GAS STORAGE EXPANSION PROJECT

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BOTAŞ PETROLEUM PIPELINE CORPORATION

ÇINAR ENGINEERING CONSULTANCY CO.

Document Title

GAS STORAGE EXPANSION PROJECT
FINAL ESIA REPORT

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ATLAS	:	ATLAS Petroleum Gas Importation Exportation Marketing Trading Co.
BOD	:	Biochemical Oxygen Demand
BOTAŞ	:	BOTAŞ Petroleum Pipeline Corporation
CEC	:	Cation Exchange Coefficient
CFU	:	Colony Forming Unit
ÇINAR	:	ÇINAR Engineering Consultancy Inc.
cm	:	Centimeter
COD	:	Chemical Oxygen Demand
CWAA	:	Central Waste Accumulation Area
dB	:	Decibel
DO	:	Dissolved Oxygen
DSİ	:	State Hydraulic Works (Devlet Su İşleri)
DV	:	Drain Valve
EC	:	Electrical Conductivity
EIA	:	Environmental Impact Assessment
EMM	:	Environmental Monitoring Manual
EMP	:	Environmental Management Plan
EMRA	:	Energy Market Regulatory Authority
ENAMR	:	Environmental Noise Assessment and Management Regulation
ERP	:	Emergency Response Plan
ERT	:	Emergency Response Team
ETL	:	Energy Transmission Line
GIS	:	Geographic Information Systems
GRP	:	Glass Fiber Reinforced Plastic
GSEP	:	Gas Storage Expansion Project
Ha	:	Hectare
HAZID	:	Hazard Identification
HAZOP	:	Hazard Operability
HDPE	:	High Density Polyethylene
hm^3	:	Cubic hectometer
HS	:	Health and Safety
HSE	:	Health and Safety, Environment
IBC	:	Intermediate Bulk Container
IUCN	:	International Union for Conservation of Nature and Natural Resources
km	:	Kilometer
KP	:	Kilometer Point
Kw	:	Kilowatt
LNG	:	Liquefied Natural Gas
LV	:	Line Valve
m	:	Meter
MoEU	:	Ministry of Environment and Urbanization
MSDS	:	Material Safety Data Sheet
N/A	:	Not Applicable
NCR	:	Non-Conformance Report
NGOs	:	Non-Governmental Organizations
OHSAS	:	Occupational Health and Safety Assessment Systems
PET	:	Polyethylene Terephthalate

pH	:	Power of Hydrogen
PAP	:	Project Affected People
PM	:	Particulate Matter
PPE	:	Personal Protective Equipment
PS	:	Pump Station
QHSE	:	Quality, Health and Safety and Environment
RAMEN	:	Regulation on Assessment and Management of Environmental Noise
RCIAP	:	Regulation on the Control of Industrial Air Pollution
RoW	:	Right of Way
RSWQM	:	Regulation on the Surface Water Quality Management
RV	:	Relief Valve
RWIHC	:	Regulation on Water Intended for Human Consumption
SEPA	:	Special Environmental Protection Area
SIA	:	Social Impact Assessment
SPO	:	State Planning Organization
SPSS	:	Statistics Package Program
SS	:	Suspended Solids
ST	:	Storage Tank
TCC	:	Total Cation Calculation
TDS	:	Total Dissolved Solids
TPC	:	Turkish Petroleum Corporation
TS	:	Turkish Standard
UGS	:	Underground Gas Storage
UGS Project	:	Underground Gas Storage Project
WHO	:	World Health Organization
WPCR	:	Water Pollution Control Regulation / Su Kirliliği Kontrolü Yönetmeliği (SKKY)
WWTP	:	Wastewater Treatment Plant

1. INTRODUCTION

1.1. Project Background

Energy has become one of the main factors affecting economic, political and social progresses of countries and international relations in our time. Also, increase in the energy consumption and expectation of continuation of this increase lead countries to have a will to reach energy sources cheaply, continuously and safely.

Forming a natural geographical bridge between world's leading energy suppliers and major consumers and therefore creating an energy center and corridor, our country has a significant importance for global energy geopolitics and safety of natural gas supply of Europe.

Within this framework, BOTAŞ Petroleum Pipeline Corporation serves as a strategic actor in terms of playing active and competitive role in providing safety of energy supply of Turkey and international energy arena, and it carries out activities such as petroleum and natural gas transportation with pipeline, natural gas imports and exports, marketing and sale and **storage** of natural gas, pipeline survey, engineering and construction works by using its geostrategic advantages.

Today, as a result of energy demand arising from population growth and the increase in natural gas usage correspondingly, underground natural gas storage and usage has a significant importance for Turkey. In line with this demand increase, various projects are being developed. It is aimed to prevent seasonal fluctuations which will occur in the future depending on the increase in demand for natural gas in the residential sector, through these planned projects.

Underground natural gas storage is addressed as an important issue in Turkey and underground storage is needed in order to balance effectively the peak gas demand depending on the rapidly increasing gas consumption. In line with the increasing demand, various projects are being developed. It is aimed that seasonal fluctuations which may occur in the future based on increasing demand for natural gas in residential sector will be prevented by these planned projects. In addition to all these, it is aimed by underground natural gas storage works to;

- Ensure the safety of supply (regulating seasonal, daily and hourly changes),
- Provide system regulation (demand and supply gaps),
- Control the fluctuations in prices (regulating in peak demand periods),
- Take countermeasures for possible failures,
- Meet the storage facility liability.

Within the scope of storage facility liability mentioned above, there is a condition that 10% of imported natural gas across the country is storage by required of the Law no. 4646 on Natural Gas Market. This portion is 20% in European Union standards. In this regard,

BOTAŞ, which holds 90% of natural gas market in our country, keeps its works on storing 10% of imported gas at the first stage. When the amount of natural gas consumption of Turkey and figures regarding current storage capacity given in the Table 1.1.1. are reviewed, it is seen that Turkey is below the storage values which should be in accordance with the Law No.4646 and European Union's standards by 2014.

Table 1.1.1. Demand for Natural Gas Storage of Turkey

Capacity	2014	2020	2030
Natural gas consumption (billion m^3)	48	68	80
Current capacity (billion m^3)	2.8	3.1	3.1
Required capacity (billion m^3)	4.8	6.8	8
Difference (the Law No.4646 10%)	**-2.0**	**-3.7**	**-4.9**
Difference (EU harmonization 20%)	**-7.5**	**-10.5**	**-12.9**

According to the report prepared by World Bank regarding Improving Gas Sector in Turkey in 2014, distribution of underground natural gas storage capacity – consumption rates by countries and the place of Turkey in it are given in the Table 1.1.2.

Table 1.1.2. Capacity of Underground Natural Gas Storage – Distribution of Consumption Rates by Countries

Countries	Storage Capacity / Total Consumption Rate (%)	Storage Capacity / Residential Consumption Rate (%)
USA	18	48
Russia	27	61
Ukraine	49	109
Germany	19	105
France	20	52
Italy	30	65
Turkey	5	20

Source: *World Bank Document, Report No: 34140-TU, 2014*

Thus, with the purpose of meeting demand for storage and legal obligations regarding the reasons specified above, and also balancing seasonal gas withdrawal, fulfilling sudden gas withdrawal, reducing the number of non-continuous customers and meeting purchase and sales commitments, it is planned to increase total storage capacity of the facility which is under construction in Sultanhanı District of Aksaray Province from 1 billion Nm^3 up to 6 billion Nm^3 by using the same technology by signing the contract on 15 June, 2011.

In this context, the Underground Gas Storage Project (UGS Project), which is planned to be established approximately 40 km south of Tuz Gölü, by BOTAŞ Petroleum Pipeline Corporation, has a significant importance. In this project, underground gas storage caverns will be made by leaching a part of the large natural salt structure which is located approximately 1,000 meters below the surface. In this regard, the usage surplus of natural gas which occurs especially during the summer months across the country is to be stored in caves/salt caverns to be carved out by withdrawing it from the Kayseri-Konya-Seydişehir areas of the Eastern Anatolia Natural Gas Main Transmission Line, which passes approximately 23 km to the south of the project area, with the help of a branchman line.

When the project is put into practice, it will be ensured that natural gas stored in caverns will be injected to Kayseri-Konya-Seydişehir areas of the Eastern Anatolia Natural Gas Main Transmission Line by withdrawing gas from the caverns with the purpose of meeting the increased demand for gas across the country in peak periods.

3-D seismic surveys were conducted by the Turkish Petroleum Corporation within 80 km² area of the designed region, under the project in November 2000, and in line with the obtained results, caverns where natural gas will be stored and locations of surface facilities which will be established with the purpose of controlling the system were determined. In this regard, the Positive EIA decision numbered 843 and dated 19.08.2003 was obtained from the former Ministry of Environment and Forestry for the Underground Gas Storage Project (see Appendix-1.1).

As a result of a revision in water supply related to this project, which received a Positive EIA decision in 2003, extra works in addition to the EIA Report were carried out by BOTAŞ. Due to the revisions made in regard to the water supply system associated with the project, BOTAŞ prepared an Addendum Report to the EIA Report as required by the Turkish EIA Regulation. That report particularly dealt with the issues concerning the adoption of a decision for supplying the water from Hirfanlı Dam Lake, instead of the wells, in line with the authorizations obtained from the General Directorate of State Hydraulic Works (DSİ) pursuant to the decision to bore the caverns in groups of 4 units rather than in groups of 2 units in an effort to ensure early completion of the project as part of the modifications related to the system to be used for supplying the water necessary for the leaching operations at the caves where natural gas is to be stored (see Appendix-1.2). The occasion regarding the additional works was notified to the former Ministry of Environment and Forestry and Ministerial approvals were received on October 25, 2004 (see Appendix-1.3).

The first 6 caverns in the “Underground Gas Storage Project”, which consists of 12 caverns each of which has 630,000 Nm^3 physical capacity and is under construction now, will be in use in 2017 (with 500 million Nm^3 storage capacity). 6 more cavern storage will be completed in 2020 and the facility will reach a total storage capacity of 1 billion Nm^3.

Within the boundaries of the Sarıyahşi, Ağaçören, Ortaköy, Eskil, Central and Sultanhanı Districts of Aksaray Province; the Emirgazi District of Konya Province and the Evren District of Ankara Province, it is planned by “BOTAŞ, Petroleum Pipeline Corporation” to increase the capacity of the “Underground Gas Storage Project”. With the expansion project, it is planned to open and operate 48 new storage caverns with 630,000 Nm^3 – 750,000 Nm^3 physical capacity in such a way that they will be within the boundaries of the licensed storage area received from the EPDK (EMRA) as shown in Appendix-1.4.

In the “Gas Storage Expansion Project”, 48 caverns with 5 billion Nm^3 capacity, 1 surface facility and 1 natural gas branchman line are planned within the scope of the principal units in addition to the existing facility. And, it is planned to establish a water line, brine discharge line, connection lines between wells, pump stations, water storage tanks and concrete plants

as auxiliary units. In the scope of the Gas Storage Expansion Project, final design will be conducted after design, supply and install contract. After the final design, there may be increase or decrease in the numbers of the mentioned auxiliary units depending on the needs of the facility and changing conditions.

The UGS project and planned Gas Storage Expansion Project areas are shown in Figure 1.1.1.

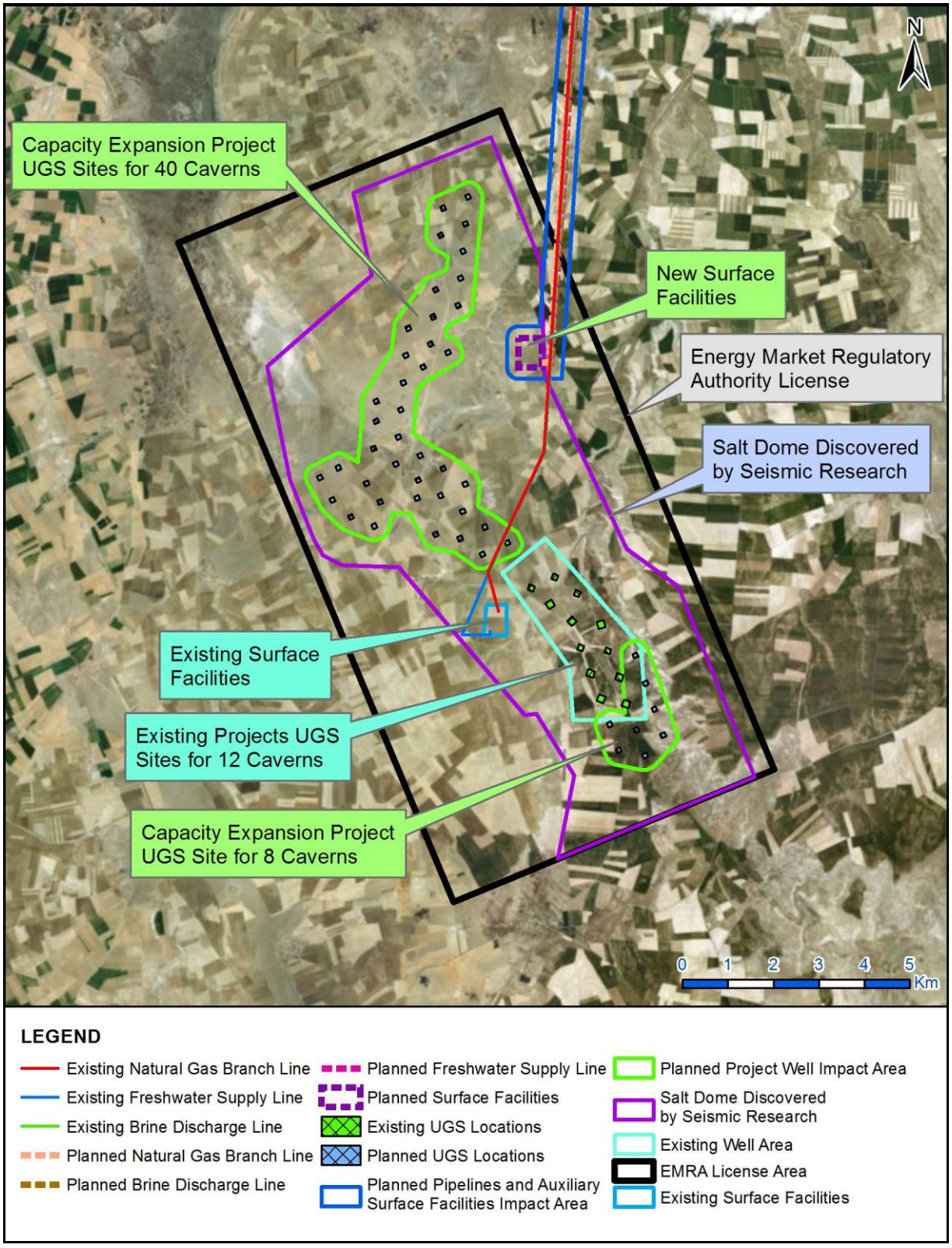


Figure 1.1.1. The Project Araes of the Underground Gas Storage Project and Gas Storage Expansion Project

In addition to the existing project;

- 48 (including 8 spare) storages (caverns) with 5 billion Nm^3 storage capacity,
- 1 surface facility,
- 1 natural gas branchman line,
- 1 fresh water line,
- 1 brine discharge line,
- Connection lines between wells,
- Access Roads (if it is required after the final design),
- Energy transmission lines,
- 3 pump stations,
- 5 water storage tanks will be established within the boundaries of Sarıyahşi, Ağaçören, Ortaköy, Eskil, Central and Sultanhanı Districts of Aksaray Province; Emirgazi District of Konya Province and Evren District of Ankara Province, as the designated project area.

This report was prepared by ÇINAR Engineering Consultancy Inc. with the purposes of research, analysis, detailing of the possible environmental and social impacts in the area where the planned Gas Storage Expansion Project for UGS Project, of which construction is in progress in the current situation, will be carried out, and the making of the necessary suggestions. Also, this report was prepared in parallel with the Environmental Impact Assessment Report of the same project which was finalized and prepared by ÇINAR Engineering Consultancy Inc. pursuant to the Turkish Environmental Legislation and under the guidance of the experience in monitoring activities conducted by ÇINAR within the Underground Gas Storage Project, in the last 4 years.

1.2. Aim

In this report, it is aimed to assess environmental and social impacts which will occur as a result of the construction, drilling, leaching and auxiliary activities of the units outlined above during the capacity expansion of the Underground Gas Storage Project. In addition, suggestions regarding the minimizing of these impacts and/or making the impacts positive will be made after the reviews, assessments and analyses in the report.

The aims of this report can be listed as below;

- Explanation of the capacity increase works of the Underground Gas Storage Project,
- Definition of the environmental and social features at the project areas,
- Studies on probable factors which might cause environmental impacts on the project areas in parallel of the same project investigations and experienced studies,
- Explanation of the results of the probable environmental impacts and effects to the current social status around the project areas during the project works,
- Suggestions on decreasing the negative environmental and social impacts,
- Explanation of planned works on increasing the positive environmental and social impacts,

- Explanation of necessary measures to be taken on environmental and social impacts during the project works,
- Explanation of obtained and formed baseline data,
- Evaluation of the performed analysis and measurement results,
- Definition of the health and safety conditions during the project works,
- Assessment of the results of social investigation studies.

1.3. Scope

This ESIA Report covers the investigation of the activity area with regards to the Environmental and Social Impact Assessment (ESIA) approach, ensuring the compliance with national and international law (international treaties, WB Operational Policies, WBG HSE Guidelines, etc.) and also inspection, monitoring and evaluation of environmental effects of the construction, drilling, leaching and operation activities to be carried out at project area and its surrounding under the headings presented below;

- Soil Management,
- Air Quality Management,
- Waste/Hazardous Waste Management,
- Wastewater Management,
- Water Management,
- Noise Management,
- Chemical and Hazardous Material Management,
- Salt Water (Brine) Management,
- Formation Wastes and Drill Mud Management,
- Flora - Fauna Management,
- Public Health, Occupational Health and Safety Management,
- Ecological Restoration and Reinstatement Management,
- Social Assessment and Management.

Furthermore, in the geographical area where the project activities have been carried out; literature review by monitoring the flora-fauna species specific to the area in addition to the impacts on socioeconomic aspects given below, and execution of the planned activities according to the determined geological and hydrogeological characteristics of the region are also included in the Report.

- Social Situation,
- Population,
- Settlement,
- Employment,

- Regional Economy,
- Agricultural Activities and Livestock,
- Agricultural Productivity,
- Traffic,
- Transportation.

1.4. Material and Method

Evaluations are made together with the surrounding of the project location within the scope of the planned expansion of Underground Gas Storage Project. To this end, literature review and field research have been carried out for the purposes of gathering physical, biological and socio-economic data on the field.

Within the scope of the Environmental Monitoring and Consultancy Services that have been continuing since 2012 under the scope of the Underground Gas Storage Project, benefited from the data gathered from monitoring activities performed by different professional disciplines (Environmental Engineers, Flora and Fauna Experts, Geology and Hydrogeology Engineer, Agricultural Engineer, Landscape Architect, Sociologist).

During the Environmental Monitoring and Consultancy Services of the “Underground Gas Storage Project” performed by the ÇINAR experts;

- The activities were monitored in Pipelines (Fresh Water Line, Brine Discharge Line, Natural Gas Branchman Line, Triple pipelines and Connection Lines of UGS Sites), Surface Facilities, Pump Stations (PS’s), Storage Tanks (ST’s), Access Roads, Central Waste Accumulation Area (CWAA), Energy Transmission Lines (ETL’s) and Drilling Areas.

- Water discharge process performed during the construction and operation works and around of the discharge points have been monitored, potential noisy areas have been inspected, air quality measurements (settled dust and PM10) has been conducted, potable water, brine (salt water), wastewater, groundwater and soil samples have been taken and related analysis have been conducted by ÇINAR.

- Environmental weekly and monthly reports were prepared by Environmental Monitors (ÇINAR Experts) according to the field observations and submitted to BOTAŞ.

- Joint visits and site surveys were carried out with BOTAŞ staff to fresh water line, brine discharge line, natural gas branchman line, triple pipelines, connection lines of UGS sites, PS’s, ST’s, surface facilities, drilling sites, access roads, ETL’s, main camp site and all camp sites. During the site visits, construction activities discussed according to the environmental issues. Good applications and improper applications are evaluated. Recommendations and comments were exchanged on how to solve these problems.

With these studies which are given above, BOTAŞ has obtained a great experience about environmental impacts of natural gas storage. With this experience, during the construction and operation phases of Gas Storage Expansion Project it is aimed that;

- Identify the environmental problems in advance and
- Solutions will be provided in a faster way.

In order to identify the area that will be affected by the project, the environmental, economic and social impacts of the project must be evaluated holistically. Some of these effects are direct, while others are indirect; The “Project Impact and Research Area” was selected by taking into account following factors; air quality, noise, flora, fauna, agriculture and forest areas, etc. When both parameters are evaluated, the impact area was determined 250 meters for 48 new caverns and same as 250 meters for pipelines and surface facilities (Figure 1.4.1.).

However; access roads and ETLs will be determined and designed after the final design engineering of gas storage expansion project. The regulations which apply to the construction and operational stages of the gas storage expansion project are provided below and the issues set out in the regulations shall be fulfilled during both the constructions of the access roads and ETLs to be established between the pre-construction and construction phases of gas storage expansion project.

Accordingly, within the scope of the gas storage expansion project, there shall be full compliance with the By-Law on Environmental Impact Assessment, which came into force upon its publication in the Official Gazette numbered 29186 and dated November 25, 2014; all construction phases of the access roads and ETLs changes and supplements in the project are authorized within the framework of the EIA Regulation which was in force at the year of the related activity. The changes and/or supplements during the construction of the project will be carried out within the scope of the EIA Regulation and under the responsibility of the General Directorate for Environmental Impact Assessment, Authorization and Inspection of the Ministry of Environment and Urbanization.

ESIA statements will be applied for the project changes such as access roads, ETLs and the other facility and units, etc. during the construction phase of the gas storage expansion projects. Determined no-go areas, public infrastructure systems, field roads, river crossings will be protected against to the construction impacts as mentioned in ESIA report.

Results of the environmental and social assessment to be studied before the construction of the planned access roads and ETLs will be added to this ESIA Report as an addendum in scope of the WB OPs and directives.

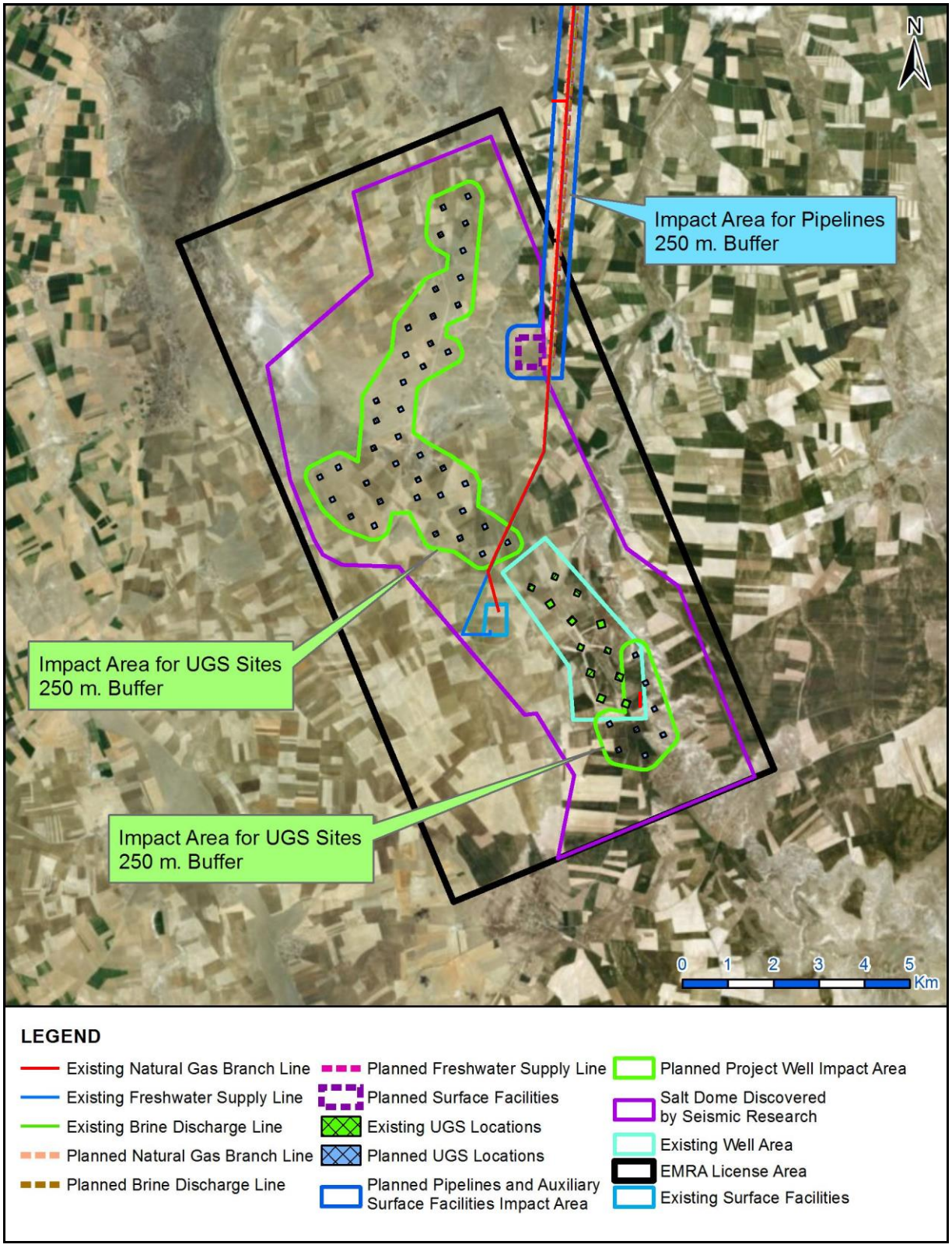


Figure 1.4.1. The Impact Araes of Gas Storage Expansion Project for UGS Sites and Pipelines

Impact area studies were conducted in the following areas; planned pipelines (freshwater line, brine discharge line, natural gas branchman line), within provincial boundaries on the 1/25,000 scaled topographic map presented in Appendix-2, including the facilities and units-under construction of the planned Gas Storage Expansion Project (GSEP), surface facilities and underground gas storage (UGS) sites, pump stations and storage tanks (PS-ST). Since the access roads and ETL's will be determined after final design are not included in the baseline and impact area studies. Access roads and ETL's will be assessed and selected according to field characteristics and their applicability for project use. In the scope of the Gas Storage Expansion Project, impact assessment methodology is given in Section 1.4.1.

Thereafter, the digitization of the project areas of planned Gas Storage Expansion Project has been achieved by making use of the topographic maps and the KMZ files prepared by the Geographic Information Systems (GIS) Department of ÇINAR and all of these routes have been individually marked on the topographic maps.

However, for the identification of how Tuz Gölü can be affected by the increase in the volume of salt water that is to be discharged into the lake after the leaching operations, the report, namely "the Tuz Gölü Special Environmental Protection Area (SEPA) [(1)] Water Resources Management Plan Project" which the obsolete Environmental Protection Agency for Special Areas had ÇINAR Mühendislik A.Ş. prepare in May 2010, has been referred to in an attempt to assess and analyze the data obtained regarding the area within Tuz Gölü Lower Basin and to conclude results with respect to the sustainability of the water resources in the region as in the Underground Gas Storage Project. In this report, it was aimed to:

- Determine the borders of the lower basin controlling the hydrologic system in the surveyed area and identify the surface water resources in the basin,
- Reveal the general condition by precipitation, temperature and evaporation analyses for the region within and around the basin through weather stations,
- Prepare isohyetal and pan evaporation maps in digital media through the use of the obtained data,
- Identify and map the geology of the surveyed area,
- Determine the aquifer, permeable and non-permeable locations after identifying the geological formations,
- Determine the existing wells (irrigation, drinking, etc.) within the borders of Tuz Gölü Lower Basin, set the parameters that would represent the aquifer environment and prepare a general water budget,

[1] Due to the presence of rich plant biodiversity, important bird and habitat areas and cultural and social values; Tuz Gölü SEPA was declared by the Decision of Cabinet of Ministers numbered 2000/1381 dated 14.09.2000. The Lake Tuz protected area is within the borders of three provinces namely, Ankara, Konya, and Aksaray. The Lake Tuz is the second largest lake in Turkey after Lake Van which is mainly fed by undergroundwater. The Lake Tuz Special Environmental Protection Area in Turkey managed by Ministry of Environment and Urbanization General Directorate for Protection of Natural Assets is a very large protected area 7414.40 km^2.

- Formulate the conceptual model that would reflect the hydrologic system,
- Prepare, in line with all surveys, the hydrogeological map with a scale of 1/50,000 to represent the study area,
- Determine the procedure and principles of the management of water resources, taking into consideration the existing data,
- Take rational planning decisions regarding the protection and utilization of the water resources, considering their amount and quality,
- Take decisions and make recommendations for sustainable use of water resources,
- Build up a database containing the CBS (any digital/printed maps and documents from organizations and institutions) studies in line with the objectives and requirements of the project, their conversion into the country's coordinate system (to UTM European Datum 1950-6 system), entry (digitalization) of positional data, and all other studies.

In the preparation of this report containing the most up-to-date data on the ecosystem and water sustainability of Tuz Gölü, it has benefited from the studies and projects presented below:

- "The Development of the Tuz Gölü Special Environmental Protection Area Water Resources Management Plan and its Principles",
- EIA report approved in 2003,
- EIA I. The Addendum Report approved in 2005,
- The "Project for Determining the Biodiversity of Tuz Gölü" (PDBTG) carried out from 2005 to 2007,
- The "Project for Researching the Salt Pans in Turkey in Floristic and Synecologic Terms", supported by the State Planning Organization (SPO) and completed in 2001,
- EIA II. Addendum Report approved in 2013,
- The "Project for Habitat Monitoring of Tuz Gölü Special Environment Protection Zone", supported by the Environmental Protection Agency for Special Areas and completed in 2010 and also
- The expert opinions of Prof. Latif Kurt, an academic in Ankara University, who had previously published scientific articles titled *"A study on the relationship of salinity and endemism ratio in the surrounding of Salt Lake (Inner Anatolia, Turkey)"*, *"New halophytic syntaxa from Central Anatolia (Turkey)"*, *"Phytosociological studies on salty steppe communities of the Central Anatolia, Turkey"*.

1.4.1. Impact Assessment Methodology for Gas Storage Expansion Project

The impact assessment methodology adopted by the Gas Storage Expansion Project (GSEP) allows a semi-quantitative analysis of the impacts on the environmental and social components. The methodology is also based on cartographical outputs and experiences of the monitoring activities of the Underground Gas Storage Project to identify the hot-spot areas where there is the potential for significant impacts to occur.

Overall the methodology is based on the identification of the following elements:

- Project elements,
- Project works,
- Impact factors,
- Sensitivity,
- Impacts and
- Mitigation measures.

The figure below is summarizing the overall methodology that will be described in detail in the following paragraphs.

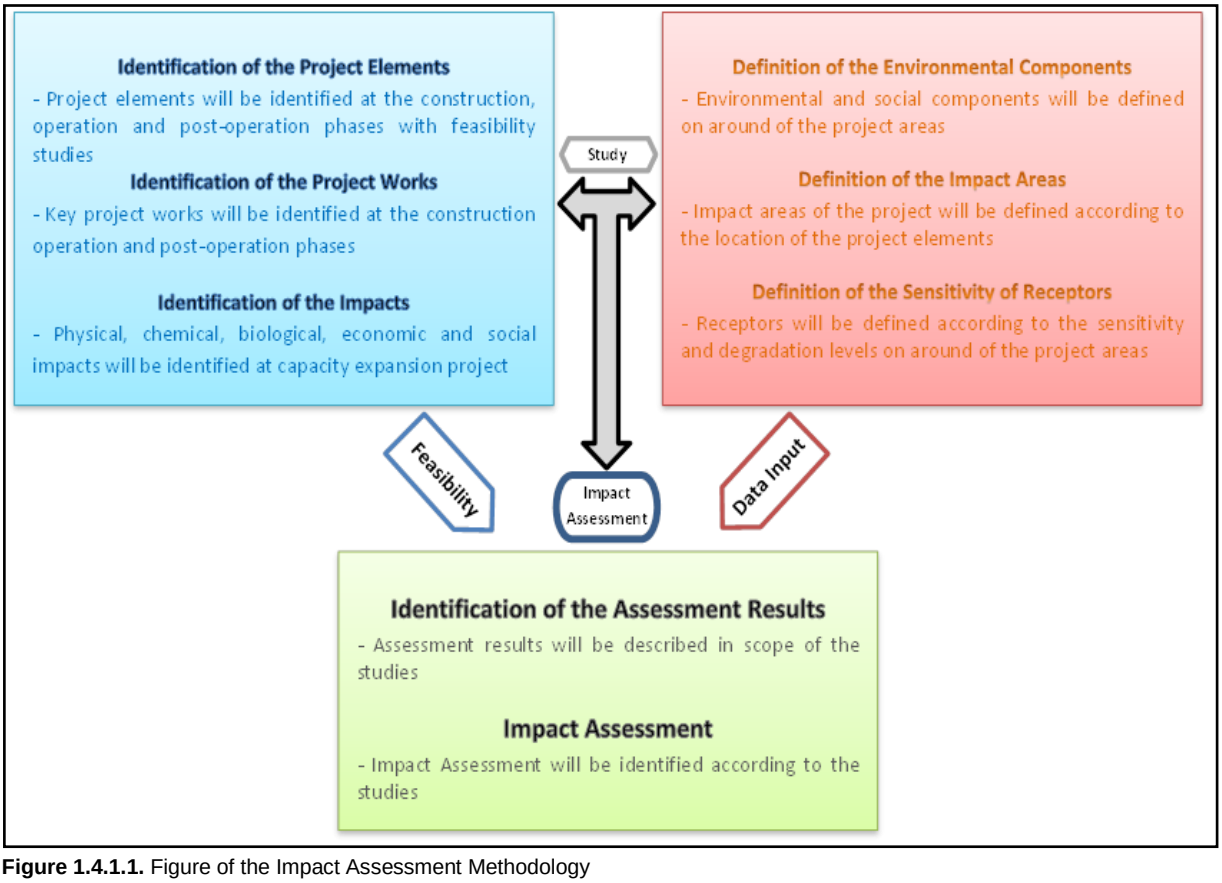


Figure 1.4.1.1. Figure of the Impact Assessment Methodology

Project Components

Distinct project components have been identified for the Gas Storage Expansion Project during the three phases of construction, operation and decommissioning. Mitigation measures have been given in Chapter 5.

Construction

- Pipelines,
- Pump stations,
- Water storage tanks,
- Valve chambers,
- Pigging stations,
- Pipe stock areas,
- Road crossings,
- Channel crossings,
- River crossings,
- Access roads,
- Surface facilities,
- Drilling sites (UGS sites),
- Connection lines,
- Camp sites and
- ETL's (Energy Transmission Lines).

Operation

- Compressor stations,
- Surface facilities,
- Connection lines,
- Gas storage sites (UGS sites) and
- Natural gas branchman line.

Decommissioning

- Compressor stations,
- Surface facilities,
- Connection lines,
- Gas storage sites (UGS sites) and
- Natural gas branchman line.

Project Actions

Each project component is characterized by a series of activities needed for its construction, functioning/ operation or decommissioning phase which all are likely to affect the environment. Project actions are listed below;

- Pre-construction works,
- Land acquisition,
- Topsoil/subsoil removal and storage,
- Pipeline excavations,
- Pipeline installations,
- Hydrostatic testing,
- Bio restoration works,
- General construction works,
- Accommodation,
- Drilling works,
- Mechanical works,
- Leaching works,
- Gas Storage works,
- Operation of the gas storages and
- Decommissioning works.

Impact Factors

Impact factors are physical, chemical, biological and social stressors that the project is introducing in the environment as a consequence of various project actions, and that have the potential to trigger changes, both positive and negative to the receiving environment. The impact factors identified for the Gas Storage Expansion Project are the following;

- Dust emissions,
- Gaseous emissions,
- GHG emissions,
- Changes of topographic shape,
- Reduction of topsoil quality/availability,
- Reduction of the agricultural activities,
- Site reinstatement and ecological restoration,
- Demand for freshwater,
- Demand for potable water,

- Discharge of wastewaters,
- Discharge of brine,
- Disposal of drilling effluents,
- Changes in natural water bodies,
- Sedimentation,
- Emission of noise and vibration,
- Demand for waste disposal services,
- Demand from the quarries,
- Removal of natural vegetation,
- Changes in endemic species,
- Change in land use,
- Loss of Assets,
- Demand for workforce,
- Demand for goods, materials and services,
- Demand for energy,
- Increase of traffic and
- Influx of workers.

In the scope of the Gas Storage Expansion Project interaction between the project actions and impact factors is given in Table 1.4.1.1.

Table 1.4.1.1. Interaction between the Project Actions and Impact Factors

IMPACT FACTORS	PROJECT ACTIONS														
	Pre-construction works	Land acquisition	Topsoil/subsoil removal and storage	Pipeline excavation	Pipeline installations	Hydrostatic testing	Bio restoration works	General construction works	Accommodation	Drilling works	Mechanical works	Leaching works	Gas Storage works	Operation of the gas storages	Decommissioning works
Dust emissions	■	■	■	■	■		■	■	■					■	■
Gaseous emissions	■	■	■	■	■		■	■	■	■	■		■	■	■
GHG emissions	■							■	■	■	■		■	■	
Changes of topographic shape	■	■	■	■		■	■	■	■	■					■
Reduction of topsoil quality/availability	■	■	■	■	■	■	■	■	■						■
Reduction of the agricultural activities	■	■	■	■	■	■	■	■	■						■
Site reinstatement and ecological restoration							■								■
Demand for freshwater	■		■	■	■	■		■	■	■	■	■		■	■
Demand for potable water	■							■	■					■	■
Discharge of wastewaters						■		■	■	■	■	■	■	■	■
Discharge of brine												■	■		
Disposal of drilling effluents										■		■	■		
Changes in natural water bodies				■	■	■	■	■							■
Sedimentation			■	■	■	■	■	■	■					■	■
Emission of noise and vibration			■	■	■	■	■	■	■	■	■	■	■	■	■
Demand for waste disposal services	■		■	■	■			■	■	■	■	■	■	■	■
Demand from the quarries			■	■	■		■	■	■	■					■
Removal of natural vegetation		■	■	■	■		■	■	■	■					■
Changes in endemic species			■	■	■	■	■					■	■		
Change in land use	■	■	■	■			■	■	■	■					■
Loss of Assets		■	■	■			■	■	■	■				■	■
Demand for workforce	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Demand for goods, materials and services	■		■	■	■	■	■	■	■	■	■	■	■	■	■
Demand for energy						■		■	■	■	■	■	■	■	■
Increase of traffic	■		■	■	■		■	■	■					■	■
Influx of workers	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Impact factors are measured according to a series of features that are derived from the analysis of the project and project actions as defined above, and are combined to define the intensity of the impact factor. The features considered for the definition of the impact factor intensity, and the scheme for scoring the intensity of the impact factors are presented below and also given in Table 1.4.1.2.

- Direction: Negative (causes a worsening of the environmental or socio-economic state or quality). Positive (causes an improvement of the environmental or socio-economic state or quality)
- Magnitude: Extent of the impact factor,

- Reversibility: Possibility to restore the qualitative state of the component following the modifications occurred
- Geographic extent: Area where the impact factor exerts its influence
- Duration: Length of time when the impact factor is effective
- Frequency: How often the potential impact factor occurs
- Probability of occurrence: Likelihood that the impact factor occurs

Table 1.4.1.2. Features Considered For the Definition of the Impact Factor Intensity

Features	Scoring Scheme	Score
Direction	Positive	-
	Negative	
Magnitude	Low	5
	Medium	10
	High	15
Reversibility	Short term reversible	1
	Long term reversible	3
	Irreversible	5
Geographic extent	Local	0
	Regional	1
	Beyond regional	2
Duration	Short (<1year)	0
	Medium (1-3 years)	1
	Long (>3years)	2
Frequency	Rare	0
	Intermittent	1
	Continuous	2
Probability	Unlikely	0
	Likely	1
	Certain	2

Impact factors will be measured only after mitigation. Impact factors are also assigned a specific Area of Influence that is the area within which the likely effects are expected to happen.

The impact factors will be the summation of the values for the features;

- Direction
- Magnitude
- Reversibility
- Geographic extent

- Duration
- Frequency
- Probability of occurrence

The result of this analysis is a score of the intensity of the Impact Factor for each project component for each of the three phases of construction, operation and decommissioning that reads as follows:

- **Negligible:** The impact factor has no or extremely limited potential to drive change in the receiving environment
- **Low:** The impact factor has the potential to drive modest change in the receiving environment and could trigger some effects only in the presence of highly sensitive receptor
- **Medium:** the impact factor has the potential to drive change in the receiving environment and is expected to trigger noticeable changes in the presence of moderately sensitive receptors and significant changes to highly sensitive receptors
- **High:** the impact factor has the potential to drive significant change to moderately and highly sensitive receptor

Total levels of the impacts to environmental and social components will be assessed between the limits of the scores for the intensity of the impact factor given below.

Features	Negligible	Low	Medium	High
Direction	Positive	Negative	Negative	Negative
Magnitude	5	5 - 10	10 - 15	15
Reversibility	1	1	1 - 3	5
Geographic extent	0	0 - 1	1 - 2	2
Duration	0	0 - 1	1 - 2	2
Frequency	0	0 - 1	1 - 2	2
Probability	0	0 - 1	1 - 2	2
TOTAL SCORES	**0 – 5**	**6 - 15**	**16 - 26**	**27 - 28**

Impact Factor Calculations for the Project Actions

Air Quality Factors	IMPACT FACTORS		
FEATURES/IMPACTS	**Dust Emissions**	**Gaseous Emissions**	**GHGs**
Direction	Negative	Negative	Negative
Magnitude	15	5	5
Reversibility	3	1	1
Geographic extent	0	0	1
Duration	2	2	2
Frequency	2	1	1
Probability	2	1	1
SCORE	**24**	**10**	**11**
	Medium	Low	Low

Waste Factors	IMPACT FACTORS				
FEATURES/IMPACTS	**Hazardous Wastes**	**Mud/Formation Wastes**	**Organic Wastes**	**Recyclable Wastes**	**Demolition Wastes**
Direction	Negative	Negative	Negative	Positive	Negative
Magnitude	15	10	5	5	5
Reversibility	3	3	1	1	1
Geographic extent	1	0	0	1	0
Duration	2	1	2	2	1
Frequency	2	2	2	2	1
Probability	2	2	2	2	2
SCORE	**25**	**18**	**12**	**13**	**10**
	Medium	Medium	Low	Low	Low

Wastewater Factors	IMPACT FACTORS				
FEATURES/IMPACTS	**Domestic Wastewater**	**Washing/Oily Waters**	**Mud Waters**	**Hydro-Test Waters**	**Brine**
Direction	Negative	Negative	Negative	Negative	Positive
Magnitude	5	15	15	10	10
Reversibility	1	5	3	1	5
Geographic extent	0	0	0	1	1
Duration	2	2	1	1	1
Frequency	2	1	1	1	2
Probability	2	2	2	2	1
SCORE	**12**	**25**	**22**	**16**	**20**
	Low	Medium	Medium	Medium	Medium

Water Factors	IMPACT FACTORS				
FEATURES/IMPACTS	**Potable Water**	**Drilling Water**	**Surface Water**	**Ground Water**	**Irrigation Water**
Direction	Negative	Negative	Negative	Negative	Negative
Magnitude	5	5	10	10	5
Reversibility	1	3	5	3	1
Geographic extent	0	0	1	0	1
Duration	2	1	2	2	1
Frequency	2	2	2	2	1
Probability	1	2	2	2	1
SCORE	**11**	**13**	**21**	**21**	**10**
	Low	Low	Medium	Medium	Low

Noise Factors	IMPACT FACTORS				
FEATURES/IMPACTS	**Excavation Works**	**Construction Works**	**Drilling Works**	**Compressors**	**Traffic**
Direction	Negative	Negative	Negative	Negative	Negative
Magnitude	10	10	10	15	5
Reversibility	1	3	1	5	1
Geographic extent	1	0	0	0	0
Duration	1	2	1	2	2
Frequency	2	2	2	2	1
Probability	2	2	1	2	1
SCORE	**17**	**19**	**15**	**26**	**10**
	Medium	Medium	Low	Medium	Low

2. LEGAL FRAMEWORK

The construction and operational phases of the Gas Storage Expansion Project will be realized in strict compliance with a large number of national and international laws and regulations.

The legislative amendments and the structural changes in the Ministry that have taken place since the date when the final EIA Report was created and the interaction between these changes and the project along with the details regarding the policies and the legal framework which shall be strictly complied with during the construction and operational periods, are detailed below.

2.1. Turkish Environmental Legislation

The Ministry of the Environment which was established in 1991 is the authority in charge of the preservation and improvement of the environment, the prevention of pollution, the development of the environmental policies and strategies and the implementation of all kinds of activities in full compliance with the Turkish Environmental Legislation (the Environmental Law along with the regulations and international conventions concerning the environment). The Ministry of the Environment has maintained its services under the title of “the Ministry of Environment and Forestry (MoEF)”, after it merged with the Ministry of Forestry in accordance with the Law numbered 4856 enacted on May 01, 2003. At present, it maintains its activities under the roof of the Ministry of Environment and Urbanization.

The Ministry of Environment and Urbanization operates in close cooperation with other ministries as well as relevant entities, governmental and non-governmental organizations (NGOs). Following the institutional restructuring in Turkey, the ministries and the governmental bodies in charge of environmental management are as follows:

- Ministry of Health
- Ministry of Culture and Tourism
  - General Directorate of Cultural Assets and Museums
- Ministry of Food, Agriculture and Livestock
  - General Directorate of Agricultural Research and Policy
  - General Directorate of Food and Control
  - General Directorate of Agrarian Reform
- Ministry of Energy and Natural Resources
  - General Directorate of Mining Works
  - General Directorate of Mineral Research and Exploration (MTA)
  - Turkish Electricity Generation Company
  - Turkish Electricity Transmission Company
  - Turkish Electricity Distribution Company
- Ministry of Transport, Maritime Affairs and Communications
  - General Directorate of Highways (KGM)

- Ministry of Forestry and Water Affairs
  - General Directorate of State Hydraulic Works (DSİ)
  - General Directorate of Water Management
  - General Directorate of Nature Conservation and National Parks

The regulations which apply to the construction and operational stages of the Gas Storage Expansion Project are provided below and the issues set out in the regulations shall be fulfilled during both the construction and operational stages. Accordingly, within the scope of the Gas Storage Expansion Project, there shall be full compliance with the following laws and regulations:

- The By-Law on Environmental Impact Assessment, which came into force upon its publication in the Official Gazette numbered. 29186 and dated November 25, 2014;
  - All changes and supplements in the project are authorized within the framework of the EIA Regulation which was in force at the year of the related activity. The changes and/or supplements during the construction of the project will be carried out within the scope of the EIA Regulation and under the responsibility of the General Directorate for Environmental Impact Assessment, Authorization and Inspection of the Ministry of Environment and Urbanization.

- The Regulation relating to the Waste Management, which came into force upon its publication in the Official Gazette numbered 29314 and dated April 02, 2015;
  - The purpose of the related regulation on waste management published during the Underground Gas Storage Project is determining the borders of the waste management principal and also managing the waste practices. The general Principles of this regulation include the less uses of the natural sources, development of the environmental friendly technologies, minimum damages to environment, reusable and recyclable producing, minimum energy uses, acceptable waste management activities such as less waste producing, proper waste collecting, separating, transporting and disposing techniques (Reduce – Reuse - Recycle). Previous regulations on waste management (solid waste, hazardous waste, etc.) have been collected in this regulation together with the new applicable instruction and suggestions according to the international environmental standards. The Gas Storage Expansion Project will be carried out in parallel with this regulation same as the Underground Gas Storage Project.
  - According to this regulation, hazardous wastes, medical wastes, used batteries and accumulators and medicine wastes as well as used tires, recyclable wastes such as packaging wastes must be disposed separately from domestic wastes. In addition, generators or transporters are strictly prohibited to dump solid wastes into such recipient media like seas, lakes and the like as well as on to streets, at forests and any other spots where they

would cause environment to be affected adversely. According to the regulation, any persons and entities generating domestic solid wastes and domestic industrial solid wastes are required to get such solid wastes ready for pick-up at locations such as houses and work places as may be required by the highest territorial administrator of the respective area.

- Municipalities are responsible for collection and disposal of wastes of any facilities located within the municipal territories. Industrial facilities are directly responsible for the transport of wastes generated by them if they are located outside the municipal territories and adjoining areas. Anyone generating garbage must protect their garbage collection containers and get them ready for pick up on roads during garbage collection operations in such a manner and to such an extent ensuring that environmental health would not be deteriorated.
- According to this regulation, anyone generating Hazardous wastes is obligated to take measures in such a manner and to such an extent ensuring that waste generation would be minimized, ensure waste management in such a manner and to such an extent ensuring that effects of wastes on human health and environment would be lowered to the minimum level in compliance with the provisions of this Regulation, prepare three year waste management plans no later than six months from the entry into force of this Regulation and obtain governor's approval for them and again obtain authorization from the Governor's Office in case of temporary storage of wastes in their facilities in compliance with the provisions of this Regulation. The Governor's Office is obligated to issue indefinite authorization for temporary storage sites provided however that anyone generating more than one thousand kilograms of hazardous waste per month ships their wastes to such environmentally licensed facilities every six months at the latest and supervise this activity every six months. In this case, the total volume permissible for anyone generating wastes up to one thousand kilograms per month shall not exceed six thousand kilograms eventually.
- In cases where the hazardous wastes are stored in the territories of a facility, anyone generating such wastes are obliged temporarily to store such wastes inside robust, impermeable and safe containers meeting internationally recognized standards which are placed on a concrete site away from the facilities and buildings, put the phrase, hazardous waste, on the containers, indicate the volumes of stored substances and their storage dates on the containers, transfer wastes into other containers meeting the same specs in case containers would be damaged, ensure that the containers remain closed all the time and store wastes temporarily in such a manner and to such an extent ensuring that wastes would not undergo any chemical reaction.
- Transport of the hazardous wastes is carried out exclusively by those vehicles meeting the specs of transported wastes, which are operated by persons and

entities licensed for this duty. Any vehicles transporting hazardous wastes must carry waste disposal forms as stipulated by the regulation.

- The temporary storage, transport and disposal of hazardous wastes that might be generated at land preparation and construction phases will be in compliance with this regulation. The disposal of hazardous wastes will be provided by the firms licensed by the Ministry of Environment and Urbanization. The temporary storage license that is not subject to environmental authority will be taken in case the monthly hazardous waste amount exceeds 1,000 kg and the annual amount reaches 12,000 kg.

- The Regulation relating to the Assessment and Management of Environmental Noise, which came into force upon its publication in the Official Gazette numbered 27601 and dated June 04, 2010;
  - In the main noise controlling, assessment and management issues, this regulation is managing the reduction of the vibration and noise impacts to the public and environmental elements on and around the project areas. The instructions of this regulation have been prepared on vibration and noise control measures together with the noise level measurement, determination of exposure levels, showing noise pollution in prepared noise maps, informing the related authorities and public via the acoustic report and environmental noise level assessment reports. Probable vibration and noise pollution will be continuously measured on behalf of BOTAŞ and necessary noise control measures will be taken within the scope of this regulation during the project works.
  - Such plants for which authorizations are to be obtained in connection with noise control are specified by the Regulation on the Permissions and Licenses required to be obtained as per the Environmental Law. Accordingly, the natural gas storage project is exempt from the relevant provisions of environmental authorization in connection with noise control.
  - However, assessment is made by competent administration in view of environmental noise regarding opening and operating licenses to be issued under the Regulation on the Inception of Work Places and Operating Licenses for such plants not included in Annex-1 and Annex-2 to the Regulation on the Permissions and Licenses Required To Be Obtained as per the Environmental Law; if necessary, an environmental noise level assessment report is required and then, affirmative comments of competent administration are sought as regards this report.
  - Article 23 (1) of the Regulation relating to the Assessment and Management of Environmental Noise stipulates that any job site activities carried out inside residential areas and their vicinities may not be maintained during evening and night time shifts, other than day time shifts. In addition, paragraph ç thereof further prescribes: “construction activities of projects such as dams,

bridges, tunnels, motorways, urban main roads and mass housing requiring public interests and such construction activities which would prevent traffic in cities during day may be maintained upon a decision of the Provincial Local Environmental Board provided that no work shall be conducted during day time shifts, that the limit values found by extracting 5 dBA and 10 dBA from the day values for evening and night, respectively, are met.

- The Water Pollution Control Regulation, which came into force upon its publication in the Official Gazette numbered 25687 and dated December 31, 2004 and
  - The Regulation amending the Water Pollution Control Regulation which entered into force after it was published in the Official Gazette numbered 26786 and dated February 13, 2008,
  - The Regulation amending the Water Pollution Control Regulation which entered into force after it was published in the Official Gazette dated March 25, 2012 and numbered 28244,
  - The Regulation amending the Water Pollution Control Regulation which entered into force after it was published in the Official Gazette dated January 10, 2016 and numbered 29589.
    - The Water Pollution Control Regulation has been published mainly for the protection of the surface and ground waters and as a preventive measure and technique against water pollution. This regulation has been amended in previous years and new instructions and suggestions have been added in for water pollution issues. According to this regulation, all water pollutants should be included in the permission document, water pollution should be determined within the scope of water classification, water sources should be used properly, wastewater pollutants should be determined at the sources together with the proper treatment technologies, necessary precautions should be taken on aquatic product prevention, eutrophication risks of the surface waters should be determined and probable pollutants such as nitrogen and phosphorus, etc. should be removed, water quality standards should be maintained at the receiving environments, Watershed Conservation Plans should be prepared for the general quality criterion, pollution sourced wastes should be prevented and stability of the receiving water sources should be protected during the project works.
    - Under the regulation, it is considered appropriate to collect the domestic wastewater in a septic tank and transmit it to wastewater infrastructure facilities by means of a sewage suction truck in locations where the population is below 84 and it is not possible to build a sewage system. These facilities must retain the protocols concluded with the wastewater management authorities as well as the certificates obtained for the disposal of the wastewater by a sewage suction truck for a period of five years and present these documents to the relevant officers during their audits. Within the scope

of the Project, the assessment of legislation regarding discharge of wastewater generated at all construction sites has been given by the Final EIA Report in details. The wastewater generated at camp sites and accommodation points where the teams responsible for excavation of ETLs and access roads stay will be discharged in accordance with the provisions of related regulation.

- The Communiqué on Wastewater Treatment / Deep Sea Outfall Facility Design Approval came into force after its publication in the Official Gazette dated July 04, 2011 and numbered 644;
    - This communiqué has been prepared for the purpose of selecting the wastewater treatment technologies having proper investment and operating costs, which would ensure treatment efficiency at the required level to protect national water resources and ensure sustainable use in line with the national interests as per the Decree – Law on the Organization and Duties of the Ministry of Environmental and Urban Affairs. In addition, integrity would be achieved over the issue of process approval operations for wastewater / deep water discharge plant designs save for reinforced concrete, static and application designs thereof by it is targeted to achieve recovery and re-use of such wastewater treated nationwide whilst it is ensured that the operation owners are capable of meeting their environmental obligations more carefully, thanks to their possession of more efficient and cost effective plants. In case of installation of a wastewater treatment plant at each facility - that will be installed during the construction and operation phases - the approval for the project will be obtained in accordance with the provisions of the memorandum. For the discharge of wastewater generated at the main camp site during the construction and operation phase of the surface facilities, a wastewater treatment plant will be installed.

- The Regulation on the Control of Waste Oils, which came into force after it was published in the Official Gazette dated July 30, 2008 and numbered 26952 and the Regulation amending the Control of Waste Oils Regulation which entered into force after it was published in the Official Gazette dated November 05, 2013 and numbered 28812;
    - According to this regulation, waste oils generated from the project works should be classified with the analyses and reuse, recycle principles and proper disposal techniques should be conducted for the waste oils within the scope of the determined classification.
    - According to Article 9 of the regulation, producers of Waste oils are obligated to take necessary measures in such a manner and to such an extent as to ensure that they minimize production of Waste oils, conduct or cause to be conducted analyses of Waste oils in compliance with Article 15 thereof, store

Waste oils temporarily as specified by Article 18 separately according to their categories, not mix Waste oils in different categories arising from the facilities with each other and with PCB and other hazardous wastes and comply with the provisions of the Regulation on the Control of Hazardous Wastes for disposal of oils contaminated by hazardous wastes.
  - The waste oils which might be generated during the construction of the project (originated from machinery and equipment) will be disposed of in accordance with the related regulation.

- The Regulation on the Control of Waste Vegetable Oils, which came into force after it was published in the Official Gazette dated June 06, 2015 and numbered 29378;
  - The objective of this Regulation is to ensure regulation of legal and technical principles for the purpose of preventing Waste Vegetable Oils from being released into recipient media in such a manner and to such an extent whereby they would inflict harm on the environment directly or indirectly due to the production of vegetal waste oils and their disposal, and the developing of the necessary technical and administrative standards for management of these waste oils and identification of relevant principles, policies and programs for the environmentally compliant management of temporary storage, recovery and disposal facilities.
  - The storage and disposal of waste vegetable oils generated at camp sites and accommodation points will be carried out in accordance with the provisions of the related regulation.

- The Regulation on the Control of Medical Wastes which entered into force upon its publication in the Official Gazette dated January 25, 2017 and numbered 29959;
  - Medical Waste Control Management has the strongest instructions in respect of medical waste storage, transportation and disposal issues. According to this regulation, medical wastes should be kept in special designed, proper medical waste bins with the labels and international signs at the produced areas. Transportation and disposal operations of these wastes should be carried out via the licensed companies with the prepared national waste transportation forms.
  - The temporary storage, transport and disposal of medical wastes generated by infirmaries at camp sites and accommodation points will be carried out in accordance with the provisions of related regulations.

- The Regulation on the Control of Packaging Wastes which came into force upon its publication in the Official Gazette dated August 24, 2011 and numbered 28035;
  - The principles for the Reuse and recycling of the packaging and recyclable wastes are clearly stated in this regulation. All recyclables should be kept in

separated areas according to types and transported to the recycling facilities via the licensed companies according to this regulation.

- According to this regulation, regardless of the materials used and sources of generation, packaging wastes generating as a result of consumption must be collected at the very locations of generation separately from other wastes for the purpose of reducing environmental pollution, making optimum use of regular storage facilities and ensuring best contributions to the economy. Anyone generating packaging wastes must collect any packaging wastes generated by them separately from other wastes. Anyone generating wastes where they are situated in the territories of a district municipality realizing individual collection works as defined by this Regulation are obligated to deliver such wastes to such municipalities which are responsible for collection of wastes and / or to such licensed collection and sorting facilities having agreements with municipalities.
- The packaging wastes that will be generated during the construction works of the project will be disposed of in accordance with the above regulation.

- The Regulation on the Control of Waste Batteries and Accumulators which entered into force upon its publication in the Official Gazette dated August 31, 2004 and numbered 25569;
  - Waste batteries and accumulators should be kept in separated areas with the labels and transported to the licensed facilities or permitted institutions according to this regulation.

- The Regulation on the Control of Construction, Demolition and Excavation Wastes which came into force after it was published in the Official Gazette dated March 18, 2004 and numbered 25406;
  - These wastes should be dumped and stored into the permitted dump sites that were determined by the municipalities or authorities. Dump sites should be kept clean and continuously leveled against to the dust and visual pollution.
  - According to Article 9 of the regulation, anyone generating excavation soil and construction / demolition wastes is required to ensure waste management in such a manner and to such an extent ensuring that negative effects of wastes on environment and human health would be minimized to the lowest level possible in compliance with the provisions of this Regulation. Facilities are required to obtain necessary authorizations and approvals at the stages of waste generation, transport and storage. In addition, they may not dump their wastes at any spots other than such recovery or storage sites exclusively permitted by a municipality or highest local territorial administrator.

- The Regulation relating to the Control of Soil Pollution and Contaminated Sites by Point Sources which came into force upon its publication in the Official Gazette dated June 08, 2010 and numbered 27605;
    - According to this regulation, pollutants cannot be disposed into agricultural lands, pasturelands or the other characteristic soil areas. Soil pollution should be prevented during the project works and contaminated areas should be cleaned with the acceptable and new techniques.
    - It is essential that soil contamination is prevented at source as per this Regulation. Engage in the activities violating the standards and procedures as set forth by the Environmental Law and relevant legislation like direct or indirect disposal into soil and storage of any kind of wastes and remnants in a manner that harms the soil, is prohibited. According to the regulation, it is the responsibility of the plant owner to remediate the contaminated soil (for example, treatment). In addition, the parameters required to be analyzed after the remediation is specified by the regulation; any analysis results thereof must meet the limit values set forth by the regulation.
    - In case of soil contamination during the construction works of the project, the provisions of the respective regulation will be complied with. Oil absorber kits will be provided at each vehicle and equipment. The contaminated soil will be taken to the nearest camp site and disposed of in accordance with the Regulation on the Waste Management.

- The Regulation on the Control of Industrial Air Pollution which came into force upon its publication in the Official Gazette dated July 03, 2009 and numbered 27277;
    - The objectives of this Regulation are to control the emissions in the form of soot, smoke, dust, gas, vapor and aerosol discharged into the atmosphere as a result of the industrial and energy generation activities; to protect the people and their environments against any hazards which might arise due to the pollution of the air; to eliminate any negative effects inflicting the considerable harms on the public and the neighborhood relationships, which arise due to the pollution of the air, and ensure that such effects do not emerge.
    - The following measures will be taken according to “the air quality standards” related to openly stored agglomerate, must be met as mentioned in Annex-1 of the related regulation, in order to minimize (especially) dust emissions during the site preparation and construction phases of the Gas Storage Expansion Project.
        - Irrigation of the emission source to minimize the potential dust generation at site,
        - Filling and excreting operations by preventing hurling,
        - Reclamation of roads,
        - Covering the top of vehicles with calash during material transport and
        - Providing the top of material in 10% moisture content.

- The Regulation on Ambient Air Quality Assessment and Management which was published in the Official Gazette dated June 06, 2008 and numbered 26898;
    - Ambient air quality measurements should be performed by the project owners and reports prepared after the assessment and measurements should be submitted within the scope of the legal liability.

- The Regulation on the Control of Air Pollution originating from Heating which came into force upon its publication in the Official Gazette dated January 13, 2005 and numbered 25699;
    - Air pollution sourced due the heating operations should be assessed and measured similar to the other air quality regulations. Heating operations should be classified according to the fuel types which have been used and permissions should be obtained within scope of the legal liability.
    - The objective of this Regulation is to reduce and control any adverse effects of the pollutants discharged into the ambient air in the form of soot, smoke, dust, gas, vapor and aerosol on the air quality emanating from the facilities used for heating purposes in houses, collective housing units, cooperatives, residential complexes, schools, universities, hospitals, governmental offices, work places, public recreational spots, industrial entities and any other similar locations.
    - For the heating methods that will be used at the camp sites during the construction phase and at the surface / permanent facilities during the operation phase, there will be compliance with the provisions of the Regulation on the Control of Air Pollution originating from Heating.

- The Regulation on the Control of Exhaust Emissions which came into force after it was published in the Official Gazette dated November 30, 2013 and numbered 28837;
    - Exhaust emissions should be kept to standard levels and periodical controls of the potential air polluters such as vehicles, work machines, portable power generators, etc. should be carried out within the scope of the legal liability.
    - The objective of this Regulation is to ensure the reduction of the exhaust gas emissions to protect the living and the non-living environments from the adverse effects of the air pollution caused by the exhaust gases emitted from the on-road motor vehicles and to define necessary procedures and principles, in order to control the exhaust gas emissions by conducting measurements. This Regulation does not cover construction machinery, agricultural and forestry tractors, motorcycles and mopeds.
    - In order to ensure the minimization of exhaust gas emissions generated by vehicles that will be used during the construction works of the project, the provisions of the related regulation will be carried out.

- The Regulation on the Permissions and Licenses Required to Be Obtained as per the Environmental Law which came into force upon its publication in the Official Gazette dated September 10, 2014 and numbered 29115 and the Regulation amending the Permissions and Licenses Required to Be Obtained as per the Environmental Law Regulation which entered into force after it was published in the Official Gazette dated September 21, 2016 and numbered 29834;
    - According to this regulation, all permissions should on waste, wastewater, air quality, noise control management elements should be obtained before discharges or releases of the pollutants sourced from the project works.
    - The objective of this Regulation is to determine any works and operations in connection with the authorizations and licenses required to be obtained due to the activities and facilities included in Annex 1 and Annex 2 as per the Law No. 2872 on the Environment and the tasks and responsibilities of competent authorities with regard to these works and operations as well as the obligations of environmental consulting companies, enterprises and operations authorized by the Ministry.
    - This project is subject to Article 9.1.2 of Annex 1 list, which reads: “Facilities with total storage tank capacity of 10,000 m³ or more for natural gas / LNG (liquefied natural gas) and similar gases (excluding storage tanks used for heating purposes)”.
    - The construction activities within the scope of the Gas Storage Expansion Project will be carried out in three phases. Thus, the “Environmental Authorization” will be obtained after the start of construction the phase and the engaging of all storage caverns. Environmental monitoring studies will be carried out in accordance with the EIA and Environment Management Plan.

- The Environmental Audit Regulation which entered into force upon its publication in the Official Gazette dated November 21, 2008 and numbered 27061;
    - The environmental conditions of the projects should be periodically checked by independent and licensed companies according to this regulation. All project owners are responsible for the inspection of the own activities by the permitted companies or government authorities.
    - The objective of this Regulation is to regulate the procedures and principles of Environmental Audits throughout the process ranging from the operating startup of facilities or activities to their de-commissioning in the best interests of environmental protection and qualifications and obligations of staff, environmental management units / environmental officers conducting audits and companies authorized for environmental services. The environmental management actions will be carried out in accordance with the Environmental Audit Regulation, as the project is subject to the Article 9.1.2 of Annex 1 list, which reads: “Facilities with total storage tank capacity of 10,000 m^3 or more for natural gas / LNG (liquefied natural gas) and similar gases (excluding

storage tanks used for heating purposes)" of the Regulation on Permits and Licenses in accordance with the Environment Law after the completion of construction and start of operation.

- The Regulation on the Management of End-of-Life Tires which came into force after it was published in the Official Gazette dated November, 25, 2006 and numbered 26357;
    - The inert tires of the vehicle or equipment should be stored and disposed according to the instructions of this regulation.

In addition to the Environmental Law and relevant regulations, there are also a number of laws and regulations dealing with the preservation of nature and wildlife. These laws and regulations are listed below:

- Law No. 2863 on the Conservation of Cultural and Natural Assets (as amended by Law No. 5226),
    - The objectives of this law are to determine the definitions in connection with any movable and immovable cultural and natural assets requiring protection, regulate any such operations and activities to be conducted in connection therewith and determine the organization and duties of the entity which will take the required principle and implementation decisions thereof. In the event that any archaeological and cultural heritage is encountered at the project site during the construction activities of the energy transmission lines and the access roads, actions will be taken in accordance with the provisions of the related law.

- Law No. 4342 on Pastures,
    - The objectives of this law are to ensure the use, protection and rehabilitation of any pastures, meadows and winter shelters as well as any publicly owned grazing land and pastures in compliance with the rules to be set forth in connection therewith. There are several pastures which would be used as part of the project. Therefore, the necessary authorizations will be obtained as per the Pastures Law.

- Law No. 5403 on Soil Conservation and Land Use,
    - The objective of this law is to lay down the procedures and principles which shall ensure planned land usage for protection and development of soil in compliance with the principle of environment priority sustainable development by preventing it from suffering losses including losses of its properties through natural or artificial means.

- The Aquatic Products Law No. 1380,
    - This law incorporates issues on the protection, production / reproduction and control of aqua products present in seas and inland waters. Under annually published communiqués, the law defines such areas where fisheries are prohibited or limited. Under this law, aqua products are defined as plants and animals existing in seas and inland waters, as well as their eggs whilst reproduction locations are described as such water sites where it is appropriate to produce / reproduce aqua products, on which any production / reproduction means may be installed and operated.

- The Regulation on Aqua Products which came into force upon its publication in the Official Gazette dated August 10, 2005 and numbered 25902;
    - This Regulation covers the following in the best interests of ensuring the optimum use of aqua products: aqua products' licenses, hunting to be carried out for sporting purposes, the relocation of production / reproduction places, the use of explosives and hazardous substances in hunting, such hazardous and contaminant substances prohibited to be dumped at aqua products' production / reproduction sites, the qualifications and conditions of production / reproduction means and tools and their use, the regulation of the hunting, troll fishing of aqua products, incidentally produced aqua products, the health / hygiene of aqua products, the production of finished and semi-finished items to be produced from aqua products and the procedures and principles and prohibitions, limitations, obligations, measures, control and supervision in connection with the marketing of aqua products.

- The Regulation on the Conservation of the Wetlands which came into force upon its publication in the Official Gazette dated May 17, 2005 and numbered 25818;
    - The legal basis of this regulation is the Convention on the Preservation of Wetlands of International Significance Especially as the Habitat of Water Birds" (RAMSAR Convention). This Regulation defines wetland as follows: "Wetlands: Whether it is within any water courses, quagmires, rushy / reedy locations and peat moors and those portions of these areas, which remain as wetland ecologically from the coastal strips to the hinterland, which cover depths of not more than 6 meters in the ebbing phase of the tidal movements of natural or artificial, permanent or temporary waters and stagnant or flowing, fresh or salty seas and have significance as the habitats of living organisms, particularly water birds".
    - According to this Regulation any lakes and streams (rivers, creeks and brooks) are defined as wetland. The zone designated in such a manner and to such an extent not exceeding maximum 2500 meters from wetland is defined as a buffer zone. In addition, the River Protection Band (As supplemented by OG Issue No 27684 of August 26, 2010) refers to the zone developed by

natural life habitats such as dunes, stretches of gravels, stones, rocks, reeds, quagmires, bushes and peat moors towers the hinterland from the point where water contacts land in the case of rivers according to the river's geographic position, topographic properties and land current utilization condition. The realization of any activities located on the river protection bands of seasonal and permanent streams is subject to authorization by the General Directorate of Nature Conservation and National Parks. An application is made to the Ministry of Forestry and Water Affairs with a form to be designated by the Ministry of Forestry and Water Affairs, for activities included in Annex-1 and Annex-2, in these areas, and a certificate of authorization is issued in the event that the application is deemed to be appropriate.

- Law No. 4915 on Terrestrial Hunting.
  - Law No 4915 on Terrestrial Hunting came into force upon its publication in the Official Gazette dated July 11, 2003 and numbered 25165. The Law extends protection to certain designated areas under annual Central Hunting Commission decisions, closing certain areas to hunting temporarily or permanently. The areas placed under protection by the Terrestrial Hunting Law are Wild Life Protection Sites and Wild Life Development Sites.

Moreover, there are also a number of laws and regulations, apart from the ones mentioned above, related directly or indirectly to environmental auditing. Therefore, the Gas Storage Expansion Project is also subject to these laws and regulations. The laws and regulations which apply to the construction period of the project are listed below:

- The Regulation on the Business Licenses which entered into force upon its publication in the Official Gazette dated August 10, 2005 and numbered 25902;
  - The objective of this Regulation is to regulate the procedures and principles which shall apply for issue of work place inauguration and operating licenses.

- The Labor Law No. 4857,
  - The objective of this law is to regulate the rights and responsibilities of workers employed under a labor contract with an employer with respect to labor conditions and the working environment.

- Law No. 6331 on Occupational Health and Safety,
  - The objective of this law is to regulate the tasks, powers, responsibilities, rights and obligations of employers and employees to ensure Labor Health and Safety and improve current health and safety conditions at places of work.

- Regulation on Occupational Health and Safety Risk Assessment (published in the Official Gazette No. 28512, dated 29.12.2012)

- Occupational Health and Safety Services Regulation (published in the Official Gazette No. 28512, dated 29.12.2012)

- Regulation on Occupational Health and Safety Committees (published in the Official Gazette No. 28532, dated 18.01.2013)

- Regulation on Suspension of Operations at Workplaces (published in the Official Gazette No. 28603, dated 30.03.2013)

- Regulation on Health and Safety Conditions in the Use of Work Equipment (published in the Official Gazette No. 28628, dated 25.04.2013)

- Regulation on the Protection of Employees From the Hazards of Explosive Atmospheres (published in the Official Gazette No. 28633, dated 30.04.2013)

- Regulation on the Procedures and Principles of Training of Employees on Occupational Health and Safety (published in the Official Gazette No. 28648, dated 15.05.2013)
- Regulation on Emergency Situations at Workplaces (published in the Official Gazette No. 28681, dated 18.06.2013)

- Regulation on the Use of Personal Protective Equipment in the Workplace (published in the Official Gazette No. 28695, dated 02.07.2013)

- Regulation on Vocational Training of Workers To Be Employed in Jobs in Hazardous and Very Hazardous Class (published in the Official Gazette No. 28706, dated 13.07.2013)

- Regulation on Health and Safety Measures To Be Taken in Workplace Buildings and Additional Structures (published in the Official Gazette No. 28710, dated 17.07.2013)

- Regulation on Protecting Employees From Risks Related to Noise (published in the Official Gazette No. 28721, dated 28.07.2013)

- Regulation on Protection Employees From Vibration-Related Risks (published in the Official Gazette No. 28743, dated 22.08.2013)

- Regulation on Health and Safety Signs (published in the Official Gazette No. 28762, dated 11.09.2013)

- Regulation on Occupational Health and Safety at Construction Works (published in the Official Gazette No. 28786, dated 05.10.2013)

- Regulation on Dust Control (published in the Official Gazette No. 28812, dated 05.11.2013)

- Regulation on Prevention of Large Industrial Accidents and Reduction of Their Effects (published in the Official Gazette No. 28867, dated 30.12.2013)

- Regulation on Occupational Responsibilities and Trainings of Workplace Physicians and Other Health Personnel (published in the Official Gazette No. 29209, dated 18.12.2014)

- Regulation on Duties, Powers, Responsibilities and Trainings of Occupational Safety Experts (published in the Official Gazette No. 29342, dated 30.04.2015)

There will be in compliance with the labor health and occupational safety laws, legislations and regulations mentioned above during the installation of the energy transmission lines and the opening of the access roads and all activities within the scope of the Project.

2.1.1. The Environmental Impact Assessment (EIA) Procedure in Turkey

The First Regulation on Environmental Impact Assessment in Turkey was promulgated in the Official Gazette dated February 07, 1993 and numbered 21489. The regulation was later revised on June 23, 1997, June 06, 2002 and December 16, 2003. The latest version of the EIA Regulation was published in the Official Gazette dated November 25, 2014 and numbered 29186. The objective of this regulation is to regulate the administrative and technical procedures and principles to be complied with throughout the EIA process.

2.2. International Treaties Recognized by Turkey

Turkey has signed many international treaties and conventions in order to protect environment and biodiversity. Major international treaties in respect of which compliance may be required as part of this project are listed below:

- “Biodiversity Convention” as ratified by Law No 4177 of August 29, 1996 and published in the Official Gazette No 22860 of December 27, 1996,

- “Convention on the International Trade of Endangered Species of Wild Animals and Plants” as published in the Official Gazette No 22672 of June 20, 1996,

- “Convention on the Protection of Wildlife and Habitats in Europe” (BERN CONVENTION) taking effect upon its publication in the Official Gazette dated January 09, 1984 and numbered 18318 after ratification under Cabinet Decree No 84-7601,

- Convention on the Preservation of Wetlands of International Significance Especially As the Habitat of Water Birds" (RAMSAR Convention) as ratified by Cabinet Decree No 94/5434 of March 15, 1994 and published Official Gazette No 21937 of May 17, 1994,

- "International Convention on the Protection of Birds" as ratified by Law No 797 of December 01, 1996 and published in the Official Gazette No 12480 of December 17, 1996,

- "Convention on the Protection of World Cultural and Natural Heritage" as published in the Official Gazette No 17959 of February 14, 1983.

It will be ensured that these species are protected and handed down the next generations by complying with the Biodiversity Convention, CITES, BERN, RAMSAR Conventions and International Convention on the Protection of Birds

The flora and fauna types that might be encountered on the project areas are defined in Section 4.13. It will be ensured these species are protected and handed down the next generations by complying with the Biodiversity Convention, CITES, BERN, RAMSAR Conventions and International Convention on the Protection of Birds.

Besides, there are movable/immovable cultural assets protected in scope of 2863 no. law under the supervision of T.R. Ministry of Culture and Tourism, Cultural Heritage and Museums General Directorate, Konya Protection of Cultural Heritage Regional Committee Directorate (for Aksaray and Konya provinces) and Ankara 2 No. Cultural Heritage Protection Regional Committee Directorate, and the planned fresh water line and 20 no. well/cavern area stays within the parcels registered in the Emirgazi Küllütepe Mound and Adalının Mound as stated in the Notice of T.R. Ministry of Culture and Tourism, Cultural Heritage and Museums General Directorate, Konya Cultural Assets Protection Regional Committee Directorate dated December 29, 2016 and numbered 3236. As it can be seen on the topographical map with 1/25,000 scaled presented in Appendix 2, where these cultural assets are marked, there is no physical intersection with the cultural assets and the required permits are going to be obtained by making application to Konya Cultural Heritage Protection Regional Committee Directorate before any kind of physical and construction applications to be carried out in scope of the registered parcels.

In the event that any cultural asset is encountered at the project site during the construction activities, the construction activities will be stopped and the nearest Civilian Authority or Directorate of Museum will be informed in compliance with the provisions of "the Convention on the Protection of World Cultural and Natural Heritage".

2.3. World Bank Environmental and Social Safeguards Policies

WB financing is aimed for the Gas Storage Expansion Project. Therefore, in addition to national laws and regulations WB safeguard policies and WB Group's Environmental, Health and Safety Guidelines have been considered while preparing the ESIA Report. The relevant safeguard policies considered during the ESIA studies are as follows:

- OP 4.01 – Environmental Assessment
  - The document includes the determination, explanation, prevention and mitigation of the negative environmental and social impacts and supporting the environmental sustainability alternatives.

- OP 4.04 – Natural Habitats
  - The document seeks to ensure that infrastructure and other development projects supported by World Bank take into account the conservation of biodiversity, as well as the numerous environmental services and products which natural habitats provide to human society.
  - Specifically, the policy prohibits Bank support for projects which would lead to the significant loss or degradation of any Critical Natural Habitats, whose definition includes those natural habitats which are either legally protected, officially proposed for protection or unprotected but of known high conservation value.

- OP 4.11 – Physical Cultural Resources
  - The objective of this document is to avoid, or mitigate, adverse impacts on cultural resources from development projects that the World Bank finances.

- OP 4.37 – Safety of Dams
  - The document included that experienced and competent professionals design and supervise construction, and that the borrower adopts and implements dam safety measures through the project cycle. The policy also applies to existing dams where they influence the performance of a project.

- OP 4.12 – Involuntary Resettlement for Social Policies
  - The document aims to avoid involuntary resettlement to the extent feasible, or to minimize and mitigate its adverse social and economic impacts.
- Access to Information Policy
  - This Policy governs the public accessibility of information in the Bank's possession. This document reflects revisions approved by the Board on April 3, 2013, and June 30, 2015, and supersedes the World Bank Policy on Access to Information, July 1, 2013. This Policy is based on five principles:
    - Maximizing access to information;
    - Setting out a clear list of exceptions;

- Safeguarding the deliberative process;
- Providing clear procedures for making information available; and
- Recognizing requesters' right to an appeals process.

WBG EHS Guidelines

The EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards.

The General EHS Guidelines contain information on environmental, health, and safety issues potentially applicable to all industry sectors. It is designed and should be used together with the relevant industry sector.

The General EHS Guidelines cover:

1. Environmental

- Air Emissions and Ambient Air Quality
- Energy Conservation
- Wastewater and Ambient Water Quality
- Water Conservation
- Hazardous Materials Management
- Waste Management
- Noise
- Contaminated Land

2. Occupational Health and Safety

- General Facility Design and Operation
- Communication and Training
- Physical Hazards
- Chemical Hazards
- Biological Hazards
- Radiological Hazards
- Personal Protective Equipment (PPE)
- Special Hazard Environments
- Monitoring

3. Community Health and Safety

- Water Quality and Availability
- Structural Safety of Project Infrastructure
- Life and Fire Safety (L&FS)
- Traffic Safety
- Transport of Hazardous Materials
- Disease Prevention
- Emergency Preparedness and Response

4. Construction and Decommissioning

- Environment
- Occupational Health and Safety
- Community Health and Safety

The industry sector EHS Guidelines are designed to be used together with the General EHS Guidelines document, which provides guidance to users on common EHS issues potentially applicable to all industry sectors.

The EHS Guidelines for Onshore Oil and Gas Development include information relevant to seismic exploration; exploration and production drilling; development and production activities; transportation activities including pipelines; other facilities including pump stations, metering stations, pigging stations, compressor stations and storage facilities; ancillary and support operations; and decommissioning. This document is organized according to the following sections:

- Industry Specific Impacts and Management
  - Environmental
    - Air emissions
    - Wastewater/effluent discharges
    - Solid and liquid waste management
    - Noise generation
    - Terrestrial impacts and project footprint
  - Community Health & Safety
    - Fire and explosion
    - Air quality
    - Hazardous materials
    - Transportation
    - Well blowouts
- Emergency preparedness and response
- Performance Indicators and Monitoring

Other International Standards and Guidelines

The following World Health Organization (WHO) standards are referred as IFC Guidelines:

- WHO Ambient Air Quality Standards;
- WHO Drinking Water Standards.

Comparison tables of the national and IFC standards on environmental issues are given in Appendix-12.

2.4. Project Standards

TG Gas Storage Expansion Project and project requirements will be performed according to the national and international standards given above. Measured parameters will be compared with the national standard values in scope of the relevant regulations of Environmental Law at first and OPs of The World Bank and then compared with the international standards (IFC, European Council Directives) as the project standards for the investigation of the most stringent standards applicable to the project and international standards will be complied for all result assessments. Results will be explained in assessment reports prepared after the analyses and comparisons will be done as to the base results conducted during the EIA and ESIA process given in Section 4. Baseline Studies of this report.

Table 2.4.1. Parameter Assessment According to the Standards

Parameter Value	National Standards	International Standards	Assessment Report	Result
Low	Control	Conformity	To be prepares according to values	Proper
High	Conformity	Conformity/ Mitigation	Prepares with the mitigation measures in scope of improper values	Follows with ongoing analyses

The following section compiles the project standards that will ensure the full compliance of the Project with the abovementioned regulatory requirements**.**

Environmental standards in all applicable legal requirements are given below. Project standards to be fully followed in the project are specifically defined as the most stringent of these legal requirements for the following components:

- Air Quality
- Wastewater Discharges,
- Noise and Vibration Emissions,
- Potable & Drinking Water and
- Soil Pollution.

Table 2.4.2. Project Air Quality Standards

Project Air Quality Standards			
SO_2 (µg/m3)	Hourly	350 (2019) (not to exceed more than 24 times in a year)	Ambient Air Quality Limits of Turkish Regulation on Air Quality Assessment and Management (Annex I: Future Target Values) Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on Ambient Air Quality and Cleaner Air For Europe
	24 hr	20 (guideline)	WHO Ambient Air Quality Guidelines- IFC General EHS Guidelines: Environmental Air Emissions and Ambient Air Quality – General Guidelines for Human Health
	Yearly and Winter Season (Oct 1 – March 31) (for wildlife and ecosystem)	20 (2014)	Ambient Air Quality Limits of Turkish Regulation on Air Quality Assessment and Management (Annex I: Future Target Values)
NO_2 (µg/m3)	Hourly	200 (2024) (not to exceed more than 18 times in a year)	Ambient Air Quality Limits of Turkish Regulation on Air Quality Assessment and Management (Annex I: Future Target Values) WHO Ambient Air Quality Guidelines- IFC General EHS Guidelines: Environmental Air Emissions and Ambient Air Quality – General Guidelines for Human Health Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on Ambient Air Quality and Cleaner Air For Europe
	Yearly	30	WHO Ambient Air Quality Guidelines- IFC General EHS Guidelines: Environmental Air Emissions and Ambient Air Quality – Guidelines for Europe (for ecosystem)
NO_x (µg/m3)	Yearly (for vegetation)	30 (2014)	Ambient Air Quality Limits of Turkish Regulation on Air Quality Assessment and Management (Annex I: Future Target Values)
PM10 ($\mu g/m^3$)	24 hr (For human health)	50 (2019) (not to exceed more than 35 times in a year)	Ambient Air Quality Limits of Turkish Regulation on Air Quality Assessment and Management (Annex I: Future Target Values)
	Yearly (for human health)	20 (guideline)	WHO Ambient Air Quality Guidelines- IFC General EHS Guidelines: Environmental Air Emissions and Ambient Air Quality – General Guidelines for Human Health

Project Air Quality Standards			
PM2.5 (µg/m³)	24 hr	25 (guideline)	WHO Ambient Air Quality Guidelines- IFC General EHS Guidelines: Environmental Air Emissions and Ambient Air Quality – General Guidelines for Human Health
	1 year	10 (guideline)	WHO Ambient Air Quality Guidelines- IFC General EHS Guidelines: Environmental Air Emissions and Ambient Air Quality – General Guidelines for Human Health
Lead (µg/m³)	Yearly (human health) (LTL)	0.5	Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on Ambient Air Quality and Cleaner Air For Europe
Benzene (µg/m³)	Yearly	5 (2021)	Ambient Air Quality Limits of Turkish Regulation on Air Quality Assessment and Management (Annex I: Future Target Values) Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on Ambient Air Quality and Cleaner Air For Europe
CO (mg/m³)	Max daily 8 hr average	10 (2017)	Ambient Air Quality Limits of Turkish Regulation on Air Quality Assessment and Management (Annex I: Future Target Values) Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on Ambient Air Quality and Cleaner Air For Europe
Ozone (µg/m³)	Maximum daily 8 hr average	100 (guideline)	WHO Ambient Air Quality Guidelines- IFC General EHS Guidelines: Environmental Air Emissions and Ambient Air Quality – General Guidelines for Human Health

LTL: Long Term Limit
STL: Short Term Limit

Table 2.4.3. Project Domestic Wastewater Discharge Standards

Project Domestic Wastewater Discharge Standards				
Parameter	**Unit**	**Concentration (mg/L)**	**Minimum Treatment Efficiency (%)**	**Reference regulatory requirements**
Biochemical Oxygen Demand (BOD5)	mg/L	25	70-90 40	Turkish Urban Wastewater Treatment Regulation (08.01.2006 dated and 26047 numbered) Council Directive 91/271/EEC of 21 May 1991 Concerning Urban Wastewater Treatment
Chemical Oxygen Demand (COD)	mg/L	125	75	Turkish Urban Wastewater Treatment Regulation (08.01.2006 dated and 26047 numbered) Council Directive 91/271/EEC of 21 May 1991 Concerning Urban Wastewater Treatment
Suspended Solids (SS)	mg/L	35 35 (more than 10,000 p.e.) 60 (2,000-10,000 p.e.)	90 90 (more than 10,000 p.e.) 70 (2,000-10,000 p.e.)	Turkish Urban Wastewater Treatment Regulation (08.01.2006 dated and 26047 numbered) Council Directive 91/271/EEC of 21 May 1991 Concerning Urban Wastewater Treatment
pH	-	6-9		IFC General EHS Guidelines
Total Nitrogen	mg/L	10		IFC General EHS Guidelines
Total Phosphorus	mg/L	2		IFC General EHS Guidelines
Oil and Grease	mg/L	10		IFC General EHS Guidelines
Total Coliform Bacteria	MPN**/100mL	400*		IFC General EHS Guidelines

** Not applicable to centralized, municipal wastewater treatment systems which are included in EHS Guidelines for Water and Sanitation.*

*** MPN = Most Probable Number*

The provisions set in Turkish Urban Wastewater Treatment Regulation, of which the discharge quality standards will be valid by 31.12.2014, are exactly the same with the provisions set in EU Directive 91/271/EEC on Urban Wastewater Treatment. The EU Directive 91/271/EEC sets the general rule of; secondary treatment in all areas and tertiary treatment with enhanced removal of nutrient is required for sensitive areas.

