 8.477
- Other: 71,248

Occupational health and safety risks that may occur in the land preparation and construction works (including clearing and leveling of the site, earthworks, laying ballast, installation of railroad ties and rail tracks, construction of civil structures and installation of electrical systems as well as activities in associated and auxiliary facilities such as construction site and quarry/borrow site) include:

- Physical hazards such as falls, struct-by incidents, crush injuries, trenching and excavation hazards.
- Chemical and biological hazards arise from handling chemicals and hazardous materials.
- Electrical hazards due to use of power tools, machinery and electrical systems.
- Mechanical hazards during the use of heavy machinery, hand and power tools.
- Exposure to dust, noise and vibration

On the other hand, railway operations present various occupational health and safety risks to workers involved. These include:

- Physical hazards such as slips, trips and falls.
- Chemical and biological hazards arise from handling chemicals and hazardous materials.
- Electrical hazards during the operation and maintenance of electrical equipment and systems.
- Mechanical hazards due to mechanical failures in trains or railway equipment.
- Transportation hazards resulting from collision, derailments and accidents with vehicles.

Issues requiring occupational health and safety measures and training are:

<u>For the construction phase</u>

- Exposure to chemicals
- Welding hazards (Aluminum Termite welding fume emissions, burns and radiation)
- Excavation work, earthwork hazards
- Vibration of heavy construction equipment
- Dust
- Noise
- Traffic accidents
- Lifting heavy materials
- Construction iron accidents
- Ergonomic hazards during construction
- Environmental hazards (insects, wasps etc.)
- Power cuts and arc failure burns
- Electric works
- Burn

<u>For the operation phase</u>

- Train operation and safety
- Track and infrastructure maintenance
- Electrical safety
- Manual handling and ergonomics
- Emergency Preparedness and Response
- Hazardous materials handling
- PPE usage
- Security

5.15.3 Impact Significance, Mitigation Measures, and Residual Impacts

Regarding the management of occupational health and safety related risks, an Occupational Health and Safety (OHS) Management Plan was developed as part of the ESMP and the following mitigation measures were determined;

- A site specific OHS risk assessment and management plan will be developed.
- OHS Management Plan will be implemented.
- Risk assessment study within the scope of every activity to be conducted for the project will be conducted before commencing the works.
- Employees will be aware of any possible OHS risks and will be trained against them properly.
- Contractor must ensure immediate response to and timely reporting, analysis and communication of all incidents to DGII.
- All incidents shall be recorded in the approved incident reporting system and be analyzed to a level commensurate with the actual consequence or potential risk rating, whichever is higher.
- Contractor is committed to return workers to meaningful and productive employment at the earliest possible time.
- Contractor employees will undergo a medical assessment to ensure they are medically fit to perform their role before commencing the works and these controls will be repeated annually.
- Contractor must ensure that health assessments are carried out in respect of all personnel who engage in specific tasks with the potential for occupational exposure.
- Contractor recognizes that fatigue may arise from hours and patterns of work and activities, and travel/commute time.
- Contractor acknowledges the risk associated with project area operations and provides for the reporting and rectification of hazards.
- Where personnel are required to work alone, the activities and conditions shall be risk assessed and a safe system of work developed.
- Where a manual handling task is required a risk assessment shall be completed to identify the hazards. The risk of injury should be assessed for each hazard, and appropriate controls implemented, including manual handling training as appropriate.
- Contractor must supply suitable facilities for personnel.
- Contractor must ensure commitment to monitoring and reporting of occupational health hazards and hazardous occupational environments and implement controls to reduce risk in accordance with all applicable regulations and, wherever practicable, with regard to accepted best practices.
- Contractor must ensure the safe control of hazardous substances and reduce the level of exposure to personnel, property and the environment in accordance with the ESIA Requirements
- Contractor must ensure that all personnel and visitors wear or use personal protective equipment provided if it is necessary to protect them from harm.
- Contractor must ensure that sufficient safety signs are posted in workplaces and travel ways to prevent incidents, identify hazards.
- Contractor must ensure that all personnel undertaking activities where there is a risk of a person falling from one level to another do so in a controlled manner to reduce the risk of personal injury.
- Task specific hazard identification will be done for each activity.
- Access to the project area will be restricted by the Contractor and necessary precautions will be taken such as fencing the area and placing relevant signs etc.
- Site inductions will be carried out by the contractor.
- Inspections of the project site should be carried out weekly. Contractor will undertake weekly inspections of the whole work site.

- Contractor is obliged to provide adequate personal protective equipment free of charge to workers, including community workers (if any).
- Workers' GM will be implemented to resolve any complaints related to OHS issues.

During the operation phase, to prevent any type of incident, significant occupational health and safety measures have to be taken, such as;

- A site specific OHS risk assessment and management plan will be developed.
- OHS Management Plan will be implemented.
- Major railway failures that can lead accidents such as broken wheel or axle and broken rail or track buckle will be controlled via control train and OHS personnel of TCDD monthly.
- Suitability of the signalization system will be controlled in a daily manner.
- No personnel will be working without having necessary trainings.
- Level crossings will be controlled daily.
- Operation will be stopped immediately if any factor that may lead accidents is reported.

More detailed information takes part in the OHS Management Plan (CNR-AND-OHSMP-002) prepared within the scope of the project.

5.16 Community Health and Safety

5.16.1 Methodology and Project Standards

5.16.1.1 Methodology

The Project's potential impacts on the community health and safety have been assessed in consideration of the settlements located near the project route.

Main data sources and guidance used to compile the baseline information, conduct impact assessment and develop related mitigation measures are listed below:

- WB ESS 4 Community Health and Safety
- WBG General EHS Guidelines for Construction and Decommissioning (April 30, 2007),
- WBG EHS Guidelines for Railways (April 30, 2007),
- Turkish Statistical Institute (TÜİK) website and related statistics (www.tuik.gov.tr)
- TCDD General Directorate statistics,
- General Directorate of Highways (KGM) website and related statistics and maps(www.kgm.gov.tr)
- General Directorate of Security Affairs Department of Traffic Services (trafik.gov.tr)

Assessment of potential community health and safety risks and impacts of the Project has been done in consideration of the existing local conditions, measures that will be inherently taken in accordance with the requirement of the national legislation, and benefit from the expert knowledge and experience of typical sectoral risks associated with the construction. International standards and guidelines have also been taken into consideration to develop additional measures for the management of community health and safety aspects. The assessment has been based on professional expert judgment that relies on a qualitative approach.

In accordance with the ESS 4, the following general aspects have been covered in the scope of the assessment:

- Infrastructure and Equipment Design and Safety
- Traffic and Road Safety
- Community Exposure to Health Problems,
- Hazardous Materials Management and Safety
- Emergency Preparedness and Response
- Security Personnel

In the assessment of impact significance, magnitude factors have been determined based on expert judgement. For the assessments related to community health and safety, the receptor sensitivity level has always been assumed as high when the safety of local communities is of concern. Sensitivity level has been assumed as moderate for other types impacts such as infrastructure, local healthcare capacity, etc.

5.16.1.2 Project Standards

Besides the applicable requirements of the national legislation relevant to the health and safety of the local communities, the main applicable international standard for the Project's potential community health and safety impacts is ESS4 – Community Health and Safety which recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts.

Other related legislation and standards applicable to community health and safety such as legislation on the management of water resources, air quality, noise, etc. are listed in Chapter 2 of this ESIA and detailed in relevant chapters.

5.16.2 Impact Assessment

5.16.2.1 Land Preparation and Construction Phase

As stated in the WBG EHS Guidelines for Railways, community health and safety impacts that may occur during railway construction, rehabilitation and maintenance phases are common with impacts that may occur in construction projects of major infrastructures and large industrial facilities. These impacts include, inter alia, dust, noise and vibration from construction machinery and equipment, and infectious diseases that may be caused by personnel temporarily employed during land preparation and construction. The impacts mentioned here are also specified in the WBG General EHS Guidelines for Construction and Decommissioning, listed below:

- General Site Hazards,
- Disease Prevention,
- Traffic Safety

These impacts are explained in more detail in ESS4: Community Health and Safety and are given below.

Hazardous Material Management and Safety

Major hazardous substances foreseen to be used in the land preparation and construction phases of the project are railway oils, powdered silica, fuels, solvents, paints and packaging containing residues of or contaminated by hazardous substances together with absorbents, cleaning cloths, protective clothing contaminated with hazardous substances.

Emergency Preparedness and Response

Potential emergencies that may occur during the land preparation and construction phases of the project include site-specific risks from natural hazards such as floods, earthquakes and landslides. Emergency situations such as this should be handled appropriately and in a timely manner, taking into account the elements specified in the Emergency Preparedness and Response Plan.

In addition, earthquake risk, landslide risk and potential structural stability risks are evaluated in Chapter 5.1.

Community Exposure to Health Problems

In case of employing local workers during the land preparation and construction phases of the project, infectious and vector-borne diseases will pose a low risk, especially for communities living in settlements around the main camp site. Therefore, an additional burden on local health

facilities is not expected. Yet, in the event of any communicable disease outbreaks, the related risks will be reassessed and the necessary mitigation measures will be redefined accordingly.

It is considered that most or all of the personnel will be provided from the local and regional workforce in order to provide the highest level of benefit to the local community during the land preparation and construction phases of the project. This may cause diseases to be observed in the Project area to spread to local communities through the local workforce.

However, this risk will exist during the temporary construction period, and the impact is considered significant if no action is taken. It is anticipated that this impact will not be significant, as measures such as general hygiene training, regular medical checks, and necessary vaccination activities, waste and wastewater management practices to be provided by DGII for free, as required.

The project will have a minimal impact on local health services, as workers will be provided with regular medical checks, health services and construction camp sites in accordance with international standards.

Traffic and Road Safety

The Project will involve a number of construction vehicles and equipment in the land preparation and construction phase. Even though the activities will be mainly conducted within Project's construction corridor, off-site traffic load is expected particularly from the transportation of construction materials from the quarries/borrow pits and local suppliers. Interchanges, underpass or overpass structures will need to be constructed to avoid any permanent traffic interruption and to prevent risks on the community health and safety. In this respect, the following situations/activities, which may result in increased traffic accident risk for the temporary construction period, will require well planned and strictly implemented traffic management practices:

- Heavy machinery conducting earthworks and construction activities along the Project's construction corridor in the vicinity of settlements.
- Personnel transport vehicles transporting workers from construction camp sites to related Project construction sites.
- Material transport vehicles transporting required materials from the quarries and borrow pits and other industrial areas (e.g. supply of concrete, steel).
- Vehicles transporting the waste generated at construction sites (i.e. excavated materials, recyclable waste, etc.) to the related reuse/disposal sites

Pedestrians and bicyclists are at greatest risk of serious injury from collisions with moving vehicles. In addition, children are regarded as the most vulnerable group in terms of pedestrian safety together with elder people, cyclists and motorcyclists. Accordingly, children, older people, cyclists, motorcyclists and all pedestrians, who live in the settlements located close to the Project's construction corridor, camp, quarry and borrow pits, access roads, underpasses and overpasses that will be constructed, would be the most vulnerable persons to Project's risks associated with construction traffic. Avoiding the passage of construction traffic through the settlements, training of the truck drivers and operators of construction machinery/equipment would be required to prevent/minimize construction traffic-related risks and impacts on local communities and users of the existing roads.

Since the construction activities are predicted to increase the traffic in the project area, a Traffic Management Plan will be prepared and implemented. This plan should respond to concerns about the safety of life and property of residents and their children and concerns about the safety of animals.

Security Personnel

Relations of the Project security personnel and the local communities present risks in terms of social conduct and conflict since the security personnel have a certain degree of authority,

which may be misinterpreted in case related personnel is not trained in terms of use of force and communications with the public. Therefore, it is necessary to ensure that the security personnel to be employed are screened that they have not been involved in past abuses and are trained in terms of applicable law, code of conduct, gender sensitivity and cultural sensitivities of the region in accordance with the ESS4. The risk is considered to be temporary to land preparation and construction phase.

When security personnel are used, the Borrower will be guided by the principles of proportionality and Good International Industry Practice, and by applicable law (in accordance with the Law No. 5188 On Private Security Services, Regulation On the Implementation Of The Law On Private Security Services, ESS2 and relevant ILO conventions), in relation to hiring, rules of conduct, training, equipping, and monitoring of such security workers.

5.16.2.2 Operation Phase

As stated in the WBG EHS Guidelines for Railways, the public health and safety impacts that can be seen during the operating phase of railways are as follows:

- General railway operational security,
- Transport of dangerous goods,
- Level crossing security,
- Pedestrian safety.

During the operational phase, the most important danger that may result in serious injury or death in railway operations is seen as the train colliding on the railway, colliding with vehicles on the road or derailing. One of the risks arising from the railway operation is the transportation of dangerous substances. The leakage of these substances during the transportation of dangerous goods poses a risk around the railway line. In addition, level crossings are areas at high risk on railways. This risk can be eliminated if the road traffic can be stopped temporarily during the train passage. Among other things, issues such as intrusion in railway facilities, power lines and equipment can also pose risks.

Emergency Preparedness and Response

Among the emergencies that may occur during the operation phase are the ones that may occur at the stations or emergencies that may occur on the railway route and result in accidents. Therefore, specific measures and management procedures for such events need to be developed within the operational phase Emergency Preparedness and Response Plan.

Emergency Preparedness

Preparedness involves actions designed to save lives and minimize damage. It is planning and training prior to a rail disaster for appropriate response when an emergency occurs.

Emergency Response

Emergency response begins as soon as a rail emergency is identified or reported. When it is notified of a rail emergency, they will immediately make notifications per TCDD protocols.

Moreover, it should be remembered that emergency response for railway accidents may require a comprehensive approach in which many institutions should take part.

It is known that railway accidents mainly include[67]:

- Collisions of trains
- Derailments of trains
- Level-crossing accidents
- Accidents to persons
- Fires in rolling stock

[67] European Railway Agency, 2014, Railway Safety Performance in The European Union

- Other accidents

These accidents can affect people, nonetheless, it is known that major fatalities are in question for unauthorized persons (see Figure 92).

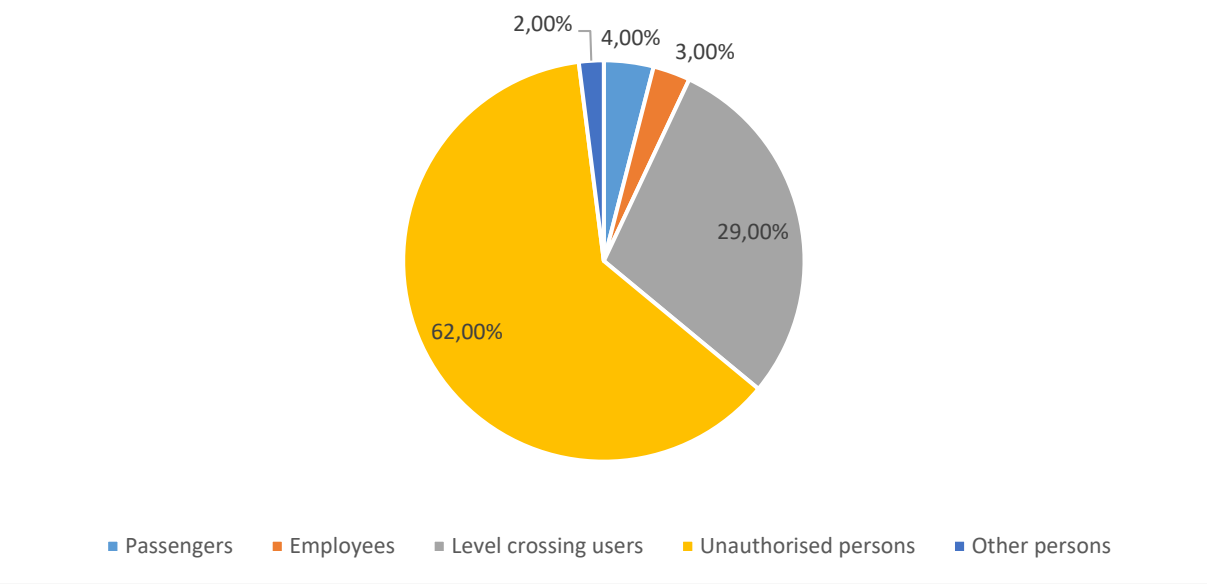


Figure 92. Relative share of fatalities per victim category among all fatalities (2010–2012)

Source: European Railway Agency, 2014, *Railway Safety Performance in The European Union*

The above figure shows that, majority of the fatalities occur due to having unauthorized people on railway and poor level crossing management. Therefore, monitoring the project route possesses a great importance.

Furthermore, a series of steps needs to be followed if a railway emergency is faced:

- The first responder on scene makes a preliminary assessment and notifies relevant authorities (Fire Department, police etc.) with all information available.
- The first arriving Fire Officer becomes the Incident Commander and will command and direct all emergency response actions until relieved by the senior official having legal or assigned responsibility
- The Incident Commander assesses the need for additional resources.
- In conjunction with the Incident Commander, law enforcement will set up security and establishes access and traffic control.
- The TCDD Branch Director shall appoint supervisors to emergency response divisions/groups.
- The Incident Commander will instruct emergency response personnel to not move property and debris associated with the wreckage unless there is imminent danger of items being destroyed, or unless they inhibit access to passenger rescue.
- The health service officers are responsible for the identification, movement and/or removal of the dead.
- In the event a body has been moved prior to the health service officers' approval, personnel moving the body shall make careful note of the location and condition of the body.
- Ministry of Interior Disaster and Emergency Management (AFAD), Police Department, Fire brigade, TCDD, and other officials shall contact the Mayor. The TCDD will be in constant communication with the Command Post.

5.16.3 Impact Significance, Mitigation Measures, and Residual Impacts

In the WBG General EHS Guidelines for Construction and Decommissioning, the above-mentioned effects and strategies for reducing these impacts can be listed as follows:

- General Site Hazards;
    - Restricting access to the site with institutional and administrative controls, in areas with high-risk structures, through fences, signs and explanations to local communities, taking into account the conditions in the site.
    - In areas where it is not possible to prevent entrance to the site, measures such as closing small gaps, keeping dangerous goods in locked warehouses and eliminating dangerous conditions,
- Disease Prevention (Community Exposure to Health Problems);
    - Prevention of disease risk by means of providing health awareness training, promoting individual protection, conducting vaccination programs to reduce the risk of infection in local communities, and providing other health services,
    - Providing treatment in the field or local health facilities, providing access to medical services for all employees,
    - To develop cooperation with local institutions in order to ensure the access of workers, their families and the society to health services,
- Traffic and Road Safety;
    - Providing periodic maintenance and safety of the vehicles used,
    - To prevent pedestrians from coming into contact with construction vehicles,
    - Cooperation with local institutions to ensure traffic signs, visibility and general safety of roads,
    - To provide coordination with emergency response teams in order to provide appropriate first aid in case of accident,
    - Reducing the transportation distance by meeting the materials used with local production as much as possible,
    - To prevent construction traffic from passing through settlements as much as possible,
    - Preparation and implementation of Stakeholder Engagement Plan.

In addition, for the land preparation and construction phases of the project, the contractor and related subcontractors, who will carry out the construction activities, floods, storms and hoses, sabotage, accidents, work accidents, spills and leaks, machinery and equipment failures, gas leakage and explosions, collapse of structures. An Emergency Preparedness and Response Plan has been prepared to cover first aid, evacuation and emergency contacts. In addition, during the operational phase of the project, TCDD will continue to operate the emergency procedures it is currently carrying out. The Emergency Preparedness and Response Plan prepared and to be executed will include the following elements:

- Administration (policy, purpose, distribution, definitions, etc.)
- Organization of emergency areas (command centers, medical stations, etc.)
- Roles and responsibilities
- Communication systems
- Emergency response procedures
- Emergency resources
- Training and updating
- Checklists (role and action list and equipment checklist)
- Business continuity and contingency

The Emergency Preparedness and Response Plan covers both on-site and off-site measures. Besides, the notification and communication systems to be established for workers, the Project Owner will also develop measures/systems for collaboration with the local communities and other external parties including local governmental agencies, media, etc. where necessary.

The following actions are also covered as part of the Emergency Preparedness and Response Plan to be implemented:

- Local communities will be notified by using appropriate tools (e.g. telephone call lists, vehicle mounted speakers) in case of emergencies arising from the Project work/construction sites may pose risk on them.
- Cooperation will be provided with related authorities both for prevention of emergencies and during emergency situations, where necessary

As a result of the effective implementation of the main elements mentioned above and the mitigation measures mentioned below, the risks to the community health and safety of the project will be minimized.

As stated in the WBG EHS Guidelines for Railways, the recommended risk management activities for risks identified for railways during operation phase are as follows:

- General Railway Operation Safety;
    - Implementing railway operational safety procedures, such as a Positive Train Control (PTC) system, aimed at reducing the likelihood of train collisions,
    - If the PTC system is not considered practical, automatic rail trusses are found, in places where manual trusses are available, when the train passes from the main line to the side road in the absence of signaling, and when it returns to its normal position on the main line, reporting and transmitting this information to all employees and train officers on the train,
    - To regularly inspect and maintain railway lines and facilities in order to operate in accordance with national and international railway line safety and standards,
    - Implementing a general safety management program equivalent to internationally recognized railway safety programs,
- Transport of Dangerous Goods;
    - A suitable system must be established for the proper separation, acceptance and transportation of dangerous substances. As these materials can be provided by third parties, the separation and acceptance process must comply with international standards applicable to packaging, marking and labeling of containers, as well as certificates and notices from the shipper.
    - The use of cistern wagons and other wagons meeting the national and international standards (eg thermal protection and puncture strength) suitable for the cargo carried and the preventive maintenance program should be implemented.
    - Spill / Leak Prevention and Control Plan and Emergency Preparedness and Response Plan should be prepared based on the analysis of hazards, including the nature, consequence and probability of accidents. Based on the result of the hazard analysis, measures and control methods, including the following, should be applied.
        - Managing and timing dangerous goods transport to minimize risk to society (for example, restricting the transport of dangerous goods on some roads),
        - Limiting train speed in developed areas of the city,

- Establishment of protective barriers and other technical measures in sensitive areas (eg water resources and settlements),
- Transfer of emergency preparedness and response information to potentially affected communities (eg emergency notification systems and evacuation procedures)
- To provide security awareness training, to prevent unauthorized access and to reduce risks during storage and transportation in order to implement the Hazardous Material Safety Plan and ensure personnel safety.

- Level Crossing Safety
  - Using bridges or tunnels instead of level crossings (removing gates can also improve train performance because most gates have low speed limits to minimize the risk of road traffic.)
  - Regular inspection / maintenance to ensure automatic doors installation and proper operation in all level crossings,
- Pedestrian Safety;
  - Putting clear warning signs at the entry points (eg stations and level crossings),
  - Installation of fences or other barriers at the ends of the station and other areas and preventing unauthorized access to the rails,
  - Providing trainings about not entering the area without permission, especially for local youth,
  - Providing regular information on road safety/ traffic and awareness raising activities to local communities especially schools, neighboring villagers including women before construction,
  - Ensuring that the specified route is safe, clearly determined and easy to use,
  - Establishment of closed-circuit security cameras and monitoring systems (CCTV) to monitor railway stations, and an emergency announcement system to prevent violations in other areas where intruders are frequent.

The mitigation measures and the assessments regarding community health and safety are presented in detail in Table 129. Additionally, throughout the lifecycle of the project, complaints, opinions, feedbacks and suggestions from community will be recorded via GM, which should be publicized, and guarantees should be given that complaints received will be resolved to the maximum extent possible.