Table 2.4.4. Drinking Water Standards

Project Drinking Water Standards			
Microbiological Parameters			
Parameter	**Unit**	**Parameter Value /100 mL**	**Reference regulatory requirements**
Escherichia coli (E.coli)	-	*0/100 ml*	*Regulation on Water for Human Consumption Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption*
Enterococcus	-	*0/100 ml*	
Coliform bacteria	-	*0/100 ml*	
Chemical Parameters			
Parameter	**Unit**	**Parameter Value**	**Reference Regulatory Requirements**
Acrylamide	µg/l	0,1	Regulation on Water for Human Consumption Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption, except Antimony, Cadmium and Vinyl Chloride. WHO parameters are used as project standards for these parameters.
Antimony	µg/l	2	
Arsenic	µg/l	10	
Benzene	µg/l	1	
Benzopyrene	µg/l	0,01	
Boron	mg/l	1	
Bromate	µg/l	10	
Cadmium	µg/l	3	
Chromium	µg/l	50	
Copper	mg/l	2	
Cyanide	µg/l	50	
1,2-Dichloracethane	µg/l	3	
Epichlorhydrin	µg/l	0,1	
Fluoride	mg/l	1,5	
Lead	µg/l	10	
Mercury	µg/l	1	
Nickel	µg/l	20	
Nitrate	mg/l	50	
Nitrite	mg/l	0,5	
Pesticides	µg/l	0,1	
Total pesticides	µg/l	0,5	
Polycyclic aromatic hydrocarbons	µg/l	0,1	
Selenium	µg/l	10	
Tetrachloroethane and Trichloroethane	µg/l	10	
Trihalomethanes-total	µg/l	100	
Vinyl chloride	µg/l	0,3	

Table 2.4.5. Non-Domestic Wastewater Discharge standards

Parameter	Unit	Composite Sample (2 hr)	Composite Sample (24 hr)	Reference Regulatory Requirement
Chemical Oxygen Demand (COD)	mg/l	400	300	Regulation on Water Pollution Control Table 19: Mixed Industrial Wastewater Discharge Standards (Industries for which sector identification cannot be done)
Total Suspended Solids (TSS)	mg/l	200	100	
Oil & Grease (O&G)	mg/l	20	10	
Total Phosphorus	mg/l	2	1	
Total Chromium	mg/l	2	1	
Chromium (Cr+6)	mg/l	0.5	0.5	
Lead (Pb)	mg/l	2	1	
Total Cyanide (CN-)	mg/l	1	0.5	
Cadmium (Cd)	mg/l	0.1	-	
Iron (Fe)	mg/l	10	-	
Fluoride (F-)	mg/l	15	-	
Copper (Cu)	mg/l	3	-	
Zinc (Zn)	mg/l	5	-	
Mercury (Hg)	mg/l	-	0.05	
Total Kjeldahl Nitrogen	mg/l	20	15	
Fish Biotest (ZSF)	-	10	10	
Colour	(Pt-Co)	280	260	
pH	-	6-9	6-9	

Soil Quality Standards

"Regulation on Soil Pollution Control and Point Source Contaminated Sites" originally published in the Official Gazette no. 27605, dated 8 June 2010; and amended on 14 June 2012 in the Official Gazette no. 28323 stating that the binding articles provisionally would be effective as of 08 June 2013. There was another amendment to the regulation on 11 July 2013. The recent amendment states that the binding articles for the investigation of soil contamination, risk assessment criteria, reporting process will be in force 06 May 2015.

The preceding regulation, namely the Soil Pollution Control Regulation (SPCR), which became ineffective as of 8 June 2010, did not provide specific guidelines related to dealing with specific types of contamination or activities. The limits given by SPCR did not differentiate the land use type and, thus, did not provide soil pollution limits for industrial areas. The SPCR required compliance with the limits given in the regulation regardless of where the site was located.

In the new regulation, the contaminant indicator parameters for soil for pipeline transport are given by defining generic threshold values indication of contamination

Table 2.4.6. Noise Standards for Industrial Facilities

Noise Standards for Industrial Facilities			
Receptor	**Period**	**Noise Level**	**Reference regulatory requirement**
Noise sensitive areas - with training, culture and health areas, summer houses and camps	**LAeq (dBA) Day-time 06:00 – 19:00**	60	Regulation on Assessment and Management of Ambient Noise - Turkish Ambient Noise Limits Generated by Industrial Facilities
	LAeq (dBA) Evening-time 19:00 – 22:00	55	
	LAeq (dBA) Night-time 22:00 – 06:00	50	
Combination of commercial and noise sensitive areas - with dense residential buildings	**One Hour LAeq (dBA) Daytime 07:00 - 22:00**	55	IFC General EHS Guidelines - Noise Standards based on WHO Guidelines
	One Hour LAeq (dBA) Night time 22:00 - 07:00	45	
Industrial areas	**LAeq (dBA) Day-time 06:00 – 19:00**	70	Regulation on Assessment and Management of Ambient Noise - Turkish Ambient Noise Limits Generated by Industrial Facilities
	LAeq (dBA) Evening-time 19:00 – 22:00	65	
	LAeq (dBA) Night-time 22:00 – 06:00	60	

Table 2.4.7. Noise Standards for Construction Sites

Noise Standards for Construction Sites		
Activity (Construction, Demolition and Renovation)	**Noise Level**	**Reference regulatory requirement**
	Leq (dBA) Day-time (06:00 – 19:00)	
Building	70	Regulation on Assessment and Management of Ambient Noise - Turkish Ambient Noise Limits Generated by Construction Sites
Road	75	
Other sources	70	

2.5. Local Corporate Requirements

The project is committed to structure the corporate systems to ensure the following minimum national legislation requirements.

All permits required by the Environment Law and other applicable legislation will be obtained for the project.

The definition of projects for which EIA reports have to be prepared, the EIA process and the relevant principles and procedures are given in detail in the regulation on EIA. Annex 1 of the regulation points out the projects subject to EIA studies and Annex 2 of the regulation points out the projects subject to selection and elimination criteria.

Article 30 in Annex 1 of the regulation on EIA states that, “Pipelines for the transportation of gas, oil or chemicals with a diameter over 600 mm and a length of more than 40 km”, are included in the list of projects subject to EIA studies. The proposed Gas Storage Expansion Project is 56-inch and 40-inch pipeline systems such as fresh water line, brine discharge line and gas branchman line of approximately 185 km in total and is subject to EIA studies. The planned Gas Storage Expansion Project and highways, roads, rural roads, railways, rivers, irrigation channels, water pipeline and sewage systems and other pipelines which exist on the project route will cross at several locations. Protocols will be signed for the aforementioned crossings with the relevant authorities (Ministry of Defence, Regional Directorates or General Directorate of Highways, Regional Directorates or General Directorate of State Hydraulic Works, All Provincial Special Administrations and Provincial Irrigation Channel Corporations) after the EIA process and before the construction phase and required permits will be obtained. BOTAŞ will have the construction drawings for crossings prepared and submitted to the relevant authorities for approval. The crossings will be installed with compliance to the construction drawings.

The potable and domestic water needs during the construction phase will be fulfilled according to the requirements of the Regulation on Water Intended for Human Consumption and Public Sanitation Law. The required permits will be obtained from the General Directorate of State Hydraulic Works to dig wells where municipal water cannot be provided.

The solid waste that would occur at all stages of project will be stored separately in impermeable, closed containers according to their properties; solid waste which can be recycled, which cannot be recycled and hazardous waste. It is planned to make use of the existing Regular Solid Waste Landfills and Recycle, Storage and Disposal Facilities licensed by MoEU and not to establish waste landfills in the scope of the project.

Land to be acquired in the scope of the project will be expropriated by the General Directorate of BOTAŞ. Permits for the use of areas qualified as forest in the scope of the project will be obtained as per Article 17 of the Forestry Law no. 6831 and permit studies and procedures will be conducted in line with the relevant instructions of the General Directorate of Forestry.

In addition, necessary permits will be obtained for the use of agricultural areas for non-agricultural purposes within the scope of the project, from the relevant Provincial Directorates of Food, Agriculture and Livestock and/or the Ministry of Food, Agriculture and Livestock, as applicable, as per the provisions of Law no. 5403 on Soil Conservation and Land Use, which was published on the Official Gazette no. 25880 dated 19.07.2005.

In the presence of areas qualified as pasture in the project area, necessary application for the amendment of the allocation purpose of the areas in question will be made to Provincial Directorates of Food, Agriculture and Livestock (Provincial Pasture Commission) prior to the execution of the investment.

The provisions of the approved plans on the project route (at all scales) will be considered as per the Law on Land Development no. 3194. The pipeline and the permanent above ground installations will be inserted on the Spatial Environmental Master Plans and other relevant land development plans after the EIA process. The buildings in the scope of the project will be installed with compliance to land development plans, regulations, licences and annexes regarding the Law on Land Development and building licence will be obtained.

The necessary permits will be obtained from the General Directorate of Cultural Entities and Museums and relevant Regional Directorate of Cultural Entities Protection Boards for the archaeological sites which are on the project route. If any cultural entity in the scope of the Law on Cultural and Natural Entities Protection on the project route is crossed during the works, the work will be stopped and the nearest Administrative Authority and the Directorate of Museum will be informed pursuant to the relevant legislation.

For the mine sites on the project route, correspondence with the General Directorate of Mining Affairs of Ministry of Energy and Natural Resources and Provincial Special Administrations was carried out. Protocols will be issued with the mine licence owners if needed and necessary permits will be obtained.

All the construction studies within the scope of the project will be performed in compliance with the provisions of the “Regulation on Buildings Constructions in Disaster Areas” which was published in the Official Gazette no. 26454 and dated 06.03.2007 (amended by the Official Gazette no. 26511 and dated 03.05.2007).

The project route determination studies were performed avoiding the areas with high risk of landslide, flood, avalanche, rock fall whenever possible, design were carried out taking the earthquake risks and active fault zone crossings into account.

It is required to obtain environmental permit(s) for the facilities prior to the operation phase according to the Regulation on Permits and Licences in Accordance with the Environment Law. However, due to the activities that will take place at the above ground installations, such as combustion plants at the compressor stations, environment permit(s) are required to be obtained in the scope of Project

The environmental permit will cover all Project activities that are subject to permits according to the regulation (e.g., emission permit, discharge permit, environmental noise permit). The application for environmental permits shall approve compliance with the regulation and shall document that the commitments provided in the EIA report are fulfilled. However, before starting Project activities the commitments on permits cannot be documented, so a "Provisional Activity Certificate" will be obtained. The activities are allowed to be started with the receipt of the certificate, which is effective for one year and the required information, licenses, and permits will be provided within this period. The application for an environmental permit shall be made when the required procedures are completed 3 months before the effective date of Provisional Activity Certificate ends. If the procedures cannot be completed for the application within this period, the period of validity of the Provisional Activity Certificate is extended provided by a letter citing justification. Once the environment permit is received the period of validity is 5 years and 3 months; prior to the end of this period an application shall be resubmitted for a permit extension.

Each phase of the Project will be conducted within compliance to the required legal procedures according to the national and international legislation and authority opinions. The authorities have informed MoEU about their significant issues on the Project, also taking into consideration the public opinions and suggestions received during public participation meetings in the scoping phase of the Project. Within the Project many procedures will be implemented to address significant issues.

Moreover, the corporate standards of BOTAŞ will be applied through all phases of the Project. BOTAŞ is aware that quality, occupational health & safety, environmental, and social issues bear prime importance in the success of the BOTAŞ in all of its functions, Projects, and performed activities. BOTAŞ shall always carry out its obligations with utmost quality and with minimized impacts to health, safety, environment, and communities by ensuring that all related risks and aspects are identified, assessed and mitigated appropriately. The health and safety of its employees and of third parties shall always take precedence over profitability. That is why integrated management systems shall be given the necessary priority.

The principles which form the integral part of BOTAŞ's policy are listed below;

- BOTAŞ seeks to implement effective and dynamic Integrated Management Systems applicable to all its activities. These Integrated Management Systems shall be process based and fully compliant with, and cover all aspects of, ISO 9001; ISO 14001 and OHSAS 18001;
- BOTAŞ implements all safety measures to prevent accidents and damage to the health of our employees and to the parties whose health is affected by our operations; to prevent occupational diseases; and to prevent environmental and social impacts;

- BOTAŞ believes that health, safety, environmental, and social issues are a common responsibility at all levels of BOTAŞ, and contractors & suppliers are obliged to act in line with BOTAŞ standards;
- BOTAŞ does not permit reprisal of any employee objecting to safety conditions or refusing to perform work under unsafe conditions;
- BOTAŞ develops Emergency Response Plans to be able to respond to accidents and emergency situations for all activities;
- BOTAŞ develops Incident Investigation Procedures to ensure all incidents are investigated to prevent recurrence of similar incidents;
- BOTAŞ will prevent pollution and protect the environment and communities by implementing a mitigation hierarchy aimed at avoiding, reducing, restoring, and, as appropriate, off-setting adverse impacts of activities;
- BOTAŞ aims to contribute to sustainable development and achieve net benefits to biodiversity conservation;
- BOTAŞ will ensure transparency, accountability and stakeholder dialogue on social, environmental, safety, security and other relevant issues through regular, free, prior, and informed consultations;
- BOTAŞ will pay particular attention to disadvantaged and vulnerable groups to establish an independent mechanism to address concerns and grievances, in a timely, impartial and transparent manner;
- BOTAŞ will seek to avoid involuntary resettlement and mitigate the impacts of economic displacement by careful planning and implementation of appropriate measures to mitigate adverse impacts on displaced persons;
- BOTAŞ will support economic and social development of communities and improve positive benefits through sustainable social investment programmes for the communities along the BOTAŞ Pipeline route;
- BOTAŞ provides high-quality systems, components, services, and solutions that, based on risk considerations, consistently meet the needs of its projects, works, ventures, and installations and thus cover the interests of BOTAŞ, the Host Government, the stakeholders and our business partners;
- BOTAŞ is committed to comply, in all its activities, with the applicable legislation, internationally accepted standards, and best business practices of the International Natural Gas Industry;
- BOTAŞ is committed to continually improve the effectiveness as well as the efficiency of its integrated management systems in every aspect of its business activities;
- BOTAŞ promotes the motivation and satisfaction of its employees and business partners;
- BOTAŞ emphasizes the importance of individual advancement and organizational improvement by encouraging further education and training, as well as, to communicate the requirements of health, safety, environmental and social policies and improve health, safety and environmental skills and

competency requirements of employees, contractors and others at the workplace;
- BOTAŞ will strictly adhere to the “Code of Conduct”.

2.6. Permitting and Licensing Process

BOTAŞ Petroleum Pipeline Corporation is licensed by the EPDK in the town of Sultanhanı-Aksaray district, where the Project area is located, with regard to natural gas storage with the license number "DEP / 1238-6 / 155" until June 27, 2037. As expressed in the official remark of Republic of Turkey Ministry of Energy and Natural Resources, General Directorate of Mining Affairs, presented in Appendix-1.5, the mentioned licensed area is marked as an enclosed area for the application of licenses numbered ER: 1157024.

After the EIA process, land acquisition fees will be paid to the beneficiaries by the Ministry of Energy and Natural Resources in accordance with the expropriation plan and the "Expropriation Law" numbered 2942, through the expropriation commission.

Within the scope of the project, agricultural activities can be carried out along the fresh water, natural gas branchman line and brine discharge line, after the construction works are completed. For the areas such as the surface facilities and drilling locations that cannot be used for agricultural purposes, a “Permission for Non-agricultural Usage” will be obtained through an application to the Aksaray Provincial Food, Agriculture and Livestock Directorate by preparing an “Soil Conservation Project” in accordance with Article 13 of "Law on Soil Conservation and Land Use" numbered 5403.

Within the scope of the Gas Storage Expansion Project, the amount of fresh water supplied from Hirfanlı Dam will increase as it will be used for the leaching process. In the present situation, obtaining 15 hm^3/year of water from Hirfanlı Dam, operated by EÜAŞ, is regarded as appropriate by the official letter of DSİ General Directorate, Department of Survey and Planning, dated November 12, 2005 and numbered 3543 (See Appendix-1.2). For obtaining 60 hm^3/year water to meet the needs of capacity growth, the required permission has been obtained from DSİ General Directorate, Department of Survey and Planning. A protocol will be signed between DSİ General Directorate and BOTAŞ Petroleum Pipeline Corporation in line with the official letter dated December 21, 2016 and numbered 858388 of the DSİ General Directorate, Department of Survey and Planning presented in Appendix-1.6.

The package wastewater treatment plant that will be established within the scope of the Project will be approved within the context of "Wastewater Treatment / Deep Sea Outfall Facility Project Approval Circular (2014/07)" dated March 04, 2014 and numbered 2746. An “Environmental Permit Certificate” will be obtained from Aksaray Environmental and Urbanization Provincial Directorate for discharging of treated wastewater by the package wastewater treatment plant in accordance with the provisions of the "Environmental Permit and License Regulation" published in the Official Gazette dated September 10, 2014 and numbered 29115. In addition, official remark from DSİ 4th Regional Directorate will be

sought for giving wastewater generated from the treatment of domestic wastewater in the package treatment plant to receiving environment.

Washing waters formed during the production of plant-mixed concrete, will be subjected to physical treatment in the field in order to provide the stated limit values stated in "Water Pollution Control Regulation (RCC) (Amended in OG- March 25, 2012-28244)" published in the Official Gazette (OG) dated December 31, 2004 and numbered 25687. See the Table 7.5 (Sector: Mining Industry (Cement, Stone Crushing, Tile, Plate Manufacture, Marble Processing, Soil, Industry etc.). After related standards are met, recycling will be applied within the scope of "Wastewater Treatment / Deep Sea Discharge Facility Project Approval Circular (2014/07)". However, if discharge is needed, the discharge criteria specified in RCC Table 7.5 shall be met and it will be discharged to the nearest receiving environment. For the wastewater treatment plant to be established within this scope, approval will be obtained within the scope of "Wastewater Treatment / Deep Sea Discharge Facility Project Approval Circular (2014/07)" No. 2746 dated March 04, 2014 (2014/07). In accordance with the provisions of the "Environmental Permit and License Regulation" published in the Official Gazette dated September 10, 2014 and numbered 29115, "Environmental Permit Certificate" shall be obtained for discharging the treated wastewater and the facility will be taken into operation simultaneously with the Project.

In accordance with the Construction Law No. 3194, for the buildings that will be built within the scope of the Project, the Construction Plan will be presented to and approved by Aksaray Special Provincial Administration since the Project area is outside the Municipal Adjacent Area Boundaries. The “Permission of Building Usage” shall be obtained from Aksaray Special Provincial Administration for the units such as administrative buildings that will be used continuously within the license area.

A "Business Start-Up and Operation License (GSM)" shall be obtained for the administrative building in accordance with Article 6 of the "Regulation Regarding Beginning Business and Working Licenses" published in the Official Gazette dated August 10, 2005 and numbered 25902.

2.7. Legal Framework and Relevant Provisions of National Legislation and International Standards for Social Assessments

2.7.1. National Legislation

Stakeholder Consultations: The Environmental Impact Assessment Regulation No. 29186 dated November 25, 2014 obligates stakeholder participation and informing. Paragraph 1 of Article 9 of the Regulation states:

"To inform the public about the investment, to get opinions and suggestions about the project; Public Participation Meeting is held in a central place and hour determined by the Governorship where the relevant people, who are expected to be most affected by the

project, can reach easily at the date determined by the Ministry with the participation of the ministry professed institutions / organizations and the project owner."[2]

It is stated in sub-paragraph 4 of the same article of the EIA Regulation that the distribution of brochures to inform the public by the institutions / organizations that has been granted by the ministry and that surveys and seminars can be held and brochures published before the Public Participation Meeting.

Land Acquisition: The Turkish Constitution, Article 46, under Subsection 3 of the Section 3 with the heading of "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 specific article of Constitution states that except special cases the compensation value and the decreed increased value will be paid in full and cash to the users. The compensation of the farmers farming the acquired land is paid in full and cash, in any case. Private users cannot benefit from expropriating public lands and assets without paying compensation to the public at large. Even when land is acquired for public interest, expropriation agencies cannot benefit from the expropriation of private lands and assets without paying into a private bank account, in advance of actual land appropriation and project construction, the value of the expropriated assets.

Expropriation Law sets the procedures to be followed during;

If and when it is required for public interest;

- 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.

[2] Environmental Impact Assessment Regulation, Official Gazette Date: 25.11.2014 Number of Official Gazette: 29186

Article 3 - Requirements for Expropriation:

For the implementation of large projects hat concern issues such as energy, irrigation and afforestation etc., administrations may expropriate by paying the fee for the immovables, resources and their easement rights in cash or as down payment in equal installments, as required for the conduct of public services or interventions they are obliged to provide according to laws.

Article 7 - Initial Procedures to be performed for Expropriation and Administrative Annotation:

The administration that is to perform the expropriation prepares or commissions a scaled plan indicating the borders, surface area and type of the immovable assets of resources on which expropriation is to be constituted or appurtenances is to be constituted by way of expropriation, enables that the owners of the expropriated immovable asset, the ownerships if no title deed registrations are present and their addresses by binding them to documents through an inquiry it would conduct on the land registry, tax and population registry records as well as additional inquiries. After the administration takes the decision on expropriation, the related annotation of the expropriation in the title deed is notified to the title deed administration where the mentioned immovable asset is registered. If the owner changes after the notification date, the title deed administration is obliged to notify the administration of any changes to occur in the ownership or in the rights in kind that are separate from the ownership. If the document to be obtained from the court indicating that a request for the identification of the expropriation fee and the registration in the name of the administration as per the Article 10 is not submitted to the title deed administration within six months starting on the annotation date, this annotation is ex officio deleted from the title deed records.

Article 8 – Procurement Procedure:

According to Article 8, after the expropriation decision is made, the administration will appoint one or more valuation commissions (consisting of at least 3 people) to identify the value of immovables. Additionally, one or more negotiation commissions (again consisting of at least 3 people) will be assigned for negotiations. After the administration has notified the owner of its intent to take over the immovable, shall the owner or its representative apply to the administration (within 15 days after notification) with the intent of selling the immovable, negotiation meetings are held on the date identified by the commission and if an agreement is reached on an amount that is not more than the estimated value, an official report is signed. The administration prepares the amount stated in the report within forty days and asks the owner to transfer the ownership rights in the name of the administration on the date specified in the title deed. The expropriate fee is is paid as soon as the transfer of rights is realized. In cases where an agreement is not reached or transfer is not realized, action is taken as per the Article 10 of this Law.

Article 10 – Identification of the Expropriation Fee by Court and Registration of Immovable in the Name of the Administration:

Article 10 states that, if the expropriation cannot be realized through procurement, the administration applies to the court of first instance in the locale of the immovable and requests that the expropriation fee for the immovable asset be identified and decision be made for its registration in the name of the administration in return for the payment of this fee. Within 30 days of the application of the administration, the Court notifies the owner of the immovables through an annotated invitation on the date of hearing. To those whose addresses could not be found after inquiries an announcement is made according to Notification Law (No. 7201) inviting them to attend the hearing. The Court also publishes information on the expropriation at least once in a local newspaper (if there is any) issued in the location of the immovable and in one of the newspapers circulated across Turkey. On the day of the hearing, the judge invites the parties to reach an agreement on the value of the immovable. If an agreement is reached, the judge considers this fee to be the expropriation fee. In cases where an agreement is not reached, the judge schedules an expedition (within ten days) to identify the value of the immovable asset and a date for the second hearing (within thirty days after the expedition). On the second hearing, if the parties fail to agree on the value once again, the judge will assign a new expert committee for the valuation within fifteen days and then identifies a fair and equitable expropriation fee by referencing both the reports and statements of the parties and experts. The identified fee is the expropriation fee of the immovable, resource or its easement rights. The Court grants fifteen days to the administration for the fee to be deposited in a bank on behalf of the owner. In cases where the right holder could not be identified, the court decides on the registration of the immovable in the name of the administration under the circumstances that the bank receipt indicating the amount was blocked to be given to the right holder to be revealed in the future and that this decision is notified to the title deed department and the bank where the fee was deposited. The provision on registration is definitive and the parties reserve their rights for appeal pertaining to the fee.

Article 27 – Urgent Expropriation:

The Expropriation Law (Article 27) states that, subject to a Council of Ministers Decree for national defence or in case of emergency, any immovable property may be expropriated by the administration undertaking expropriation for public interest. Such a Council of Ministers Decree has already been obtained by BOTAŞ with respect to the Project. To apply the emergency clause of the law and to urgently acquire land through this mechanism, the value of the immovable property and asset (crop values are determined and paid prior to land entry) in question must be appraised by the valuation commission (established within the expropriation agency consist of relevant discipline experts) according to the article 11 of the Expropriation Law within seven days. The expropriation shall be made after the appraised value of the immovable is fully deposited by the administration in the name of the owner.

Article 27 of the law allows the expropriation body to enter the field earlier as compared to the timing of entry under the standard expropriation procedures, but the article does not limit the claims of the owner on valuation of land and fixed assets. The valuation process is done by the court or court nominated experts within one week. This article will only be used when other avenues have failed.

Involuntary Resettlement: There is no provision regarding the minimization of resettlement in Turkish Law. Resettlement entitlements are limited to certain categories of PAPs. Each nuclear family within affected dwellings is entitled to a resettlement home; this provisioning exceeds international standards. No legal provisions force the project proponents to prepare social impact assessments and/or resettlement action plans under Turkish Law. Resettlement Law 5543 provides resettlement options to displaced PAPs by asking their preferences for urban versus rural resettlement.

Resettlement activities are regulated by Resettlement Law no 5543 and Regulation for the Execution of Resettlement Law. Resettlement Law deals with the families applying to related governmental agencies in the project region and requesting government assisted resettlement. Resettlement assistance of the government is provided for entitled families while expropriation compensation payments are paid to all individuals possessing immovable properties in the project area. According to Article 3 of the Law, three types of resettlement can be applied for as the choices and requests of affected families. Article 3 of the Law sets this point out as follows;

"ARTICLE 3 – (1)

a) 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 the Ministry of Environment and Urbanization (MoEU), house, management building, animal, agricultural devices and tools, workbench and credits one or more.

b) 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.

c) Physical settlement: This type of resettlement is implemented through providing construction credit support to a family within the amount of loan determined by the Ministry (MoEU) 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".

Article 12 of the Law refers to the resettlement of persons whose immovable assets are expropriated, and specifies eligibility criteria for government assisted resettlement as follows:

"(1) Due to the construction of a dam, an area adjacent to the dam, an area under protection, airport, highway, railway, plant and other facilities related to national economy and defense will be erected by public institutions and organizations; and due to the implementation of special laws and in order to protect historical and natural values;

a) The families who have to leave their locations/places as a result of partial or full expropriation of their immovable properties,

b) The families who do not own any immovable property, but who reside in the expropriation area at least for three years before the beginning of the calendar year, in which the resettlement planning studies were commenced, will be resettled to the locations/places indicated by the Ministry (MoEU) according to the provisions of this Law, provided that they request.

(2) However, the families who own immovable properties to be expropriated but have left their properties before the commencement date of the resettlement planning studies shall not be resettled. Families who have sold their immovable properties without any compulsory circumstances, within the last 3 years as of this date, and did not purchase immovable property with an equal or higher value, shall not be resettled even if they did not leave their properties.. The compulsory circumstances mentioned above shall be determined by the regulations.

(3) Among the families residing in the expropriation area, those who are affected from the expropriation implemented by the public institutions and organizations, can be resettled by the Ministry to a location indicated within their village boundaries upon their written application, if they do not want to be resettled by the government in any other place, provided that the suggestion of relevant Governorate and the approval of the Ministry of Interior are obtained.

(4) Among the families included in the scope of this article, and requested to be resettled by the Government;

- the families who do not apply within the ninety-day following the ending date of the announcement of resettlement, and

- the families who do not commit to deposit the amount determined by the Ministry (MoEU) from their expropriation compensation they received or will receive, or their full expropriation compensation and additional increase awarded by court in the case that the amount of expropriation compensation is lower than the amount (determined by the Ministry) into the account of the Central Account Unit of the Ministry, shall not be resettled.

Resettlement Assistance; Article 9 of Resettlement Law explains the resettlement assistance (which is similar to WB Standards) as follows:

a) "A first, house and its plot (for building),

b) For craftsmen, artisans and tradesmen: work place and its' building plot and operation credit to enable them providing for their livelihood,

c) For farmers, land, necessary agricultural inputs, agricultural structures or plot of structure, and in kind and in cash operation and equipment credits as envisaged in agricultural resettlement project (specific),

d) In case of the request of the right holder families (entitled to resettlement), resettlement credits can be given to the families collectively or individually, if the house, work place and agricultural land are found by themselves and their suggestions are approved by MoEU."

Other forms of assistance can be summarized as follows;

"Transportation (moving) of those entitled families to the resettlement areas (sites) shall be provided free of charge by the government according to the "Transportation (moving) Project" to be prepared (specifically) by the Ministry,"

To summarize, families with no land, tenants of houses and/or work places, tenant users of the land, formal/informal users of treasury or forest areas and artisans including itinerant peddlers without immovable property, but living in that area can be entitled to government assisted resettlement for which they might be eligible.

The Resettlement Law and Regulation for the Execution of Resettlement Law provides for government-assisted resettlement in rural and urban areas. For now, no residential areas or units are present in the 48m study corridor of fresh water, brine water lines and natural gas pipeline. However, since the well points are not fully and exactly determined yet, it is not possible to say whether there are residential areas or units or not. However, it is quite likely that a residential area or unit to be found on the well points since there is many scattered and small settlements within the license borders. If found, the project will need to act according to the resettlement law and to entitle those who are forced to relocate as a result of land acquisition for investments in public interest.

The Resettlement Law incorporates a level of consultation with affected persons and communities that goes beyond mere information provision. These concern the choice of resettlement sites rather than on encompassing broader aspects of the resettlement process, such as house design, community layout, etc. Consultation with the affected people is essential in the framework of Government assisted resettlement since the compensation payments for residential structures, together with other immovable assets on them, are kept by the resettlement agency to finance the new resettlement arrangements. Because the resettlement homes are often more costly than the traditional homes the affected people resided in prior to the project, the difference between the value of the affected assets and the actual costs of new residential units are paid by the affected people over a period of time. Thus, the concept of replacement cost that is privileged by the WB and IFC, is not used in Government assisted resettlement arrangements. As a result, owners of affected assets

often reject Government assisted resettlement; only those families that use (but not own) the Project affected homes consider participation in such arrangements. The Regulation for the Execution of Resettlement Law states that the disclosure shall be held by written notification and be posted for 30 days at an apparent place (such as schools, mosques, cooperative buildings etc.

2.7.2. International Standard

Stakeholder Consultations:

World Bank Operational Manual 4.01

WB OP 4.01 requires for all Category A and B projects proposed for IBRD or IDA financing, during the EA process, to consult project-affected groups and local non-governmental organizations (NGOs) about the project's environmental aspects and to take their views into account. The borrower (in this case BOTAŞ) will initiate such consultations as early as possible. For Category A projects (in this case Gas Storage Expansion Project), the borrower consults these groups at least twice: (a) shortly after environmental screening and before the terms of reference for the EA are finalized; and (b) once a draft EA report is prepared. In addition, the borrower consults with such groups throughout project implementation as necessary to address EA-related issues that affect them.

For meaningful consultations between the borrower and project-affected groups and local NGOs on all Category A and B projects proposed for IBRD or IDA financing, the borrower provides relevant material in a timely manner prior to consultation and in a form and language that are understandable and accessible to the groups being consulted.

For a Category A Project, the borrower provides for the initial consultation a summary of the proposed project's objectives, description, and potential impacts; for consultation after the draft EA report is prepared, the borrower provides a summary of the EA's conclusions. In addition, for a Category A project, the borrower makes the draft EA report available at a public place accessible to project-affected groups and local NGOs. Once the borrower officially transmits the Category A EA report to the Bank, the Bank distributes the summary (in English) to the executive directors (EDs) and makes the report available through its Info Shop.

World Bank Operational Manual 4.12

The overall objectives of the Bank's policy on involuntary resettlement are the following:

- Involuntary resettlement should be avoided where feasible, or minimized, exploring all viable alternative project designs.
- Where it is not feasible to avoid resettlement, resettlement activities should be conceived and executed as sustainable development programs, providing sufficient investment resources to enable the persons displaced by the project to share in

project benefits. Displaced persons should be meaningfully consulted and should have opportunities to participate in planning and implementing resettlement programs.

- Displaced persons should be assisted in their efforts to improve their livelihoods and standards of living or at least to restore them, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.

As relevant with stakeholder engagement, the WB OP 4.12 requires the borrower to prepare a resettlement plan or a resettlement policy framework that includes measures to ensure that the displaced persons are;

- informed about their options and rights pertaining to resettlement;
- consulted on, offered choices among, and provided with technically and economically feasible resettlement alternatives;
- provided prompt and effective compensation at full replacement cost for losses of assets attributable directly to the project

The resettlement plan or resettlement policy framework for impacts covered in this policy, the Bank also requires that displaced persons and their communities, and any host communities receiving them, are provided timely and relevant information, consulted on resettlement options, and offered opportunities to participate in planning, implementing, and monitoring resettlement. Appropriate and accessible grievance mechanisms are established for these groups.

Involuntary Resettlement: Involuntary resettlement may cause severe long-term hardship, impoverishment, and environmental damage unless appropriate measures are carefully planned and carried out. For these reasons, the overall objectives of the Bank's policy on involuntary resettlement are the following:

- Involuntary resettlement should be avoided where feasible, or minimized, exploring all viable alternative project designs.

- Where it is not feasible to avoid resettlement, resettlement activities should be conceived and executed as sustainable development programs, providing sufficient investment resources to enable the persons displaced by the project to share in project benefits. Displaced persons should be meaningfully consulted and should have opportunities to participate in planning and implementing resettlement programs.

- Displaced persons should be assisted in their efforts to improve their livelihoods and standards of living or at least to restore them, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.

To address the impacts covered under involuntary settlements of this policy, the borrower (BOTAŞ) prepared a Resettlement Policy Framework (RPF) including measures to ensure that the displaced persons are;

- informed about their options and rights pertaining to resettlement;
- consulted on, offered choices among, and provided with technically and economically feasible resettlement alternatives; and
- provided prompt and effective compensation at full replacement cost for losses of assets attributable directly to the project.
- If the impacts include physical relocation, the resettlement plan or resettlement policy framework includes measures to ensure that the displaced persons are
- provided assistance (such as moving allowances) during relocation; and
- provided with residential housing, or housing sites, or, as required, agricultural sites for which a combination of productive potential, locational advantages, and other factors is at least equivalent to the advantages of the old site, compensation for their losses at full replacement cost and assistance in improving their former living standards, income earning capacity and production levels or at least restoring them.

OP (WB operational policy) 4.12 requires that no land shall be acquired before compensation is paid in full to the affected people.

Moreover, OP 4.12 requires the Project to create and implement a resettlement plan, the preparation of which involves the involuntary resettlers and hosts in planning. In this regard, OP 4.12 requires the Project to systematically inform and consult resettlers about their options and rights during the preparation of the resettlement plan.

“Replacement cost” is the method of valuation of assets that helps determine the amount sufficient to replace lost assets and cover transaction costs endorsed by OP 4.12, and entails the following:

- Paying special attention to the adequacy of the legal arrangements concerning land title, registration, and site occupation;
- Publicising among people to be displaced the laws and regulations on valuation and compensation;
- Establishing criteria for determining the resettlement eligibility of affected households; e.g., households that have only partially lost their assets but are no longer economically viable should be entitled to full resettlement; and
- Developing mechanisms to prevent illegal encroachers and squatters, including an influx of nonresidents entering to take advantage of such benefits, from participating in the compensation arrangements, by an early recording of the numbers and names of affected populations entitled to compensation/rehabilitation

OP 4.12 also recognizes that some types of loss, such as access to public services, customers and suppliers, grazing or forest areas, cannot easily be compensated for in monetary terms and, therefore, requires the Project to attempt to make or establish access to equivalent and culturally acceptable resources and earning opportunities.

While OP 4.12 covers all affected people, it calls on the Project to pay particular attention to the needs of the poorest groups to be resettled and specifically states that the absence of legal title to land should not bar compensation to the population adversely affected by the Project, indigenous groups, ethnic minorities and pastoralists who may have usufruct or customary rights to the land or resources taken for the project.

According to the WB OP 4.01; Environmental and social management framework (ESMF) examines the issues and impacts associated when a project consists of a program and/or series of sub-projects and the impacts cannot be determined until the program or sub-project details have been identified. The ESMF sets out the principles, rules, guidelines and procedures to assess the environmental and social impacts. It contains measures and plans to reduce, mitigate and/or offset adverse impacts and enhance positive impacts, provisions for estimating and budgeting the costs of such measures, and information on the agency or agencies responsible for addressing project impacts.

Gaps between National and International Policies: There are several gaps between international and local standards in regard to the preparation of Resettlement Action Plan (RAP). First, under Turkish law, RAP is not a requirement for investments that cause economic and physical displacement. Similarly, Social Impact Assessment is a requirement under international policy, but not under Turkish law. In addition, within the national legal framework, there is a lack of specific requirements for consultation and disclosure of RAP and SIAs. The activities relevant to RAP consultations and disclosure are less explicit in Turkish national legislation, thus requiring the application of WB policies.

Rationale for preparing a RPF: Resettlement Policy Framework has been prepared by the BOTAŞ, as required by the OP 4.12, since the specifics of Project components are not known at the time of project appraisal. Had the locations been known in advance, a Resettlement Action Plan would have been required prior to appraisal of the project. Policy Framework describes anticipated project impacts, the legal framework for expropriation, types of project-affected persons, entitlements and compensation, and the steps that BOTAŞ will take to ensure compliance with the Operational Policy. The objective of preparing a RPF is to ensure the adequate management of land acquisition and easement required for the project in accordance to international standards, and also to provide guidance for the preparation and implementation of Resettlement Action Plan(s) for the construction of the project. The RPF establishes a standard approach for the treatment of land acquisition and easements, as well as livelihood restoration in all Project activities in line with Turkish regulations and the WB OP 4.12. It identifies procedures and requirements to guide BOTAŞ in dealing with people who experience land and property losses or economic displacement due to the Project-related land requirements. If the exact routes of the pipeline are

determined before the well areas and surface facilities, it is envisaged to prepare two separate RAPs first for pipelines and then for well areas and surface facilities.

In additionally the other co-financiers will also apply the WB safeguards.

3. DEFINITION AND SPECIFICATIONS OF THE PROJECT

3.1. Project Site Selection

Underground gas storage activities and projects relating to such activities have been carried out successfully for the last 100 years in different parts of the world. The majority of these gas storage projects are in exhausted oil and gas reservoirs and salt formations within the scope of the alternatives pointed out in Section 3.8.2. In order to safely carry out and operate storage projects, the storage areas should be assessed, selected and designed based on the following characteristics:

- The area should be well defined and proper,
- The permeability of the storage area,
- The thickness and expansion of the formation where the storage area is located,
- The tightness of the cap rock,
- The geological structure and lithology.

An evaluation of the different alternatives in Turkey, based on their geological favorability for underground storage, reveals that the Tuz Gölü Basin, where big salt caves/caverns can be built, is the primary choice for underground storage.

The Tuz Gölü Basin is the most favorable place for gas storage in salt formations because of the following factors,

- Geographical location,
- Proximity to tŞhe Kayseri-Konya-Seydişehir Natural Gas Pipeline, 40 inches,
- Availability of pure salt masses at the proper depth in the area,
- Minimum level of seismic activities in Turkey (Figure 3.1.1.).

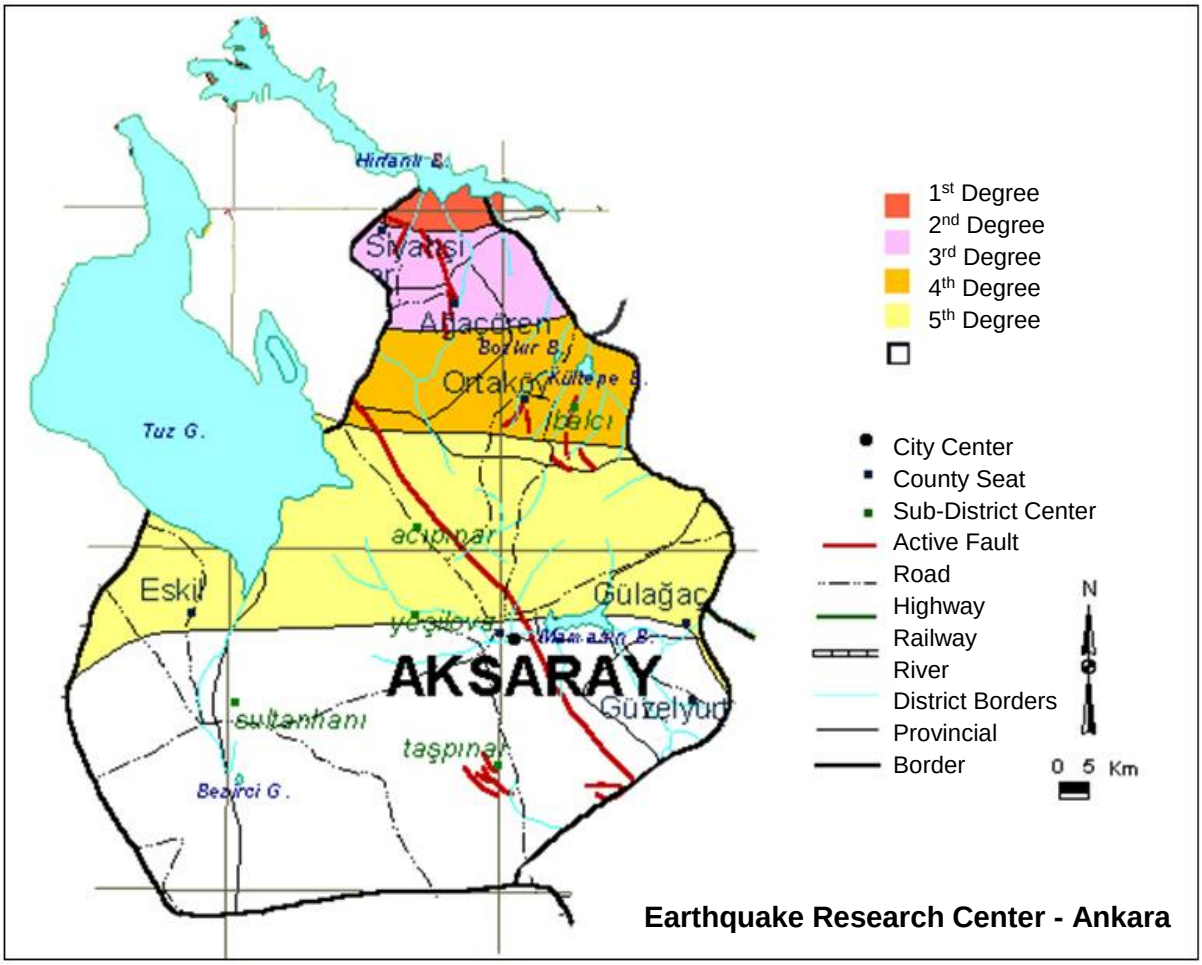


Figure 3.1.1. Seismicity Situation in the Underground Gas Storage Project and the Gas Storage Expansion Project

Within the scope of the Underground Gas Storage Project (UGS Project), the EIA for which was approved in 2003, and construction of which is ongoing, several procedures have been fulfilled within the framework of technical feasibility, such as the seismic inspection of the area by BOTAŞ, the laboratory testing of salt layers to define their mechanical characteristics, the hydrological work for water supply and brine discharge.

In this respect, first of all, a three-dimensional seismic analysis was carried out in an area of 80 square km. Then, TPAO opened 2 wells and performed core sampling in 2001 to identify the structure of the salt formation to be used for storage (these wells have been used within the scope of the project for which the construction work is ongoing). Cores of 180 m length in total were taken from the said wells at depths of 700 m and 1,500 m. Seismic inspections were performed by internationally recognized experts, and revealed that the possibility of failure was quite low due to the depth and strength of the salt domes and that the risk was no higher than that in a similar facility in any other part of the world.

In line with the results of the three-dimensional seismic inspections performed by TPAO in the project area and other data, the locations of 12 underground cavities where natural gas will be stored within the scope of the UGS Project, for which the construction is ongoing, and the surface facility, which will be constructed to control the storage system. The locations are shown on the topographic map of a scale of 1/25,000, provided in Appendix-2 and Figure 3.1.2.

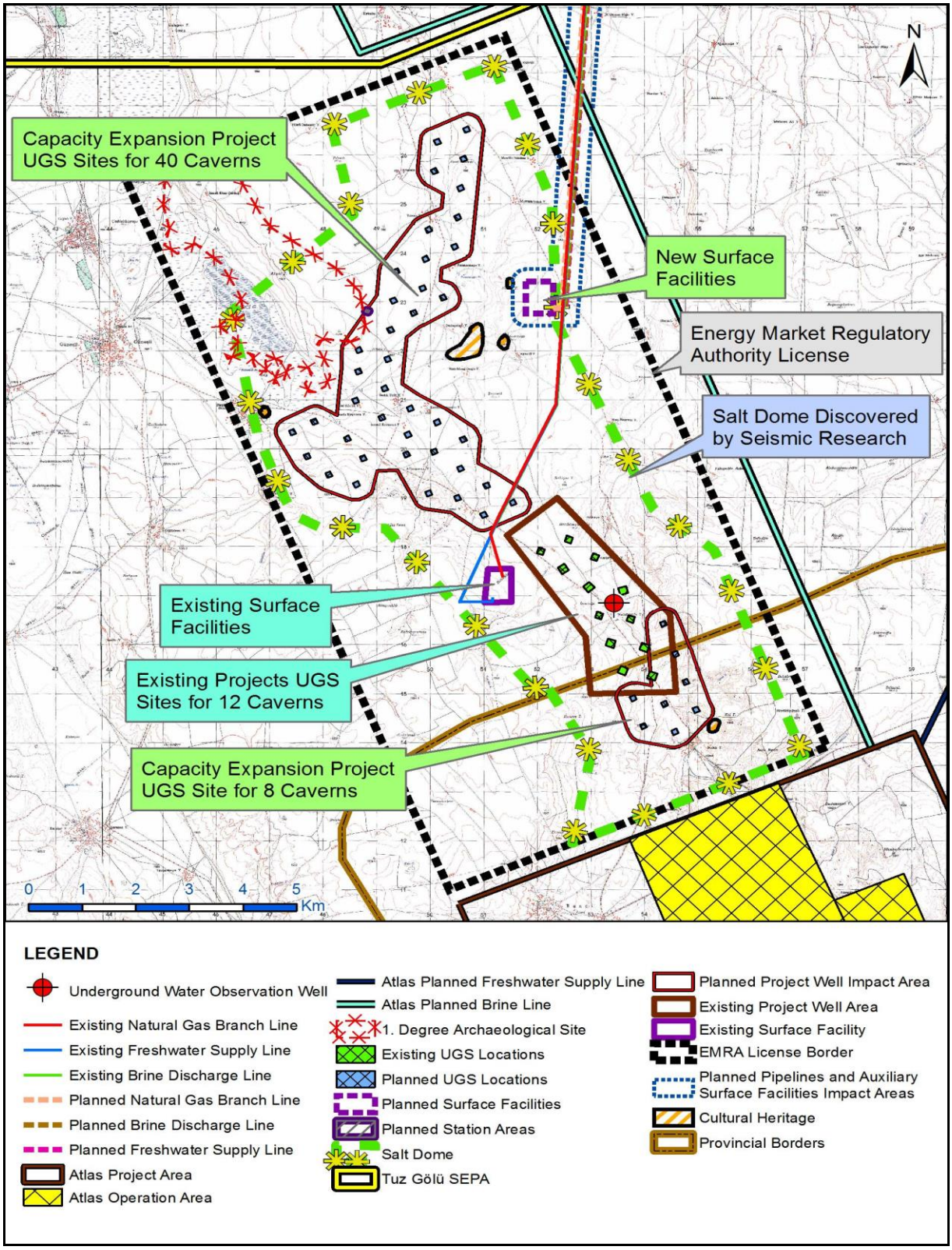


Figure 3.1.2. The Salt Dome, detected with the Seismic Inspections performed within the scope of the Underground Gas Storage Project, and the Facilities

This salt layer of 15 km in length and 2.5 km in width will be used to construct 48 caverns within the scope of the planned Gas Storage Expansion Project. These layers are located at a depth of approximately 700 m and their thicknesses vary between 700 m and 1,500 m. The locations of the salt formation and the 12 wells, the drilling work of which have been completed within the scope of the Underground Gas Storage Project, where the construction is ongoing, is given in Figure 3.1.3.

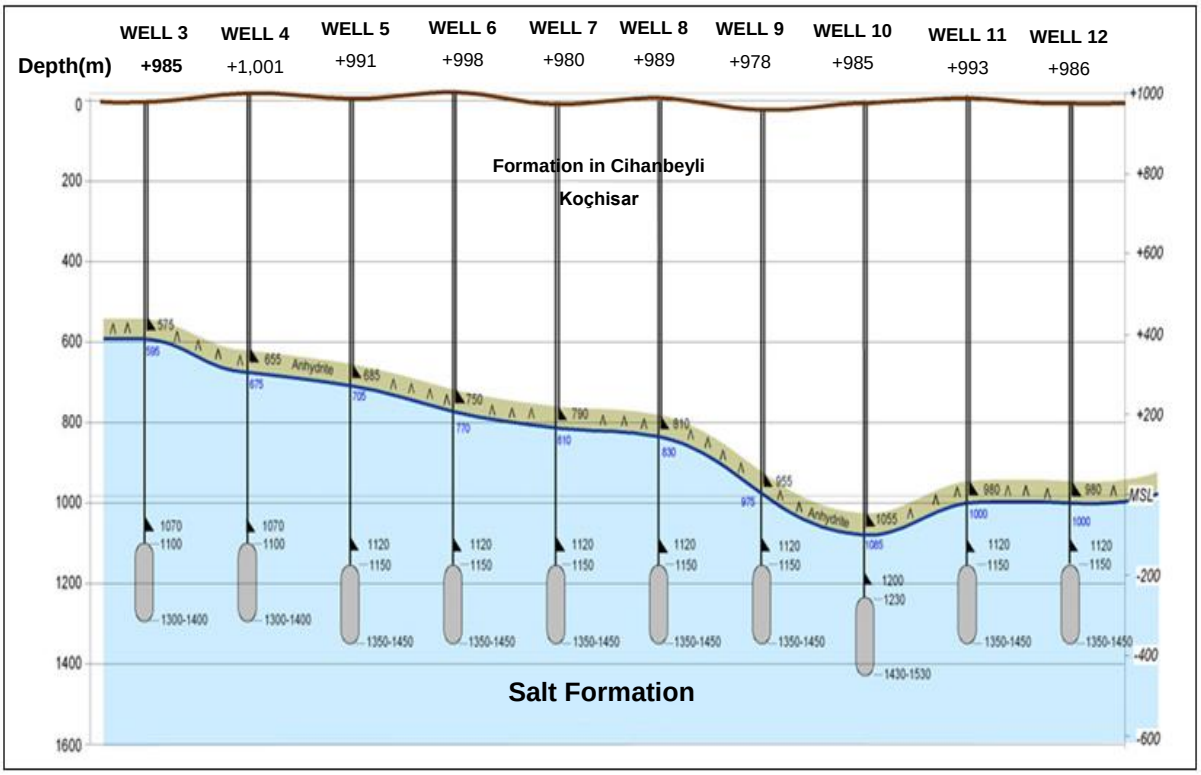


Figure 3.1.3. The Location of the Natural Gas Stores in the Salt Formation, within the scope of the Underground Gas Storage Project

3.1.1. Location of the Project Area and Units of Gas Storage Expansion Project

Within the scope of the "Gas Storage Expansion Project"; surface facilities, UGS sites, pipelines, pump stations and water storage tanks will be constructed as activity/service facilities. In this regard, 48 storage units with a capacity of 5 billion Nm^3, 1 surface facility and 1 natural gas branchman line will be constructed within the scope of principal units in addition to existing facility which consists of 12 storage units and a capacity of 1 billion Nm^3, and 1 fresh water line, 1 brine discharge line, connection lines between wells, 3 pump stations, 5 water storage tanks and 2 mobile concrete plants will be constructed as auxiliary units (Figure 3.1.1.1.).

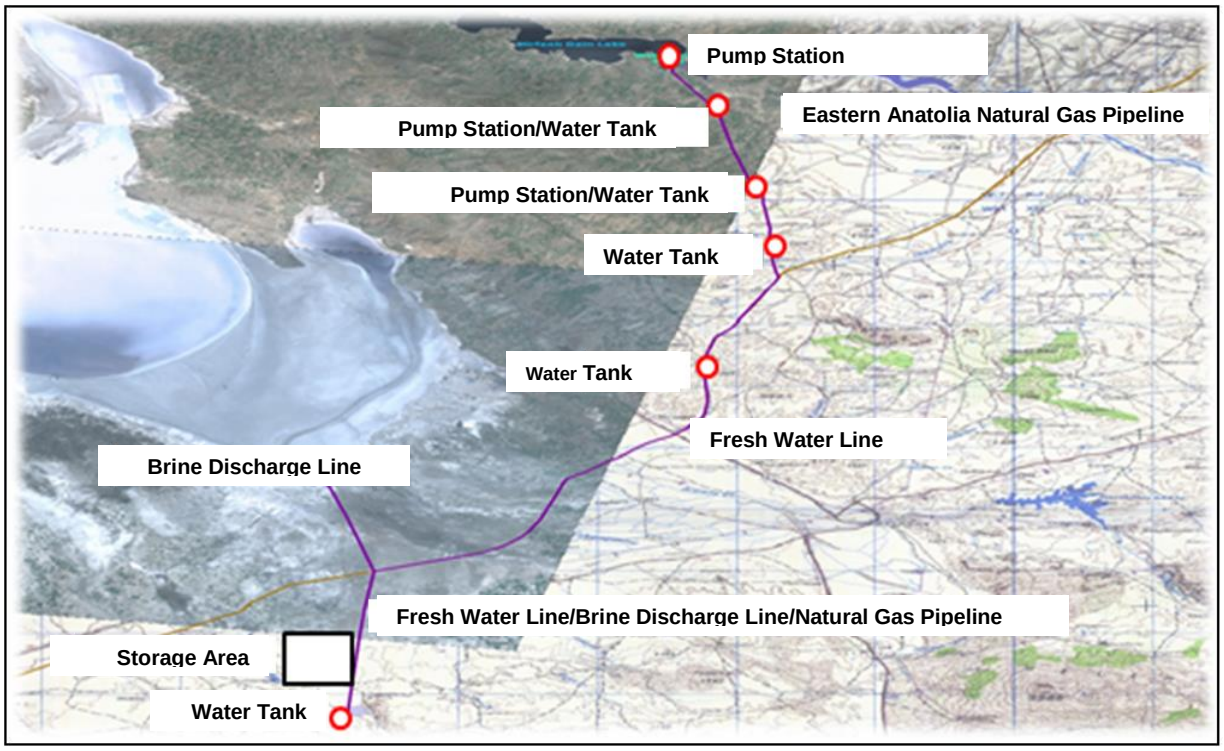


Figure 3.1.1.1. Activity Units Planned within the Scope of Gas Storage Expansion Project

The facilities and units of the planned Gas Storage Expansion Project are within the boundaries of Sarıyahşi, Ağaçören, Ortaköy, Eskil, Central and Sultanhanı Districts of Aksaray Province, Emirgazi District of Konya Province and Evren District of Ankara Province. Accordingly, locations of the units to be constructed within the scope of planned project are listed as follows:

- A part of 3 km of fresh water line will be within the boundaries of Evren District of Ankara Province, the remaining 127 km and pump stations and water storage tanks will be within the boundaries of Sarıyahşi, Ağaçören, Ortaköy, Central and Sultanhanı Districts of Aksaray Province;
- The water intake structure will be within the boundaries of Evren District of Ankara Province;
- The whole Brine Discharge Line and natural gas branchman line will be within the boundaries of Eskil and Sultanhanı Districts of Aksaray Province;
- The brine water discharge point will be within the boundaries of Eskil District of Aksaray Province;
- The surface facility will be within the boundaries of Sultanhanı District of Aksaray Province and
- 41 wells out of the 48 will be within the boundaries of Eskil and Sultanhanı Districts of Aksaray Province, and the remaining 7 wells will be within the boundaries of Emirgazi District of Konya Province.

Within the scope of project, locations of all activity units partaking in project area including the existing and additional pipeline are shown together with provincial borders on 1/25,000 scaled topographic map given in Appendix-2.

Distances of settlement areas around the each planned unit and facility are presented below.

Pipelines

Fresh Water Line

The freshwater line planned for approximately 130 km length starts from the borders of Evren District of Ankara Province and reaches the planned surface facilities and well fields by following the route of Aksaray province, Sarıyahşi, Ağaçören, Ortaköy, Central and Sultanhanı Districts.

The nearest settlements to the route throughout the fresh water line, were presented below in Table 3.1.1.1.

Table 3.1.1.1. Nearest Settlements, Directions and Distances to the Planned Route of Fresh Water Line

Planned Facilities/Units	Location	Direction of Facility/ Unit by Location	Distance (km)
Freshwater Line	Ankara Province, Evren District	Northeast	~ 5.6 km
	Aksaray Province, Sarıyahşi District	Northeast	~ 4.3 km
	Aksaray Province, Sarıyahşi District, Bogazkoy	East	~ 2.1 km
	Aksaray Province, Ağaçören District, Town of Harmandalı	West	~ 2.8 km
	Aksaray Province, Ağaçören District, Town of Kütüklü	West	~ 0.6 km
	Aksaray Province, Ağaçören District	Northeast	~ 1.9 km
	Aksaray Province, Ağaçören District, Town of Camili	West	~ 1 km
	Aksaray Province, Ağaçören District, Town of Kederli	West	~ 1.5 km
	Aksaray Province, Ağaçören District, Town of Hacıismailli	East	~ 2.6 km
	Aksaray Province, Ağaçören District, Town of Abdiusagı	East	~ 1.1 km
	Aksaray Province, Ağaçören District, Town of Çatalçeşme	East	~ 1.9 km
	Aksaray Province, Ortaköy District, Town of Hacımahmutuşağı	East	~ 0.9 km
	Aksaray Province, Ortaköy District, Town of Pınarbasi	East	~ 1.1 km
	Aksaray Province, Ortaköy District, Town of Hacıibrahimuşağı	West	~ 2.1 km
	Aksaray Province, Ortaköy District, Town of Hıdırlı	West	~ 0.95 km
	Aksaray Province, Ortaköy District, Towns of Karapınar and İshaklı Karapınar	East	~ 1 km
	Aksaray Province, Ortaköy District, Town of Oğuzlar	West	~ 1.8 km
	Aksaray Province, Ortaköy District, Town of Camuzluk	West	~ 1.95 km
	Aksaray Province, Central District, Town of Bostanlık	West	~ 0.75 km
	Aksaray Province, Central District, Town of Cerit	East	~ 0.7 km
	Aksaray Province, Central District, Town of Sapmaz	Through the town	~ 0.02 km (*)
	Aksaray Province, Central District, Town of Baymış	Northwest	~ 1.5 km

Planned Facilities/Units	Location	Direction of Facility/ Unit by Location	Distance (km)
	Aksaray Province, Central District, Koçaş Agricultural Management Directorate of TIGEM	Northwest	~ 1.7 km
	Aksaray Province, Central District, Town of Yeşiltepe	Southeast	~ 2.7 km
	Aksaray Province, Central District, Town of Yeşilova	Northwest	~ 5.75 km
	Aksaray Province, Central District, Town of Yenikent	Northwest	~ 1.5 km
	Aksaray Province, Central District, Town of Yeşiltömek	East	~ 8.6 km
	Aksaray Province, Central District, Town of Sultanhanı	East	~ 4.3 km
	Aksaray Province, Central District, Town of Sultanhanı, Şemsettin Highland	West	~ 0.4 km
	Aksaray Province, Sultanhanı District, Süleyman Mutlu Highland	West	~ 0.15 km
	Aksaray Province, Sultanhanı District, Küçük Katırcı Highland	West	~ 0.35 km
	Aksaray Province, Sultanhanı District, Mustafa Solak Highland	West	~ 0.55 km
	Aksaray Province, Sultanhanı District, Mustafa Dölek Highland	East	~ 0.65 km
	Aksaray Province, Sultanhanı District, H. Osman Böge Highland	West	~ 0.25 km

***** *Distance of the Planned Line to the Nearest Settlement*

In addition, the planned fresh water line intersects the Ankara-Aksaray E-90 highway at 60th km after Aksaray province, Central district, Village of Baymış and the Aksaray-Konya D-300 highway at approximately 110th km.

Approximately 46.5 km of the planned fresh line is within the borders of the Tuz Gölü Special Environmental Protection Area (SEPA) in Aksaray Province, as it is stated in the letter numbered 4410 and dated November 29, 2016 of Governorship of Aksaray, Provincial Directorate of Environment and Urbanization, Directorate General for Preservation of Natural Heritage given in Appendix-1.7. Prior to starting the construction works, the necessary permissions regarding the areas in question will be obtained by applying to Directorate General for Preservation of Natural Heritage, Ministry of Environment and Urbanization after EIA process of planned Gas Storage Expansion Project.

Brine Discharge Line

The brine discharge line planned to be approximately 27.9 km in length reaches the planned brine discharge point starting from the Aksaray province, Sultanhanı District boundaries and followed by Aksaray province, Eskil district.

The nearest settlements to the route throughout brine discharge line, are presented below in Table 3.1.1.2.

Table 3.1.1.2. Nearest Settlements, Directions and Distances to the Planned Route of Brine Discharge Line

Planned Facilities/ Units	Location of the Settlement	Direction of the Facility/ Unit by Location	Distance (km)
Brine Discharge Line	Aksaray Province, Sultanhanı District, H. Osman Böge Highland	West	~ 0.25 km
	Aksaray Province, Sultanhanı District, Mustafa Dölek Highland	East	~ 0.65 km
	Aksaray Province, Sultanhanı District, Mustafa Solak Highland	West	~ 0.55 km
	Aksaray Province, Sultanhanı District, Küçük Katırcı Highland	West	~ 0.35 km
	Aksaray Province, Sultanhanı District, Süleyman Mutlu Highland	West	~ 0.15 km
	Aksaray Province, Sultanhanı District, Şemsettin Highland	West	~ 0.4 km
	Aksaray Province, Sultanhanı District	East	~ 4.3 km
	Aksaray Province, Central District, Town of Yeşiltömek	Northeast	~ 5.35 km
	Aksaray Province, Eskil District, Town of Böget	Northeast	~ 8 km
Brine Discharge Point	Aksaray Province, Eskil District	Northeast	~ 8 km

In addition, the planned brine discharge line intersects the Aksaray-Konya D-300 Highway. Further, approximately 1.5 - 2 km of the planned brine discharge line and brine discharge point is located within the Tuz Gölü Special Environmental Protection Area (SEPA) and Priority 1 Natural Preservation Site within the boundaries of Aksaray as stated in the letter numbered 4410 and dated November 29, 2016 of the Governorship of Aksaray, Provincial Directorate of Environment and Urbanization, Directorate General for Preservation of Natural Heritage given in Appendix-1.7, and approximately 19 km of the brine discharge line is located within the boundaries of the Tuz Gölü Special Environmental Protection Area in Aksaray as stated in the same letter. Prior to starting the construction works, the necessary permissions regarding the areas in question after the EIA process of the planned Gas Storage Expansion Project will be obtained by applying to Directorate General for Preservation of Natural Heritage, of the Ministry of Environment and Urbanization, for the Tuz Gölü Special Environmental Protection Area, and Regional Committee on Preservation of Natural Heritage of Nevşehir for a Priority 1 Natural Preservation Site.

Natural Gas Branchman Line

Starting from the Kayseri-Konya-Seydişehir section of the Eastern Anatolia Natural Gas Main Transmission Line, the natural gas branchman line- planned as approximately 21 km in length, passes through the Sultanhanı District - located about 17 km north of the project area, and reaches the surface facilities and well fields planned within the borders of Aksaray province, Sultanhanı District.

The nearest settlements to the route throughout natural gas branchman line, were presented below in Table 3.1.1.3.

Table 3.1.1.3. Nearest Settlements, Directions and Distances to the Planned Route of Natural Gas Branchman Line

Planned Facilities/ Unit	Settlement	Direction of the Facility/ Unit by Location	Distance (km)
Natural Gas Branchman Line	Aksaray Province, Central District, Town of Yeşiltömek	East	~ 8.6 km
	Aksaray Province, Sultanhanı District	East	~ 4.3 km
	Aksaray Province, Sultanhanı District, Şemsettin Highland	West	~ 0.4 km
	Aksaray Province, Sultanhanı District, Süleyman Mutlu Highland	West	~ 0.15 km
	Aksaray Province, Sultanhanı District, Küçük Katırcı Highland	West	~ 0.35 km
	Aksaray Province, Sultanhanı District, Mustafa Solak Highland	West	~ 0.55 km
	Aksaray Province Sultanhanı District, Mustafa Dölek Highland	East	~ 0.65 km
	Aksaray Province Sultanhanı District, H. Osman Böge Highland	West	~ 0.25 km

Further, 10.5 km of the planned natural gas branchman line is projected to be located within the Tuz Gölü Special Environmental Protection Area within the boundaries of Aksaray Province as stated in the letter numbered 4410 and dated November 29, 2016 of Governorship of Aksaray, Provincial Directorate of Environment and Urbanization, Directorate General for Preservation of Natural Heritage given in Appendix-1.7. Prior to starting the construction works, the necessary permissions regarding the areas in question will be obtained by applying to Directorate General for Preservation of Natural Heritage, of the Ministry of Environment and Urbanization after the EIA process of the planned Gas Storage Expansion Project.

Pump Stations

The planned pump stations shall be installed in the project area and the Area of Influence of new pipelines around the existing stations; their precise locations will be determined depending on the hydraulic calculations after detailed engineering works

The nearest settlements to the planned pump stations, were presented below in Table 3.1.1.4.

Table 3.1.1.4. Nearest Settlements, Directions and Distances to the Planned Pump Stations

Planned Facilities/ Unit	Settlement	Direction of the Facility/ Unit by Location	Distance (km)
Planned 1st Pump Station	Ankara Province, Evren District	Northeast	~ 6 km
Planned 2nd Pump Station	Aksaray Province, Sarıyahşi District, Bogazkoy	Southeast	~ 2.6 km
	Aksaray Province, Ağaçören District, Town of Harmandalı	Northwest	~ 3.4 km
Planned 3rd Pump Station	Aksaray Province, Ağaçören District, Town of Camili	Southwest	~ 2 km
	Aksaray Province, Ağaçören Province	Southeast	~ 3 km

Water Tanks

The planned water tanks shall be installed in the project area and the Area of Influence of new pipelines around the existing stations, their precise locations will be determined depending on the hydraulic calculations after detailed engineering works.

Planned 2 water tanks (1st and 2nd planned water tanks) shall be constructed within the same structure with above mentioned two pump stations (2nd and 3rd planned water tanks) and the effects derived from those facilities were evaluated in this report.

The nearest settlements to the planned water tanks, were presented below in Table 3.1.1.5.

Table 3.1.1.5. Nearest Settlements, Directions and Distances to the Planned Water Tanks

Planned Facilities/ Unit	Settlement	Direction of the Facility/ Unit by Location	Distance (km)
Planned 1st Water Tank (*)	Aksaray Province, Sarıyahsi District, Bogazkoy	Southeast	~ 2.6 km
	Aksaray Province, Ağaçören District, Town of Harmandalı	Northwest	~ 3.4 km
Planned 2nd Water Tank (**)	Aksaray Province, Ağaçören District, Town of Camili	Southwest	~ 2 km
	Aksaray Province, Ağaçören District	Southeast	~ 3 km
Planned 3rd Water Tank	Aksaray Province, Ağaçören District, Town of Abdiusagı	Southeast	~ 2 km
	Aksaray Province, Ağaçören District, Town of Catalcesme	Northeast	~ 2.1 km
Planned 4th Water Tank	Aksaray Province, Central District, Town of Bostanlık	West	~ 0.8 km
	Aksaray Province, Central District, Town of Cerit	East	~ 0.65 km
Planned 5th Water Tank	Aksaray Province, Sultanhanı District, Tomu Highland	Northeast	~ 1.35 km

***** *In the composite construction with the planned 1st Pump Station*
****** *In the composite construction with the planned 2nd Pump Station*

Surface Facilities/ Underground Gas Storage (UGS) Sites

Within the scope of the project, it is planned to construct a new surface facility located approximately 5,250 m northeast of the surface facilities of the Underground Gas Storage Project, of which construction is in progress and which is shown in Picture 3.1.1.1.

Picture 3.1.1.1. A view of Surface Facilities of Underground Gas Storage Project under Construction

In addition, construction sites will be used during construction and will be removed after completion of the construction, batch plants (2 mobile batch plants with a capacity of 60 m^3/hour) and material storage areas shall be constructed. The mentioned facility is located within the borders of Aksaray Province, Sultanhanı District.

As a part of the project, 48 wells shall be constructed and 41 of them are planned to be located within the Aksaray province, Eskil and Sultanhanı Districts and the remaining 7 are located within the borders of Emirgazi district of Konya province. Some changes may occur at drilling site locations after the final design and seismic investigations.

The nearest settlements to the planned surface facilities and well/ cavern areas, were presented below in Table 3.1.1.6.

Table 3.1.1..6. Nearest Settlements, Directions and Distances to the Planned Surface Facilities/Well Fields

Planned Facilities/ Unit	Settlement	Direction of the Facility/ Unity by Location	Distance (m)
Surface Facilities	Aksaray Province, Sultanhanı District, Tomu Highland	Northeast	~ 1,000 m
	Aksaray Province, Sultanhanı District, Ismail Koyuncu Highland	Southeast	~ 1,300 m
	Aksaray Province, Sultanhanı District, Kazım Koyuncu Highland	Southeast	~ 1,200 m
	Aksaray Province, Sultanhanı District, Akhalil Highland	East	~ 1,300 m
	Aksaray Province, Sultanhanı District, Haci Bayram Highland	West	~ 1,500 m
	Aksaray Province, Sultanhanı District, Collulu Highland	Northwest	~ 1,800 m
	Aksaray Province, Sultanhanı District,, Acikuyu Highland	Northwest	~ 2.,000 m
Nearest Well/ Cavern	Konya Province, Emirgazi District, Bucak Highland	North	~ 460 m
		Northwest	~ 195 m
	Aksaray Province, Sultanhanı District, Nasuhusagı Highland	Southeast	~ 750 m
	Aksaray Province, Sultanhanı District, Omeraga Highland	Southeast	~ 1,000 m
	Aksaray Province, Sultanhanı District, Tomu Highland	Northwest	~ 100 m
		East	~ 50 m
	Aksaray Province, Sultanhanı District, Ali Koyuncu Highland	Northeast	~ 280 m
	Aksaray Province, Sultanhanı District,, Celal Koruk Highland	Northwest	~ 45 m
	Aksaray Province, Sultanhanı District,, Ismail Koyuncu Highland	Northwest	~ 375 m
		Southeast	~ 100 m
	Aksaray Province, Eskil District, Town of Gunesli, Mustafa Koyuncu Highland	Southeast	~ 280 m
	Aksaray Province, Sultanhanı District, Sadık Telli Highland	Southeast	~ 190 m
		Northwest	~ 225 m
	Aksaray Province, Sultanhanı District, Alioglu Highland	South	~ 70 m
	Aksaray Province, Eskil District, Town of Gunesli, Bezirci Street	Southeast	~ 750 m
	Aksaray Province, Sultanhanı District, Fatmaoglu Highland	Northeast	~ 305 m
		Northwest	~ 400 m
	Aksaray Province, Sultanhanı District, Yılanlı Highland	Southwest	~ 100 m
	Aksaray Province, Sultanhanı District, Kosenin Highland	East	~ 500 m
	Aksaray Province, Sultanhanı District, Mustafa Solak Highland	Northwest	~ 900 m
	Aksaray Province, Sultanhanı District, Mevlit Pekmez Highland	West	~ 1,200 m

3.2. Underground Gas Storage Project which is Under Construction

As stated in Section 3.1., in November 2000 TPAO performed a 3D seismic inspection on an area of approximately 80 square kilometers in the region selected for the project, and the locations of the caves where the natural gas will be stored under the scope of the Underground Gas Storage Project (UGS Project), whose construction work is ongoing, and the surface facilities that will be used for system control were identified. Accordingly, the EIA approval was obtained on 19.08.2003 for the Underground Gas Storage Project in line with the Turkish Environmental Legislation. A copy of the EIA approval No 843 of 19.08.2003 of the Ministry of Environment and Forestry of Turkish Republic is given in Appendix 1.1.

Following the obtainment of the EIA approval in 2003, the water supply mechanism in the project was revised and thus BOTAŞ performed additional activities further to the EIA Report. Within the scope of these activities, which aimed at modifying the water supply systems to be used in leaching of caves to be used for the storage of natural gas, it was decided that the water to be received from the wells, in line with the permits to be obtained from the General Directorate of State Hydraulic Works, are supplied from the Hirfanlı Dam, because of the fact that the caverns would be opened in groups of 4, instead of groups of 2, in order to complete the project sooner (Appendix 1.2.). This was notified to the Repealed Ministry of Environment and Forestry and the Ministry approval was obtained on 25.10.2004 (Appendix 1.3.).

Regarding the project, an International Loan Agreement (7342-TU) was signed on February 2, 2006, between the World Bank and BOTAŞ. It was approved that the funds that are to be used in addition to the World Bank loans under the scope of the Natural Gas Sector Development Project will be provided by World Bank loans on condition that they are used after 2013. Accordingly, the financing of the project is managed in three phases, which include: Project Management and Implementation Support Consultancy Services, Environmental Monitoring and Consultancy Services, and Surface and Underground Facilities, Water Supply and Brine Discharge Pipelines Supply and Installation and Cavern Leaching Operations.

Furthermore, BOTAŞ performed additional activities in order to fulfill the requirements of the World Bank Environmental Assessment policies and procedures and further reports were prepared in addition to the EIA Report. The Turkish copy of the EIA documents were sent to the Repealed Aksaray Provincial Directorate of Environment and Forestry on 01.06.2005 (including the EIA Annex), and the English version was sent to the World Bank on 27.05.2005. In advanced phases of the project, in 2012, it was decided that the leaching procedure is performed in groups of 6 (2*6) with a physical volume of 630.000 cubic meters each, without any modification in the surface area and the locations of the wells, the number and capacity of the caverns. In this respect, the General Directorate of EIA Permits and Inspection of the Ministry of Environment and Urbanization certified with the letter No. 14352 of 24.08.2012 that there no further procedure was needed under the EIA Regulation.

In the period following the additional EIA Report, the detailed engineering activities were completed following the completion of the tender process and signing of the contract with the contractor. As a result, certain technical modifications were requested:

- The leaching procedures will be performed in groups of 6 (2*6), instead of groups of 4 (3*4) with a physical volume of 630.000 cubic meters each, without any modification in the total number of the caves where the natural gas will be stored and the total amount of fresh water to be used throughout the project.

- Because of the modification in the leaching procedure, the fresh water to be supplied from the Hirfanli Dam Pond, which is needed for the leaching of the underground salt formations, the annual amount of water was increased from 10 hm^3/year to 15 hm^3/year, without any modification in the total amount of water to be used throughout the project, in line with the approval of 12.04.2006 of the Department of Research and Plan of the General Directorate of State Hydraulic Works, provided in Annex 1.2.

- Supply of the energy required for 3 pump stations, which will be used for the transfer of the leaching water from the Hirfanli Dam to surface facilities, 5 storage tanks, and the surface facilities through 5 Energy Transmission Lines of 34.5kV with a total length of 102,943 m, and construction of connection and/or transmission lines for access to the pump stations, water tanks, and other facilities for the transfer of leaching water to the region where the wells/caverns are located.

Regarding the abovementioned modifications, a second study was performed in addition to the EIA Report, within the scope of the planned project amendments. This second study, within the scope of the EIA Report, evaluated the possible impact of the modification in the rate of supply of the fresh water supply needed for the leaching procedures on the Tuz Gölü Basin, the environmental impacts of the energy transmission lines which will satisfy the electricity needs of the auxiliary units and surface facilities, the site access roads to be used for access to such points, the environmental impacts of all these modifications on the project area, and the cumulative impacts of other projects planned on the site.

The EIA process of the Underground Gas Storage Project, whose construction work is ongoing, is summarized in Table 3.2.1.

Table 3.2.1. EIA Process of the Underground Gas Storage Project

Activity	Date
Preparation of the EIA Report of the Project, and its Approval	2003
Performance of the First Additional Study further to the EIA Report	2003 - 2004
Commencement of the Project in the second half of 2012, upon obtainment of all necessary permits	2012
Performance of the First Additional Study further to the EIA Report	2012 - 2013

The project activities are performed in three phases, which are as follows:

- Phase-I, Supply and Installation of Pipelines (Fresh water line, Brine Discharge Line, Natural Gas Branch Line, Storage Tanks and Pump Stations),
- Phase-II, Leaching of the First Group of Six Wells/Caverns, Supply and Installation of Surface Facilities, Supply and Installation of Underground Facilities, Natural Gas Storage in the First Group of Six Wells/Caverns, and
- Phase-III, Leaching of the Second Group of Six Wells/Caverns, Natural Gas Storage in the Second Group of Six Wells/Caverns.

Among the three phases of the UGS Project, Phase I was completed on December 31, 2013. The items of work performed within the scope of the Underground Gas Storage Project, whose construction activities are ongoing under Phase II, are given below.

Supply and Installation of the Pipelines:

- 123 km of fresh water pipeline (24"-10mm, 28"-14,2 mm, 30"- 10 and 11 mm)
- 44 km of brine discharge pipeline (GRP 36 " – 11,5 mm)
- 3 pump stations, 5 storage tanks, water intake structure, energy transmission lines, operation of the pipelines, Scada
- 23 km of 36" natural gas pipeline (11 mm)

Supply and Installation of Surface Facilities:

- Leaching facilities (Piping, pumps, brine ponds, gas filling and discharge equipment)
- Injection and production facilities (ultrasonic measurement unit, turbo compressors with gas tribunes, piping, cooling and heating units, filters and separators, pressure reducers, glycol regeneration unit, etc.)

Supply and Installation of Underground Facilities:

- Drilling, piping (casing) and caverns

Solution Mining Process – Water Supply and Cavern Leaching:

- Water injection into salt formations
- Leaching of salt for cavern formation – Gas injection and brine discharge
- Replacement of brine with compressed gas

In the framework of the works identified above;

- Fresh water pipeline construction was started on April 2012 and finished on December 2013,
- Brine discharge pipeline construction was started on September 2012 and finished on December 2013,

- Surface facilities construction was started on December 2012 and almost finished (commissioning activities are ongoing),
- First fresh water injection from Hirfanlı Dam to UGS8 is on 30th of April, 2014,
- The drilling work of 12 wells was completed,
- First gas filling to UGS 8 is on 14th of January, 2017,
- Actual progress of the project 91 % including engineering, procurement and construction,
- First 3 caverns (UGS8, UGS9 and UGS7) were filled with natural gas,
- UGS 6 and UGS 4 first gas filling were started on December 2017 and January 2018 respectively and ongoing and
- First withdrawal was carried out successfully on 8th of November, 2017.

At the current stage, leaching process is ongoing in 6 wells for Underground Gas Storage Project, where regular measurement is performed by sonar imaging method in order to check the leaching process and to facilitate the engineering design of the leaching process in advanced stages. Figure 3.2.1 provides an example of images taken at different moments from one of the wells where the leaching process is ongoing.

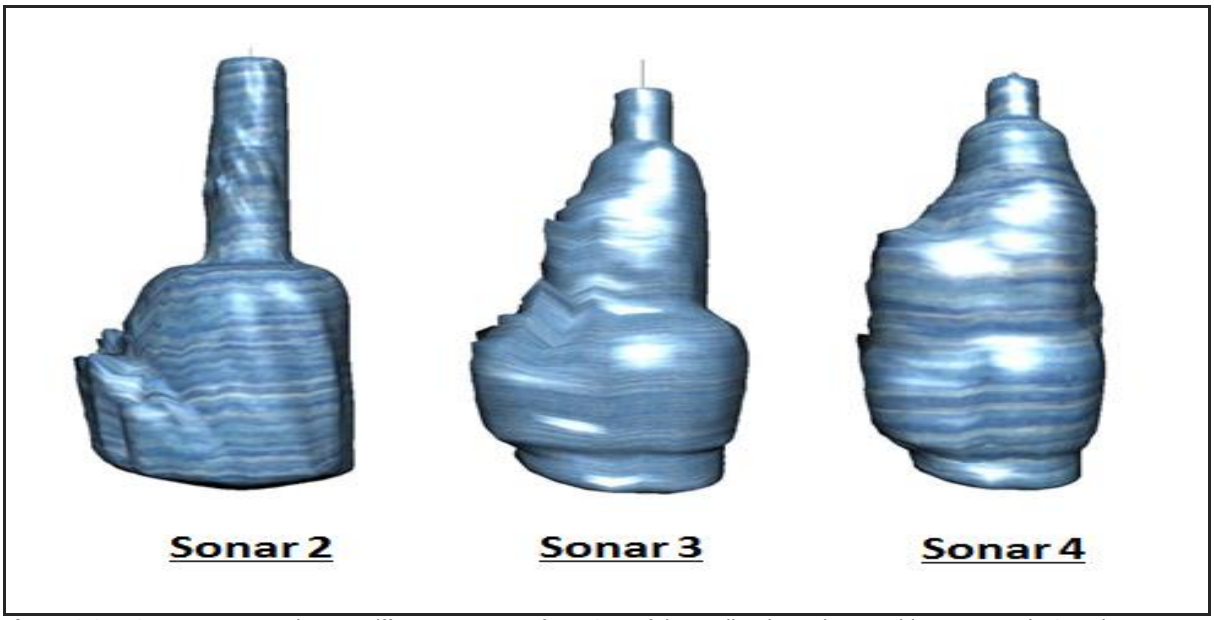


Figure 3.2.1. Sonar Images Taken at Different Moments from One of the Wells where the Leaching Process is Ongoing

All the above mentioned activity units of the UGS project, whose EIA process has been completed and construction work is ongoing, their position on the project area, and the provincial borders are shown on a topographic map of scale 1/25.000 provided in Appendix 2. Besides, the units constructed under the project and the leaching process are shown in Figure 3.2.2.

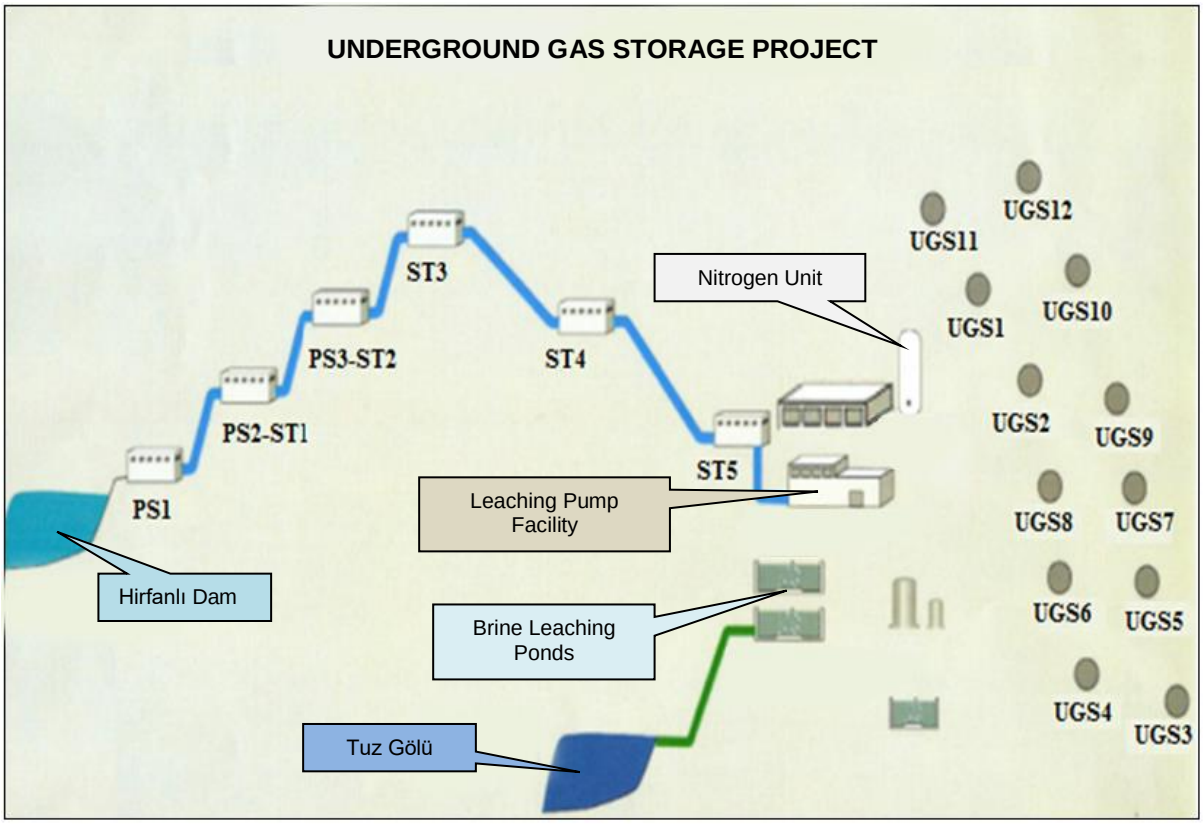


Figure 3.2.2. The Leaching Process in the Underground Gas Storage Project

With the completion of the Underground Gas Storage Project, main objectives are to increase the reliability and stability of gas supply and delivery to Turkish gas consumers by implementing critically needed gas storage and network infrastructure. To achieve these objectives World Bank supported BOTAŞ with the financing of storage and associated network investments.