Table 129. Community Health and Safety Related Impacts, Mitigation Measures to be Taken and Residual Impacts

Impact Description	Project Phase	Receptor	Impact Magnitude					Sensitivity/ Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Reversibility	Duration	Frequency	Overall Magnitude				
Risk on traffic and pedestrian safety due to construction traffic	Land Preparation and Construction	Local communities, Users of existing roads	Restricted	Short-term reversible or irreversible (depending on the consequence of impact, such as accident-related injuries or deaths)	Short-term	Intermittent	High	High	Major	▪ Implement the Traffic Management Plan, ▪ Implement the Stakeholder Engagement Plan, ▪ Investigate all construction areas and construction access routes for potential community interaction (with a particular attention to schools, children parks, etc.) with Project construction phase traffic. Based on results, develop and implement site specific measures (i.e. improve signage, visibility) and driver/operator trainings prior to initiation of any construction work, ▪ Implement access restriction at construction areas and access routes, by specifying restricted zones, (i.e. dangerous routes), fencing, barriers, etc, ▪ Install signs, signals, markings and other appropriate traffic regulation devices, including reflective and flashing signage for nighttime traffic safety, at all required sites, ▪ Avoid passage of construction traffic through the settlements, whenever alternative roads are present, ▪ Where passage through existing settlements is unavoidable, take all necessary measures (i.e. speed limits, traffic signs, driver trainings) to prevent safety risks on local communities, engage with community representatives to plan the traffic by taking the daily life of the communities into account (i.e. selection of routes, school transportation hours, market days, etc.) and inform the communities about the construction schedule, activities to be conducted and safety measures taken, through appropriate means such as meetings and leaflets, notices, signs, etc, ▪ Allow only drivers/operators with valid licenses specific to each construction phase vehicle to drive/operate vehicles, ▪ Provide driving skills improvement trainings in consideration of the requirements of specific vehicles, machinery, etc, ▪ Implement speed limits at all construction sites, ▪ Conduct periodic medical checks for drivers/operators, ▪ Conduct periodic vehicle maintenance, ▪ Initiate construction only after relevant permits are obtained and all required measures such as signage, barriers, fencing, lighting, etc. are taken, ▪ Prioritize selection of material borrow sites and quarries in the areas that does not interact with public, ▪ Use only licensed firms for explosives delivery to ensure safety along the existing roads to be used for transport of explosives. ▪ Provide information and awareness raising activities with stakeholders, communities including women, children and also disabled.	Minor
		Communities Along the Routes Vehicles Along the Routes	Wide	Short-term reversible or irreversible (depending on the consequence of impact, such as accident-related injuries or deaths)	Short term	Intermittent	Medium	High	Moderate		Minor
Emergency Preparedness and Response	Land preparation and construction	Local Communities Project employees	Local	Short-term reversible or irreversible (depending on the consequence of impact, such as accident-related injuries or deaths)	Short-term	One-off	Negligible to High (depending on the type of incident, number of people affected)	High	Major	▪ Develop and implement a project-specific Emergency Preparedness and Response Plan for the construction phase covering the risks on local communities, ▪ Develop measures/systems for collaboration with the local communities and other external parties including local governmental agencies, media, etc. where necessary, ▪ Notify local communities by using appropriate tools (e.g. telephone call lists, vehicle mounted speakers) in case of emergencies arising from the Project work/construction sites may pose risk on them, ▪ Where necessary, communicate the details of the nature of the emergency, protection options, etc. through trained community liaison officer(s), ▪ The Project Company will cooperate with related authorities both for prevention of emergencies and during emergency situations, where necessary, ▪ Communicate to the media through qualified, trained persons and/or by using appropriate tools (i.e. press releases), where necessary.	Minor
	Operation	Local Communities Users of Railway and Connection	Restricted	Short-term reversible or irreversible (depending on the consequence of impact, such as accident-related injuries or deaths)	Medium-term	One-off/rare	High	High	Major	▪ Implementing a site-specific Emergency Preparedness and Response Plan, ▪ Controlling the project route for unauthorized people, ▪ Cooperation with related authorities (for emergency prevention and during emergencies), ▪ Emergency response begins as soon a rail emergency is identified or reported. When it is notified of a rail emergency, they will immediately make notifications per TCDD protocols. If a railway emergency occurs: ▪ The first responder on scene makes a preliminary assessment and notifies relevant authorities (Fire Department, police etc.) with all information available. ▪ The first arriving Fire Officer becomes the Incident Commander and will command and direct all emergency response actions until relieved by the senior official having legal or assigned responsibility.	Minor

Impact Description	Project Phase	Receptor	Impact Magnitude					Sensitivity/ Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Reversibility	Duration	Frequency	Overall Magnitude				
										▪ The Incident Commander assesses the need for additional resources. ▪ Together with the Incident Commander, law enforcement will set up security and establishes access and traffic control. ▪ The TCDD Branch Director shall appoint supervisors to emergency response Divisions/Groups. ▪ The Incident Commander will instruct emergency response personnel not to move property and debris associated with the wreckage unless there is imminent danger of items being destroyed, or unless they inhibit access to passenger rescue. ▪ The health service officers are responsible for the identification, movement and/or removal of the dead bodies. ▪ In the event a body has been moved prior to the health service officers' approval, personnel moving the body shall make careful note of the location and condition of the body. ▪ The Ministry of Interior Disaster and Emergency Management (AFAD), Police Department, Fire brigade, TCDD, and other officials shall contact the Mayor. The TCDD will be in constant communication with the Command Post.	
Security Personnel	Land preparation and construction	Local Communities	Local	Short-term reversible	Short-term	Intermittent	Low	Medium	Minor	▪ Ensure that the security personnel to be employed are screened that they have not been involved in past abuses Train the security personnel in terms of applicable law, code of conduct, gender-based harassment and violence, cultural sensitivities of the region, stakeholder engagement procedure in accordance with the ESS4. ▪ Conduct legal inquiries during the hiring process of security personnel (or the company the security service is procured from) to check competency and existence of any former abuse incidents. ▪ In accordance with the ESS4, Security Personnel will be trained adequately (or determine that they are properly trained) in the use of force (and where applicable, firearms) and appropriate conduct toward workers and affected communities; and (iii) require them to act within the applicable law and any requirements. ▪ Provide trainings on code of conduct, gender sensitivities and local cultural sensitivities to security personnel or ensure that the company the security service is procured from provides its personnel with similar trainings. The trainings will ensure force is used only for preventive and defensive purposes and in proportion to the threat. ▪ Employment of armed security necessitates additional training provisions. ▪ Provide necessary identification, communications devices, and any other equipment required for the job to the security personnel to ensure maximum efficiency. The security personnel will not be allowed to carry firearms. ▪ Investigate any grievance from local communities regarding inappropriate conduct of security forces immediately. ▪ Ensure appropriate conduct of security personnel through document and incident report reviews, as well as review of grievances received. ▪ Ensure all measures are included in contractual agreements. ▪ When security personnel is used, the Borrower will be guided by the principles of proportionality and Good International Industry Practice, and by applicable law (in accordance with the Law No. 5188 On Private Security Services, Regulation On The Implementation Of The Law On Private Security Services, ESS2 and relevant ILO conventions), in relation to hiring, rules of conduct, training, equipping, and monitoring of such security workers. ▪	Negligible
Community exposure to health problems	Land preparation and construction	Local Communities Project employees	Wide	Short term Reversible or Irreversible (depending on the consequence of impact, such as accident-related injuries or deaths)	Short-term	Intermittent	Medium	Medium	Moderate	▪ Ensure compliance with Workers' accommodation: processes and standards for accommodation; including clean and safe areas that ensure the minimum space requirements, air-conditioning and ventilation that is appropriate for the existing climatic conditions to avoid spread of disease among the Project workforce, ▪ Provide trainings on healthcare and general hygiene cleanliness to all personnel, ▪ Conduct periodic medical checks for personnel, provide vaccination and/or develop other mitigating measures when required, ▪ Develop and implement appropriate waste and wastewater management plans, ▪ Implement health related awareness raising activities covering local communities.	Minor
General railway operation safety	Operation	Local Communities	Restricted	Short term Reversible or Irreversible (depending on the consequence of impact, such as	Medium-term	Intermittent	High	High	Major	▪ Implementing railway operational safety procedures, such as a Positive Train Control (PTC) system, aimed at reducing the likelihood of train collisions, ▪ If the PTC system is not considered practical, automatic rail trusses are found, in places where manual trusses are available, when the train passes from the main line to the side road in the absence of signaling, and when it returns to its normal position on the main line, reporting and transmitting this information to all employees and train officers on the train,	Minor

Impact Description	Project Phase	Receptor	Impact Magnitude					Sensitivity/ Value of Resource/ Receptor	Impact Significance (prior to mitigation or with existing mitigation)	Proposed Mitigation Measures	Residual Impact Significance
			Extent	Reversibility	Duration	Frequency	Overall Magnitude				
				accident-related injuries or deaths)						▪ To regularly inspect and maintain railway lines and facilities in order to operate in accordance with national and international railway line safety and standards, ▪ Implementing a general safety management program equivalent to internationally recognized railway safety programs.	
Level crossings safety	Operation	Local Communities	Restricted	Short term Reversible or Irreversible (depending on the consequence of impact, such as accident-related injuries or deaths)	Medium-term	Intermittent	High	High	Major	▪ Using bridges or tunnels instead of level crossings (removing gates can also improve train performance because most gates have low speed limits to minimize the risk of road traffic), ▪ Regular inspection / maintenance to ensure automatic doors installation and proper operation in all level crossings.	Minor
Pedestrian safety	Operation	Local Communities	Restricted	Short term Reversible or Irreversible (depending on the consequence of impact, such as accident-related injuries or deaths)	Medium-term	Intermittent	High	High	Major	▪ Putting clear and clear warning signs at the entry points (eg stations and level crossings), ▪ Installation of fences or other barriers at the ends of the station and other areas and preventing unauthorized access to the rails, ▪ Providing trainings about not entering the area without permission, especially for local youth, ▪ Providing regular information on road safety/ traffic and awareness raising activities to local communities especially schools, neighboring villagers including women before construction, ▪ Ensuring that the specified route is safe, clearly determined and easy to use, ▪ Establishment of closed-circuit security cameras and monitoring systems (CCTV) to monitor railway stations, and an emergency announcement system to prevent violations in other areas where intruders are frequent.	Minor

6 CUMULATIVE IMPACT ASSESSMENT

The previous chapters of this ESIA have included assessments on the potential impacts of the Project. As the Project is a major infrastructure project which is located in a region where other infrastructure projects are in operation, under construction or in evaluation/planning stages, potential cumulative environmental and social impacts of the Project on the Valued Environmental and Social Component (VESCs), together with other existing or future developments have been given particular importance and assessed in this Chapter.

6.1 Methodology and Project Standards

The Cumulative Environmental and Social Impact Assessment study to be conducted for the Project will follow the methodologies specified by relevant international guidelines. Being one of the most recent and comprehensive documents, the Good Practice Handbook on Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets (IFC, August 2013) is the primary document for the methodology to be applied in this chapter, while the following additional key documents will also be resorted:

- Cumulative Impacts Assessment and Management Guidance published by International Association for Impact Assessment (IAIA) (Canter L., and William R., 2009; http://www.iaia.org/);
- European Commission's (EC) Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions (May, 1999);
- Cumulative Impacts Assessment Practitioners Guide prepared by the Cumulative Impacts Assessment Working Group (Hegmann, G. C. Cockling, R. Creasey, S. Dupuis, Kennedy, L. Kingsley, W. Rodd, H. Spaling and D. Stalker; February and AXYS Environmental Consulting Ltd. for the Canadian Environmental Assessment Agency (1999).
- World Banks Sample Guidelines on Cumulative Environmental Impact Assessment for Hydropower Projects in Türkiye published under the Energy Sector Management Assistance Program (ESMAP, 2012).

IFC defines cumulative impacts as "those that result from the successive, incremental, and/or combined impacts of an action, project, or activity (collectively referred as "developments") when added to other existing, planned, and/or reasonably anticipated future ones. Multiple and successive environmental and social impacts from existing developments, combined with the potential incremental impacts resulting from proposed and/or anticipated future developments, may result in significant cumulative impacts that would not be expected in the case of a stand-alone development (IFC, August 2013) (Figure 93).

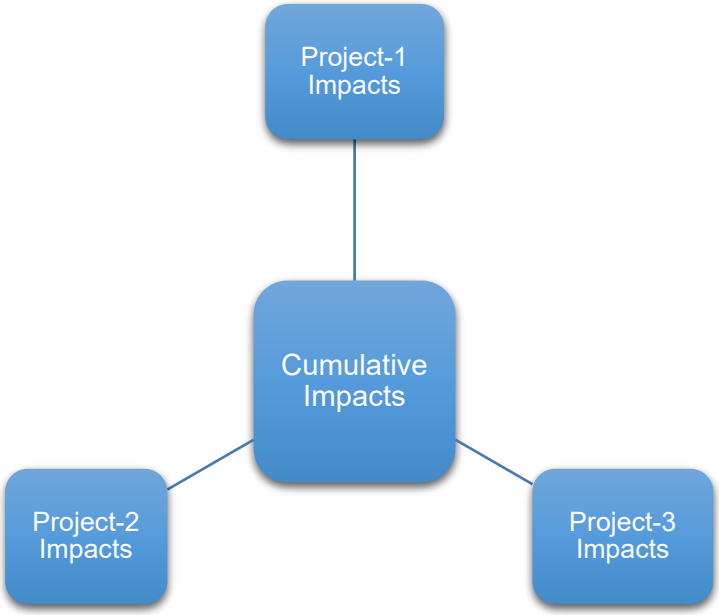


Figure 93. Illustration of Cumulative Impacts

The need for Cumulative Impact Assessment (CIA) emerges in circumstances where a series of developments, which may or may not be of the same type, is occurring, or being planned within an area where they would impact the same VESCs, which are defined as the environmental and social attributes that are considered to be important in assessing risks.

The CIA process to be implemented in case of such circumstances is defined by IFC (August 2013) as:

(i) analyzing the potential impacts and risks of proposed developments in the context of the potential impacts of other human activities and natural environmental and social drivers on the chosen VESCs over time, and

(ii) proposing concrete measures to avoid, reduce, or mitigate such cumulative impacts and risk to the extent possible. In light of the evolving global practice, IFC proposes a six-step approach for conducting Project-initiated CIA studies (IFC, August 2013).

This approach, which will be adopted in the CIA study to be conducted as a part of the Project ESIA studies, is illustrated below.

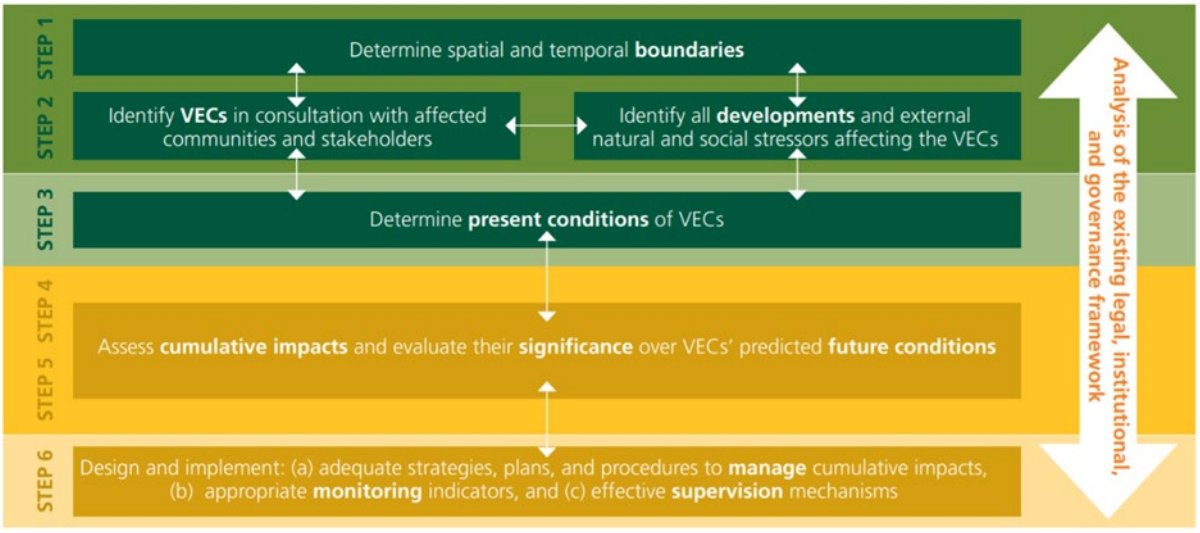


Figure 94. Six-Step CIA Approach

Source: IFC, August 2013

Steps to be followed in scope of the CIA study for the Project are listed below:

- Step 1: Scoping Phase I – VESCs, Spatial and Temporal Boundaries
- Step 2: Scoping Phase II – Other Activities and Environmental Drivers
- Step 3: Establish Information on Baseline Status of VESCs
- Step 4: Assess Cumulative Impacts on VESCs
- Step 5: Assess Significance of Predicted Cumulative Impacts
- Step 6: Management of Cumulative Impacts

6.2 Cumulative Impact Assessment

This chapter has been developed considering the studies and assessments carried out during Phase-1. Phase-2 findings will be added after the determination of draft final railway route and this chapter will be revised accordingly.

6.2.1 Step 1: Scoping Phase I – VESCs, Spatial and Temporal Boundaries

In the first step of the CIA study, initially VESCs will be identified in consideration of the environmental and social assessments performed in the above chapters of the ESIA Report. Afterwards, spatial boundaries and spatial boundaries of the assessment (as the CIA Study Area) will be established. Details of the Step 1 assessments are provided in the following chapter.

6.2.1.1 Valued Environmental and Social Components (VESCs)

The good CIA practice suggests that the CIA studies are conducted with a focus on the environmentally or socially important natural resources, ecosystems or human values, which are in this report referred to as Valued Environmental and Social Components (VESCs) and may include the following:

- Physical features,
- Social conditions, or
- Cultural aspects

This approach entails the CIA studies to be looked at “from the VESCs point of view”, instead of a Project centered perspective as this is the case in the ESIA studies and allows assessment of combined (i.e., cumulative) impacts of various projects/activities on each VESC.

In line with the good CIA perspectives as explained above, the CIA study for the Project will focus on the impacts on the selected VESCs that are to be affected by the Project activities. In other words, any VESC that would be affected by other projects/activities, but not the Project, will not be assessed in the scope of the CIA.

In consideration of the findings of the baseline and impact assessment studies conducted for the Project, valued environmental and social components to be considered in the CIA have been selected as presented in the table below.

Table 130. Selected VESCs for the Project within the CIA Study

Environmental/Social Subject	Valued Environmental/Social Components	Specific VESCs
Biodiversity and Natural Resources	Legally Protected Areas	- Osmaniye Zorkun Wildlife Development Area (11.2 km away) - Ciftmazi Nature Park (14.1 km away) - Yumurtalık Lagoon Nature Conservation Area, National Park, Ramsar Site (30.6 km away)
	Key Biodiversity Areas	- Burnaz Kumsalı (Dunes) KBA
	Species that meet Key Biodiversity Area criteria	- *Acanthodactylus schreiberi*
	Regional endemic and Critically Endangered (CR) species according to IUCN criteria	- *Echinops dumanii;* - *Astragalus antiochianus*
	Groundwater Resources	- Burnaz Spring Group Groundwater Reserve and Protection Area
Land Use	Agricultural Areas	- 1. Class Arable Lands
Air emissions and Noise	Air quality and noise levels in settlements along the route	- Yukarıburnaz - Aşağıburnaz - Sirincir - Turunçlu
Cultural Heritage	Registered Archaeological sites	- Issus Ancient City 1st Degree Archaeological Site - Issus Ancient Waterway - Existing Erzin Station
Social and Economic Environment	Land and assets	- Settlements having land and assets within the construction corridor
	Economy	- Agricultural activities - Industrial activities and employment - Tourism
	Welfare	- Access to healthcare, education, commercial facilities

6.2.1.2 Spatial and Temporal Boundaries

Cumulative impacts can occur (a) when there is “spatial crowding” as a result of overlapping impacts from various actions on the same VESC in a limited area, (e.g., increased noise levels in a community from industrial developments, existing roads, and a new highway; or landscape fragmentation caused by the installation of several transmission lines in the same area) or (b) when there is “temporal crowding” as impacts on a VESC from different actions occur in a shorter period of time than the VESC needs to recover (e.g., impaired health of a fish’s downstream migration when subjected to several cascading hydropower plants) (IFC, August 2013).

For the determination of spatial boundaries of the CIA study, an iterative process has been applied. In this scope, first, a larger region covering all major transportation projects were investigated covering a desk based review of relevant readily available and public data sources. As a result of the investigation, the cumulative impacts from existing Osmaniye OIZ, TAYSEB and Toprakkale - İskenderun Railway, Erzin OIZ, Ceyhan OIZ, Ceyhan Energy Specific OIZ and Erzin Port and Erzin-1 and Erzin-2 Solar Power Plants (SPP) which are in the planning phase, were assessed.

6.2.2 Step 2: Scoping Phase II – Other Activities and Environmental Drivers

Environmental drivers refer to natural drivers and other stressors, such as fires, droughts, floods, predator interactions, human migration, new settlements, etc. that may exert an influence on the VESCs. For example, the fire regime in forested areas is a major driver that shapes social, ecological and economic systems (IFC, August 2013).

Acquisition of lands on railway connection lines routes will be carried out mainly by DGII in accordance with the applicable national laws and regulations, and necessary measures will be taken to close the gaps between national legislation and World Bank ESS-5. Especially long-term impacts from land acquisition reveal transformative impacts on local economy and livelihoods. Basic changes that land preparation and construction activities will create with cumulative impacts are;

- Narrowing of the agricultural activities, increasing agricultural costs and searching for new livelihoods,
- The loss of lands where livestock activities are carried out, the increase of the feed costs of the livestock activities and searching for new livelihoods.

The decrease in land assets will lead to leaving from farming activity with cumulative impacts. It is the common idea of stakeholders that this divergence will be compensated by industrial development, where local economy, livelihoods and employment will be improved. On the other hand, some stakeholders who stated that they do not expect a negative impact on agricultural activities if the developing industry in the region is chimney-free and necessary stack gas treatment requirements are not neglected, emphasized that greenhouse activities are also developing in the region in line with the industry.

Based on the existing knowledge of the ecology and/or natural dynamics of the selected VESCs, no other major environmental driver that may contribute to cumulative impacts has been identified for this CIA study.

6.2.3 Step 3: Establish Information on Baseline Status of VESCs

Information on the baseline status of the VESCs will be mainly based on the information gathered for each environmental and social subject in scope of the ESIA study. Thus, relevant information on the baseline status for VESCs are presented in the related chapters of this ESIA Report.

6.2.4 Step 4: Assess Cumulative Impacts on VESCs

Assessment of potential cumulative impacts of the Çukurova sub-project together with other projects/activities/developments identified in the CIA Study Area on the selected VESCs has been based on a qualitative approach. The cumulative impact potential on the VESCs has been evaluated considering the projects affecting the VESC along with this Project.

In this regard, the cumulative impact potential on each VESC has been classified as none, low, medium or high depending on the criteria described in Table 131

Table 131. Criteria for Magnitude of Cumulative Impact Potential

Magnitude of Cumulative Impact Potential	Criteria
Negligible	The VEC is affected only by the Project
Low	The VEC is affected by this Project and 1 other project
Medium	The VEC is affected by this Project and 2 other projects
High	The VEC is affected by this Project and 3 or more projects

The potential impacts of the Project on the social and economic environment have been assessed above, and the negative and positive cumulative impacts on the VESCs are assessed in the table below. In the assessment below, the nationally protected areas are not included in the evaluation, as they are out of the study area. It is also assumed that the impacts of the nearby projects which are in operation phases on the environmental noise level and air quality already assessed during the baseline studies.