3.3. Detailed Information about Proposed Gas Storage Expansion Project

The Gas Storage Expansion Project (GSEP) will be established with a 400% larger capacity than the ongoing Underground Gas Storage Project. The project will consist of five phases, which are;

- Preparation works of the Gas Storage Expansion Project,
- Installation of the pipelines, construction of the pump stations, storage tanks and surface facilities,
- Drilling and leaching activities,
- Operation phase and
- Decommissioning phase.

During the preparation works of the project, the construction corridors of the pipelines and project areas of the principal and auxiliary units (camp sites, energy transmission lines,

access roads, etc.) will be determined within the scope of the feasibility studies parallel with the Underground Gas Storage Project (1st Phase). Three main pipelines will be established - these are the fresh water line for the fresh water needs during the leaching operation, the brine discharge line for discharges of the brine which sourced from the leaching operation into Tuz Gölü Basin and the natural gas branchman line for the gas storage activities for the operation phase and also pump stations, storage tanks and surface facilities will be constructed during the pipeline works (2nd Phase) and drilling activities will be carried out before the leaching operation (3rd Phase). Operation activities will be started by BOTAŞ after the completion of the storage caverns (4th Phase) and the transportation and reinstatement works will be planned and performed at end of the project (5th Phase).

The GSEP will be similar with the ongoing Underground Gas Storage Project (UGS Project) and can be detailed in basic terms as follows: fresh waters will be taken from the water intake structure of the first pump station established on the coast of Hirfanlı Dam and transported to the surface facilities and drilling sites within the 130 km installed length fresh water line (∅: 52-56'') via the pump stations and storage tanks for the leaching operation. During the leaching operation, the brines which occur will be discharged into the arid zones of Tuz Gölü via the brine discharge line (∅: 52-56'') and its diffusors. After the completion of the caverns, natural gas will be taken from the one of the principal gas lines of Turkey (Kayseri – Konya – Seydişehir Main Natural Gas Pipeline) from within the 21 km installed length natural gas branchman line (∅: 40'') to storing in the caverns. Pipes will be buried along the pipeline routes at 3 – 3.5 m depth from the surface in approximately a 28 – 40 m width construction corridor. Installations of all pipelines will be planned on a 250 m width both on sides of the existing pipelines at the acquired land sections (500 m in total). All pipeline installations will be completed in 18 months from the start of the project according to the planning.

The principal and auxiliary units which are known as the surface facilities will be used for the main distribution center for the fresh waters, brines and natural gases during the leaching and gas storing operations. Surface facilities will be constructed on an approximately 650 x 800 m rectangular area and include the pipelines, pumps, brine pools, gas circling equipment and buildings. The principal units for the leaching operation at the surface facilities will be completed in 18 months from the start of the project according to the planning and construction of the gas circling units which will be ongoing at the surface facilities for another 2 years.

Three pump stations constructed onto the fresh water line will be provided with sufficient pressure for the fresh water supply and five storage tanks will be used for the fresh water storage during the leaching operation, similar to the Underground Gas Storage Project. All constructions of the pump stations and storage tanks will be completed in 18 months from the start of the project according to the plans.

The drilling areas will be ongoing during the construction works of the pipelines and principal units. After the completion of the drilling areas, leaching operations will be performed within the scope of the solution mining techniques. One drilling operation will be completed within 2 – 3 months and the leaching operation at a drilling site will be ongoing for approximately 24 – 28 months.

Within the scope of the planned project, the locations of underground spaces where natural gas will be stored in surface facilities to be established with the purpose of controlling the storage system were determined in accordance with the results obtained by conducting 3-D seismic surveys by TPAO (Turkish Petroleum Corporation) under the Underground Gas Storage Project in an area of around 80 km^2, as shown in the Topographic Map with a scale of 1/25,000, given in Appendix-2. In the area in which 3-D seismic surveys were carried out, it is determined that there is a salt structure whereby 6 billion Nm^3 gas can be stored.

In this regard, it is planned to drill 48 new caverns, of which 40 are on the northern and 8 are on the southern to storage facility, under construction with a capacity of 1 billion Nm^3, each with 630,000 Nm^3 – 750,000 Nm^3 physical capacity within the scope of the Gas Storage Expansion Project, and total storage amount will increase from 1 billion Nm^3 to 6 billion Nm^3 with the capacity increase. The fresh water required for leaching existing salt domes will be supplied from Hirfanlı Dam under the project, and for water supply, a second pipeline will be established in parallel with fresh water line of the existing project. The brine generated as a result of the leaching process will be discharged to the point in the Tuz Gölü arid land where is utilized within the scope of the existing UGS Project (Figure 3.3.1.).

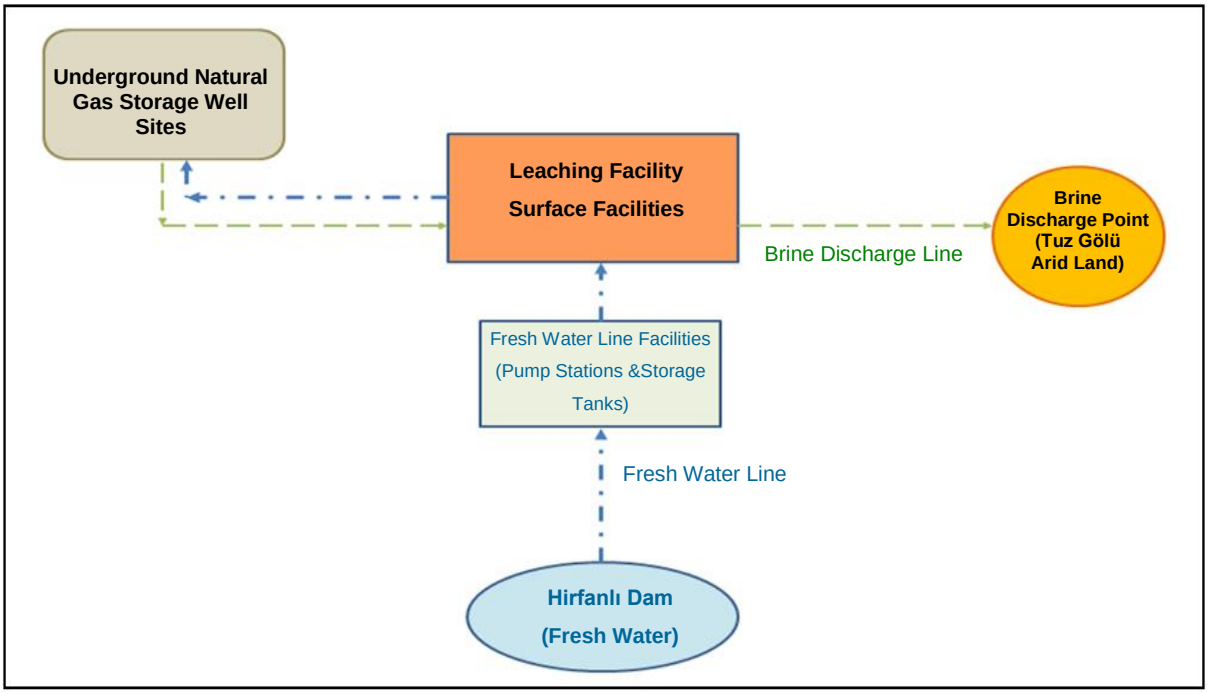


Figure 3.3.1. Water Supply and Discharge Planned Within the Scope of Gas Storage Expansion Project

The numbers of facilities and units of planned Gas Storage Expansion Project and Underground Gas Storage Project under construction are given in Table 3.3.1., for each project.

Table 3.3.1. Facilities and Units of the Underground Natural Gas Storage Project and Planned Gas Storage Expansion Project

Facilities / Units	Underground Gas Storage Project Received Positive EIA Decision (In number)	Planned Gas Storage Expansion Project (In number)	Total (In number)
Number of Well/Cavern	12 Caverns	48 Caverns	60 Caverns
Fresh Water Line	1 Pipeline	1 Pipeline	2 Pipelines
Brine Discharge Line	1 Pipeline	1 Pipeline	2 Pipelines
Natural Gas Branchman Line	1 Pipeline	1 Pipeline	2 Pipelines
Surface Facilities	1 Facility	1 Facility	2 Facilities
Pump Station	3 Stations	3 Stations	6 Stations
Water Storage Tank	5	5	10
Water Intake Structure	1	1	2
Concrete Plant	1	2	3
Water Supply Point	Hirfanlı Dam Lake (with pipeline to be established)	Hirfanlı Dam Lake (with pipeline to be established)	-
Discharge Point	Tuz Gölü arid land (with pipeline to be established)	Tuz Gölü arid land (with pipeline to be established)	-

The construction process of the project is expected to take 7 years and its economic life is estimated as 30 years. In the project, 48 new caverns in groups of 6 are planned to be constructed, and by putting into practice these storages;

- It is aimed to reach a total working gas capacity of 6 billion Nm^3 by the end of 2023 with the project planned to have the first gas storage in 2020 and the Underground Gas Storage Project which is still under construction.
- A total working gas capacity of 5 billion m^3 will be reached with 48 storages (caverns).
- In the period between April-October, 60 million m^3 gas in total will be pumped daily to these storages from Kayseri-Konya-Seydişehir Natural Gas Transmission Line, which is approximately 23 km far away from the project area, together with the Underground Gas Storage Project.

- In the period between October-March, 80 million m³ gas will be able to be pumped to system from storages, on a daily basis.
- In the period between October-March, gas will be able to be pumped from storages to the system, and the maximum pressure in the storages will be around 205 bars.

Thus, balancing seasonal gas drawing, fulfilling sudden gas withdraw, supplying non-continuous gas supply, reducing the number of non-continuous customers and meeting purchase and sale commitments will be provided, and the Underground Gas Storage Project under the construction and planned Gas Storage Expansion Project will play a significant role in providing the security of natural gas supply of Turkey and fulfilling the increasing demand especially in the winter months.

As indicated in Table 3.3.1., surface facilities, well sites, pipelines, pump stations and water storage tanks will be constructed under the project. Accordingly, 48 storages with 5 billion Nm^3 storage capacity, 1 surface facility and 1 natural gas branchman line will be constructed within the scope of main facilities and 1 fresh water line, 1 brine discharge line, connection lines between the wells, 3 pump stations, 5 water storage tanks and 2 mobile concrete plants will be constructed as auxiliary units in addition to existing facility which consists of surface facilities and 12 storages with a capacity planned to reach 1 billion Nm^3.

The leaching processes within the scope of the Gas Storage Expansion Project will be carried out by the Solution Mining Process – Water Supply and Solution of Caverns methods; and in this regard, the processes of:

- Injection of fresh water transported with fresh water line to saline formation,
- Dissolution of saline, Gas Injection and Discharge of Brine for Cavern Formation,
- Replacement of brine with pressure gas will be carried out.

Impermeable ponds will be established around the wells for drilling mud to be used during drilling works in the planned wells. After the drilling process, drilling mud will be analyzed, its classification will be identified under the “Regulation on Waste Storage Regularly” and it will be sent with the waste code received to disposal plants licensed by the Ministry of Environment and Urbanization, to be disposed of in the Underground Gas Storage Project, which is under construction. The collected in the mud ponds will never be covered by excavation soil and topsoil even if the mud is non-hazardous.

500 persons in land preparation and construction stages of the Gas Storage Expansion Project and 100 persons in operation stage with the capacity increase are projected to be employed. In the construction stage within the project, unqualified staff will be employed from the region as far as possible and also permanent staff will be employed from the region in the operation stage so that the project will contribute to the local economy. The needs of the staff who will work under the Gas Storage Expansion Project will be satisfied in an

existing camp area (Picture 3.3.1.) which is currently in use and in new camp areas to be constructed within the scope of the project.

Picture 3.3.1. A view from campsite on Underground Gas Storage Project Under Construction

Additionally, there will be social facilities (security building, administrative building, etc.) for staff who will work in the facility at the operation stage. The operating life of the investment is projected to be 30 years.

In line with the planned social and infrastructure activities within the scope of the Gas Storage Expansion Project;

- Meeting the water needs of staff working in the construction and operation phases in the melting process of the UGSs/caverns, the water resource to be used in construction works and the water supply and wastewater treatment systems for discharging wastewater,
- Electricity lines for the electricity required for the activities to be carried out during the construction and operation stages of the planned facilities,
- Lighting, security and communication systems to be used in construction and operation phase, and
- Creation of service roads to access the Project sites are planned.

In order to meet the water needs of the personnel who will work in the construction and operation phase, as with the ongoing Underground Gas Storage Project, the water needed shall be purchased with tankers from the Municipality of Sultanhanı. In addition, within the scope of the Gas Storage Expansion Project, two groundwater wells are planned to be opened in the case of any need, and the necessary permits will be obtained in accordance with the Law on Groundwater No.167. With regard to the domestic wastewater to be formed, the wastewater treatment plant based on the biological treatment system shall be used in the operation phase of the Project. After the treatment, if effluent characteristics are observed as appropriate, it will be discharged to the t determined receiving environments, such as the

seasonal streams and natural drainages after wastewater discharge permits are obtained. Following the obtaining of agricultural irrigation water permits, treated water will also be used for the irrigation of landscape areas.

As has been the case during the construction and operation phases of the ongoing Underground Gas Storage Project, the energy required during the construction and operation of the planned Gas Storage Expansion Project will be provided from Şereflikoçhisar substation for Pump Stations (PS) and storage tanks (ST) or Ortaköy substation. For surface facilities and UGS sites, the required energy will be supplied from the Aksaray substation.

Within the context of the project, the existing roads used in the Underground Gas Storage Project – which is under construction for transportation purposes - will be utilized. The tasks necessary for enhancement and restoration will be carried out in above mentioned roads.

Since the access roads and ETL's will be determined after final design are not included in the baseline and impact area studies. Access roads and ETL's will be assessed and selected according to field characteristics and their applicability for project use.

There is no need for any infrastructure facilities other than those mentioned above as part of the planned Gas Storage Expansion Project.

It is planned that the Gas Storage Expansion Project be put into use on a phase by phase basis with all sections starting to operate by 2023.

3.3.1. Technical Characteristics of the Project Units

Within the scope of the Gas Storage Expansion Project, details of these units are given below.

Surface Facilities

Within the scope of the project, a new surface facility composed of leaching facilities (piping systems, pumps, brine pools, gas filling and discharging equipment), injection and production facilities (Ultrasonic measuring unit, gas turbine turbo compressors, piping systems, cooling and heating units, filters and separators, pressure reducers, glycol regeneration unit etc.) shall be constructed in an area of approximately 650 m X 800 m (52 ha) used for the construction and operation phase.

Surface facilities will be utilized in leaching and storage processes and construction and operation stages of the project within the scope of the project, and all activities in operation stage will be carried out by utilizing automatic control systems and high technological processes.

Also, construction sites, concrete plants (2 mobile concrete plants with 60 m^3/hour capacity) and material stores, which will be used during construction and then will be removed, will be constructed around the surface facilities.

Surface facilities will consist of units and buildings listed below where all kinds of controls of the stored gas will be provided during the operation stage and pumping of the stored gas to the Kayseri-Konya-Seydişehir Natural Gas Transmission Line, will be ensured. They will have storey heights changing between 1 and 3 meters as seen in the picture of the surface facilities that are presently under construction within the scope of the Underground Gas Storage Project shown in Picture 3.1.1.1. The general process and layout plan of the operation in the planned surface facilities are given in Figure 3.3.1.1.

- Social Facilities (Social Service Building),
- Security Building,
- Brine Pools,
- Leaching Pump Building,
- Generator,
- General Office Building (Control Room),
- Fire and Drinking Water Tanks,
- Fuel Tanks,
- Banquet Unit,
- Electricity Units,
- Compressor Buildings (2 piston compressors, 5 centrifugal compressors),
- Heating and Pressure Reducing Units,
- Filter and Gauging Units,
- TEG Dehydration Unit,
- Vent Shaft,
- Pigging Station and
- Wastewater Treatment Building.

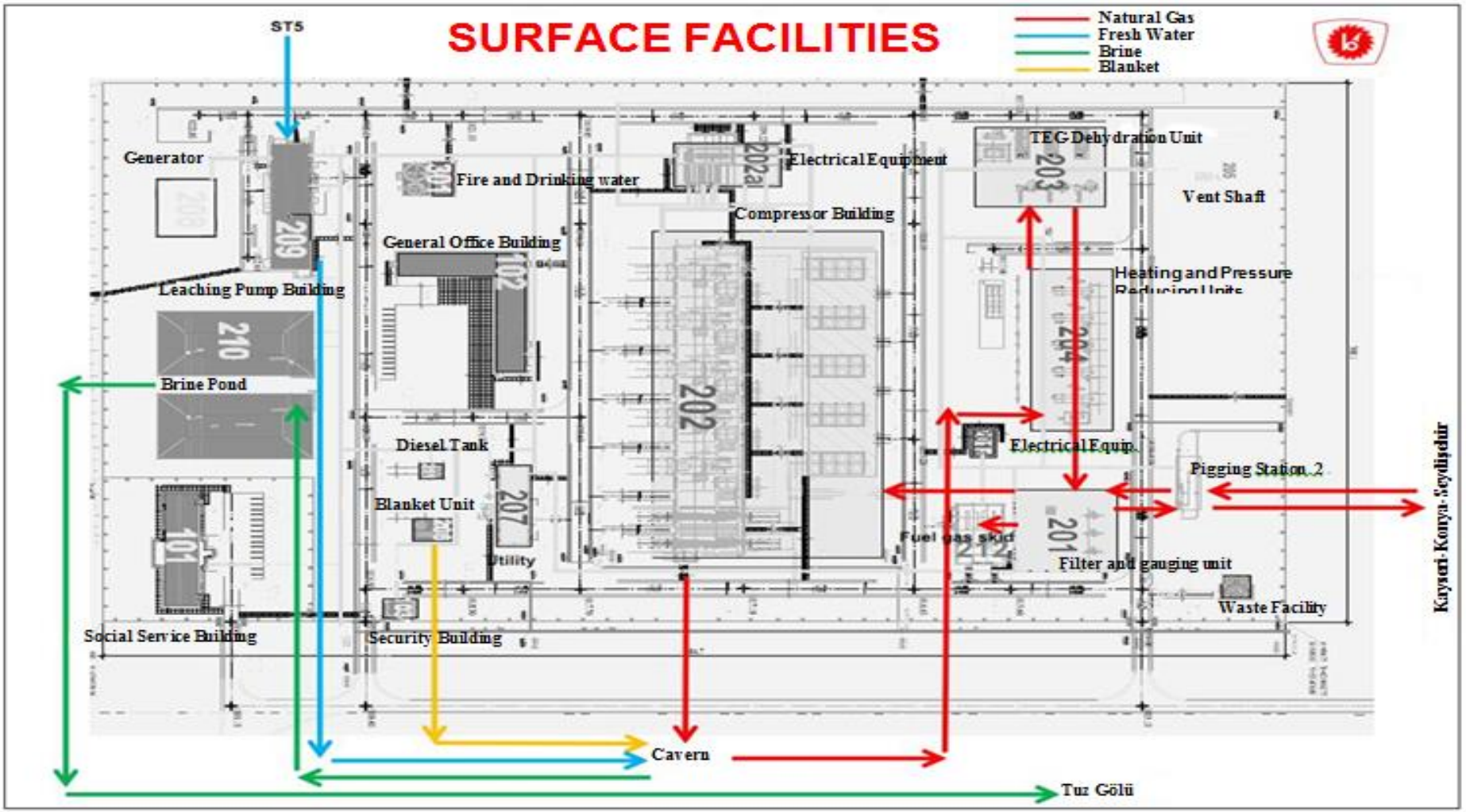


Figure 3.3.1.1. Surface Facilities – General Process and Layout

Wells/Caverns

48 wells will be carved out within the scope of the project, and works in the wells will be carried out in two stages - the drilling and leaching processes. The leaching process will be carried out by the Solution Mining – Water Supply and Leaching of the Caverns method.

For each well to be carved out within the scope of project, approximately 100 m X 100 m (1 ha) area will be utilized. The layout plan of the units to be established within this area are shown in Figure 3.3.1.2. and Figure 3.3.1.3., respectively, for the drilling and leaching processes.

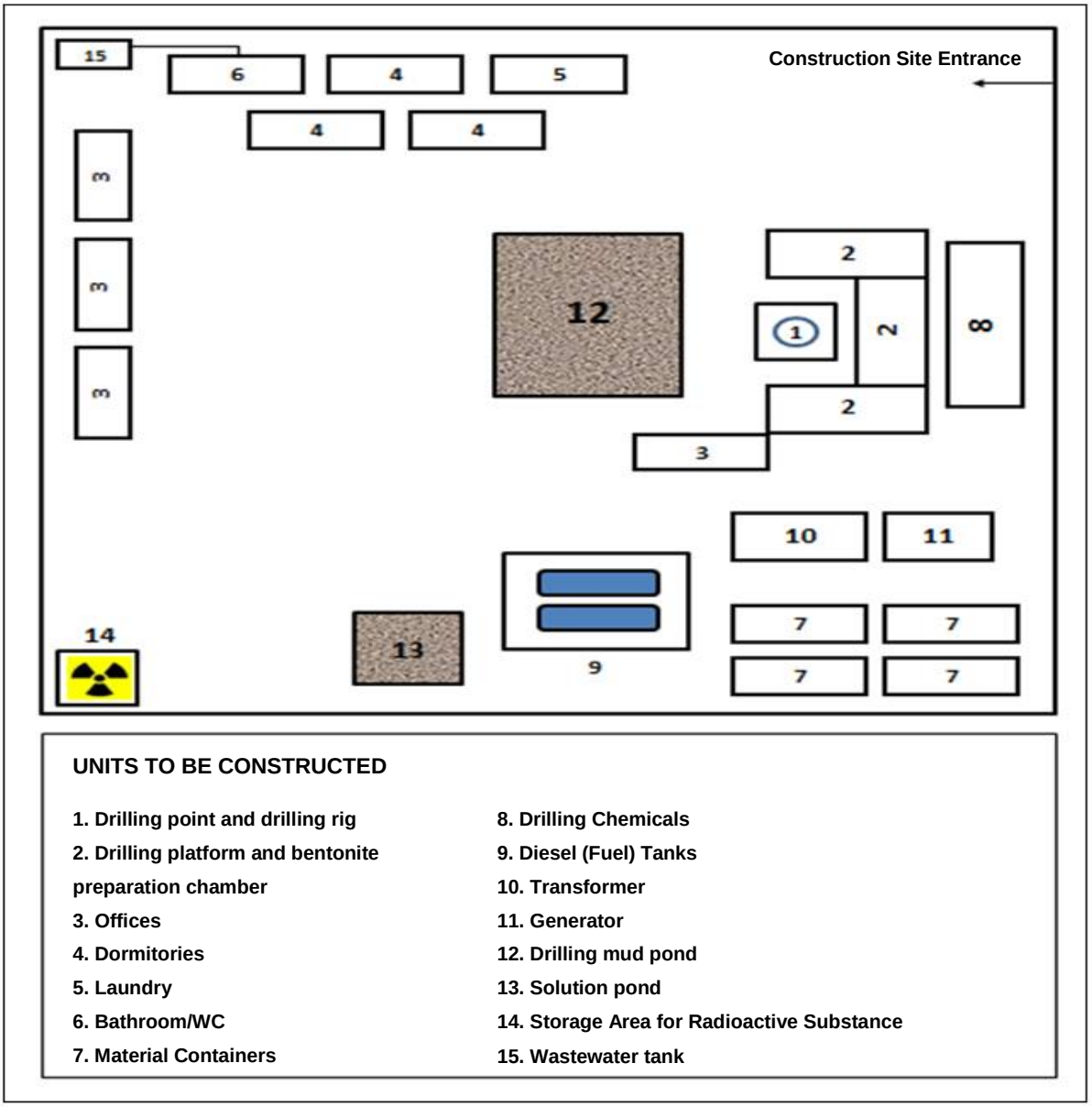


Figure 3.3.1.2. Well Site Layout and Units to be Established In the Drilling Processes

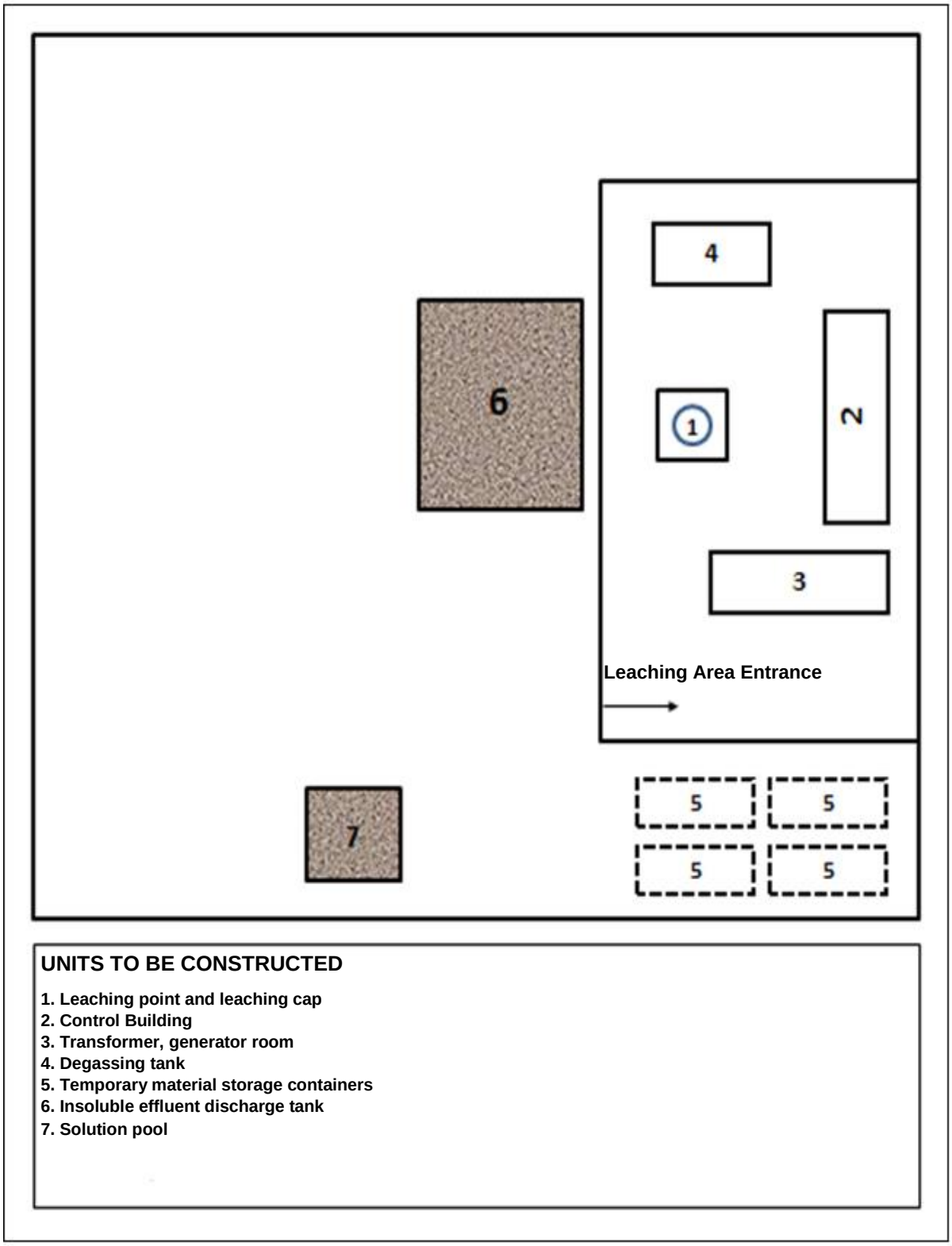


Figure 3.3.1.3. Well Site Layout and Units to be Constructed In Leaching Processes

Within the scope of the project, containers will be used during the drilling works, and these containers will be removed from the area after the drilling works are completed.

The construction of single-storey control structures to be utilized in the operation stage will be carried out during the leaching process.

These locations may be changed after the detail engineering works that will be carried out following the EIA Process provided that the locations remain within the licensed storage area received from the EPDK as shown in Appendix-1.4. In case these changes become obligatory, the required works and processes will be performed within the scope of the EIA Regulation and WB Standards.

Fresh Water Line

Fresh water will be used for the leaching of the caverns. 48 caverns are planned to be drilled in groups of 6, and the fresh water requirement will be supplied from the reservoir of Hirfanlı Dam, which is 115 km from the project area, through approximately 130 km-long and 52 - 56 inch-diameter new pipeline to be installed underground parallel to the pipeline used within the Underground Gas Storage Project (currently under construction).

The planned fresh water line will have a capacity of 10,000 m^3 per hour and will ensure that the water (45 million m^3 per year) required for leaching is taken from the Hirfanlı Dam and bring it to the wells. In this respect, a protocol will be signed between the General Directorate of the State Hydraulic Works and BOTAŞ in line with the letter No. 858388 of December 21, 2016, of the Department of Research and Plan of the General Directorate of State Hydraulic Works, provided in Appendix-1.6.

The characteristics of the fresh water line planned under the Gas Storage Expansion Project are as follows:

- **Length of the Pipeline** **:** ~ 130 km
- **Diameter of the Pipe** **:** 52 - 56”
- **Type of the Pipe** **:** American Petroleum Institute-API 5L standard, X42 Steel Pipe, external surface covered with polyethylene (PE), internal surface covered with epoxy resin
- **Wall Thickness of the Pipe** **:** 11 - 14 mm
- **Design Pressure** **:** 45 bar (g)
- **Operational Pressure** **:** 15 - 28 bar (g)

For water intake, a new water intake structure for the Gas Storage Expansion Project will be established near the reservoir area of Hirfanlı Dam as part of the fresh water line. Water taken from dam reservoir will be transported to surface facilities by pump stations to be constructed on the fresh water line route. Also, in case of a possible water cut, water taken from the dam will be stored in water tanks to be constructed on the same route with the

purpose of the continuity of the leaching process. 3 pump stations and 5 storage tanks will be constructed within the scope of the project, and the locations of these facilities will be determined according to the hydraulic calculations in a manner to ensure that they will be on the fresh water line route and around the pump stations and storage tanks used in the Underground Gas Storage Project under construction and remain within the Area of Influence (500 m corridor).

Brine Discharge Line

Brine arising from the leaching of the caverns will be discharged to Tuz Gölü with a approximately 27.9 km long, 52 - 56 inch-diameter and have a capacity of 10,000 m^3/h discharge line by its own gravity due to the elevation difference without any need for a pump station.

The technical characteristics of the planned brine discharge line are given below.

- **Length of the Pipeline** **:** ~ 27.9 km for
- **Diameter of the Pipe** **:** 52 - 56”
- **Type of the Pipe** **:** GRP (Glass Fiber Reinforced Plastic) Pipe
- **Wall Thickness of the Pipe** **:** 16 – 17 mm
- **Design Pressure** **:** 21 bar (g)
- **Operational Pressure** **:** 16 bar (g)

At the end point of the pipeline planned within the scope of brine discharge, a unit will be established as a diffuser structure, an example of which was established at a point where brine was generated as a result of a leaching process, is discharged under the UGS Project seen in Picture 3.3.1.1. In order to minimize the damage that may occur as a result of brine discharge at one-point, distributors/diffusors will be placed on both sides of the planned line in the shape of a crossing. Also, a gabion system, formed by means of filling stone into a gabion basket, will be established on the ground.

Picture 3.3.1.1. A view from Brine Discharge Point of Underground Gas Storage Project where Leaching Process is in Progress

Natural Gas Branchman Line

The surplus of gas occurring in the summer months will be stored in wells/caverns by being taken from the Kayseri-Konya-Seydişehir areas of Eastern Anatolia Natural Gas Main Transmission Line passing 23 km from project area through the Branchman line, which will be constructed at a length of 21 km and a diameter of 40 inches, parallel to the pipeline used within the scope of the Underground Gas Storage Project. It will be pumped back to national network during the periods when demand increases.

Maximum gas withdrawal has been taken into consideration in identification of the characteristics of the pipes of the natural gas branch line. The characteristics of the line, which has an approximate capacity of 30×106 m³/day are given below:

- **Length of the Pipeline** **:** ~ 21 km
- **Diameter of the Pipe** **:** 40”
- **Type of the Pipe** **:** American Petroleum Institute-API 5L standard, X70 Steel Pipe, external surface covered with polyethylene (PE), internal surface covered with epoxy resin
- **Wall Thickness of the Pipe** **:** 15,9 mm
- **Design Pressure** **:** 82.5 bar (g)
- **Operational Pressure** **:** 75 bar (g)

Connecting Lines between the UGS Sites

Between the wells to be constructed in the project area, connecting lines will be constructed for the connection of fresh water, brine solutions, natural gas and support gases such as nitrogen. The total length of these lines will be approximately 21 km (47 wells X ~ 450 m), and this may vary according to the locations of the wells. The characteristics of the connecting lines between the planned storage wells are given below:

- **Natural Gas Line:** 16" diameter, carbon steel, 31 mm wall thickness, American Petroleum Institute-API 5L standard X65 and 10" diameter, carbon steel, 21 mm wall thickness, American Petroleum Institute-API 5L standard X52.
- **Brine Line:** 12" diameter, 5 mm wall thickness, CTP Pipe (Glass Fiber Reinforced Plastic).
- **Nitrogen Line:** 3" diameter, carbon steel, 11 mm wall thickness, American Petroleum Institute-API 5L standard X52.
- **Fresh Water Line:** 10" diameter, carbon steel, 14 mm wall thickness, American Petroleum Institute-API 5L standard X52 and 12" diameter, carbon steel, 15 mm wall thickness, American Petroleum Institute-API 5L standard X52.

The routes of the pipelines and location of the facilities, the technical characteristics of which are given above, are shown on a topographic map of a scale of 1/25,000, provided in Appendix-2. The technical characteristics may vary according to the detailed engineering activities during the final design stage.

As stated in Section 3.1.1., 3 pump stations (PS's) that will be installed on the route of the fresh water line for taking water from Hirfanlı Dam reservoir area and transporting to the surface facilities. Additionally, for the continuity of the leaching process within the context of the fresh water project, water taken from Hirfanlı Dam will be stored in 5 storage tanks (STs) to be built on the fresh water line route for a case of possible interruption of water supply. Technical details of the PS's and ST's will be determined after final design.

3.4. Construction Activities of Proposed Gas Storage Expansion Project

3.4.1. Construction of Pipelines

Preparation of the Construction Corridor

Unless the construction activities in planned lines show parallelism with each other, the construction corridor will have a width of 28 m in line with the reference drawings provided in Annex-3 of the Regulation on the Technical Security and Environment Related to the Construction and Operation of Crude Oil and Natural Gas Pipeline Facilities, issued by the General Directorate of the Petroleum Pipeline Corporation (BOTAŞ), which entered into force with the Official Gazette dated July 04, 2014 and numbered 29050.

Within the scope of the cleaning and preparation of the route corridor, any material that exists on the route corridor and might hinder the progress on the working site will be removed. Then, in all areas (including wetlands, swamps, side and steep slopes areas, and agricultural areas) within the construction corridor (~ 28 m), the topsoil (if any), which is the most important element for the reinstatement work, will be stripped and preserved in proper condition so that it can be used again. In addition to this,

- Permits will be obtained to cut the trees on the route,
- All necessary measures will be taken to prevent damage to any trees and bushes outside the construction corridor and the temporary working site,
- Construction equipment that is used to open the route will not be allowed outside the construction corridor,
- Only permitted access routes will be used to access to the construction corridor.

Transportation of Pipes to the Construction Corridor and Stringing

The pipes to be used in the planned pipeline will be transferred to the construction corridor through exiting or permitted routes. During the transportation of the pipes, the necessary measures will be taken to prevent dust emission and speed limits will be adhered to, especially in settlement areas. The pipes transferred to the route will be collated properly along the line, taking the necessary safety measures (not stocking on steep slopes, supporting the pipes with sand sacks or wedges, etc.).

Pipe Bending and Welding

The pipes transferred to the area will be bent according to the topographic structure and their intersection with other lines and infrastructure projects before they are welded.

Nondestructive Testing

The welding points will be filmed for the quality control of the welding process.

Blasting and Coating in Pipe Connection Points

Following the completion of the welding process, a blasting operation will be conducted at welding points in order to achieve a smooth surface before coating.

Since the pipes to be used in the project will be covered before they arrive to the site (except for the brine discharge line), no isolation process will be required for any of the pipes. Only the welding points of the pipes will be isolated. The GRP pipes, which will be used for the brine discharge line, will have seals that allow interlocking.

Trenching

Excavators and grooving machines will be used for trenching. Before the pipes are placed in the trench, the sand obtained by sifting of the excavated material will be placed on the ground of the channel.

The waste material obtained from the trench excavation will be stored next to the trench, across the topsoil obtained from the construction corridor, taking necessary measures to prevent the material mixing with the topsoil.

The excavation material that remains after bedding, supporting and backfilling, will be used in restoration of the roads and land preparation processes. The remaining excavation soil will be stored on permitted sites on the route.

Laying Pipes in the Trench

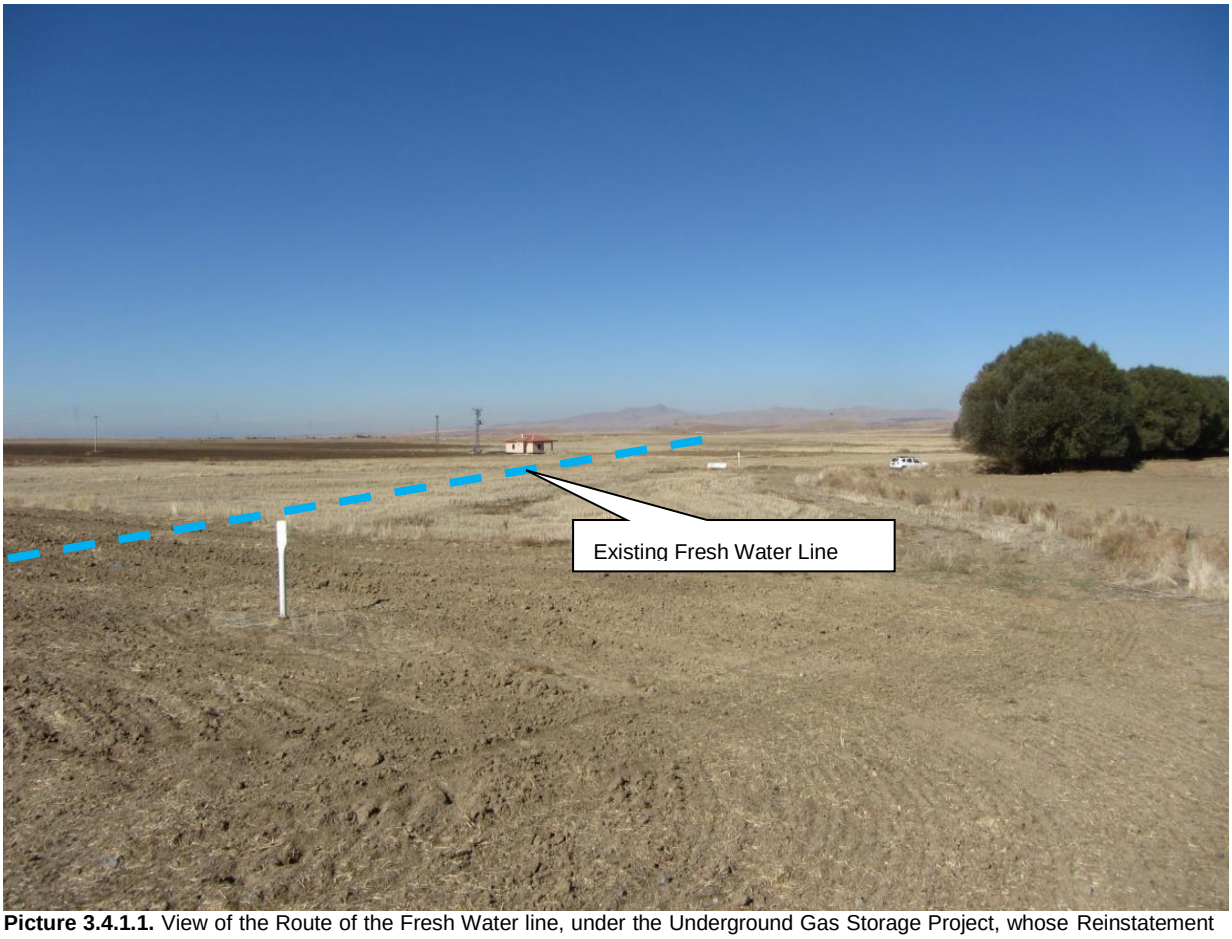
The pipes will be laid in the channels after they are welded and the welding points are isolated. During the pipe-laying process, special construction equipment (sideboom) will be used.

Backfilling

After the pipe-laying process is completed, the channel will be backfilled with the excavation material obtained from the channel. The backfilling material will be compacted so that sitting and collapse is avoided. Furthermore, following backfilling, berms of maximum 30 cm will be rested on the pipes and necessary time will be given for the accommodation of the soil before the topsoil is laid back.

Cleaning and Reinstatement

In order for the minimization of the visual impact of the planned pipelines and restoration of the area, the topsoil that was stripped before will be laid back following the necessary leveling and cleaning (rocks, project construction wastes, etc.) activities and the plowing of the areas tightened due to vehicle movements. Picture 3.4.1.1. shows an image of the route reinstated following the construction of the fresh water line under the Underground Gas Storage Project whose construction work is ongoing.



Picture 3.4.1.1. View of the Route of the Fresh Water line, under the Underground Gas Storage Project, whose Reinstatement Work is Completed (November, 2015)

In order to ensure that the existing infrastructure facilities (underground cables, water lines, canalization lines, irrigation projects, etc.) along the routes of the pipelines (fresh water line, brine discharge line, natural gas branch line) to be constructed under the project are not damaged, the design activities will be performed in due fashion and the construction plans will abide by such designs. The construction plans will be submitted to the relevant institutions to get their approval before the construction work.

Moreover, safety measures will be taken to prevent any possible accident in the pipelines to be constructed under the planned project. The fresh water line and the brine discharge line will respectively have valve chambers with line valves, air discharge valves, and discharge valves available. Furthermore, along the fresh water line and the brine discharge line, line markers will be used to mark the line route and the line point in such a way that at least two markers see each other. The name of the line, type of pipe, the emergency numbers, “High Pressure” warnings, diameters and thickness of the pipes, kilometer points, etc. will be written on the markers (Picture 3.4.1.2.).

Picture 3.4.1.2. Views of Line Markers Used on the Routes of Fresh Water line and Brine Discharge Line under the Underground Gas Storage Project (December 2015)

Information will be provided to relevant institutions so that necessary permits and warnings are given before any agricultural activity and electricity, natural gas, or any other infrastructure system installation in the area where the lines are laid. Thanks to the pressure and flow rate sensors installed against accidents and leakages in the lines, the valves on both sides of the point of accident will be closed and the water flow will be temporarily blocked. The flow will be restored only after the completion of the maintenance, repair and cleaning activities. Teams will be trained and held at disposal for the prevention of any failure or accident.

Under the planned Gas Storage Expansion Project, the fresh water line intersects with the Aksaray Mamasın Dam Irrigation Project (at project stage) and the Groundwater Irrigation Project, as pointed out in the official letter of the Department of Inspection, Planning and Allocations of the General Directorate of DSİ of the Ministry of Forestry and Water Affairs of the Republic of Turkey, provided in Appendix-1.8.

The activity and impact area of the planned fresh water line covers the irrigation channels, drainage channels, and relevant maintenance corridors of the Aksaray Mamasın Dam Irrigation Project and the groundwater project. Necessary measures will be taken to ensure that the activities do not jeopardize the integrity of the existing and planned projects and that the fresh water line does not damage the construction elements and maintenance corridors of the abovementioned projects and necessary engineering structures will be built at intersection points. At the design phase, the dimensions of these engineering structures will be determined in line with the criteria of the State Hydraulic Works so that they do not interfere with the integrity of the irrigation activities.

The projects of these engineering structures will be submitted to the 4th Regional Directorate of the State Hydraulic Works and any damage or loss caused during the construction of such engineering structures will be borne by BOTAŞ, the contractor. In this respect, following the termination of the EIA process, a protocol will be signed between BOTAŞ and the 4th Regional Directorate of the State Hydraulic Works.

Environmental impacts (topsoil management, waste management, hydrotest management, air quality management and noise) from pipeline construction activities and measures to be taken are given in Chapter 5.

3.4.2. Construction of UGS Sites

Within the scope of the planned Gas Storage Expansion Project and Underground Gas Storage Project, where the construction is ongoing, the storage method will involve voluminous cavities that will be created by the dissolution of salt with water. With this method, which is also defined as leaching mining, the specified salt formations will be leached. Detailed information on the use of salt formations in underground natural gas storage is given in Section 3.8.1.

In the scope of the Gas Storage Expansion Project, leaching processes in the caverns which will be formed within the project will be gradually carried out in phases with the method of Solution Mining Process – Water Supply and Leaching of the Cavern.

In this method, binary pipe-in-pipe assemblies which have different diameters and various lengths are placed inside the drilling well which is preserved through protection pipes. While fresh water needed for making the salt solublet is fed via a pipe, the produced salt solution is withdrawn to above the ground via another pipe. The sizes and shapes of the solution opening can be gradually directed by means of the processes of solution withdrawal and the feeding of fresh water realized equably with each other (Özarslan and others, 2007). A protective blanket which is lighter than water and does not disperse salt, is pumped into the cavern via the third connection generally located in the outermost circuit in order to prevent solutions in the top and an-rea around the cavern (BOTAŞ, 2003).

The design of the leaching process is made ready for optimal use without exceeding mechanically acceptable sizes. There are two main technologic application types of the method including direct and indirect application (Figure 3.4.2.1.). The factors considered in determining the leaching method are geologic conditions, the required cavern shape and economic conditions.

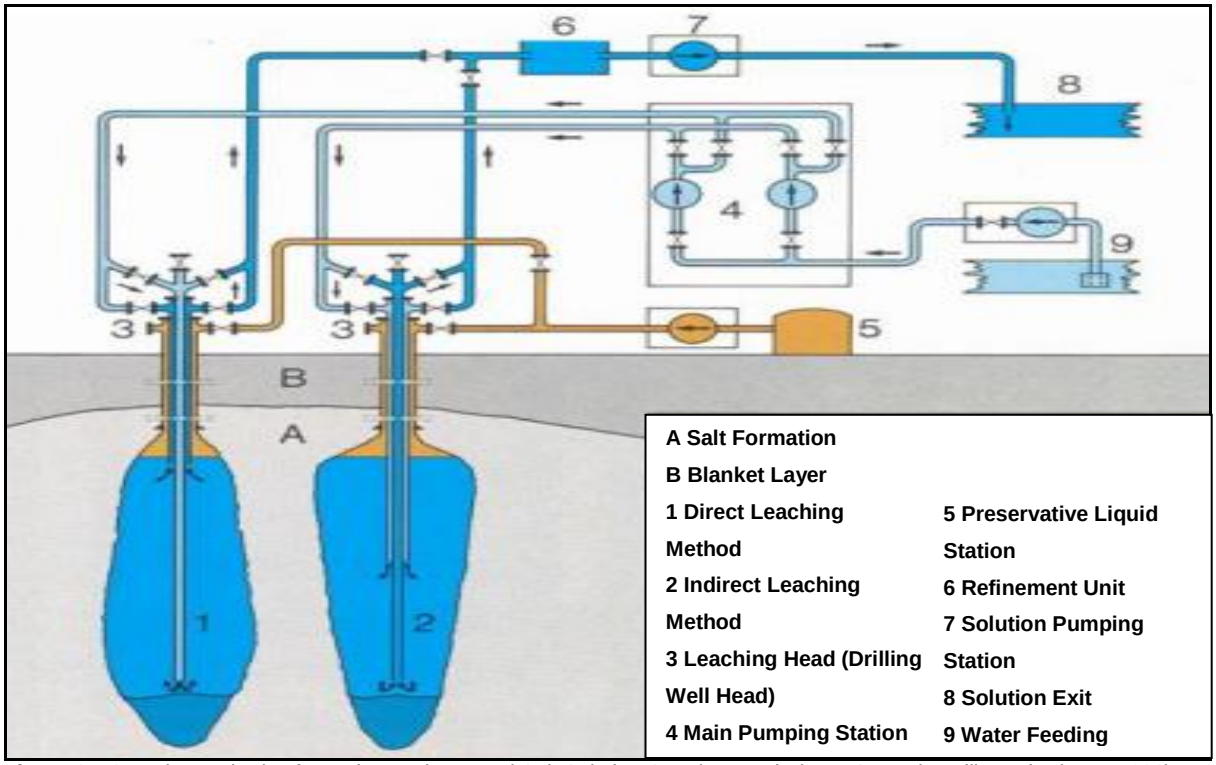


Figure 3.4.2.1. The Methods of Forming Underground Salt Solution Openings and Above Ground Facility Units (KBB, 1988)

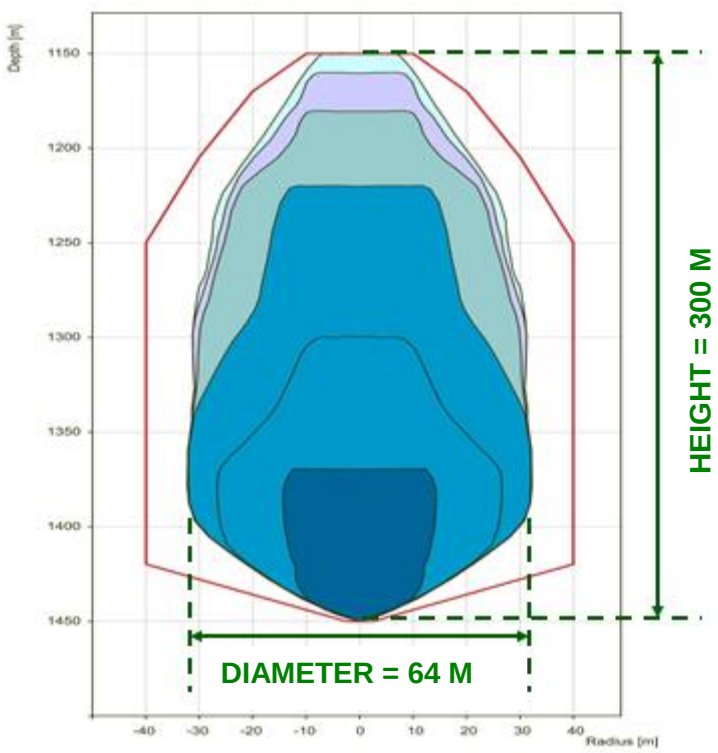
In the direct leaching method, fresh water is fed via the pipe located in a field near the opening bottom and salt solution liquid is conveyed to above the ground via the gap between the outer and inner pipe near the opening top. The above method especially allows the parts near the opening bottom to enlarge more rapidly (Özarslan and others, 2007).

In the indirect leaching method, while fresh water is given to the upper part of cavern through the inner circuit, the salt solution is withdrawn from the lower part of cavern (BOTAŞ, 2003). This method especially allows the parts near the opening top to enlarge more rapidly (Özarslan and others, 2007).

The required cavern shape is obtained by optionally changing the depth arrangements of the leaching lines, the leaching ratios and the direct and indirect leaching methods. The control and follow-up of the leaching process are carried out via water and solution analysis, eco-metric researches and computer-based calculations and simulations (BOTAŞ, 2003).

The storage volumes of salt caverns may increase up to 100,000 – 750,000 m³ based on the geologic conditions and needs related to the operation. For further storage processes, both leaching lines are changed with the production line (BOTAŞ, 2003).

The geometry and technical features of the caverns which will be formed within the Gas Storage Expansion project are described in Figure 3.4.2.2. and leaching phases are described in Figure 3.4.2.3.



Leaching Rapid of Cavern (max)	280 m³/h
Physical volume of cavern	~ 630,000 - 750,000 m³
Total gas volume of cavern	~ 156 million m³
Working gas volume of cavern	~ 104 million m³
Cushion gas volume of cavern	~ 52 million m³

Figure 3.4.2.2. The Geometry and Technical Features of the Caverns to be Formed within the Gas Storage Expansion Project

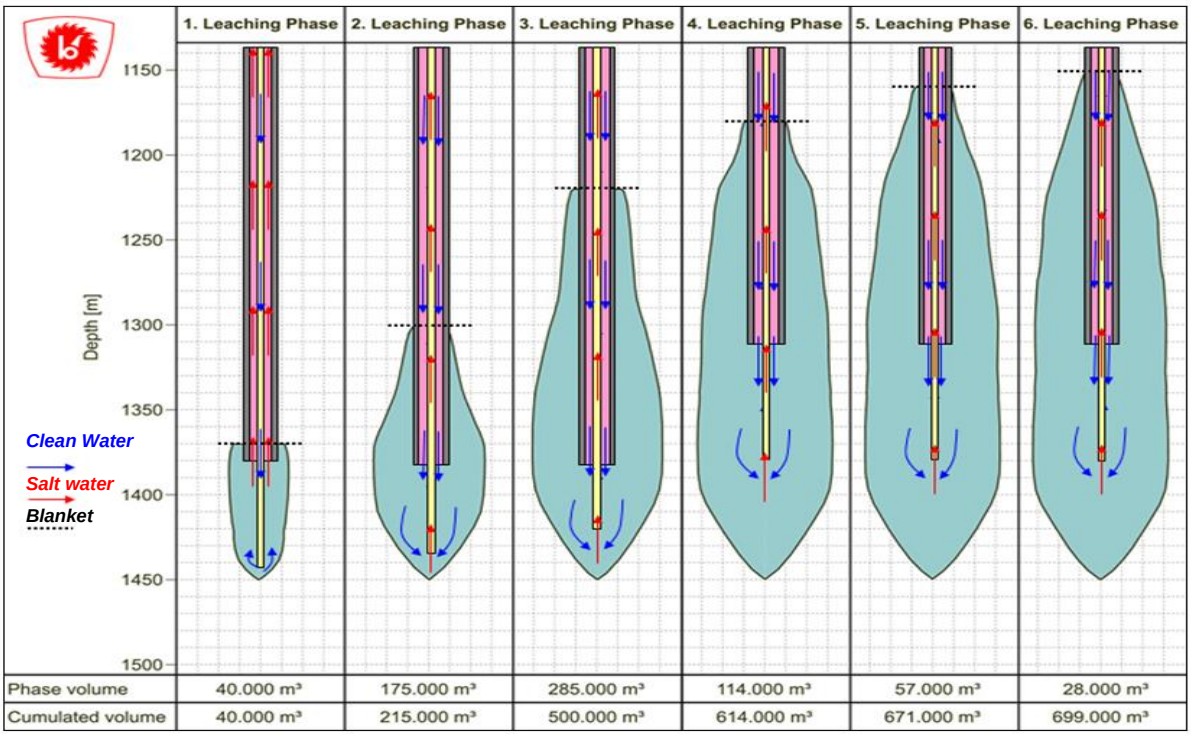


Figure 3.4.2.3. Leaching Phases

During the construction period of UGS Sites; drilling mud, insoluble effluents, brine (salt water) and insoluble sludge of brines will be consist sourced from the leaching activities and measures to be taken are given in Chapter 5.

3.5. Proposed Project Schedule of Gas Storage Expansion Project

It is estimated that the construction phase of the Gas Storage Expansion Project will last 7 years and that its economic life will be 30 years. As shown in Figure 3.5.1., with the planned Gas Storage Expansion Project, where the first gas storage will be in last quarter of 2019, the Underground Gas Storage Project will reach a total working capacity of 6 billion Nm^3 at the end of 2023.

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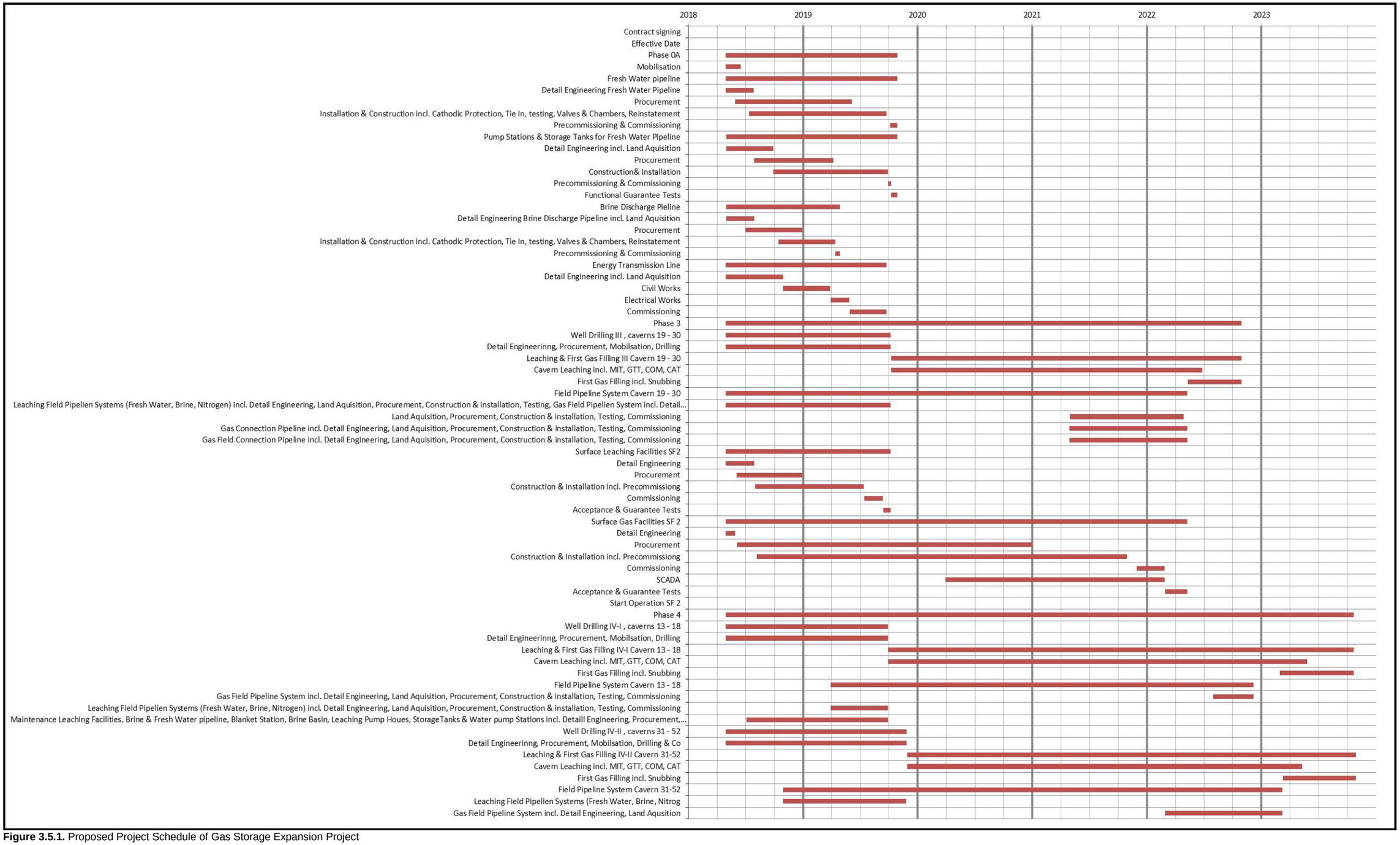


Figure 3.5.1. Proposed Project Schedule of Gas Storage Expansion Project

3.6. Area of Influence of Gas Storage Expansion Project

Area of Influence is defined as the area that a project planned to be established impacts positively or negatively by means of environmental components during pre-operation, operation and decommissioning phases according to Regulation of Environmental Impact Assessment.

The Area of Influence (AoI) for Gas Storage Expansion Project (GSEP) activities has been defined in the scope of the ESIA as the area in which a direct or indirect impact on the physical, ecological, social or cultural environment might occur. The size of the AoI can vary depending on the nature of the impact and on different types of impacted components as also defined above.

The AoI encompasses:

- Direct impacts, which are caused by an action and that occur at the same time and place.
- Indirect impacts, which are caused by the action and occur later or further removed in distance, but are still reasonably foreseeable.
- Cumulative impacts, which result from the incremental impact of the project when added to other existing, planned and reasonably predictable future projects and developments, and/or from combined effects of the multiple components associated with the project in the same geographical area.

Some impacts affect an area related to the Project's direct footprint or a restricted buffer. This area is defined as "local AoI".

For instance, some impacts potentially acting within the local AoI could be the following:

- Impact on air quality due to dust emission related to topsoil removal, soil excavation, topsoil storage, etc.;
- Impact on soil due to reduction of soil area related to building/infrastructure construction, etc.;
- Impact on terrestrial flora due to removal of vegetation by clearing within the construction corridor;
- Impact from noise due to noise emissions related to construction activities;
- Impact on land use and agriculture due to soil reduction related to building/infrastructure construction;
- In addition, some impacts act beyond the local AoI, as:
    - Impact on air quality due to gaseous pollutant emission related to the operation of the compressor stations;
    - Impact on visual aesthetics due to the presence of buildings/infrastructures/materials;
    - Impact on groundwater due to the withdrawal of water related during construction and operation phases;
    - Impact on economic conditions due to the demand of goods, materials, and services related to construction activities.

The Baseline Study Areas are based on the likely area of influence of the Project in which a direct or an indirect impact on the physical, biological and social components might occur. Study areas will be defined for each environmental and social component, within the general framework described below.

The Project planning, including engineering and environmental routing studies, will be completed within the 500 m Route Corridor with the intent to define the centerline for the pipeline, around which the Pipeline System will be designed. It is understood that some of the Pipeline System and Project-related facilities (e.g., ETL's, access roads and disposal areas) may be outside of the 500 m Route Corridor.

The baseline study will be mainly focused on the 500 m wide Route Corridor and within the 500 m from all of the Above Ground Infrastructures (AGIs) including temporary construction facilities defined as the Local Study Area (LSA). The LSA has been determined according to route and UGS sites selection studies of GSEP and does contain the pipelines, the construction corridor and other project related facilities.

Depending on the environmental and social components analyzed in this document, variable buffers centered on the LSA will be considered as well, as described in the relevant sections below.

To correctly assess the importance and role of some environmental components in the LSA, a Regional Study Area (RSA) will be analyzed as well. RSAs will serve as a reference for comparison of the environmental and social data collected in the LSA, in order to increase the understanding of the importance and role of the LSA within a broader context. This comparison will allow refining the definition of sensitivity of the VECs during the Impact Assessment stage. The RSA is spatially identified for the environmental components as reported below (Table 3.6.1.).

Table 3.6.1 RSA Extension

Onshore Physical Components	RSA Extension
Meteorology and climatology	regional climatic area (for climatology) meteorological homogeneous area (for meteorology)
Air quality	meteorological homogeneous area
Geology and geomorphology	stratigraphic/structural homogeneous zone (for geology) homogeneous landform area (for geomorphology)
Seismology	seismogenic zone / homogeneous seismic hazard area
Soil	soil homogeneous area (referred to "reference soil group" or " soil capability classes")
Hydrology and surface water quality	river basin
Hydrogeology and groundwater quality	groundwater basin
Noise and vibration	district area

Onshore Physical Components	RSA Extension
Visual aesthetics	homogeneous landscape area
Terrestrial flora	Ecological Zone
Terrestrial fauna	Ecological Zone
Freshwater flora	Ecological Zone
Freshwater fauna	Ecological Zone
Terrestrial habitats and ecosystems	Ecological Zone
Freshwater habitats and ecosystems	Ecological Zone
Biodiversity	Ecological Zone
Protected areas	250 m buffer from the LSA.

The term “homogeneous”, as referred to physical components, means the component has the “same features”.

The RSA is defined as the provinces for the social components of the study, of which there are 20 through which the pipeline crosses. The LSA is defined as the districts that the pipeline route crosses and also UGS areas for the social components of the study.

Both the RSA and LSA have been assessed chiefly by a desktop study and verified through field study where significant knowledge gaps or uncertainties are identified or assumptions are not justified.

The site baseline data collection is performed within the 500 m corridor and EMRA License Area for certain disciplines as detailed below.

Pipelines

- Within the 500m corridor along the proposed pipeline centerline (250 m wide on each side) and 250m from the border of UGS sites for Air Quality (PM_{10}/$PM_{2.5}$),
- Within the 500 m wide corridor along the pipeline route and 250m from the border of UGS sites for Surface Water,
- Within the 500 m wide corridor along the pipeline route and 250m from the border of UGS sites for Noise,
- Within the 500 m wide “Study Corridor” along the pipeline route and 250m from the border of UGS sites for the Biological components.

Detailed information on baseline studies conducted are provided in Section 4 of the ESIA Report.

Groundwater samples have been collected along the pipeline route and around of planned UGS sites of GSEP where the groundwater was present at the drilled boreholes. The selection of the sampling locations for groundwater will aim to be representative of the groundwater quality along the route. The completed groundwater sampling and analysis are presented in Chapter 4 of the ESIA Report.

Access Roads

Existing access roads of UGS Project has been re-defined and also the new access roads will be determined during the upcoming phases of the project after the final design. Access roads will be assessed and selected according to field characteristics (sensitivity, proximity to residential area, etc.) and their applicability for project use.

Camp Sites

Existing camp sites of UGS Project will be re-used and also the new camp sites will be determined during the upcoming phases of the project after the final design. Camp sites will be assessed and selected according to:

- Within 250 m from the boundary of proposed construction camps for Air Quality (PM_{10}/$PM_{2.5}$).
- Within 250 m of the pipeline workers camp sites for Noise.
- Within the 250 m-wide “Study Corridor” along the pipeline route for Biological components, where the construction camps are inside the 250m corridor.

For socioeconomic components, similar to the ones considered for the route, the same buffer will be considered for the proposed camp sites. The settlements within this area will be considered to be potentially affected from the land acquisition, construction activities, and Project traffic.

For cultural heritage impacts, the area of influence for the construction camps will similarly be delineated by their physical footprint.

Surface Facilities/Compressor Buildings

- Within 250 m from the boundary of the proposed surface facilities/compressor buildings for Air Quality (PM_{10}/$PM_{2.5}$),
- For Air Quality (SO_2, NO_x)

The impact area according to the Regulation on the Control of Industrial Air Pollution Annex 2, item b, Article 1, is “the facility impact area which has a radius of 50 times the stack heights from the center of emissions determined according to the provisions given in Annex-4 of this regulation. For the facilities that have emissions-effective-heights less than 30 m ($\Delta h+h$), the impact area is a square with side lengths of 2 km.

Since the impact area is the anticipated distribution area of the air polluting emissions originating from the Project, it has a conservative width to enable the estimation of impacts of the Project on the environment.

- Within 250 m to surface facilities/compressor buildings for Noise
- Within 250 m Study Corridor for Biological components

For the socioeconomic studies, the same buffer was considered for the surface facilities/compressor buildings. Settlements within this area were considered to be potentially affected by land acquisition, construction activities, and Project traffic.

For the cultural heritage impacts, the area of influence for the compressor stations will similarly be delineated by their physical footprint.

Pump Stations (PS's) and Storage Tanks (ST's) Stations

The PS's and ST's are inside the LSA of the pipeline corridor. Therefore, the environmental, socioeconomic, and the cultural heritage impacts of these are evaluated within the area of influence of the pipeline.

Pigging stations

The pigging stations are inside the LSA of the onshore pipeline corridor. Therefore, the environmental, socioeconomic, and cultural heritage impacts of the pigging stations are evaluated within the area of influence of the onshore pipeline.

Considering the planned facilities and units, it is conceived that the most important area that can be affected from the project is the town of Sultanhanı, since the majority of the surface facilities and well fields are located on the land belonging to Sultanhanı District, bordered by Aksaray province.

The principal and auxiliary units that will be established within the scope of the project are within the borders of Aksaray, Sarıyahşi, Ağaçören, Ortaköy, Eskil, Central and Sultanhanı districts, Konya province, Emirgazi district and Ankara province, Evren district; these facilities and structures are generally covered with agricultural land and pasture areas.

3.7. Existing and Future Projects around the Gas Storage Expansion Project

In the vicinity of the Gas Storage Expansion Project, there is another Gas Storage Project planned by ATLAS Petroleum Gas Co has a EIA decision (Figure 3.7.1.).

Also, in the area between the Underground Gas Storage Project (UGS Project), under construction and the planned ATLAS Project, a high-speed train project is planned to pass the south of EMRA licensed area of UGS Project.

The cumulative impacts of both Gas Storage Projects for the environmental impacts are given in Section 5.6.9.

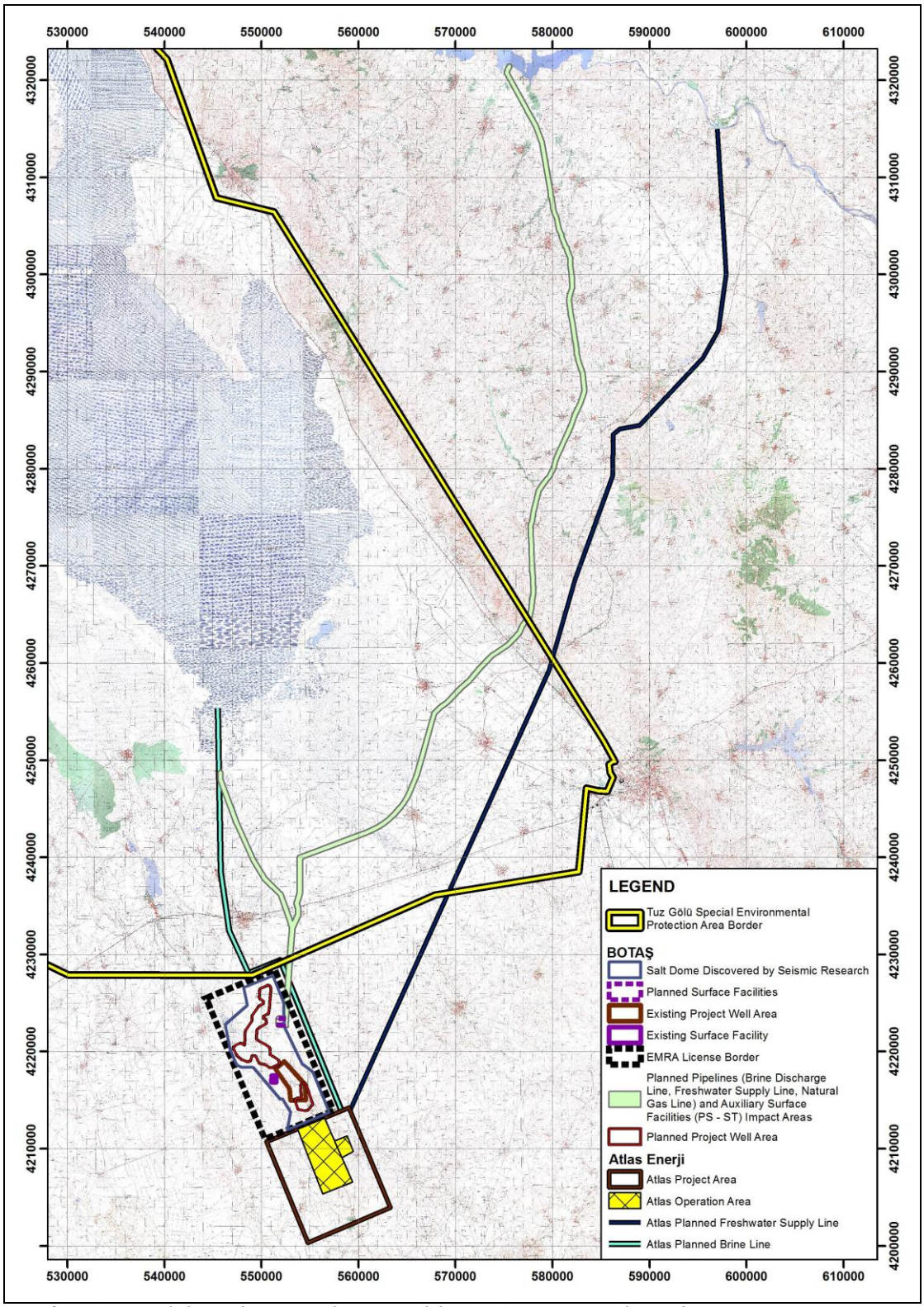


Figure 3.7.1. Existing and Future Projects around the Gas Storage Expansion Project

3.8. Alternative Analysis of Gas Storage Expansion Project

3.8.1. Alternatives of Gas Storage Expansion Project Area and Pipelines

Hirfanlı Dam Alternative for Fresh Water Supply System

In the scope of the Underground Gas Storage Project (UGS Project), it will be created a series of underground gas storage caverns by controlled fresh water dissolving of the selected portions of extensive underground natural salt formations existing at approximately a depth of 1000 m.

According to studies, the amount of fresh water required for leaching each cavern is approximately 280 m^3/hour. At the early stages of the project, it was planned to leach 2 caverns simultaneously and supply the total fresh water demand, which is 560 m^3/h, from groundwater resources. However, to speed up the project for the compensation of increasing storage demand within years, BOTAŞ envisages performing leaching operations as groups of 4, instead of 2. In such a case, the fresh water demand of project will increase up to 1,120 m^3/h. This amount of water is required for a total period of 7.5 years, the entire duration of the leaching operations.

Initially, local groundwater was considered for the fresh water source and DSİ (State Hydraulic Works), the authority responsible for the water resources allocation in Turkey allowed to utilize local groundwater resources. However, due to the water demand increase as a consequence of doubling the leaching operations and the groundwater shortage, which was one of the major concerns raised during the Public Consultation Meeting, BOTAŞ (although there exist no problem for allowance of such an amount of water from groundwater resources by DSİ) revised the project design to utilize Hirfanlı Dam reservoir located 115 km from the project site as a fresh water source and DSİ, provided the official approval for use of the required 10-12x10^6 m^3/year water from Hirfanlı Dam (Official Letter of DSI is given in Appendix-2).

Hirfanlı Dam, constructed in 1960, is one of the major multi-purpose dams in Turkey, which is used for energy and irrigation. It receives an annual inflow of approximately 2,400x10^6 m^3/year of the inlet flow to the dam reservoir. Therefore, DSİ (the letter of DSI is given in (Appendix-2) stated that they have no difficulty in supply of this amount of water over
the project life and, in addition the existing and future energy and irrigation based demands on the dam will not be affected adversely.

Within this scope, Hirfanlı Dam has been selected as the project fresh water supply source. In the scope of the Gas Storage Expansion Project, needed fresh water for leaching process will be transported by an underground pipeline of approximately 130 km to the project site as in the UGS Project.

Fresh Water Line Alternative for GSEP

Planned new fresh water line route has been selected considering the topographical, geological and environmental conditions and the following general criteria:

- Reducing the length of pipeline routes as far as possible,
- Keeping the new routes close to and in parallel the existing pipelines,
- Avoiding existing structures,
- Acceleration of the construction process in view of both the time and budget,
- Providing easy access to the pipelines via parallel routing road,
- Keeping away from population centers and
- Since the no farmer's complaints for existing pipeline route, minimizing disruption to agricultural activities.

Considering the mentioned conditions and general criteria, there is no complaint and negative feedback for the existing fresh water line. Thus new fresh water line route parallel to the existing line which is shown in 1/25,000 scaled topographic map in Appendix-2 has been selected for the GSEP.

Brine Discharge Line Alternative for GSEP

There is a military zone in this region (Figure 3.8.1.1.), and for the brine discharge line of GSEP two alternatives are evaluated to avoid a military zone area.

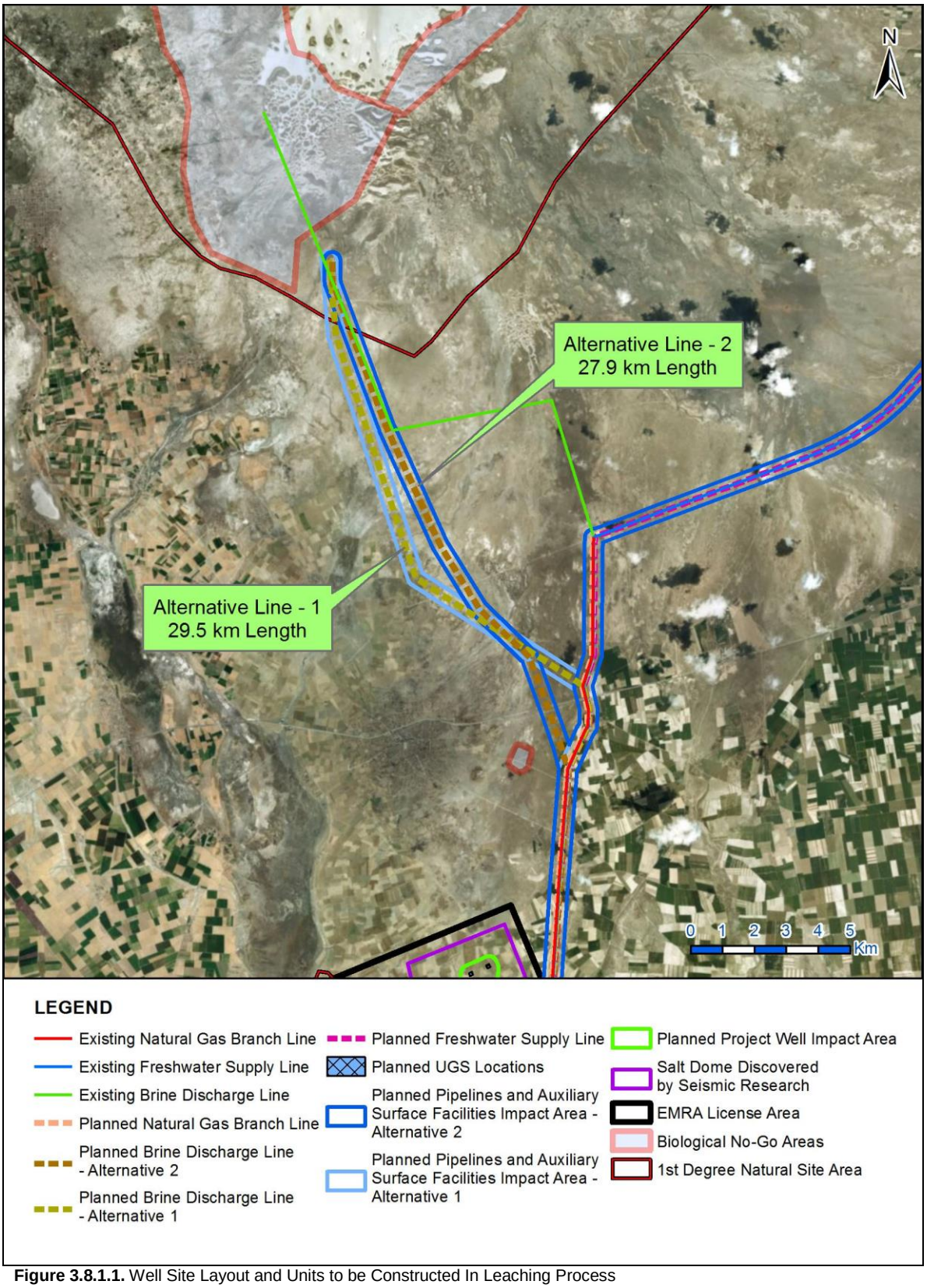


Figure 3.8.1.1. Well Site Layout and Units to be Constructed In Leaching Process

The corridor in orange (Alternative-2, 27.9 km) is determined as the technically and economically preferred alternative for brine discharging of the GSEP.

Brine Discharge Point Alternative for GSEP

According to the floristic baseline studies of UGS Project and GSEP, there are ecological sensitive areas consisting of salty steppes in this region.

As seen in Figure 3.8.1.1. brine discharge point of the UGS Project remains at least partially within an ecological sensitive area.

In the BAP study (see Appendix 7.13.), our approach was to identify critical habitats, but with the sensitiveness of the endemic / restricted ranged flora species, critical habitats were declined as “No-Go Areas”. This would have an impact to a large area of the “No-Go Areas”, where SSC species were located.

Therefore the brine discharge line was changed for GSEP. The presented alternative coloured in red was selected to avoid a No-Go Area. According to the new discharge point, a new water flow may appear and the habitat will be suitable for the SSC species to distribute.

Well/Cavern Point Alternative for GSEP

It is planned that the Project of Planned Capacity Expansion will be carried out in the area with a storage license, 17 km south of the Sultanhanı Town, in Aksaray Province, which includes the Underground Gas Storage Project, where construction works are continuing, as in the case of the Underground Gas Storage Project, and the below-mentioned issues are taken in consideration in determining the place chosen for the project. They include;

- The proximity to the Natural Gas Main Transmission Line (Kayseri-Konya-Seydişehir part of the East Anatolia Natural Gas Main Transmission Line which transmits Iran Supply Source),
- Easiness in the formation of natural underground storage and leaching processes,
- The fact that the area is in the region where earthquake risk is the lowest in Turkey and,
- The fact that the said project is a capacity expansion project which is the follow-up of the Underground Gas Storage Project, where construction works are continuing.

When these factors have been considered, it has been determined that there is no other alternative.

The criteria taken into consideration in determining the positions of underground storages are as follows:

- Features of salt layer (depth, thickness etc.),
- Quality of salt layer (tectonic movements etc.) and
- Specific distance to the current wells.

A lot of works have been realized such as the observation of the area in term of seismic, determining the characteristics of the salt layers after testing the samples taken from salt layer in laboratory environment, hydrologic work for water supply and brine discharge as stated in the Section 3. within the scope of the technical feasibility work of the UGS Project.

Alternatives by No-Go Areas

In the scope of the Gas Storage Expansion Project, another criterion of the alternative analysis is “No-Go Areas”. During the baseline studies, environmental and social sensitive areas such as archaeological sites, critical habitats and settlement areas were defined as “No-Go Areas”.

Especially, site selection of the wells / caverns has been done considering the No-Go Areas.

The EUNIS Habitats and Constraints Map of Gas Storage Expansion Project is given in Appendix-6. During the construction period, neither for designed project units nor for planned units that will be finalized after the final design, these areas will certainly not be intervened.

In addition, if a new No-Go Area is found during the Environmental and Social Monitoring Studies, that area will definitely not be intervened.

3.8.2. Alternatives of the Project Technology and Location

The underground storage of natural gas which is a second alternative along with the storage of natural gas in liquid or gas states in tanks above the ground is distinguished in terms of providing storage capacity in large quantities with lower cost. The underground storage of natural gas in liquid and gas states is crucial in terms of balancing seasonal gas withdrawal, meeting sudden gas withdrawals, providing continuous gas supply, reducing the number of discontinuous clients and fulfilling purchase and sale commitments.

In consequence of the researches carried out, it has been proven that underground storage activities are better and more superior than above-ground storage facilities because of the below-mentioned reasons;

- In the underground storage activities; abandoned petroleum and gas reservoirs, abandoned mines, aquifers, hard rock and salt caverns/caves are used for the purpose of storage and building and operating of underground storage facilities are much more economic than above ground storage facilities which are relatively larger than the other.
- The natural gas which will be stored by means of the underground storage activities are preserved in a safer environment against the accident risks which will occur due to operation (occupational accidents, safety faults etc.) and environmental hazards such as earthquake, bad weather conditions, fire, being blown up, explosion and sabotage.

- Underground storage facilities for natural gas provide advantage in spatial terms since storage activities are carried out underground and they are much more appropriate in environmental terms than above ground facilities (Figure 3.8.2.1.).

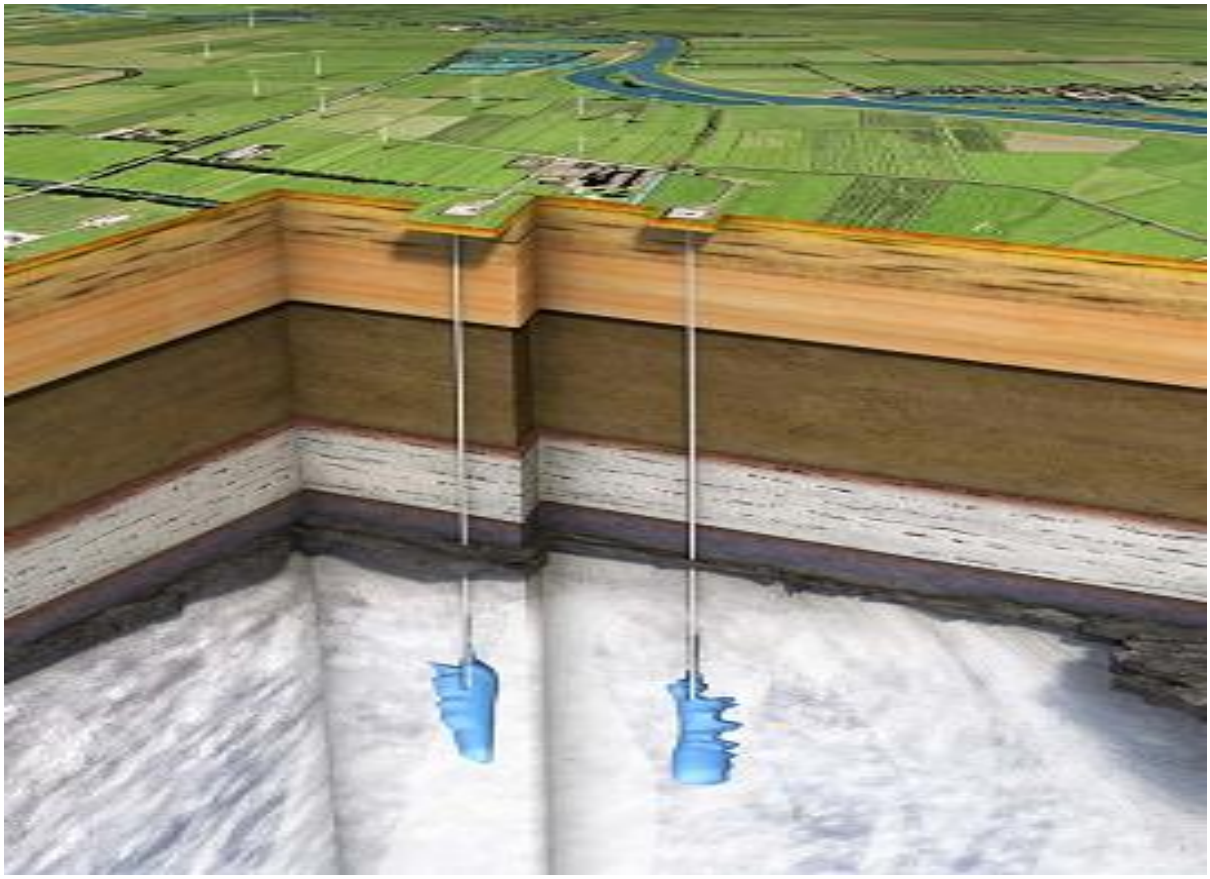


Figure 3.8.2.1. A view from The Activities of Underground Storage of Natural Gas

Natural gas is generally stored in abandoned petroleum and gas reservoirs, abandoned mines, aquifers and salt caverns/caves. The alternative places which can be used within the scope of the underground storage of natural gas can be specified as:

- Hard rock caverns,
- Aquifers,
- Abandoned mines,
- Spent petroleum and gas reservoirs and;
- Salt caverns.

The detailed information on the alternatives and techniques of the said underground storage of natural gas has been described below.