Table 132.Cumulative Impacts on VESCs

Environmental and Social Factor	VESCs	Specified VESCs	Çukurova Sub-Project	Existing Osmaniye OIZ	Existing TAYSEB	Existing Toprakkale - İskenderun Railway	Existing Erzin OIZ	Existing Ceyhan OIZ	Existing Ceyhan Energy Specific OIZ	Erzin Port In Planning	Erzin-1 & Erzin-2 SPP In Planning
Biodiversity and Natural Resources	Key Biodiversity Areas	Burnaz Kumsalı (Dunes) KBA	**Minor**								
	Species that meet Key Biodiversity Area criteria	*Acanthodactylus schreiberi*	**Minor**								
	Regional endemic and Critically Endangered (CR) species according to IUCN criteria	*Echinops dumanii; Astragalus antiochianus*	**Minor**								
	Groundwater Resources	Burnaz Spring Group Groundwater Reserve - 1st &2nd Degree Protection Area	**Moderate**								
		Burnaz Spring Group Groundwater Reserve - Strict Protection Area	**Negligible**								
Land Use	Agricultural Areas	1. Class Arable Lands	**Negligible**								
Air emissions	Air quality in settlements along the route	Turunçlu-2	**Negligible**								
		Yukarıburnaz	**Negligible**								
		Aşağıburnaz	**Negligible**								
		Sirincir	**Negligible**								
Noise	Noise levels in settlements along the route	Turunçlu-2	**Negligible**								
		Yukarıburnaz	**Negligible**								
		Aşağıburnaz	**Negligible**								
		Sirincir	**Negligible**								
Cultural Heritage	Registered Archaeological sites	Ancient City of Issus	**Negligible**								
		Issus Ancient Waterway	**Minor**								
		Historical Erzin Train Station Complex	**Negligible**								
Social and Economic Environment	Land and assets	Settlements having land and assets within the construction corridor	**Negligible**								
	Economy	Agricultural activities	**Negligible**								
		Livestock activities	**Negligible**								
		Industrial activities									
		Tourism	**Negligible**								
	Well fare	Access to healthcare, education, commercial facilities									

6.2.5 Step 5 and Step 6: Assess Significance of Predicted Cumulative Impacts and Manage Cumulative Impacts

The environmental impacts of a project on a specific receptor and/or resource may not be significant. However, when the individual impacts are considered in combination, the resulting cumulative impacts may be significant. At this point, the significance of cumulative impacts should be determined by the extent to which the impacts can be accommodated by the receptor and/or resource.

Significance of the assessed cumulative impacts are determined according to the significance levels presented below. In this regard, importance of the cumulative impact will be estimated in terms of the vulnerability and/or risk to the sustainability of the VESC assessed. Consequently, cumulative impact assessment will be directly related with the existing sensitivity/vulnerability conditions of the VESCs.[68]

Table 133.Criteria for the Determination of Significance of Cumulative Impacts

Significance	Impact
Severe	Impacts that the decision-maker must take into account as the receptor/resource is irretrievably compromised.
Major	Impacts that may become key decision–making issue.
Moderate	Impacts that are unlikely to become issues on whether the project design should be selected, but where future work may be needed to improve on current performance.
Minor	Impacts that are locally significant.
Insignificant	Impacts that are beyond the current forecasting ability or are within the ability of the resource to absorb such change.

In this regard, the importance of cumulative effects on VESCs are as follows;

Table 134. Significance of Cumulative Impacts on Identified VESCs

VESC	Significance	Description
Biodiversity and Natural Resources	Moderate	*Specified VESC: Burnaz Spring Group Groundwater Reserve - 1st & 2nd Degree Protection Area* It has been determined that the project routes intersect with the "Absolute, 1st and 2nd Degree Protection Areas" belonging to the "Burnaz Spring Group Groundwater Reserve and Protection Area" According to the provisions of "Announcement of Reserves and Protected Area", only the activities of borehole drilling for the purpose of providing drinking water, installation of energy transmission lines to provide power to these boreholes and the activities for the protection of drinking water resources are allowed in the Strict Protection Area. In addition, it is stated that construction of buildings, material extraction and the storage and disposal of solid or liquid waste and residues are not allowed in the 1st Degree Protection Area.
Land use	Negligible	-
Air emissions and noise	Negligible	-
Cultural Heritage	Minor	Minor impact is expected on Issus Ancient Waterway. The cumulative impact is negligible on Ancient City of Issus and Erzin Train Station Complex.

[68] UK Highways Agency 205/08: Design Manual for Roads and Bridges; http://www.standardsforhighways. co.uk /ha/standards/dmrb/

VESC	Significance	Description
Socio-economic environment	Negligible	-

It is important to highlight that, cumulative impacts typically result from actions of multiple stakeholders and the responsibilities for management of these potential impacts are versatile.

Project level mitigation measures are defined in Chapter 5 of this ESIA Report. Where project specific mitigation measures are not sufficient and prevention of an unacceptable cumulative impact by project mitigation alone is not possible, collaborative engagement in regional management strategies will be necessary (IFC, August 2013). IFC recommends the following specific actions that may be required to effectively manage cumulative impacts:

- Project design changes to avoid cumulative impacts (where possible, location, timing and technology)
- Project mitigation to minimize cumulative impacts, including adaptive management approaches to project mitigation.
- Mitigation of project impacts by other projects (not under control of the proponent to further minimize impacts on VESCs).
- Collaborative protection and enhancement in other regional cumulative impact management strategies.
- Collaborative engagement in other regional cumulative impact management strategies.
- Participation in regional monitoring programs to assess the realized cumulative impacts and efficacy of management efforts.

Overall management for the cumulative impacts will be the responsibility of DGII. DGII will make sure that project activities will be advancing with the knowledge of all the stakeholders defined during stakeholder management studies.

Authorities for each activity considered during this cumulative impact assessment will be informed by DGII periodically and WB will be informed about the interactions between these authorities.

7 PROJECT ALTERNATIVES

7.1 Route Selection and Optimization

A proceeding from the Conference on Railway Engineering (Melbourne 30th April – 3rd May 2006) titled “Route Selection Criteria for a New Railway” emphasizes that the railway alignment should have the maximum of straight track, minimum gradients and the largest circular curve radii possible, giving due consideration to the traffic, individual vehicle characteristics and operational requirements, providing for the most economical operation and the least amount of maintenance. The publication further indicates that alignment design is an iterative process rather than a straightforward application of basic criteria and must involve an intuitive understanding of the trains (Beale, 2006).

The proceeding also underlines that future modifications to the alignment are extremely difficult, so it is essential that all aspects have been considered before construction is commenced. The difficulty and cost of construction can be affected by the topography and geology along the route. The presence of existing man-made structures may affect the alignment of the route and the construction techniques employed. Specific factors that may affect constructability are:

- Extensive construction through rock, water crossings or any other crossing that requires bridging, narrow rights-of-way and steep slopes;
- The presence of overhead power cables and pylons, buried services such as gas, water, sewerage, power and telecommunications;
- The ability to stage works in a practical, safe, functional and economic way (Beale, 2006).

The conference proceeding further points out that the infrastructure design is closely linked to operational requirements, for example speeds through turnouts at junctions, the provision of emergency crossovers and reversible signalling on double track railways and the provision of passing loops on single track railways. In addition to the ability of the route to cater for the predicted demand, operations criteria should ensure future flexibility to accommodate further upgrading or provide for a change in the service pattern (Beale, 2006).

Furthermore, the traction system will be a significant input to route selection. Route selection will impact on power and braking requirements for the trains and consequently fuel consumption. Journey times, which is also an essential criterion in route planning will be affected by the following:

- Length of route;
- Linespeed (affected by gradients, curvature, signalling, connections to existing network and conflict with other rail traffic);
- Number of station stops (Beale, 2006).

In conclusion, the route selection criteria for a new railway should be developed to achieve the following objectives:

- Safety, reliability and comfort;
- Best practice engineering standards, principles and criteria;
- Compatibility and integration with existing land use and planned development;
- Promote sustainable development;
- Maximum ridership/revenue potential;
- Maximum connectivity and accessibility;
- Minimum journey time;
- Minimum capital, operating and maintenance costs;
- Minimum maintenance requirements;
- Minimum environmental impact;

- Minimum impacts on social, cultural and economic resources (Beale, 2006).

Within the scope of the Project, the following criteria have been taken into consideration in determining the project route:

- Geological formation and soil structure,
- Impacts on biodiversity,
- Environmental impacts,
- Location of the settlements,
- Land use types,
- Land acquisition requirement,
- Location of the water structures (dam, pond),
- Cut and fill balance,
- Location of the existing and planned highways,
- Wind erosion,
- Agricultural and irrigation fields,
- Areas under the jurisdiction of the state,
- Maintenance and operational difficulties,
- Construction costs,
- Proximity to the present load bearing areas,
- The fact that the planned line will end with the main line.

7.1.1 Route Revisions Regarding Environmental and Social Considerations

REZ Allocation Areas

There are two planned solar energy power plant projects; named as Erzin-1 SPP and Erzin-2 SPP, located in the Çukurova Project area. The areas shown in Figure 95 were allocated for "Solar-Based Renewable Energy Zones (REZ)" by the Ministry of Energy and Natural Resources (MoENR). Based on the REZ allocation areas stated in the letter of MoENR dated 18.08.2022 and numbered 137990, Erzin-TAYSEB connection line was shifted down as shown in Figure 96.

PHASE-1 ROUTE

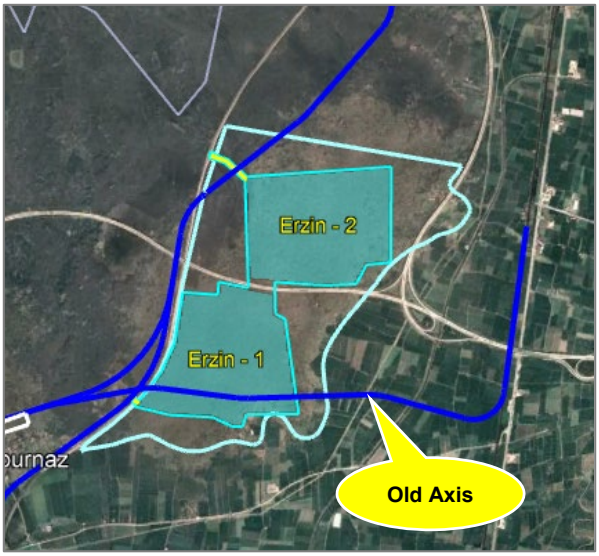


Figure 95. REZ Allocation Areas

PHASE-2 ROUTE

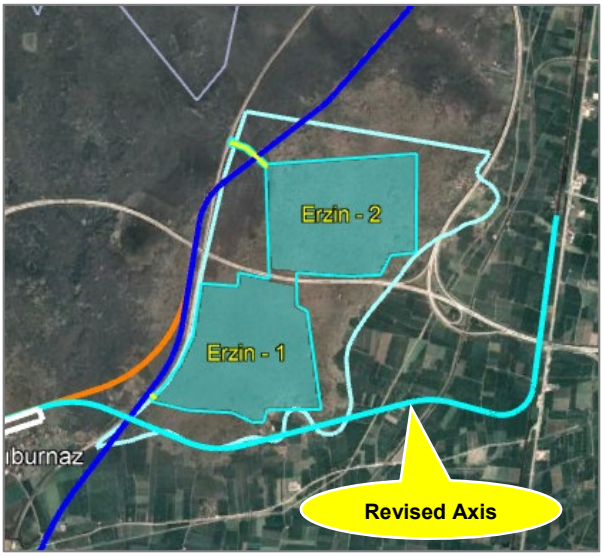


Figure 96. Route Revision in Solar Based Renewable Energy Zones

Burnaz Dunes and Critical Habitat Areas

As a result of the biodiversity studies conducted during Phase-1 and Phase-2 within the scope of the Project, it was identified that the OIZ - Port connection line and Erzin Port Station as part of the Project were planned to situated on the dune habitat. DGII was informed about the conservation priorities for Burnaz Dunes and *Acanthodactylus schreiberi*. In line with the mitigation hierarchy, the line was revised as demonstrated in Figure 97 so that the railway does not situated on the dune habitat and thus does not result in any Project-related direct impacts on the dune habitats and species populations they support.

PHASE-1 ROUTE **PHASE-2 ROUTE**

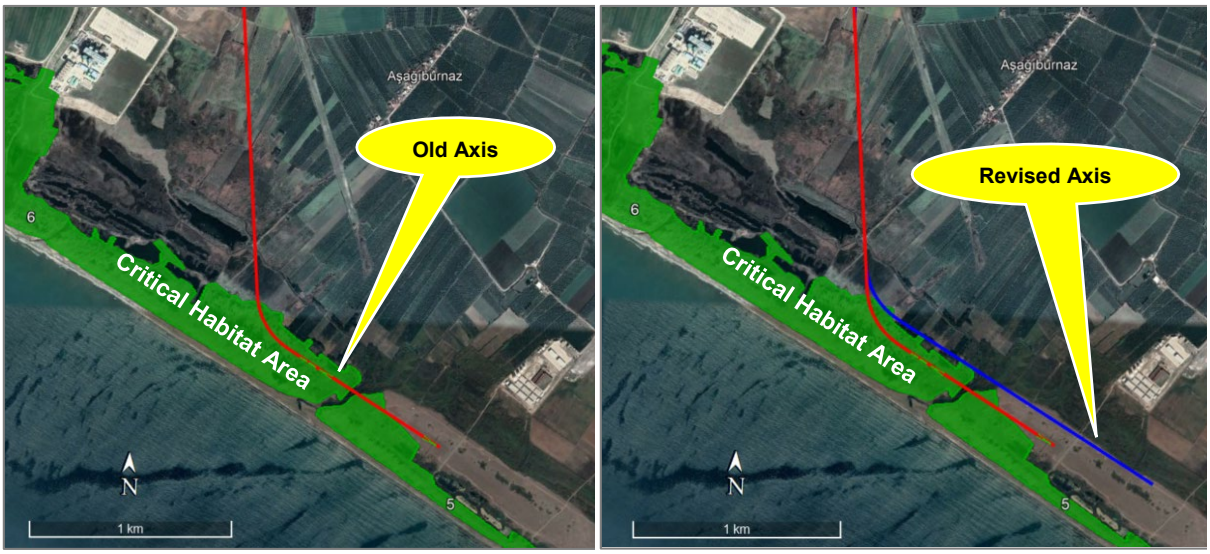


Figure 97. Revised OIZ-Port Connection Line

Cultural Heritage Areas

During the cultural heritage desktop studies, it was realized that there are three (3) registered archaeological sites on the railway project route. According to the Phase-1 design of the Çukurova sub-project (see Figure 98), the Issus Ancient Waterway intersected with the Osmaniye OIZ- Erzin Port Line at 4 different locations. However, the railway route was revised during Phase-2, and in the current situation the ancient waterway intersects with the railway route at a single point (Km: 2+550). Furthermore, the project route between Km: 3+400 and Km: 3+600, passes within the ancient waterway protection border.

PHASE-1 ROUTE **PHASE-2 ROUTE**

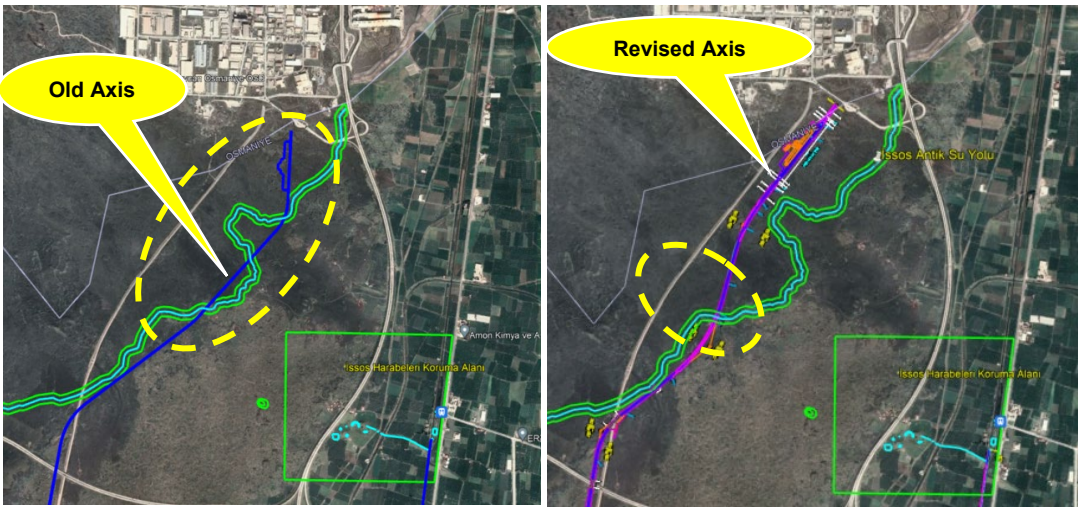
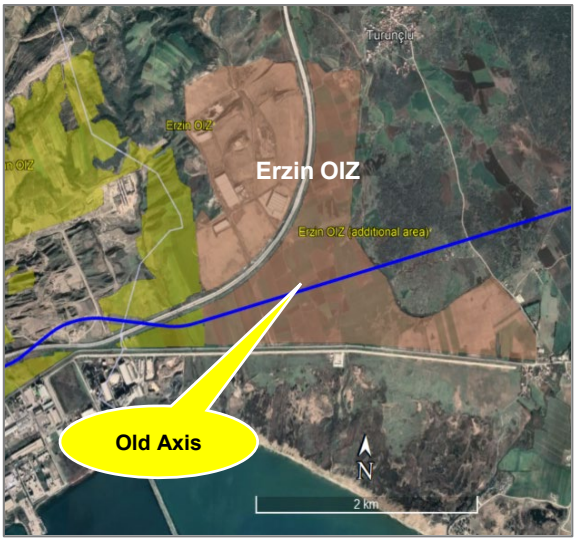


Figure 98. Comparison of the Previous and Revised Railway Lines

Stakeholder Suggestions/Requests

Furthermore, following a comprehensive assessment of the economic, environmental, and social considerations pertaining to stakeholders' suggestions and requests, the Erzin-TAYSEB connection line has been revised with respect to the railway proposal put forth by the Erzin OIZ.

PHASE-1 ROUTE **PHASE-2 ROUTE**



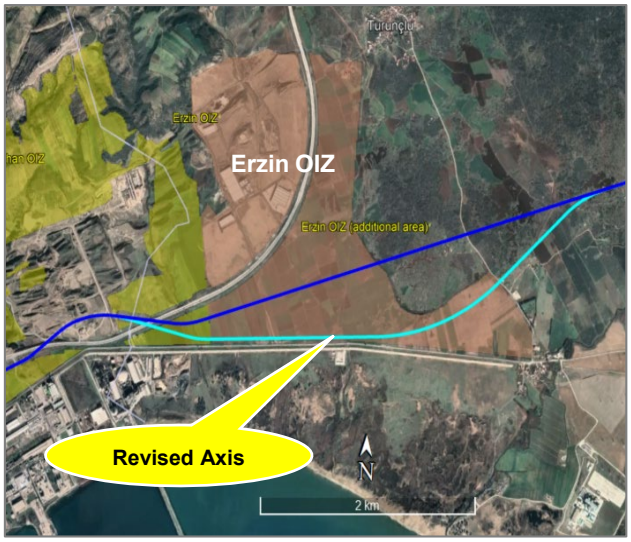


Figure 99. Approved Route **Figure 100. Route Proposed by Erzin OIZ**

During Phase-1 studies, it was initially planned to construct Station-3 of the OIZ-Port line within the Osmaniye OIZ. However, Station-3 was relocated as shown in Figure 101 in response to the request made by the Osmaniye OIZ management during stakeholder meetings with DGII.

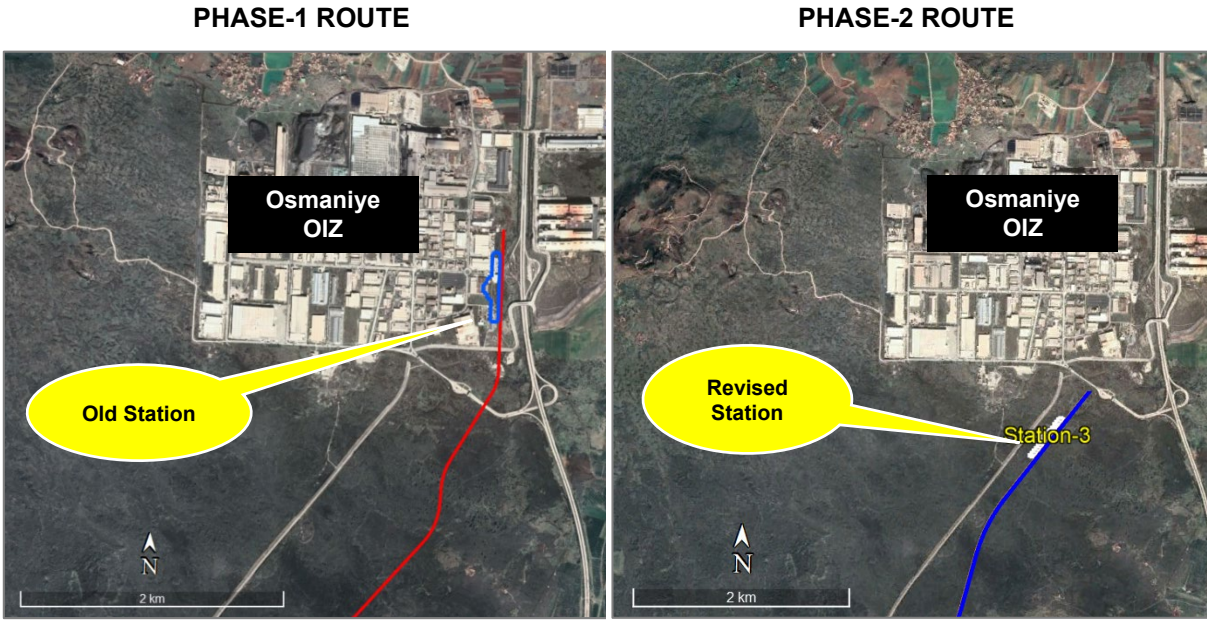


Figure 101. Relocation of Station-3

Burnaz Spring Groundwater Protection Area

One of the significant issues outlined in the ESCP is to revise the railway design to obtain the permit for the Burnaz Spring Groundwater Protection Area from State Hydraulic Works (DSİ). The Çukurova sub-project railway route designed in Phase-1 is shown in Figure 102 with the overlapping areas with Burnaz Springs strict protection area, 1st degree protection area and 2nd degree protection area.

This issue was brought up to the agenda by the 6th Region of DSİ during the stakeholder consultation meetings held on 29-30 September 2022. It was stated that it is strictly forbidden to pass through the Burnaz Spring Groundwater Strict Protection Zone.

In this context, the railway route was revised (see Figure 103) to avoid the strict protection area as much as possible and the opinion of DSİ was asked with an official letter dated 21.07.2023 and numbered 1275604.