Hard Rock Caverns

These structures are magmatic, metaphoric or sedimentary rocks and provide various preconditions for underground storage. These caverns are dug by means of excavation by machinery and/or conventional methods such as drilling-exploding (Picture 3.8.2.1.). In the event of the storage of gas or liquefied materials, impermeability of these storages are provided by means of undercoating the inner walls. (BOTAŞ, 2003).

Picture 3.8.2.1. A view from the Large-Scale Stable Underground Opening Without Ground Support in the Underground Rock Salt Mine in Which Chamber Method is Applied (KALI und SALZ, 2007).

Aquifers

These structures are porous hollows of sediment rocks which include water and are suitable for gas storage as long as they have impermeable loads on them (BOTAŞ, 2003). In order for natural gas to be stored in aquifers, the rocks above aquifers should not be permeable and in order to put pressure between storage point and gas transmission system, aquifer should be minimum at 50 m depth.

Abandoned Mines

These structures are coal and salt mines and generally suitable for natural gas storage (BOTAŞ, 2003). Since current hollows are used in mines, the most important advantage of natural gas storage in these areas is that there is no need to drill hollow for storage. Current hollows are used together with some rehabilitation work in these areas.

Spent Petroleum and Gas Reservoirs

Due to the fact of the impermeability of these structures during the geologic periods, they are suitable for use in gas storage (BOTAŞ, 2003).

Salt Caverns

These structures are generally in great thickness (salt domes, layered salt) and provide the ideal preconditions needed for underground storage areas by means of the absolute impermeability. The caverns formed inside salt for storage are generally formed by means of leaching salt (BOTAŞ, 2003).

The drilling of salt caverns is conducted based on the assumption that there are thick salt formations. In this respect, it is preferred that salt-solution openings for the purpose of natural gas storage is drilled in relatively homogenous rock salt beds which have enough thickness and diffusion. In the process of leaching salt layers, approximately 8-9 m³ water is needed for each m³ of salt. The necessary water is provided by surface water, groundwater and sea water.

Together with this method, which is also defined as solution mining, it is possible that water-soluble evaporitic ores such as rock salt, potash and trona are produced as solution material from under the ground. The basis of the method is based on salt becoming soluble as a result ofn- contact with fresh water, which is conveyed via the pipe placed inside, drilling well underground with solid salt minerals in evaporitic salt beds. This method has been successfully applied especially in rock salt beds which have enough thickness and diffusion (Özarslan and other, 2007).

The building of high-pressure natural gas caverns with the leaching-mining method is carried out in order to balance the short-term or seasonal fluctuations in providing natural gas to the consumers (BOTAŞ, 2003).

The advantages that storage of natural gas in salt caverns provides are described below (BOTAS, 2003):

- The volume of the cavern and therefore the volume of gas which can be stored in the cavern can be determined and used in the design.
- The capacity of the cavern may be gradually increased in order to meet the increasing need for natural gas.
- The operating pressure and stored natural gas are mainly dependent on the depth of the salt reservoir and can be changed if needed. It is possible that the operated gas volume can reach 80% or more of the stored volume.
- By means of their high drawing speeds, salt caverns can be used in order not only to balance seasonal changes but also to meet short-term cast iron exits.

The preparation of salt caverns technically corresponds to the production of a salty solution. In this respect, the technology of salt caverns is the technology of a salty solution production. Based on geologic factors, the below-mentioned methods are used in the production of a salty solution (BOTAŞ, 2003):

- The injection of fresh water to the well by using general construction methods for salty solution production.
- Two or more wells should be used for the production of the solution in salt deposits of which thickness is not very high. These unconnected caverns grow horizontally based on the low leaching finish level and combine in a way to form only one cavern. As a result of this formation, fresh water is injected to one of the wells and withdrawn from other wells of which salt is in the solution.

- The hydraulic connection of wo or more drilling wells can be made through the "Fracturing Method". This connection forms as a result of rising of thin zones located under salt deposits in consequence of hydraulic fractures. After fresh water is injected to the well, it flows along fracturing zones and rises from other wells in salty solution state. Thus, the prematurely saturated salty solution is formed, the gap between the wells are enlarged and their numbers are decreased.

Optimum yield can be obtained in the event that solution production for industrial salty solution processes is conducted together with the formation of underground storages. Operation and maintenance of the facilities used in underground storage activities requires professionalism. Leak-proofing should be emphasized. Corrosion and poor cementation may lead to leakages. The support of reservoir engineering is crucial in terms of preventing the reservoir or equipment getting harmed beyond the activities relating to security. For example, the optimizing of operating procedures and continually improving of reservoir simulation models are crucial for a good operation (BOTAŞ, 2003).

In line with the above-mentioned alternatives and techniques, the comparison of natural gas underground storage environments is described in the Table 3.8.2.1. and storage investment costs are described in Table 3.8.2.2.

Table 3.8.2.1. Comparison of Natural Gas Underground Storage Environments

Parameters	Storage Environments		
	Salt Openings	Spent Reservoirs	Aquifers
Cushion Gas /Working Gas Ratio	30% - 50%	100% - 150%	150% - 200%
Injection time (day)	20 - 40	200 - 250	200 - 250
Back Production time (day)	10 - 20	100 - 150	100 - 150
Annual Injection-Back Production Circle	5 - 6	1 - 2	1 - 2
Water content of Gas	It can be neglected after first several circles.	Substantially	In high quantity

Table 3.8.2.2. Storage Investment Costs of Natural Gas Underground Storage Environments

Type of Storage (100 x 106 m^3 For underground storage area)	Working Gas Investment Cost US$/$m^3$		Storage Supply Debit Investment Cost US$/$m^3$ /day	
	Europe	USA	Europe	USA
Aquifer	0.35- 0.6	0.14	35-60	10
Spent Petroleum and Gas Reservoir	0.35- 0.6	0.12	35-60	5
Salt Gaps	0.70- 10	0.30	7-10	2

When the numbers presented in Table 3.8.2.1. are reviewed, salt openings provide advantages as compared with the underground storages in aquifers and spent areas in terms of the injection period, back production time and circle. According to the data presented in Table 3.8.2.2., the operating gas investment costs of aquifers and spent areas are cheaper than those of salt gaps. They have much more capacity for seasonal demand. However, since salt gaps can provide production in high debits in short-term high gas demand, salt gaps have cheaper supply debit investment cost (Anonym, 2007).

As in the case of the Underground Gas Storage Project, where the construction works continue, salt caverns will be used based on the features of the area in the underground storage of natural gas within the scope of the planned Gas Storage Expansion Project, and leaching processes in the caverns which will be formed within the project will be gradually carried out in phases with the method of Solution Mining Process – Water Supply and Leaching of the Cavern.

3.9. Closure/Decommissioning of Gas Storage Expansion Project

In the scope of the Gas Storage Expansion Project; it will be ensured that the equipment are maintained regularly and that the equipment which has reached the end of their service lives are renewed and re-operated in order to ensure usability of the project throughout its economic life. Depending on the current conditions at the end of the license period, the project can be reused for storage purpose with revisions that can be made to the facility.

When the project site and facilities are planned to be reused for similar purposes, it will be appropriate to carry out environmental impact assessment studies again in order to examine the impacts of the Project on the ecosystem during 30 years of operation, reveal its difference from recent conditions and establish new measures.

If the facility is completely shut down and is not used for any other purposes, the units will be disassembled and the opened wells will be closed before land reclamation. In this context, all surface facilities will be disassembled and the caverns where all of the stored gas inside has been withdrawn will be filled with water or salt water (brine), and inlet ports will be closed with concrete after being filled with the filler material. Natural landscaping will be performed in the areas covered by the facilities using reinstatement, revegetation and restoration applications. These applications will be carried out according to the restoration and rehabilitation projects and plans which will be prepared considering the conditions of the period after operation (land, climate, geomorphological conditions, etc.).

During decommissioning the pipelines will be left in situ and the cathodic protection system disconnected. In addition, it is planned that fresh water pipeline might be transferred to DSİ after the completion of the project to be used for water supply and/or for the irrigation to benefit the local people.

Details of decommissioning of Gas Storage Expansion Project are given Section 5.5 of report.

4. BASELINE FEATURES

4.1. Introduction

In this report, the studies which have been performed are explained in respect of their probable impacts to the air, water, soil, flora, fauna, protection zones and social activities during the ongoing Underground Gas Storage Project. In scope of the Underground Gas Storage Project, three main areas are most impacted from the construction and operating works at the project sites given below;

- Hirfanlı Dam at Water Intake Structure,
- Project surface facilities, drilling and leaching sites and
- Tuz Gölü Basin.

In this stage, studies and analysis which have been performed will be given for probable and expected effects during the project under 3 headings, which are:

1. Underground Gas Storage Project (UGS Project) / 3rd party Monitoring Studies
2. The EIA Studies for Gas Storage Expansion Project (GSEP)
3. The ESIA Process for Gas Storage Expansion Project (GSEP)

4.1.1. On-going Monitoring Activities of UGS Project

Large parts of the baseline data given in this report have been established during the site inspection, monitoring, sampling and analysis activities in the scope of the 3rd Party Monitoring activities performed by ÇINAR Engineering. Monitoring activities are still performed in the scope of the UGS Project with the methods explained below:

- Site visits,
- Monitoring of the environmental elements,
- Monitoring of the negative impacts to environment,
- Monitoring of the health and safety conditions of the worksites,
- Daily, weekly and monthly reporting,
- Follow-up of the monthly checklist together with BOTAŞ,
- Monthly sampling and analysis at the project areas,
- Monthly noise measuring at the project areas,
- Yearly air quality measuring at the project areas in determined periods,
- Periodically comparing of the environmental status of the project areas,
- Follow-up of the improvement activities for negative impacts and
- Control of actions taken for results of the monitoring activities.

The results of the monitoring activities explained above are used for the definition of the environmental impacts of the project. Monitoring activities are conducted and periodically reported under the main titles given below;

- Air Quality management,
- Waste management,

- Wastewater management,
- Water management,
- Washing, oily water management,
- Hydro-test water management,
- Noise Management,
- Chemical and hazardous material management,
- Salt water management,
- Formation and drilling mud management,
- Brine discharge line and points,
- Health and safety management,
- Soil, ecological and bio-restoration management,
- Flora-fauna management

4.1.2. Scope of Baseline Studies Performed for ESIA Studies

Baseline data studies have been performed during the ESIA process of GSEP with the site walks, analyses, measurements, literature searches and desk works. On the other hands, the baseline data which has been obtained will be guidance to the baseline study of the GSEP which has not yet been completely established due to seasonal restriction at sometimes. However, the current baseline study can help to show the probable environmental impacts during the project works, such as pipelines, station, water storage tanks, surface facilities, drilling sites, etc., and all construction activities to be carried out by BOTAŞ in the scope of the GSEP.

4.2 Climate and Meteorology

The majority of the project area and the planned main units are located within the provincial borders of Aksaray (all surface facilities and 41 wells). In this context, while defining the environmental characteristics of the project domain, Observations of General Directorate of Meteorology, Aksaray Meteorology Station between 1960 and 2015 have been taken into consideration during the design and planning phase of the project.

4.2.1. General Climate Conditions of the Region

The province of Aksaray is in the mid-climatic zone and has a cold, continental climate type. The summers are hot and dry, the winters are cold and rainy. Precipitations are often seen in spring and winter. The average precipitation (last 40 years) is 340 mm (kg / m²). Temperature differences between summer and winter and day and night are very high. Moisture is low in the summer months and the amount of evaporation is high due to the lack of temperature and wind intensity. Snowfall causes floods and landslides in spring.

Pressure distribution (average, maximum, minimum pressure)

The maximum pressure was observed in November and measured as 933.6 hPa, while the minimum pressure was measured at December as 974.3 hPa. Pressure data are shown in Table 4.2.1.1., and graphical representations of data are shown in Figure 4.2.1.1.

Table 4.2.1.1. Average, Maximum and Minimum Pressure Values (hPa)

Meteorological Parameter	Months												Annual
	January	February	March	April	May	June	July	August	April	October	November	December	
Average Pressure (hPa)	906.6	905.1	904.2	903.4	904.3	903.6	902.2	903	905.6	907.9	908.4	907.5	905.2
Maximum Pressure (hPa)	924.6	921.6	919.7	914.6	913.4	912.3	910	909.7	914.6	918.4	933.6	923.6	933.6
Minimum Pressure (hPa)	880.4	883.1	884.3	889.5	891.8	892.8	894	894.5	894.5	896.3	891.7	880.1	880.1

Source: *Aksaray Meteorology Station Observation Records (1960-2015)*

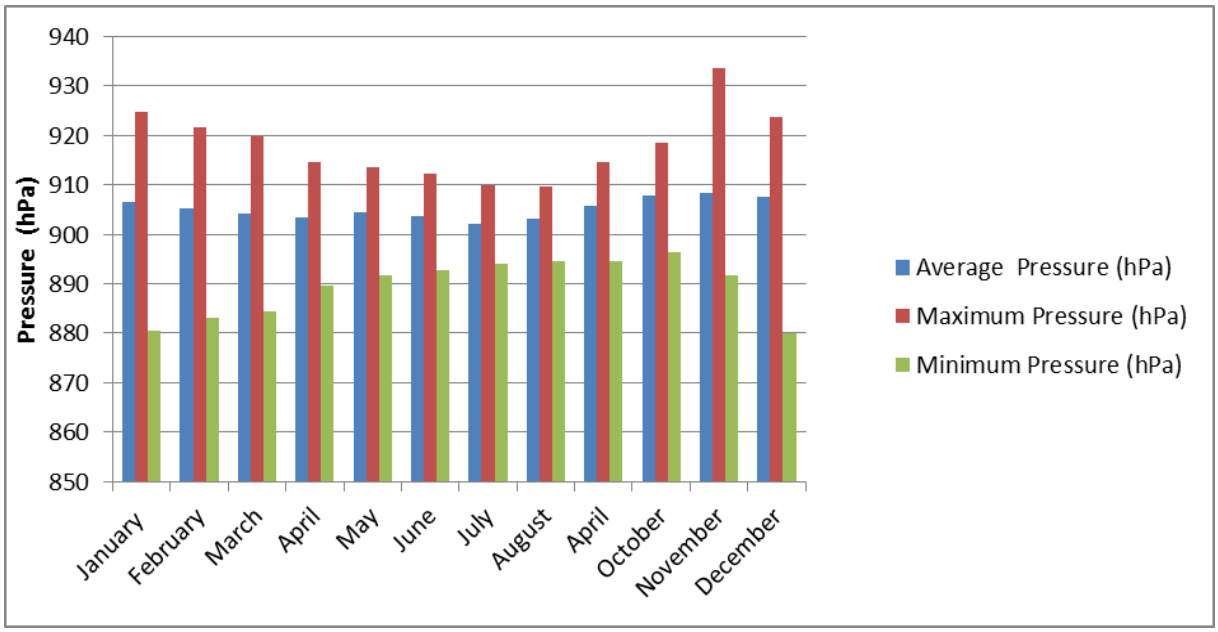


Figure 4.2.1.1. Average, Maximum and Minimum Pressure Values (hPa)
Source: *Aksaray Meteorology Station Observation Records (1960-2015)*

Temperature distribution (average, maximum, minimum temperature)

According to Aksaray Meteorology Station observation records; the lowest temperature was recorded as -29°C in February and the highest temperature at 40°C in July; the average annual temperature is 12.1°C. Aksaray Meteorology Station temperature values are given in Table 4.2.1.2. and graphical representations are given in Figure 4.2.1.2.

Table 4.2.1.2. Average, Maximum and Minimum Temperature Values (°C)

Meteorological Parameter	Months												Annual
	January	February	March	April	May	June	July	August	April	October	November	December	
Average Temperature (ºC)	0.5	2	6.5	11.5	16.2	20.4	23.7	23.2	18.6	13	6.9	2.5	12.1
Maximum Temperature (ºC)	19.4	21.6	29	31.8	33.8	36.9	40	38.8	36.5	32.8	26.2	22	40
Minimum Temperature (ºC)	-26.4	-29	-19	-7.5	-0.2	2.9	6.8	5.9	1	-6	-14	-21.9	-29

Source: *Aksaray Meteorology Station Observation Records (1960-2015)*

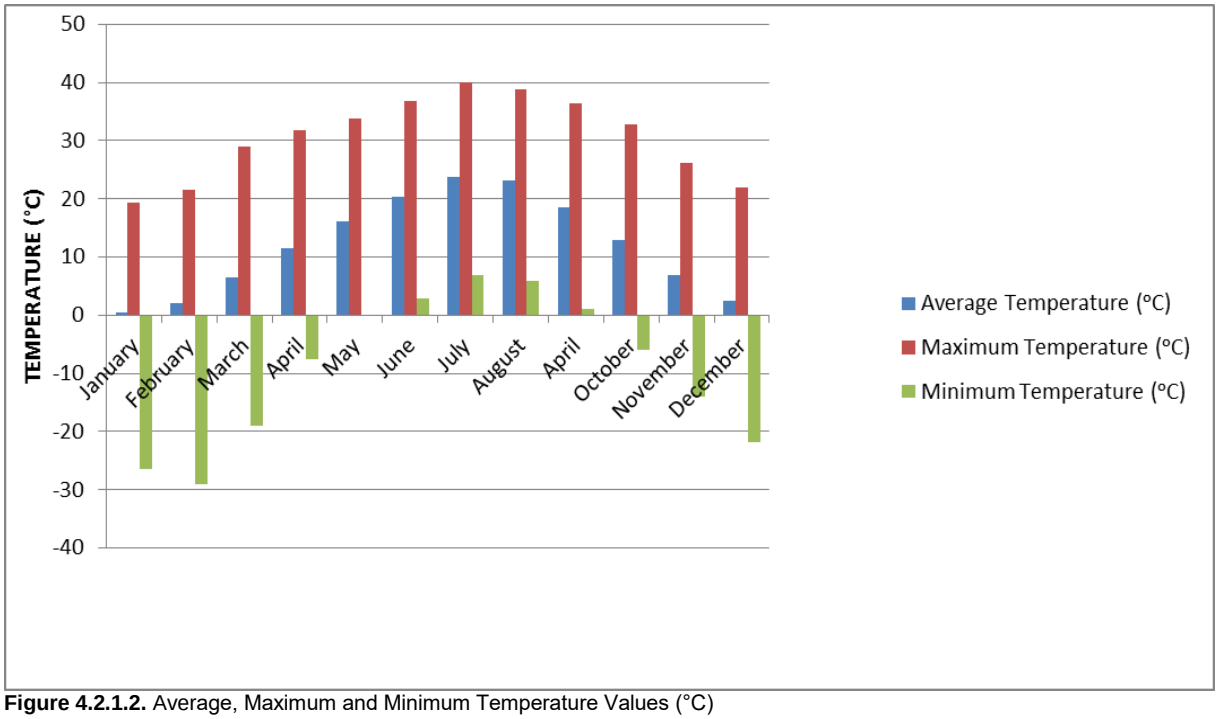


Figure 4.2.1.2. Average, Maximum and Minimum Temperature Values (°C)
Source: *Aksaray Meteorology Station Observation Records (1960-2015)*

Precipitation distribution (Average Total Precipitation, daily maximum Precipitation amount)

According to Aksaray meteorological station observation records, the annual average total Precipitation was recorded as 339.7 mm. The month with the maximum Precipitation is 45.9 mm and the month with the minimum Precipitation is 3.6 mm. The daily maximum Precipitation observed to date is 65.8 mm.

Precipitation data are shown in Table Figure 4.2.1.3., while data are graphically shown in Figure 4.2.1.3.

Table 4.2.1.3. Monthly Total and Maximum Precipitation Values (mm)

Meteorological Parameter	Months												Annual
	January	February	March	April	May	June	July	August	April	October	November	December	
Total Precipitation Averagesı (mm)	37.7	34.3	39.7	45.9	39.9	24.8	5.8	3.6	8.2	24.9	31.5	43.4	339.7
Günlük Maximum Precipitation (mm)	33	21.4	32.7	33.4	32.1	43.9	29.4	31.5	19.9	65.8	29.4	33.6	65.8

Source: Aksaray Meteorology Station Observation Records (1960-2015)

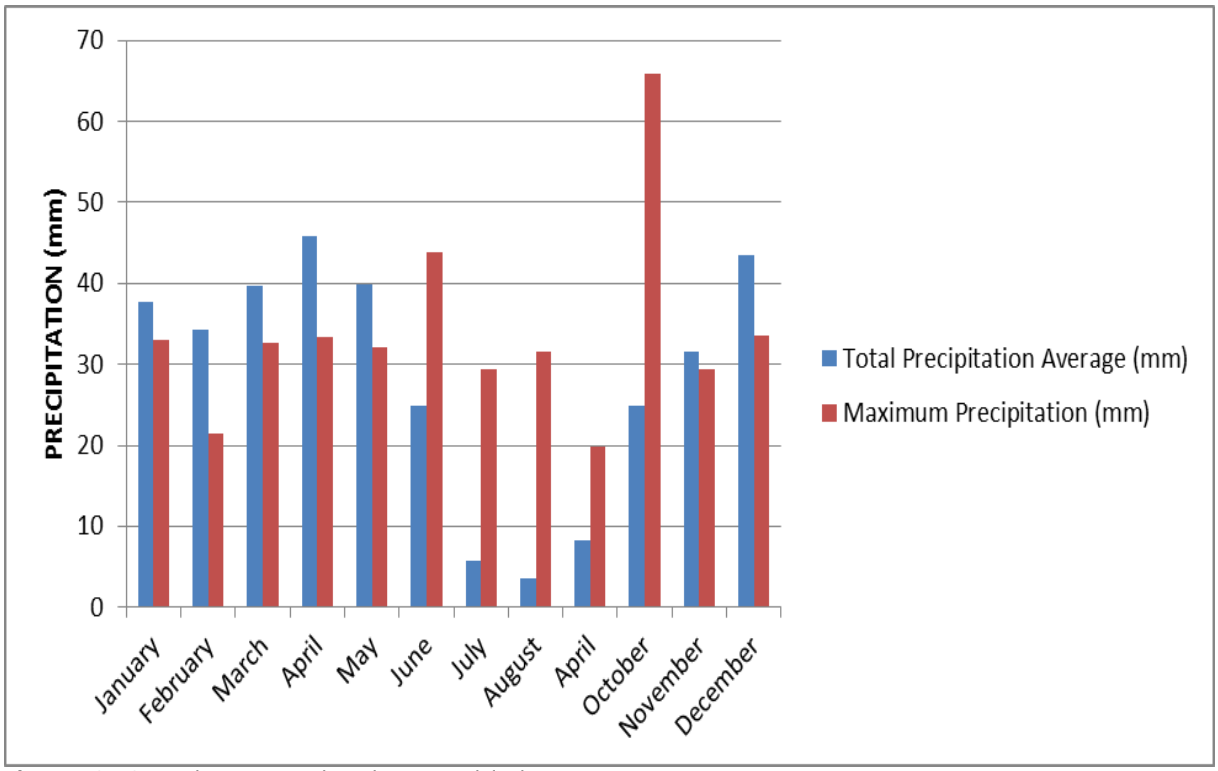


Figure 4.2.1.3. Total Average and Maximum Precipitation
Source: *Aksaray Meteorology Station Observation Records (1960-2015)*

Average Relative Humidity

According to Aksaray meteorological station records, the annual average relative humidity is 58.3% and the minimum humidity is 2%. Aksaray meteorological station relative humidity data are given in Table 4.2.1.4., and graphical representations are given in Figure 4.2.1.4.

Table 4.2.1.4. Monthly Average and Minimum Humidity (%)

Meteorological Parameter	Months												Annual
	January	February	March	April	May	June	July	August	April	October	November	December	
Average Humidity (%)	71.2	67.6	61.7	58	55.4	50.4	45	45.5	49	58.6	65.9	71.4	58.3
Minimum Humidity (%)	17	10	6	11	10	8	8	10	2	5	9	13	2

Source: *Aksaray Meteorology Station Observation Records (1960-2015)*

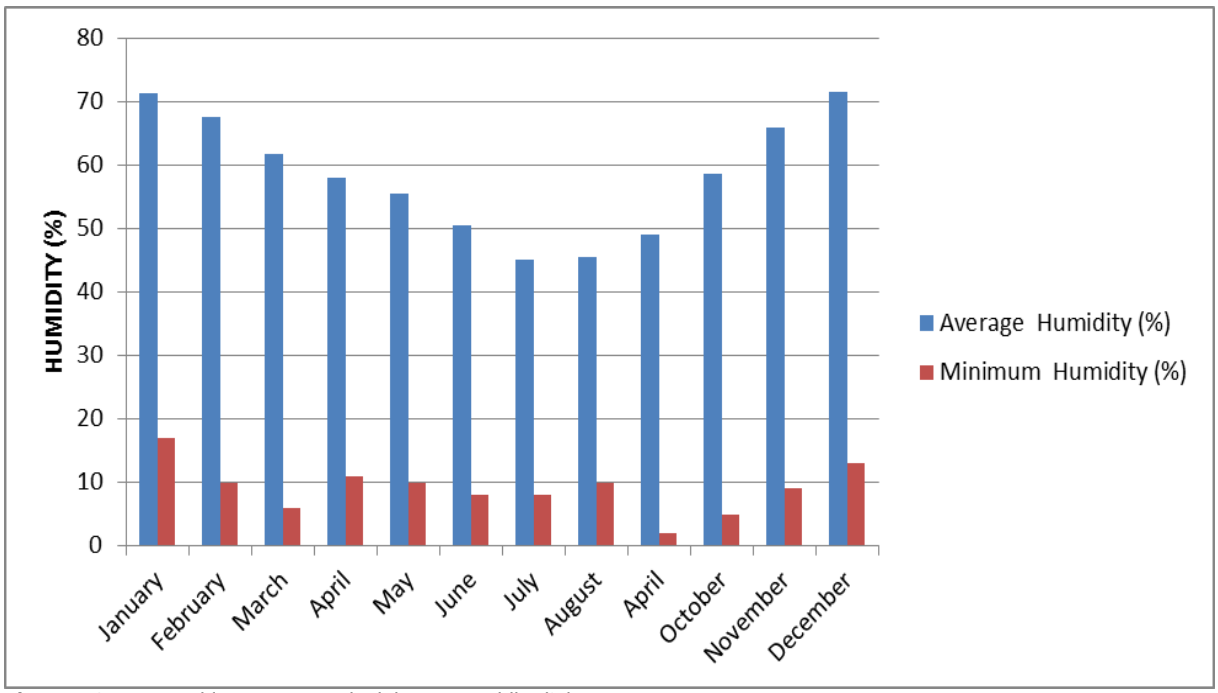


Figure 4.2.1.4. Monthly Average and Minimum Humidity (%)
Source: *Aksaray Meteorology Station Observation Records (1960-2015)*

Evaporation Status (Average open surface evaporation, daily maximum open surface evaporation)

According to Aksaray meteorological station records, annual average open surface evaporation is 1,302 mm maximum open surface evaporation is 17.9 mm. In Aksaray meteorological station open surface evaporation data Table 4.2.1.5., Graphical representation is given in Figure 4.2.1.5.

Table 4.2.1.5. Monthly Average and Maximum Open Surface Evaporation (mm)

Meteorological Parameter	Months												Annual
	January	February	March	April	May	June	July	August	April	October	November	December	
Average Open Surface Evaporation (mm)	-	-	0,3	82.1	162.6	223.1	281.7	266.1	180.1	98.2	7.8	-	1302
Maximum Open Surface Evaporation (mm)	-	-	6,1	15.5	14.2	15.5	16.8	17.9	15.1	9.4	4.8	-	17.9

Source: *Aksaray Meteorology Station Observation Records (1960-2015)*

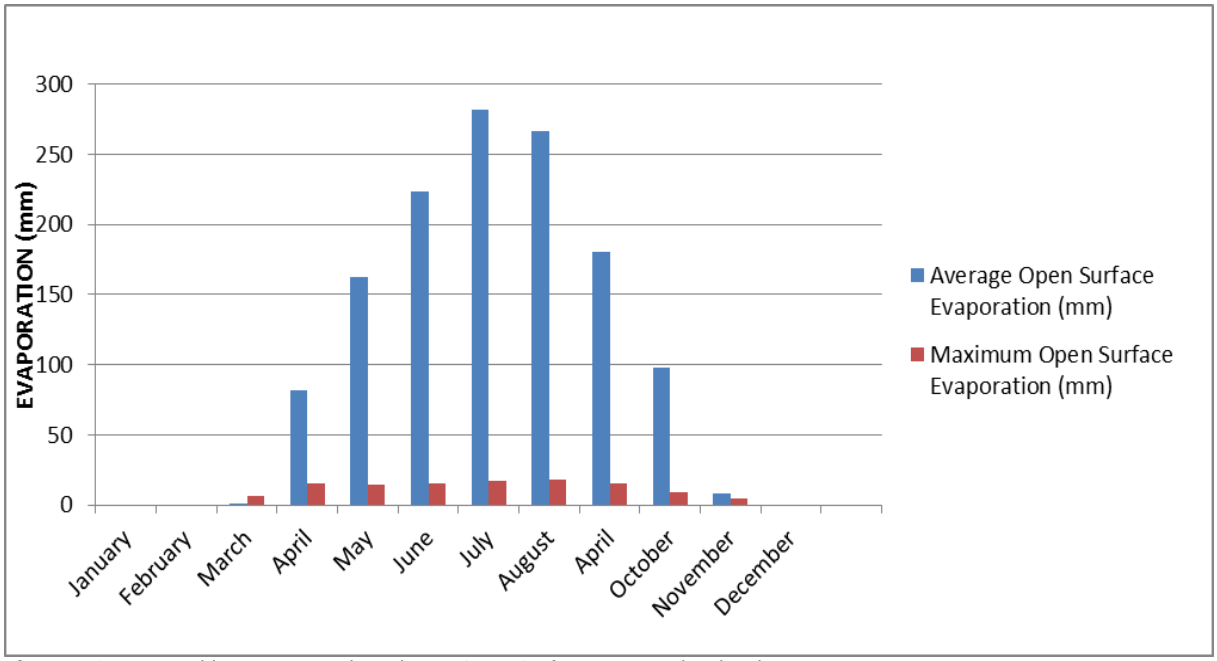


Figure 4.2.1.5. Monthly Average and Maximum Open Surface Evaporation (mm)
Source: *Aksaray Meteorology Station Observation Records (1960-2015)*

Numbered days distribution (Average Number of Days with Snow Precipitation, Average Number of Days with Snow Cover, Average Number of Foggy Days, Average Number of Days with Hail, Average Number of Days with Rime, Total Number of Days with Thunderstorm)

According to observation records of Aksaray meteorological station, the annual average number of snow precipitation days is 23.2, the annual average number of foggy days is 14.3 and the number of days with hail days is 2.

Numbered days data are shown in Table 4.2.1.6., while data are graphically displayed in Figure 4.2.1.6.

Table 4.2.1.6. Numbered Days Data

Meteorological Parameter	Months												Annual
	January	February	March	April	May	June	July	August	April	October	November	December	
Average Number of Days with Snow Precipitation	6.3	5.9	3.8	0.9	0.1	-	-	-	-	0.1	1.5	4.6	23.2
Average Number of Days with Snow Cover	8.7	7	2.1	0.2	0	-	-	-	-	0	1	5.4	24.4
Average Number of Foggy Days	3.6	1.9	1	0.2	0.1	0	-	-	0.1	0.7	2	4.7	14.3
Average Number of Days with Hail	0.1	0.2	0.5	0.5	0.3	0.3	-	-	0	0	0	0.1	2
Average Number of Days with Rime	7.4	6.6	6.5	1.9	0.2	-	-	-	0.1	2.6	8.1	7.8	41.2
Total Number of Days with Thunderstorm	0	0.1	0.7	2.2	4.6	3.6	0.8	0.9	1.1	0.9	0.2	0.1	22.1

Source: *Aksaray Meteorology Station Observation Records (1960-2015)*

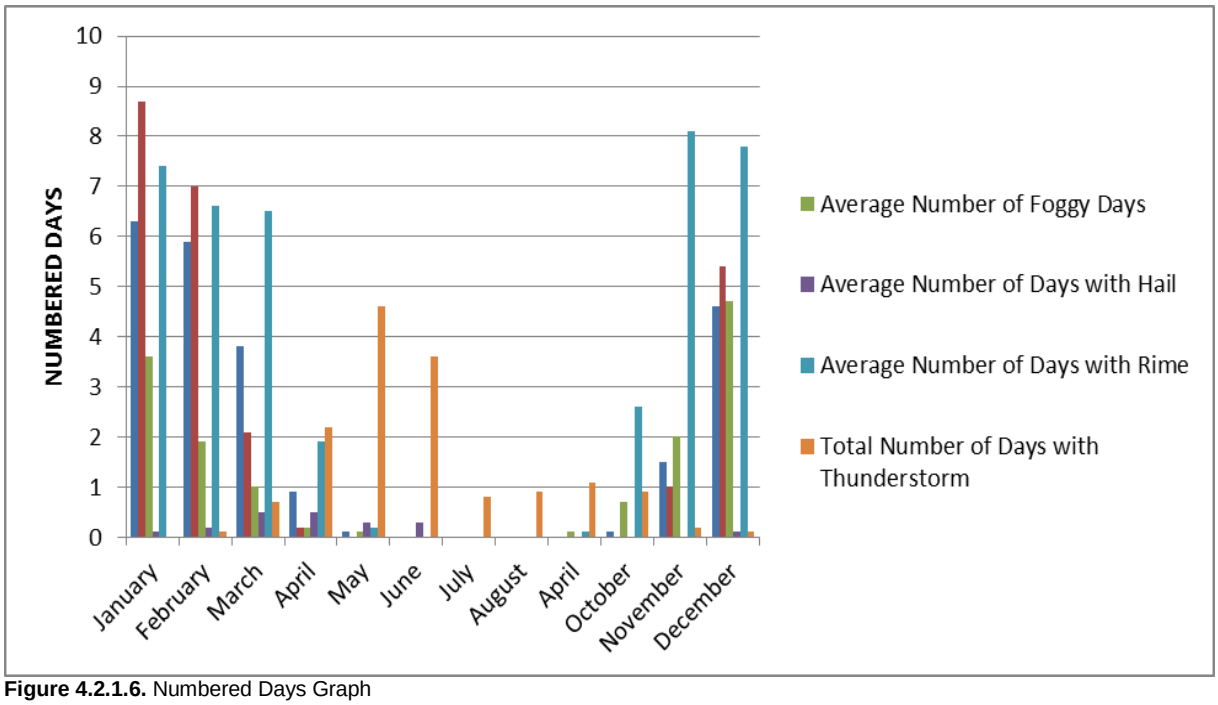


Figure 4.2.1.6. Numbered Days Graph
Source: *Aksaray Meteorology Station Observation Records (1960-2015)*

Maximum Snow Depth

According to the long-term bulletin (1960-2015) of the Aksaray meteorological station, the maximum snow depth observed is 45 cm in December.

Monthly maximum snow depth, in Table 4.2.1.7., graphical representation of snow precipitation and snow covered days, presented in Figure 4.2.1.7.

Table 4.2.1.7. Monthly Maximum Snow Depth (cm)

Meteorological Parameter	Months												Annual
	January	February	March	April	May	June	July	August	April	October	November	December	
Monthly Maximum Snow Depth (cm)	25	41	29	16	1	-	-	-	-	5	19	45	45

Source: *Aksaray Meteorology Station Observation Records (1960-2015)*

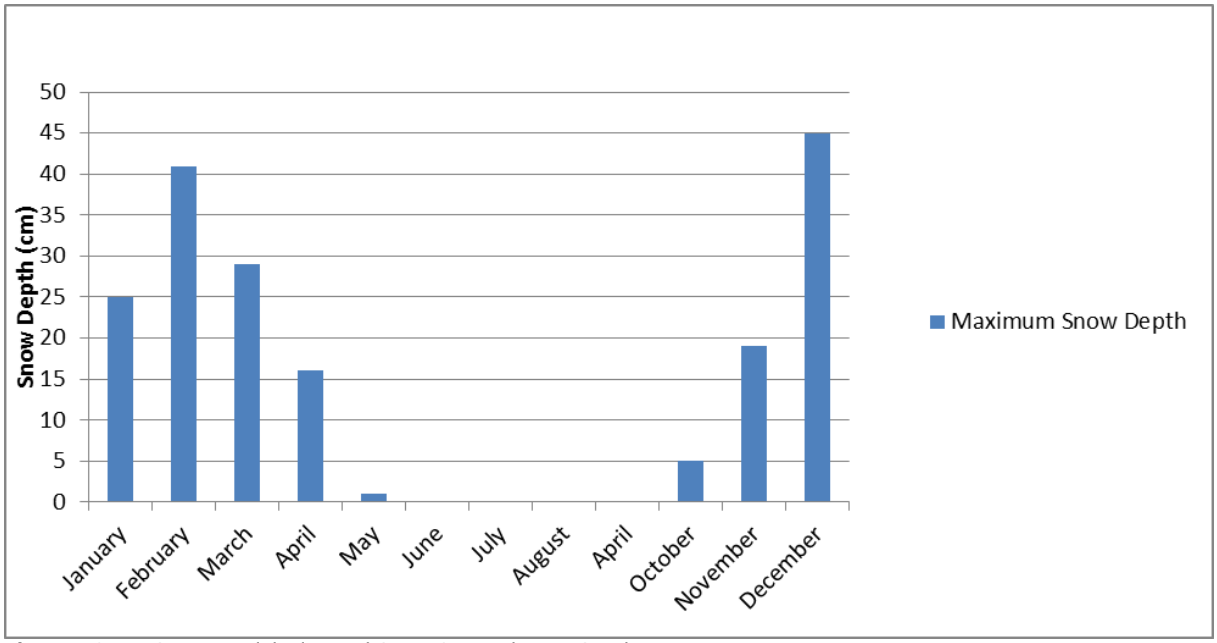


Figure 4.2.1.7. Snow Precipitation and Snow Covered Days Graph
Source: *Aksaray Meteorology Station Observation Records (1960-2015)*

Wind distribution

- Annual, Seasonal, Monthly Wind Direction Distribution

According to observations records of Aksaray meteorological station, the sum of blow numbers according to directions is given in 4.2.1.8. The annual wind diagram is given in Figure 4.2.1.8.

Table 4.2.1.8. Total Number of Winds according to Directions

Direction	Meteorological Parameter	Months												Annual
		January	February	March	April	May	June	July	August	April	October	November	December	
N	Total Number of Winds	1386	1167	1503	1591	1734	1980	2053	1901	1790	1648	1808	1738	20299
NNE	Total Number of Winds	2265	2070	2473	2248	2406	3097	4110	3737	3206	3185	2655	2826	34278
NE	Total Number of Winds	4398	4306	4001	3569	3606	4473	5790	5989	4950	5110	4199	4515	54906
ENE	Total Number of Winds	6773	6334	6543	5090	5839	6060	8805	8394	6593	7008	6333	6199	79971
E	Total Number of Winds	2029	2225	2226	1952	2361	2392	2769	2650	2870	3166	2816	2240	29696
ESE	Total Number of Winds	1523	1076	1243	1218	1518	1362	1060	1444	1381	1292	1443	1641	16201
SE	Total Number of Winds	1509	1163	1359	1405	1423	1163	924	988	1061	1223	1326	1570	15114
SSE	Total Number of Winds	2247	1736	1938	1789	1727	1121	954	976	1184	1328	1739	2446	19185
S	Total Number of Winds	2563	2289	2265	2119	1587	1211	736	859	1075	1482	1834	2747	20767
SSW	Total Number of Winds	3121	3312	3307	2772	2001	1117	879	898	1110	1615	2530	2988	25650
SW	Total Number of Winds	2108	2217	2355	2292	1899	1328	795	915	1122	1393	1581	2010	20015
WSW	Total Number of Winds	2158	1926	2621	2745	2427	1816	1348	1394	2053	2097	1929	1877	24391
W	Total Number of Winds	1798	1587	1954	2339	2528	2431	1707	2011	2089	2062	1743	1568	23817
WNW	Total Number of Winds	2452	2017	2495	3047	3669	3829	3481	3697	3943	3450	2721	2388	37189
NW	Total Number of Winds	1943	1470	1939	2332	2542	2878	2274	2127	2602	2221	2151	1854	26333
NNW	Total Number of Winds	1324	1006	1407	1629	1895	1758	1683	1459	1436	1453	1374	1478	17902

Source: Aksaray Meteorology Station Observation Records (1960-2015)

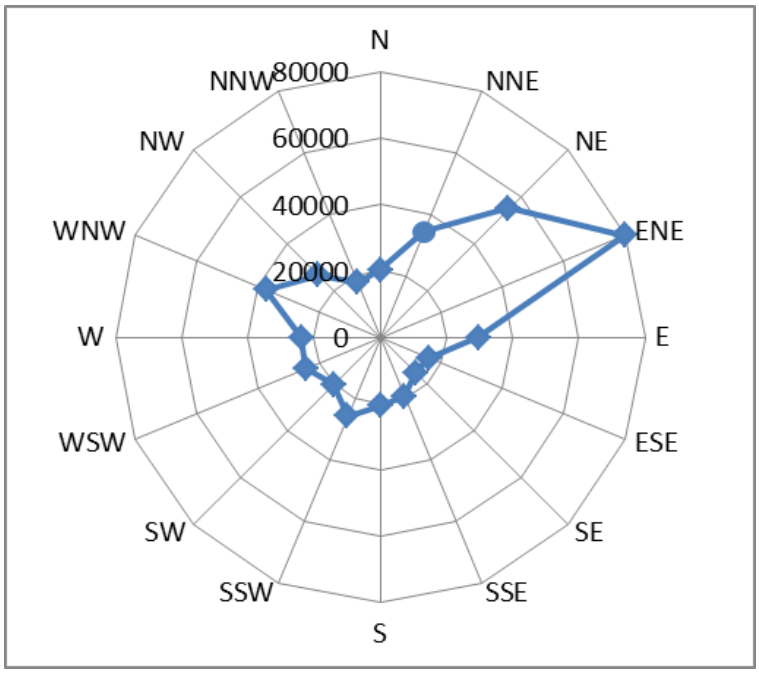


Figure 4.2.1.8. Monthly Maximum Wind Velocity Diagram According to Number of Blows
Source: *Aksaray Meteorology Station Observation Records (1960-2015)*

According to the numbers in the records of Aksaray Meteorological Station observation records, dominant wind direction, (East-northeast) with 79,971 blows, NE (northeast) with 54,906 blows, WNW (west-northwest) with 37,189 blows and NNE (north-northeast) with 34,278 blows respectively.

According to Aksaray Meteorological Station observation records, the number of seasonal blows of wind according to the directions are given in Table 4.2.1.9. The seasonal wind diagrams according to the numbers are shown in Figure 4.2.1.9. and the monthly wind diagram is shown in Figure 4.2.1.10.

Table 4.2.1.9. Total Number of Winds According to the season and Direction

Meteorological Parameter		Spring	Summer	Autumn	Winter
N	Total Number of Winds	4828	5744	5194	4291
NNE	Total Number of Winds	7127	10944	9046	7161
NE	Total Number of Winds	11176	16252	14259	13219
ENE	Total Number of Winds	17472	23259	19934	19306
E	Total Number of Winds	6539	7811	8852	6494
ESE	Total Number of Winds	3979	3866	4116	4240
SE	Total Number of Winds	4187	3075	3610	4242
SSE	Total Number of Winds	5454	3051	4251	6429
S	Total Number of Winds	5971	2806	4391	7599
SSW	Total Number of Winds	8080	2894	5255	9421
SW	Total Number of Winds	6546	3038	4096	6335
WSW	Total Number of Winds	7793	4558	6079	5961

Meteorological Parameter		Spring	Summer	Autumn	Winter
W	Total Number of Winds	6821	6149	5894	4953
WNW	Total Number of Winds	9211	11007	10114	6857
NW	Total Number of Winds	6813	7279	6974	5267
NNW	Total Number of Winds	4931	4900	4263	3808

Source: *Aksaray Meteorology Station Observation Records (1960-2015)*

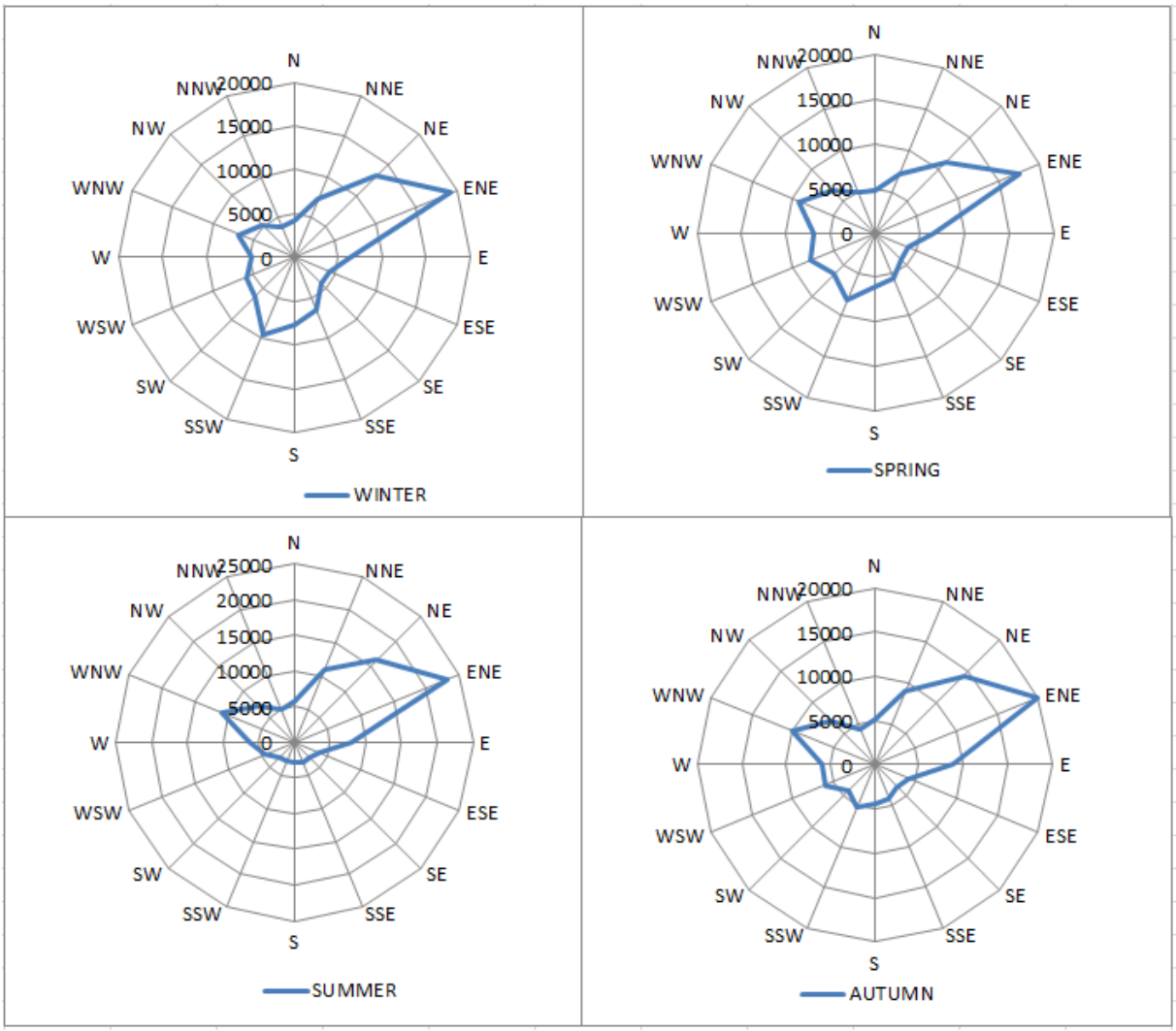


Figure 4.2.1.9. Seasonal Wind Diagram According to Number of Blows
Source: *Aksaray Meteorology Station Observation Records (1960-2015)*

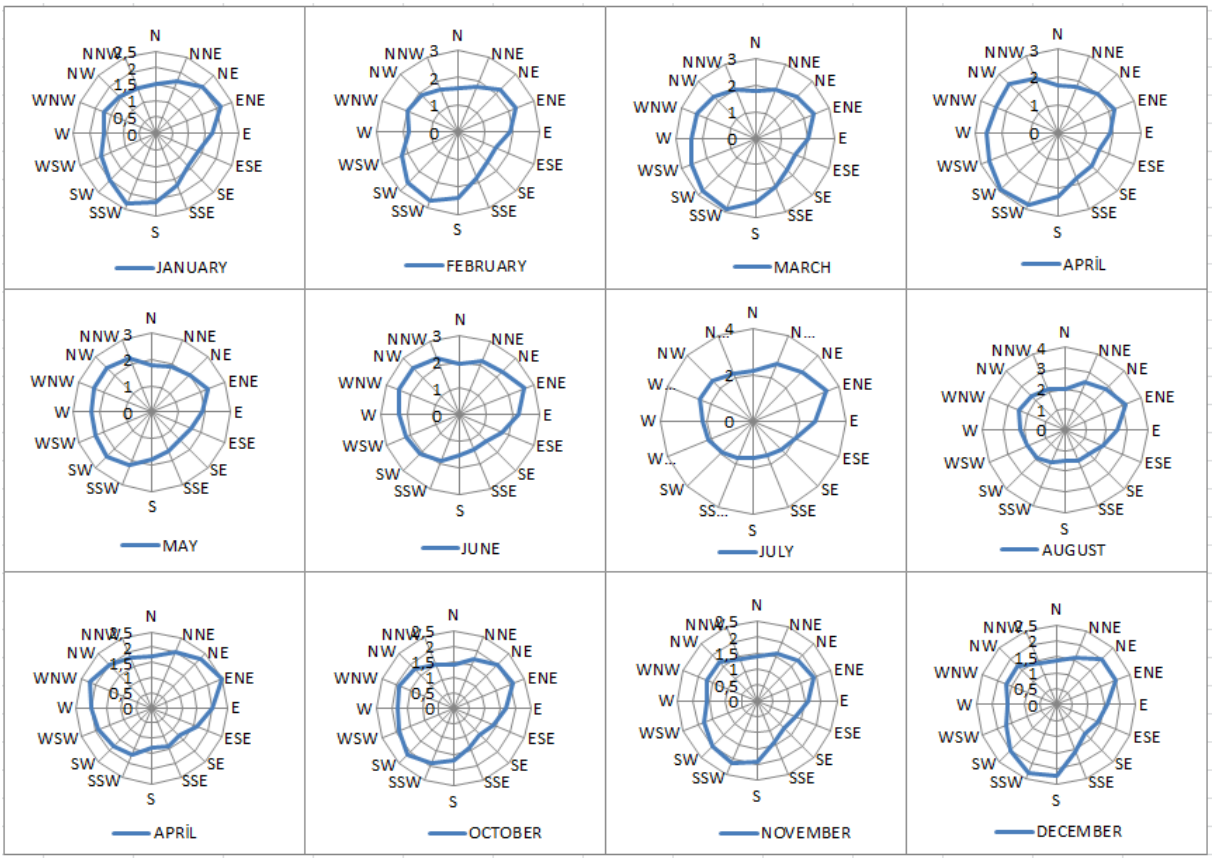


Figure 4.2.1.10. Monthly Wind Diagram According to Number of Blows
Source: *Aksaray Meteorology Station Observation Records (1960-2015)*

- Wind Velocity According to Directions

According to Aksaray Meteorological Station observation records, the average wind speeds are given in Table 4.2.1.10. The annual wind diagram according to the average wind speed is given in Figure 4.2.1.11.

Table 4.2.1.10. Average Wind Velocity According to Direction

Direction	Meteorological Parameter	Months												Annual
		January	February	March	April	May	June	July	August	April	October	November	December	
N	Average Wind Velocity (m/s)	1.5	1.6	1.8	1.7	1.8	1.9	2.2	2	1.7	1.4	1.4	1.4	1.7
NNE	Average Wind Velocity (m/s)	1.7	1.8	2	1.8	1.9	2.2	2.7	2.5	2	1.7	1.6	1.6	2.0
NE	Average Wind Velocity (m/s)	2	2.2	2.2	2	2	2.3	3	2.8	2.3	2	1.8	2	2.2
ENE	Average Wind Velocity (m/s)	2.1	2.3	2.4	2.2	2.3	2.6	3.4	3.2	2.5	2.1	1.9	2	2.4
E	Average Wind Velocity (m/s)	1.7	1.9	2	1.9	1.9	2.2	2.7	2.5	2	1.7	1.6	1.6	2.0
ESE	Average Wind Velocity (m/s)	1.4	1.5	1.6	1.6	1.6	1.7	2	2	1.6	1.4	1.3	1.4	1.6
SE	Average Wind Velocity (m/s)	1.4	1.5	1.7	1.7	1.5	1.4	1.7	1.6	1.3	1.2	1.2	1.3	1.5
SSE	Average Wind Velocity (m/s)	1.7	1.8	2	1.8	1.6	1.4	1.6	1.6	1.4	1.4	1.4	1.6	1.6
S	Average Wind Velocity (m/s)	2.1	2.4	2.4	2.3	1.8	1.5	1.6	1.5	1.3	1.7	1.9	2.2	1.9

Direction	Meteorological Parameter	Months												Annual
		January	February	March	April	May	June	July	August	April	October	November	December	
SSW	Average Wind Velocity (m/s)	2.3	2.7	2.9	2.8	2.2	1.9	1.7	1.7	1.7	1.9	2.1	2.3	2.2
SW	Average Wind Velocity (m/s)	2	2.6	2.8	2.9	2.4	2.1	1.9	1.9	1.8	2.1	2	2	2.2
WSW	Average Wind Velocity (m/s)	1.8	2.2	2.6	2.7	2.3	2.2	2.1	2	1.9	1.9	1.8	1.7	2.1
W	Average Wind Velocity (m/s)	1.6	1.8	2.4	2.6	2.3	2.3	2.2	2.2	2	1.8	1.6	1.5	2.0
WNW	Average Wind Velocity (m/s)	1.7	2	2.4	2.4	2.4	2.5	2.5	2.4	2.2	1.9	1.7	1.7	2.2
NW	Average Wind Velocity (m/s)	1.6	1.9	2.2	2.5	2.4	2.5	2.5	2.3	2	1.8	1.7	1.7	2.1
NNW	Average Wind Velocity (m/s)	1.5	1.7	2	2.1	2.2	2.3	2.2	2.1	1.8	1.5	1.4	1.4	1.9

Source: Aksaray Meteorology Station Observation Records (1960-2015)

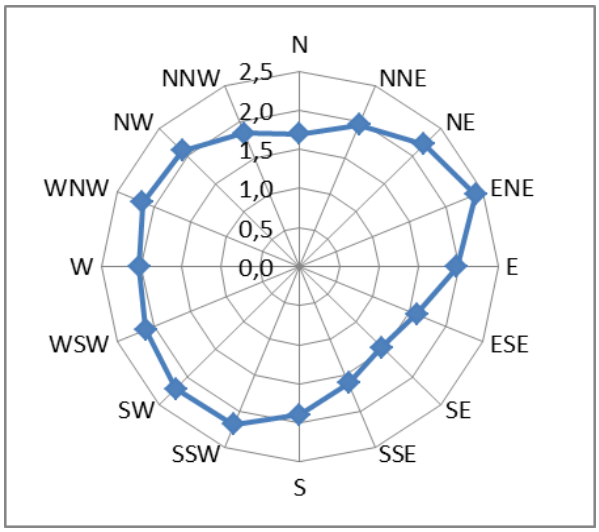


Figure 4.2.1.11. Monthly Wind Diagram according to Average Wind Velocity
Source: *Aksaray Meteorology Station Observation Records (1960-2015)*

- Average Wind Velocity Distribution

According to observations records of Aksaray Meteorology Station, the average wind velocities are given in Table 4.2.1.11. and in Figure 4.2.1.12.

Table 4.2.1.11. Monthly Average Wind Velocity

Meteorological Parameter	Months												Annual
	January	February	March	April	May	June	July	August	April	October	November	December	
Average Wind Velocity (m/s)	2.3	2.6	2.8	2.6	2.4	2.5	3	2.8	2.4	2.2	2.2	2.3	2.5

Source: *Aksaray Meteorology Station Observation Records (1960-2015)*

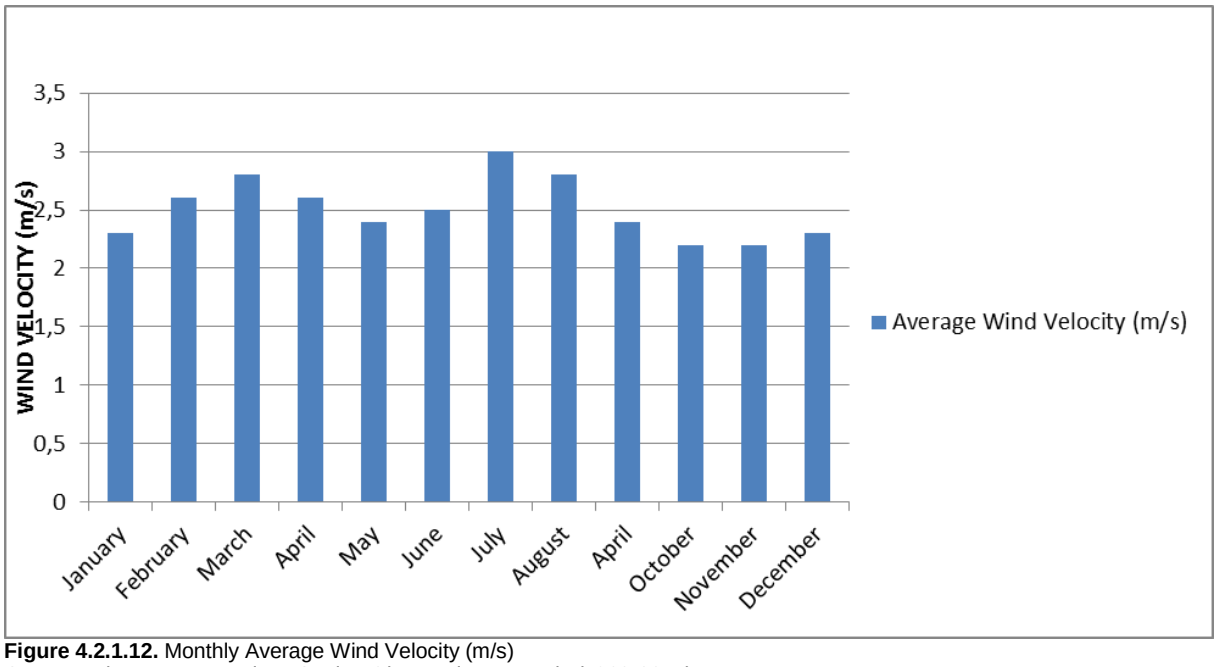


Figure 4.2.1.12. Monthly Average Wind Velocity (m/s)
Source: *Aksaray Meteorology Station Observation Records (1960-2015)*

- Fastest Wind Direction and Velocity

According to observations records of Aksaray Meteorology Station, the maximum speed of the wind is 40,1 m / s in the direction of S, in February. The maximum speed of the monthly wind is given in Table 4.2.1.12. and Figure 4.2.1.13.

Table 4.2.1.12. Monthly Maximum Wind Velocity and Direction

Meteorological Parameter	Months												Annual
	January	February	March	April	May	June	July	August	April	October	November	December	
Maximum Wind Velocity (m/s)	34.8	40.1	46	36.1	28	33.5	24.2	38	32.5	31.7	29.4	33.7	40.1
Maximum Wind Direction	SW	S	SW	W	SSE	SW	WSW	NW	WSW	SSW	S	SSW	S

Source: *Aksaray Meteorology Station Observation Records (1960-2014)*

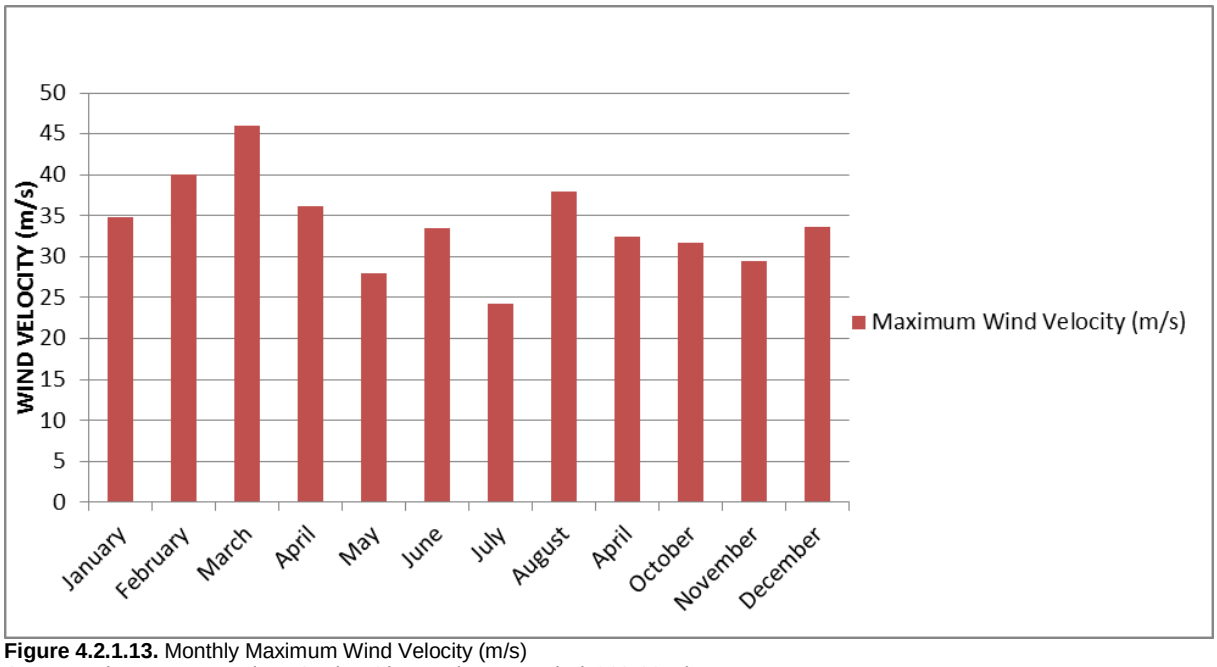


Figure 4.2.1.13. Monthly Maximum Wind Velocity (m/s)
Source: *Aksaray Meteorology Station Observation Records (1960-2015)*

- Average Number of Stormy Days

According to Aksaray Meteorological Station observation records, the number of stormy days is given in Table 4.2.1.13.and in Figure 4.2.1.14.

Table 4.2.1.13. Average Number of Stormy Days

Meteorological Parameter	Months												Annual
	January	February	March	April	May	June	July	August	April	October	November	December	
Average Number of Stormy Days	1.1	1.3	2.1	2.1	1.4	1.3	1.1	1	0.9	0.9	0.6	1.1	14.9

Source: *Aksaray Meteorology Station Observation Records (1960-2015)*

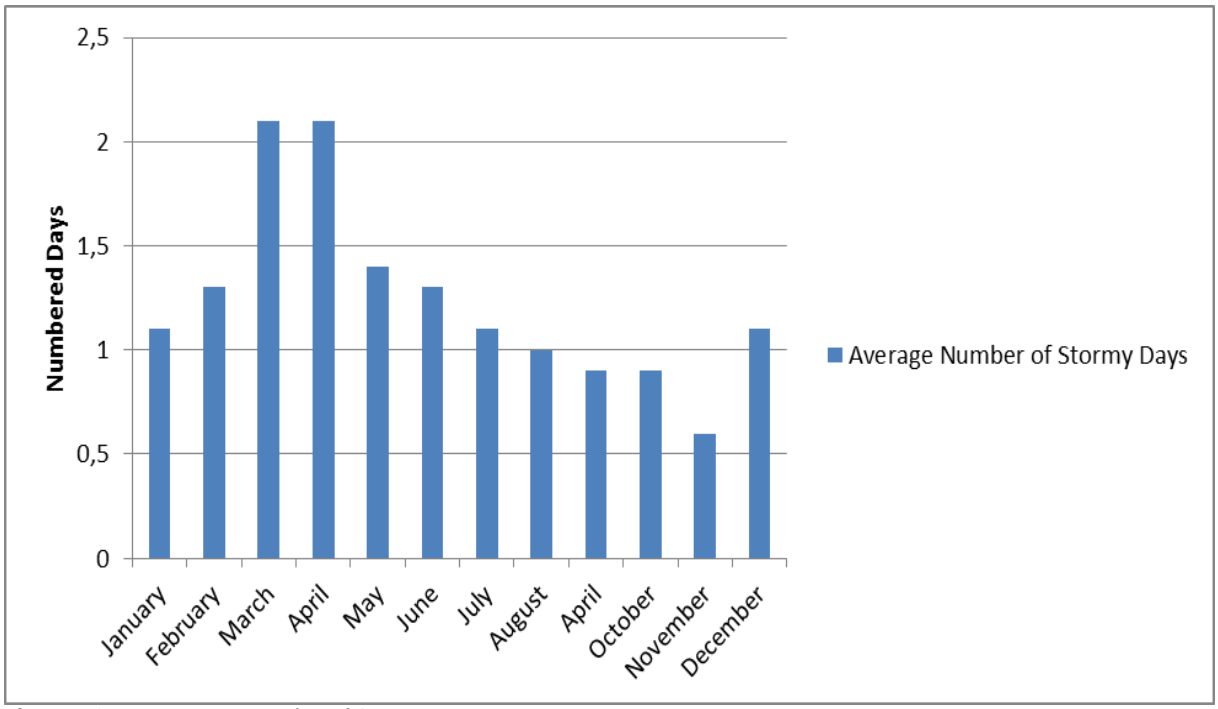


Figure 4.2.1.14. Average Number of Stormy Days
Source: *Aksaray Meteorology Station Observation Records (1960-2015)*

- Average Days with Strong Windy Days

According to Aksaray Meteorological Station observation records, the average number of strong windy days is given in Table 4.2.1.14. and in Figure 4.2.1.15.

Table 4.2.1.14. Average Days with Strong Windy Days

Meteorological Parameter	Months												Annual
	January	February	March	April	May	June	July	August	April	October	November	December	
Average Days with Strong Windy Days	3.6	4.9	6.2	6.9	6.7	6.4	8.3	7.8	5.1	4.2	3.5	3.8	67.4

Source: *Aksaray Meteorology Station Observation Records (1960-2015)*

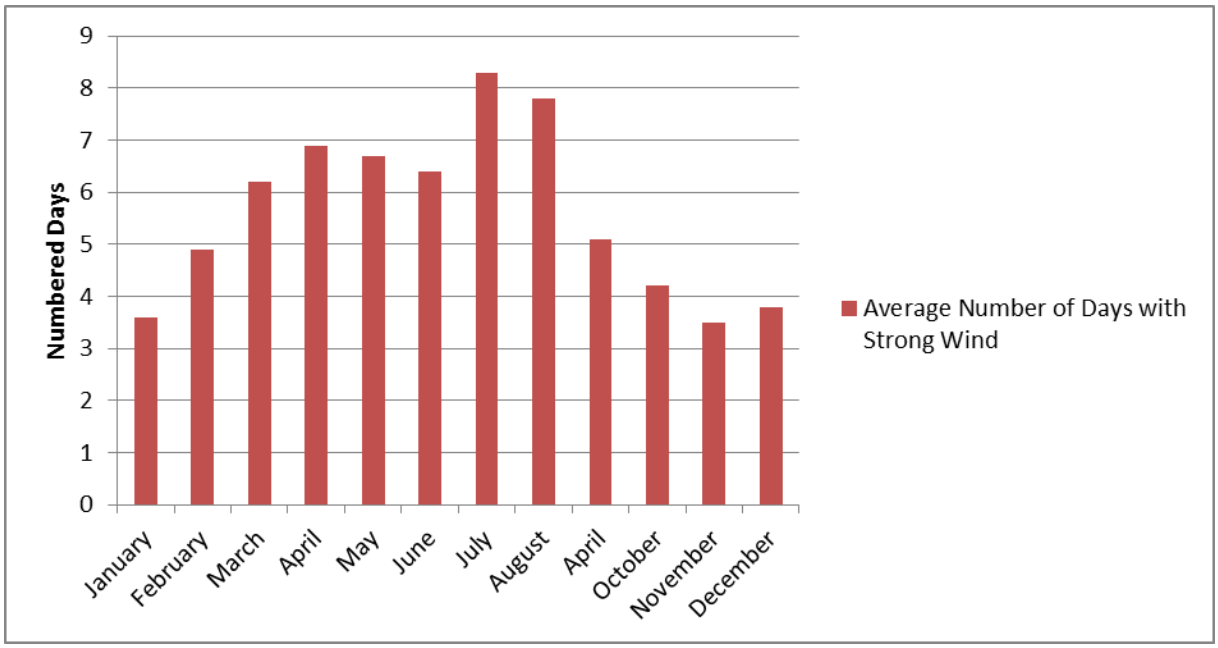


Figure 4.2.1.15. Average Days with Strong Windy Days
Source: *Aksaray Meteorology Station Observation Records (1960-2015)*

4.3 Ambient Air Quality

4.3.1 Baseline Air Quality Monitoring Locations and Sampling Methodology

PM10 and PM2.5 Measurements

The measurements are performed according to TS EN 12341 Air quality - Determination of the PM_{10} or $PM_{2.5}$ fraction of suspended particulate matter. For air quality across the European Union to be assessed on a consistent basis, Member States need to employ standard measurement techniques and procedures. The aim of this European Standard is to present a harmonized methodology for monitoring the mass concentrations of suspended particulate matter (PM_{10} and $PM2_{.5}$ respectively) in ambient air, following Directive 2008/50/EC on ambient air quality and cleaner air for Europe which sets the parameters specific to the assessment of ambient concentration levels of particulate matter.

This European Standard describes a standard method for determining the PM_{10} or $PM_{2.5}$ mass concentrations of suspended particulate matter in ambient air by sampling the particulate matter on filters and weighing them by means of a balance. Measurements are performed with samplers with inlet designs as specified in standards, operating at a nominal flow rate of 2,3 m^3/h, over a nominal sampling period of 24h measurement results are expressed in $\mu g/m^3$, where the volume of air is the volume at ambient conditions near the inlet at the time of sampling.

PM_{10} concentration is calculated by the following formula and equipment (Figure 4.3.1.1.):

C = 1000 (M2-M1)/ (V)

M2= Weight of filter paper after the test, (mg)

M1= Weight of filter paper previous the test, (mg)

V= Gas volume, (m^3)

$V = 60 * Q_{act} * t / 1000$

t = Time, Hour

Figure 4.3.1.1. PM Measurement Equipment

The sequential substitution system of the filtering membrane with 16 membranes capacity and the electronic flow rate controller, allow continuous, unattended operations as well as an easy replacement of the exposed filters without interrupting the sampling.

Skypost PM FG is an automatic outdoor station for continuous atmospheric particulate monitoring using 47mm diameter filter membrane.

The sequential substitution system of the filtering membrane with 16 membranes capacity and the electronic flow rate controller, allow continuous, unattended operations as well as an easy replacement of the exposed filters without interrupting the sampling.

Skypost PM FG has up to 50 l/min flow rate capacity and is suitable for dust sampling with LVS PM10 2.3 m^3/h sampling head and LVS PM2.5 2.3 m^3/h sampling head, according to EN12341 norm.

The completely straight suction tube with its round shape and the separation of the storage filter zone from internal and radiant source of heat, allow collecting and keeping the integrity of the pollutants.

A ventilation and differential thermoregulated heating system allows the instrument to operate even in extreme ambient conditions.

Passive Sampling (SO_2, NO_2, NO_x) Measurements

Ambient concentrations of SO_2, NO_2, NO_x, are measured by use diffusion tube sampling methodology (Figure 4.3.1.2.). These samplers made of small plastic tubes, approximately 7 cm long with about 1 cm internal diameter

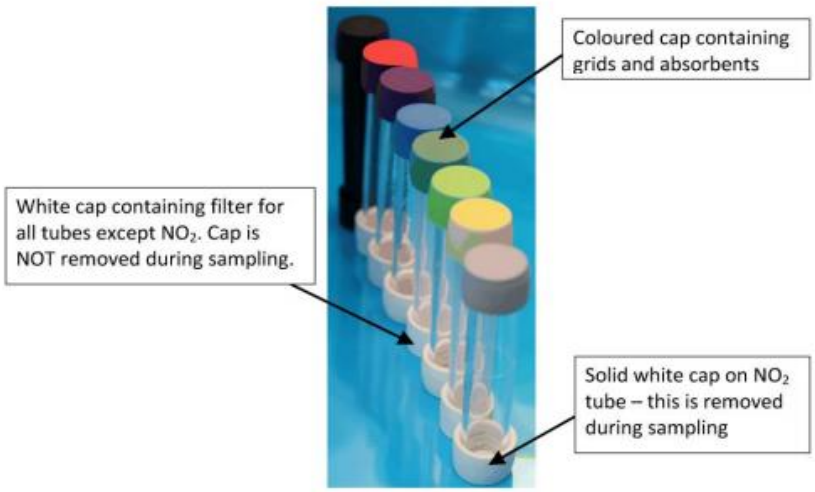


Figure 4.3.1.2. Passive Sampling Tubes

During sampling, one end of the tubes remains open to air and the other close. The SO_2, NO_2, NOx tubes differentiate by the colour of their upper caps. The closed ends contains an absorbent for the gaseous species (in this case SO_2, NO_2, NO_x) monitor, and the samplers operate on the principle of molecular diffusion.

Diffusion tubes (Figure 4.3.1.3.) work by a process called molecular diffusion. During molecular diffusion, compounds move from an area of high concentration to an area of low concentration. The compounds in air are higher concentration than those in the tube, so the compounds diffuse into the tube and collect on the absorbent at the end of the tube. Because the compounds are absorbed, the low concentration in the tube is maintained, and therefore diffusion continues. The rate that the compounds move into the tube is called the uptake rate. This is a known rate and is used in the calculations during analysis.

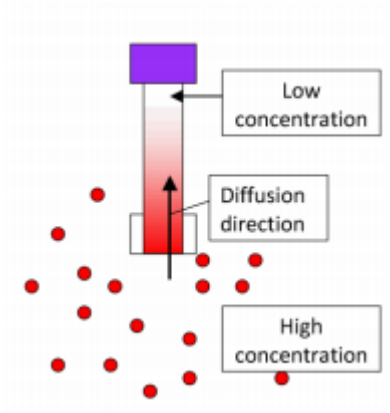


Figure 4.3.1.3. Compound Diffusing in Tubes

Triethanolamine (TEA) shows to be a suitable NO_x absorber for used in the diffusion tubes. Stainless steel mesh discs coate with absorber by either dipping into solution of TEA and acetone or pipeting a small quantity of the aqueous solution onto the discs in the assembled tube. The impregnated mesh discs hold at the closed ends of the tubes. The closed ends of the tubes seal and the tubes store prior to exposure. The caps remove immediately before exposure period and NO_2 and NO_x allow to diffusing through the tubes. After completion of exposure, the caps place again and the tubes send to the laboratory for analysis.

The absorbent used for SO_2 tubes are, potassium hydroxide in glycerol solution placed on the closed end of the tubes. The other ends cover with another cap contains a filter to prevent any kind of acidic particulate matter that can contaminate the samplers. The tubes then stored in plastic bottles. The tubes remove from the plastic bottles immediately before exposure and left without removing the filter. After exposure period, the tubes place into their plastic bottles and sent to the laboratory for analysis.

The storage time for the SO_2, NO_2, NO_x tubes 12 weeks after preparation to analysis. At site and during transport, the storage conditions keep as cool as possible without refrigeration (i.e. heat insulated boxes use).

After 30 days exposure period, the tubes sent to the Gradko Laboratory in England with bottom ends closed and in an airtight bag. At Gradko Laboratory, NO_2, NO_x tubes extract from the absorbent and the extract is analyzed by U.V. Spectrophotometer to obtain the amount of nitrite (NO_x-) in µg. The concentration of NO_2, NO_x in the environment (in µg/m3) calculate accordingly using the mass of nitrite determined in µg, exposure time and diffusion coefficient of the gas.

The SO_2 tubes send to Gradko Laboratory in their plastic bottles and analyzed for sulphate (thus S in µg) by Ion Chromatography. The ambient concentration of SO_2 calculates accordingly using the amount of sulphate (SO_4-2), exposure time and diffusion coefficient of SO_2.

Diffusion tubes design for long-term monitoring so that a sufficient concentration of compounds is absorbed on to the tubes to be detected during the analysis. The tube should be placed in the required monitoring location and left there for between 2 and 4 weeks. Once the sampling period is over, the tubes seal and return to the laboratory for analysis. Various analysis techniques are use for the different diffusion tubes. The lab determines the concentration of compounds on the tube. This is then used in a calculation with the uptake rate to calculate the average concentration of compounds that were present in the air over the monitoring period.

After every 30 days exposure, a blank tube for each tube types are send to Gradko Laboratory according to Gradko Laboratory Standard Operation Procedure.

4.3.2 Results of Baseline Noise Monitoring

Underground Gas Storage Project (UGS Project) / 3rd party Monitoring Studies

In the scope of the third party monitoring and measurement activities, PM_{10} and dust deposition measurements are conducted at the project areas two months in a row, within a year, by the Experts of ÇINAR (Picture 4.3.2.1.).

Picture 4.3.2.1. Photos of Air Quality Measurements (Dust Deposition, PM_{10}) at the Project Sites

In addition to all of these analyses and measurements, PM_{10} air quality measurement results that periodically performed by ÇINAR and ÇINAR Environmental Laboratory Experts on September 26, 2016 and September 15, 2017 and additionally $PM_{2.5}$ measurement on May 23, 2013 that conducted for one time during UGS Project are given in Table 4.3.2.1 below.

Table 4.3.2.1. PM10 and PM 2.5 Measurement Results

GPS Coordinates			
Easting	**Northing**		
551172	4217355		

Parameters	**September 2016 (PM10)**	**Limit Value (µg/Nm³)**	**September 2017 (PM10)**	**Limit Value (µg/Nm³)**	**May 2013 (PM2.5)**	**Limit Value (µg/Nm³)**
Empty Filter Paper Weight (gr)	**0.09079**	**-**	**0.08984**	**-**	**0.09106**	**-**
Full Filter Paper Weight	**0.09099**	**-**	**0.09001**	**-**	**0.11210**	**-**
Weight Difference (µg)	**200**	**-**	**170**	**-**	**21040**	**-**
Air Pressure (mm.Hg)	**675**	**-**	**677**	**-**	**756.1**	**-**
Temperature (Co)	**22**	**-**	**29**	**-**	**27**	**-**
Temperature (Ko)	**295**	**-**	**302**	**-**	**300**	**-**
Actual Flow (L/min)	**38.50**	**-**	**38.50**	**-**	**38.5**	**-**
Start Time	**14:20**	**-**	**13:30**	**-**	**15:35**	**-**
Finish Time	**16:20**	**-**	**15:30**	**-**	**15:30**	**-**
Past Time (Hour)	**02:00**	**-**	**02:00**	**-**	**23:55**	**-**
Actual Volume (m³)	**4.62**	**-**	**-**	**-**	**55.44**	**-**
Standard Volume (m³)	**3.80**	**-**	**3.72**	**-**	**50.19**	**-**
Actual Concentration (µg/m³)	**43.29**	**-**	**36.80**	**-**	**>200**	**-**
Standard Concentration (µg/m³)	**52.67**	**100(1)**	**45.70**	**70(1)**	**>200**	**>200**

*(1) RCIAP Appendix 1.b.2**

As seen, given sample measurement in Table 4.3.2.1., the PM_{10} concentration values are measured as;

- 0.05267 mg/Nm^3 on September 2016
- 0.04570 mg/Nm^3 on September 2017 and these values are acceptable according to Appendix 1.b.2 (limit value; 3 mg/Nm^3) of Regulation on the Control of Industrial Air Pollution

*RCIAP, Appendix 1; *In this case, considering the main wind direction, the average concentration of dust (PM 10) at 3 meters distance from the powder source should not exceed 3 mg / Nm^3 maximum*.

The dust deposition measurement that periodically performed by ÇINAR and ÇINAR Environmental Laboratory Experts during the Underground Gas Storage Project between the periods below;

- July - September 2016 (1st Period, July-August and 2nd Period, August-September)
- July - September 2017 (1st Period, July-August and 2nd Period, August-September)

were completed at the project sites. The results of the sample measurements are given in Table 4.3.2.2. and Table 4.3.2.3., below.

Table 4.3.2.2. Dust Deposition Measurement Results of the months July-August 2016 (1st Period) and August-September 2016 (2nd Period) (Resulted in September 2016)

GPS Coordinates									
Easting				**Northing**					
551137				4217198					
Measurement Information									
Dust Deposition (mg/m²- day)									
July 13, 2016-August 17, 2016				**August 17, 2016-Sptember 20, 2016**				**Average Values**	
1st Period				**2nd Period**				**1st Period**	**2nd Period**
335	248	155	137	379	235	169	132	**218**	**229**

Loss of the Measurement: +/- 11.93%

When the dust deposition measurement results are examined, according to Table 4.3.2.2., the average values of dust deposition have been calculated as **218 mg/m²-day** for 1st period and **229 mg/m²-day** for 2nd period, at the first station. These values are acceptable according to Appendix 1.b.2 **(limit value; 450 mg/m²-day*)** of Regulation on the Control of Industrial Air Pollution (RCIAP).

Table 4.3.2.3. Dust Deposition Measurement Results of the months July-August 2017 (1st Period) and August-September 2017 (2nd Period) (Resulted in September 2017)

GPS Coordinates									
Easting				**Northing**					
551137				4217198					
Measurement Information									
Dust Deposition (mg/m²- day)									
July 12, 2017-August 16, 2017				**August 16, 2017-Sptember 15, 2017**				**Average Values**	
1st Period				**2nd Period**				**1st Period**	**2nd Period**
93	74	65	44	130	104	75	73	69	96

Loss of the Measurement: +/- 11.93%

When settled dust measurement results are examined, according to Table 4.3.2.3 average values of the settled dust have been calculated as **69 mg/m^2-day** for 1st period and **96 mg/m^2-day** for 2nd period at station. These values are acceptable according to Annex 1.b.2 **(limit value; 450 mg/m^2-day*)** of Regulation on Control of Industrial Air Pollution (RCIAP).

*RCIAP, Appendix 1; *The amount of deposited dust measured in consideration of the prevailing wind direction in the operation area can not exceed the value of 450 mg / m^2 -day as the average monthly value.*

The EIA Studies for Gas Storage Expansion Project (GSEP)

Sampling works of PM_{10} measurements were carried out in the scope of the project area and its vicinity between the dates November 03, 2016 – December 03, 2016. Measurement for 1 month was carried out at 4 points, by taking into account the topographical and meteorological conditions in the selection of the measurement points.

The particles accumulated on the filters in the scope of air PM_{10} measurements were weighed at the ÇINAR Environmental Measurement and Analysis Laboratory and dust concentrations were determined.

The point of measurement is shown in the current condition map in Appendix 5 and points where the measurement was carried out remain within area where the facility area is planned (Picture 4.3.2.2.).

Picture 4.3.2.2. Photos of Air Quality Measurements (Dust Deposition, PM_{10})

The filter paper obtained from the device by using MCZ LVS 1 is conditioned for 48 hours with the help of an air conditioner, under laboratory conditions of 20°C (+-1°C) and 50% (+-5%) relative humidity, and then weighed with the precision scales and the results are recorded. In the scope of the PM10 measurements, the analysis results are given in Table 4.3.2.4. below.

Table 4.3.2.4. PM10 Measurement Results of the f EIA Studies for GSEP

Measurement Point	Measurement Information		
	Period	Average Values	Limit Value (µg/Nm³)
PM-1	03.11.2016 - 03.12.2016	**59,61**	52(1)
PM-2	03.11.2016 - 03.12.2016	**55,49**	52(1)
PM-3	03.11.2016 - 03.12.2016	**62,35**	52(1)
PM-4	03.11.2016 - 03.12.2016	**60,43**	52(1)

(1)RCIAP Appendix 2 Table.2.2

Dust deposition measurement was carried out over a period of one month at each of the 4 points in the scope of the planned project influence area. Topographical and meteorological conditions were taken into account when selecting the measurement point.

Dust deposition measurements were carried out by the gravimetrical method using "Four-Way Environmental Air Sampling Device". Dust deposition is measured by using the Four-Way Environmental Air Sampling device according to TS 2342 standard. The sampling system consists of 1 base plate, 1 tripod and 4 dust collection containers (Picture 4.3.2.3.). Therefore, the sampling system is able to measure the dust deposition that may be formed from 4 main directions (north, south, west, and east) and the source of a dust from a specific point can be understood. The particles accumulated on the filters were weighed at the ÇINAR Environmental Measurement and Analysis Laboratory and dust concentrations were determined.

Picture 4.3.2.3. Photos of Four-Way Environmental Air Sampling Devices

The point of measurement is shown in the topographical map stated in the current condition map in Appendix 5 and the points where the measurement was carried out remain within the area where the facility area is planned.

The analysis results for the dust deposition measurement studies are given in Table 4.3.2.5.

Table 4.3.2.5. Dust Deposition Measurement Results of the EIA Studies GSEP

Measurement Point	Measurement Information									
	Dust Deposition (mg/m^2- day)									
	November 03, 2016 – December 03, 2016				December 03, 2016 – January 02, 2017				Average Values	
	1st Period				2nd Period				1st Period	2nd Period
SD-1	135	118	113	89	114	91	98	83	**114**	**97**
SD-2	137	117	121	65	104	95	96	78	**110**	**93**
SD-3	114	107	85	94	106	87	70	95	**100**	**89**
SD-4	140	110	89	91	94	78	82	65	**108**	**80**

Loss of the Measurement: +/- 11.93%

The ESIA Studies for Gas Storage Expansion Project (GSEP)

The activities in order to control the emissions in the form of fume, smoke, dust, gas, vapor and aerosol sourced from any kind of activities, to protect the human beings and the environment from pollution, to eliminate the adverse effects which occur because of air pollution and prevent the occurrence of these effects have been conducted according to the Regulation on the Protection of Air Quality until 2008. In the scope of harmonization with EU legislation, the Regulation on Air Quality Assessment and Management which has been prepared in line with 96/62/EC Framework Directive on Air Quality and daughter Directives (1999/30/EC, 2000/69/EC, 2002/3/EC, and Decision on Exchange of Information 97/101/EC) came into force on 06 June 2008 repealing the Regulation on the Protection of Air Quality

The aim of the Regulation on Air Quality Assessment and Management is to define air quality targets to prevent or mitigate the harmful impacts of air quality on the environment and human health and assess the air quality with regards to predefines methods and criteria, to preserve the existing conditions of the areas with adequate air quality and to refine in worse situations, to acquire data on air quality and to inform public by means of threshold values. The regulation defines harmonization and staged implementation schedule for 13 different pollutants which are specified in framework and daughter directives (96/62/EC, 1999/30/EC: SO2, NO2. NOx, PM10 and Pb, -2000/69/EC: C_6H_6 and CO, -2002/03/ EC: O_3. -2004/107/EC: As, Cd, Hg, Ni and PAHs-B(a) P) 13. Also it is aimed to control pollution and monitor air quality, and institutional enhancement.

The Regulation on Control of Air Pollution Caused by Heating, the Regulation on the Control of Industrial Air Pollution and the Regulation on the Control of Exhaust Gas Emission were issued on 13 January 2005, 03 July 2009, 04 April 2009 respectively in order to protect the air quality by taking the necessary measures on the sources (heating,

industrial, traffic) causing air quality. The regulation on the Quality of Petrol and Diesel was also published on 11 June 2004 concerning the fuel used for the vehicles in traffic.