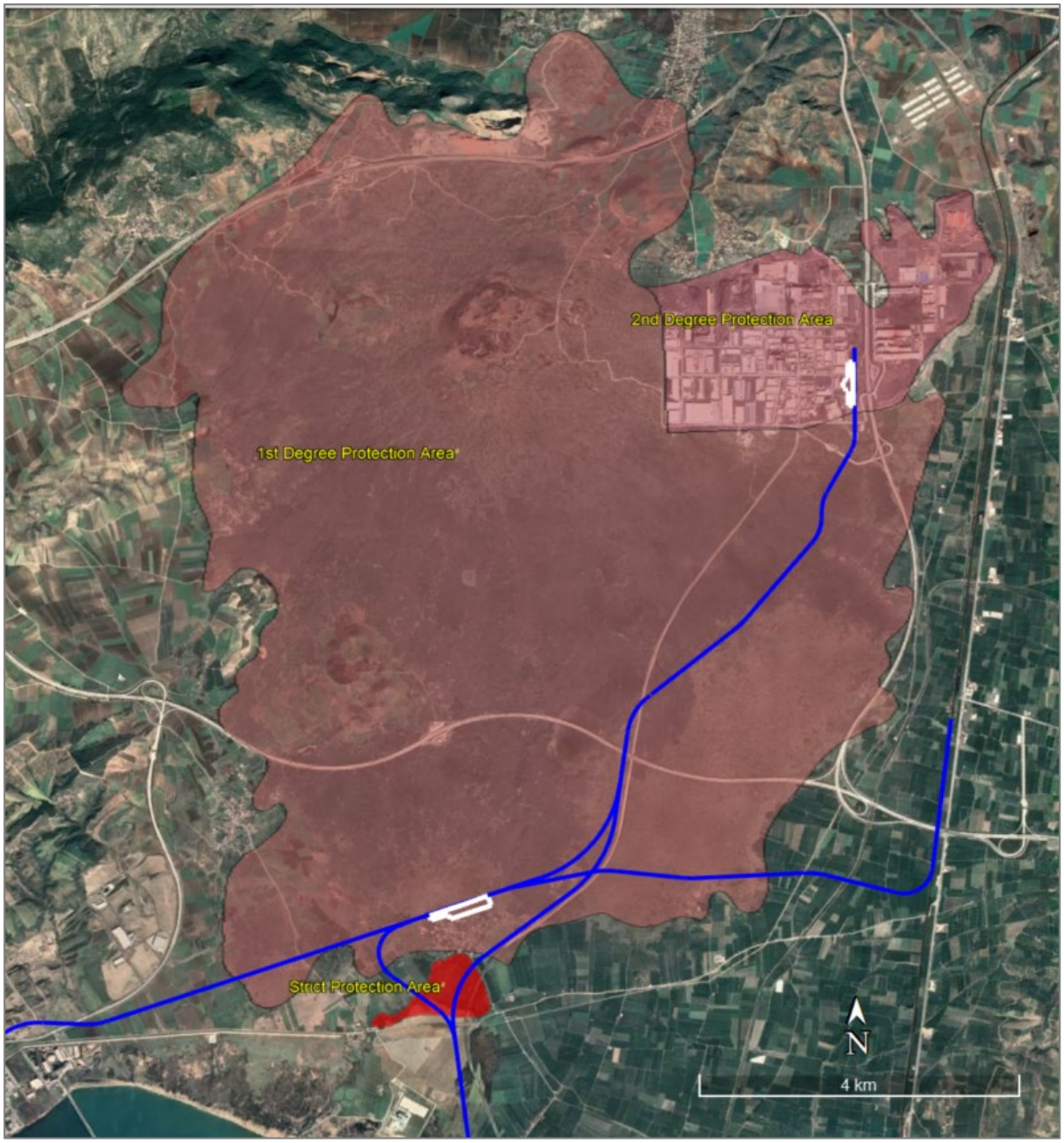


Figure 102. Overlapping Areas of Phase-1 Route with Burnaz Spring Groundwater Protection Area

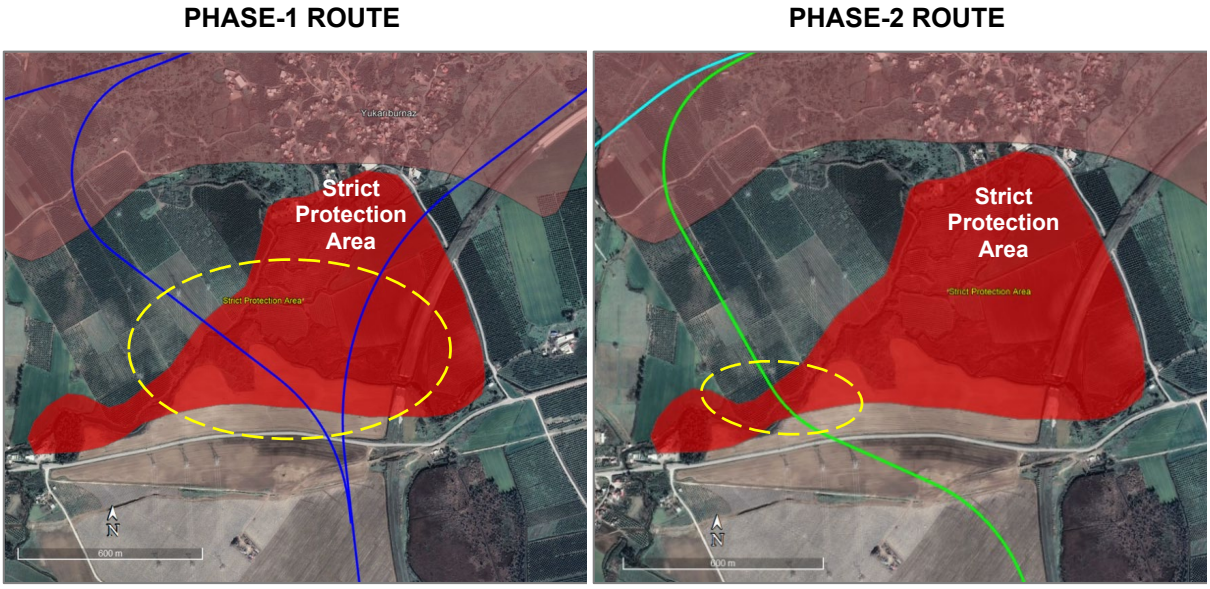


Figure 103. Route Revision in the Strict Protection Area

7.2 Technology Selection

In general, considering the infrastructure and maintenance costs of the vehicles utilizing this infrastructure, conventional railway lines for speeds up to 160 km/h and high-speed railway lines for speeds up to 250 km/h are regarded as the most economical systems. Within the scope of the Project, it is considered appropriate to choose conventional systems with speeds up to 160 km/h.

The signaling system to be installed as part of the Project will be suitable for train speeds up to and including 160 km/h. Trains travelling at speeds lower than 160 km/h will also be able to operate safely and effectively on this line.

In terms of the traction system, Çukurova railways will be electrified. As indicated in the International Energy Agency's Report on "The Future of Rail: Opportunities for Energy and the Environment" (2019), electric trains are significantly more efficient than diesel-electric, especially in situations where rapid acceleration and frequent starting and stopping are necessary. Electric trains are less energy intensive than diesel trains because electric motors have much higher thermodynamic efficiencies than internal combustion engines. Electric motors are also much better placed to enable regenerative braking, minimizing inertial losses (especially relevant in the case of frequent stops). As a result, countries with large shares of trains running on electricity tend to have lower energy demand per train-kilometer for similar sized trains. The carbon intensity of diesel traction does not vary significantly across regions. On the other hand, the carbon intensity of electricity depends on the fuel used to generate power. Electric trains can effectively reduce emissions, compared with diesel-powered trains, but only if the power generation mix is not largely dependent on primary fuels with high carbon content, such as coal. Electric trains are significantly less carbon intensive than diesel trains if they draw power from primary energy sources with low-carbon content (International Energy Agency (IEA), 2019).

7.3 Quarries and Material Borrow Sites

Within the scope of the Project, the borrow pits were surveyed for determining the natural materials to be used in construction of the railway lines (infrastructure, superstructure, engineering structures, concrete works, etc.). In the Geological-Geotechnical Survey Report prepared for the Project, two (2) quarries and one (1) borrow pit were specified and evaluated for use. However, the specified borrow pit remains within the 1st Degree Protection Area on the "Burnaz Spring Group Groundwater Reserve and Protection Area" where construction materials extraction activities are not allowed. Therefore, the alternatives to the material borrow site should be identified by the Design and Supervision Consultant prior to construction.

7.4 Construction Camp Sites

As indicated in the Improving Rail Connectivity Project in Türkiye, the camp sites formerly utilized by the Directorate General of Highways are planned to be used during the construction phase. Nevertheless, the footprints of the camp sites are yet to be identified based on the results of the additional studies to be undertaken at the final design stage. Therefore, no alternatives to the camp sites have been defined yet.

7.5 Optimization of Engineering Structures

Bridge, underpass and box culverts were placed by the Project designer at the required locations along the railway routes considering the Project standards, hydraulic conditions, ground conditions, etc. The lists of the engineering structures planned on the project route prepared by the Supervision Consultant is given in Table 12.

A protection structure (129-m long bridge) was designed to facilitate the railway crossing in the Strict Protection Area, starting from KM: 1+386 to 1+515.

As elaborated under Section 5.16 Issus Ancient Waterway and Ancient City of Issus belonging to Roman Period, which are registered and taken under protection by the law numbered 2863 are located within the boundaries of the Project. The intersection with Issus Ancient Waterway at Km 2+550 will be protected by using a concrete conservation structure (box culvert). Railway will be built in a way that passes over this concrete structure. And in the railway section which runs parallel to the ancient water way within the protection area of "Issus Ancient Water Way" (Km 3+400 and Km: 3+600), a retaining (protection) wall will be built around the railway route with the purpose of mitigating the impacts of the project on the water way. In this section, the purpose is to protect the ancient water way with this protection wall. From the design phase of the project, for any kind of project planning, project revision and similar applications to be made in and around the ancient waterway, the Hatay Cultural Heritage Conservation Regional Board should be consulted, and the decisions to be taken by the conservation board should be followed at all stages of the project as dictated by Law No. 2863.

The other registered site that is affected by the project activities is the Ancient City of Issus. 0 + 000 - 0 + 470 kilometer points of the Connection line pass through the borders of the ancient city. This part also includes the existing Erzin Station (Station Building-Logistics Directorate building), which is a registered cultural asset. In all phases of the project, Hatay KVKBKM should be consulted, and the decisions to be taken by the conservation board should be followed as dictated by the Law No. 2863. In addition, the vibration and sound waves of the railway to be constructed during both construction and operation phases may damage other remains, especially the aqueducts of Ancient City of Issus, over time. Considering this risk, it is recommended to construct the railway by designing the material that will prevent vibration as much as possible.

The design of the engineering structures should be carried out taken into consideration also the extreme weather events in the region stated in Chapter 5.1.

7.6 No Project Alternative

Within the scope of the feasibility studies carried out for the Project, the operations analysis and cost-benefit analysis in case the Project is not implemented were performed and the results were compared with the scenario in which the Project is implemented.

In the “no Project” scenario, it was assumed that trucks will perform freight-transportation operations via highways between the existing Erzin Station and TAYSEB Station as well as between Osmaniye OIZ and Erzin Port. Along with distance and travel times during road use, fuel consumption, truck fleet's requirements, operator costs, operation and maintenance costs of trucks were evaluated. Considering the stated costs, the following benefits will be acquired when the project is implemented:

- Operating income of TCDD which will be the operating institution of the transportation with railway,
- Annual operation-maintenance expenses, earnings comparing the trucks carrying freight in the case of having a project with railways,
- The monetary values of the saved time of the employees working in the transportation using the railway compared to those working in the transportation with the trucks.

Evaluation of the impacts on safety and environment:

- Difference in the number of traffic accidents
- Difference in noise emissions
- Difference in air pollution are expected.

In the feasibility report, the project is evaluated according to the followings;

- Train maintenance expenses
- Train energy expenses
- Train driver expenses
- Train crew expensed
- Operating expenses due to train employees
- Operation-maintenance expenses

The followings are considered for No Project Scenario;

- Freight transport by trucks
- Frequency of trips
- Distance covered by trucks
- Time spent in transportation by trucks
- Fuel consumption
- Truck fleet requirements
- Driver expenses
- Truck maintenance expenses
- Indirect expenses

In addition to the components given above, the monetary values of the annual time gains were calculated and the cases with and without projects were compared. Considering the most critical load scenario, the Low Load scenario, these investments are considered to be economically feasible.

Taking environmental and social mitigation measures, the management practices proposed in this report, the environmental and social management plan set aims at the correct and sustainable management of the project during the construction and operation phases. Therefore, considering avoiding and minimizing potential adverse impacts, establishing

relevant operational and management measures, and the numerous beneficial impacts of the project, it was determined that the no-project scenario is not feasible.

8 STAKEHOLDER ENGAGEMENT AND GM OF THE PROJECT

Stakeholder Engagement Plan (SEP) is the basis for building strong, constructive, and responsive relationships that are essential for the successful management of the Project's environmental and social impacts. The purpose of stakeholder engagement is to establish and maintain a constructive relationship with a variety of external stakeholders over the entire life of the Project. Initiating the engagement process in early phases helps ensure the timely public access to all relevant information and gives the stakeholders an opportunity to input into the Project design and the assessment of impacts.

The SEP will promote two-way communication between the Project Implementation Unit (PIU) and different stakeholders continuously. Information regarding the project, environmental and social risks and impacts, proposed mitigation measures, resettlement plans, grievance redress mechanism, will be shared with project stakeholders on a regular basis.