The Regulation on Air Quality Assessment and Management presents “Limit Values, Target Values, Long Term Targets, Assessment Threshold Values, Notification and Alert Threshold Values” in Annex-1, which is provided below Table 4.3.2.6.

Table 4.3.2.6. Limit and Assessment Values

Pollutant	Averaging Period	Limit Value	Margin of tolerance	Upper assessment threshold	Lower assessment threshold	Date by which target value should be met
PM_{10}	**24 hours** -for the protection of human health -	**50 µg/m³** (cannot be exceeded more than 35 times in one year)	**50 µg/m³** (100 % of the limit value) on 1.1.2014, and decreasing every 12 months equally thereafter to reach 0 % by 1 1.1.2019	**30 µg/m³** (cannot more than 7 times in one year)	**20 µg/m³** (cannot more than 7 times in one year)	1st January 2019
	Annual -for the protection of human health -	**40 µg/m³**	**20 µg/m³** (50 % of the limit value) on 1.1.2014, and decreasing every 12 months equally thereafter to reach 0 % by 1 1.1.2019	**14 µg/m³**	**10 µg/m³**	1st January 2019

There is no limit value for $PM_{2.5}$ in the national legislation.

In addition, directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe lays down measures for defining and establishing objectives for ambient air quality designed to avoid, prevent or reduce harmful effects on human health and the environment as a whole; assessing the ambient air quality in Member States on the basis of common methods and criteria; 3. obtaining information on ambient air quality in order to help combat air pollution and nuisance and to monitor long-term trends and improvements resulting from national and Community measures; ensuring that such information on ambient air quality is made available to the public; maintaining air quality where it is good and improving it in other cases; promoting increased cooperation between the Member States in reducing air pollution.

The directive presents the limit values for PM_{10} on Annex XI Limit Values for the Protection of Human Health “B. Limit values” which is presented below Table 4.3.2.7.

Table 4.3.2.7. Limit Values for the Protection of Human Health

Parameter	Averaging Period	Limit value	Margin of tolerance	Date by which limit value is to be met
PM10	One day	50 µg/m³, not to be exceeded more than 35 times a calendar year	50 %	— (1)
	Calendar year	40 µg/m³	20 %	— (1)

(1) Already in force since 1 January 2005

The directive presents the limit values for PM2.5 on Annex XIV National Exposure Reduction Target, Target Value and Limit Value for PM2.5 "E. Limit value" which is presented below Table 4.3.2.8.

Table 4.3.2.8. Limit Value for $PM_{2.5}$

Parameter	Averaging Period	Limit value	Margin of tolerance	Date by which limit value is to be met
STAGE 1				
PM2.5	Calender year	25 µg/m^3	20 % on 11 June 2008, decreasing on the next 1 January and every 12 months thereafter by equal annual percentages to reach 0 % by 1 January 2015	1st January 2015
STAGE 2(1)				
PM2.5	Calendar year	20 µg/m^3		1st January 2020

(1) Stage 2 — indicative limit value to be reviewed by the Commission in 2013 in the light of further information on health and environmental effects, technical feasibility and experience of the target value in Member States.

In the scope of the Gas Storage Expansion Project, PM_{10} measurements were conducted at 8 points to determine the current condition of the fresh water pipeline route (Picture 4.3.2.4.).

Picture 4.3.2.4. Photos of Air Quality Measurements (Dust Deposition, PM_{10})

Table 4.3.2.10. PM10 Measurement Results of the ESIA Studies for the Fresh Water Line Route

Measurement Point	Measurement Information			
	Period	Average Values	Limit Value (µg/Nm³)	Limit Value (µg/Nm³)
PM-5	March 10, 2017 – April 08, 2017	**27,73**	48(1)	50(2)
PM-6	March 10, 2017 – April 08, 2017	**26,49**	48(1)	50(2)
PM-7	March 10, 2017 – April 08,2017	**25,70**	48(1)	50(2)
PM-8	March 10, 2017 – April 08, 2017	**22,39**	48(1)	50(2)
PM-9	February 07, 2017 – March 09, 2017	**40,33**	48(1)	50(2)
PM-10	February 07, 2017 – March 09, 2017	**38,50**	48(1)	50(2)
PM-11	February 07, 2017 – March 09, 2017	**31,81**	48(1)	50(2)
PM-12	February 07, 2017 – March 09, 2017	**42,04**	48(1)	50(2)

(1) RCIAP Appendix 2 Table.2.2
(2) Daily PM10 Limit Values on Annex XI for the Protection of Human Health

$PM_{2.5}$ values along pipelines have been measured under the limits (See. Table 4.3.2.11.).

Table 4.3.2.11. PM2.5 Measurement Results of the ESIA Studies of GSEP

Measurement Point	PM-5	PM-6	PM-7	PM-8	PM-9	PM-10	PM-11	PM-12
Location	PS1 Station	PS2-ST1 Station	PS3-ST2 Station	ST3 Station	Sapmaz Village	Yenikent District	Pig Station	Triple Pipelines
Coordinates	36 S 575512	36 S 579175	36 S 581754	36 S 582453	36 S 577466	36 S 565141	36 S 553919	36 S 553100
	4321289	4311425	4300943	4291655	4264568	4245603	4239801	4228708
PM2.5 (µg/m³)	15,00	13,24	14,06	10,83	18,26	16,15	11,46	12,15
Limit Value[1] PM2.5 (µg/m³)	25,00	25,00	25,00	25,00	25,00	25,00	25,00	25,00
CO (mg/m³)	<1,23	<1,23	<1,23	<1,23	<1,23	<1,23	<1,23	<1,23
Limit Value[2] CO (mg/m³)	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00

*[1] WHO AIR QUALITY GUIDELINES FOR PARTICULATE MATTER, OZONE, NITROGEN DIOXIDE AND SULFUR DIOXIDE "**Table 2** WHO air quality guidelines and interim targets for particulate matter: 24 hour concentrations"*
*[2] AIR QUALITY ASSESSMENT AND MANAGEMENT REGULATION "**Annex -1** Limit Values, Target Values, Long Term Targets, Assessment Thresholds, Information and Remark Thresholds, B) Limit Values, Assessment and Remark Thresholds"*

The Environmental, Health, and Safety (EHS) Guidelines of the International Finance Cooperation, 30, April 2007 are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP)1.

The General EHS Guidelines are organized as follows:

1. Environmental
2. Occupational Health and Safety
3. Community Health and Safety
4. Construction and Decommissioning
5. References and Additional Sources

Air Emissions and Ambient Air Quality section of the guideline applies to facilities or projects that generate emissions to air at any stage of the project life-cycle. It complements the industry-specific emissions guidance presented in the Industry Sector Environmental, Health, and Safety (EHS) Guidelines by providing information about common techniques for emissions management that may be applied to a range of industry sectors. This guideline provides an approach to the management of significant sources of emissions, including specific guidance for assessment and monitoring of impacts. It is also intended to provide additional information on approaches to emissions management in projects located in areas of poor air quality, where it may be necessary to establish project-specific emissions standards.

The guideline on ambient air quality puts forth that;

Projects with significant sources of air emissions, and potential for significant impacts to ambient air quality, should prevent or minimize impacts by ensuring that:

- Emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards by applying national legislated standards, or in their absence, the current WHO Air Quality Guidelines7 (see Table 1.1.1), or other internationally recognized sources.

- Emissions do not contribute a significant portion to the attainment of relevant ambient air quality guidelines or standards. As a general rule, this Guideline suggests 25 percent of the applicable air quality standards to allow additional, future sustainable development in the same airshed.

Table 1.1.1: WHO Ambient Air Quality Guidelines of IFC Environmental, Health and Safety Guidelines, of General EHS Guidelines: Environmental presents limit values for PM_{10} and $PM_{2.5}$ which are given below in Table 4.3.2.12 and Table 4.3.2.13.

Table 4.3.2.12. WHO Ambient Air Quality Guidelines

Parameters	Averaging Period	Guideline value in µg/m³
Particulate Matter PM_{10}	1-year 24-hour	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline) 150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
Particulate Matter $PM_{2.5}$	1-year 24-hour	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline) 75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)

Table 4.3.2.13. Guidelines for Air Quality Methods

Parameter	Method Number	Method Name
PM10	TS EN 12341	Ambient air - Standard gravimetric measurement method for the determination of the PM10 or PM2,5 mass concentration of suspended particulate matter
PM 2,5		
SO_2	TS EN 13528-1 TS EN 13528-2 TS EN 13528-3 (Passive Measurement)	Ambient Air Quality - Diffusive Samplers For The Determination Of Concentrations Of Gases And Vapours - Requirements And Test Methods - Part 1: General Requirements
NO_2		Ambient Air Quality - Diffusive Samplers For The Determination Of Concentrations Of Gases And Vapours - Requirements And Test Methods - Part 2: Specific Requirements And Test Methods
NO_x		Ambient Air Quality - Diffusive Samplers For The Determination Of Concentrations Of Gases And Vapours - Requirements And Test Methods - Part 3: Guide To Selection, Use And Maintenance

In scope of the air quality measurement at ESIA process, SO_X and NO_X measurements have been completed and results are given in Table 4.3.2.14. for the planned Gas Storage Expansion Project area.

Table 4.3.2.14. Ambient Air Quality Results

Measurement Point	**PM-5**		**PM-6**		**PM-7**		**PM-8**		**PM-9**		**PM-10**		**PM-11**		**PM-12**	
Location	**PS1 Station**		**PS2-ST1 Station**		**PS3-ST2 Station**		**ST3 Station**		**Sapmaz Village**		**Yenikent Village**		**Pig Station**		**Triple Pipelines**	
Coordinates	36 S 575512		36 S 579175		36 S 581754		36 S 582453		36 S 577466		36 S 565141		36 S 553919		36 S 553100	
	4321289		4311425		4300943		4291655		4264568		4245603		4239801		4228708	
SO_2 ($\mu g/m^3$)	1,69	<2,08	<1,60	<2,08	<1,60	<2,08	<1,60	<2,08	34,99	<2,08	3,16	<2,08	<1,60	<2,08	10,12	<2,08
Limit Value[1] SO_2 ($\mu g/m^3$)	60^2		60^2		60^2		60^2		60^2		60^2		60^2		60^2	
NO_2 ($\mu g/m^3$)	10,81	2,50	6,65	2,38	6,63	1,84	5,67	1,41	0,81	2,67	13,33	3,25	7,99	2,01	0,65	2,33
Limit Value[1] NO_2 ($\mu g/m^3$)	44^2		44^2		44^2		44^2		44^2		44^2		44^2		44^2	

4.4 Noise

4.4.1 Baseline Noise Monitoring Locations and Sampling Methodology

Environmental Noise Measurements have been carried out according to TS 9315 ISO 1996-1 and TS ISO 1996-2 standards. The results of the measurements are evaluated according to Regulation on the Assessment and Management of Environmental Noise.

Noise monitoring was undertaken at each measurement point for a minimum period of 1 hour (i.e. 2 consecutive 30 minute periods), during representative periods of works or operations.

The measured 30 minute logged noise levels were reported in tabulated form to include the LAeq, LAmax,fast and 1/1 octave band (linear) noise levels.

The measured LAeq, LAmax and 1/1 octave data was tabulated and assessed against the allowable sound levels from Turkish legislations. The daytime results will be compared against noise limits of 55 dB LAeq and should not exceed 70 dB LAmax, at the nearest noise sensitive receptors (free-field). The night time results will be compared against noise limits of 45 dB LAeq and should not exceed 60 dB LAmax, at the nearest noise sensitive receptors (free-field).

Where noise monitoring is undertaken closer to the source, for example as a result of high ambient noise levels at the receptor, the measured noise levels will be extrapolated to the receiver location using the following method:

LR = L1- 20*Log10(R2/R1)

Where:

LR is the calculated noise level at the receiver position

R2 is the source to receiver distance, m;

R1 is the source to noise monitoring location distance, m; and

L1 is the noise level measured at R1.

A summary of the detailed sites notes were included in the report. Details of on-site activities during the monitoring period will also be reported along with typical levels for each activity, where possible.

The measurements will be carried out on 4 receptor locations for 3rd party monitoring studies and 5 receptor locations for EIA studies of Gas Storage Expansion Project.

4.4.2 Results of Baseline Noise Monitoring

Underground Gas Storage Project (UGS Project) / 3rd party Monitoring Studies

Noise level control measurements are conducted every month by the Noise Experts of ÇINAR at the project areas where potentially noisy areas are on and around the surface facilities and camp sites in the scope of the third party monitoring and measurement activities (Picture 4.4.2.1.).

Picture 4.4.2.1. Photos of Noise Measurements at the Project Sites

From the starting of the Underground Gas Storage Project, environmental noise levels that affecting the settlements at the project areas such as UGS sites, camp sites, Hirfanlı Dam at PS1 site, surface facilities, etc. have been measured and checked by ÇINAR monthly. Noise measurement results were reported to BOTAŞ until to June 2014 and only noise level checking activities are conducted after this month until now in scope of the Phase II of the project. Environmental noise levels are generally measured below 60 Leq in monthly. Average values of the noise levels during the Underground Gas Storage Project are given in Table 4.4.2.1. below and noise measurement points are given in Appendix-5.

Table 4.4.2.1. Noise Measurement Results during the Underground Gas Storage Project

Years	Months	UGS Sites (Leq)	Main Camp Site (Leq)	Hirfanlı Dam (Leq)	Surface Facilites (Leq)	Status
2013	APRIL	46.6	-	-	-	REPORTING
	MAY	-	50.3	-	-	
	JUNE	-	53.3	-	-	
	JULY	59,6	-	-	-	
	AUGUST	40.9	52.6	-	-	
	SEPTEMBER	51.7	45.1	-	-	
	OCTOBER	44.9	45.6	40.75	-	
	NOVEMBER	66.8	-	-	79.6	
	DECEMBER	-	-	-	-	
2014	JANUARY	58	38.4	-	-	
	FEBRUARY	68.5	44.8	-	-	
	MARCH	67.3	47.9	-	-	
	APRIL	65.2	39.2	-	54.7	
	MAY	62.2	59.8	-	-	
	JUNE	66.9	29.5	-	-	
	JULY	58	52	-	-	CHECKING
	AUGUST	55	51	-	-	
	SEPTEMBER	58	51	-	-	
	OCTOBER	55	-	-	52	
	NOVEMBER	56	-	-	58	
	DECEMBER	58	48	-	-	
2015	Every Month	< 60	< 60	< 60	< 60	
2016	Every Month	< 60	< 60	< 60	< 60	
2017	Every Month	< 60	< 60	< 60	< 60	

The EIA Studies for Gas Storage Expansion Project (GSEP)

Turkish regulation concerning environmental noise is the Regulation on the Assessment and Management of Environmental Noise which was published on the Official Gazette numbered 27601 and dated 04.06.2010.

The purpose of this regulation is to define a common approach for prevention or mitigation of adverse impacts of environmental noise. The regulation presents the principles and procedures with regards to environmental noise and vibration to which humans are exposed at highly populated areas, quiet locations on open areas, schools, hospitals and other sensitive areas. The Regulation also sets forth the principles for noise permission.

The criteria for the noise levels dispersed from construction areas and prevention from noise is given in the Regulation. The noise levels from construction activities shall not exceed the limit values given in Table-5 of Annex-VII to the Regulation which are presented below in Table 4.4.2.2

Table 4.4.2.2. Environmental Noise Limit Values for Construction Areas

Activities Type (construction, destruction and repairment)	**Lday (dBA)**
Building	70
Road	75
Others sources	70

The criteria for the noise levels dispersed from enterprises, facilities and working places is given in the Regulation. The noise levels from industrial facilities shall not exceed the limit values defined in Table-4 of Annex-VII of the Regulation which are presented below in Table 4.4.2.3. The limit values depend on the type of the areas where the receptor exists. The Compressor Stations (CSTs) are evaluated as industrial facilities because of the combustion units.

Table 4.4.2.3. Environmental Noise Limit Values for Industrial Facilities

Receptors	**L_{DAY} (dBA)**	**$L_{EVENING}$ (dBA)**	**Lnight (dBA)**
Noise sensitive areas where schools, cultural and health areas, summer houses, camp sites are found intensively.	60	55	50
The areas of both commercial structures and noise sensitive uses at which residences exist intensively.	65	60	55
The areas of both commercial structures and noise sensitive uses at which working places exist intensively.	68	63	58
Industrial Areas	70	65	60

The results of the noise measurements conducted within 250 m wide study corridor and within 250 m from the camp sites were evaluated according to Annex 7, Table 5 “Environmental Noise Limit Values for Construction Areas” of the Regulation.

The results of the noise measurements conducted within 250 m from the surface facilities were evaluated according to Annex 7, Table 5 “Environmental Noise Limit Values for Construction Areas” and also Table-4 of Annex-VII “Environmental Noise Limit Values for Industrial Facilities” of the Regulation.

The regulation also specifies that the environmental noise levels of any workplace, workshop, manufacturing plant or similar activity which is close to noise sensitive uses and which may have impacts on noise sensitive uses shall not exceed the background noise levels by 5 dBA in terms of Leq.

The vibration levels on the very sensitive and sensitive uses caused by the activities at the constructions such as piling and heavy construction equipment shall not exceed the limit values defined in Table-7 of Annex VII of the Regulation which are given below in Table 4.4.2.4.

Table 4.4.2.4. The Vibration Levels on the Very Sensitive and Sensitive Uses Caused by the Activities at the Constructions such as Piling and Heavy Construction Equipment

	Maximum Vibration Velocity Allowed (Peak Value -mm/s)	
	Continuous Vibration	Intermittent Vibration
At Settlement Areas	5	10
At Industrial and Commercial Areas Ş	15	30

On the other hand, directive 2002/49/EC of the European Parliament and of the Council 25 June 2002 relating to the assessment and management of environmental noise aims to define a common approach intended to avoid, prevent or reduce on a prioritised basis the harmful effects, including annoyance, due to exposure be implemented progressively:

(a) the determination of exposure to environmental noise, through noise mapping, by methods of assessment common to the Member States;

(b) ensuring that information on environmental noise and its effects is made available to the public;

(c) adoption of action plans by the Member States, based upon noise-mapping results, with a view to preventing and reducing environmental noise where necessary and particularly

where exposure levels can induce harmful effects on human health and to preserving environmental noise quality where it is good.

The Directive also aims at providing a basis for developing Community measures to reduce noise emitted by the major sources, in particular road and rail vehicles and infrastructure, aircraft, outdoor and industrial equipment and mobile machinery.

The Environmental, Health, and Safety (EHS) Guidelines of the International Finance Cooperation, 30, April 2007 are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP).

The General EHS Guidelines are organized as follows:

1. Environmental
2. Occupational Health and Safety
3. Community Health and Safety
4. Construction and Decommissioning
5. References and Additional Sources

The noise section of the guideline addresses impacts of noise beyond the property boundary of the facilities.

Noise prevention and mitigation measures should be applied where predicted or measured noise impacts from a project facility or operations exceed the applicable noise level guideline at the most sensitive point of reception.6 The preferred method for controlling noise from stationary sources is to implement noise control measures at source.7 Methods for prevention and control of sources of noise emissions depend on the source and proximity of receptors.

The guideline also decides that the maximum increase in background level at the nearest receptor location off-site shall not exceed 3 dBA.

There is no limit value for vibration in the guideline.

The limit noise levels which are given below in Table 4.4.2.5 are presented in Table 1.7.1 of the guideline.

Table 4.4.2.5. The Limit Noise Levels of the Guideline

Table 1.7.1- Noise Level Guideline	**One Hour LAeq (dBA)**	
Receptor	Daytime (07.00 – 22.00)	Nightime (22.00 – 07.00)
Residential; institutional; educational	55	45
Industrial; commercial	70	70

Noise measurement was carried out in order to determine the current noise level at 5 points during the morning, evening and night time periods in the scope of settlement areas close to the area and the project area in the scope of the works to determine the current conditions (Picture 4.4.2.1.). The mentioned measurement points are marked on the current condition map in Appendix 5.

Picture 4.4.2.1. Noise Measurement Photos for the EIA Process of Gas Storage Expansion Project

The points where the noise measurement was carried out were selected according to the "Regulation on Assessment and Management of Environmental Noise (RAMEN)" which came into force by being published in the Official Gazette dated June 04, 2010 and numbered 27601 and with that purpose, measurement was carried out with a 1 m distance at the most from the receiver and 1.5 meter height from the ground (to ensure the noise back reflection is kept at a minimum level).

As can be seen in the table presented below (Table 4.4.2.6.), the noise measurement results fulfill the limit values of the RAMEN. The noise levels shall be taken as reference in the scope of the noise determination works to be carried out during the project's land preparation-construction and operation stages.

Table 4.4.2.6. Noise Measurement Results of EIA Studies for Gas Storage Expansion Project

Measurement Point	Measurement Information						
	Date	Average Values			Limit Value (µg/Nm^3)		
		Day	Evening	Night	Day	Evening	Night
NMP-1	10-14.12.2016	**49.8**	**47.0**	**44.6**	65	60	55
NMP-2	10-14.12.2016	**63.3**	**58.7**	**54.4**	65	60	55
NMP-3	10-14.12.2016	**48.5**	**47.7**	**47.1**	65	60	55
NMP-4	10-14.12.2016	**54.7**	**52.4**	**50.1**	65	60	55
NMP-5	10-14.12.2016	**56.9**	**53.4**	**50.8**	65	60	55

(1)RCIAP Appendix 2 Table.2.2

4.5. Geology

The Tuz Gölü basin, where the project area is located, is a North West (NW) - South East (SE) basin cross located within a cross-land structural depression. It is surrounded by Ankara - Galatian volcanic in the North; Kırsehir Kristalin Complex (Kırsehir Massif) in the East; Taurus Mountains (Bolkar Mountains Complex) in the South and Southwest; Sivrihisar-Bozdag massif in the West. In the basin of Tuz Gölü, it is observed that thickness increased up to 10 km from the Upper Cretaceous until now. It was revealed by the researchers that in the deep parts of the basin, units such as shales, sandstones, conglomerates and

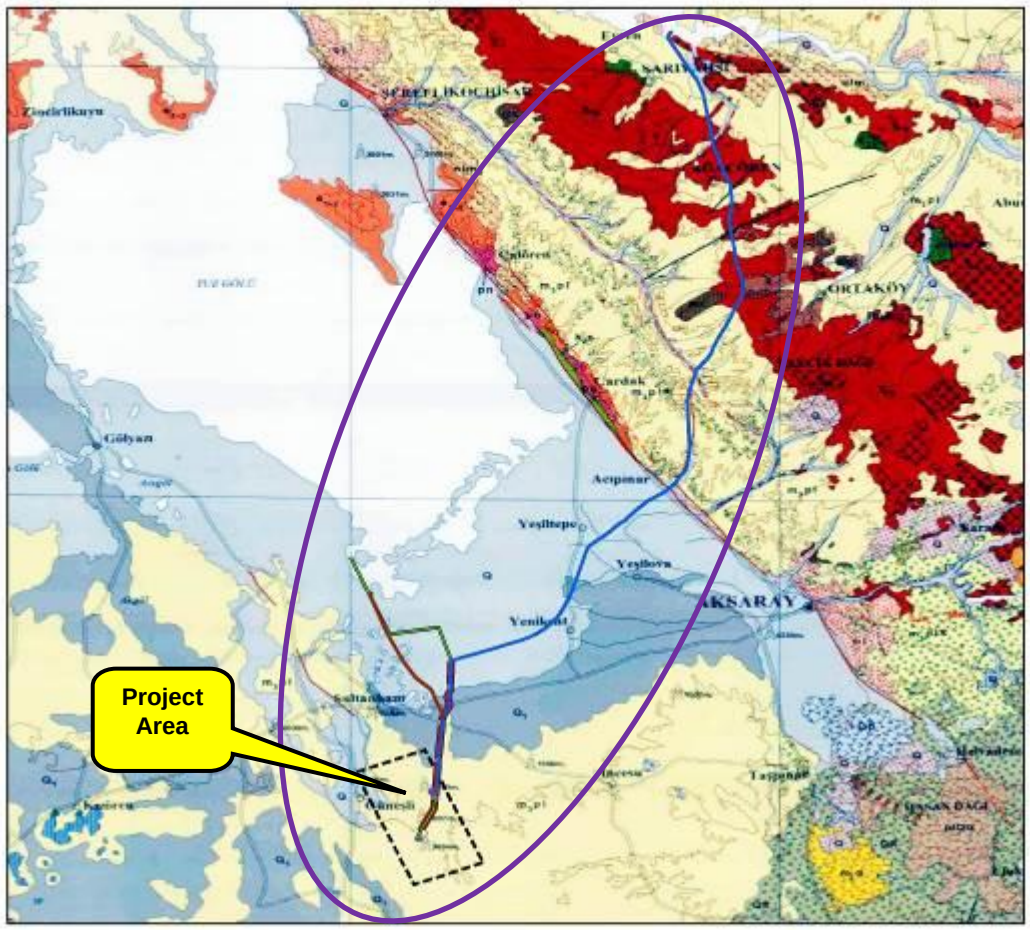
limestones- generally associated with each other in lateral and vertical directions - have subsided, while terrestrial and shallow marine units have subsided in the corner part. In shallow marine and terrestrial environments, conglomerates and sandstones- high energy products - have been deposited, and shale, limestone, gypsum and anhydrite have formed during calm periods (Arıkan, Y., 1975).

The basic rock units in the northern and north-eastern part of the Basin of Tuz Gölü were composed of Temirözü and Mollaresul Formations; units belonging to the Ankara Complex and Kırşehir Crystalline Complex; low grade metamorphic in the west and southwest. (Görür, N., Derman, A., S., 1978). It was believed that the Tuz Gölü basin is a separate basin, separated from the Upper Cretaceous-Eocene by a brink from the Polatlı-Haymana basin, but that after the Lutetian era, the sedimentological sedimentation conditions of the basin changed; and even in the same part of the Kırşehir Massif lieing east of Tuz Gölü, they illustrate the same sedimentary features. It is also said that the abundant amount of salt in the Tuz Gölü basin is related to the regression of marine life in the late Eocene era (Görür, N., Oktay, F.Y., et al., 1984).

In the Tuz Gölü basin, subsidence was observed during the Upper Senonian-Lower Middle Eocene periods, followed by a regression that started in Upper-Middle Eocene and continued to the end of the Oligocene period. During the Upper Senonian-Lower Middle Eocene, the Tuz Gölü basin created a single and continuous depression towards the North-West, to the Haymana area. After the storage of Middle Eocene Nummulitic limestones, the Tuz Gölü basin was separated from the rising Haymana basin by a fault zone extending along the Eastern margin of the Upper Karacadağ (Arıkan, Y., 1975).

The connection towards the north-northeast with the Çankırı basin occurred in the Palaeocene era and it continued throughout Middle Eocene-Oligocene eras where the Tuz Gölü basin became a graben bounded by Northwest (NW) - Southeast (SE) fault line. After the main deformation in late Oligocene or Miocene period, some depositional basins occurred during the Neogene period and terrestrial sediments were accumulated in these basins including volcanic of different thicknesses and lacustrine limestones. The Tuz Gölü basin was slightly affected by last Alpine compressional movements on Plian. The tensional movements of the Neogene sediments- continuing as the Pleistocene - have caused volcanic activity extending to the historical times (Arıkan, Y., 1975).

The General Geological Map of the project area and its surroundings is given in Figure 4.5.1.



LEGEND

Sedimentary Rocks

Q	Quaternary, Composite Quaternary
Q_t	Quaternary, Composite Terrestrial Clasts
m_{3pl}	Upper Miocene - Pliocene, Composite Terrestrial Clasts

Plutonic Rocks

γ_{k-e}	Upper Cretaceous - Paleocene, Granitoid

Figure 4.5.1. General Geological Map of the Project Area and Its Surroundings
Source: Geological Map of Turkey- Kayseri Map Sheet (1 / 500,000) MTA, 2002

4.5.1. Activity Area Geology

New drilling areas planned for capacity expansion within the scope of the Gas Storage Expansion Project and the main surface area of the project are located completely on the Miocene aged Insuyu formation (lacustrine limestone marl, conglomerate, sandstone, claystone and volcanic intercalations). In the planned brine discharge line and natural gas branchman line routes, clastic rocks belonging to the Insuyu formation (lacustrine limestone marl, conglomerate, sandstone, claystone and volcanic intercalations) and pebble, sand, silt, limestone and carbonaceous killer belonging to the Quaternary Tuz Gölü formation, are surfacing.

The Miocene Insuyu formation (lacustrine limestone marl, conglomerate, sandstone, claystone, and volcanic intercalations) where the slope is small and the land is flat in a large part of the planned freshwater pipeline route that comes from Hirfanlı Dam, located to the north-east of the Tuz Gölü basin, clastic rocks composed of sand and pebbles; gravel, sand, silt, limestone and carbonated clay and alluviums belonging to the Quaternary Tuz Gölü formation are surfacing. The route passes over the Cretaceous Middle Anatolian Granitoids and the Paleozoic Kalkanlıdag Marbles that form ascents in the northern part of the basin.

The base of other planned auxiliary surface facilities, pump stations and water storage tanks are composed of the Miocene Pecenek formation (sand, gravel), Miocene Insuyu formation (lacustrine limestone marl, conglomerate, sandstone, claystone and volcanic intercalation) and Paleozoic Kalkanlıdag.

4.5.2. Geological-Geotechnical Properties of the Surface Facilities and the Fresh Water - Brine Discharge Line Routes

The surface facility areas (water storage tanks and pump stations as auxiliary surface facilities and the main surface facility area) planned within the scope of the Gas Storage Expansion Project and the fresh water and brine discharge lines are planned to be next to and close to the currently commissioned and already constructed surface facilities with the EIA Positive Decision and in parallel to the current lines, next to the fresh water supply and brine discharge lines. The geological-geotechnical studies were carried out to determine the geological-geotechnical and hydrogeological properties of the ground where the freshwater and brine lines pass, in addition to the surface facilities (water storage tanks, pump stations, main surface facility area) which are already available and operational.

According to this; the geological and geotechnical parameters of the grounds, on which the planned surface facilities and the fresh water and brine discharge lines are located, are stated below.

The Geological-Geotechnical Properties of the Ground of Surface Facilities

The current and planned main surface facility area is located on clastic units that belong to the Miocene period Insuyu formation (lacustrine limestone, pebblestone, sandstone, claystone and volcanic inclusion clastic units in places). In total 48 ground survey drilling and

geophysical (seismic, resistivity) works were carried out on the stated unit, with the depths of these varying between 10-20 m.

Sieve analyses, Atterberge Limit, Water Content, Specific Gravity, Uniaxial Compressive Strength, Point Loading Test, Shear Box, Consolidation and Pressuremeter tests were carried out on the disturbed (SPT), non-disturbed (UD) and core samples taken by drilling. The ground at the surface facility areas was determined as silty-clayey sand, clayey silt, gritty-sandy-silty clay and silty-sandy grit type ground according to the unified soil classification system. As the result of the land observations, pressure meter and SPT results carried out in the field in addition to the laboratory tests, the safe bearing capacity of the ground where the main surface facilities to be placed was calculated as qem = 1.60 – 2.30 kg/cm^2. No problem or risk was determined in the scope of placement, inflation and liquidization and no groundwater was found during the drilling. The main ground group for the surface facility area was determined as “C”, the local ground class as “Z2” and the ground spectrum characteristic periods as TA=0.15 sn, TB=0.40 sn.

The auxiliary surface facility areas and current auxiliary surface facilities are planned to be next to each other and the ground survey works with drilling were previously carried out for the current facilities (pump stations and water storage tanks).

In total, 350 m ground survey drilling was carried out within the scope of the auxiliary surface facility places, with the depths of these varing between 10 - 20 m. The required laboratory and field tests were carried out on the disturbed (SPT), non-disturbed (UD) and core samples taken by drilling and the safe bearing power of the ground within the scope of facility places were determined as between qem = 1.50 – 2.50 kg/cm^2.

Other than this, no problem or risk was determined in terms of placement, inflation or liquidization within the scope of the ground of the facility places. The main ground group for the auxiliary surface facility areas was determined as “B-C”, local ground class as “Z2-Z3” and ground spectrum characteristic periods as TA=0.15 sn, TB=0.40 - 0.60 sn.

Ground Geological-Geotechnical Properties of the Fresh Water Line-Brine Discharge Line

The fresh water and brine discharge lines planned within the scope of the GSEP are planned to be in parallel to the current lines next to the current fresh water and brine discharge lines. Geological-geotechnical survey studies were previously carried out to determine the geological-geotechnical and hydrogeological properties of the ground on the current fresh water and brine discharge lines.

According to this; 305 test pits were opened in total on the current fresh water and brine discharge line routes (with 250 m intervals for the mountainside and 500 m intervals for the flat bottomlands). Sieve analysis, atterberg limit, specific gravity, water content, consolidation, unit volume weight, direct shear test, triaxial compressive strength test, proctor and CBR tests were carried out on the disturbed and non-disturbed samples taken from these test pits.

Mainly gritty-silty sand, gritty-sandy-silty clay and clayey silt type grounds were determined according to the unified soil classification system within the scope of these test pits. Groundwater was seen in 57 of the opened test pits and the ground water was determined between 0,6 – 4.3 m. No liquidization risk was determined while the amount of settling within the scope of the clayey grounds according to the consolidation tests carried out on the sample obtained was determined as between 0,59 – 5.65 cm. The safe bearing power of the ground within the scope of line routes was determined as between qem = 0.46 – 4.29 kg/cm2 according to the calculations.

Moreover, the below mentioned criteria shall be taken into account in terms of the stability of caverns to be formed in scope of the GSEP:

- For safety reasons, the horizontal distances between the salt caverns shall not be less than 500 m.
- The gas formation within scope of the wells/caverns cannot be outside the salt sections. Because of the possible effects of the high-pressure gas to be stored within the salt body, the lateral distance between the cavern axes shall not be less than 600 m. Having higher distances between the caverns reduces the underground passage risks. Therefore, the minimum common distance between the cave axes is increased from 300 m to approximately 600 m.
- Caverns shall be formed at the sections, about which geological information was acquired and based on the seismic studies, where the underground topography is relatively smooth, along the vertical axis of the salt bodies.

4.5.3. Tectonic

The region is located on the Mediterranean Alpine Belt and in the central part of the Anatolian Plate. Development of the basin started from the Upper Cretaceous period and continued until today. The Eskişehir Sultanhanı fault system, which controls the western edge of the basin, the Tuz Gölü fault zone which controls the eastern edge of the basin and the Altinekin fault zone which controls the southwest of the basin and the climate changes played an important role in the development of the basin during this process. Lithologies of the units in the basin, the facies changes they show in lateral and vertical directions, the erosion-deposition surfaces and thetectonomorphological surface forms reflect the impact of climate changes and tectonism very well.

The Tuz Gölü Basin that began to form with tensional movements in the Late Cretaceous period developed under the influence of the stress regime until the Middle Eocene period. The basin remained under the influence of compressional regime as from the late Eocene period, becoming shallow and completely isolated from the open sea. A broad plateau (Anadolu peneplains) was formed in Central Anatolia in the Early-Middle Miocene period, following the uplift and erosion in the Late Eocene-Oligoscene period. The erosional and depositional surfaces formed during the Miocene-Early Pleistocene period in Central Anatolia reflect the impact of the climate and tectonism on morphology. The NW-SE direction fault-

controlled basins began to develop on a large plateau formed in the Late Miocene period after the Tuz Gölü fault zone, the Eskişehir Sultanhanı fault system and other fault zones in parallel with them gained activity. While the Tuz Gölü Basin continued its development, the new accumulation basins were developing on the basins such as Peçenek, Muratlı, Günyüzü which lost their edge faults activity between the Early Pliocene and the Late Pliocene periods. The Early Pleistocene period and younger lake shorelines that can be observed today, provide evidence for the control of the development of Tuz Gölü by tectonism also during this period.

Earthquake epicenters which are currently recorded and have reached up to a magnitude of 6 prove that the fault systems which control the development of Tuz Gölü are active today. The Tuz Gölü Basin and its surroundings are controlled by three major fault zones. The first of them is the Tuz Gölü fault zone that controls the eastern margin of Tuz Gölü. The second one is the Eskişehir Sultanhanı fault system consisting of Yeniceoba and Cihanbeyli fault zones in the west and the third one is the Altinekin fault zone in the south-west of the basin.

Tuz Gölü Fault Zone

NW-SE direction fault zone controls the west of the Tuz Gölü Basin. It has a length of about 190-200 km and a width of 5-25 km and starts in the north of the Tuz Gölü fault zone and continues until the SW of Niğde. It presents half-graben or graben morphology in steps and it consists of parallel or semi-parallel faults.

Eskişehir-Sultanhanı Fault Zone

This structure which is named as the Eskişehir-Sultanhanı Fault zone since it consists of several fault zones, is observed tothe south of the Tuz Gölü from the Sultanhanı vicinity. It extends in the NW direction to the Cihanbeyli-Günyüzü and possibly merges with the Eskişehir fault zone. This fault system consists of the Ilica, Yeniceoba and Cihanbeyli fault zones from the north to the south.

Both NW-SE direction fault zones consist of right-lateral strike slip faults with high-angle normal fault components that are parallel or semi-parallel to each other. Older units including the units of the base along the fault zone are side by side with the Miocene-Pliocene aged sediments.

Altınekin Fault Zone

This NE-SW direction fault, which is younger than all the other faults in this fault zone, cuts across the NW-SE direction faults. It cuts these fault zones that start by controlling the western edge of the Konya plain and extends to and past Kulu to the north. The Altinekin plain has developed as graben in this fault zone.

The major faults in the vicinity of the project area are presented below together with the base and cover rocks in Figure 4.5.3.1.

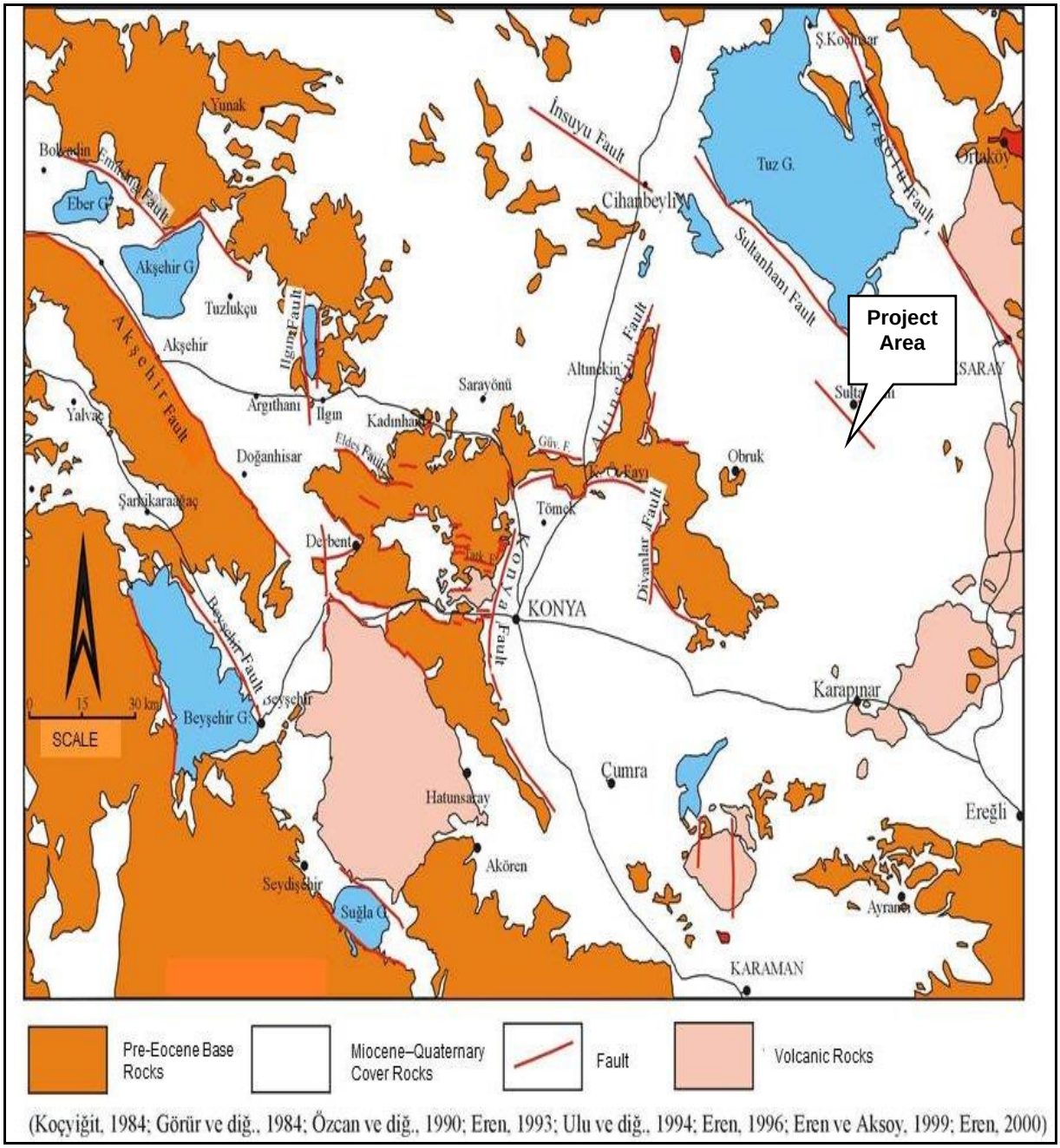


Figure 4.5.3.1. The Major Faults In The Vicinity of Project Area
Source: *Eren, Y., 2000, Selçuk University Engineering Faculty Geological Engineering Department, Konya*

The earthquakes occurred between 1900-2017 within a radius of 100 km around the project area having magnitudes ≥ 4 are given below together with their frequencies (Table 4.5.3.1.).

Table 4.5.3.1. Earthquakes Occurred M≥4 within the Vicinity of Project Area (1900-2017)

Date	Origin Time	Latitude	Longitude	Depth (km)	Magnitude	Location
11.09.2009	01:58:29.89	37,9427	32,4960	6,7	4,8	Selcuklu (Konya) [North 6.1 Km]
10.09.2009	18:29:52.06	37,9422	32,5197	2	4,7	Selcuklu (Konya) [North East 6.4 Km]
13.12.2007	18:06:18.70	38,8300	33,0500	5	4,8	Acikuyu-Kulu (Konya) [East 5.2 Km]
18.05.2007	23:27:44.78	37,3147	33,2805	6	4,5	Hamidiye- (Karaman) [South East 3.6 Km]
07.03.2002	06:12:39.00	38,2300	33,9900	10	4,1	Taspinar- (Aksaray) [North West 6.9 Km]
26.09.2001	12:36:55.40	37,8200	33,5800	10	4	Karapinar (Konya) [North East 12.0 Km]
20.06.2001	08:16:39.30	37,9300	34,0900	10	4	Obruk-Bor (Nigde) [South East 10.3 Km]
11.03.2001	19:21:45.60	38,5300	33,7600	4	4,1	Ulukisla- (Aksaray) [North 3.2 Km]
13.12.1998	08:14:40.30	37,7300	34,2700	1	4	Acikuyu-Eregli (Konya) [North West 1.8 Km]
01.10.1998	17:02:38.20	38,0200	34,3900	3	4	Yesilyurt-Altunhisar (Nigde) [North 1.1 Km]
17.11.1985	00:16:12.00	37,6000	33,3000	10	4,2	Hasanoba-Karapinar (Konya) [North East 2.1 Km]
24.02.1978	02:51:26.90	37,8400	32,6600	41	4,4	Abditolu-Cumra (Konya) [North West 13.7 Km]
27.04.1973	00:31:03.00	38,6500	32,9200	29	4,9	Cihanbeyli (Konya) [South West 0.8 Km]
04.08.1972	05:30:01.20	37,7900	32,7400	41	4,4	Abditolu-Cumra (Konya) [North 5.7 Km]
03.08.1972	21:39:25.60	37,8500	32,8100	34	4,8	Bakirtolu-Karatay (Konya) [North 6.3 Km]
03.08.1972	02:04:26.50	37,7600	32,7200	44	4,3	Abditolu-Cumra (Konya) [North West 3.6 Km]
13.12.1924	18:53:30.00	38,0000	33,5000	30	5,2	Basaran-Eskil (Aksaray) [South West 3.8 Km]
16.01.1921	23:55:55.80	38,3300	32,7900	10	5,8	Akkoy-Altinekin (Konya) [South West 2.4 Km]
16.01.1918	16:32:06.00	38,8000	32,9000	10	5,5	Damlakuyu-Cihanbeyli (Konya) [North West 4.7 Km]

Source: *Boğaziçi University Kandilli Observatory and Earthquake Research Institute, Regional Earthquake-Tsunami Monitoring Center*

The frequency of above listed earthquakes is given below in Table 4.5.3.2.

Table 4.3.3.2. Earthquake Frequencies M≥4 (1900-2017)

Earthquake.Magnitude Range	Frequency
4 ≤ M < 4.5	10
4.5 ≤ M < 5	6
5 ≤ M < 5.5	1
5.5 ≤ M < 6	2

4.6. Seismicity

The seismic data originates from the seismic studies performed by Turkish Petroleum (TP) at the site between October – November 2000. These data were reprocessed and interpreted by TP in September 2017 and the "Tuz Gölü 3D Seismic Processing and Interpretation Report" was submitted to BOTAŞ.

Based on the results of the seismic survey (including new reprocessing and interpretation) and the thirteen already drilled storage wells UGS-1[4] to UGS-12, the integrity of the salt body in the Tuz Gölü area is proven. However, some geological risks have been identified during the exploration phase, which are remaining after the execution of the UGS Project. Those two possible geological risks have been identified for the construction of the subsurface facilities of the GSEP:

- Deviation in salt depth / position and planned drilling depth: It is always possible that the salt depth and hence the real well depths might deviate from the planned well depths based on the results from the seismic investigation and the already drilled wells.
- CO_2 encounter during drilling and leaching: During exploration drilling and in 4 existing storage wells, it was shown that the salt body in Tuz Gölü area, as well as overburden and cap rock, partly contains CO2 accumulations in not entirely determined distributions and quantities. Gas-filled micro-cracks, which are to be assumed to be developed throughout parts of the salt body, can influence the process of cavern construction with time. The gas accumulations do not only contain pure CO_2, but may also contain hydrocarbons and H2S is not to exclude.

The insoluble content (mainly anhydrite and some clay) in the 13 existing cavern wells, was determined to be in the amount of 10 % (maximum up to 30 %) and is disperse distributed as grains and chunks, but no concrete and consistent layers are observed. No fast leaching salt varieties are observed either. The salt quality in the existing caverns is good-natured for leaching and therefore the shape of the existing caverns is very evenly.

[4] The original well, UGS-1 was drilled and abandoned by TP in year 2001, it has CO2 history and communication to surface as well. 20" casing with shoe at 704 m had two cement plugs, 8 ½" open hole has 5 more cement plugs. During UGS Project drilling Works, on 24 January 2014, first plug was drilled out between 128 and 208 m. Attempt to pressure test 20" K-55 casing against second cement plug at 540 m resulted in damaging casing with 1.29 SG mud at 6 MPa pressure. Consewuently, it was decided not to utilise this well for the UGS Project. Well was abandoned by two new cement plugs, at 520-320 and 320-100 m. Replacement well UGS-1A was drilled in August 2015.

During drilling the salt section in the well UGS-1, UGS-1A, UGS-3 and UGS-12, gas kick's and inflows occurred. The chemical analysis indicates predominately CO_2 with a differing amount of N_2 and hydrocarbons, as CH_4. It could not be excluded that the amount of hydrocarbons reaches the ignition limit, which has to be considered for the definition of explosion protection zones. Since H_2S cannot be excluded either, it has to be considered for measuring capability and HSE restrictions. It is assumed that this gas is trapped in small micro-cracks within the salt section and was generated during the volcanic activities of youngest Tertiary age.

The data from the UGS Project exhibits the regional distributed occurrence of trapped gas in the Tuz Gölü Basin and the geological risk to come across of gas in the wells. Since the storage wells of the previous UGS project, with gas accumulations, are widely spread (UGS-12 in NE, UGS-1 and UGS-1A in NW, UGS-3 in SE), no distribution pattern can be evaluated. Therefore also for the planned new cavern wells the occurrence of gas within the salt section can never be excluded. There is no chance to predict, if a drilling location could discover trapped gas and therefore could be risky or not.

4.7 Surface Water Quality

4.7.1 Hydrology

While the new drilling areas, surface facility area, some auxiliary surface facilities (water storage tanks), brine discharge line, natural gas branchman line and a large part of the fresh water line planned within the scope of Gas Storage Expansion Project are within the Konya Closed Basin, which is reserved throughout Turkey, a small part of the fresh water line and some planned auxiliary surface facilities (pump stations, water storage tank) remain within the Kızılırmak basin.

There is no significant surface water other than the dried stream bed with few seasonal flows in the region where the surface facility area and new drilling areas, which are planned in the scope of the Gas Storage Expansion Project, are located. There is no important surface water other than the dried stream bed with few seasonal flows along the planned brine discharge line and the natural gas branchman line, while the brine discharge line passes through areas which may turn into swamps depending on the rain as it gets closer to Tuz Gölü. The planned fresh water line route moves on a very smooth area until the Ankara-Aksaray road, and in this area it is cut by drying canals and swamp areas depending on the rains from place to place. The fresh water route planned towards northeast after passing the main road (Ankara-Aksaray), cuts the stream bed with many seasonal flows while passing through the mountainous and hilly areas that constitute the east section of the basin. Peçenek stream (Bostanlık S.) towards the northeast, Camızlıközü stream, Çırçıl stream, Karasakal stream, Karacaören stream, Kocabağ stream, Çelikgöl stream, Kocaöz stream, Derin stream and Küçükhortu stream can be counted as the important surface waters passing along the fresh water line route along this mountainous area.

All surface waters in the Tuz Gölü basin, which shows closed basin properties, are discharged into Tuz Gölü. Peçeneközü stream mainly drains the mountainous section at the east side of the basin where the planned fresh water line passes, and feeds Tuz Gölü. The most important surface waters around the project area are Tuz Gölü and Hirfanlı Dam. The planned brine discharge line reaches the south side of Tuz Gölü and has approximately 45km of distance to the Gas Storage Expansion Project and surface facility areas. Hirfanlı dam is going to provide water for dissolving processes and is located approximately 115 km to the northeast of the new drilling areas and surface facility areas. The technical properties of Hirfanlı Dam are given in Table 4.7.1.1.

Table 4.7.1.1. Hirfanlı Dam Technical Properties

Dam Name	Hirfanlı
Location	Kırşehir
Stream	Kızılırmak
Purpose	Energy-Flood Protection
Construction year (beginning-completion)	1953-1959
Body filling type	Rock
Body Volume	2,000 dam^3
Height (from thalweg)	78 m
Lake Volume at normal water elevation	5,980 hm^3
Lake Area at normal water elevation	263 km^2

Source: www2.dsi.gov.tr/baraj

Tuz Gölü: Tuz Gölü is the second biggest lake of Turkey, after Van Lake. It is located within the provincial borders of Aksaray, Ankara and Konya. Its rain area is 11.900 km² and it is a closed basin lake without any flow to the outside. Despite of the wideness of its rain area, its feeding resources are poor. The streams that bring water to the lake are streams, of which waters significantly reduce or completely dry during summer periods. Despite its size, it is one of the shallowest lakes in Turkey and its depth does not exceed 0.5 m in many places. The lake's average water level is around 40 cm and approximately 110 cm during the month of May when the rain increases. The lake becomes dry in August, to a great extent. As the salt rate is high, annually renewed 10-30 cm of salt sedimentation occurs within a large part of the lake area, as the result of evaporation. The lake area reaches 164.200 hectares during the spring months, when the water is plentiful. A significant part of the lake becomes dry towards the end of the summer months. The lake is fed by rain, groundwater and surface flow. İnsuyu stream, Peçeneközü stream and Uluırmak streamlet (Melendiz) are the streams that feed Tuz Gölü. Other than those, an unnatural continuous water entry is made by the wastewaters carried by the Konya main Evacuation Canal which is 150 km long. Slight salt swamps are formed where the canals and streamlets enter the lake.

Current water usage status, planned and current irrigation facilities within the scope of the project area and surroundings are given in Figure 4.7.1.2.

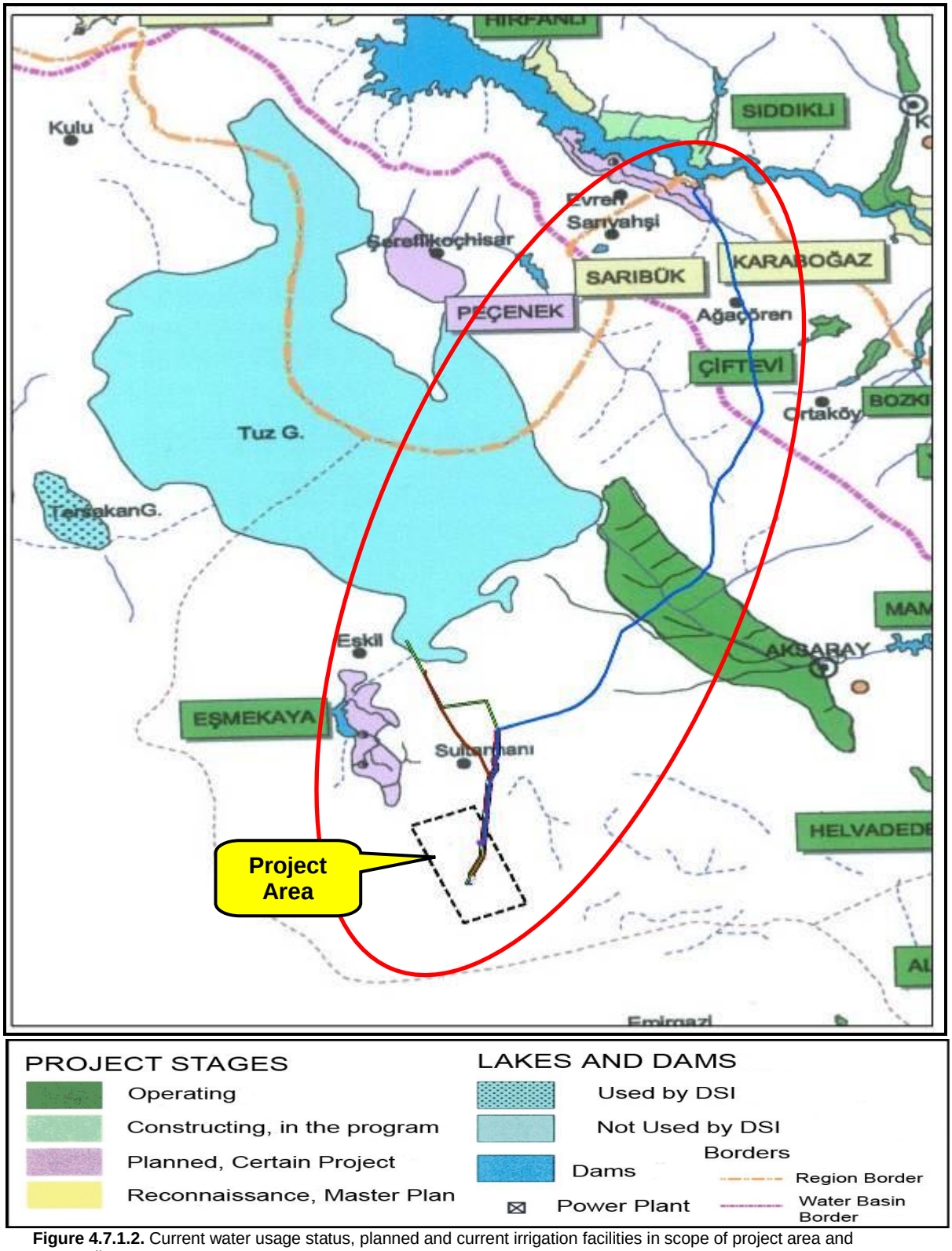


Figure 4.7.1.2. Current water usage status, planned and current irrigation facilities in scope of project area and surroundings
Source: DSİ, 2006

The fresh water line route planned within the scope of the project intersects with the Aksaray Mamasın Dam Irrigation Project (in project stage) and the irrigation canals and drainage canals of the groundwater Project and the related maintenance ways. No damage shall be done to the mentioned project structural elements and maintenance corridors during construction, and suitable engineering structures shall be constructed at the intersection points to pass. These engineering structures shall have their dimensions and designs prepared in such a way as not to disrupt the integrity of irrigation according to the DSİ (general directorate of state hydraulic works) criteria. The projects regarding the engineering structures shall be submitted to the DSİ 4th Regional Directorate for approval and a protocol shall be entered into. If the activity affects the DSİ structures negatively during the construction works, all kinds of damages and losses shall be paid by the owner of the related activity.

4.7.2. Baseline Measurements and Analysis

Surface water samples have been collected by Çınar Environmental Laboratory staff who have Water and Waste Water Sampling Competency Certificate given by The Ministry of Environment and Urbanization Environmental Management General Directorate.

1. pH, electrical conductivity, temperature and dissolved oxygen of the samples will be measured on site with an instrument HACH Lange HQ40D or similar. The equipment is a portable multi-parameter instrument measuring the above stated parameters by electrochemical method. Prior to performing the measurements the equipment is calibrated and calibration is recorded in the equipment's logbook.

2. For microbiology analysis, TS EN ISO 19458 "Sampling for Microbiologic Analysis" will be used. The maximum holding time for both Total Coliform Bacteria samples and BOD5 is twenty four hours. For this reason, samples will be transferred to Çınar Environmental Laboratory in Ankara and analysed within this holding time.

3. Water sampling from rivers, streams and river crossings will be conducted according to TS ISO 5667-6 "Guidance on Sampling of rivers and streams." Samples will be stored, transported to the laboratory according to the TS ISO 5667-3 "Guidance on the preservation and handling of water samples". The samples are taken with appropriate protective measures for the analyses to be performed. They will be stored and transported to the laboratory in freezers between 1 oC and 5 oC.

4. They will be labeled according to name of sample point. After they arrive to laboratory, sample code will be given each sample to identify.

5. Properly filled labels shall be affixed to the outer surfaces of corresponding sample bottles. The information on the label shall be written with a permanent marker.

6. Sample vessels suitable to the analyses are selected. In order to reduce the smudging of the samples because of the vessels or the lids used to minimum,

generally plastic sample vessels are used for inorganic material analyses whereas glass sample vessels are used for organic materials and heavy metals. The vessels used are resistant to high and low temperatures, don't break easily, are easy to seal and open, do not react to the content of the sample and are for single use only.

7. For the samples whose physical-chemical parameters are going to be determined, the vessel is filled with the sample and sealed in a way that no air gap is left on the top. This precaution reduces shaking while being carried to minimum and decreases the reaction with the gas phase.

8. All sample bottles will be placed in iceboxes in order to provide the necessary cooling as well as the protection from external damage that may occur during shipment.

9. The samples will be brought to the steady state by the addition of the chemicals suitable to their parameters which will be analysed and are put in dark refrigerators at a temperature of 1-5ºC. The samples will be taken to the laboratory as soon as possible. Some of the parameters (pH, DO, conductivity etc.) will be measured while the samples are being taken. The devices and apparatus used during the taking of the samples are always hygienic and ready to be used. The reactive used for preservation are always fresh and clean.

10. The samples are preserved so that there are no losses during the carriage and their impermeability is obtained in such a way that that their situation won't get worse.

11. The samples that reach the laboratory are permanently labelled in a clear way which leaves no room for doubt. Depending on the types of the desired parameters, the labelled samples are analysed by our laboratory staff using standard methods.

12. The correctness of our experiment is checked using certified reference material for every sample in the analyses made and the results are recorded in our analysis records log.

The results of the measurements will be evaluated according to relevant Project standards are based on the Turkish Environmental regulations detailed below:

- Water Pollution Control Regulation (Official Gazette Date/Number: 31.12.2004/25687; last amended on 10.01.2016)
- Regulation on Control of Pollution Caused by Hazardous Substances in Aquatic Environment (Official Gazette Date/Number: 26.11.2005/26005; last amended on 30.03.2010)
- Surface Water Quality Management Regulation (SWMR) (Official Gazette Date/Number: 30/11/2012/28483; last amended on 10.08.2016).
- Regulation on Monitoring of Surface water and Groundwater (Official Gazette Date/Number: 11/02/2014/28910)

The results will be classified based on Surface Water Quality Management Regulation (SWMR) in four classes: 1) Class I: High quality water, 2) Class II: Less polluted water, 3) Class III: Polluted water and 4) Class IV: Highly polluted water.

- Class I: surface water courses (i) with high drinking water potential, (ii) that can be used for recreational purposes and swimming, (iii) that can be used for trout production and (iv) that can be used for animal breeding and farming.
- Class II: surface water courses (i) with drinking water potential, (ii) that can be used for recreational purposes, (iii) that can be used for fish production other than trout and (iv) that can be used for irrigation purposes provided that necessary quality requirements are met.
- Class III: water and industrial water (other than food or textile industry) that can be used in fisheries after appropriate treatment
- Class IV: surface water courses with lower quality than the Class III water courses and can become higher quality with improvement measures.

At least two monitoring sites will be installed at each of the main watercourses that will monitor water quality of surface water bodies:

- A baseline station, located outside the construction area of influence,
- A monitoring station, located downstream of the impact source.

Sampling will be carried out once pre-construction, quarterly during construction, one approximately one month after completion.

Surface Water Monitoring Parameters

The parameters of monitoring samples are tabled below (Table 4.7.2.1.):

Table 4.7.2 .1. The parameters of monitoring samples for Surface Water

	Parameter	Analysis Method
Hydrological parameters (streams):	Water Flow Rate	EPA 841-B-97-003
	Speed of the current	EPA 841-B-97-003
Parameters (Watering Hole)	Areal extent of standing water bodies	
General Parameters	Temperature	SM 2550 B
	Colour	TS EN ISO 7887 SM 2120 C
	Conductivity	TS 9748 EN 27888
	Suspended solids	SM 2540
	pH	SM 4500 H^+
	Turbidity	TS 5091 EN ISO 7027
	TPH	TS EN 14039
Oxygenating Parameters	Dissolved Oxygen, oxygen saturation	TS EN ISO 5814 ASTM D 888-05
	Chemical oxygen demand (COD)	SM 5220 B
	Biochemical oxygen demand (BOD)	SM 5210 B
	Dissolved Oxygen	TS EN ISO 5814 ASTM D 888-05
Nutrient Parameters	Ammonia as N	SM 4500-NH3 B SM 4500-NH3 C
	Nitrite as N	SM 4500-NO_2 B
	Nitrate as N	EPA 352.1
	Total Kjeldahl Nitrogen as N	SM 4500 N_{org} B
	Total Phoshorus (P)	SM 4500 P B SM 4500 P E
Trace Elements (Metals)	Mercury (Hg)	SM 4110B
	Cadmium (Cd)	SM 4110B
	Lead (Pb)	SM 4110B
	Copper (Cu)	SM 4110B
	Nickel (Ni)	SM 4110B
	Zinc (Zn)	SM 4110B
Fractionated TPH (Total Petroleum Hydrocarbon)		TS EN 14039
Bacteriological Parameters	Fecal Coliform	SM 9222 D
	Total Coliform	TS EN IS9308-1

4.7.2.1. Hirfanlı Dam

Underground Gas Storage Project (UGS Project) / 3rd party Monitoring Studies

In the scope of the 3rd party monitoring studies of UGS Project, impacts to the receiving areas on and around the project sites are determined with the conducted analyses sampled from Hirfanlı Dam water at the PS1 water intake site, groundwater at the UGS sites, brines at the diffuser and spread areas of Tuz Gölü, on a monthly basis and analysis reports are regularly submitted to BOTAŞ within the monthly reports together with the explanations.

Firstly, surface water samples have been taken from the spherical coordinates; 0575407-East, 4321517-North of Hirfanlı Dam Reservoir at the water intake structure of PS1 site to determine the impacts of the water taken for operation from the dam water. In the scope of the Hirfanlı Dam water quality monitoring studies, depending on the drinking water quality of

the water supply, the water from Hirfanlı Dam has been analyzed and found to contain the following parameters: Dissolved Oxygen (DO), Oxygen Saturation, pH, Electrical Conductivity (EC), Turbidity, Fecal Coliform, Total Coliform, Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), Nitrite Nitrogen, Nitrate Nitrogen, Ammonium Nitrogen, Zinc, Nickel, Cadmium, Lead, T. Phosphorus, Mercury, Kjeldahl Nitrogen, Suspended Solids (SS) and Color. The late analysis results are summarized in Table 4.7.2.1.1. and Table 4.7.2.1.2. below.

Table 4.7.2.1.1. Surface Water Quality Monitoring Results at Hirfanlı Dam for January 2017

Parameters	PS1 Station Site / Water İntake Structure	Water Quality Class
	2017 January Analysis Results	
Dissolved Oxygen (mg/L)	13.17	I
Oxygen Saturation (%)	107.5	-
pH	8.73	I
Temperature	3.30	-
Electrical Conductivity (µS/cm)	1718	III
Turbidity (NTU)	0.244	-
Fecal Coliform (KOB/100 mL)	No Growth	-
Total Coliform (KOB/100 mL)	50	-
COD (mg/L)	24.0	I
BOD (mg/L)	5.90	II
Nitrite Nitrogen (mg/L)	0.027	-
Nitrate Nitrogen (mg/L)	0.573	I
Ammonium Nitrogen (mg/L)	<0.05	I
Zinc (mg/L)	<0.005	-
Nickel (mg/L)	<0.005	-
Cadmium (mg/L)	<0.0005	-
Lead (mg/L)	<0.0005	-
T. Phosphorus (mg/L)	0.022	I
Mercury (mg/L)	<0.0001	-
Kjeldahl Nitrogen (mg/L)	0.426	I
Suspended Solids (mg/L)	<10.0	-
Color (RES (m^{-1})) (436 nm)	<0.1	I
Color (RES (m^{-1})) (525 nm)	<0.1	I
Color (RES (m^{-1})) (620 nm)	<0.1	I

Table 4.7.2.1.2. Hirfanlı Dam Surface Water Analysis Results at PS1 Site (2014 - 2016)

Parameters	May 29, 2014	June 25, 2014	July 18, 2014	August 18, 2014	January 20, 2015	May 30, 2015	September 30, 2015	January 15, 2016	July 14, 2016
Dissolved Oxygen (mg/L)	8.44	6.82	6.78	6.66	10.6	6.37	5.82	8.9	8.08
Oxygen Saturation (%)	114.8	96.3	102.2	100	98.8	79.3	76.8	94	106.6
pH	8.26	8.15	9.3	7.98	7.25	7.62	8.79	8.63	8.55
Temperature	24.1	25.7	28.5	28.2	6.1	20.7	23.6	6.7	24.7
Electrical Conductivity (µS/cm)	1,175	1,212	1,199	1,180	1,198	1,144	1.862	1,455	1,504
Turbidity (NTU)	***	1.01	3.85	1.89	1.49	0.9	0.947	1.07	2.86
Fecal Coliform (KOB/100 mL)	No Growth	No Growth	No Growth	No Growth	15	No Growth	No Growth	No Growth	No Growth
Total Coliform (KOB/100 mL)	150	1,000	2,500	750	100	1,000	250	700	No Growth
COD (mg/L)	10.4	12.5	16.4	30.2	24.2	14.8	21.4	11.9	12.3
BOD (mg/L)	< 4.0	< 4.0	< 4.0	5.2	7	<4.0	5.2	<4.0	<4.0
Nitrite Nitrogen (mg/L)	<0.002	<0.002	<0.002	<0.002	0.014	0.04	<0.002	0.015	<0.002
Nitrate Nitrogen (mg/L)	<0.1	<0.1	<0.1	<0.1	0.194	0.28	<0.1	0.433	0.142
Ammonium Nitrogen (mg/L)	<0.1	<0.1	0.25	<0.1	<0.1	<0.1	0.22	<0.1	<0.05
Zinc (mg/L)	0.03	0.0105	<0.005	0.024	<0.005	0.0168	0.0071	0.006	0.017
Nickel (mg/L)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0559	<0.005	<0.005
Cadmium (mg/L)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Lead (mg/L)	0.00056	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
T. Phosphorus (mg/L)	0.039	0.021	0.011	0.0255	0.024	0.0065	0.019	0.0098	0.028
Mercury (mg/L)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.016	<0.0001	<0.0001
Kjeldal Nitrogen (mg/L)	21.6	1.68	1.66	0.88	21.3	0.7	1.28	0.224	1.16
Suspended Solids (mg/L)	<10.0	<10.0	<10.0	10.6	<10.0	<10.0	16	<10.0	<10.0
Color (RES (m-1)) (436 nm)	0.3	0.4	1.1	1.2	0.3	0.3	<0.1	<0.1	<0.1
Color (RES (m-1)) (525 nm)	0.1	0.1	0.8	0.8	0.2	0.2	<0.1	<0.1	<0.1
Color (RES (m-1)) (620 nm)	<0.1	0.1	0.6	0.6	0.1	0.1	<0.1	<0.1	<0.1

The results of the measurements were evaluated according to Table 2 of Annex-5 in the current Regulation on Surface Water Quality Management (RSWQM). The objective of the regulation is to determine and classify the biological, chemical, physical-chemical and hydro morphologic qualities, to monitor water quality and amount, to put forth the intended use of these waters, by considering the protection-use equilibrium, in accordance with sustainable development goals, to protect waters and to determine the procedures and principles for measures to be taken to achieve good quality status. The quality criteria according to inland surface water sources water quality parameters are given in Table 4.7.2.1.3. below.

Table 4.7.2.1.3. Quality Criteria According to Inland Surface Water Sources Water Quality Parameters

Water Quality Classes				
	I	**II**	**III**	**IV**
General Conditions				
Temperature (°C)	≤ 25	≤ 25	≤ 30	> 30
pH	6.5-8.5	6.5-8.5	6.0-9.0	Above 6.0-9.0
Conductivity (µS/cm)	< 400	400-1000	1001-3000	> 3000
Color	436 nm: 1.5 525 nm: 1.2 620 nm: 0.8	436 nm: 3 525 nm: 2.4 620 nm: 1.7	436 nm: 4.3 525 nm: 3.7 620 nm: 2.5	436 nm: 5 525 nm: 4.2 620 nm: 2.8
(A)* Oxygenation *Parameters				
Dissolved Oxygen (mg O2/L)a	> 8	6-8	3-6	< 3
Oxygen Saturation (%)a	90	70-90	40-70	< 40
Chemical oxygen demand (COD) (mg/L)	< 25	25-50	50-70	> 70
Biological oxygen demand (BOD5) (mg/L)	< 4	4-8	8-20	> 20
B) Nutrient Parameters				
Ammonium Nitrogen (mg NH4+-N/L)	< 0.2b	0.2-1b	1-2b	> 2
Nitrite Nitrogen (mg $NO2^{-}$-N/L)	< 0.002	0.002-0.01	0.01-0.05	> 0.05
Nitrate Nitrogen (mg $NO3^{-}$-N/L)	< 5	5-10	10-20	> 20
Kjeldahl Nitrogen (mg/L)	0.5	1.5	5	> 5
Total Phosphorous (mg P/L)	< 0.03	0.03-0.16	0.16-0.65	> 0.65
C) Trace Elements (Metals)				
Mercury (µg Hg/L)	< 0.1	0.1-0.5	0.5-2	> 2
Cadmium (µg Cd/L)	≤ 2	2-5	5-7	> 7
Lead (µg Pb/L)	≤10	10-20	20-50	> 50
Copper (µg Cu/L)	≤20	20-50	50-200	> 200
Nickel (µg Ni/L)	≤20	20-50	50-200	> 200
Zinc (µg Zn/L)	≤200	200-500	500-2000	> 2000
D) Bacteriological Parameters				
Fecal Coliform (CPU/100 mL)	≤10	10-200	200-2000	> 2000
Total Coliform (CPU/100 mL)	≤100	100-20000	20000-100000	> 100000

Intended uses of water according to quality classes:

Class I – High quality water;

1. Surface waters with high potential of use as drinking water,
2. Water intended to be used for recreational activities including the contact with human body like swimming,
3. Water for trout production,
4. Water for livestock raising and farming requirements,

Class II – Slightly polluted water;

1. Surface waters with potential of use as drinking water,
2. Water intended to be used for recreational activities
3. Water for fish farming except for trout,
4. Irrigation water provided that the quality criteria defined by the regulation are met.

Class III – Polluted water;
Can be used for industrial water supply with a proper treatment except for food, textile etc. industries that require high quality water

Class IV – Very polluted water;
Surface water with lower quality than given for Class III and can be improved to upper quality class only after refinement.

The water intake operation at the PS1 site may be a causeof the sedimentation and wastewater leak problems defined as the hazardous impacts into the dam water and as seen in the analysis table; physical, chemical and microbiological parameters are monitored together with heavy metal parameters such as Zinc, Nickel, Cadmium, Lead, Mercury, etc., for the probable impacts of the project activities. All analyses since the year 2014 have been given above - from the start of the first leaching operation to the end of the year 2016, at the Tuz Gölü Project. However, during the studies, probable pollutant indicator parameters such as microbiological parameters BOD, COD, Total Coliform and heavy metals Zinc, Nickel, Mercury, Cadmium, Lead have been checked with the graph shown for all analyses conducted from the first leaching operation of the project between the years 2014 – 2016.

As seen in the graphics below; the BOD (Biochemical Oxygen Demand) and COD values in the surface water sample are continuously between the Class I (High-Quality Water) and Class II (Less Contaminated Water) classifications of the current Surface Water Quality Regulation (BOD: <4 – 8< mg/l, COD: <25 – 50< mg/l) during the leaching operation at the project. The determined values have been most probably sourced from the eutrophication formation in the dam water and these values shown to us there do not contain any biological pollutants from the project activities at the PS1 site (Figure 4.7.2.1.1.).

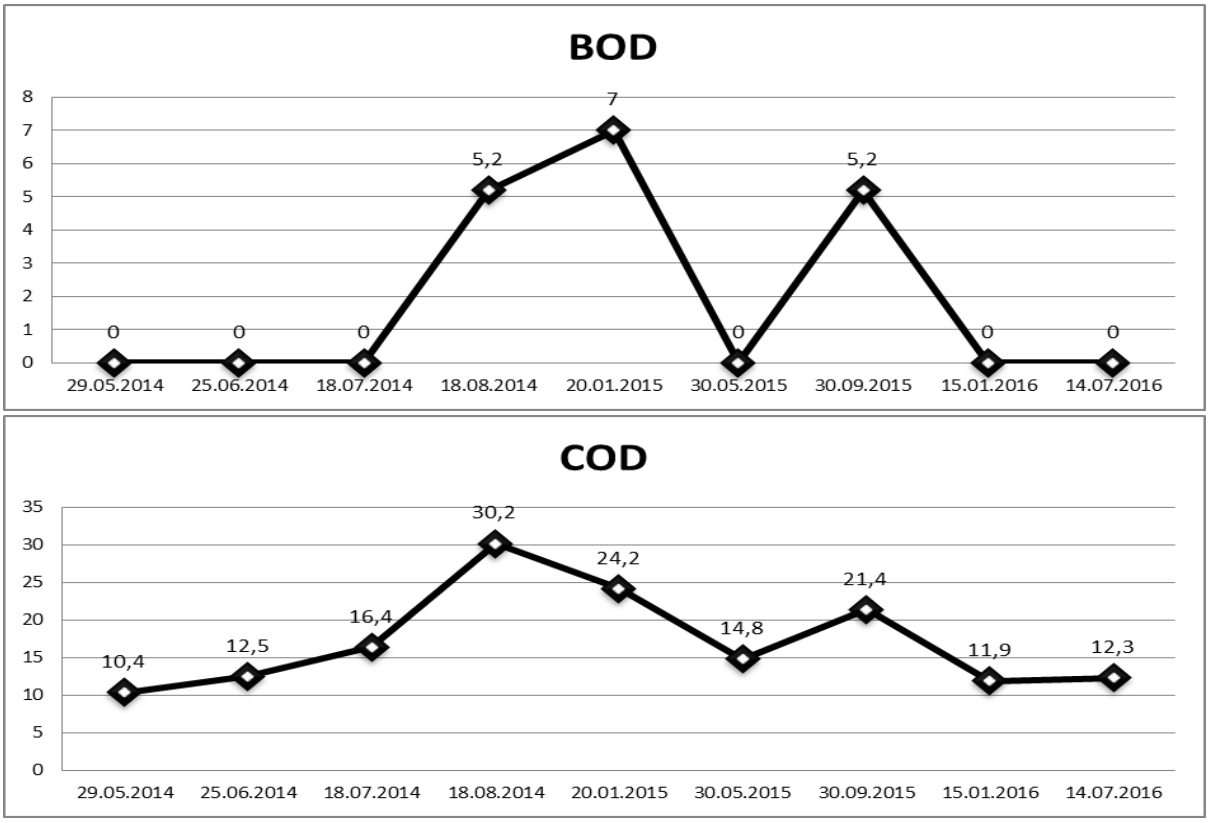


Figure 4.7.2.1.1. Graphics of the BOD and COD Values Measured in Hirfanlı Dam Water at PS1 Site

In addition to the monitoring of microbiological pollutants in the surface waters at the PS1 site, the total coliform values are continuously monitored during the water intake operation in the project. The total coliform values are not a part of the classification of the surface waters according to the relevant regulations but this parameter should be followed in samples in order to check the coliform bacterium formations in the surface waters. As seen in the graph below, the total coliform bacterium value has been increased up to 1,000 KOB/100 ml (KOB: CFU; Colony Forming Unit) only one time most probably due to the eutrophication formation on the surface water layer in July 2014 (Figure 4.7.2.1.2.)

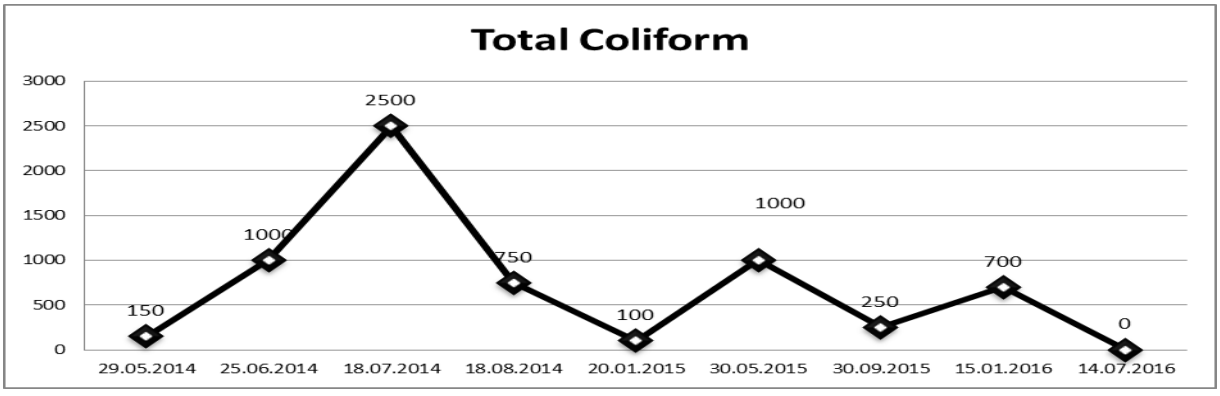


Figure 4.7.2.1.2. Graphics of Total Coliform Value Measured in Hirfanlı Dam Water at PS1 Site

Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy lays down a strategy against pollution of water and requires further specific measures for pollution control and environmental quality standards (EQS). Directive 2008/105/EC of the European Parliament and of the Council of This Directive lays down EQS in accordance with the provisions and objectives of Directive 2000/60/EC. Annex-1 EQS for Priority Substances and Certain Other Pollutants, Part A lays down the EQS for surface water. The limit values for the parameters related with the baseline studies of the project are given in Table 4.7.2.1.4.

Table 4.7.2.1.4. Environmental Quality Standards (EQS)

Name of substance	CAS Number (1)	AA-EQS (2) Inland Surface Waters (3)	AA-EQS (2) Other Surface Waters	MAC-EQS (4) Inland Surface Waters (3)	MAC-EQS (4) Other Surface Waters
Mercury and its compounds	7439-97-6	0,05 (9)	0,05 (9)	0,07	0,07
Cadmium and its compounds (depending on water hardness classes) (6)	7440-43-9	≤ 0,08 (Class 1) 0,08 (Class 2) 0,09 (Class 3) 0,15 (Class 4) 0,25 (Class 5)	0,2	≤ 0,45 (Class 1) 0,45 (Class 2) 0,6 (Class 3) 0,9 (Class 4) 1,5 (Class 5)	≤ 0,45 (Class 1) 0,45 (Class 2) 0,6 (Class 3) 0,9 (Class 4) 1,5 (Class 5)
Lead and its compounds	7439-92-1	7,2	7,2	not applicable	not applicable
Nickel and its compounds	7440-02-0	20	20	not applicable	not applicable

AA: annual average
MAC: maximum allowable concentration
Unit: [µg/l]

1. *CAS: Chemical Abstracts Service.*
2. *This parameter is the EQS expressed as an annual average value (AA-EQS). Unless otherwise specified, it applies to the total concentration of all isomers.*
3. *Inland surface waters encompass rivers and lakes and related artificial or heavily modified water bodies.*
4. *This parameter is the EQS expressed as a maximum allowable concentration (MAC-EQS). Where the MAC-EQS are marked as 'not applicable', the AA-EQS values are considered protective against short-term pollution peaks in continuous discharges since they are significantly lower than the values derived on the basis of acute toxicity.*
5. *For the group of priority substances covered by brominated diphenylethers (No 5) listed in Decision No 2455/2001/EC, an EQS is established only for congener numbers 28, 47, 99, 100, 153 and 154.*
6. *For cadmium and its compounds (No 6) the EQS values vary depending on the hardness of the water as specified in five class categories (Class 1: < 40 mg CaCO3/l, Class 2: 40 to < 50 mg CaCO3 /l, Class 3: 50 to < 100 mg CaCO3/l, Class 4: 100 to < 200 mg CaCO3 /l and Class 5: ≥ 200 mg CaCO3/l).*
7. *This substance is not a priority substance but one of the other pollutants for which the EQS are identical to those laid down in the legislation that applied prior to 13 January 2009.*
8. *DDT total comprises the sum of the isomers 1,1,1-trichloro-2,2 bis (p-chlorophenyl) ethane (CAS number 50-29-3; EU number 200-024-3); 1,1,1-trichloro-2 (o-chlorophenyl)-2-(p-chlorophenyl) ethane (CAS number 789-02-6; EU number 212-332-5); 1,1-dichloro-2,2 bis (p-chlorophenyl) ethylene (CAS number 72-55-9; EU number 200-784-6); and 1,1-dichloro-2,2 bis (p-chlorophenyl) ethane (CAS number 72-54-8; EU number 200-783-0).*
9. *If Member States do not apply EQS for biota they shall introduce stricter EQS for water in order to achieve the same level of protection as the EQS for biota set out in Article 3(2) of this Directive. They shall notify the Commission and other Member States, through the Committee referred to in Article 21 of Directive 2000/60/EC, of the reasons and basis for using this approach, the alternative EQS for water established, including the data and the methodology by which the alternative EQS were derived, and the categories of surface water to which they would apply.*

According to Environmental Quality Standards (EQS), main heavy metals that measured in Hirfanlı Dam at PS1 site compared in Table 4.7.2.1.5.

Table 4.7.2.1.5. Environmental Quality Standards (EQS).

Name of substance	Measured Maximum Value at Hirfanlı Dam (µg/l)	AA-EQS (2) Inland Surface Waters (3)	AA-EQS (2) Other Surface Waters	MAC-EQS (4) Inland Surface Waters (3)	MAC-EQS (4) Other Surface Waters
Mercury and its compounds	16	0,05 (9)	0,05 (9)	0,07	0,07
Cadmium and its compounds (depending on water hardness classes) (6)	0.08	≤ 0,08 (Class 1) 0,08 (Class 2) 0,09 (Class 3) 0,15 (Class 4) 0,25 (Class 5)	0,2	≤ 0,45 (Class 1) 0,45 (Class 2) 0,6 (Class 3) 0,9 (Class 4) 1,5 (Class 5)	≤ 0,45 (Class 1) 0,45 (Class 2) 0,6 (Class 3) 0,9 (Class 4) 1,5 (Class 5)
Lead and its compounds	1.2	7,2	7,2	not applicable	not applicable
Nickel and its compounds	4	20	20	not applicable	not applicable

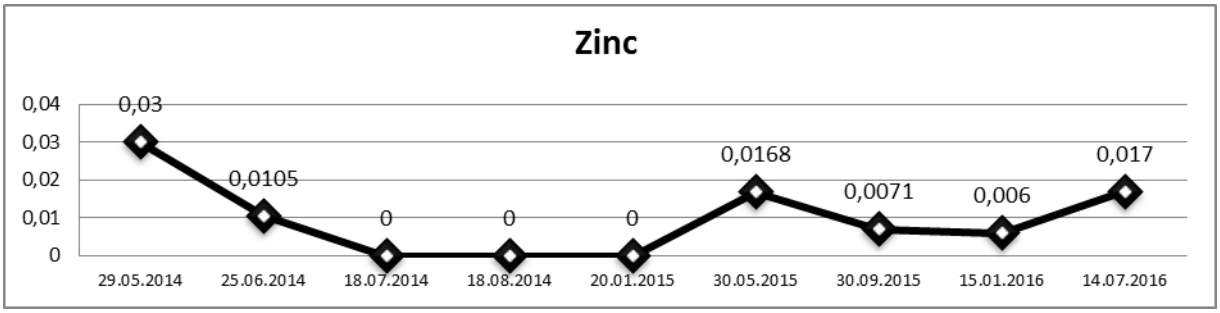
For the determination of the heavy metals, Zinc, Nickel, Mercury, Cadmium, Lead, parameters are monitored in the analysis reports according to Appendix 5 Table 4 as given below; only nickel (0.0559 mg/l) and mercury (0.016 mg/l) values have measured up to the maximum acceptable concentration for only one measure on September 30, 2015 and then determined under the measurable values during the analyses (see Table 4.7.2.1.6. and Figure 4.7.2.1.3.).