8.1 Preliminary Stakeholder Participation Activities

Detailed participation activities were documented in Stakeholder Engagement Plan (SEP) and the summary of the studies is as presented below:

- Stakeholder engagement began in the ESIA phase and continued into Resettlement Action Plan (RP) preparation.
- Stakeholders include public authorities, community leaders, landowners, and other affected individuals.
- Multiple consultations with stakeholders served various purposes.
- Stakeholders were systematically informed about project details.
- Phase 2 involved stakeholder meetings to establish communication and address grievances.
- Strategies to mitigate project impacts on stakeholders were discussed.

Stakeholders of the Project

Vulnerable Groups::According to ESS10, disadvantaged or vulnerable refers to those who may be more likely to be adversely affected by the project and/or more limited than others in their ability to take advantage of a project's benefits.
Such an individual/group is also more likely to be excluded from/unable to participate fully in the mainstream consultation process and as such may require measures and/or assistance to do so. This will take into account considerations relating to age, including the elderly and minors, and including in circumstances where they may be separated from their family, the community, or other individuals upon which they depend.
Various types of barriers may influence the capacity of disadvantaged or vulnerable groups to articulate their concerns and priorities about project impacts as sociopolitical, societal conflict, educational, or practical factors. Project SEP has defined alternative tools and methods in this context

Within the scope of the Project and specific to the Project AoI, the vulnerable or disadvantaged groups have been defined as the following:

- Elderly people in need of care and social assistance,
- Disabilities (Mental and Physical),
- Women who have lost their husbands/divorced,
- Home-bound due to chronic illness,
- Illiterate adult,
- Refugee/migrant,
- Earthquake victims,
- Seasonal agricultural workers, including Syrian refugees.

- PAPs who don't know Turkish
- Lack of ability to access information and limited communication skills

Other Interested Parties (OIPs) are individuals, groups, or organizations with a vested interest in the project, potentially due to its location, its characteristics, impacts, or public interest aspects. Within the scope of the project, various OIPs are detailed in the project SEP. In summary, project-specific OIPs include nearby Organized Industrial Zones, Free Zones within the Project AoI, Energy Investment Areas, farms, mines, businesses, workplaces, industrial or commercial areas in the surrounding region. Additional OPIs include national or local CSOs/ NGOs, professional chambers, trade, industry, agriculture chambers, cooperatives, sectoral organizations, labor associations or unions, as well as local and/or national media, outlets. The full detailed list of OIPs can be found in Section 4.2. of the Project SEP.

Other individuals or groups that may have an interest in the project are identified as "other interested parties". The list of the possible interest groups is provided in following:

- 57th Branch Office Chief of Republic of Türkiye Ministry of Transport and Infrastructure General Directorate of Highways
- 5th Regional Directorate of Republic of Türkiye Ministry of Transport and Infrastructure
- 6th Provincial Directorate of General Directorate of State Hydraulic Works
- 6th Regional Directorate, Modernization Directorate, Republic of Türkiye Ministry of Transport and Infrastructure, Turkish State Railways
- 6th Regional Directorate, Traffic and Station Management Directorate of Republic of Türkiye Ministry of Transport and Infrastructure Turkish State Railways
- 7th Regional Directorate of Republic of Türkiye Ministry of Agriculture and Forestry General Directorate of Nature Conservation and National Parks
- Adana Metropolitan Municipality Projects Directorate
- Adana Provincial Directorate of Environment, Urbanization and Climate Change
- ByPort Petroleum Product Terminal Services Inc.
- BOTAŞ
- BTC
- Ceyhan Chamber of Commerce
- Ceyhan Organized Industrial Zone
- Eastern Mediterranean Petrochemicals (Formerly known as Ceyhan Petrochemical Industry Zone Incorporated Company)
- Çukurova Development Agency Programming Unit
- Eastern Mediterranean Development Agency
- Erzin Chamber of Agriculture
- Erzin Chamber of Industry and Trade
- Erzin District Directorate of Agriculture and Forestry
- Erzin Organized Industrial Zone
- Erzin Yeşilkent Irrigation Cooperative
- Hatay Governorship
- Osmaniye Organized Industrial Zone
- Republic of Türkiye Ministry of Trade, Adana Yumurtalık Free Zone
- Toros Adana Yumurtalık Free Zone Founder and Operator Incorporated Company
- Toros Agriculture Industry and Trade
- Tosyalı Holding

8.2 Planned Engagement

Stakeholder engagement is an ongoing process that commenced prior to the inception of this SEP and will persist throughout the Project's lifecycle. DGII is committed to maintaining active communication with stakeholders identified during the project's duration. Specifically, DGII will actively seek input from stakeholders regarding the environmental and social performance of the project, as well as the implementation of identified mitigation measures. In cases where substantial alterations to the project occur, resulting in additional risks and impacts, especially those affecting parties impacted by the project, DGII will disclose information regarding these risks and impacts and engage in consultations with the affected parties to determine how to mitigate them.

Consultation processes and tools are defined within the scope of the detailed Stakeholder map in the Project SEP document. SEP document Stakeholder Matrix table contains details on this subject.

8.3 Stakeholder Consultation Meetings for Information Disclosure

As part of the project, stakeholder participation/consultation meetings have been held in two locations across the provinces of Adana and Osmaniye on 13.06.2025. A Leaflet prepared for the project has been distributed in the meetings and invitation letters, and governmental organizations were also notified through an official letter. Additionally, efforts were made to reach the Mukhtars, who were consulted during the ESIA process, via WhatsApp platform using their contact numbers.

Information about the meetings is provided in Table 135.

Table 135. Information about the Stakeholder Participation Meetings

Meeting Province	Meeting Place	Address	Date	Time	Number of Participants
Adana	TAYSEB Conference Hall	Sarımazı, Ceyhan, 01920 Adana	13.06.2025	11:00-13:00	25
Osmaniye	Osmaniye OIZ Conference Hall	E. Ayhan Tosyalı Cad., No:20, Toprakkale/Osmaniye	13.06.2025	14:00-16:00	21

The disaggregated information for the participants for both meetings is provided in Table 136 and Table 137, respectively.

Table 136. Disaggregated Participant Information for TAYSEB SPM

Category	Details	Number of Participants	Female	Male
Mukhtars	Sarımazı Village	1	-	1
Engineers/Technicians from DSİ Branch/Regional Directorates	One (1) engineer from DSİ Regional Directorate, One (1) engineer and One (1) landscape architect from DSİ Branch Directorate	3	2	1
Business Owners/Workers	Engineers, managers, etc. from companies within TAYSEB Participating companies: -Köksan Pet Plastic Packaging Industry and Trade Inc. -Aktaş Foreign Trade Inc. -Samet Ready-Mix Concrete Construction Limited Company -Yonca Food Industry Enterprises Domestic and Foreign Trade Inc. -Likit Chemical Industry and Trade Inc. -Aschem Petrochemical Industry and Trade Inc. -Mavi Sistem Environmental Consulting -BC International Food Trade Inc.	11	2	9
TAYSEB Official	-	1	-	1
DGII Official	Social Expert	1	1	-
Consultants and Contractors	Özgün-Özdemir Construction Joint Venture (Contractor) Optimal-Eptisa-Optim-Obermeyer Joint Venture (Consultant)	8	3	5
Total		**25**	**8**	**17**

Table 137. Disaggregated Participant Information for Osmaniye OIZ SPM

Category	Details	Number of Participants	Female	Male
Mukhtars	Hürriyet, Turunçlu, Aşağıburnaz, Yukarıburnaz neighborhoods	4	-	4
Engineers/Technicians from DSİ Branch Directorates	-	4	1	3
Osmaniye Provincial Directorate of Environment, Urbanization and Climate Change	-	1	-	1
Representatives from Osmaniye Organized Industrial Zone (OSB)	Regional Director and Engineer	2	-	2

Ceyhan Left Bank Irrigation Union	Civil Engineer	1	-	1
DGII Official	Social Expert	1	1	-
Consultants and Contractors	Özgün-Özdemir Construction Joint Venture (Contractor) Optimal-Eptisa-Optim-Obermeyer Joint Venture (Consultant)	8	3	5
Total		**21**	**5**	**16**

The key outcome of the meetings was the information should be obtained from the DSİ regarding water bodies and watering structures in the Project area. AYGM PIU has stated that they made proper applications regarding the matter and waiting response from DSİ.

During stakeholder meetings, participants primarily sought clarifications on route alignment, locations of overpasses/underpasses and stations, land acquisition, and potential overlaps with existing infrastructure projects. Concerns were raised regarding agricultural land impacts, irrigation areas, and connectivity to ports and industrial zones. The contractor confirmed that the presented route reflects the latest design, pending final approval, and that expropriation will comply with Turkish law and relevant international standards, with no urgent expropriation planned. DSİ's input on irrigation and stream crossings is awaited, and any future route adjustments may require updates to project documents. No formal objections or strong opposition were recorded, and no immediate changes to E&S documents or project design are required at this stage.

The project introduction and all environmental and social documents prepared as part of the project are available on AYGM's website (https://aygm.uab.gov.tr/dunya-bankasi-turkiye-de-demiryolu-lojistigini-gelistirme-projesi).

Detailed information about stakeholder participation meetings, the issues raised during these meetings, and stakeholders' opinions and suggestions are provided in the SEP document (see CNR-ADN-SEP-002).

8.4 Grievance Mechanism

The Project GM Procedure was developed in accordance with World Bank Environmental and Social Standard 10.

Key elements of the grievance mechanism include:

- Clear information about how grievances are submitted and handled after submission, including a minimum period that a stakeholder must wait to receive a reply; and
- Presenting alternatives tools for submitting a grievance in person to a staff member if a stakeholder is not able to or comfortable with submitting a grievance in writing.

Within the scope of the GM Procedure, with the designated personnel in the DGII and Contractor, Project GM responsible unit(s) will be responsible for adhering to the GM that has been put in place to document and address all complaints raised by stakeholders.

They will also oversee the monitoring of corrective actions taken to resolve these complaints. To ensure stakeholders are informed about this process and can readily express their concerns, contact information will be made available through the Project's website, public information meetings, consultation sessions, and Project brochures. These efforts aim to raise awareness and promote transparency regarding how stakeholders can formally voice their grievances. Various formal channels for stakeholders to lodge their grievances are defined in the SEP/GM of the Project with the related responsibilities.

The Project tailored GM includes grievance mechanisms for both the public and for Project workers.

The project-specific GM mechanism procedure defined the following processes:

- Receiving and Recording Complaints
- Evaluation and Resolution Process
- Closure of the Complaint and Evaluation Process

In addition, Project GM also includes a separate Workers Grievance Mechanism and separate instructions for Handling Sexual Exploitation and Abuse/Sexual Harassment (SEA/SH) issues and offers a detailed approach.

All notifications and complaints within the scope of the Project will be managed and monitored in accordance with the Project's approach described above.

The SEP and GM will undergo consultation and disclosure to all stakeholders prior to being finalized.

The project's GM communication tools and complaint mechanism application form can be accessed at the following website:

https://aygm.uab.gov.tr/dunya-bankasi-turkiye-de-demiryolu-lojistigini-gelistirme-projesi

Project GM also defines the following tools:

CİMER: CİMER serves as a platform for citizens to report various issues, lodge complaints, and make requests. CIMER has been actively utilized by citizens since its inception. This system operates through dedicated software and a web page developed by the Presidential Department of Communications, facilitating communication between citizens and the government, allowing applications to be submitted at any time and from anywhere.

YİMER: The Republic of Türkiye Ministry of Interior, under the Presidency of Migration Management, is committed to providing accurate, rapid, and reliable information in accordance with the law 24/7 through YİMER 157 and other service channels for those seeking assistance. YİMER 157 provides continuous assistance to foreigners 24/7, 7 days a week, helping them with questions related to visas, residence permits, international protection, temporary protection, and more.

World Bank Grievance Redress Service:

Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanisms or the WB's Grievance Redress Service (GRS).

The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit http://www.worldbank.org/en/projects-operations/products-and-services/grievance-redress-service.

Project affected communities or individuals can also raise their grievances to the World Bank Independent Inspection Panel (IIP). This panel determines whether the person or communities that made the complaint were harmed because of the breach of one or more of the WB's performance criteria. The panel can directly convey its concerns about the received complaints to the WB. At this stage, WB would have an opportunity to respond to the complaints. For

information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.

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