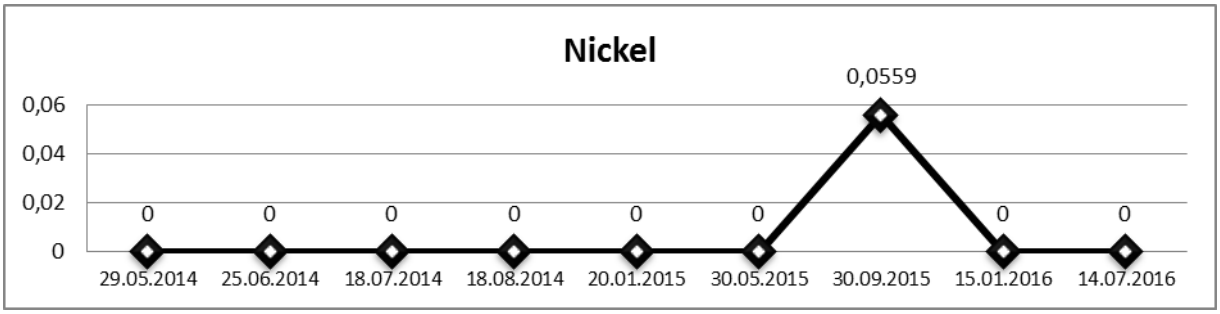
Values of Heavy Metals at Hirfanli Dam at PS1 Site

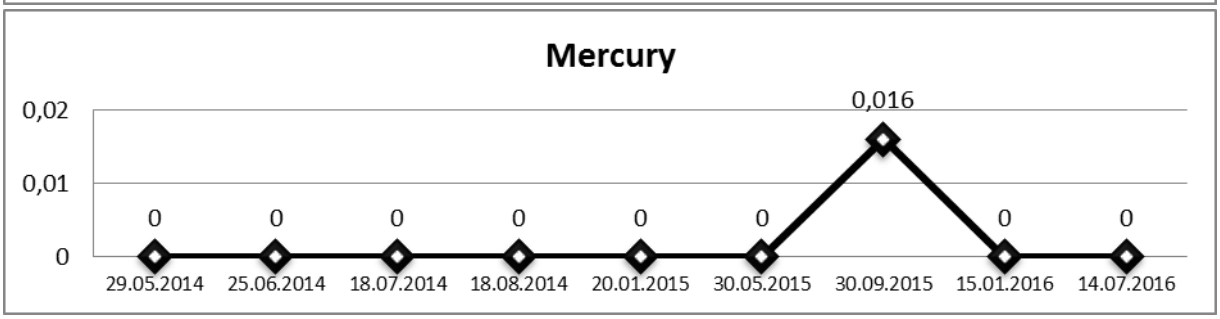
Max. Measured Zinc Value: 0.03 mg/l, on the date May 29, 2014
Max. Measured Nickel Value: 0.0559 mg/l, on the date September 30, 2015
Max. Measured Mercury Value: 0.016 mg/l, on the date September 30, 2015
Avr. Cadmium Value: <0.0005 mg/l, in all of the analyses
Max Measured Lead Value: 0.00056 mg/l, on the date May 29, 2014

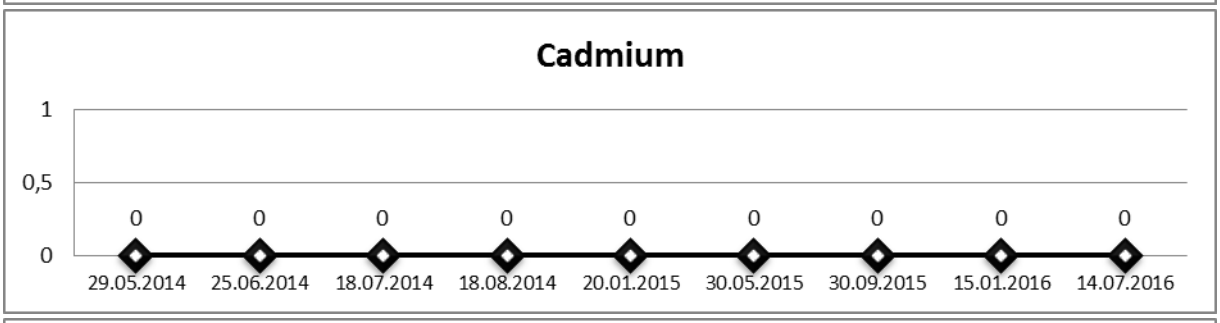
Table 4.7.1.6. Heavy Metal Standards for the Surface Water *

Parameter	Maximum Values of Hirfanlı Dam	YA/EQS (Yearly Average Concentration / Environmental Quality Standards)	MAC/EQS (Max Acceptable Concentration / Environmental Quality Standards)
Zinc (mg/l)	0.03	0.0059	0.231
Nickel (mg/l)	0.0559	0.004	0.034
Mercury (mg/l)	0.016	0	0.000007
Cadmium (mg/l)	< 0.0005	0.00008	0.00045
Lead (mg/l)	0.00056	0.0012	0.014









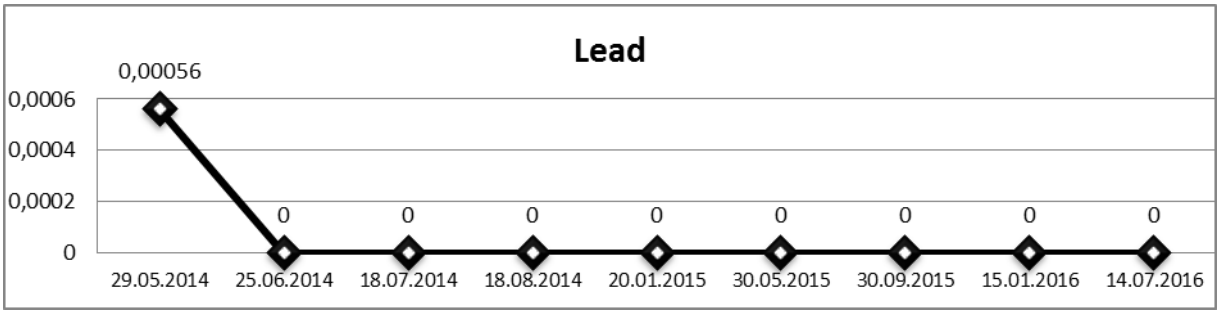


Figure 4.7.2.1.3. Graphics of Heavy Metals Measured in Hirfanlı Dam Water at PS1 Site.

4.7.2.2. Tuz Gölü

Beside this, throughout the preparation period of the EIA Report, as part of the studies carried out in relation to the salt water discharge, the “Niggle Diagram” which has been utilized in the basin and irrigation water projects of the State Hydraulic Works and the drinking water projects of the Bank of Provinces over the years, has been referred to in order to determine whether the salt water arising from the leaching operations presents characteristics similar to the water of Tuz Gölü (Figure 4.7.2.2.1.).

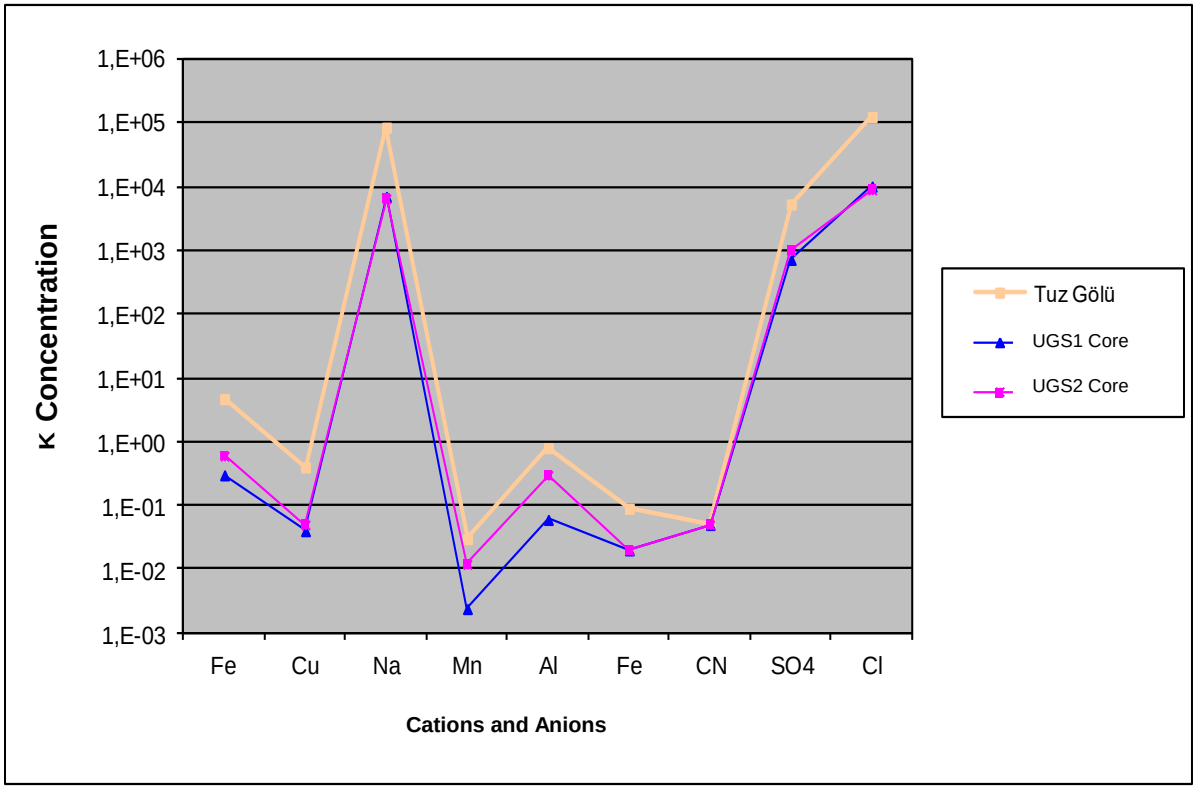


Figure 4.7.2.2.1. The Niggle Diagram
Source: EIA Report for Underground Gas Storage Project for the 2003 Year

The anion and cation variations of water were observed by drawing the anion-cation concentration in water sources as single-sided within a Niggle Diagram. Analysis was carried out by sampling at two different points on the Cavern and two different points on Tuz Gölü, for the purpose of detecting the characteristics of salt water generated at the end of the leaching process, within the project. As seen in the analysis results in Table 4.7..2.2.1., anion-cation variations of the same sourced waters show similarities (BOTAŞ Petroleum Pipeline Corporation, 2003).

Table 4.7.2.2..1. Core taken in the scope of Underground Gas Storage Project under construction and Water Analysis Results

Parameter	UGS1 Core	UGS2 Core	Water Sample 1	Water Sample 2
Fe (mg/L)	0.3	0.6	4.7	0.38
Cu (mg/L)	0.04	0.03	0.4	<0.002
Zn (mg/L)	0.03	0.03	0.2	0.1
Cr (mg/L)	<0.002	<0.002	<0.002	<0.002
Hg (mg/L)	<0.002	<0.002	<0.002	<0.002
Pb (mg/L)	0.0074	0.0046	0.235	<0.002
Ni (mg/L)	<0.002	0.005	0.017	0.01
Cd (mg/L)	0.1	0.1	1.410	<0.002
As (mg/L)	0.0095	0.0046	0.37	0.136
Na (mg/L)	7,000	6,500	85,000	220
Se (mg/L)	0.0085	0.0098	0.0094	0.0065
Mn (mg/L)	0.0024	0.012	0.03	0.3524
B (mg/L)	0.9	5.3	43	0.00121
Al (mg/L)	0.06	0.3	0.8	0.5
Li (mg/L)	0	0	0.17	0.36
Br (mg/L)	<0.02	<0.042	<0.1	0.287
F (mg/L)	0.02	0.02	0.09	0.39
Co (mg/L)	0.0013	0.0022	0.0075	<0.0007
Total CN^-(mg/L)	<0.05	<0.05	<0.05	<0.05
SO_4^{2-}(mg/L)	719	989	5,329	142
Oil and Grease (mg/L)	45	117	50	155
Cl^-(mg/L)	10,137	8,950	124,590	197
Ammonium nitrogen (mg/L)	0.14	0.14	1.05	3.4
NO_3^--N(mg/L)	0	0	0.21	0.75
Total PO_4^--P(mg/L)	0.49	0.48	0.45	0.87
Total Dissolved Solids (mg/L)	18,991	17,622	227,930	1,183
KOİ (mg/L)	1,821	19,317	1,821	13.5
BOİ (mg/L)	0	0	0	0
AKM (mg/L)	14.2	114.5	28.2	16.2
TOC (mg/L)	0	0	9.64	2.85
Fecal Coliform (EMS/100 mL)	0	0	0	0
Total Coliform (EMS/100 mL)	0	0	0	32

As can be seen from the above diagram, the cores show similarities with the Tuz Gölü anion-cation variations. It is possible to infer from the result that the water being formed at the end of leaching the cores belonging to salt domes in water obtained for analysis from the project area with water samples from Tuz Gölü, are from the same source (BOTAŞ petroleum pipeline corporation, 2003).

Due to the fact that the density of the discharged brine is the same as the density of the Tuz Gölü water mass, within the scope of the project being currently executed, it was observed that there had been no effect on flora, fauna, soil and water structures in the Tuz Gölü ecosystem. In addition to this, as in the Underground Gas Storage Project (currently under construction), in monthly periods (and weekly where necessary), brine samples will be taken from the exit point of Brine Discharge Line, the closest storage units formed by brine discharged and storage units formed by possibly the farthest point.

In these samples, the following parameters shall be checked: pH, Electrolytic Conductivity (EC), Salinity, Total Dissolved Solids (TDS), Suspended Solids (SS), Sulphate, Chloride, Alkalinity, Nitrate, Nitrite, Ammonium Nitrogen, Sodium, Magnesium, Calcium, Copper, Zinc, Arsenic, Mercury and Lead. In these analyses, the amounts of the values such as SSs formation in salt water, Anion-Cation Balance, heavy Metals etc. shall be determined and monitored.

In conclusion, the discharge of the salt water that is to be generated due to the leaching of the salt caverns into Tuz Gölü will not affect the current quality of the lake adversely as it will have the same content with Tuz Gölü and it will not be discharged directly into Tuz Gölü. Moreover, Tuz Gölü, which is subject to continuous water loss and therefore faces the risk of drying out, is envisaged not to be affected adversely from the discharge of the salt water presenting characteristics similar to Tuz Gölü, as resulting from the salt caverns extending until those under Tuz Gölü, and thus having the same characteristics with Tuz Gölü. Therefore, the increase in the quantity of the salt water to be discharged in parallel with the increase in the quantity of the fresh water per unit of time required for the leaching operations will not result in adverse impacts on Tuz Gölü.

4.7.2.3. Brine Discharge

Underground Gas Storage Project (UGS Project) / 3rd party Monitoring Studies

Brine samples are taken by the experts of ÇINAR and ÇINAR Environmental Laboratories from the diffuser point (0543614-East, 4253345-Kuzey) of the brine discharge line and nearest (0543730-East, 4253373-North) and farthest (0543835-East, 4253682-North) ponds, to diffusers of the brine discharge line in order to determine the brines which have been discharged and the spread brine quality and characteristics. The discharged brine quality has been monitored by ÇINAR every month since May 2014 that is the starting date of the leaching operations, and probably impacts on the Tuz Gölü Basin are followed with the help of the analysis results. In the scope of the brine quality monitoring studies, discharged brine analyses have been carried out on the following parameters: pH, Electrical Conductivity (EC), Salinity, Total Dissolved Solids (TDS), Suspended Solids (SS), Sulphate, Chloride, Alkalinity, Nitrate, Nitrite, Ammonium, Sodium, Magnesium, Calcium, Oil-Grease, Total Chromium, Iron, Copper, Zinc, Arsenic, Mercury and Lead. The analysis results have been given above for the last year 2016, at UGS Project. However, during the studies, anion/cation balances are monitored with the Sodium, Calcium, Sulphate, Chloride parameters at the

diffuser point of the brine discharge line and heavy metals Total Chromium, Iron, Copper, Zinc, Arsenic, Mercury and Lead parameters have been checked with the graph shown for analyses in the year 2016 (see Table 4.7.2.3.1.., Table 4.7.2.3.2., Table 4.7.2.3.3. and Figure 4.7.2.3.1., Figure 4.7.2.3.2.).

Table 4.7.2.3.1. Brine Water Monitoring Results for January 2017

Parameters	Brine Water of Brine Discharge Point
	2017 January Monitoring Results
pH	6.97
Electrical Conductivity (µS/cm)	>100,000
Salinity	>86
Total Dissolved Solids (mg/L)	>50,000
Suspended Solids (mg/L)	<10.0
Sulphate (mg/L)	1,894
Chloride (mg/L)	178,294
Alkalinity (mg $CaCO_3$/L)	130
Nitrate (mg/L)	1.40
Nitrite (mg/L)	0.043
Ammonium Nitrogen (mg/L)	<0.05
Sodium (mg/L)	100,346
Magnesium (mg/L)	27.0
Calcium (mg/L)	909
Oil-Grease (mg/L)	<10

Table 4.7.2.3.2. Analysis Results of Brine at Discharge Point (2016)

Parameters	January 16, 2016	February 18, 2016	March 16, 2016	April 14, 2016	May 12, 2016	June 15, 2016	July 14, 2016	August 12, 2016	September 20, 2016	October 14, 2016	November 11, 2016	December 14, .2016
pH	6.67	6.8	6.65	7.01	6.88	6.4	6.96	6.73	6,79	6,56	6.45	6.67
Electrical Conductivity (µs/cm)	>100,000	>100,000	>100,000	>100,000	>100,000	>100,000	>100,000	>100,000	>100,000	>100,000	>100,000	>100,000
Salinity	>86	>86	>86	>86	>86	>86	>86	>86	>86	>86	>86	>86
Total Dissolved Solid (mg/L)	>50,000	>50,000	>50,000	>50,000	>50,000	>50,000	>50,000	>50,000	>50,000	>50,000	>50,000	>50,000
Total Suspended Solids (mg/L)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Sulphate (mg/L)*	2,473	2,326	2,267	2.422	3,016	2,693	2,188	2,422	2,490	1,921	1,770	1,863
Chloride (mg/L)*	180,344	175,046	168,948	182.943	183,493	203,436	176,245	190,590	190,990	187,592	195,132	180,794
Alkalinity (mg $CaCO_3$/L)	116	128	129	66	108	115.6	117	122	108	107	98.8	116
Nitrate (mg/L)	<0.45	1.33	1.16	<0,45	<0.45	<0.45	1.92	<0.45	<0.45	<0.45	<0.45	1.09
Nitrite (mg/L)	0.019	0.017	0.011	<0,01	<0.01	<0.01	<0.01	0.016	0.036	0.013	0.032	0.023
Ammonium Nitrogen (mg/L)	<0.1	<0.05	<0.05	<0,05	<0.05	0.17	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sodium (mg/L)*	109,722	104,971	96,120	111.391	98,362	117,664	100,903	116,156	101,480	115,233	118,327	81,854
Magnesium (mg/L)	30.8	29.3	26.4	32,6	31.3	40.05	24.4	52.5	39.4	28.3	30.4	37.8
Calcium (mg/L)*	1,059	989	920	1.015	946	1,666	979	1,206	962	913	992	1,072
Oil-Grease (mg/L)	<0.1	<0.05	<0.05	<0,05	<0.05	0.17	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

** Due to the characteristic of Tuz Gölü and major cation and anions which are Sodium – Calcium and Chloride – Sulphate parameters are followed during the monthly analyses. These cation and anions in discharged brines have shown same characteristics approximately with Tuz Gölü waters.*

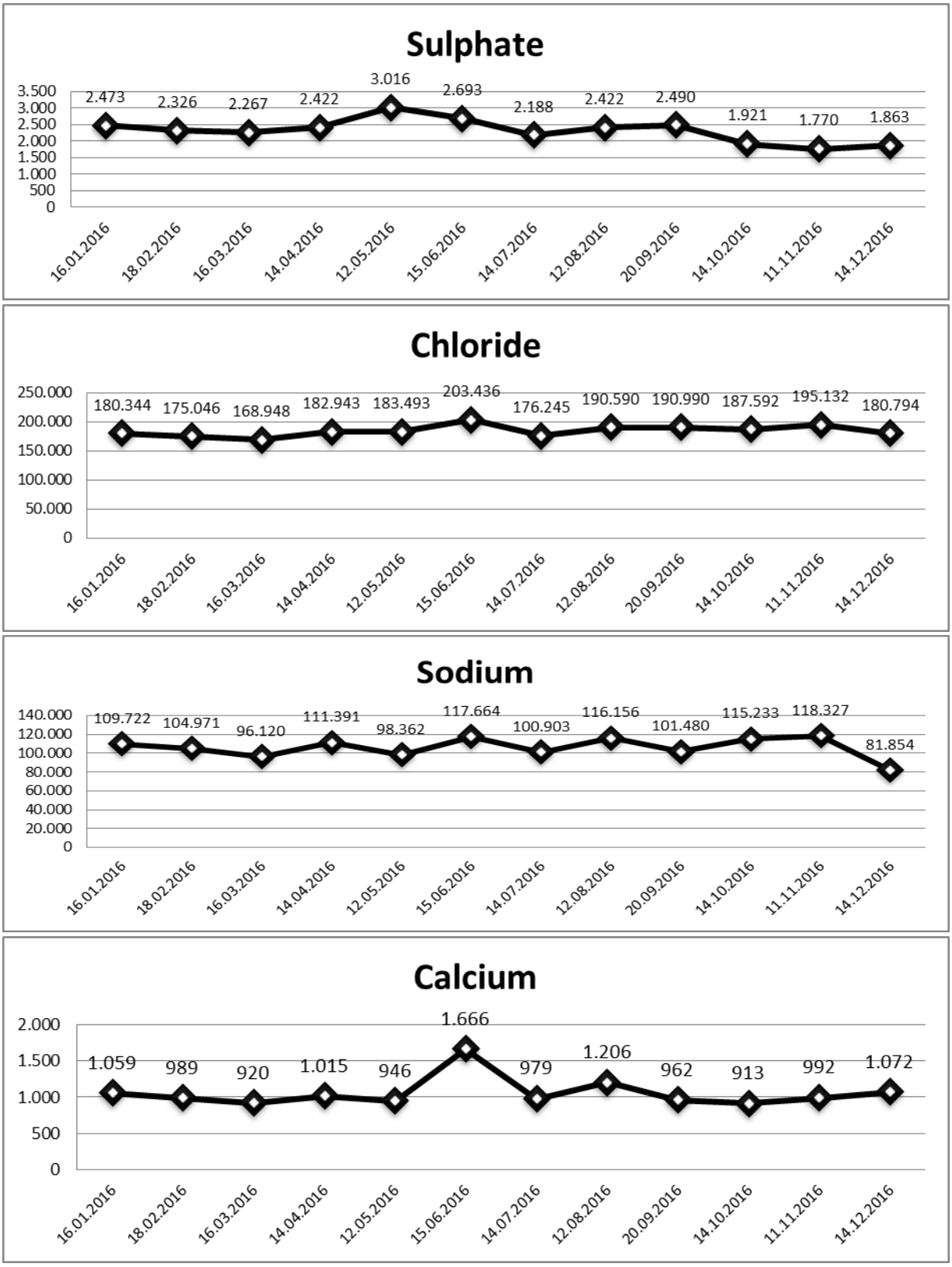


Figure 4.7.2.3.1. Graphics of anion and cation parameters measured at the brine diffuser point at Tuz Gölü

Table 4.7.2.3.3. Brine Analysis Results in Nearest Pond to Discharge Point (2016)

Parameters	January 16, 2016	February 18, 2016	March 16, 2016	April 14, 2016	May 12, 2016	June 15,2016	July 14, 2016	August 12, 2016	September 20, 2016	October 14, 2016	November 11, 2016	December 14, 2016
pH	6.6	6.84	6.34	7.15	6.85	6.73	7.03	6.93	6.88	6.67	6.53	6.8
Electrical Conductivity (µS/cm)	> 100,000	> 100,000	> 100,000	> 100,000	> 100,000	> 100,000	> 100,000	> 100,000	> 100,000	> 100,000	> 100,000	> 100,000
Salinity	> 86	> 86	> 86	> 86	> 86	> 86	> 86	> 86	> 86	> 86	> 86	> 86
Total Dissolved Solids (mg/L)	> 50,000	> 50,000	> 50,000	> 50,000	> 50,000	> 50,000	> 50,000	> 50,000	> 50,000	> 50,000	> 50,000	> 50,000
Suspended Solids (mg/L)	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00
Sulphate (mg/L)	2,929	2,312	2,283	2,448	2,691	2,596	2,460	3,373	2,490	1,859	1,689	2,098
Chloride (mg/L)	178,294	169,747	169,697	186,492	178,944	166,969	184,392	207,285	188,341	186,742	185,442	177,445
Alkalinity (mg $CaCO_3$/L)	120	133	138	68.8	108	114	127	121	116	102	93	110
Nitrate (mg/L)	<0.45	1.24	2.84	1.57	<0.45	<0.45	<0.45	<0.45	<0.45	<0.45	<0.45	<0.45
Nitrite (mg/L)	0.022	0.014	<0.01	0.01	<0.01	<0.01	0.012	0.013	0.039	0.026	0.039	0.023
Ammonium Nitrogen (mg/L)	<0.1	<0.05	<0.05	<0.05	<0.05	0.68	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sodium (mg/L)	110,830	114,729	104,259	105,661	98,181	110,871	111,494	116,409	101,589	103,833	99,923	71,759
Magnesium (mg/L)	32.5	29.9	32.9	27	27	0.064	35.4	43.6	38.9	33.7	27.1	24.5
Calcium (mg/L)	1,086	1,054	1,002	958	939	1.071	1,039	1,154	1,034	957	824	884
Total Chromium (mg/L)	<0.001	<0.001	<0.001	0.031	0.007	0.345	<0.001	<0.001	<0.001	0.013	<0.001	<0.001
Iron (mg/L)	2.38	1.3	1.32	1.64	1.36	1.69	1.61	0.773	0.744	0.725	<0.005	<0.005
Copper (mg/L)	<0,.001	<0.001	<0.001	<0.001	<0.001	0.16	<0.001	0.044	0.034	0.514	<0.001	<0.001
Zinc (mg/L)	0.156	<0.005	<0.005	0.758	<0.005	0.228	1.5	<0.005	<0.005	0.889	<0.005	<0.005
Arsenic (mg/L)	0.031	0.019	<0.0005	0.013	0.018	0.026	0.031	0.015	<0.0005	0.015	<0.0005	0.02
Mercury (mg/L)	<0.0001	<0.0001	0.107	0.037	0.037	0.064	0.03	0.219	0.027	0.022	<0,0001	0.017
Lead (mg/L)	<0.0005	<0.0005	<0.0005	0.04	0.019	0.009	0.027	<0.0005	<0.0005	0.133	<0.0005	<0.0005

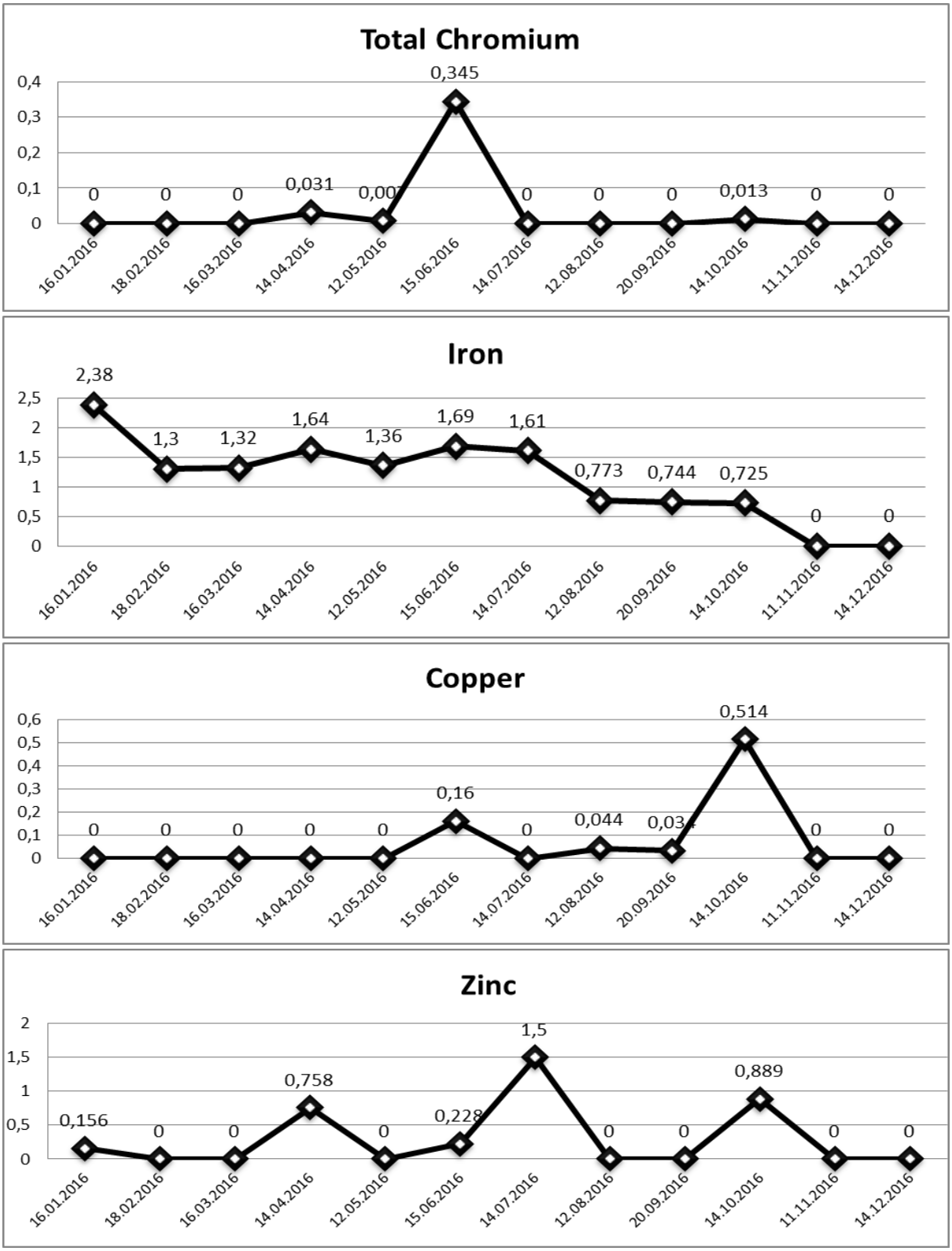


Figure 4.7.2.3.2. Graphics of Heavy Metals Measured in Nearest Pond at the Brine Spread Area

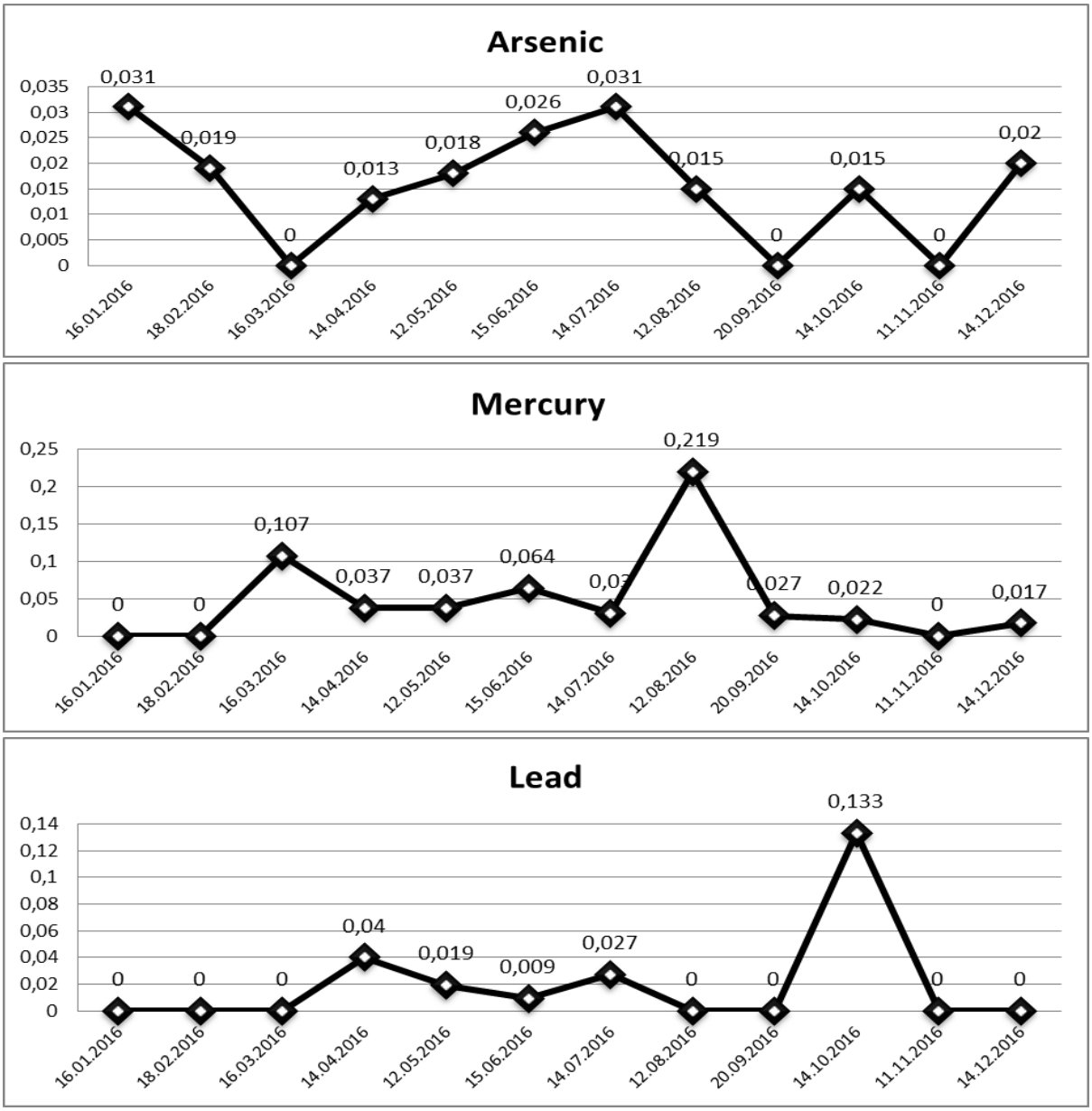


Figure 4.7.2.3.2. (continued) Graphics of Heavy Metals Measured in Nearest Pond at the Brine Spread Area

As seen in the graphs, all of the metal and heavy metal parameters are generally determined under the measurable values in discharged brines at the Tuz Gölü Basin except the October 2016 measurements that most probably consisted due the minerals that comes from the leaching operation conducted formations. Probable mineral leakages containing the heavy metals will be determined with the conducted analyses during the Gas Storage Expansion Project as in the Underground Gas Storage Project.

The ESIA Process for Gas Storage Expansion Project (GSEP)

Brine analyses have been carried out by ÇINAR during the ESIA process and brine samples were taken from around of the salt production facilities in terms of showing the lake characteristics. Analysis results of Tuz Gölü are given in Table 4.7.2.3.4. below.

Table 4.7.2..3.4. Analysis Results of Tuz Gölü

Parameter	Unit	Test Result	Uncertainties	Test Method
pH	-	7,71	± 0,07	SM 4500 H+
Electrical Conductivity (µS/cm)	µS/cm	>100000	% ± 3,13	TS 9748 EN 27888
Salinity	-	>86	% +/- 3,13	TS 9748 EN 27888
Total Dissolved Solids (mg/L)	mg/L	>50000	% ± 11,9	SM 2540 C
Oil – Grease	mg/L	<10	% ± 13,4	TS 8312
Nitrate (mg/L)	mg/L	0,660	% ± 16,5	EPA 352.1
Nitrite (mg/L)	mg/L	0,066	% ± 11,3	SM 4500-NO2 B
Suspended Solids (mg/L)	mg/L	105,9	%± 13,3	SM 2540 D
Total Cyanide	mg/L	<0,01	% ± 6,50	SM 4500 CN- C ve E
Chemical Oxygen Demand (COD)	mg/L	<10	% ± 15,2	SM 5220 B
Biochemical Oxygen Demand (BOD)	mg/L	<3	% ± 18,0	SM 5210 B
Bromide	mg/L	95,95	% ± 19,2	SM 4110 B
Fluoride	mg/L	<0,1	% ± 17,6	SM 4110 B
Sulphate (mg/L)	mg/L	9670	% ± 13,7	SM 4500 SO4-2 E
Chloride (mg/L)	mg/L	194139	% ± 15,9	SM 4500 Cl- B
Ammonium Nitrogen (mg/L)	mg/L	0,974	% ± 14,6	SM 4500-NH3 F
Total Organic Carbon (TOC)	mg/L	<5	% ± 17,4	TS 8195 EN 1484
Total Coliform	KOB/100ml	No Growth	% ± 13,9	TS EN ISO 9308-1
Fecal Coliform	KOB/100ml	No Growth	% ± 16,4	SM 9222 D
Alkalinity (mg CaCO3/L)	mgCaCO3/L	159,6	% +/- 12,5	SM 2320 B
Magnesium (mg/L)	mg/L	4832	% +/- 12,8	TS EN İSO 17294-1/2
Iron (mg/L)	mg/L	1,026	% ± 8,40	EPA 6020 A
Chromium (mg/L)	mg/L	0,069	% ± 8,30	TS EN İSO 17294-1/2
Sodium (mg/L)	mg/L	139581	% ± 12,6	
Calcium (mg/L)	mg/L	672,49	% +/- 13,7	
Lithium	mg/L	39,13	% ± 11,2	
Total Phosphorus	mg/L	0,786	% ± 7,50	
Aluminum	mg/L	0,849	% ± 4,70	
Manganese	mg/L	0,109	% ± 6,90	
Copper (mg/L)	mg/L	0,145	% ± 7,80	
Zinc (mg/L)	mg/L	0,353	% ± 8,20	
Boron	mg/L	69,78	% ± 8,80	
Cobalt	mg/L	0,0018	% ± 10,7	
Nickel	mg/L	0,088	% ± 8,40	
Arsenic (mg/L)	mg/L	0,577	% ± 13,1	
Cadmium	mg/L	<0,0005	% ± 11,7	
Total Chromium (mg/L)	mg/L	0,069	% ± 8,30	
Lead (mg/L)	mg/L	0,0072	% ± 2,80	
Selenium	mg/L	0,016	% ± 10,3	
Mercury (mg/L)	mg/L	0,0084	% ± 21,7	EPA 6020 A

In addition, brine samples had been taken from Tuz Gölü for determination of the elementary characteristic of the lake during EIA process of Tuz Gölü Project (TGP) in February 2002. Due to there is not any national document on pollutant accumulation study for Tuz Gölü Basin, a salty water sample has been taken by ÇINAR with the same parameters from around of the salt production facilities at Tuz Gölü whereas 47 km away from the brine discharge point in scope of Gas Storage Expansion Project (GSEP) in November 2017 and comparison of the parameters has conducted with the last analysis results that are given in Table 4.7.2.3.5 below.

Table 4.7.2.3.5. Parameter Comparison between Results of Tuz Gölü (2002 / 2017)

Parameter	Sample 1 EIA of TGP (February 2002)	Sample 2 ESIA of TGEP (November 2017)	Comparison Result
Fe (mg/L)	4.7	1.026	Decreased
Cu (mg/L)	0.4	0.145	Decreased
Zn (mg/L)	0.2	0.353	Increased
Cr (mg/L)	<0.002	0.069	Increased
Hg (mg/L)	<0.002	0.0084	Increased
Pb (mg/L)	0.235	0.0072	Decreased
Ni (mg/L)	0.017	0.088	Increased
Cd (mg/L)	1.410	<0.0005	Decreased
As (mg/L)	0.37	0.577	Increased
Na (mg/L)	85000	139581	Normal
Se (mg/L)	0.0094	0.016	Increased
Mn (mg/L)	0.03	0.109	Increased
B (mg/L)	43	69.78	Increased
Al (mg/L)	0.8	0.849	Increased
Li (mg/L)	0.17	39.13	Increased
Br (mg/L)	<0.1	95.95	Increased
F (mg/L)	0.09	<0.1	In Minimum
Co (mg/L)	0.0075	0.0018	Decreased
Total CN^-(mg/L)	<0.05	<0.01	Decreased
SO_4^{2-}(mg/L)	5329	9670	Normal
Oil and Grease (mg/L)	50	<10	Decreased
Cl^-(mg/L)	124590	194139	Normal
Ammonium nitrogen (mg/L)	1.05	0.974	Decreased
NO_3^--N(mg/L)	0.21	0.660	Increased
Total PO_4^--P(mg/L)	0.45	0.786	Increased
Total Dissolved Solids (mg/L)	227930	>50000	Normal
KOİ (mg/L)	1821	<10	Decreased
BOİ (mg/L)	0	<3	Increased
AKM (mg/L)	28.2	105.9	Increased
TOC (mg/L)	9.64	<5	Decreased
Fecal Coliform (EMS/100 mL)	0	0	In Minimum
Total Coliform (EMS/100 mL)	0	0	In Minimum

As result of the comparing between the parameters; some critical heavy metal parameters such as Zinc, Chromium, Mercury, Nickel, Arsenic, and relatively less critical parameters

such as Nitrate, Phosphate and Suspended Solid parameters are increased in Tuz Gölü since the year 2003 that most probably caused from the seasonal rainwater drainages, agricultural water discharges, contaminated water/wastewater transportations into the lake body from the nearest settlements (Aksaray Province, Kulu, Cihanbeyli, Şereflikoçhisar Districts, Yenikent, Yeşilkent, Yeşiloba Municipalities).

Characteristic and variable parameters of Tuz Gölü that can be classified as anionic and cationic of Tuz Gölü such as Sodium, Sulphate and Chloride are increasing in the lake water but these parameters can be changed due the climatic and seasonal reasons along the year.

Sampling point of Tuz Gölü (Sample 2) is 47 km far to the brine diffuser point of the Underground Gas Storage Project (See Figure 4.7.2.3.3.). Analysis results of water sample from Tuz Gölü have been compared with brine samples discharged from the brine diffusor point for last three months. Comparison of the parameters is given in Table 4.7.2.3.6. below.

Table 4.7.2.3.6. Comparison of the Parameters of Tuz Gölü and Brine Diffusor Points

Parameters	November 2017 Tuz Gölü	September, 2017 Brine Discharge Point	October, 2017 Brine Discharge Point	November, 2017 Brine Discharge Point
pH	7.71	6,54	6,25	6,41
Electrical Conductivity (µS/cm)	>100000	>100000	>100000	>100000
Salinity	>86	>86	>86	>86
Total Dissolved Solids (mg/L)	>50000	>50000	>50000	>50000
Oil – Grease	<10	<10	<10	<10
Suspended Solids (mg/L)	105.9	651,7	265.5	289,2
Sulphate (mg/L)	9670	3410	5366	3419
Chloride (mg/L)	194139	156601	145505	137207
Alkalinity (mg $CaCO_3$/L)	159,6	95.2	91	95
Nitrate (mg/L)	0.660	1.639	1.103	1.502
Nitrite (mg/L)	0.066	0,026	0,055	0,170
Ammonium Nitrogen (mg/L)	0.974	<0,05	<0,05	<0,05
Sodium (mg/L)	139581	83497	64050	108007
Magnesium (mg/L)	4832	28,02	24,51	62.14
Calcium (mg/L)	672.49	1561	1242	2003
Total Chromium (mg/L)	0.069	<0,001	<0,001	0,075
Iron (mg/L)	1.026	1,524	<0,005	1,602
Copper (mg/L)	0.145	<0.001	<0,001	0,135
Zinc (mg/L)	0.353	0.584	<0,001	0,192
Arsenic (mg/L)	0.577	0,018	0,012	0,588
Mercury (mg/L)	0.0084	<0,0001	0,013	<0,0001
Lead (mg/L)	0.0072	0,00197	0,00748	0,019

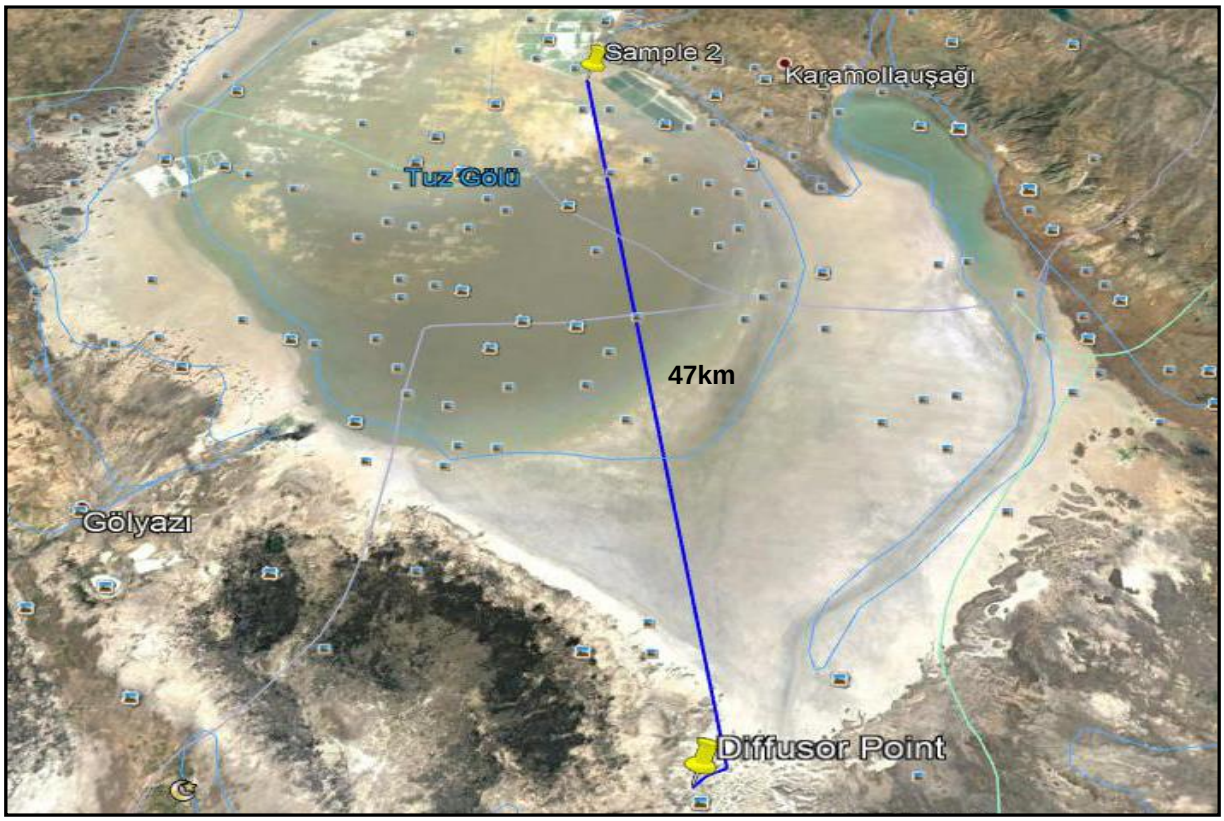


Figure 4.7.2.3.3. Sampling Points of Tuz Gölü (Sample 2) and Brine Diffusor

Some parameters of the brine diffusor point are higher than the sample of Tuz Gölü such as suspended solids for all three months. However, some critical parameters such as heavy metals (Chromium, Zinc, Arsenic, Lead, etc.) are same values with the sample of Tuz Gölü.

In additionally, due the currently pollutant capacity of Tuz Gölü, during the gas storage expansion project; discharge parameters and characteristics will be continuously monitored and potential pollution status of discharged brines will be analyzed by BOTAŞ. Impacts of discharged brines to Tuz Gölü will be regularly investigated together with the seasonal changes of the parameters and lake water characteristic. BOTAŞ will prepare an investigation plan to compare the pollution levels between the dates of before / after of the project.

In this context, sediment samples were taken from the two points given in Figure 4.7.2.3.4. for determining the current state the bottom of theTuz Gölü. The analysis process is continuing for these samples and the results will be used as the baseline samples for the Gas Storage Expansion Project once analyses completed.

Figure 4.7.2.3.4. Sedimet Sampling Points of Tuz Gölü

4.8 Land Usage and Soils

The principal and auxiliary units to be established within the scope of the project stay within the borders of Aksaray province, Sarıyahşi, Ağaçören, Ortaköy, Eskil and Central Districts, Konya province, Emirgazi district and Ankara province, Evren district and it is seen as the result of the environmental survey studies which have been carried out, that the facilities and structures are generally located within agricultural areas and pasture areas. Mainly beet, alfalfa and sunflower are grown in these areas.

When the whole surface facilities are examined within the scope of the land capability map with a scale of 1/25,000, presented in Appendix-3, and according to the big soil groups, it is seen that the whole area in which the facility is located consists of Brown Soil (B). When the surface facilities that are going to cover an area of 650 m x 800 m (52 ha) are examined according to land usage capacity classification, it is seen that the whole land consists of class I soil groups. The whole surface facility area with sufficient level in terms of soil depth, remains within Dry and Fallows Farming Lands (K).

All lands where 48 wells are going to be established within the scope of the project, remain within the Pasture (M) and Dry and Fallow Farming Lands (K), and the big soil groups (BTG) that belong to the planned well areas, erosion classes, current land usages (SAK) and land usage capacity classes are given for each well in Table 4.8.1.

Table 4.8.1. Big Soil Groups for the Planned Well Areas, Erosion Class, Current Land Usage and Land Usage Capacity Classes

Planned Facility / Unit	Big Soil Groups (BTG)	Erosion Class	Current Land Usage by land capability map with 1/25,000 scaled (SAK)	Land Usage Capability Class (AKK)	Area (m^2) *
UGS-15	Brown Soil	Medium	Dry Farming (fallowing)	I	10,000
UGS-16	Brown Soil	Medium	Dry Farming (fallowing)	I	10,000
UGS-17	Brown Soil	Very severe	Pasture	VII	10,000
UGS-18	Brown Soil	Medium	Dry Farming (fallowing)	I	70
	Brown Soil	None or very few	Dry Farming (fallowing)	I	9,930
UGS-19	Brown Soil	Medium	Dry Farming (fallowing)	I	10,000
UGS-20	Brown Soil	Very severe	Pasture	VII	10,000
UGS-21	Brown Soil	Medium	Pasture	VI	8,938
	Brown Soil	Very severe	Pasture	VII	1,062
UGS-22	Brown Soil	Very severe	Pasture	VII	10,000
UGS-23	Brown Soil	Medium	Dry Farming (fallowing)	I	9,964
	Brown Soil	None or very few	Dry Farming (fallowing)	I	36
UGS-24	Brown Soil	None or very few	Dry Farming (fallowing)	I	10,000
UGS-25	Brown Soil	Medium	Dry Farming (fallowing)	I	2,776
	Brown Soil	Severe	Pasture	VII	7,224
UGS-26	Brown Soil	Medium	Dry Farming (fallowing)	I	10,000
UGS-27	Brown Soil	None or very few	Dry Farming (fallowing)	I	10,000
UGS-28	Brown Soil	Severe	Pasture	VII	10,000
UGS-29	Brown Soil	Medium	Dry Farming (fallowing)	I	10,000
UGS-30	Brown Soil	Medium	Dry Farming (fallowing)	I	10,000
UGS-31	Brown Soil	Medium	Dry Farming (fallowing)	I	10,000
UGS-32	Brown Soil	Medium	Dry Farming (fallowing)	I	10,000
UGS-33	Brown Soil	Medium	Dry Farming (fallowing)	I	10,000
UGS-34	Brown Soil	Medium	Dry Farming (fallowing)	I	3,459
	Brown Soil	Medium	Pasture	III	6,541
UGS-35	Alluvial Earth	None or very few	Pasture	VI	10,000
UGS-36	Brown Soil	Medium	Dry Farming (fallowing)	I	10,000
UGS-37	Brown Soil	Medium	Pasture	III	9,630
	Alluvial Earth	None or very few	Pasture	VI	370
UGS-38	Brown Soil	Medium	Pasture	IV	10,000
UGS-39	Brown Soil	Medium	Dry Farming (fallowing)	I	10,000
UGS-40	Brown Soil	Medium	Dry Farming (fallowing)	I	10,000
UGS-41	Brown Soil	Medium	Dry Farming (fallowing)	I	9,782

Planned Facility / Unit	Big Soil Groups (BTG)	Erosion Class	Current Land Usage by land capability map with 1/25,000 scaled (SAK)	Land Usage Capability Class (AKK)	Area (m^2) *
	Brown Soil	None or very few	Dry Farming (fallowing)	III	218
UGS-42	Brown Soil	Medium	Pasture	III	10,000
UGS-43	Brown Soil	Medium	Pasture	III	10,000
UGS-44	Brown Soil	Medium	Pasture	III	10,000
UGS-45	Brown Soil	Medium	Dry Farming (fallowing)	I	5,933
	Alluvial Earth	None or very few	Pasture	VI	4,067
UGS-46	Brown Soil	Medium	Pasture	III	10,000
UGS-47	Brown Soil	Medium	Pasture	III	10,000
UGS-48	Brown Soil	Medium	Pasture	III	10,000
UGS-49	Brown Soil	Medium	Pasture	III	10,000
UGS-50	Brown Soil	None or very few	Dry Farming (fallowing)	III	10,000
UGS-51	Brown Soil	Medium	Dry Farming (fallowing)	III	10,000
UGS-52	Brown Soil	Medium	Pasture	III	10,000
UGS-53	Brown Soil	Medium	Dry Farming (fallowing)	III	10,000
UGS-54	Brown Soil	Medium	Pasture	III	10,000
UGS-55	Brown Soil	Medium	Pasture	III	10,000
UGS-56	Brown Soil	Medium	Pasture	III	10,000
UGS-57	Brown Soil	Medium	Pasture	III	10,000
UGS-58	Brown Soil	Medium	Pasture	III	10,000
UGS-59	Brown Soil	Medium	Dry Farming (fallowing)	II	10,000
UGS-60	Brown Soil	Medium	Pasture	III	10,000
UGS-61	Brown Soil	Medium	Dry Farming (fallowing)	II	10,000
UGS-62	Brown Soil	R2	Dry Farming (fallowing)	IV	10,000

**** 100 m X 100 m (1 ha) of area shall be used for each well area***

However, during the site surveys performed at the planned UGS sites, depending on the use of intensive groundwater, irrigated farming activities were observed at these dry farming lands and beet, alfalfa and sunflower are grown in these areas as mentioned above.

It is planned to use 100 ha of area in total to be used for the surface facilities and well areas within the scope of the project and all of the lands to be used remain within agricultural lands and pasture areas. The required permissions are going to be obtained from the Ministry of Food, Agriculture and Livestock and/or Aksaray and Konya Food, Agriculture and Livestock Provincial Directorates, according to the provisions of the "Soil Protection and Land Use Law" numbered 5403, which entered into force by being published in the Official Gazette dated July 19, 2005 and numbered 25880 in order to use the agricultural areas for non-agricultural purposes and to provide the lands required for the construction area and the preparation of the lands to be used in the scope of the project.

The required permissions are going to be obtained by applying to the Aksaray and Konya Governorships (governorship pasture commission) regarding the allocation purpose revision for the mentioned pasture areas, before starting the actual investment, according to Article 14 of the Pasture Law numbered 4342, for the pasture areas that remain within the project areas.

Current flood protection structures shall not be damaged, the excess excavation materials and waste-like wastes which are not going to be used for the project shall not be poured into the stream bed within the scope of all construction activities to be carried out for the surface facilities among the permanent fixed production and the well/cavern locations, during the land preparation and construction works. Wastewater with domestic properties, which is made harmless with the package wastewater treatment plant, shall be removed according to the Water Pollution Control Regulations and Water Products Regulations provisions and criteria. The provisions of the Water Products Law numbered 1380 shall be followed at all stages of the project.

The agricultural activities can be continued with restoration works after the construction works along the fresh water line, natural gas branchman line and brine discharge line planned within the scope of the project, and a "Non-Agricultural Usage Permit" shall be obtained by applying to the Aksaray Provincial Food, Agriculture and Livestock Directorate, by preparing a Soil Protection Project according to article 13 of the "Soil Protection and Land Use Law" numbered 5403, for the areas where agricultural usage cannot be provided such as surface facilities and drilling locations.

4.8.1 Baseline Surveys

Samples will be collected by Çınar Environmental Laboratory staff who have Soil, Treatment Sludge and Solid Waste Sampling Certificate by The Ministry of Environment and Urbanization Environmental Management General Directorate.

The results have been evaluated based on:

- Regulation on Soil Pollution Control and Point-Source Contaminated Sites (Official Gazette Date/Number: 08.06.2010/27605; last amended on 14.06.2014)
- Law on the Soil Conservation and Land Use (dated 19.07.2005 and numbered 5403)

Soil monitoring points were done at the following locations:

- Crossing of the watercourse;
- Open cut construction area;
- Temporary road area;
- Along the each section of the pipeline as it is constructed; and
- Construction site of the landfall structures including Receiving Terminal.

-

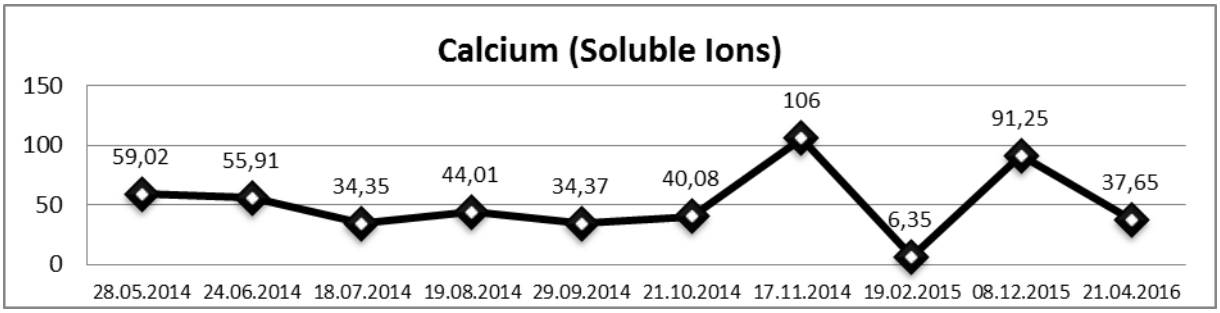
4.8.2 Results

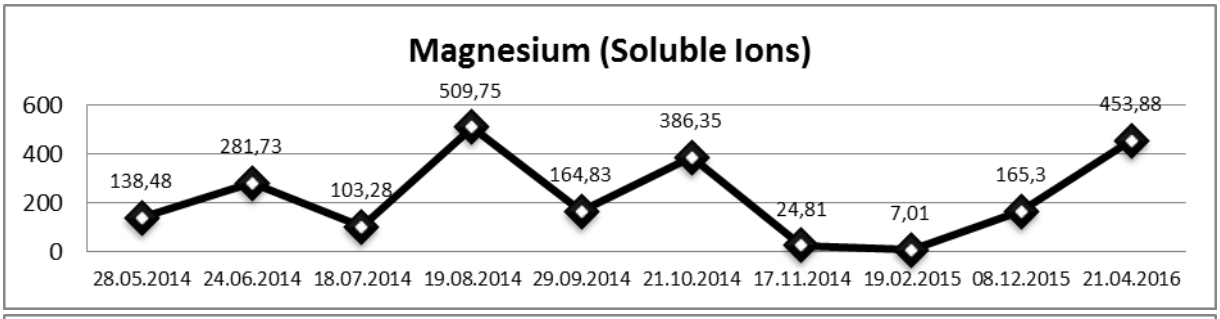
Underground Gas Storage Project (UGS Project) / 3rd party Monitoring Studies

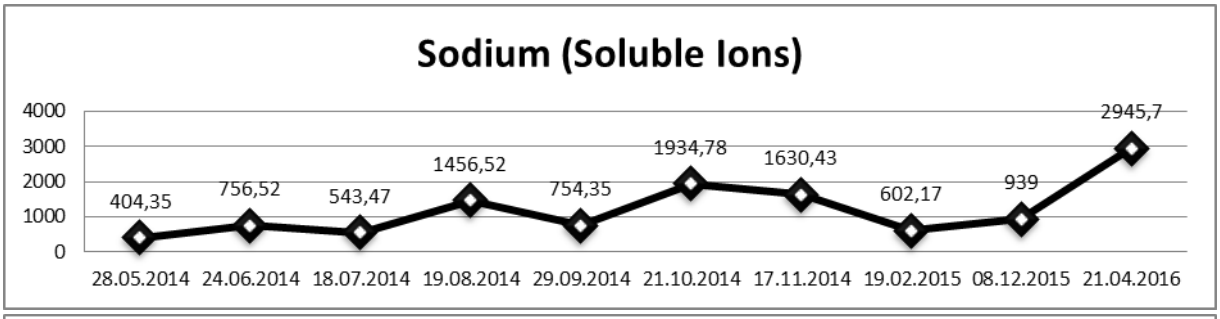
In the scope of the soil analyses at the brine spread areas, soil samples were taken from the brine discharge area (0543740-East, 4253338-North). However; in the scope of the requirements for the April 2016 measurements, the last soil sample was taken from surrounding area of the diffuser point of the brine discharge line in order to determine the impacts of the brine on the soil structure (Table 4.8.2.1. and Figure 4.8.2.1.).

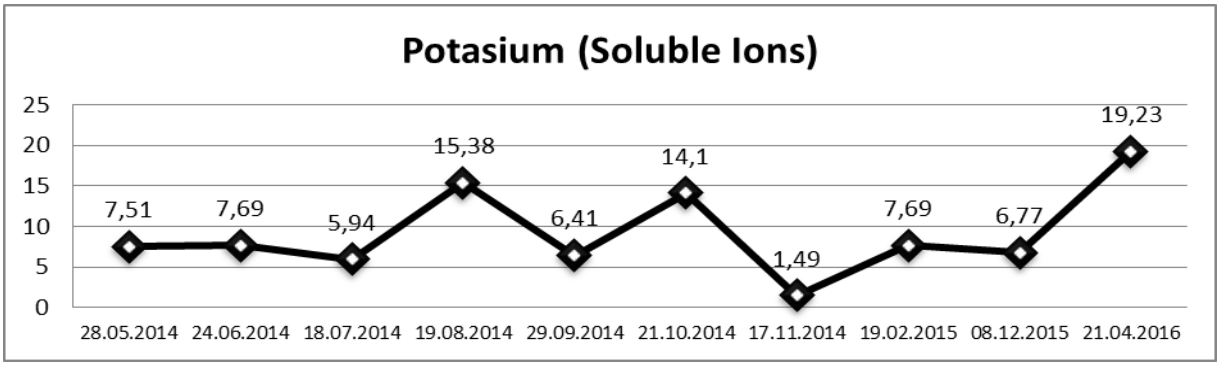
Table 4.8.2.1. Soil Analysis Results at Brine Spread Area (2014-2016)

Parameters		May 28, 2014	June 24, 2014	July 18,2014	August 19, 2014	September 29, 2014	October 21, 2014	November 17, 2014	February 19, 2015	December 08, 2015	April 21, 2016
Saturation with Water	%	170.74	171.82	-	71.11	90.4	61.91	52.69	80.14		64.64
pH in Soil Extract	-	-	-	-	-	7.52	-	-	7.7	7.65	7.53
pH in Filter	-	7.2	7.29	7.74	7.27	-	7.45	7.24			
EC in Soil Extract	-	66.3	-	60.9	-	85.5	-	182.5	65.68	134.5	383.5
EC in Filter	-	-	68.7	-	200	-	195	-	-		
% Salt	%	-	-	-	-	-	-	-	-		
Calcium	me/l	59.02	55.91	34.35	44.01	34.37	40.08	106	6.35	91.25	37.65
Magnesium	me/l	138.48	281.73	103.28	509.75	164.83	386.35	24.81	7.01	165.3	453,88
Sodium	me/l	404.35	756.52	543.47	1,456.52	754.35	1,934.78	1,630.43	602.17	939	2,945.7
Potassium	me/l	7.51	7.69	5.94	15.38	6.41	14.1	1.49	7.69	6.77	19.23
Total Cation Calculation	**me/l**	**609.36**	**1,101.85**	**687.04**	**2,025.66**	**959.96**	**2,375.31**	**1,762.73**	**623.22**	**1,202.32**	**3,456.46**
Carbonate	me/l	0	-	-	-	-	-	-	0	0	
Bicarbonate	me/l	1.18	-	-	-	-	-	0.81	0.54	0.73	10.28
Chloride	me/l	595	-	-	-	-	-	1662.5	4.12	491.31	1,142.5
Sulphate	me/l	13.18	-	-	-	-	-	99.42	618.56	710.31	2,303.6
Calcium	%	50.13	-	53.84	42.92	6.85	76.34	18.43	75.03	67.2	68.78
Magnesium	%	34.3	-	35.7	54.3	4.46	15.79	11.72	20.44	13.96	26.31
Sodium	%	6.18	-	5.23	1.41	17.84	5.13	69.54	1.84	17.78	3.31
Potassium	%	9.38	-	3.92	1.37	2.57	2.73	0.31	2.69	1.06	1.16
CEC(Cation Exchange Coefficient)	me/100g	13.7	19.43	21.7	47.69	31.74	44.02	59.44	37.67	54.45	19.9
Gypsum	%	-	-	-	-	-	-	-	-		
Boron	ppm	8.47	19.33	3.25	-	11.85	-	1.1	5.87	6.78	









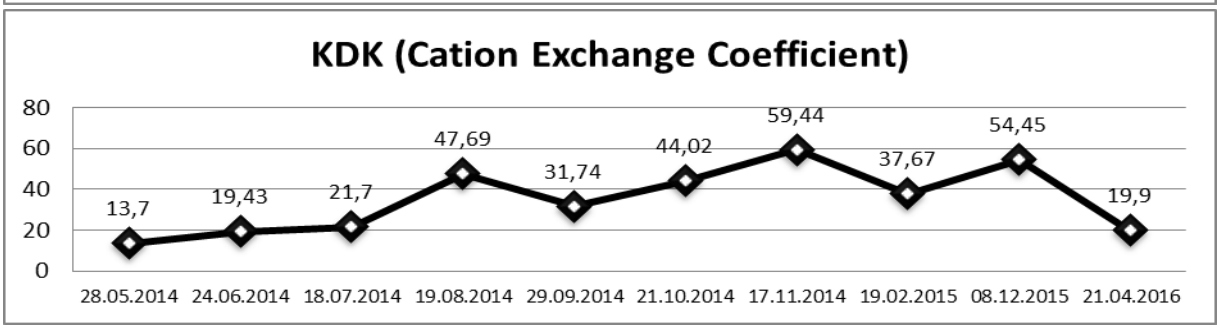


Figure 4.8.2.1. Graphics of Measured Parameters for Soil Samples at Tuz Gölü Discharge Area

Soil analyses results are checked by the soil experts according to the anion and cation rates and by the flora/fauna experts according to the ecological changes at the brine spread area as information for the studies to be conducted at the Tuz Gölü Basin.

The EIA Studies for Gas Storage Expansion Project (GSEP)

In the scope of the works to determine the current condition, the soil sample was obtained to carry out heavy metal analyses in the scope of the Regulation on Soil Pollution Control and Point Source Contaminated Sites, at 4 points shown on the current condition map in Appendix-5 and given Picture 4.8.2.1. The heavy metal analyses were carried out at the ÇINAR Environmental Laboratory and results are given below in Table 4.8.2.2. for the baseline data.

Picture 4.8.2.1. Soil Sampling Photos for the EIA Process of Gas Storage Expansion Project

Table 4.8.2.2. Soil Analysis Results of the EIA Studies for the Gas Storage Expansion Project

Parameters	SSP-1	SSP-2	SSP-3	SSP-4	Limit Values SF = 10*
pH	7.70	7.82	8.02	7.79	-
Electrical Conductivity (µS/cm)	121.8	232	159	254	-
Zinc (mg/kg)	34.0	10.2	7.14	8.52	6811
Cadmium (mg/kg)	0.115	<0.05	<0.05	<0.05	27
Lead (mg/kg)	9.13	1.21	<0.05	<0.05	135
Arsenic (mg/kg)	5.11	<0.05	<0.05	<0.05	3
Copper (mg/kg)	6.22	<0.1	<0.1	<0.1	514
Chromium (mg/kg)	24.3	1.06	2.56	2.37	10
Barium (mg/kg)	140	86.9	399	151	288
Cobalt (mg/kg)	6.78	3.24	0.348	1.34	5
Nickel (mg/kg)	36.5	17.2	2.97	6.98	13
Vanadium (mg/kg)	16.5	<0.05	<0.05	<0.05	2556
Total Petroleum Hydrocarbons (TPH) (mg/kg)	<100	<100	<100	<100	146
BTEX (mg/kg)	0.2	0.18	0.28	0.19	-
*TOX (mg/kg)	<200	<200	<200	<200	-

**Regulation on Soil Pollution Control and Point Source Contaminated Sites, Appendix 1, SF=10; Transport of pollutants to groundwater and drinking of groundwater, Other Situations (> 3m to aquifer layer)*

According to the soil analyses results, some heavy metals such as arsenic, chromium, cobalt, nickel have been determined above the standards of Regulation on Soil Pollution Control and Point Source Contaminated Sites, (Appendix 1, SF=10) especially at SSP-1 and SSP-2 sampling points at the planned project areas of the Gas Storage Expansion Project. Comparison of the soil monitoring results that conducted during construction of the Gas Storage Expansion Project will be performed according to considering of these high values.

The ESIA Process for Gas Storage Expansion Project (GSEP)

In the scope of the works to determine the current condition of the fresh water line route, the soil sample was obtained to carry out heavy metal analyses in the scope of the Regulation on Soil Pollution Control and Point Source Contaminated Sites at the 4 points shown on the current condition map in Appendix-5. The heavy metal analyses were carried out at the ÇINAR Environmental Laboratory and comparison of the soil parameters and standards are given in Table 4.8.2.3. below for the baseline data.

Table 4.8.2.3. Soil Analysis Results of the ESIA Studies for the Fresh Water Line Route

Parameters	SSP-5	SSP-6	SSP-7	SSP-8	SSP-9	SSP-10	SSP-11	SSP-12	SSP-13	SSP-14	Limit Values SF = 10*
pH	8.24	8.42	8.05	8.63	8.53	8.22	8.31	9.9	9.85	8.74	-
Electrical Conductivity (µS/cm)	104.3	89	89.4	38.6	107.3	88	101	455	2,420	2,372	-
Zinc (mg/kg)	899	14.93	26.89	45.28	34.45	33.72	22.87	20.65	6.042	9.53	6811
Cadmium (mg/kg)	2.064	<0.05	0.056	0.053	0.135	0.159	0.119	0.06	<0.05	<0.05	27
Lead (mg/kg)	136	4.53	8.43	8.64	13.29	9.302	6.632	6.299	1.964	3.129	135
Arsenic (mg/kg)	101.4	12.25	3.32	24.3	12.3	9.35	8.65	8.806	30.8	366	3
Copper (mg/kg)	9.07	4.25	5.15	13.69	7.86	13.92	6.94	9.73	2.97	4.029	514
Chromium (mg/kg)	9.12	4.33	17.42	24.47	19.64	70.77	22.7	25.83	6.72	9.82	10
Barium (mg/kg)	634	49.16	121.3	89.23	141.5	156.3	71.9	62.1	134	64.65	288
Cobalt (mg/kg)	7.044	2.27	4.55	5.14	5.093	11.66	5.88	5.69	1.44	1.966	5
Nickel (mg/kg)	18.01	6.45	16.19	14.04	23.07	99.89	26.34	36.49	8.48	11.37	13
Vanadium (mg/kg)	25.1	20.88	18.97	30.38	19.96	34.87	24.68	27.26	48.54	53.47	2556
Total Petroleum Hydrocarbons (TPH) (mg/kg)	191.1	176.8	189.9	158.53	163.3	170.7	164.6	143.6	171.4	173.6	146
BTEX (mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-
*TOX (mg/kg)	49.8	170.4	296.1	86.5	40.9	126.4	38.8	24.7	205.9	34	-

Regulation on Soil Pollution Control and Point Source Contaminated Sites, Appendix 1, *SF=10; Transport of pollutants to groundwater and drinking of groundwater, Other Situations (> 3m to aquifer layer)

According to the comparison table above; SSP-5 sample point is more contaminated than the others due to above the standards of Lead, Arsenic, Barium, Cobalt, Nickel and TPH parameters. Due to currently contamination level of the soil structure at the planned project areas, potential pollution of the soil during the gas storage expansion project; probable soil pollutants will be continuously monitored and pollution status of the project areas will be investigated by BOTAŞ.

4.9 Groundwater

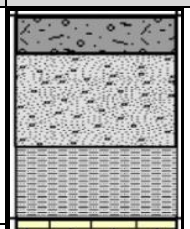
4.9.1 Hydrogeology

When we examine the groundwater resources around Tuz Gölü (Tuz Gölü), it is observed that the mentioned resources are mainly located within the scope of the Eşmekaya reeds on the south side of Tuz Gölü and the reed-swamp areas at the southwestern side of Tuz Gölü. The Eşmekaya reeds are located at an approximate distance of 22 km to the northwest of the project area. There are also source formations as the result of the faulting within the scope of the Peçenek formation (sand-pebble) and the alluvium near the Peçenek stream located at the Tuz Gölü E-SE location. It is thought that most of the sources within Tuz Gölü's sub basin are dry.

The sources at the Eşmekaya reeds are the most important source group and feed Tuz Gölü. The springs at the Eşmekaya reeds are the Ürbük, Memduh, Çakıöz, Beşpınar ve Bağırtlak Springs, and currently most of them are dry and their flow rates have dropped significantly.

There are many underground wells (approximately 20,149 pieces) with and without permits, within the boundaries of the Sultanhanı-Obruk and Karapınar sub basins, where the surface facilities and drilling areas planned within the scope of the project are located. Most of the wells are used for agricultural irrigation and as utility water in the region. The underground static level varies between 7.70 – 83.00 m, the dynamic level between 13.49 – 88.90 and efficiency between 20 - 60 lt/sn within the scope of the wells around the areas, planned within the scope of the project.

The most important units that carry the groundwater at the southern section of Tuz Gölü; where a large part of the drilling areas, surface facility area, brine discharge, natural gas and fresh water lines planned within the scope of the project are located, are the Quaternary period alluviums; clayey, sandy, gritty levels that belong to the Tuz Gölü formation and the limestone levels of the Miocene period units. The limestones with carstic properties and plenty of fractures-cracks within the Miocene period units constitute important aquifers in the basin. The hydrogeological properties of the geological units surfacing to the south section of Tuz Gölü are given in Figure 4.9.1.1.

Period	Stratigraphy	Formation	Symbol	Lithology	Hydrogeological Properties
Quaternary		Alluvium	Qal	Clay, sand, pebble	
		Tuz Gölü Fm.	Qtu	Clay, sand, pebble	Good in terms of groundwater
		Tuz Gölü Fm. Alibekağılı Member	Qtua	Sand, silt, limestone	
Miocene - Pliocene		Peçenek Fm. Kışladağ Member	Tpa	Limestone	Small amounts of ground water
		Kızılkaya Fm.	Plk1	Ignimbrite	Found as positioned on tuffs
		Keçikalesi Volcanite	Tmke	Andesite, basaltic andesite	
		Kulaklıdağ Volcanite	Tmku	Andesite, basaltic andesite	Groundwater is found in andesite and basalt cracks
		İnsuyu Fm.	Tmi	Yellow, thin-layered marn, lacustrine limestone with medium level	Carries plenty of groundwater
Oligocene		İncik Fm.	Toi	Pebble stone, clay stone, sand stone, silt stone, gypsum	Weak groundwater
Eocene		Çayraz Fm. Arzılar Limestone Member	Teça	Neritic limestone	Contains groundwater in its cracks
Paleozoic		Bozçaldağ Fm.	Pzb	Marble	Carries groundwater in its cracks
		Kalkanlıdağ Fm.	Pzka	Quartzite, gneiss, mica schist	No groundwater

T= Conductance coefficient (m^3/day/m) QS= Specific Capacity (lt/sn/m) EC=Electrical Conductance (micromho/sn)

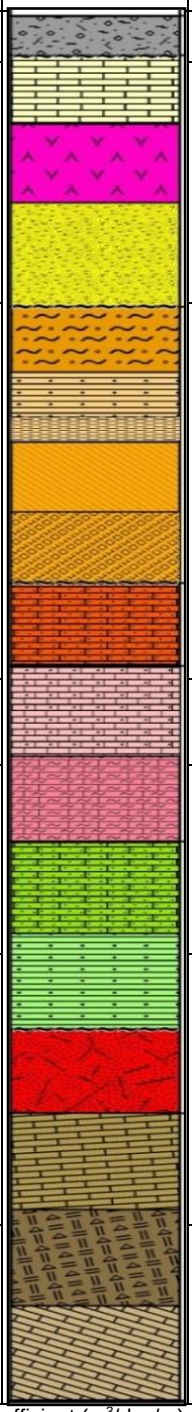
Figure 4.9.1.1. The hydrogeological properties of the geological units surfacing the south section of Tuz Gölü (Obruk-Sultanhanı Plain)
Source: *DSİ IV. Regional Directorate, 1975, Obruk Sultanhanı Groundwater Reserve Report*

Therefore, the new drillings planned within the scope of the Gas Storage Expansion Project shall be opened starting from the Insuyu formation that carries the groundwater in the region, and when the aquifer and groundwater levels are taken into account within the scope of the region, in order to prevent the mixture of the possible drilling leakages with the groundwater, especially the first 100-110 m of the drillings shall be made by using completely closed protection pipes that insulate the aquifer environment. The wells/caverns to be formed other than those are going to be created within impermeable salt domes around 1,150 – 1,500 m in depth and very far below the aquifer environment with 100 - 150 m thickness from the surface, and no negative effect is expected from the caverns against the regional groundwaters.

Within this scope, the groundwater samples have been regularly obtained and observed since 2013 (from the 0553438-East, 4216849-North global coordinate points shown on the topographical map in Appendix 2) in order to determine the interaction of the project with the groundwaters within the scope of the observation program created within the scope of the Underground Gas Storage Project, for which construction works still continue. No change was observed in the scope of the current quality level of the groundwater in the region as a result of these studies.

Regular groundwater samples are going to be taken and observed according to the observation program to be created similar to the Underground Gas Storage Project, for which construction works still continue, from the new groundwater observation and control points to be determined according to the final condition of the well locations within the scope of the planned Gas Storage Expansion Project

Quaternary period alluviums, Pliocene period sand and gritty units and Cretaceous period granitoids that spread in the northwest-southeast direction that constitute the east edge of the Peçeneközü basin and the Mesozoic period marbles that are widely spread are the main formations with aquifer properties within the Peçeneközü Basin on the east side of Tuz Gölü, where some of the fresh water line routes and auxiliary surface facilities (pump stations and water storage tanks) are located. Mesozoic period marbles have a structure of plenty of fractures-cracks and feed the units at the lower elevations with groundwater flow. Cretaceous period granites have a structure with plenty of cracks-fractures especially at the high sections and the sections close to the surface. However, these cracks are not very deep and their lengths and interrelations are not wide, and therefore they only have aquifer properties at a regional scale. Regional groundwater is fed by rains and as the result of infiltration from the surface flow. The hydrogeological properties of the geological units surfacing to the east section of Tuz Gölü are given in Figure 4.9.1.2.

PERIOD	STRATIGRAPHY	FORMATION	Symbol	Lithology	Hydrogeological Properties
Quaternary		Alluvium	Qal	Clay, sand, pebble	Carries groundwater (common aquifer) QS= 0.3 -20 T= 26-2000
Miocene - Pliocene		Peçenek Fm. Kışladağ member Peçenek Fm. Göstük Tuff Member Peçenek Fm.	Tpa Plkü Tpc	Limestone Tuff Sand, pebble	Carries groundwater (local aquifer) QS= 0.1 -0.75
Oligocene		İncik Fm. Şıhkuyusu Member İncik Fm. Mezgit Fm. Tepeköy Kumtaşı Boğazdere Fm. Kızılöz Fm.	Toiş Tol Tmt Tb Tk	Pebble, sand stone, clay stone, gypsum Gypsum bearing sand stone, clay stone Sand stone Gypsum, anhydride Conglomerate, sandstone	Does not carry groundwater (impermeable) Does not carry groundwater (impermeable) Does not carry groundwater (impermeable) Carries salty groundwater locally (weak aquifer) Does not carry groundwater (impermeable)
Eocene		Boyalı Fm.	Tb	Sandstone, limestone	Carries small amount of groundwater QS= 0.1-3
Paleocene		Kırkkavak Fm. Çaldağ Fm.	Tck1 Tc	Alg limestone Alg limestone	Does not carry groundwater (impermeable) Carries small amount of undrground water
Cretaceous		Asmaboğazı Fm. Kartal Fm. Middle Anatolia Granitoid	UKra UKra Kog	Gray colored calcite, siliceous veined sandy limestone Red conglomerate, sandstone, mudstone, gypsum Granodiorite, granite,	Does not carry groundwater (impermeable) Does not carry groundwater (impermeable) Carries small amount of groundwater QS= 0.2-8
Mesozoic		Bozçaldağ Fm. Kaleyboynu Fm. Kalkanlıdağ Fm.	Pzb Pzka Pzk	Marble Schist, Quartzite, gneiss Marble	Carries groundwater (local aquifer) Does not carry groundwater (impermeable) Does not carry groundwater (impermeable)

T= Conductance coefficient (m^3/day/m) QS= Specific Capacity (lt/sn/m) EC=Electrical Conductance (micromho/sn)

Figure 4.9.1.2. They hydrogeological properties of the geological units surfacing the Peçeneközü basin and east section of Tuz Gölü

Source: *DSİ IV. Regional Directorate 1975, Tuz Gölü East Section-Peçeneközü Basin Groundwater Reserves Report,* Değirmenci , M.,1981)

4.9.2 Groundwater Use

Groundwaters are especially used for the irrigation activities of the agricultural lands at UGS Project and GSEP areas. In addition, within the scope of GSEP; two groundwater wells are planned to be opened in the case of any need, and the necessary permits will be obtained in accordance with the Law on Groundwater No.167.

4.9.3 Groundwater Quality

Underground Gas Storage Project (UGS Project) / 3rd party Monitoring Studies

In addition to the total analyses in the month, groundwater analyses are conducted upon the request of BOTAŞ. Groundwater samples are taken from the well of the settlement which is near the UGS drilling sites to determine the effects of drilling activities on groundwater.

According to the groundwater quality monitoring studies and contents of the chemicals used in the drilling operation, groundwater from the well of the settlements have been analyzed for the following parameters: pH, Dissolved Oxygen (DO), Oxygen Saturation, Electrical Conductivity (EC), Salinity, Sulfate, Chloride, Total Dissolved Solids and Sodium. The latest groundwater analysis results are given below (Table 4.9.3.1., Table 4.9.3.2. and Figure 4.9.3.1.).

Table 4.9.3.1. Groundwater Monitoring Results for December 2016

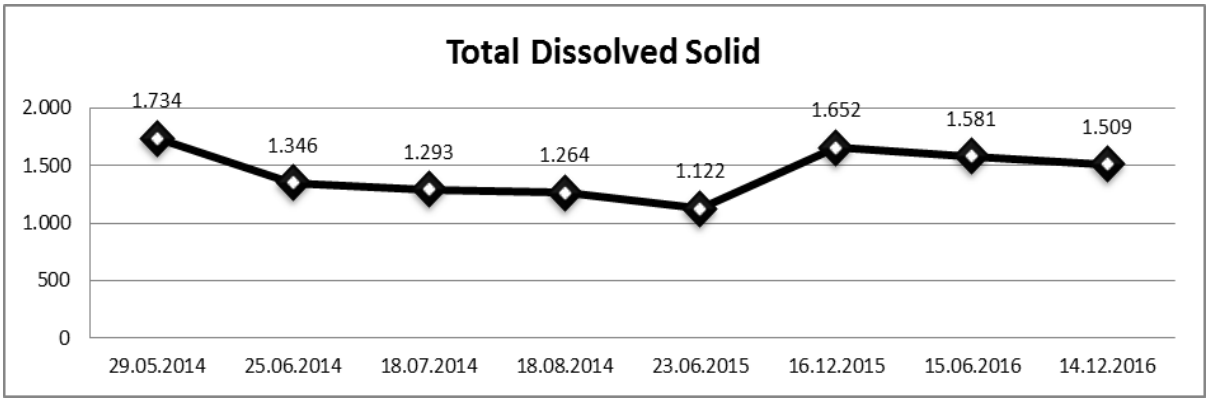
Parameters	Groundwater of Settlement
	Analysis Results
pH	7.64
Temperature (°C)	20.8
Salinity (mg/L)	1.85
Electrical Conductivity (µS/cm)	3,440
Dissolved Oxygen (mg/L)	7.44
Oxygen Saturation (%)	90.9
Sulfate (mg/L)	879
Chloride (mg/L)	700
Total Dissolved Solids (mg/L)	1,509
Sodium (mg/L)	337

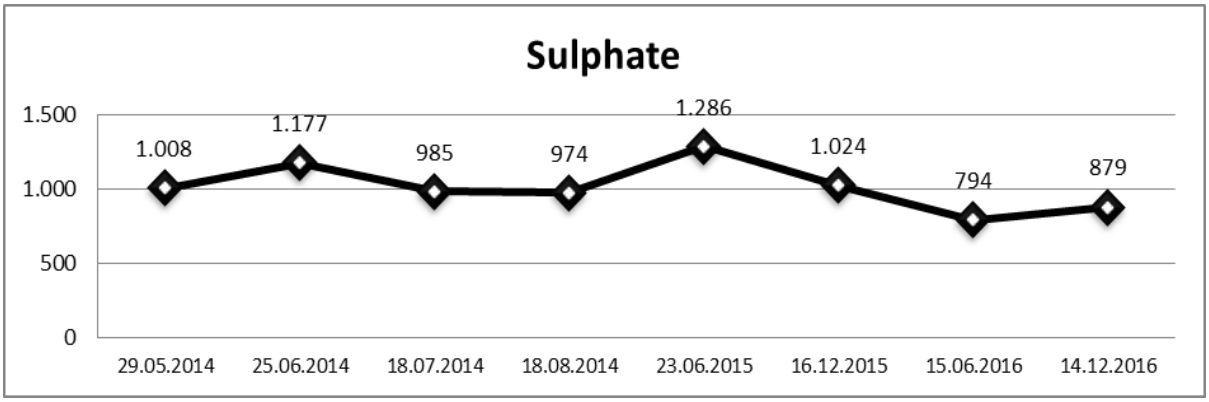
The results of the analyses will be evaluated according to both WHO Standards and the “Protection of Groundwater against Pollution and Deterioration Regulation” for 2012. In the “Protection of Groundwater against Pollution and Deterioration Regulation”, evaluations are made according to the Protection Areas of Groundwater Part of Article 13. According to Article 13, monitoring at wells for potable water should be performed in reference to the “Regulation on Water Intended for Human Consumption Annex-1”.

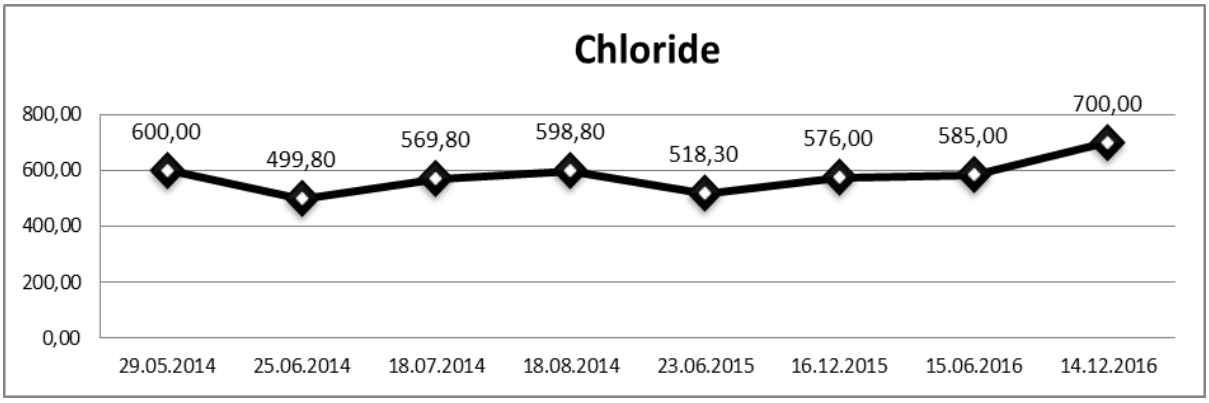
According to these data, due the Electrical Conductivity, Sulphate, Total Dissolved Solids and Sodium parameters being on TS 266 and the WHO limit values, but the groundwater sampling points being in closed basin and non-refreshable aquifer characteristic, so the observation of seasonal contamination in groundwater is possible due the pollutant leakages from the periodic fertilization activities of the farmers on around of the project areas.

Parameters	May 29, 2014	June 25, 2014	July 18, 2014	August 18, 2014	June 23, 2015	December 16, 2015	June 15, 2016	December 14, 2016
pH	8.18	7.01	7.29	6.92	7.51	7.54	7.46	7.64
Dissolved Oxygen (mg/L)	6.70	5.32	5.17	4.72	5.78	7.69	6.10	7.44
Oxygen Saturation (%)	84.30	72.40	75.20	63.20	85.00	79.20	80.50	90.90
Electrical Conductivity (µS/cm)	3,260	2.650	2,550	2,490	2,220	3,350	3,080	3,440
Total Dissolved Solids (mg/L)	1,734	1.346	1,293	1,264	1,122	1,652	1,581	1,509
Sulfate (mg/L)	1,008	1.177	985	974	1,286	1.024	794	879
Chloride (mg/L)	600	499.80	569.80	598.80	518.30	576	585	700
Sodium (mg/L)	334	331	389	369.7	531	315	293	337
Salinity (mg/L)	1.80	1.40	1.30	1.30	1.10	1.64	1.61	1.85

Table 4.9.3.2. Groundwater Analysis Results at UGS Sites







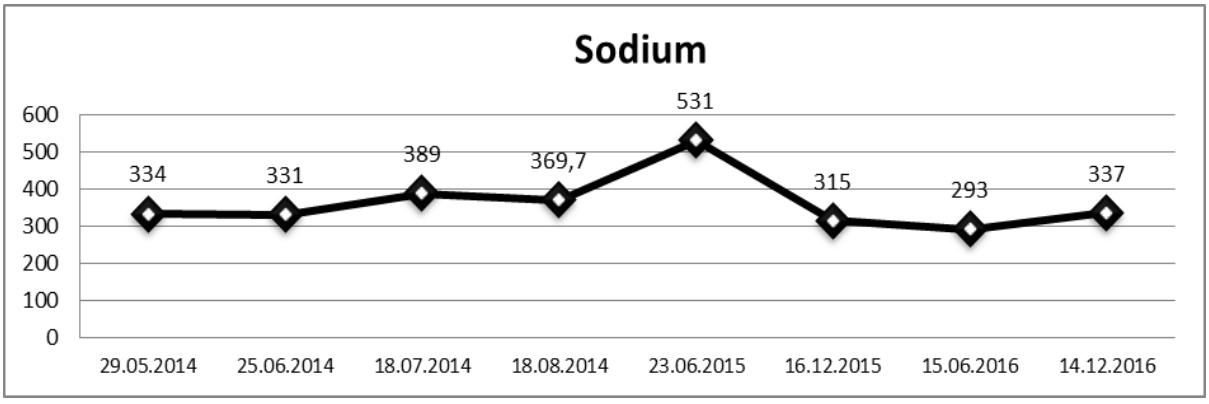


Figure 4.9.3.1. Graphics of Measured Parameters in Groundwater Samples at UGS Sites

The EIA Studies for Gas Storage Expansion Project (GSEP)

Groundwater samples were taken from 2 points within the area of influence of GSEP on November 11, 2016, in the scope of the current condition determination works for the Gas Storage Expansion Project, planned within the borders of Aksaray province, Sarıyahşi, Ağaçören, Ortaköy, Eskil and Central Districts, Konya province, Emirgazi district and Ankara province, Evren district by the BOTAŞ Petroleum Pipeline Corporation (Picture 4.9.3.1.).

Picture 4.9.3.1. Groundwater Sampling and Water Level Measurement at GW-1 Sampling Point for the EIA Baseline Studies

The water samples which were obtained were analyzed at the ÇINAR Environmental Laboratory in the scope of the "Regulation on the Protection of Groundwaters from Pollution and Deterioration" and the results are given in the table below (Table 4.9.3.3.).

Table 4.9.3.3. Groundwater Analysis Results of the EIA Studies for the Gas Storage Expansion Project

Parameters	GW-1	GW-2
pH	7.71	7,04
Dissolved Oxygen (mg/L)	5.21	3,36
Oxygen Saturation (%)	67.3	40,5
Electrical Conductivity (µS/cm)	1,683	1,267
Salinity (mg/L)	0,85	0,72
Suspended Solids (mg/L)	308,3	<10
Sulphate (mg/L)	369	142
Mineral Oil and Derivatives (TPH)	<0,1	<0,1
Chloride (mg/L)	309	159
Nitrate (mg/L)	<0,45	<0,45
Ammonium (mg/L)	<0,061	<0,061
Phosphate (mg/L)	0,086	0,125
Total Cyanide (mg/L)	<0,01	<0,01
Total Pesticide (mg/L)	<0,001	<0,001
Arsenic (mg/L)	0,376	0,052
Cadmium (mg/L)	<0,0005	<0,0005
Lead (mg/L)	<0,0005	<0,0005
Mercury (mg/L)	<0.0001	<0.0001
Trichlorethylene (mg/L)	<0.01	<0.01
Tetrachlorethylene (mg/L)	<0.01	<0.01
AOX (mg/L)	0,949	0,750

Groundwater samples were taken from 4 points along the pipeline routes for determination of the current water quality and water level of groundwater. The analysis results are given below in Table 4.9.3.4.

Table 4.9.3.4. Groundwater Analysis Results of the ESIA Studies for the Fresh Water Line Route

Parameters	GW-4	GW-5	GW-6	GW-7	Limit WHO*
pH	7.13	6.65	8.52	8.48	6.5-8.5
Dissolved Oxygen (mg/L)	8.06	7.77	4.95	4.32	-
Oxygen Saturation (%)	91	87.6	51.6	44.8	-
Electrical Conductivity (µS/cm)	540	2,310	1,937	1.568	-
Salinity (mg/L)	0.26	1.19	0.99	0.79	-
Suspended Solids (mg/L)	508	360	<10	<10	-
Sulphate (mg/L)	27.2	321	119	87.7	250
Mineral Oil and Derivatives (TPH)	<0.1	<0.1	<0.1	<0.1	0.1
Chloride (mg/L)	12	235	196	160	5
Nitrate (mg/L)	46.2	<0.45	2.46	87.7	50
Ammonium (mg/L)	0.12	<0.061	<0.061	<0.061	3
Phosphate (mg/L)	<0.1	<0.1	<0.1	<0.1	0.1
Total Cyanide (mg/L)	<0.01	<0.01	<0.01	<0.01	0.5
Total Pesticide (mg/L)	<0.001	<0.001	<0.001	<0.001	0.001
Arsenic (mg/L)	<0.0005	<0.0005	0.133	0.069	0.01
Cadmium (mg/L)	<0.0005	<0.0005	<0.0005	<0.0005	0.003
Lead (mg/L)	<0.0005	<0.0005	<0.0005	<0.0005	0.01
Mercury (mg/L)	<0.0001	<0.0001	<0.0001	<0.0001	0.006
Trichlorethylene (mg/L)	<0.01	<0.01	<0.01	<0.01	0.02
Tetrachlorethylene (mg/L)	<0.01	<0.01	<0.01	<0.01	0.04
AOX (mg/L)	280	399	139	161	-

** WHO Standards: World Health Organization, Guidelines for Drinking Water Quality, Chemical Summary Tables, Annex 3*

According to the comparison table above; GW-7 sample point is more contaminated than the others due to above the WHO standards of Chloride, Nitrate, Total Cyanide and Arsenic parameters

4.10. Landscape and Visual

As a result of the field studies and literature studies conducted in the area, it was attempted to obtain key findings about the general landscape, flora, geomorphologic structure and soil properties and the state of erosion of the areas in order to determine the landscape elements that can be affected along the energy transmission lines and the routes of the access roads, to identify the effects that may occur on them and to achieve the basic data to be utilized during the landscaping repair process.

When the areas where the main units and ancillary facilities related to the project to be built are examined in terms of landscape, it is observed that these areas generally have almost

uniform land structure in terms of geomorphological aspects, have very weak texture in terms of forest vegetation and terrestrial steppe vegetation is predominantly dominant.

Although the area has a flat land structure and vegetation with steppe characteristics, Tuz Gölü occupying a flat and wide area, is a significant natural and visual landscape value and area with its water surfaces and surroundings (Figure 4.10.1.).

Picture 4.10.1. General View of Tuz Gölü and Its Surrounding

4.11 Cultural Heritage

In the scope of the Gas Storage Expansion Project, there are movable/immovable cultural assets protected in the scope of the legislation number 2863 under the supervision of the T.R. Ministry of Culture and Tourism, Cultural Heritage and Museums General Directorate, the Konya Protection of Cultural Heritage Regional Committee Directorate (for Aksaray and Konya provinces) and the Ankara 2nd Cultural Heritage Protection Regional Committee Directorate, and the planned fresh water line and the area of the well/cavern numbered 20 remains within the parcels registered in the Emirgazi Küllütepe Mound and Adalının Mound as stated in the Notice of the T.R. Ministry of Culture and Tourism, Cultural Heritage and Museums General Directorate, the Konya Cultural Assets Protection Regional Committee Directorate, dated December 29, 2016 and numbered 3236. As can be seen on the topographical map with a scale of 1/25,000, presented in Appendix-2, where these cultural assets are marked, there is no physical intersection with the cultural assets and the required permits are going to be obtained by making an application to the Konya Cultural Heritage Protection Regional Committee Directorate before any kind of physical and construction applications are carried out within the scope of the registered parcels.

The distances of the mentioned cultural assets to the project units are stated in Table 4.11.2.

Table 4.11.2. The distances of the Cultural Assets in Scope of the Project Area and Around, to the Project Units

Planned Facility / Unit	Settlement Area	Cultural Asset	Distance (m) / Direction according to the facility unit
Fresh Water Line	Ankara province, Evren district	Abandoned Graveyard	~ 300 m / Northwest
Fresh Water Line	Aksaray province, Sarıyahşi district	Urungüş Mound	~ 177 m / Southwest
Fresh Water Line	Aksaray province, Ağaçören district	Çatalçeşme Mound	~ 160 m / West
Fresh Water Line	Aksaray province, Central District	Kölü Mound	~ 127 m / Northwest
Fresh Water Line	Aksaray province, Central District	Abidin Mound	~ 169 m / Southeast
Fresh Water Line	Aksaray province, Central District	Adalının Mound	~ 14 m / East
49 No. Well Area	Aksaray province, Central District	Malır Mound Necropolis Area	~ 745 m / Southeast
48 No. Well Area			~ 880 m / Northeast
47 No. Well Area			~ 1,100 m / Northeast
43 No. Well Area			~ 1,100 m / East
38 No. Well Area			~ 625 m / Northeast
35 No. Well Area			~ 660 m / Northeast
32 No. Well Area			~ 710 m / North
Surface Facilities			~ 1,500 m / Northwest
49 No. Well Area	Aksaray province, Central District	Savaştepe Necropolis Area	~ 1,100 m / Northeast
55 No. Well Area			~ 1,122 m / Southeast
Fresh Water Line			~ 957 m / Southeast
44 No. Well Area	Aksaray province, Eskil district	Bezirci Mound	~ 492m / Northwest
45 No. Well Area			~ 770 m / Northwest
20 No. Well Area	Konya province, Emirgazi district	Küllütepe Mound	~ 293 m / Southeast

In addition, during the EIA process of the Gas Storage Expansion Project, experts from the Cultural Assets Protection Agency performed a site walk to investigate the cultural assets on the pipeline routes and at the licensed drilling location areas. There is no critical impact found at the planned project areas to be sourced from project the works of the Gas Storage Expansion Project. According to the investigation results;

- Körü Mound at Aşağı Sapmaz Village and Kuru Mound at Baymış Village has been discovered by the Experts of Protection Agency and these mounds will be registered by them and

- Küllütepe Mound at Emirgazi Disctrict and Adalının Mound at Merkez Disctrict have been determined on the route beside the pipelines.

During the construction activities archeological monitoring will be performed and all studies will be carried out according to the requirements Law No. 2863 on the Conservation of Cultural and Natural Assets (as amended by Law No. 5226) and OP 4.11 policy of the World Bank. In this context, Cultural Heritage Management Plan and Chance Find Procedure have been preapered for Gas Storage Expansion Project (Appendix 7.8.). BOTAŞ is responsible for the management of the plan and implementing of the procedures about cultural heritage and archaeological aspects of Gas Storage Expansion project.

4.12 Waste

It has been observed during the ESIA studies, there is not any waste storage or dump area at the ESIA study areas of GSEP. Municipality's garbages are collected at the waste transfer stations in the border of SEPA (Special Environmental Protection Area) and transported to the Aksaray Garbage Dump Site via the semi-trailers.

4.13 Terrestrial Biodiversity

Within the scope of the Gas Storage Expansion Project, flora and fauna species found in the project area including the pipelines routes are provided in detail below. Relevant legislations for biology are also given below.

Relevant Legislations

Convention on the Conservation of European Wildlife and Natural Habitats (BERN Convention)

National / International: International

Content, Objective and Scope: This Convention, prepared by the EU member states, intends to conserve the natural plant and animal species and their habitats.

Annexes and its Descriptions: Bern Convention consists of 3 appendices. Appendix 1 includes the appropriate and necessary legislative and administrative measures to guarantee the conservation of strictly protected wild flora species. It prohibits the possession or sale of such species.

Enforcement dates and numbers and dates of the Official Gazette: Published in the Official Gazette no. 18318 on February 20, 1984 and entered into force on September 1, 1984.

International Union for Conservation of Nature (IUCN)

National / International: International

Content, Objective and Scope: International Union for Conservation of Nature, also known as International Union for Conservation of Nature and Natural Resources or (IUCN), is an international organization founded for the conservation of natural resources.

Annexes and its Descriptions:

EX: Extinct **EW:** Extinct in the wild

CR: Critically endangered **EN:** Endangered

VU: Vulnerable **NT:** Near threatened

LC: Least concern **DD:** Data deficient

NE: Not Evaluated

For the plant species protected by IUCN in Turkey, the IUCN Red Data Book categories used in the publication named “Red Data Book of Turkish plants” and prepared by Ekim, T. et al. (2000) are listed below:

EX: Extinct **EW:** Extinct in the wild

CR: Critically endangered **EN:** Endangered

VU: Vulnerable **DD:** Data Deficient

NE: Not evaluated **LR:** Lower risk.

Lower risk category has 3 sub-categories that may be listed according to their future threat level:

1) cd - Conservation Dependent: This group contains the taxa that may be included in one of the above-mentioned categories in 5 years.

2) nt - Near Threatened: This group contains the plant species that are not listed in the previous sub-category, but are likely to be included in VU category in the future.

3) lc - Least Concern: This group contains the plant species that are not threatened and do not require any protection.

Enforcement dates and numbers and dates of the Official Gazette: Turkey is one of the member countries.

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, 1975)

National / International: International

Content, Objective and Scope: CITES is an international regulation prescribing the issuance of permissions and certificates for the import, export, re-export, introduction from the sea of, briefly international trade in, specimens of wild animal and plant species, alive or dead, as well as the readily recognizable part or derivative thereof between signatory countries, provided that some requirements mentioned in the Convention are met.

The main objectives of the Convention are as follows:

1. To monitor and, where required, stop the international trade in endangered or potentially endangered species,

2. To prevent the abuse of ecological balance through international trade,

3. To help signatory countries ensure sustainable use of the biological resources they possess.

Annexes and its Descriptions: Among 29,000 animal and plant species, 5,000 species are protected by CITES from over-exploitation through international trade. All protected species and populations are listed in 3 Appendices. Each species or population listed in the Appendices reflects the necessity to control their trade, which threatens them.

Appendix I, about 1200 species, contains species that are threatened with extinction and are or may be affected by trade. Commercial trade in wild-caught specimens of these species is illegal.

Appendix II, about 21,000 species, contains species that are not necessarily threatened with extinction, but may become so unless trade in specimens of such species is subject to strict regulation in order to avoid utilization incompatible with the survival of the species in the wild. In addition, Appendix II can include species similar in appearance to species already listed in the Appendices.

Appendix III, about 170 species, contains species that are listed after one member country has asked other CITES Parties for assistance in controlling trade in a species. The species are not necessarily threatened with extinction globally. In all member countries, trade in these species is only permitted with an appropriate export permit and a certificate of origin from the state of the member country who has listed the species.

Enforcement dates and numbers and dates of the Official Gazette: Published in the Official Gazette no. 22672 on June 20, and entered into force on December 22, 1996.

Regulation on the Implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora

National / International: National

Content, Objective and Scope: The purpose of this Regulation is to set out the procedures and principles for controlling the international trade in animal and plant species under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) through coordination with relevant organizations and institutions in order to ensure sustainable use of those species.

Annexes and its Descriptions: This Regulation covers the procedures and principles for controlling international trade of specimens defined in the 4th article of the Regulation within the framework of CITES.

Enforcement dates and numbers and dates of the Official Gazette: Published in the Official Gazette no. 24623 on December 27, 2001.

Regulation on Dismantling, Production and Export of Natural Flower Bulbs

National / International: National

Content, Objective and Scope: The objective of this Regulation is to regulate the procedures and principles regarding the collection directly from nature, production, harvesting, storage and exportation of the seed, bulb or other parts of the bulbous plants that exist in nature with the aim of protecting them.

Annexes and its Descriptions: This Regulation includes the plant species with bulbs, tubers and rhizomes described as natural flower bulbs whether they are found in nature or not.

Enforcement dates and numbers and dates of the Official Gazette: Published in Official Gazette No. 28358 dated July 19, 2012

Law (5042-08.01.2004) and regulations on the Protection of Plant Breeders' Rights for New Plant Varieties

National / International: National

Content, Objective and Scope: The objective of this Law is to encourage the improvement of plant varieties, and to protect the rights of the breeders and the new varieties. This Law includes all plant species.

Enforcement dates and numbers and dates of the Official Gazette: Published in Official Gazette No. 25551 dated August 12, 2004

Seed Law (5553-31.10.2006)

National / International: National

Content, Objective and Scope: The objective of this Law is to increase the efficiency and quality in plant production; to provide quality assurance in seed plants; to make arrangements regarding seed plant production and trade; and to perform necessary arrangements for restructuring and development of seed planting sector.

Annexes and its Descriptions: This Law includes keeping records of the genetic resources and varieties belonging to the reproduction materials of field crops, vineyards and orchards plants, forest plants and other plant species; and regulations regarding production, certification, market supervision of seed plants, and institutional structuring.

Enforcement dates and numbers and dates of the Official Gazette: Published in Official Gazette No. 26340 dated November 8, 2006

Pasture Law (4342-25.02.1998) and Regulation

National / International: National

Content, Objective and Scope: The objective of this Regulation is to regulate the procedures and principles regarding the implementation of the Act on Amending Certain Provision of the Pasture Law No. 4342, 25/02/1998 and Pasture Law No. 4368, 11/06/1998

Annexes and its Descriptions: This Regulation includes meadows, mountain pastures, winter shelters, and public prairies and grasslands

Enforcement dates and numbers and dates of the Official Gazette: Published in Official Gazette No. 23272 dated February 28, 1998

Forestry Law No. 3071 and Implementation Regulations

National / International: National

Content, Objective and Scope: Principles regarding forest management such as forest planning, operation and protection are determined.

Enforcement dates and numbers and dates of the Official Gazette: Published in Official Gazette No. 28750 dated August 29, 2013

Law on Plant Protection and Agricultural Quarantine (6968-15.05.1957)

National / International: National

Content, Objective and Scope: Includes the procedures and principles in regards to the usage, sales, citation, manufacturing, export, import of the agricultural pest control tools and pesticides; protection of all plants from diseases and pests, and their exportation, importation and transportation within the country.

Enforcement dates and numbers and dates of the Official Gazette: Came into effect on December 22, 2000.

4.13.1 Scope and Methodology

Scope, Objectives and Methodology of Habitat Studies

Terrestrial habitats and ecosystem field data was collected to:

- ground thruth the EUNIS level 2 and level 3 habitat classification map.

Source of Information

The data presented in the report have been compiled as a result of the observations carried out in the field survey and the literature researches.

Terrestrial Habitats and Ecosystem Analysis Methodology

Results of the flora and fauna survey were used to confirm the actual classification of habitats conducted by interpretation of remote sensing data during desktop studies. Analysis of flora species assemblages was help to confirm the classification and eventually to identify phytosociological units. Results of the ground thruthing during field studies allow to refine and correct the habitat map and to prepare a final habitat map as the main result.

In the identification of the habitat and ecosystems; the literature used in distribution and containing the species and other information are in alphabetical order are Akman, 1981; Akman et al., 1978; Akman et al., 1979; Barkman et al., 1986, Davies et al., 2004 and Quezel et al., 1980.

Scope, Objectives and Methodology of Flora Species

Terrestrial flora field data was collected to:

- confirm the presence and distribution of terrestrial flora species particularly within natural habitat areas in the fresh water line (250 m corridor), brine discharge line (250 m corridor), Surface facilities and salt caverns;
- determine the presence of endemic, restricted-range, critically endangered and endangered flora species in the fresh water line (250 m corridor), brine discharge line (250 m corridor), Surface facilities and salt caverns.

Source of Information

The information presented in the report was compiled by observations made during the field studies and the identification of the plants collected in such studies.

Flora Sampling Methodology

Impacts on Natural habitats (IFC, 2012), deriving from the construction of the fresh water line, brine discharge line, Surface facilities and salt caverns probably will have to be minimized by specific habitat restoration activities. The field work was assessing the vegetation present before the construction of the fresh water line, brine discharge line, Surface facilities and salt caverns, in order to guide restoration management activities.

The level 2 and level 3 EUNIS Habitat type map was used as starting point for flora field studies. Flora sampling locations were selected to adequately represent each of the tentatively assigned EUNIS level 2 and level 3 habitat types and investigated methodology is as following.

The general following approach is adopted:

- surveys were performed in the flowering season (according to Turkey climate; May to June),
- plants in quadrats were counted and if necessary collected to identification (Picture 4.13.1.1. and Picture 4.13.1.2.),
- collected speciemens were pressed (Picture 4.13.1.3) and identified in Ankara University Herbarium.

Picture 4.13.1.1. Field Studies-I

Picture 4.13.1.2. Field Studies-II

Picture 4.13.1.3. Pressing of Collected Plant Species

In order to identify the presence of endemic, restricted range, critically endangered or endangered species, random transect surveys were performed in the habitats selected for the quadrats survey, focusing in particular on ecotones and micro habitats interesting for the species of concern potentially present in the area.

In case of restricted range, critically endangered or endangered species were discovered, the following data were collected:

- Area of the populations;
- relative abundance on the Braun-Blanquet cover scale (Sutherland, 2006);
- ecological conditions of the site (if possible soil and main rock types, slope, altitude, cardinal direction);

Floristic list are given according to the phylogenetic order in the Flora of Turkey and families under each group were sorted in accordance with the phylogenetic order in the Flora of Turkey then it is categorized in alphabetical order. Species are given with their classifications, phytogeographical regions, whether it is endemic or not, conservation categories of endemic and rare species, their habitat, and abundance of each species within the area will be given respectively.

Plants collected from the study area were determined using relevant floras (Brummitt, 2001; Donner, 1990; Eken et al., 2006; Ekim, 2007; Güner, 2012; Güner et al., 2012; Kaynak et al., 2007; Özhatay, 2006; Özhatay et al., 2003, Seçmen and Leblebici, 1997), the work Flora of Turkey 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, conservation categories were revised in accordance with IUCN 2001.

Endemic, rare species and species under international conservation, as well as significant habitats were determined within the determined species. Areas where endangered species concentrates along the fresh water line (250 m corridor), brine discharge line (250 m corridor), surface facilities and salt caverns and sensitive ecosystems are reported including reasons and such areas were referred as "No Go Areas". These no-go areas are highly sensitive to deterioration either due to rare species they contain or to the fact that necessary measures were not taken (such as grazing). These measures are not connected to the project itself. The effects on these areas are mainly of the farmers and villagers at the surrounding.

Scope, Objectives and Methodology of Fauna Studies

Terrestrial fauna field data was collected to:

- confirm the presence and distribution of terrestrial fauna species within natural habitat areas;
- identify the presence of endemic, restricted-range, critically endangered and endangered, migratory and congregatory fauna species;
- if there are habitats that require preservation on global or national level, borders of such habitats was determined.

Source of Information

The data presented in the report have been compiled as a result of the observations carried out in the field study and the literature researches.

Fauna Sampling Methodology

The methods of Fauna Baseline Field Study were addressed to search for evidence of fauna presence, and assess the suitability of the habitats to support their populations. Mammals, birds, reptiles and amphibians were considered as priority taxa. Arthropods were added according to literature.

Mammals

Even though terrestrial small mammals are often quite abundant, they are rarely observed and their tracks are rarely seen and hard to identify to species. However, they can be easily

sampled with sufficient numbers of traps or pitfalls (e.g. Standard Sherman Live Trap). Species specific to habitat types were determined by setting live animal traps at sufficient number, in order to represent habitat types.

Observational methods were used which suitable for medium-sized and large mammals, in particular as (i) direct observations and (ii) identification of dung, tracks and any other signs.

Priority aim in site studies was to find out species diversity in stations to be determined according to habitat types along the line. To this end, transect method was used. During transects minimum 30 minutes walk in order 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.

Information from local folk, especially hunters and foresters, were utilized in the study. Sometimes local knowledge (especially from hunters) was useful for a preliminary list of species and/or help with identification of signs.

Birds

Within the scope of the Project, techniques called “point count method” and “transect count method” were used (Bibby et. al. 1998).

Each point was studied about 30 minutes in duration. Observations were performed at also transects, simultaneously by two observers, at opposite directions along the midline of the brine discharge line and fresh water line route 125 m distance band from the lines was surveyed and totally 250 m width area, UGS sites and surface facilities were surveyed. All identified bird species seen or heard within a 250 m distance parallel with the observers track, UGS sites and surface facilities was recorded.

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.

Direct observations and interviews with local people were performed in order to identify the ornithofauna components in the bird survey points.

Besides, data from the literature, obtained in surveys on the region carried out in previous years, were used.

Bird species and their habitats in the areas were documented using advanced optical equipment (binoculars and monocular telescopes) in the site surveys. Also species’ photos were taken when it is possible.

Reptiles

Within the scope of the Project, reptile species were determined in specific microhabitats (e.g., under rocks, bushes). Each sampling study was about 30 minutes in duration.

For each sampling points, identified species were recorded. Also species' photos were taken when it is possible.

Amphibians

Within the scope of the Project, amphibian species were determined in specific microhabitats (e.g., near water, bushes, under soil). Each sampling study was about 30 minutes in duration.

For each sampling points, identified species were recorded. Also species' photos were taken when it is possible.

Arthropods

Arthropods were added according to literature. Especially "The biodiversity of Tuz Gölü Project" between 2005-2007 was used. Also literature findings from near habitats were evaluated.

4.13.2 Eco Region Description

Turkey is under influence of various climates due to its geographical position. Therefore, oceanic climate is governs the northern, and especially Black Sea facing ridges of North Anatolia and Yildiz (Stranja) Mountains at north; Mediterranean climate governs the surroundings of Marmara Sea, Aegean and Mediterranean Regions; and continental climate governs the Central, Eastern and Southeastern Anatolia. Thus, our country includes humid-warm climate which dominates west of continents at the east of oceans, at Anatolia and north of Thrace; subtropical at Aegean and Mediterranean; continental climate which dominates central sections of continents, at the central and eastern regions of Anatolia. Cold climate conditions which is effective at northern latitudes is observed at high mountainous areas. Due to this, presence of different areas and phytogeography regions in terms of plant cover is a necessity of natural conditions in Turkey (See. Figure 4.13.2.1) (Atalay, 2002).

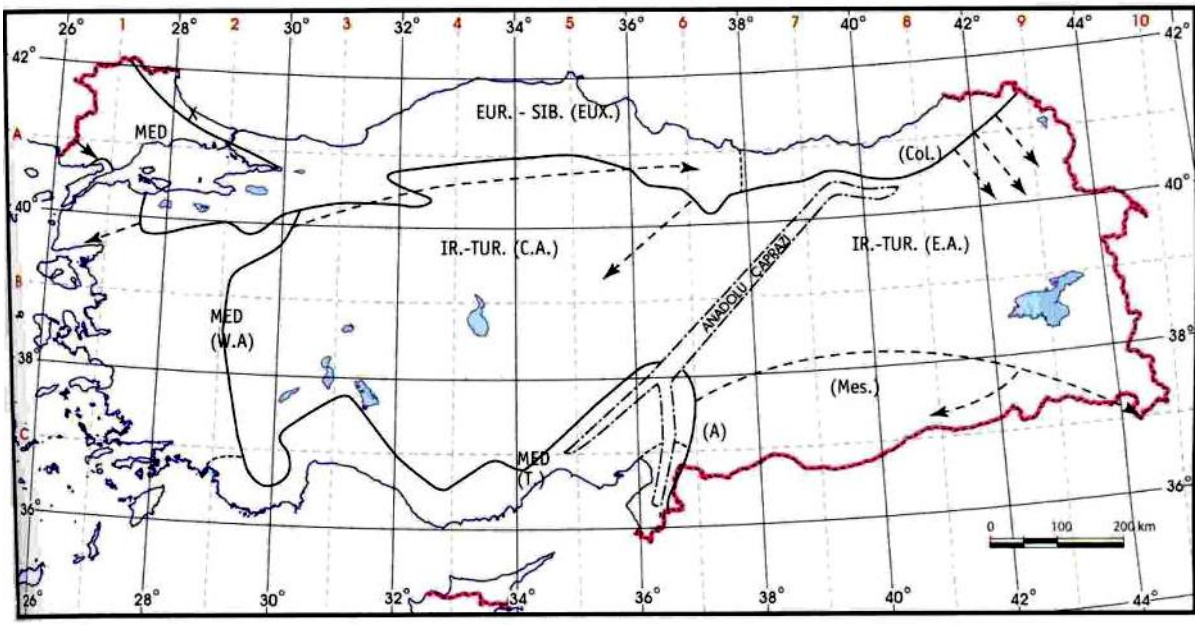


Figure 4.13.2.1. Phytogeographic Regions and Anatolia Diagonal at Turkey

(EUR.-SIB.: Europe-Siberia Phytogeography Region; MED.: Mediterranean Phytogeography Region, IR-TUR.: Irano-Turanien Phytogeography Region)

In a general assessment, northern part of Turkey falls within European-Siberia Flora Region as a whole. Eastern Black Sea Region, starting from east of Ordu Province in the north, falls under kolsch, and western region falls under auxin sub-flora or sections of the same flora kingdom. Northern shores of Marmara Sea, Aegean and Mediterranean Regions forms the Eastern Mediterranean Flora Kingdom. Central and Eastern Anatolia Regions falls within Turanian-ForeAsia or Irano-Turanian Flora Regions, and steppe regions of Southeastern Anatolia falls within Irano-Turanian Flora Region. In short, Turkey is a country where Euro-Siberia, Mediterranean and Irano-Turanian flora regions are present together (Davis, 1985; Davis, 1988).

Along with this, elevation and aspect conditions make distinction of these flora regions from each other with distinct regions difficult. For example, while dry forests are present at the south facing ridges of mountains, xenophytic bushes are present at valleys and depressions of auxin flora region. Similarly, plant groups composed of Auxin elements and bush, shrubs and tree group formations are present at north facing ridges and high elevations just as at Nur (Amanos) Mountains of Mediterranean Region. Therefore, different flora parts which have preserved themselves and continued their existence at appropriate ecological conditions, are present at local areas (Davis, 1985; Davis, 1988).

The Project area is located in the Irano-Turanian Flora Regions. This unique region of the central Anatolian basin hosts salt steppe, saline lakes and halophytic vegetation as well as marshes, rivers and freshwater bodies. It represents one of the centers of endemism of the diverse Anatolian flora, with 12 vascular plant taxa endemic to the area's central lake.

This ecoregion is largely comprised of three separate areas of steppe vegetation in central Anatolia. The largest area is dominated by Tuz Gölü and lies in the center of the Anatolian basin. The northern and eastern edges of this area are defined by a long arch in the Kızılırmak River, the biggest river in Anatolia.

Salt steppes and lakes are the principal formations in this region. Tuz Gölü is (max.190,000 ha.), Tersakan Gölü (6,400 ha.), Eşmekaya Marsh, (11,250 ha.), and the Çumra, Ereğli, Çalıkdüzü and Karapınar plains are the most representative examples of these formations. Because of the saline conditions, halophytic plants are favored and woody plants do not occur here. The most abundant species of the salt steppes belong to the Chenopodiaceae and Plumbaginaceae families.

Salt concentrations decrease from the inner to the outer areas of the lakebed and determine the type of the plant communities that grow. Thus, the most salt tolerant species grow near the center of the lakebed while Artemisia steppes are found near the periphery. Another feature that determines the nature of the plant communities in the area is the micro-topography (Zohary 1973), which affects the salt concentration in the soil. Depending on salinity levels, plant communities surrounding Tuz Lake can be described as follows, starting from the inner periphery (Birand 1960, Zohary 1973).

1.*Salicornietum europaeae*: This species is found in areas where the water has just receded; its cover value may reach up to 95 % in some localities (Magnin & Eken 1999).

2. *Halocnemum strobilaceum*: This is an almost monospecific genera whose cover value may reach up to 90 %. Salsola stenoptera and Limonium iconicum may also occur with it.

3. *Atropis distans-Limonium gmelinii* association: This association does not form a continuous belt but rather grows in patches; it is less halophilous than the species below. Other important components of this association are Limonium globuliferum, Juncus maritimus, Plantago crassifolia, Salicornia europaea, and Halocnemum strobilaceum.

4. *Petrosimonia birandii*: This species grows in the muddy sandy soils close to the lake and may form associations with any of the following: Petrosimonia triandra, Salsola anatolica, Halocharis sulphurea, Salicornia herbacea, Kochia prostrata, Suaeda prostarta, Triplospermum praecox, Stipa hohenackeriana, S. lagascae, and Haplophyllum graveolens.

5. *Frankenia hirsuta-Limonium iconium* association: This association can be seen on the gently sloping elevations around Tuz Lake. Some of the other component species are: Frankenia hirsuta, Limonium iconium, Reaumuria alternifolia, Salsola inermis, Camphorosma monspeliaca, Atropis distans, Limonium gmelinii, Halocnemum strobilaceum, Apera intermedia, Kochia prostrata, Petrosimonia brachiata, Salsola vermiculata, and Atriplex tatarica.

6. *Salsola inermis* association: This association lies in the outermost belt of Tuz Lake and is adjacent to non-halophytic Artemisia steppe. It can also be seen near other lakes, such as Aci Lake and Tersakan Lake in the southern Ere?li region. Some of the other species in this association are: Salsola inermis, Aeluropus lagopoides, Camphorosma monspeliaca, Limonium iconium, Artemisia fragrans, Apera intermedia, Petrosimonia birandii, Kochia prostrata, Salsola anatolica, Salsola kali, Cynodon dactylon, Frankenia hirsuta, Bromus tectorum, Hordeum murinum, H. marinum, Agropyron cristatum, Atriplex lasiantha, Agrostis spica-venti, and Reaumuria alternifolia.

Due to the unique water regime here, the life cycle of the halophytic vegetation near the lake is completely different from that of the surrounding steppe vegetation. The flowering season of these halophytes lasts from August to October, when all other steppe formations are experiencing the dry season period of slow growth.

4.13.3 Key Biodiversity Areas

Key Biodiversity Areas (KBAs) are the places of international importance for the conservation of biodiversity at the global level. The concept of KBAs has been developed by conservation organizations including Bird Life International, Conservation International, and Plant Life International. Recently, a global initiative named “The Alliance for Zero Extinction” (AZE) has been launched to identify and protect the last remaining habitats, which are KBAs for the world’s most threatened species. In 2006, Doğa Derneği published the book “Key Biodiversity Areas of Turkey” which is also available in the Official Website of Doğa Derneği. This book identifies 305 KBAs which cover 20.280.149 hectars, equivalent to Turkey’s 26 % surface area. Among these, 106 are Important Bird Areas (IBAs) of global significance.

KBAs in Turkey are inadequately protected. 71 KBAs have one protection status and 52 others have more than one. 176 KBAs do not have any kind of protection. However, less than 14% of the surface area of KBAs in Turkey is legally protected.

These KBAs also constitute the basis of scientific studies that are carried out within the scope of Natura 2000 network for Turkey’s EU accession process. Natura 2000 is an ecological network of protected areas in the territory of the European Union (EU). There are two directives of EU that form the Natura 2000 network. These are the Birds Directive (Council Directive 79/409/EEC on the conservation of wild birds) and the Habitats Directive (Concil Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora).

3 KBAs are present at and in the project area; Tuz Gölü KBA, Hirfanlı Barajı KBA and Eşmekaya Sazlığı KBA (Figure 4.13.3.1).

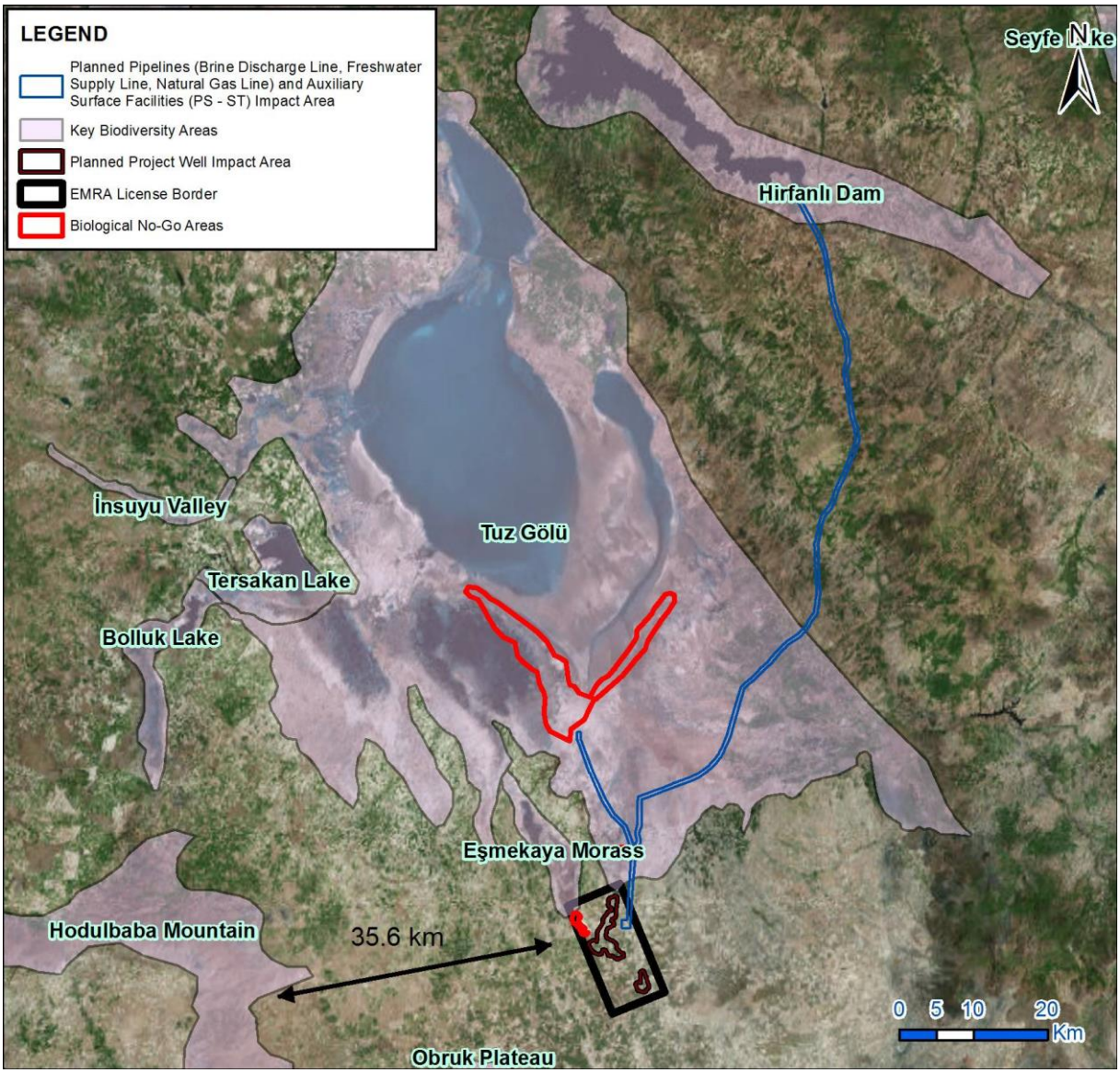


Figure 4.13.3.1. KBAs and the Project Area **Source:** KBAs of Turkey, 2006

It should be noted that there is no conservation status for the KBAs in accordance with the National Environmental Legislation. Tuz Gölü KBA, Hirfanlı Barajı KBA and Eşmekaya Sazlığı KBA includes important habitats and Important Bird Areas (Eken et al., 2006).

4.13.4 Protected Areas

The water intake structure and approximately 3 km of fresh water line from the units to be provided in the scope of the Gas Storage Expansion Project remian within the borders of the Evren district of Ankara province, while 7 of the planned well areas remain within the borders of Emirgazi district of Konya province. Among the protected areas within these provinces, the

Bozdağ Wildlife Development Area (YHGS) within the borders of Konya provinceis approximately 35.6 km from the planned Gas Storage Expansion Project area.

There are 2 protected areas in Aksaray province. These are the Tuz Gölü Special Environmental Protection Area and the Ihlara Valley Special Environmental Protection Area. The Ihlara Valley Special Environmental Protection Area has a bird's eye distance of 57 km to the Project Area and no influence is expected. Approximately 46.5 km part of the planned fresh water line, 23.5 km of the planned brine discharge line, the brine discharge point and approximately 10.5 km of the natural gas branchman line remains within the Tuz Gölü Special Environmental Protection Area, and regarding the mentioned areas, the required permits are going to be obtained by making applications to the Ministry of Environment and Urbanization and Natural Heritage Protection General Directorate, before starting the construction works after the planned Gas Storage Expansion Project EIA process.

These planned lines are in parallel with the currently constructed and operational lines in the scope of the Tuz Gölü (Tuz Gölü) Underground Natural Gas Storage Project, for which construction is continuing. No large-scale effect is expected from these areas, thanks to correct top soil management.

The project area and the surrounding protected areas and their distances to the project area are shown in Table 4.13.4.1. and the image where the protected areas are shown in Figure 4.13.4.1.

Table 4.13.4.1. Project Area, Surrounding Protected Areas and Their Distances to the Project Area

Protected Area	**Distance to the project area***
Tuz Gölü Special Environmental Protection Area	Within the area
Ihlara Valley Special Environmental Protection Area	57 km
Bozdağ Wildlife Development Field	35.6 km

**The distances are bird's eye distances.*

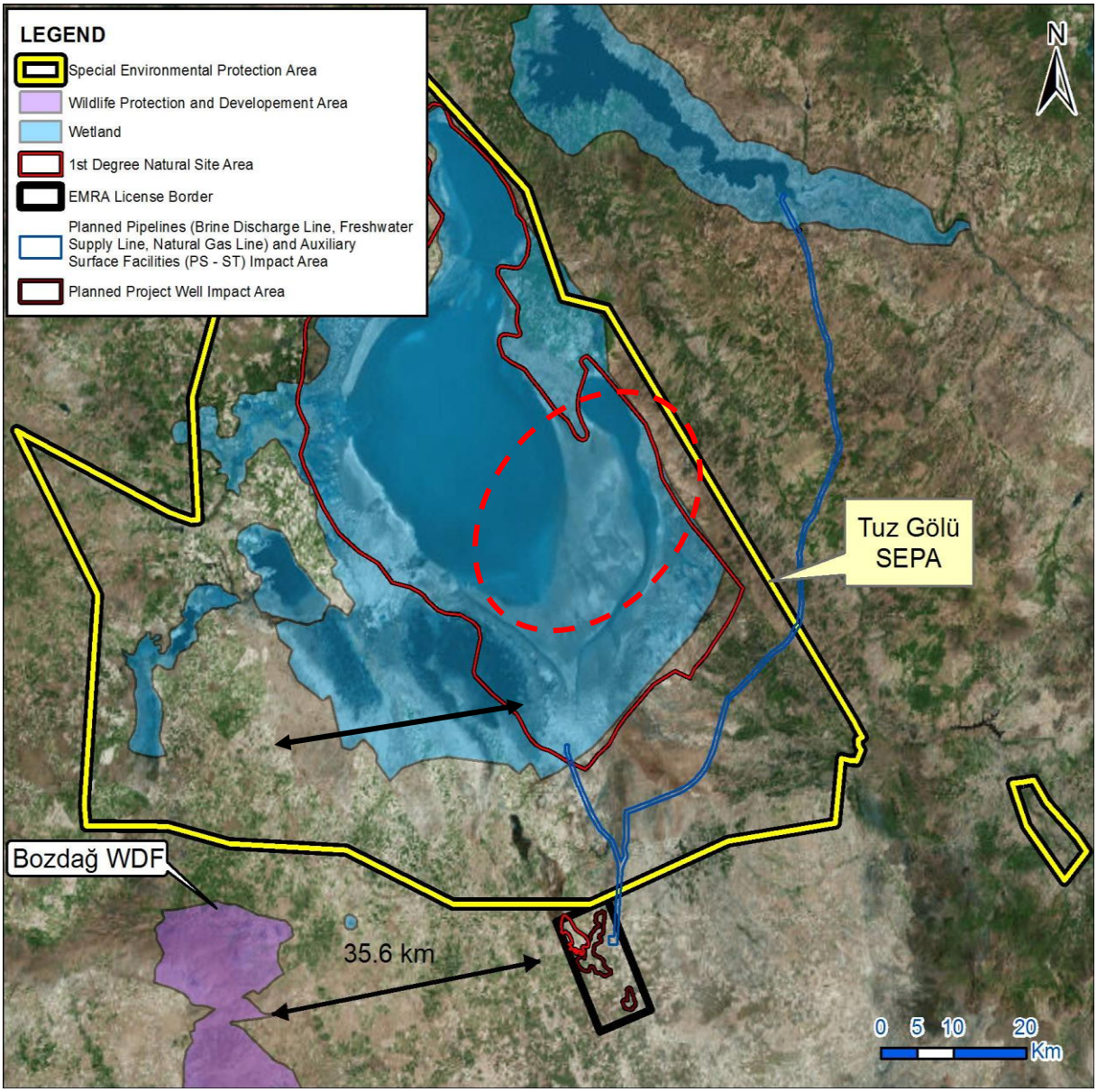


Figure 1.12.4.1. Project Area and Surrounding Protected Areas

Moreover, there are Tuz Gölü and Bezirci (Güneşli) Lake Grade I Natural Protected Areas as stated in the text, dated November 29, 2016 and numbered 4410, issued by the T.R. Aksaray Governorship, Environment and Urbanization Provincial Directorate, Protection of Natural Heritage Branch Directorate attached in Appendix-1.6, within the borders of Aksaray province, around the project areas. In the scope of these areas, approximately 7,5 km part of the brine discharge line and brine discharge point remain within Tuz Gölü Grade I Natural Protected Area. The required permit is going to be obtained from the Nevşehir Natural Heritage Protection Regional Commission before starting the construction works after the EIA process regarding the mentioned intersection.

In the scope of the protected areas, a topographical map with a scale of 1/25,000 is presented in Appendix-2, showing the project units, the Tuz Gölü Special Environmental Protection Area, the Tuz Gölü and Bezirci (Güneşli) Lake Grade I Natural Protection Areas.

4.13.5 Species of Conservation Significance

Plant Species

Based on the desktop and field studies of the Project, flora diversity was identified. As a result of the habitat-based field studies carried out in 20 stations along the project, a total of 315 taxa were identified. The classification of species, sampling stations and habitat information, abundances, conservation and endemism statuses are given in Section 1.12.7.

According to the Red Data Book of Turkish Plants revised in accordance with IUCN 2001, of the taxa identified 1 endangered (EN), 9 are vulnerable (VU) and 2 are conservation depended (LR [cd]). The remaining is listed as least concern (LC) or has not been evaluated. Moreover 12 of these are considered as a restricted range.

Of the 12 species of conservation significance identified during the studies are given in Table 4.13.5.1.

Table 4.13.5.1. Identified Species of Conservation Concern of Flora Species

No	Family	Taxon	IUCN	Endemic / Restricted Range	Potential/ Observation
1	Brassicaceae	*Lepidium caespitosum*	VU	Endemic / Restricted Range	Observation
2	Brassicaceae	*Erysimum torulosum*	VU	Endemic / Restricted Range	Observation
3	Brassicaceae	*Arabidopsis parvula*	VU	- / Restricted Range	Observation
4	Guttiferae	*Hypericum salsugineum*	VU	Endemic / Restricted Range	Observation
5	Plumbaginaceae	*Limonium anatolicum*	VU	Endemic / Restricted Range	Observation
6	Fabaceae	*Sphaerophysa kotschyana*	LR (cd)	Endemic / Restricted Range	Observation
7	Apiaceae	*Ferula halophila*	VU	Endemic / Restricted Range	Observation
8	Asteraceae	*Achillea sieheana*	VU	Endemic / Restricted Range	Observation
9	Asteraceae	*Cousinia iconica*	LR (cd)	Endemic / Restricted Range	Observation
10	Asteraceae	*Centaurea tuzgoluensis*	VU	Endemic / Restricted Range	Observation
11	Chenopodiaceae	*Microcnemum coralloides*	VU	- / Restricted Range	Observation
12	Plumbaginaceae	*Limonium tamaricoides*	EN	Endemic / Restricted Range	Observation

Mammals

None of the species are listed in the IUCN Red list CR and EN categories according the observation studies carried along the project lines and facilities. At the same time, there are no species with probable distribution on the observation route in literature.

All species are listed in the IUCN categories, 8 species are listed in the Bern Convention and 2 species are listed in the CITES appendix. Due to the suitable habitats around the project area, mammals won't be affected form the construction. However construction period of the

fresh water line and brine discharge line will be completed in a very short time. This will prevent the potential impacts of the units on these species at the facility stage.

Due to suitable areas around the project area and large distribution of the mammal species around the project area no species of conservation significance is determined.

Birds

Among the bird species identified in the project area, the bird species which are in the threat categories (CR - EN) of IUCN and / or which have quite low population in Turkey, which form colony (congregatory) and which show limited diversity (restricted range) were classified as "critical species". In this context, *Phoenicopterus roseus* (LC), *Oxyura leucocephala* (EN), *Aquila heliaca* (VU), *Falco cherrug* (EN) and *Streptopelia turtur* (VU) were determined and evaluated. Especially the affect of the water level is evaluated for these species, birding places and generally on their behavior. *Aythya ferina* (VU) feeds in groups on aquatic organisms. Prefers less than 6 meters depth and open waters. It is found in abundant places, where it can find sunken macrophytes and animal food. It is likely to pass the winter in Tuz Gölü. It is not expected to be affected by the increase in water level. It is envisaged that the presence of the specie will not be affected by the project activities. *Oxyura leucocephala* (EN) is seen in the inner waters of Turkey in winter. It usually occurs in compact, closed, semi-permanent or transient fresh waters, coarse waters or eutrophic ponds, including Phragmites or Typha. Prefers large wetlands such as 0.3-0.5 m depth lakes. The project area is not the ideal breeding place for the white-headed duck, but it is likely to be seen in winter. It is unlikely to be affected by the increase of water level. *Aquila heliaca* (VU) is seen in forests, steppes, large wooded fields, plains, river forests and semi-deserts. It breeds in forests, steppes, large wooded farming areas with altitudes of 1000 m and more. This specie is seen at the project area and the surrounding, also it is not thought to be affected because it is not a direct water dependent species. *Falco cherrug* (EN) is seen in step, half-desert, open mountain area and sometimes at water edges. This specie feeds on birds and domesticated pigeons. This specie is seen at the project area and the surrounding, also it is not thought to be affected because it is not a direct water dependent species. *Streptopelia turtur* (VU) is found in shrubs, agricultural land, dry and sunny habitats, parks and gardens. This specie is seen at the project area and the surrounding, also it is not thought to be affected because it is not a direct water dependent species. *Phoenicopterus roseus* might be the most affected specie when the project is evaluated. This specie feeds and breeds at the Tuz Lake. The increase of the water level is a enhancing affect on feeding. Because, the increase of water level forms ponds, where this spicie can feed easily. Breeding places of the specie containes high river banks. The increase of water level without evaporation is 5-24 cm within 6 years. But for a significant evaluation when evaporation, which is % 84 at the area, is considered a 1-5 cm increase of the water level will appear within 6 years. Thus won't have a negative affect of the breeding places of the flamingos, due to flamingos nests are 15-45 cm higher than the water level. Elsewhere with the brine discharge new feeding habitats are formed (Picture 4.13.5.1.).

Picture 4.13.5.1. *Phoenicopterus roseus* feeding at the UGS Project Brine Discharge Area

According to the evaluation above, bird species haven't been classified as species of conservation significance. The project won't have permanent affects and on the other hand new habitats for these species, especially Phoenicopterus roseus might be formed.

Reptiles

Testudo graeca is categorized as "VU" and is not under threat, because it is distributed in a large area in Turkey and has a dense population. However, agricultural activities and collecting from nature to be sold as pet animals are affecting the population. Therefore, before and during the construction period a biologist should control the excavation area and transport the specie to appropriate habitats. Therefore no species of conservation significance is determined.

Amphibians

In the field studies in respect to amphibians carried out along the project, among the observed amphibian species, no species endemic to Turkey nor species in the CR or EN category in accordance with the IUCN was identified. All amphibian species identified are species that can be regarded as having wide distribution.

In addition, there is no species of conservation significance expected to be found in accordance with literature at the local study area.

Arthropods

According to the literature 4 endemic species, 1 “CR” categorized and 1 “EN” categorized were determined. Due to the distribution of these insects target specie haven’t been chosen.

The distribution of the endemic and the “CR”, “EN” and “VU” categorized species are shown below at Figure 4.13.5.1.

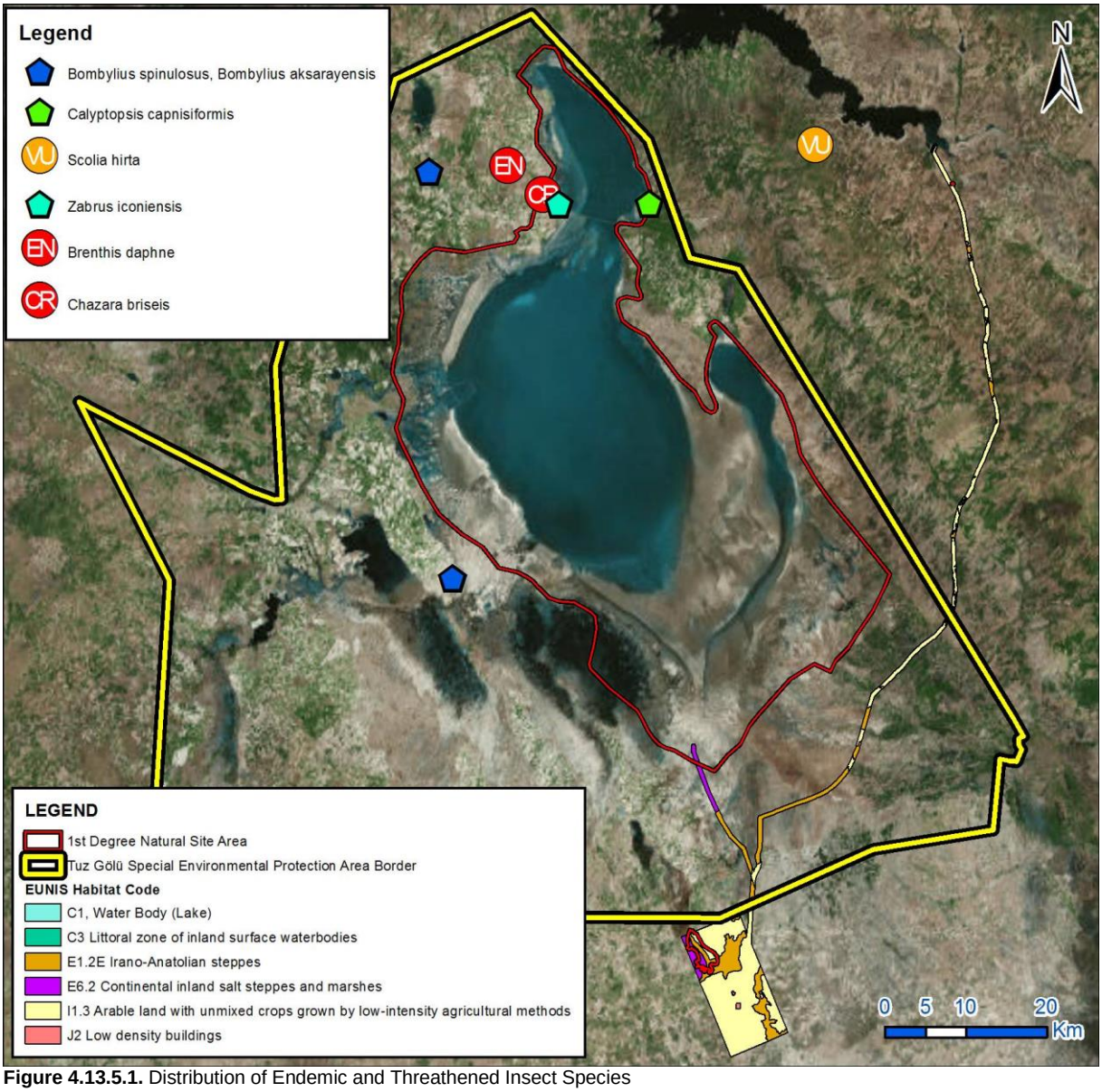


Figure 4.13.5.1. Distribution of Endemic and Threathened Insect Species

(turquois pin = *Zabrus iconiensis* [Endemic], green pin = *Calyptopsis capnisiformis* [Endemic], blue pin = *Bombylius spinulosus* and *Bombylius aksarayensis* [Endemic], VU = *Scolia hirta*, EN = *Brenthis daphne*, CR = *Chazara briseis*)

According to the distribution of endemic and threatened insect species the project area won't cause any impact. Therefore no species of conservation significance is determined.

According to identified species of conservation significance Biodiversity Action Plan (BAP) was prepared and given in Appendix 7.13.

4.13.6 Habitats

The European Union Nature Information System (EUNIS) is a system built to define and classify the types of habitats in Europe. The area of classification is quite broad and encompasses all mainlands and seas of Europe, including the islands close to the mainland (excluding Cyprus, Iceland and Greenland), archipelago of European Union Member States (Canary Islands, Madeira Islands and Azor Islands), and the continental Europe as far as the east of Ural Mountains, encompassing Turkey and the Caucasus.

Accordingly, the region encompassing the Continental Europe, European seas, Turkey and the Caucasus contains 10 different EUNIS habitat types at Level 1 (Davies et al., 2004). The marine (A) and inland surface water (C) habitats are aquatic, whereas the remaining 8 habitat types are terrestrial habitats.

Baseline Results

Although Turkey is much smaller than Europe, it is exceptionally rich in terms biodiversity and terrestrial habitat diversity. Biodiversity and habitat diversity are directly proportional. The higher is the level of habitat diversity in a region, the higher is the level of biodiversity there, because living organisms prefer the suitable habitats for their own lives. The major reasons behind this high level of habitat diversity in Turkey are that Turkey is under the influence of 3 different phytogeographic regions (Mediterranean, Euro-Siberian and Irano-Turanian), that 3 different types of bioclimatic zone can be observed (Mediterranean, Oceanic and Terrestrial), that soil and bedrock diversity is high, that the elevation ranges between 0 and 5,000 m, and that Turkey was not affected by the Ice Age as much as the Europe.

5 different terrestrial habitats (Table 4.13.6.1) at Level 2 and Level 3 were identified at the project areas (Figure 4.13.6.1).

Table 4.13.6.1. EUNIS Level 2 and Level 3 Habitat Types

No	EUNIS Code	EUNIS Habitat Type
1	E1.2E.	Irano-Anatolian steppes
2	E6.2	Continental inland salt steppes and marshes
3	C3	Littoral zone of inland surface waterbodies
4	I1.3	Arable land with unmixed crops grown by low-intensity agricultural methods
5	J2	Low density buildings

E1.2E. Irano-Anatolian steppes: Steppes of the Anatolian Plateau, of Transcaucasia, of the eastern cis-Caucasian hills of Daghestan and the Terek basin, of the Iranian Plateau, the Kopet Dagh, the Pamir-Alai, the extreme western Tien-Shan, around the rim of the Ferghana basin and along the spur of the Karatau, and of northern Mesopotamia.

E6.2 Continental inland salt steppes and marshes: Salt steppes and their associated salt-tolerant herbaceous communities outside the Mediterranean zone. In Europe they are found in the substeppe and steppe zones eastwards from the Hungarian Plain.

C.3. Littoral zone of inland surface waterbodies: Reedbeds and other water-fringing vegetation by lakes, rivers and streams; exposed bottoms of dried up rivers and lakes; rocks, gravel, sand and mud beside or in the bed of rivers and lakes.

I1.3. Arable land with unmixed crops grown by low-intensity agricultural methods: Traditionally and extensively cultivated crops, in particular, of cereals, harbouring a rich and threatened flora of field weeds including *Agrostemma githago, Centaurea cyanus, Legousia speculum-veneris, Chrysanthemum segetum, Calendula arvensis, Adonis* spp., *Consolida* spp., *Nigella* spp., *Papaver* spp.

J.2. Low density buildings: Buildings in rural and built-up areas where buildings, roads and other impermeable surfaces are at a low density, typically occupying less than 30% of the ground. Excludes agricultural building complexes where the built area exceeds 1 ha.

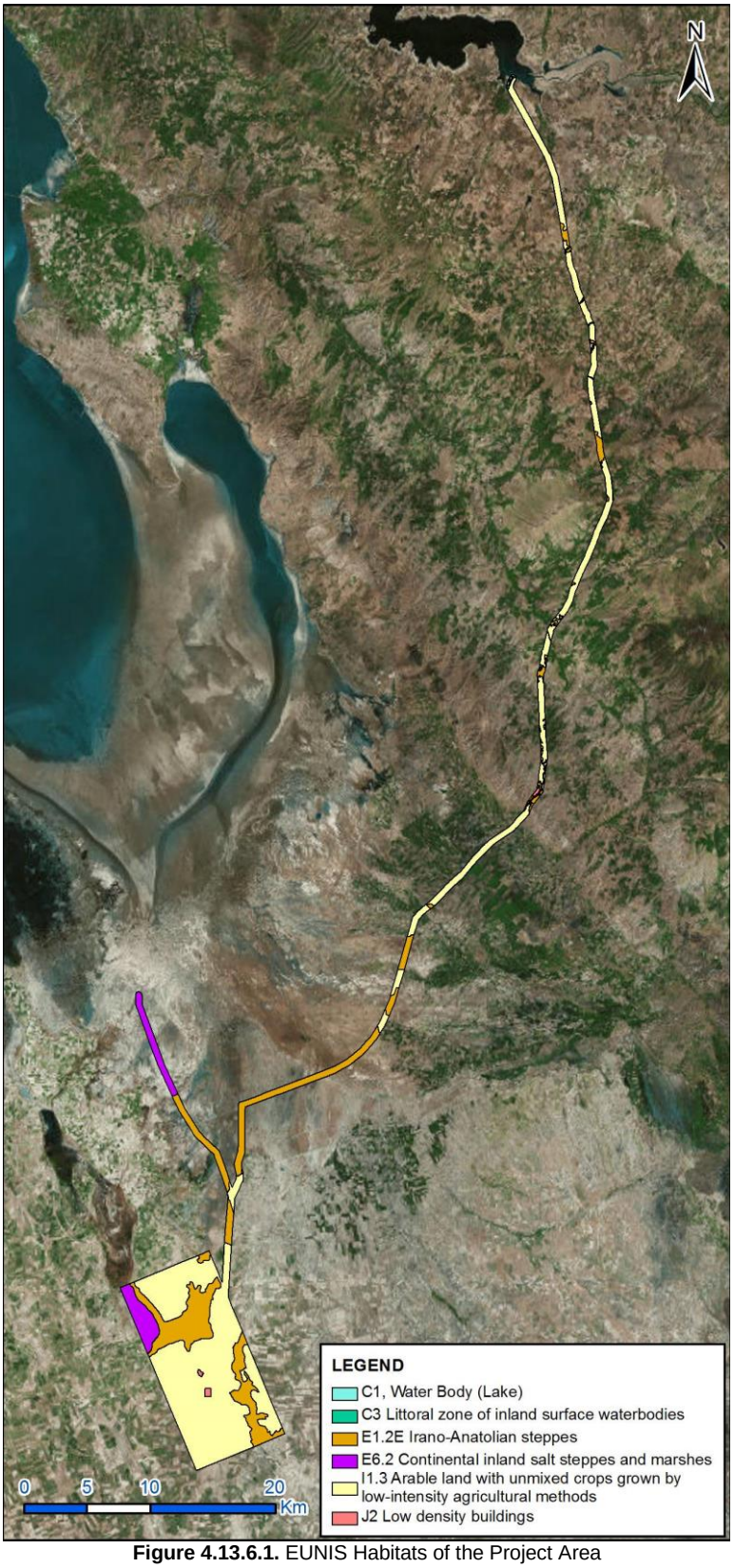


Figure 4.13.6.1. EUNIS Habitats of the Project Area

Critical Habitats (PS6; IFC 2012)

Critical Habitats are areas with high biodiversity value, including

(i) habitat of significant importance to Critically Endangered and/or Endangered species;

(ii) habitat of significant importance to endemic and/or restricted-range species;

(iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species;

(iv) highly threatened and/or unique ecosystems; and/or

(v) areas associated with key evolutionary processes.

Critical Habitats are areas of high biodiversity value that may include at least one or more of the five values specified in Performance Standard 6 and/or other recognized high biodiversity values. Critical habitat criteria are as follows and should form the basis of any critical habitat assessment:

Criterion 1: Critically Endangered (CR) and / or Endangered (EN) species

Criterion 2: Endemic and / or restricted- range species

Criterion 3: Migratory and / or congregatory species

Criterion 4: Highly threatened and / or unique ecosystems

Criterion 5: Key evolutionary processes

Criterion 1: Critically Endangered (CR) and/or Endangered (EN) species

Species threatened with global extinction and listed as CR and EN on the IUCN Red List of Threatened Species shall be considered as part of Criterion 1. CR species face an extremely high risk of extinction in the wild. Endangered species face a very high risk of extinction in the wild.

Tier 1 sub- criteria for Criterion 1 are defined as follows:

- Habitat required to sustain ≥ 10 percent of the global population of an IUCN Red - listed CR or EN species where there are known, regular occurrences of the species and where that habitat could be considered a discrete management unit for that species.
- Habitat with known, regular occurrences of CR or EN species where that habitat is one of 10 or fewer discrete management sites globally for that species.

Tier 2 sub- criteria for Criterion 1 are defined as follows:

- Habitat that supports the regular occurrence of a single individual of an IUCN Red- listed CR species and/or habitat containing regionally - important concentrations of an IUCN Red – listed EN species where that habitat could be considered a discrete management unit for that species.

- Habitat of significant importance to CR or EN species that are wide- ranging and/or whose population distribution is not well understood and where the loss of such a habitat could potentially impact the long - term survivability of the species.
- As appropriate, habitat containing nationally / regionally - important concentrations of an EN, CR or equivalent national/regional listing.

Criterion 2: Endemic and Restricted- range Species

An endemic species is defined as one that has ≥ 95 percent of its global range inside the country or region of analysis.

The Tier 1 sub- criterion for Criterion 2 are defined as follows:

- Habitat known to sustain ≥ 95 percent of the global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that species (e.g., a single - site endemic).

Tier 2 sub- criteria for Criterion 2 are defined as follows:

- Habitat known to sustain ≥ 1 percent but < 95 percent of the global population of an endemic or restricted- range species where that habitat could be considered a discrete management unit for that species, where adequate data are available and/or based on expert judgment .

Criterion 3: Migratory and 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 defined as species whose individuals gather in large groups on a cyclical or otherwise regular and/or predictable basis; examples include the following:

- Species that form colonies
- Species that form colonies for breeding purposes and/or where large numbers of individuals of a species gather at the same time for non - breeding purposes (e.g., foraging, roosting).
- Species that move through bottleneck sites where significant numbers of individuals of a species pass over a concentrated period of time (e.g., during migration).
- Species with large but clumped distributions where a large number of individuals may be concentrated in a single or a few sites while the rest of the species is largely dispersed.

- Source populations where certain sites hold populations of species that make an inordinate contribution to recruitment of the species elsewhere.

The Tier 1 sub- criterion for Criterion 3 are defined as follows:

- Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 95 percent of the global population of a migratory or congregatory species at any point of the species' life - cycle where that habitat could be considered a discrete management unit for that species.

The Tier 2 sub- criteria for Criterion 3 are defined as follows:

- Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent but < 95 percent of the global population of a migratory or congregatory species at any point of the species' life- cycle and where that habitat could be considered a discrete management unit for that species, where adequate data are available and/or based on expert judgment.
- For birds, habitat that meets BirdLife International's Criterion A4 for congregations and/or Ramsar Criteria 5 or 6 for Identifying Wetlands of International Importance .
- For species with large but clumped distributions, a provisional threshold is set at ≥5 percent of the global population for both terrestrial and marine species.
- Source sites that contribute ≥ 1 percent of the global population of recruits.

Quantitative thresholds for Tiers 1 and 2 of Critical Habitat Criteria 1 through 3 are given in Table 4.13.6.2.

Table 4.13.6.2. Quantitative thresholds for Tiers 1 and 2 of Critical Habitat Criteria 1 through 3 (IFC, 2012)

Criteria	Tier 1	Tier 2
1. Critically Endangered (CR) / Endangered (EN) Species	(a) Habitat required to sustain ≥ 10 percent of the global population of a CR or EN species /subspecies where there are known, regular occurrences of the species and where that habitat could be considered a discrete management unit for that species. (b) Habitat with known, regular occurrences of CR or EN species where that habitat is one of 10 or fewer discrete management sites globally for that species.	(c) Habitat that supports the regular occurrence of a single individual of a CR species and/or habitat containing regionally- important concentrations of a Red - listed EN species where that habitat could be considered a discrete management unit for that species/ subspecies. (d) Habitat of significant importance to CR or EN species that are wide -ranging and/or whose population distribution is not well understood and where the loss of such a habitat could potentially impact the long - term survivability of the species. (e) As appropriate, habitat containing nationally / regionally important concentrations of an EN, CR or equivalent national/regional listing.
2. Endemic / Restricted Range Species	(a) Habitat known to sustain ≥ 95 percent of the global population of an endemic or restricted - range species where that habitat could be considered a discrete management unit for that species (e.g., a single- site endemic).	(b) Habitat known to sustain ≥ 1 percent but < 95 percent of the global population of an endemic or restricted- range species where that habitat could be considered a discrete management unit for that species, where data are available and/or based on expert judgment.
3. Migratory/ Congregatory Species	(a) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 95 percent of the global population of a migratory or congregatory species at any point of the specie s' lifecycle where that habitat could be considered a discrete management unit for that species.	(b) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent but < 95 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle and where that habitat could be considered a discrete management unit for that species, where adequate data are available and/or based on expert judgment. (c) For birds, habitat that meets BirdLife International's Criterion A4 for congregations and/or Ramsar Criteria 5 or 6 for Identifying Wetlands of International Importance. (d) For species with large but clumped distributions, a provisional threshold is set at ≥5 percent of the global population for both terrestrial and marine species. (e) Source sites that contribute ≥ 1 percent of the global population of recruits.

Criterion 4: Highly Threatened and/ or Unique Ecosystems

Highly threatened or unique ecosystems are those (i) that are at risk of significantly decreasing in area or quality; (ii) with a small spatial extent; and/or (iii) containing unique assemblages of species including assemblages or concentrations of biome - restricted species. Areas determined to be irreplaceable or of high priority/significance based on systematic conservation planning techniques carried out at the landscape and/or regional scale by governmental bodies, recognized academic institutions and/or other relevant qualified organizations (including internationally- recognized NGOs) or that are recognized as such in existing regional or national plans, would qualify as critical habitat per Criterion 4. An example of a unique ecosystem would be one that occurs in very limited numbers in the region, such as the only lowland dipterocarp forest. An example of a highly threatened ecosystem would be one that is losing a high percentage of its area each year.

Highly threatened or unique ecosystems are defined by a combination of factors that determine their importance for conservation action. The prioritization of rare and endangered ecosystems employs similar factors to those used for the IUCN Red List of Threatened Species. The ecosystem prioritization factors include long - term trend, rarity, ecological condition, and threat. All of these values contribute to the relative biodiversity and conservation value of the particular ecosystem. IUCN's Commission on Ecosystem Management is leading an initiative to put together criteria and categories for threatened ecosystems.

For regional scale biodiversity conservation applications, ecosystems are classified and mapped at specific scales with a focus on vegetation structure and composition, land cover, and key abiotic factors. Data used to create these regional - scale ecosystem maps typically include vegetation and land use maps, and other driving environmental factors including climate, hydrology, geochemistry and landscape position (elevation and aspect).

Criterion 5: Key Evolutionary Processes

The structural attributes of a region, such as its topography, geology, soil, temperature and vegetation and combinations of these variables can influence the evolutionary processes that give rise to regional configurations of species and ecological properties. In some cases, spatial features that are unique or idiosyncratic of the landscape have been associated with genetically unique populations or subpopulations of plant and animal species. Physical or spatial features have been described as surrogates or spatial catalysts for evolutionary and ecological processes, and such features are often associated with species diversification. Maintaining these key evolutionary processes inherent in a landscape as well as the resulting species (or subpopulations of species) has become a major focus of biodiversity conservation in recent decades, particularly the conservation of genetic diversity. By conserving species diversity within a landscape, the processes that drive speciation, as well as the genetic diversity within species, ensures the evolutionary flexibility in a system, which is especially important in a rapidly changing climate.

This criterion therefore is defined by: (i) the physical features of a landscape that might be associated with particular evolutionary processes; and /or (ii) subpopulations of species that are phylogenetically or morphogenetically distinct and may be of special conservation concern given their distinct evolutionary history. The latter includes evolutionarily significant units (ESUs) and Evolutionarily Distinct and Globally Endangered (EDGE) species (IFC, 2012)

The habitat based flora studies along the route of the project resulted in the observation of a total of 12 plant taxa. The identified target plant species along the project according to IFC are given in Table 4.13.6.3.

Tablo 4.13.6.3. The Identified Target Plant Species

No	Species	Status	Provinces According To Field Studies
1	*Lepidium caespitosum*	VU / Restricted range species	E6.2
2	*Erysimum torulosum*	VU / Restricted range species	E6.2
3	*Arabidopsis parvula*	VU / Restricted range species	E6.2
4	*Hypericum salsugineum*	VU / Restricted range species	E6.2
5	*Limonium anatolicum*	VU / Restricted range species	E6.2
6	*Sphaerophysa kotschyana*	LR (cd) / Restricted range species	E6.2
7	*Ferula halophila*	VU / Restricted range species	E6.2
8	*Achillea sieheana*	VU / Restricted range species	E6.2
9	*Cousinia iconica*	LR (cd) / Restricted range species	E6.2
10	*Microcnemum coralloides*	VU / Restricted range species	E6.2
11	*Centaurea tuzgoluensis*	VU / Restricted range species	E6.2
12	*Limonium tamaricoides*	EN / Restricted range species	E6.2

Key Baseline Findings and Conclusions

5 different terrestrial habitat types at Level 2 and Level 3, identified on the Project, sheds light on the habitat diversity of Turkey.

As is the case for the terrestrial ecosystem diversity, the diversity of plant communities in such ecosystems is quite rich. 12 important plant taxa were determined. Since determined plant taxa are restricted range species and only exist at the brine discharge area "Biodiversity Action Plan" is prepared and these habitats were declared as "No-Go Areas" (Figure 4.13.6.2.).

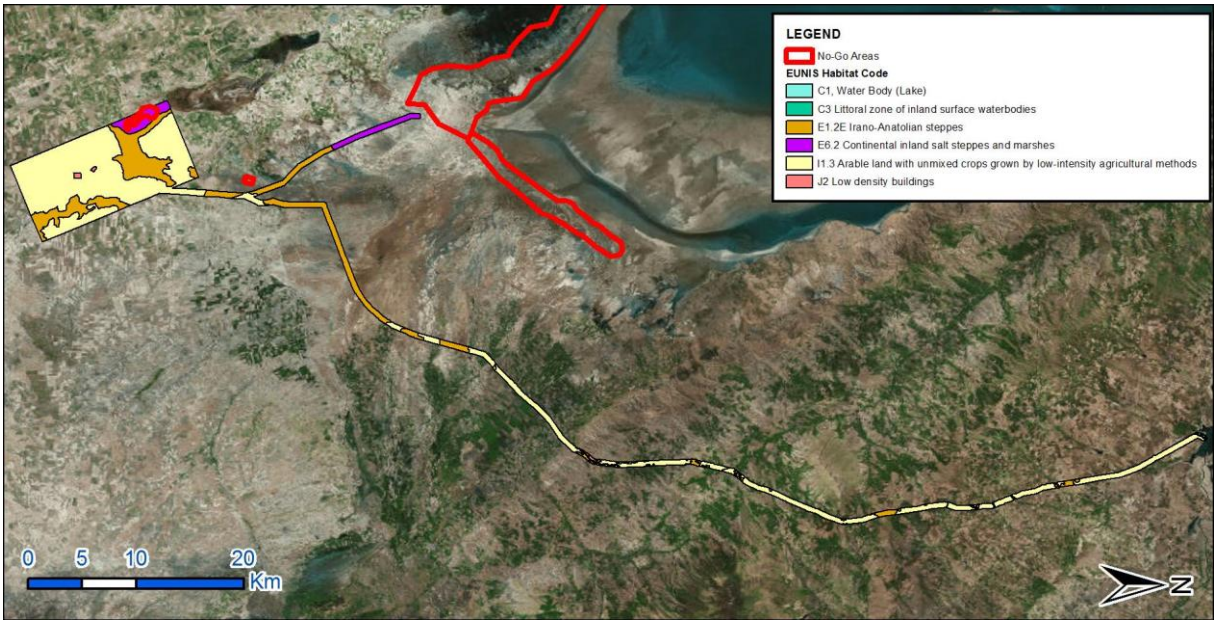


Figure 4.13.6.2. "No-Go Areas"

Figure 4.1.6.4.2. General view of No-Go Area 1

Figure 4.1.6.4.3. General view of No-Go Area 2

Figure 4.1.6.4.4. General view of No-Go Area 3

During the construction, operation and decommissioning phases of the Project, the vulnerable biological resources will be directly or indirectly impacted. Although the majority of the project does not pass through critical habitat areas, because these critical habitat areas were declared as “No-Go Areas”. Nethertheless the impact of the salty discharge to Tuz Gölü will affect these “No-Go Areas” and the endemic \ restricted-range species. Therefore a Biodiversity Action Plan (BAP) should and has been prepared in given in Appendix 7.13. Within the framework of BAP, in order to ensure the conservation of these highly sensitive habitats and species, future monitoring programs and species / habitat action plan has been developed through desktop and field studies.

4.13.7 Flora

In the preparation of the list of the flora species found in the project area including the pipeline routes within the borders of the Sarıyahşi, Ağaçören, Ortaköy, Eskil and Central Districts of the Aksaray Province and the Şereflikoçhisar and Evren Districts of Ankara, the field surveys conducted previously by Prof Dr. Latif KURT (Ankara University) and the literature search (EIA report approved in 2003, EIA I. Addendum report approved in 2005, “Project for Determining the Biodiversity of Tuz Gölü” (PDBTG), carried out from 2005 to 2007, EIA II. Addendum report approved in 2013, “Project for Researching the Salt Pans in Turkey in Floristic and Synecologic Terms”, supported by the State Planning Organization (SPO) and completed in 2001, “Project for Habitat Monitoring of Tuz Gölü Special Environment Protection Zone”, supported by the Environmental Protection Agency for Special Areas and completed in 2010 and monitoring studies since 2013) have been used.

General Conditions of Flora

With respect to plant diversity, considering its geographical zone, Turkey has an extremely rich floristic structure. European botanists, being aware of this richness, have visited Turkey to collect plants since the 16th century. The first comprehensive flora study concerning Turkey was made by the Swiss botanist Boissier and the results of this study was published between 1867-1888as the 5-volume “Flora Orientalis”. In this reference, records of about 5000 species from Turkey were given. The most comprehensive study concerning Turkey was made by the British botanist P.H. Davis. Davis wrote the 10-volume “Flora of Turkey and The East Aegean Islands” between 1965-1888. In this work, 1146 natural genera and 8575 natural species exhibiting distribution in Turkey are cited. After the publication of the Flora of Turkey prepared by Davis, every year publication of new taxa from Turkey has continued. In 2000, the Turkish botanists published the 11th volume compiling the new taxa. With this additional volume, the number of taxa reached 10,754, and the number of endemic taxa reached 3,708. With the “List of Turkish Plants” published in 2012 again by Turkish botanists, the number of taxa exhibiting distribution in Turkey at the species and subspecies level reached 11,466 and the number of endemic taxa reached 3649.

That identification of many new species in Turkey continues every year indicates that it still has an interesting structure with respect to flora. Although Turkey is much smaller than

Europe in area, its richness in species is nearly equivalent to that of the whole Europe, and the features that render Turkey different are briefly as follows:

Turkey is under the effect of 3 plant geography regions (Mediterranean, Europe-Siberia, Irano-Turanian); the effects of 3 different bio-climate types are observed in Turkey (Mediterranean, Oceanic, Terrestrial); Turkey is a bridge between the continents Asia and Europe and in relation to this plant migration between these two continents continue; the genetic centre of many genera and division exhibiting distribution in Turkey is Anatolia and in relation to this, the number of endemic species is high; Turkey is the genetic source where the ancestors or natural forms of many species which are cultured; the edaphic factors are varied; ecosystem and vegetation diversity is high; the altitude differs between 0-5000 m; Turkey was not affected by the ice age as much as Europe.

Selection of Sampling Stations

The habitat classification based on EUNIS was performed as follows:

1. A general land cover map was created from the Corine Land Cover database, which in its latest version (no. 16) includes the entire territory of the Republic of Turkey (www.eea.europa.eu/data-and-maps/data/clc-2006-vector-data-version-2).
2. The map was refined to a EUNIS Level 2 and Level 3 Habitat Type Map analysing appropriate field surveys.
3. Field studies were include different habitats, and a random sample of crossing habitats.

The level 2 and level 3 EUNIS habitat type map was used as starting point for field studies. Sample sites are determined considering sizes, continuous and intermittent character of natural habitats. Sampling sites were given in Figure 4.13.7.1.

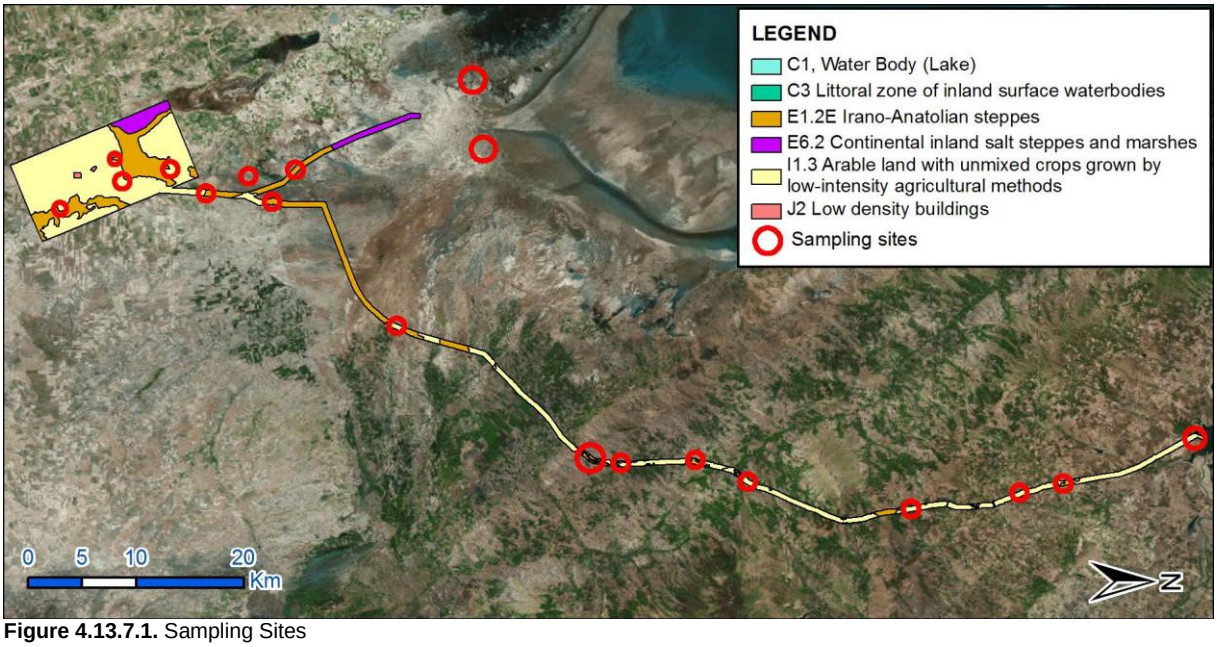


Figure 4.13.7.1. Sampling Sites

Baseline Results

The distribution of and detailed information about flora components are shown below. The classification of species, sampling station and habitat information, their conservation and endemism statuses are indicated on the tables along with their sensitivities.

In determining the IUCN threat categories of the endemic species and of the non-endemic restricted-range species identified, the main reference work used was the “Red Data Book of Turkish Plants”, by Ekim et al., 2000, and in addition, these threat categories were re-interpreted in accordance with the IUCN 2001 criteria, taking into account the population of the species in the area and the threat factors.

As a result of the habitat-based field studies carried out in 20 different stations along the project route, a total of 315 taxa were identified. These species, their systematics information and conservation statuses are given in Table 4.13.7.1. 48 endemic plant species were identified in the area where the studies were carried out. The distribution of the 315 taxa into phytogeographical regions is given in Figure 4.13.7.2.

Table 4.13.7.1. The 315 Taxa Identified Plants

Family	Species	Endemic	Element	IUCN	CITES	BERN	Habitat Code	Abundance
Aspidiaceae	*Dryopteris filix-max*	-	-	-	-	-	E1.2E	High
Ranunculaceae	*Consolida stenocarpa*	Endemic	Iranian-Turanian	LR (lc)	-	-	E1.2E, I1.3	Medium
Ranunculaceae	*Ranunculus sphaerospermus*	-	-	-	-	-	C2	High
Ranunculaceae	*Consolida orientalis*	-	Iranian-Turanian	-	-	-	I1.3	High
Ranunculaceae	*Consolida ambigua*	-	-	-	-	-	C2	High
Ranunculaceae	*Consolida raveyi*	Endemic	Iranian-Turanian	LR (lc)	-	-	E1.2E, I1.3	Medium
Ranunculaceae	*Consolida hellespontica*	-	Iranian-Turanian	-	-	-	I1.3	High
Ranunculaceae	*Adonis flammea*	-	-	-	-	-	E1.2E, I1.3	High
Ranunculaceae	*Ranunculus argyreus*	-	-	-	-	-	E1.2E	High
Ranunculaceae	*Ceratocephalus falcatus*	-	-	-	-	-	E1.2E	High
Berberidaceae	*Leontice leontopetalum*	-	Mediterranean	-	-	-	I1.3	High
Brassicaceae	*Brassica elongata*	-	-	-	-	-	E1.2E, I1.3	High
Brassicaceae	*Alyssum minutum*	-	-	-	-	-	I1.3	High
Brassicaceae	*Alyssum macropodum* var. *macropodum*	-	Iranian-Turanian	-	-	-	I1.3	High
Brassicaceae	*Draba bruniifolia* subsp. *bruniifolia*	-	-	-	-	-	E1.2E	High
Brassicaceae	*Arabis caucasica* subsp. *brevifolia*	-	E. Mediterranean	-	-	-	E1.2E	High
Brassicaceae	*Lepidium perfoliatum*	-	-	-	-	-	E1.2E, E6.2, I1.3	High
Brassicaceae	*Lepidium caespitosum*	Endemic	Iranian-Turanian	VU	-	-	E6.2	Low
Brassicaceae	*Cardaria draba* subsp. *draba*	-	-	-	-	-	I1.3	High
Brassicaceae	*Cardaria draba* subsp. *chalepensis*	-	-	-	-	-	I1.3	High
Brassicaceae	*Isatis floribunda*	-	-	-	-	-	E1.2E, I1.3	High
Brassicaceae	*Hymenolobus procumbens*	-	-	-	-	-	E6.2	High
Brassicaceae	*Boreava orientalis*	-	-	-	-	-	I1.3	High
Brassicaceae	*Alyssum linifolium* var. *linifolium*	-	-	-	-	-	E1.2E, I1.3	High
Brassicaceae	*Alyssum dasycarpum*	-	-	-	-	-	E1.2E, I1.3	High
Brassicaceae	*Alyssum desertorum* var. *desertorum.*	-	-	-	-	-	E1.2E	High
Brassicaceae	*Alyssum minus*	-	-	-	-	-	E1.2E	High
Brassicaceae	*Alyssum paphlagonicum*	Endemic	Iranian-Turanian	LR (lc)	-	-	E1.2E	Medium
Brassicaceae	*Alyssum pateri* susbp. *pateri*	Endemic	Iranian-Turanian	LR (lc)	-	-	E1.2E	Medium
Brassicaceae	*Arabis nova*	-	-	-	-	-	E1.2E	High
Brassicaceae	*Chorispora syriaca*	-	Iranian-Turanian	-	-	-	I1.3	High
Brassicaceae	*Erysimum diffusum*	-	European-Siberian	-	-	-	I1.3	High
Brassicaceae	*Erysimum crassipes*	-	-	-	-	-	I1.3	High
Brassicaceae	*Erysimum torulosum*	Endemic	-	VU	-	-	E6.2	Low

Family	Species	Endemic	Element	IUCN	CITES	BERN	Habitat Code	Abundance
Brassicaceae	*Erysimum sisymbrioides*	-	-	-	-	-	E6.2	High
Brassicaceae	*Sisymbrium altissimum*	-	-	-	-	-	I1.3	High
Brassicaceae	*Descurainia sophia*	-	-	-	-	-	I1.3	High
Brassicaceae	*Arabidopsis parvula*	-	-	VU	-	-	E6.2	Low
Brassicaceae	*Camelina hispida* var. *grandiflora*	Endemic	Iranian-Turanian	LR (lc)	-	-	E1.2E, I1.3	Medium
Caryophyllaceae	*Vaccaria hispanica* var. *pyramidata*	-	-	-	-	-	I1.3	High
Caryophyllaceae	*Silene subconica*	-	-	-	-	-	E1.2E	High
Caryophyllaceae	*Minuartia hamata*	-	-	-	-	-	E1.2E	High
Caryophyllaceae	*Minuartia sclerantha*	-	Iranian-Turanian	-	-	-	E1.2E	High
Caryophyllaceae	*Stellaria media* subsp. *media*	-	-	-	-	-	C2	High
Caryophyllaceae	*Cerastium perfoliatum*	-	-	-	-	-	I1.3	High
Caryophyllaceae	*Cerastium brachypetalum* subsp. *roeseri*	-	-	-	-	-	C2	High
Caryophyllaceae	*Holosteum umbellatum* var. *umbellatum*	-	-	-	-	-	C2	High
Caryophyllaceae	*Holosteum umbellatum* var. *glutinosum*	-	-	-	-	-	C2	High
Caryophyllaceae	*Spergularia media*	-	-	-	-	-	E6.2	High
Caryophyllaceae	*Dianthus zonatus* var. *zonatus*	-	-	-	-	-	I1.3	High
Caryophyllaceae	*Gypsophila viscosa*	-	Iranian-Turanian	-	-	-	C2, E1.2E, I1.3	High
Caryophyllaceae	*Silene spergulifolia*	-	Iranian-Turanian	-	-	-	E1.2E	High
Caryophyllaceae	*Silene dichotoma* subsp. *sibthorpiana*	-	-	-	-	-	E6.2	High
Cistaceae	*Helianthemum canum*	-	-	-	-	-	E1.2E	High
Cistaceae	*Helianthemum salicifolium*	-	-	-	-	-	E1.2E	High
Illecebraceae	*Herniaria glabra*	-	-	-	-	-	E1.2E	High
Illecebraceae	*Scleranthus annuus* subsp. *polycarpos*	-	-	-	-	-	C2	High
Illecebraceae	*Herniaria incana*	-	-	-	-	-	E1.2E	High
Chenopodiaceae	*Atriplex rosea*	-	-	-	-	-	I1.3	High
Chenopodiaceae	*Halimione verrucifera*	-	-	-	-	-	E6.2	High
Chenopodiaceae	*Camphorosma monspeliaca* subsp. *monspeliaca*	-	-	-	-	-	E6.2	High
Chenopodiaceae	*Panderia pilosa*	-	-	-	-	-	E6.2	High
Chenopodiaceae	*Halocnemum strobilaceum*	-	-	-	-	-	E6.2	High
Chenopodiaceae	*Salicornia europaea*	-	-	-	-	-	E6.2	High
Chenopodiaceae	*Suaeda altissima*	-	-	-	-	-	E6.2	High
Chenopodiaceae	*Suaeda confusa*	-	-	-	-	-	E6.2	High
Chenopodiaceae	*Salsola inermis*	-	Iranian-Turanian	-	-	-	E6.2	High
Chenopodiaceae	*Salsola crassa*	-	Iranian-Turanian	-	-	-	E6.2	High

Family	Species	Endemic	Element	IUCN	CITES	BERN	Habitat Code	Abundance
Chenopodiaceae	*Salsola macera*	-	Iranian-Turanian	-	-	-	E6.2	High
Chenopodiaceae	*Salsola laricina*	-	-	-	-	-	E6.2	High
Chenopodiaceae	*Salsola canescens*	-	Iranian-Turanian	-	-	-	E1.2E	High
Chenopodiaceae	*Halanthium kulpianum*	-	-	-	-	-	E6.2	High
Chenopodiaceae	*Beta lomatogona*	-	Iranian-Turanian	-	-	-	E1.2E, I1.3	High
Chenopodiaceae	*Chenopodium botrys*	-	Mediterranean	-	-	-	C2, E1.2E, I1.3	High
Chenopodiaceae	*Chenopodium foliosum*	-	-	-	-	-	E1.2E, I1.3	High
Chenopodiaceae	*Chenopodium vulvaria*	-	-	-	-	-	E1.2E	High
Chenopodiaceae	*Chenopodium album*	-	-	-	-	-	E1.2E, I1.3	High
Chenopodiaceae	*Atriplex laevis*	-	-	-	-	-	E6.2	High
Chenopodiaceae	*Atriplex tatarica* var. *tatarica*	-	Mediterranean	-	-	-	E1.2E, E6.2	High
Chenopodiaceae	*Halimione portulacoides*	-	-	-	-	-	C2	High
Chenopodiaceae	*Kochia prostrata*	-	-	-	-	-	E1.2E, E6.2	High
Chenopodiaceae	*Microcnemum coralloides*	-	-	-	-	-	E6.2	High
Chenopodiaceae	*Suaeda eltonica*	-	-	-	-	-	E6.2	High
Chenopodiaceae	*Suaeda carnosissima*	-	Iranian-Turanian	-	-	-	E6.2	High
Chenopodiaceae	*Salsola anatolica*	Endemic	Iranian-Turanian	LR (lc)	-	App -I	E6.2	Medium
Chenopodiaceae	*Salsola nitraria*	-	-	-	-	-	E6.2	High
Chenopodiaceae	*Noaea mucronata* subsp. *mucronata*	-	-	-	-	-	E1.2E	High
Convolvulaceae	*Convolvulus lineatus*	-	Mediterranean	-	-	-	C2	High
Convolvulaceae	*Convolvulus holosericeus* subsp. *holosericeus*	-	-	-	-	-	E1.2E	High
Tamaricaeae	*Reaumuria alternifolia*	-	Iranian-Turanian	-	-	-	E6.2	High
Frankeniaceae	*Frankenia hirsuta*	-	-	-	-	-	E6.2	High
Guttiferae	*Hypericum salsugineum*	Endemic	-	VU	-	App -I	E6.2	Low
Malvaceae	*Malva neglecta*	-	-	-	-	-	E1.2E, I1.3	High
Linaceae	*Linum seljukorum*	-	-	-	-	-	E6.2	High
Linaceae	*Linum austriacum* subsp. *austriacum*	-	-	-	-	-	E1.2E, I1.3	High
Geraniaceae	*Geranium tuberosum*	-	-	-	-	-	I1.3	High
Geraniaceae	*Geranium collinum*	-	Iranian-Turanian	-	-	-	C2	High
Geraniaceae	*Erodium hoefftianum*	-	-	-	-	-	C2	High
Geraniaceae	*Erodium amanum*	Endemic	Iranian-Turanian	LR (lc)	-	-	E1.2E, I1.3	Medium
Geraniaceae	*Erodium cicutarium* subsp. *cicutarium*	-	-	-	-	-	E1.2E, I1.3	High
Zygophyllaceae	*Peganum harmala*	-	-	-	-	-	E1.2E	High
Campanulaceae	*Asyneuma limonifolium* subsp. *limonifolium*	-	-	-	-	-	E1.2E	High
Primulaceae	*Androsace maxima*	-	-	-	-	-	E1.2E	High

Family	Species	Endemic	Element	IUCN	CITES	BERN	Habitat Code	Abundance
Plumbaginaceae	*Limonium bellidifolium*	-	-	-	-	-	E6.2	High
Plumbaginaceae	*Limonium iconicum*	Endemic	Iranian-Turanian	LR (lc)	-	-	E6.2	Medium
Plumbaginaceae	*Limonium lilacinum*	Endemic	Iranian-Turanian	LR (lc)	-	-	E6.2	Medium
Plumbaginaceae	*Limonium globuliferum*	-	Iranian-Turanian	-	-	-	E6.2	High
Plumbaginaceae	*Limonium anatolicum*	Endemic	Iranian-Turanian	VU	-	App -I	E6.2	Low
Plumbaginaceae	*Acantholimon puberulum.* var. *puberulum*	-	Iranian-Turanian	-	-	-	E1.2E	High
Plantaginaceae	*Plantago crassifolia*	-	Mediterranean	-	-	-	E6.2	High
Plantaginaceae	*Plantago lanceolata*	-	-	-	-	-	C2	High
Fabaceae	*Galega officinalis*	-	European-Siberian	-	-	-	C2	High
Fabaceae	*Astragalus angustifolius* subsp. *angustifolius* var. *angustifolius*	-	-	-	-	-	E1.2E	High
Fabaceae	*Lathyrus brachypterus* var. *haussknechtii*	Endemic	Iranian-Turanian	LR (lc)	-	-	E1.2E	Medium
Fabaceae	*Trifolium fragiferum* varyete *pulchellum*	-	-	-	-	-	E6.2	High
Fabaceae	*Trifolium arvense* var. *arvense*	-	-	-	-	-	E1.2E	High
Fabaceae	*Trigonella aurantiaca*	-	Iranian-Turanian	-	-	-	I1.3	High
Fabaceae	*Trigonella coerulescens*	-	Iranian-Turanian	-	-	-	E1.2E, I1.3	High
Fabaceae	*Alhagi pseudalhagi*	-	Iranian-Turanian	-	-	-	E6.2	High
Fabaceae	*Genista anatolica*	-	Mediterranean	-	-	-	E1.2E	High
Fabaceae	*Sphaerophysa kotschyana*	Endemic	Iranian-Turanian	LR (cd)	-	-	E6.2	Low
Fabaceae	*Astragalus pinetorum*	Endemic	Iranian-Turanian	LR (lc)	-	-	E1.2E	Medium
Fabaceae	*Astragalus microcephalus*	-	Iranian-Turanian	-	-	-	E1.2E	High
Fabaceae	*Astragalus odoratus*	-	-	-	-	-	C2	High
Fabaceae	*Astragalus lydius*	Endemic	Iranian-Turanian	LR (lc)	-	-	E1.2E	Medium
Fabaceae	*Astragalus mesogitanus*	Endemic	-	LR (lc)	-	-	E1.2E	Medium
Fabaceae	*Astragalus cadmicus*	Endemic	-	LR (lc)	-	-	E1.2E	Medium
Fabaceae	*Astragalus karamasicus*	Endemic	Iranian-Turanian	LR (lc)	-	-	E1.2E	Medium
Fabaceae	*Astragalus campylosema* subsp. *campylosema*	Endemic	Iranian-Turanian	LR (lc)	-	-	C2	Medium
Fabaceae	*Vicia cappadocica*	-	-	-	-	-	E1.2E, I1.3	High
Fabaceae	*Vicia peregrina*	-	-	-	-	-	I1.3	High
Fabaceae	*Trigonella fischeriana*	-	Iranian-Turanian	-	-	-	E1.2E, I1.3	High
Fabaceae	*Trigonella monantha* subsp. *monantha*	-	-	-	-	-	E1.2E, I1.3	High
Fabaceae	*Medicago minima* var. *minima*	-	-	-	-	-	E1.2E, I1.3	High

Family	Species	Endemic	Element	IUCN	CITES	BERN	Habitat Code	Abundance
Fabaceae	*Lotus corniculatus* var. *corniculatus*	-	-	-	-	-	C2	High
Fabaceae	*Onobrychis armena*	Endemic	-	LR (lc)	-	-	C2	Medium
Fabaceae	*Alhagi pseudalhagi*	-	Iranian-Turanian	-	-	-	E6.2	High
Rosaceae	*Prunus x domestica*	-	-	-	-	-	I1.3	High
Rosaceae	*Geum urbanum*	-	European-Siberian	-	-	-	C2	High
Rosaceae	*Crataegus szovitsii*	-	Iranian-Turanian	-	-	-	C2	High
Rosaceae	*Filipendula vulgaris*	-	European-Siberian	-	-	-	C2	High
Saxifragaceae	*Saxifraga exarata*	-	European-Siberian	-	-	-	E1.2E	High
Grossulariaceae	*Ribes orientale*	-	-	-	-	-	E1.2E	High
Apiaceae	*Oenanthe silaifolia*	-	-	-	-	-	C2	High
Apiaceae	*Eryngium campestre* var. *virens*	-	-	-	-	-	E1.2E, I1.3	High
Apiaceae	*Bunium microcarpum* subsp. *microcarpum*	-	Mediterranean	-	-	-	E1.2E	High
Apiaceae	*Bupleurum sulphureum*	Endemic	Iranian-Turanian	LR (lc)	-	-	E1.2E	Medium
Apiaceae	*Ferula szowitsiana*	-	-	-	-	-	E6.2	High
Apiaceae	*Ferula halophila*	Endemic	Iranian-Turanian	VU	-	-	E6.2	Low
Apiaceae	*Ferula caspica*	-	-	-	-	-	E6.2	High
Apiaceae	*Turgenia latifolia*	-	-	-	-	-	I1.3	High
Valerianaceae	*Valeriana coronata*	-	-	-	-	-	E1.2E	High
Valerianaceae	*Valerianella vesicaria*	-	-	-	-	-	E1.2E	High
Dipsacaceae	*Pterocephalus plumosus*	-	-	-	-	-	E1.2E	High
Dipsacaceae	*Scabiosa argentea*	-	-	-	-	-	E1.2E, I1.3	High
Asteraceae	*Anthemis fumariifolia*	Endemic	Iranian-Turanian	LR (lc)	-	-	E6.2	Medium
Asteraceae	*Cirsium alatum*	-	Iranian-Turanian	-	-	-	E6.2	High
Asteraceae	*Jurinea consanguinea*	-	-	-	-	-	E1.2E, I1.3	High
Asteraceae	*Carthamus dentatus*	-	-	-	-	-	E1.2E, I1.3	High
Asteraceae	*Echinops ritro*	-	-	-	-	-	C2, E1.2E, I1.3	High
Asteraceae	*Tragopogon buphthalmoides* var. *buphthalmoides*	-	Iranian-Turanian	-	-	-	I1.3	High
Asteraceae	*Scariola orientalis*	-	Iranian-Turanian	-	-	-	I1.3	High
Asteraceae	*Taraxacum bessarabicum* subsp. *bessarabicum*	-	-	-	-	-	E6.2	High
Asteraceae	*Xanthium spinosum*	-	-	-	-	-	E1.2E	High
Asteraceae	*Helichrysum noeanum*	Endemic	Iranian-Turanian	LR (lc)	-	-	E6.2	Medium
Asteraceae	*Helichrysum arenarium* subsp. *aucheri*	Endemic	Iranian-Turanian	LR (lc)	-	-	E1.2E	Medium
Asteraceae	*Filago pyramidata*	-	-	-	-	-	I1.3	High

Family	Species	Endemic	Element	IUCN	CITES	BERN	Habitat Code	Abundance
Asteraceae	*Cymbolaena griffithii*	-	Iranian-Turanian	-	-	-	E1.2E	High
Asteraceae	*Senecio vernalis*	-	-	-	-	-	E1.2E, I1.3	High
Asteraceae	*Anthemis cretica* subsp. *albida*	-	-	-	-	-	E1.2E	High
Asteraceae	*Anthemis tinctoria* var. *tinctoria*	-	-	-	-	-	E1.2E, I1.3	High
Asteraceae	*Anthemis austriaca*	-	-	-	-	-	E1.2E, I1.3	High
Asteraceae	*Achillea sieheana*	Endemic	Iranian-Turanian	VU	-	-	E6.2	Low
Asteraceae	*Achillea wilhelmsii*	-	Iranian-Turanian	-	-	-	E1.2E, I1.3	High
Asteraceae	*Achillea aleppiea* subsp. *zederbaueri*	Endemic	Iranian-Turanian	LR (lc)	-	-	E1.2E, I1.3	Medium
Asteraceae	*Achillea biebersteinii*	-	-	-	-	-	E1.2E, I1.3	High
Asteraceae	*Matricaria chamomilla* var. *recutita*	-	-	-	-	-	I1.3	High
Asteraceae	*Tripleurospermum elongatum*	-	-	-	-	-	E1.2E	High
Asteraceae	*Tripleurospermum parviflorum*	-	-	-	-	-	E1.2E, E6.2, I1.3	High
Asteraceae	*Artemisia santonicum*	-	-	-	-	-	E6.2	High
Asteraceae	*Artemisia taurica*	-	-	-	-	-	E1.2E	High
Asteraceae	*Artemisia spicigera*	-	Iranian-Turanian	-	-	-	E1.2E	High
Asteraceae	*Cousinia caesarea*	Endemic	Iranian-Turanian	LR (lc)	-	-	E1.2E	Medium
Asteraceae	*Cousinia iconica*	Endemic	Iranian-Turanian	LR (cd)	-	-	E1.2E	Low
Asteraceae	*Cirsium ligulare*	-	-	-	-	-	E1.2E	High
Asteraceae	*Cirsium arvense* subsp. *vestitum*	-	-	-	-	-	I1.3	High
Asteraceae	*Acroptilon repens*	-	Iranian-Turanian	-	-	-	E1.2E, E6.2, I1.3	High
Asteraceae	*Centaurea virgata*	-	-	-	-	-	E1.2E	High
Asteraceae	*Centaurea patula*	-	Iranian-Turanian	-	-	-	E1.2E, I1.3	High
Asteraceae	*Centaurea pulchella*	-	-	-	-	-	E1.2E, I1.3	High
Asteraceae	*Centaurea solstitialis* subsp. *solstitialis*	-	-	-	-	-	I1.3	High
Asteraceae	*Centaurea iberica*	-	-	-	-	-	I1.3	High
Asteraceae	*Centaurea carduiformis* subsp. *carduiformis* var. *carduiformis*	-	-	-	-	-	E1.2E, I1.3	High
Asteraceae	*Centaurea triumfettii*	-	-	-	-	-	E1.2E	High
Asteraceae	*Xeranthemum longipapposum*	-	Iranian-Turanian	-	-	-	E1.2E	High
Asteraceae	*Centaurea depressa*	-	-	-	-	-	I1.3	High
Asteraceae	*Scolymus hispanicus*	-	Mediterranean	-	-	-	I1.3	High
Asteraceae	*Cichorium intybus*	-	-	-	-	-	I1.3	High
Asteraceae	*Cichorium glandulosum*	-	Iranian-Turanian	-	-	-	I1.3	High
Asteraceae	*Koelpinia linearis*	-	Mediterranean	-	-	-	E1.2E, E6.2	High
Asteraceae	*Scorzonera cana* var. *radicosa*	-	-	-	-	-	E1.2E	High

Family	Species	Endemic	Element	IUCN	CITES	BERN	Habitat Code	Abundance
Asteraceae	*Scorzonera cana* var. *jacquiniana*	-	-	-	-	-	I1.3	High
Asteraceae	*Scorzonera hieraciifolia*	Endemic	Iranian-Turanian	LR (lc)	-	-	E6.2	Medium
Asteraceae	*Scorzonera mollis* subsp. *szowitzii*	-	Iranian-Turanian	-	-	-	E1.2E	High
Asteraceae	*Scorzonera parviflora*	-	-	-	-	-	E6.2	High
Asteraceae	*Tragopogon longirostris* var. *abbreviatus*	-	-	-	-	-	E1.2E	High
Asteraceae	*Tragopogon coloratus*	-	Iranian-Turanian	-	-	-	E1.2E	High
Asteraceae	*Picris cyprica*	-	Mediterranean	-	-	-	E1.2E	High
Asteraceae	*Hieracium pannosum*	-	-	-	-	-	C2	High
Asteraceae	*Cicerbita racemosa*	-	Iranian-Turanian	-	-	-	C2	High
Asteraceae	*Taraxacum farinosum*	Endemic	Iranian-Turanian	LR (lc)	-	-	E6.2	Medium
Asteraceae	*Taraxacum officinale*	-	-	-	-	-	I1.3	High
Asteraceae	*Crepis foetida* subsp. *rhoeadifolia*	-	-	-	-	-	E6.2	High
Asteraceae	*Crepis micrantha*	-	-	-	-	-	C2, I1.3	High
Asteraceae	*Centaurea tuzgoluensis*	Endemic	-	VU	-	-	E6.2	low
Amaranthaceae	*Amaranthus albus*	-	-	-	-	-	I1.3	High
Asclepiadaceae	*Vincetoxicum fuscatum* subsp. *fuscatum*	-	-	-	-	-	C2	High
Boraginaceae	*Rochelia disperma* var. *disperma*	-	-	-	-	-	E1.2E, I1.3	High
Boraginaceae	*Myosotis minutiflora*	-	Mediterranean	-	-	-	C2	High
Boraginaceae	*Onosma nemoricolum*	-	Iranian-Turanian	-	-	-	E1.2E, I1.3	High
Boraginaceae	*Alkanna pseudotinctoria*	Endemic	Iranian-Turanian	LR (lc)	-	-	E1.2E, I1.3	Medium
Boraginaceae	*Heliotropium dolosum*	-	-	-	-	-	E1.2E, I1.3	High
Boraginaceae	*Heliotropium suaveolens*	-	-	-	-	-	I1.3	High
Boraginaceae	*Asperugo procumbens*	-	European-Siberian	-	-	-	I1.3	High
Boraginaceae	*Myosotis ramosissima*	-	-	-	-	-	E1.2E	High
Boraginaceae	*Buglossoides arvensis*	-	-	-	-	-	I1.3	High
Boraginaceae	*Buglossoides incrassata*	-	Mediterranean	-	-	-	C2, I1.3	High
Boraginaceae	*Echium italicum*	-	-	-	-	-	I1.3	High
Boraginaceae	*Moltkia coerulea*	-	-	-	-	-	E1.2E, I1.3	High
Boraginaceae	*Nonea caspica*	-	-	-	-	-	E1.2E, I1.3	High
Boraginaceae	*Nonea stenosolen*	Endemic	Iranian-Turanian	LR (lc)	-	-	E1.2E, I1.3	Medium
Chenopodiaceae	*Microcnemum coralloides*	-	-	VU	-	-	E6.2	low
Solanaceae	*Lycium chinense*	-	-	-	-	-	I1.3	High
Solanaceae	*Hyocyamus niger*	-	-	-	-	-	I1.3	High
Solanaceae	*Hyocyamus reticulatus*	-	Iranian-Turanian	-	-	-	I1.3	High
Solanaceae	*Solanum dulcamara*	-	-	-	-	-	C2	High

Family	Species	Endemic	Element	IUCN	CITES	BERN	Habitat Code	Abundance
Scrophulariaceae	*Verbascum sinuatum* var. *adenosepalum*	-	E. Mediterranean	-	-	-	E1.2E, I1.3	High
Scrophulariaceae	*Verbascum cappadocicum*	Endemic	Iranian-Turanian	LR (lc)	-	-	E1.2E, I1.3	Medium
Scrophulariaceae	*Linaria iconia*	Endemic	Iranian-Turanian	LR (lc)	-	-	E1.2E, I1.3	Medium
Scrophulariaceae	*Veronica hederifolia*	-	-	-	-	-	C2	High
Scrophulariaceae	*Verbascum insulare*	Endemic	Iranian-Turanian	LR (lc)	-	-	E1.2E, I1.3	Medium
Scrophulariaceae	*Linaria simplex*	-	Mediterranean	-	-	-	E1.2E, I1.3	High
Scrophulariaceae	*Veronica grisebachii*	-	Mediterranean	-	-	-	E1.2E	High
Scrophulariaceae	*Veronica praecox*	-	-	-	-	-	C2	High
Scrophulariaceae	*Veronica pontica*	-	-	-	-	-	C2	High
Scrophulariaceae	*Veronica multifida*	Endemic	Iranian-Turanian	LR (lc)	-	-	E1.2E, I1.3	Medium
Orobanchaceae	*Orobanche arenaria*	-	-	-	-	-	E1.2E	High
Lamiaceae	*Ziziphora clinopodioides*	-	-	-	-	-	E1.2E	High
Lamiaceae	*Teucrium polium*	-	-	-	-	-	I1.3	High
Lamiaceae	*Eremostachys moluccelloides*	-	Iranian-Turanian	-	-	-	E1.2E	High
Lamiaceae	*Phlomis armeniaca*	-	-	-	-	-	E1.2E, I1.3	High
Lamiaceae	*Lamium amplexicaule*	-	-	-	-	-	E1.2E, I1.3	High
Lamiaceae	*Wiedemannia orientalis*	Endemic	Iranian-Turanian	LR (lc)	-	-	E1.2E, I1.3	Medium
Lamiaceae	*Nepeta congesta* var. *congesta*	Endemic	-	LR (lc)	-	-	I1.3	Medium
Lamiaceae	*Clinopodium vulgare* subsp. *vulgare*	-	-	-	-	-	E1.2E	High
Lamiaceae	*Ziziphora tenuior*	-	Iranian-Turanian	-	-	-	E1.2E, I1.3	High
Lamiaceae	*Ziziphora taurica* subsp. *taurica*	-	-	-	-	-	E1.2E	High
Lamiaceae	*Salvia cyanescens*	Endemic	Iranian-Turanian	LR (lc)	-	-	C2, E1.2E	Medium
Cyperaceae	*Eleocharis uniglumis*	-	-	-	-	-	C2	High
Iridaceae	*Iris albicans*	-	-	-	-	-	I1.3	High
Ceratophyllaceae	*Ceratophyllum demersum*	-	European-Siberian	-	-	-	C2	High
Euphorbiaceae	*Euphorbia paralias*	-	-	-	-	-	E1.2E	High
Euphorbiaceae	*Euphorbia macroclada*	-	-	-	-	-	E1.2E	High
Ulmaceae	*Celtis tournefortii*	-	-	-	-	-	E1.2E	High
Rubiaceae	*Galium floribundum* subsp. *floribundum*	-	-	-	-	-	E1.2E	High
Rubiaceae	*Galium verticillatum*	-	Mediterranean	-	-	-	E1.2E	High
Rubiaceae	*Cruciata pedemontana*	-	-	-	-	-	C2	High
Alismataceae	*Alisma gramineum*	-	-	-	-	-	C2	High
Liliaceae	*Ornithogalum ulophyllum*	-	-	-	-	-	E1.2E	High
Liliaceae	*Gagea granatellii*	-	Mediterranean	-	-	-	E1.2E	High
Liliaceae	*Asparagus verticillatus*	-	-	-	-	-	C2	High
Liliaceae	*Asparagus officinalis*	-	-	-	-	-	E1.2E	High

Family	Species	Endemic	Element	IUCN	CITES	BERN	Habitat Code	Abundance
Liliaceae	*Allium sieheanum*	Endemic	Iranian-Turanian	LR (lc)	-	-	E6.2	Medium
Liliaceae	*Allium cappadocicum*	Endemic	Iranian-Turanian	LR (lc)	-	-	E6.2	Medium
Liliaceae	*Allium macrochaetum* subsp. *macrochaetum*	-	Iranian-Turanian	-	-	-	E6.2	High
Liliaceae	*Allium scorodoprasum* subsp. *rotundum*	-	-	-	-	-	E1.2E	High
Liliaceae	*Allium scabriflorum*	Endemic	Iranian-Turanian	LR (lc)	-	-	E6.2	Medium
Liliaceae	*Muscari longipes*	-	-	-	-	-	E1.2E, I1.3	High
Papaveraceae	*Glaucium corniculatum* subsp. *refractum*	-	Iranian-Turanian	-	-	-	E1.2E	High
Papaveraceae	*Roemeria hybrida*	-	-	-	-	-	E1.2E, I1.3	High
Papaveraceae	*Papaver rhoeas*	-	-	-	-	-	I1.3	High
Papaveraceae	*Hypecoum procumbens*	-	Mediterranean	-	-	-	I1.3	High
Papaveraceae	*Hypecoum imberbe*	-	Mediterranean	-	-	-	I1.3	High
Papaveraceae	*Fumaria vaillantii*	-	-	-	-	-	E1.2E	High
Polygonaceae	*Rumex scutatus*	-	-	-	-	-	E1.2E, I1.3	High
Polygonaceae	*Rumex conglomeratus*	-	-	-	-	-	E1.2E, I1.3	High
Plumbaginaceae	*Limonium tamaricoides*	Endemic	Iranian-Turanian	EN	-	-	E6.2	low
Poaceae	*Elymus elongatus subsp. ponticus*	-	-	-	-	-	E6.2	High
Poaceae	*Helictotrichon versicolor*	-	European-Siberian	-	-	-	C2	High
Poaceae	*Rhizocephalus orientalis*	-	Iranian-Turanian	-	-	-	E6.2	High
Poaceae	*Festuca arundinacea* subsp. *arundinacea*	-	-	-	-	-	C2	High
Poaceae	*Loliolum subulatum*	-	Iranian-Turanian	-	-	-	E6.2	High
Poaceae	*Poa nemoralis*	-	-	-	-	-	C2	High
Poaceae	*Oryza sativa*	-	-	-	-	-	I1.3	High
Poaceae	*Agropyron cristatum* subsp. *pectinatum* var. *pectinatum*	-	Mediterranean	-	-	-	C2	High
Poaceae	*Eremopyrum orientale*	-	-	-	-	-	C2	High
Poaceae	*Aegilops biuncialis*	-	-	-	-	-	E1.2E, I1.3	High
Poaceae	*Hordeum marinum*	-	Mediterranean	-	-	-	E6.2	High
Poaceae	*Hordeum murinum* subsp. *murinum*	-	Mediterranean	-	-	-	E6.2	High
Poaceae	*Bromus danthoniae*	-	-	-	-	-	C2	High
Poaceae	*Bromus tectorum*	-	-	-	-	-	E1.2E	High
Poaceae	*Bromus sterilis*	-	-	-	-	-	I1.3	High
Poaceae	*Apera intermedia*	-	-	-	-	-	C2	High
Poaceae	*Anthoxanthum odoratum* subsp. *odoratum*	-	-	-	-	-	C2	High
Poaceae	*Festuca valesiaca*	-	-	-	-	-	I1.3	High
Poaceae	*Vulpia unilateralis*	-	Mediterranean	-	-	-	C2	High
Poaceae	*Poa trivialis*	-	-	-	-	-	C2	High

Family	Species	Endemic	Element	IUCN	CITES	BERN	Habitat Code	Abundance
Poaceae	*Poa bulbosa*	-	-	-	-	-	E1.2E	High
Poaceae	*Puccinellia koeieana*	-	-	-	-	-	E6.2	High
Poaceae	*Stipa hohenackeriana* var. *hohenackeriana*	-	Iranian-Turanian	-	-	-	E1.2E	High
Poaceae	*Pragmites australis*	-	-	-	-	-	C2	High
Poaceae	*Stipagrostis plumosa*	-	-	-	-	-	C2	High
Poaceae	*Cynodon dactylon* var. *villosus*	-	-	-	-	-	C2	High
Poaceae	*Bromus japonicus* subsp. *japonicus*	-	-	-	-	-	I1.3	High
Poaceae	*Puccinellia convoluta*	-	-	-	-	-	E6.2	High

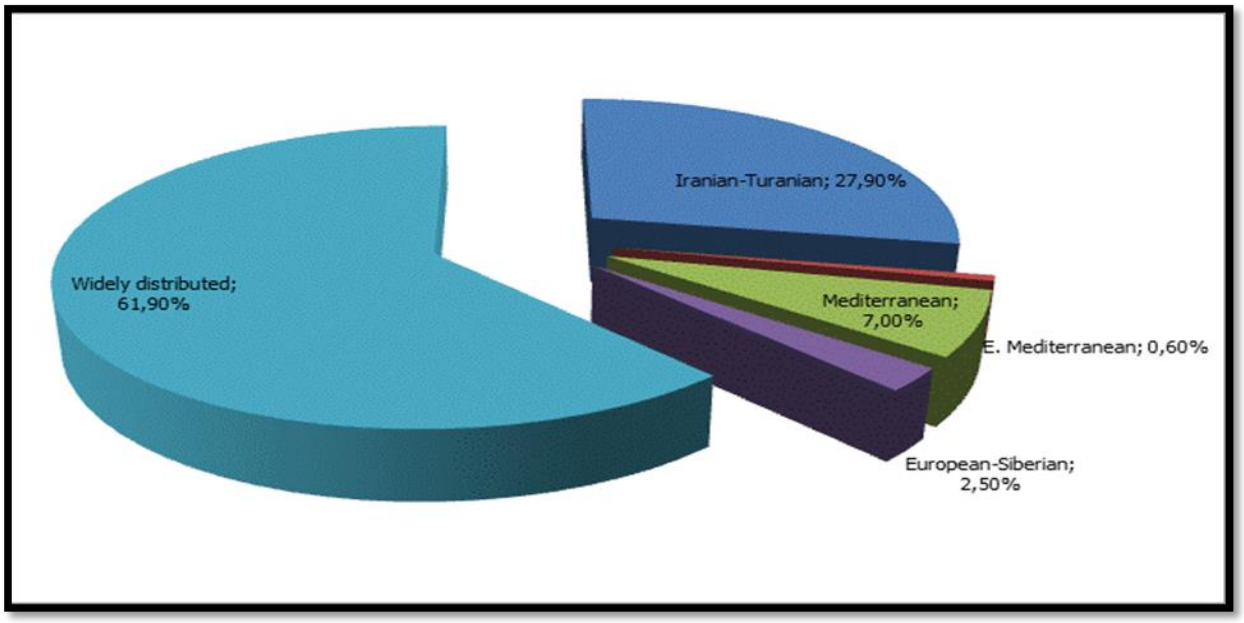


Figure 4.13.7.2. The Phytogeographical Regions of the 315 Taxa Identified

According to the Red Data Book of Turkish Plants, at Tuz Gölü and the surrounding, there are 48 endemic species and 1 non-endemic but rare species (Ekim et al., 2000) (Table 4.1.2.2.3.5.1). Of these species, the IUCN threat category of the non-endemic but rare specie *Arabidopsis parvula* is VU, the IUCN threat category of the endemic specie *Limonium tamaricoides* is EN, the IUCN threat category of *Lepidium caespitosum, Erysimum torulosum, Hypericum salsugineum, Limonium anatolicum, Ferula halophile, Achillea sieheana, Microcnemum coralloides* and *Centaurea tuzgoluensis* is again VU, the IUCN threat category of Sphaerophysa kotschyana and Cousinia iconica is LR(cd), and the IUCN threat category of *Consolida stenocarpa, Consolida raveyi, Alyssum paphlagonicum, Alyssum pateri* susbp. *pateri*, *Camelina hispida* var. *grandiflora*, *Salsola anatolica, Erodium amanum, Limonium iconicum, Limonium lilacinum, Lathyrus brachypterus var. haussknechtii, Astragalus pinetorum, Astragalus lydius, Astragalus mesogitanus, Astragalus cadmicus,*

Astragalus karamasicus, Astragalus campylosema subsp. campylosema, Onobrychis armena, Bupleurum sulphureum, Anthemis fumariifolia, Helichrysum noeanum, Helichrysum arenarium subsp. aucheri, Achillea aleppiea subsp. zederbaueri, Cousinia caesarea, Scorzonera hieraciifolia, Taraxacum farinosum, Alkanna pseudotinctoria, Nonea stenosolen, Verbascum cappadocicum, Linaria iconia, Verbascum insulare, Veronica multifida, Wiedemannia orientalis, Nepeta congesta var. congesta, Salvia cyanescens, Allium sieheanum, Allium cappadocicum and *Allium scabriflorum* is LR (lc). Thus, before and after the construction, necessary measures to protect the populations of the *Lepidium caespitosum, Erysimum torulosum, Arabidopsis parvula, Hypericum salsugineum, Limonium anatolicum, Sphaerophysa kotschyana, Ferula halophile, Achillea sieheana, Cousinia iconica, Microcnemum coralloides, Limonium tamaricoides* and *Centaurea tuzgoluensis* species, all of which are in the EN, VU and LR (cd) category (Table 1.12.7.2).

Table 4.13.7.2. The Endangered Taxon Distribution and the IUCN Threat Categories of These Plants

Family	Species	Endemic	Element	IUCN	CITES	BERN	Habitat Code	Abundance
Brassicaceae	*Lepidium caespitosum*	Endemic	Iranian-Turanian	VU	-	-	E6.2	Low
Brassicaceae	*Erysimum torulosum*	Endemic	-	VU	-	-	E6.2	Low
Brassicaceae	*Arabidopsis parvula*	-	-	VU	-	-	E6.2	Low
Guttiferae	*Hypericum salsugineum*	Endemic	-	VU	-	App-I	E6.2	Low
Plumbaginaceae	*Limonium anatolicum*	Endemic	Iranian-Turanian	VU	-	App-I	E6.2	Low
Fabaceae	*Sphaerophysa kotschyana*	Endemic	Iranian-Turanian	LR (cd)	-	-	E6.2	Low
Apiaceae	*Ferula halophila*	Endemic	Iranian-Turanian	VU	-	-	E6.2	Low
Asteraceae	*Achillea sieheana*	Endemic	Iranian-Turanian	VU	-	-	E6.2	Low
Asteraceae	*Cousinia iconica*	Endemic	Iranian-Turanian	LR (cd)	-	-	E1.2E	Low
Plumbaginaceae	*Limonium tamaricoides*	Endemic	Iranian-Turanian	EN	-	-	E6.2	low
Chenopodiaceae	*Microcnemum coralloides*	-	-	VU	-	-	E6.2	low
Asteraceae	*Centaurea tuzgoluensis*	Endemic	-	VU	-	-	E6.2	low

The habitat types where endemic restricted-range taxa exhibit intense distribution are given in Figure 4.13.7.3.

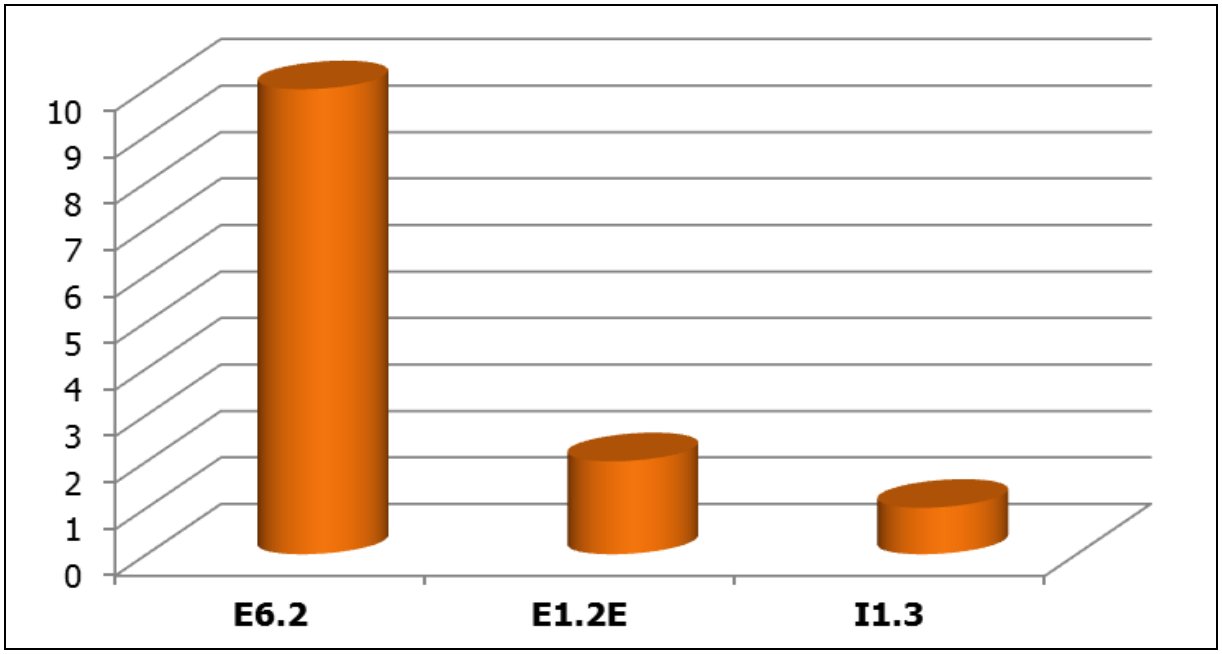


Figure 4.13.7.3. The Habitat Types where Endemic Restricted-Range Taxa Exhibit Intense Distribution

Within the borders of the project, studies were conducted at 20 stations of different habitats. The habitat distribution of these stations is given in Figure 4.13.7.4.

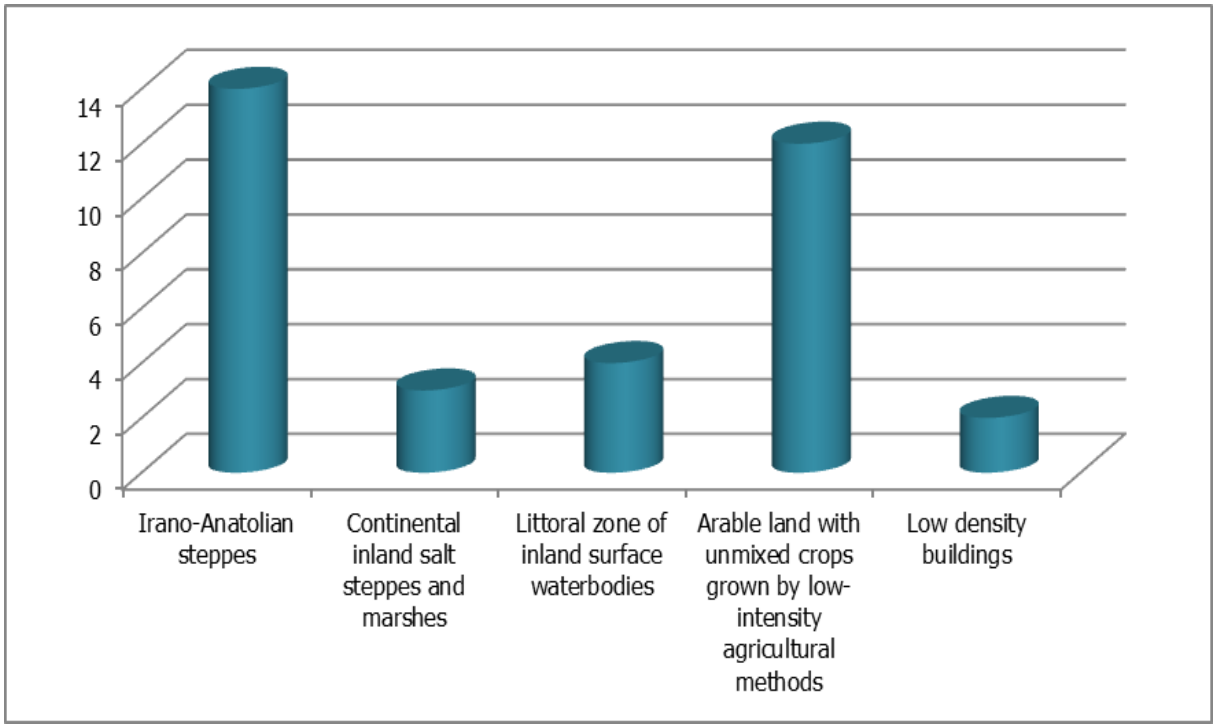


Figure 4.13.7.4. Habitat Distribution of Stations where Studies were Carried Out

Key Baseline Findings and Conclusions

Within the scope of this project, the whole project area (including licence area, gas pipeline area, brine discharge line area) was investigated. In order to reveal the ecological and floristic structure of this project, taking into account the habitat vulnerability, field studies were conducted at 20 different stations, belonging to 5 different EUNIS habitat types identified. The results of these field studies were used to define the general floristic structure of the project. According to the data obtained in the studies, on the whole project, 315 plant taxa were determined.

48 of the **315** taxa identified in the field studies are endemic to Turkey. Thus, the rate of endemism is **15.2%.** Considering that **34%** of the Turkish flora is endemic, one might think that the endemics in the project area is low; however, given that about 65,6% of the project area is agricultural land, it will be appreciated that the endemism rate in the project area is very **high**. The most important habitats where the endemism rate is high is the salty steppes at Tuz Gölü. These areas contain the endemic and rare species, therefore the calculated endemism rate high. Due to the reason, these areas were determined as “No-Go Areas”. Although the majority of the endemic species identified (Table 4.13.7.2) are local range species. On the other hand the rest 36 endemic species are identified are wide range species, some are regional or are known from one or two localities. Of the endemic species identified in the project area, the IUCN threat category of 1 specie is “EN”, 8 species is “VU”, 2 species is “LR(cd)” and 37 species is “LR(lc)”. The IUCN threat category of the species *Arabidopsis parvula**,*** which is not endemic but is restricted ranged in Turkey, is “VU”. The distribution of the 49 taxa identified into the IUCN threat categories is given in Figure 4.13.7.5.

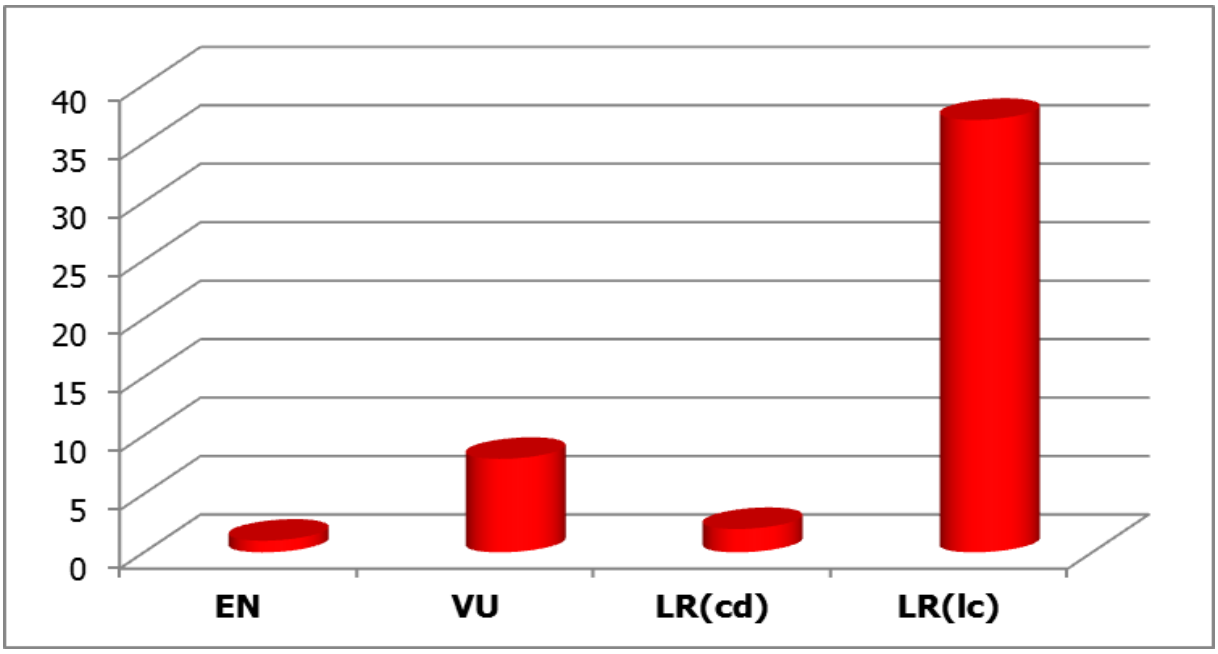


Figure 4.13.7.5. The Distribution of the 49 Taxa Identified into the IUCN Threat Categories

Field studies, in general, were carried out in each sampling site when the vegetation is most appropriate; however, since the development of every plant is not concomitant, a second field study was made for some locations. The vulnerabilities of the 5 different habitats along the project are not at the same level. Thus, for each habitat, the measures which must be taken before and after each construction are given in Table 4.13.7.3. Since the vulnerability of the areas where floristic and ecological studies were conducted along the project are not at the same level, some areas were deemed to have critical importance with respect to flora and such areas are assessed under the title "**No Go Areas**". The reasons for sensitivity of these areas that are determined to be "no go areas" are given in Table 4.13.7.4. Taking the suggested measures concerning the local range endemic species and no-go areas, the adverse effect of the project on the ecosystem will be reduced to a minimum. In addition, taking the measures required to accelerate biorestoration, probable habitat degradation will be reversed in a short time.

Table 4.13.7.3. Habitats along the Project and Methods of Biorestoration

Habitats	Methods of Biorestoration
Littoral zone of inland surface waterbodies	In these habitats, the construction works must start when water dries out and must be completed in the shortest time possible. Appropriate soil management is sufficient for this habitat.
Irano-Anatolian steppes	Top soil management is sufficient for this habitat.
Continental inland salt steppes	Some salt steppes habitats along the route are critical. Therefore these habitats are declined as "no go areas". Monitoring studies should be prepared after brine discharge.
Arable land with unmixed crops grown by low-intensity agricultural methods	Top soil management is sufficient for this habitat.

Table 4.13.7.4. The "No Go Areas"

No	Habitat	Endemic and/or Rare Species Found in the Area	IUCN Thr. Cat.	Measures to Be Taken	Restrictions
1	Continental inland salt steppes	*Lepidium caespitosum* *Erysimum torulosum* *Arabidopsis parvula* *Hypericum salsugineum* *Limonium anatolicum* *Sphaerophysa kotschyana* *Ferula halophila* *Achillea sieheana* *Microcnemum coralloides* *Limonium tamaricoides* *Centaurea tuzgoluensis*	VU VU VU VU VU LR (cd) VU VU VU EN VU	Biodiversity Action Plan is prepared for these areas. Monitoring studies should be prepared after brine discharge.	No construction at this area
2	Continental inland salt steppes	*Lepidium caespitosum* *Erysimum torulosum* *Arabidopsis parvula* *Hypericum salsugineum* *Limonium anatolicum* *Sphaerophysa kotschyana* *Ferula halophila* *Achillea sieheana* *Microcnemum coralloides* *Limonium tamaricoides* *Centaurea tuzgoluensis*	VU VU VU VU VU LR (cd) VU VU VU EN VU	Biodiversity Action Plan is prepared for these areas. Monitoring studies should be prepared after brine discharge.	No construction at this area
3	Continental inland salt steppes	*Lepidium caespitosum* *Erysimum torulosum* *Arabidopsis parvula* *Hypericum salsugineum* *Limonium anatolicum* *Sphaerophysa kotschyana* *Ferula halophila* *Achillea sieheana* *Microcnemum coralloides* *Limonium tamaricoides* *Centaurea tuzgoluensis*	VU VU VU VU VU LR (cd) VU VU VU EN VU	No construction at this area	No construction at this area

No	Habitat	Endemic and/or Rare Species Found in the Area	IUCN Thr. Cat.	Measures to Be Taken	Restrictions
4	Irano-Anatolian steppes	*Cousinia iconica*	LR (cd)	No construction at this area	No construction at this area
		Consolida stenocarpa	LR (lc)		
		Consolida raveyi	LR (lc)		
		Alyssum paphlagonicum	LR (lc)		
		Alyssum pateri susbp. pateri	LR (lc)		
		Camelina hispida var. grandiflora	LR (lc)		
		Salsola anatolica	LR (lc)		
		Erodium amanum	LR (lc)		
		Limonium iconicum	LR (lc)		
		Limonium lilacinum	LR (lc)		
		Lathyrus brachypterus var. haussknechtii	LR (lc)		
		Astragalus pinetorum	LR (lc)		
		Astragalus lydius	LR (lc)		
		Astragalus mesogitanus	LR (lc)		
		Astragalus cadmicus	LR (lc)		
		Astragalus karamasicus	LR (lc)		
		Astragalus campylosema subsp. campylosema	LR (lc)		
		Onobrychis armena	LR (lc)		
		Bupleurum sulphureum	LR (lc)		
		Anthemis fumariifolia	LR (lc)		
		Helichrysum noeanum	LR (lc)		
		Helichrysum arenarium subsp. aucheri	LR (lc)		
		Achillea aleppiea subsp. zederbaueri	LR (lc)		
		Cousinia caesarea	LR (lc)		
		Scorzonera hieraciifolia	LR (lc)		
		Taraxacum farinosum	LR (lc)		
		Alkanna pseudotinctoria	LR (lc)		
		Nonea stenosolen	LR (lc)		
		Verbascum cappadocicum	LR (lc)		
		Linaria iconia	LR (lc)		
		Verbascum insulare	LR (lc)		
		Veronica multifida	LR (lc)		
		Wiedemannia orientalis	LR (lc)		
		Nepeta congesta var. congesta	LR (lc)		
		Salvia cyanescens	LR (lc)		
		Allium sieheanum	LR (lc)		
		Allium cappadocicum	LR (lc)		
		Allium scabriflorum	LR (lc)		

4.13.8 Fauna

General Conditions

Fauna species show seasonal variations, and since it may take one or more years to establish the fauna inventory of an area, the species given at the fauna lists have been based on site surveys, observations and information from local people, biotope characteristics of the region and the current occurrence areas. Fauna lists contain those species that were seen during site surveys, and have not been observed during site survey, but have been determined according to the literature researches.

In this scope, the ÇINAR Fauna Specialist (Dr. Ayşegül İLİKER, Dr. Bahadır AKMAN and Levent BİLER) conducted land surveys on the routes of the pipelines, surface facilities and UGS sites were located.

Mammals

Mammalia is a well-known group of the class vertebrates. All mammals are warm-blooded organisms. All mammals give birth to their babies and feed them with milk, except for those that lay eggs. Furthermore, that they possess hair and fur is another distinct characteristic. They are distributed all over the world, having approximately 5500 species (Wilson and Reeder 1993, 2005, Nowak 1999, IUCN 2011).

Turkey hosts a rich biodiversity which comprises the three of the 34 worldwide designated hot spots, the Persian-Anatolian, Mediterranean and Caucasian basins (Mittermeier et al. 2004). It is known that 168 mammalian species, of which 128 are small mammals, are distributed in Turkey (Osborn, 1964; Doğramacı, 1989; Demirsoy, 1996; Benda and Horacek, 1998; Yiğit et al., 2006; Krystufek and Vohralik, 2001, 2005, 2009). 6 of these are endemic to Anatolia and also other species exist whose distribution area is mostly within the boundaries of Turkey (Krystufek and Vohralik 2005). It is observed that the number of mammal species dispersed in Turkey is higher compared to the European countries. The mammals in Turkey may be grouped generally in nine taxonomic orders: Soricomorpha (Shrew-form), Erinaceomorpha (Hedgehog Family), Chiroptera (Bats), Lagomorpha (Lagomorphs), Rodentia (Rodents), Carnivora (Carnivores), Artiodactyla (Even-toed ungulates), Perissodactyla (Odd-toed ungulates), Cetacea (Cetaceans).

According to the IUCN, of the mammalian species in Turkey, *Balaenoptera physalus* EN; *Monachus monachus* CR; *Rhinolophus mehelyi*, *Myotis capaccinii*, *Spermophilus citellus*, *Mesocricetus auratus*, *Myomimus roachi*, *Vormela peregusna*, *Ursus arctos*, *Physeter catadon*, *Capra aegagrus*, *Gazella subgutturosa*, *Gazella gazella* VU; *Rhinolophus euryale*, *Myotis bechsteinii*, *Nyctalus lasiopterus*, *Barbastella barbastellus*, *Miniopterus schreibersii*, *Oryctolagus cuniculus*, *Spermopihlus xanthoprymnus*, *Mesocricetus brandti*, *Prometheomys schaposchnikowi*, *Allactaga euphratica*, *Lutra lutra*, *Hyaena hyaena*, *Ovis aries gmelini* and *Ovis aries anatolic,* including *Meriones*, are in the NT category (IUCN 2017).

Birds

Turkey bears great significance in ornithologic terms with its geographical location, wide territory, topographical structure and different climatic zones. Turkey, which is located at the intersection point of the Asia, Europe and Africa continents, forms a natural bridge that connects the West Palearctic zone to the wintering grounds of the birds in the South. Turkey is on the great migratory routes in the Palearctic zone; also, its geographical structure and climatic diversity provides a suitable habitat for plenty of bird species (Beaman, 1997; Erdoğan, 1998; Kiziroğlu, 1989; Roselaar, 1995). Both the migrations from the Straits and from the Çoruh Valley and the bird intensity in the specific wetlands emphasize the ornithologic significance of Turkey (Anonymous, 2004).

Of the about 9600 bird species belonging to 154 families included in 27 orders on the world, about 500 species belonging to 23 orders are found in Europe and of these species, a great majority, i.e. 453 species are found in Turkey (Aslan and Kiziroğlu, 2003; Beaman, 1997; Bilgin and Akçakaya, 1987; Erdoğan, 1998; Heinzel and Parslow, 1995; Roselaar, 1995; Kirwan et al., 1998; Kiziroğlu, 1989). Within these, there are 13 species the statues of which are not ascertained, 300 species use Turkey for incubation regularly, about 70 species only spend the winter in this area or they are seen during migration. 40-45 species are not normally found in Turkey but in some years and especially with the influence of the adverse weather conditions, these species are encountered in Turkey in very small numbers (Anonymous, 2004).

The distribution of the birds in Turkey displays important variation according to different seasons and years. The bird communities, which are concentrated in the coastal regions, reach the highest population in autumn (September-November) when they migrate to South. A similar bird flow can be seen at a lower degree in spring (February-April). While the spring migration is realized in a longer time period, on a wider territory with a smaller number of birds, the migrations made to the south in autumn are in the form of crowded and regular coveys and they are rather short-termed (Anonymous, 2004).

Repitles

Turkey hosts a biological diversity comparable to that of the continents due to being located at the junction of three different bio-geographical regions, that is Europe-Siberia, Iran-Turan and the Mediterranean; occurrence of very diverse land forms within short distances; and in connection to this, emergence of different local climates; being a bridge between south-west Asia and Europe; and being located on the fauna migration paths. Additionally, since our country was not much influenced by the four ice ages occurred on the earth between 1 million years ago and 12 thousand years ago and since the animals migrating in escape from the glaciers moving down from the North Europe to the Mediterranean find our country as a kind of shelter, as thousands of species disappeared in Europe, a completely opposite diversity emerged in our country. Turkey, which is at the intersection point of fauna elements of many different origins, has a potential almost as rich as that of the continental Europe with about 129 reptilian species it hosts (Baran & Atatür, 1998; Sindaco et al., 2000).

Reptiles are a class of vertebrates between amphibians and birds. They are completely adapted to life on dry land. This class includes turtles, lizards and snakes. Their skin is dry and secretory glands are almost non-existent in the skin. Their skin is covered with a creatinine layer. This ceatinine layer forms scales or plaque structures at various locations on the body. This layer is shed of and renewed at certain intervals.

Some reptiles have four legs, and some do not have legs. Even in reptiles with legs, the body is low to touch the ground. Majority of reptiles live on dry land, and some in water. Those living in water too breathe with lungs.

In Turkey, there are a total of 11 turtle species living in on land, sea and in fresh waters, and 63 lizard species completely adapted to life on dry land. 8 of these lizard species are endemic species living only in Turkey. Of the lizard species living in Turkey, 4 species (*Blanus strauchi, Anguis fragilis, Pseudopus apodus,* and *Ophiomorus punctatissimus*) do not have legs and they crawl for locomotion just like snakes.

Of the 55 snake species living in Turkey, only 15 are venomous. These species belong to the Viperidae and Elapidae families. Of the remaining species, 3 are semi-venomous, and the other is non-venomous. Among the snake species there are 11 endemic species that live only in Turkey. Reptiles, establishing crowded populations in habitats suitable for themselves, have a very wide distribution area in Turkey.

Amphibians

Due to its geographical location, Turkey is both a natural bridge and a barrier between the Asia and Europe continents. It is at an extremely significant location with respect to biological diversity due to reasons such as being positioned at the Iran-Turan, Europe-Siberia and the Mediterranean biogeographies, at the transit zones of these geographies and at the juncture of the three continents, and varying climatic and topographical characteristics. This significant geographical position of Turkey has a positive impact on the richness of the amphibian species. Turkey is almost as rich as Europe with respect to amphibian fauna.

In Turkey, a total of 28 amphibian species exhibit distribution. Of these, 14 are salamander species of the Urodela order. Of these species that exhibit distribution in various regions of Turkey, 7 (*Lyciasalamandra fazilae, Lyciasalamandra antalyana, Lyciasalamandra billae*, *Lyciasalamandra atifi*, *Lyciasalamandra flavimembris*, *Lyciasalamandra luschani*, *Neurergus strauchi*) are endemic to Turkey. These tailed amphibian species need water or a humid environment to reproduce, and thus, they are more active at nights.

In Turkey, there are 14 species of the tailless amphibians of the Anura order. Of these species, 3 (*Rana holtzi, Rana tavasensis, Pelophylax caralitanus)* are endemic to Turkey. There are species that are fully dependent on water as well as species that are completely terrestrial. However, even if they are completely terrestrial, they absolutely need water for reproduction. Tailless amphibians have a wide distribution area in Turkey.

Arthropods

The name Arthropoda phylum consists of the words *arthros* (joint) and *podos* (foot) and means “jointed legs”. In Turkish it is called “Eklembacaklılar”. Arthropods which cover about 75% of the known animal species, is the largest phylum of the animal kingdom both with respect to number of species and the number of members. They are represented nearly in all habitats in the biosphere.

All insects, spiders, ticks, scorpions, false scorpions, millipedes, centipedes, lobsters, shrimps and crabs, which we frequently see in the environment we live in, are arthropods.

Although invaluable studies were made in Turkey concerning the animals covered by the arthropods, these studies are not adequate to reveal a full inventory of the biological richness and the distribution of these species. And, current studies are focused on certain arthropod groups.

Giving roughly the known number of species of the Arthropoda groups in Turkey;

Crustaceans (Crustacea): Marine crustaceans approximately 430 species, those living in fresh water 126 species

Arachnids (Arachnida): The species, which are pests on animals and plants that have economical value, which live as parasites, and which carry and transfer various disease agents as vectors, have been thoroughly investigated. According to this, 979 spider species and 23 scorpion species are known in Turkey.

Millipedes (Diplopoda): Although studies carried out concerning this group are extremely insufficient, there are 123 species known.

Insects (Insecta): Insects, which are the widest animal group both with respect to the number of species and to the number of members on the earth, attracts close attention of the scientists in Turkey, just as it is throughout the world. Particularly, groups and species having economical and medicinal significance in relation to plants, animals and humans have been investigated in detail.

Mayflies (Ephemeroptera): The members of this order, in which the adult period is highly reduced, pass 99% of their lives in water as larvae and nymphs. Numerous studies have been made, especially starting with the 1970s. A recent control list covers 138 species.

Dragonflies (Odonata): These amphibiotic insects are one of the well investigated and known insect orders in Turkey. Therefore, the Turkish fauna is well established and a total of 101 species are known.

Stoneflies (Plecoptera): This is another amphibiotic insect order. Although their wings are well developed, they generally prefer to live on stones, plants. Together with the Ephemeroptera order, they are used as a criterion for water quality. This is an order that has

been researched well enough to partially represent the Turkish fauna. As a result of the studies made up to date, most of which are regional, 93 species were identified.

Cockroaches (Blattodea): These are the animals that are the longest known by man. Although they are one of the groups not sufficiently studied, there are some studies on the harmful ones. 25 species are known from Turkey.

Mantids (Mantodea): These can readily be recognised by their front legs and extended pro-thoraxes. They are one of the well investigated insect orders in Turkey and 18 species have been identified.

Earwigs (Dermaptera): These are nocturnal insects. The Turkish fauna is almost fully identified and 15 species are known.

Straight wings (Orthoptera): They are one of the best known insect orders, because of their specific jumps, because many give out cries, and because they seriously damage agricultural products. Up to now, 675 species have been identified from Turkey.

True bugs (Hemiptera): They can be readily distinguished from the members of the Homoptera order, with which they are close relatives, by their wing structure and the location of their proboscis. In general, they are known with agricultural pest species.

Homopterans (Hemiptera): All are terrestrial and can be readily recognised by their wing and mouth parts. Green aphids (Aphioidea) belonging to this order is one of the first ranking agricultural pests and it is observed that recently studies on this group have been intensified; about 1400 species are known from Turkey.

Net-winged insects (Neuroptera): They can be readily recognised by their wing structures that form a roof-like shape on the body during rest. This is an insect order that has been investigated mostly in recent years. As a result of these studies -although they are insufficient for now- 207 species are known from Turkey.

Caddisflies (Trichoptera): Unlike butterflies, their wings are mostly covered with thick hairs. It includes important indicator species with respect to water quality studies. This is one of the insect orders that have been investigated in detail. Currently a limited number of scientists work on them and about 400 species have been identified.

Scorpionflies (Mecoptera): Their characteristics are their heads extending down like a beak and genital structures of the males, resembling that of the scorpions. There are very few studies on them, and these studies are regional or on a certain genus (particularly *Panorpa*). 15 species are known from Turkey.

Butterflies and moths (Lepidoptera): They can readily be distinguished from other insects by two pairs of wings covered with scales. Especially butterflies are the best known insect order in the amateur or professional sense in Turkey, just as it is all over the world. It has been

extensively studied. While 410 species of diurnal butterflies are known from Turkey, more than 4600 species of nocturnal butterflies or moths have been recorded. Many species of this order are facing extinction due to environmental pollution, destruction of their habitats, the agricultural chemicals used and intensive collection of some species for commercial purposes.

Flies (Diptera): These are insects having only one pair of wings because their hind wings have been transformed into a balancing organ called “halter”. Up to only recently, studies on groups harmful to humans, animals and plants have been carried out in Turkey. However, currently, many other groups as well as these groups are being investigated. Together with the studies made in recent years, it is known that there are more than 3000 species in Turkey.

Membranous Wings (Hymenoptera): They are recognised readily by their membranous wings. There are no detailed studies, except for a few groups (Formicidae, Braconidae, Andreinidae, Vespidae, Apidae and Bombidae). Studies on parasite groups are almost non-existent.

Beetles (Coleoptera): Their characteristic structures are their hind wings and the hardened front wings that shield the abdomen. It is the insect order represented by the highest number of species in the world. Although many families were studied in detail in Turkey, because of the families not investigated, it is not possible to state the number of known species, even if approximately, in Turkey. However, it is being estimated that there are 8,000-10,000 species.

Turkey is like a natural museum due to the living organisms it hosts and their habitats. Besides its floristic richness, its fauna is also rather rich and diverse. Although it is not possible to give an accurate number, it is being assumed that the number of insect species known from Turkey is around 25,000-30,000.

Selection of Sampling Stations

The level 3 EUNIS habitat type map was used as starting point for terrestrial field studies. Sample sites were selected to adequately represent each of the tentatively assigned EUNIS level 2 and Level 3 habitat types.

Sample sites are determined considering sizes, continuous and intermittent character of natural habitats.

Description of Sampling Stations

There are 20 sampling stations for herpetofauna, mammalia and ornithofauna studies. Sampling stations are given in Figure 4.13.8.1.

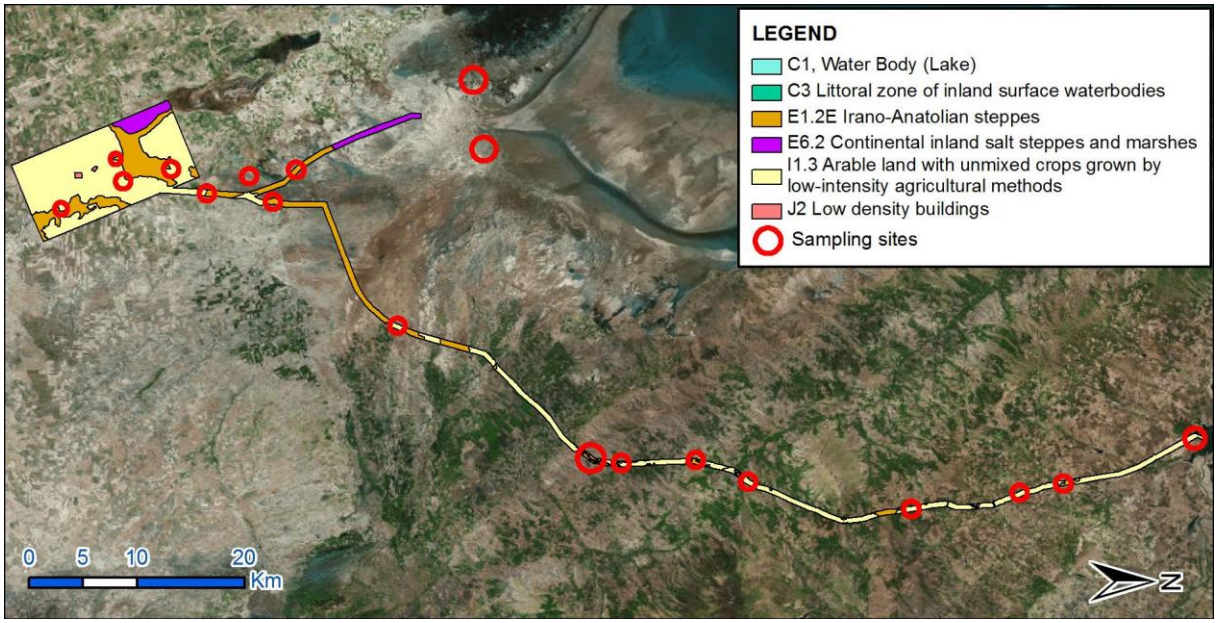


Figure 4.13.8.1. Sampling Stations for Fauna Studies

Baseline Results

The distribution of and detailed information about fauna components are shown below. The classification of species, their threat factor if exists, their conservation and endemic statuses are indicated on the tables along with their sensitivities.

Mammals

Within the scope of the Project, observations regarding mammals were carried out at 20 stations.

At these stations 14 species were identified. Detailed information about the mammalian species identified on the project is given in Table 4.13.8.1.

Table 4.13.8.1. Observed Mammalian Species

Family and Species Scientific Name	English Common Name	Bern	CHC*	IUCN	CITES
LEPORIDAE					
Lepus europaeus	European Hare	An-III	An-II	LC	-
ERINACEIDAE					
Erinaceus concolor	Southern White-breasted Hedgehog	-	-	LC	-
CRICETIDAE					
Microtus nivalis	Caucasian Snow Vole	An-III	-	LC	-
Arvicola terrestris	European Water Vole	-	-	LC	-
CANIDAE					
Vulpes vulpes	Red Fox	-	An-II	LC	App.III
Canis lupus	Gray Wolf	An-II	-	LC	App.II
SCIURIDAE					
Spermophilus xanthoprymnus	Asia Minor Ground Squirrel	-	-	NT	-

Family and Species Scientific Name	English Common Name	Bern	CHC*	IUCN	CITES
SPALACİDAE					
Nannospalax nehringi	Nehring's Blind Mole Rat	-	-	DD	
RODENTIA					
Allactaga williamsi	Williams's Jerboa	-	-	LC	
MUSTELIDAE					
Mustela nivalis	Least Weasel	An-III	An-I	LC	
VESPERTILIONIDAE					
Pipistrellus pipistrellus	Common Pipistrelle	An-III	-	LC	
Myotis blythii	Lesser Mouse-eared Myotis	An-II	-	LC	
RHINOLOPHIDAE					
Rhinolophus hipposideros	Lesser Horseshoe Bat	An-II	-	LC	
MUSTELIDAE					
Meles meles	Eurasian Badger	An-III	An-I	LC	

Reference: *Demirsoy, A., 1997, Omurgalılar "Sürüngenler, Kuşlar ve Memeliler" (Vertebrates "Reptiles, Birds and Mammals") Meteksan A.Ş., Ankara.*
Reference: *Demirsoy, A., 1996, Türkiye Omurgalıları "Memeliler" (Vertebrates of Turkey "Mammals"), Ministry of Environment General Directorate of Environmental Protection, Project No: 90-K-1000-90. Ankara*
(*)*= Republic of Turkey Ministry of Forestry and Water Affairs, "2017-2018 Hunting Season, Decisions of Central Hunting Commission".*

According to the IUCN categories of the mammalian species identified along the project route, *Spermophilus xanthoprymnus* is in the NT; *Nannospalax nehringi* is in the DD; the rets are in the LC category.

Of the mammalian species identified along the route, 3 species (*Canis lupus, Myotis blythii* and *Rhinolophus hipposideros*) are listed in Annex 2 and 5 species (*Lepus europaeus, Microtus nivalis, Mustela nivalis, Pipistrellus pipistrellus* and *Meles meles*) are listed in Annex 3 of the Bern Convention. According to CITES, *Canis lupus* is listed in Appendix 2 and *Vulpes vulpes* is listed in Appendix 3.

The pictures of the mammalian species that live in the project area are given Picture 4.13.8.1., Picture 4.13.8.2. and Picture 4.13.8.3.

Picture 4.13.8.1. *Erinaceus concolor* (Southern White-breasted Hedgehog)

Picture 4.13.8.2. *Vulpes vulpes* (Red Fox)

Picture 4.13.8.3. *Spermophilus xanthoprymnus* (Asia Minor Ground Squirrel)

Birds

Within the scope of the Project, observations regarding birds were carried out at 20 stations.

At these stations 113 species were identified. Detailed information about the bird species identified on the project is given in Table 4.13.8.2.

Table 4.13.8.2. Observed Bird Species

Family	Species	English Common Name	BERN	IUCN	Red Data Book	Status	CHC*	CITES
Podicipedidae	*Podiceps cristatus*	Great Crested Grebe	An-III	LC	A.5	Y	-	-
Podicipedidae	*Podiceps grisegena*	Red-necked Grebe	An-II	LC	A.3	Y	-	-
Podicipedidae	*Podiceps nigricollis*	Black-necked Grebe	An-II	LC	A.4	Y	-	-
Podicipedidae	*Tachybaptus ruficollis*	Little Grebe	An-II	LC	A.3	Y	-	-
Ardeidae	*Ardea cinerea*	Grey Heron	An-III	LC	A.3	Y	An-I	-
Ardeidae	*Ardea alba*	Great White Egret	An-II	LC	A.3	Y	-	-
Phoenicopteridae	*Phoenicopterus roseus*	Greater Flamingo	An-III	LC	A.3	Y	-	App-II
Anatidae	*Spatula clypeata*	Northern Shoveler	An-III	LC	A.4	Y	An-I	-
Anatidae	*Anas crecca*	Common Teal	An-III	LC	A.5	Y	An-II	-
Anatidae	*Spatula querquedula*	Garganey	An-III	LC	A.4	Y	An-II	-
Anatidae	*Anser anser*	Greylag Goose	An-III	LC	A.4.	Y	An-II	-
Anatidae	*Anser albifrons*	Greater White-fronted Goose	An-III	LC	B.5.	K	An-II	-

Family	Species	English Common Name	BERN	IUCN	Red Data Book	Status	CHC*	CITES
Anatidae	*Tadorna ferruginea*	Ruddy Shelduck	An-II	LC	A.4.	Y	-	-
Anatidae	*Tadorna tadorna*	Common Shelduck	An-II	LC	A.3	Y	-	-
Anatidae	*Anas platyrhynchos*	Mallard	An-III	LC	A.5.	Y	An-II	-
Anatidae	*Anas acuta*	Northern Pintail	An-III	LC	A.5.	Y	An-II	-
Anatidae	*Mereca penelope*	Eurasian Wigeon	An-III	LC	A.5.	Y	An-II	-
Anatidae	*Aythya fuligula*	Tufted Duck	An-III	LC	A.5.	Y	An-II	-
Anatidae	*Aythya ferina*	Common Pochard	An-III	VU	A.5.	Y	An-II	-
Anatidae	*Netta rufina*	Red-crested Pochard	An-III	LC	A.5.	Y	-	-
Anatidae	*Oxyura leucocephala*	White-headed Duck	An-II	EN	A.2.	Y	-	App-II
Accipitridae	*Buteo rufinus*	Long-legged Buzzard	An-II	LC	A.3	Y	-	App-II
Accipitridae	*Circus aeruginosus*	Western Marsh-harrier	An-II	LC	A.3	Y	-	App-II
Accipitridae	*Circus cyaneus*	Hen Harrier	An-II	LC	A.1	KZ	-	App-II
Accipitridae	*Aquila chrysaetos*	Golden Eagle	An-II	LC	A.1	Y	-	App-II
Accipitridae	*Aquila heliaca*	Eastern Imperial Eagle	An-II	VU	A.1	Y	-	App-I
Accipitridae	*Buteo buteo*	Eurasian Buzzard	An-II	LC	A.3.	Y	-	App-II
Falconidae	*Falco cherrug*	Saker Falcon	An-II	EN	A.1	Y	-	App-II
Falconidae	*Falco tinnunculus*	Common Kestrel	An-II	LC	A.2	Y	-	App-II
Falconidae	*Falco naumanni*	Lesser Kestrel	An-II	LC	A.2.	Y	-	App-II
Falconidae	*Falco peregrinus*	Peregrine Falcon	An-II	LC	A.1	Y	-	App-I
Falconidae	*Falco columbarius*	Merlin	An-II	LC	B.1	K	-	App-II
Falconidae	*Falco vespertinus*	Red-footed Falcon	An-II	NT	B.3.	T	-	App-II
Rallidae	*Fulica atra*	Common Coot	An-III	LC	A.5	Y	An-II	-
Charadriidae	*Vanellus vanellus*	Northern Lapwing	An-III	NT	A.5	KZ	An-I	-
Charadriidae	*Actitis hypoleucos*	Common Sandpiper	An-III	LC	A.3	YZ	-	-
Charadriidae	*Charadrius dubius*	Little Ringed Plover	An-II	LC	A.3	Y	-	-
Scolopacidae	*Tringa glareola*	Wood Sandpiper	An-II	LC	B.3	T	-	-
Laridae	*Larus ridibundus*	Black-headed Gull	An-III	LC	A.5	KZ	An-I	-
Laridae	*Larus melanocephalus*	Mediterranean Gull	An-II	LC	A.3	Y	-	-
Laridae	*Larus minutus*	Little Gull	An-II	LC	B.3.	K	-	-
Laridae	*Larus argentatus*	European Herring Gull	An-III	LC	A.4.	Y	-	-
Columbidae	*Columba livia*	Rock Dove	An-III	LC	A.5	Y	An-II	-
Columbidae	*Columba oenas*	Stock Dove	An-III	LC	A.3	Y	An-I	-
Columbidae	*Columba palumbus*	Common Woodpigeon	-	LC	A.4	KZ	An-II	-
Columbidae	*Streptopelia decaocto*	Eurasian Collared-dove	An-III	LC	A.5	Y	An-I	-
Columbidae	*Streptopelia turtur*	European Turtle-dove	An-III	VU	A.3	G	-	-
Strigidae	*Athene noctua*	Little Owl	An-III	LC	A.2	Y	-	App-II
Alaudidae	*Alauda arvensis*	Eurasian Skylark	An-III	LC	A.4	KZ	An-I	-

Family	Species	English Common Name	BERN	IUCN	Red Data Book	Status	CHC*	CITES
Alaudidae	*Galerida cristata*	Crested Lark	An-III	LC	A.3	Y	An-I	-
Alaudidae	*Lullula arborea*	Woodlark	An-III	LC	A.3	KZ	An-I	-
Alaudidae	*Melanocorypha calandra*	Calandra Lark	An-II	LC	A.5	Y	-	-
Alaudidae	*Calandrella brachydactyla*	Greater Short-toed Lark	An-II	LC	A.3	Y	-	-
Motacillidae	*Anthus pratensis*	Meadow Pipit	An-II	NT	A.3	KZ	-	-
Motacillidae	*Anthus campestris*	Tawny Pipit	An-II	LC	A.2	G	-	-
Motacillidae	*Motacilla flava*	Western Yellow Wagtail	An-II	LC	A.3	G	-	-
Motacillidae	*Motacilla alba*	White Wagtail	An-II	LC	A.3	Y	-	-
Motacillidae	*Motacilla cinerea*	Grey Wagtail	An-II	LC	A.2	Y	-	-
Muscicapidae	*Phoenicurus ochruros*	Black Redstart	An-II	LC	A.2	KZ	-	-
Muscicapidae	*Saxicola torquatus*	Common Stonechat	An-II	LC	A.3	KZ	-	-
Muscicapidae	*Phoenicurus phoenicurus*	Common Redstart	An-II	LC	A.3.	Y	-	-
Turdidae	*Turdus merula*	Eurasian Blackbird	An-III	LC	A.3	Y	An-II	-
Turdidae	*Turdus philomelos*	Song Thrush	An-III	LC	A.2	KZ	An-II	-
Turdidae	*Turdus viscivorus*	Mistle Thrush	An-III	LC	A.2	Y	An-I	-
Turdidae	*Erithacus rubecula*	European Robin	An-II	LC	A.3.	Y	-	-
Turdidae	*Luscinia megarhynchos*	Common Nightingale	An-II	LC	A.2.	G	-	-
Turdidae	*Saxicola rubetra*	Whinchat	An-II	LC	A.3.	Y	-	-
Turdidae	*Saxicola torquatus*	Common Stonechat	An-II	LC	A.3.	Y	-	-
Turdidae	*Oenanthe oenanthe*	Northern Wheatear	An-II	LC	A.3.	G	-	-
Turdidae	*Oenanthe hispanica*	Black-eared Wheatear	An-II	LC	A.2.	G	-	-
Turdidae	*Oenanthe isabellina*	Isabelline Wheatear	An-II	LC	A.3.	Y	-	-
Turdidae	*Turdus pilaris*	Fieldfare	An-III	LC	B.2.	K	An-I	-
Apodidae	*Apus apus*	Common Swift	An-III	LC	A.3	G	-	-
Apodidae	*Tachymarptis melba*	Alpine Swift	An-II	LC	A.3	G	-	-
Paridae	*Cyanistes caeruleus*	Eurasian Blue Tit	An-II	LC	A.2	Y	-	-
Paridae	*Parus major*	Great Tit	An-II	LC	A.3	Y	-	-
Corvidae	*Corvus frugilegus*	Rook	-	LC	A.5	Y	An-II	-
Corvidae	*Garrulus glandarius*	Eurasian Jay	-	LC	A.3	Y	An-II	-
Corvidae	*Pica pica*	Eurasian Magpie	-	LC	A.5	Y	An-II	-
Corvidae	*Corvus corax*	Common Raven	An-III	LC	A.5	Y	-	-
Corvidae	*Corvus corone*	Carrion Crow	-	LC	A.5	Y	An-II	-
Corvidae	*Corvus monedula*	Eurasian Jackdaw	-	LC	A.5	Y	An-II	-
Sturnidae	*Sturnus vulgaris*	Common Starling	-	LC	A.5	KZ	An-I	-
Sturnidae	*Sturnus roseus*	Rosy Starling	An-II	LC	A.4	G	An-I	-
Passeridae	*Passer domesticus*	House Sparrow	-	LC	A.5	Y	An-II	-

Family	Species	English Common Name	BERN	IUCN	Red Data Book	Status	CHC*	CITES
Passeridae	*Passer montanus*	Eurasian Tree Sparrow	An-III	LC	A.3	Y	An-I	-
Phasianidae	*Alectoris chukar*	Chukar	An-III	LC	A.2	Y	-	-
Phasianidae	*Coturnix coturnix*	Common Quail	An-III	LC	A.3	Y	An-II	-
Recurvırostrıdae	*Recurvirostra avosetta*	Pied Avocet	An-II	LC	A.4	Y	-	-
Burhinidae	*Burhinus oedicnemus*	Eurasian Thick-knee	An-II	LC	A.2	Y, G	-	-
Upupidae	*Upupa epops*	Common Hoopoe	An-II	LC	A.2	G	-	-
Hirundiinidae	*Hirundo rustica*	Barn Swallow	An-II	LC	A.5	G	-	-
Hirundiinidae	*Delichon urbicum*	Northern House Martin	An-II	LC	A.3	G	-	-
Sylvidae	*Cettia cetti*	Cetti's Warbler	An-II	LC	A.2	Y	-	-
Sylvidae	*Locustella luscinioides*	Savi's Warbler	An-II	LC	A.2	G	-	-
Sylvidae	*Acrocephalus scirpaceus*	Common Reed-warbler	An-II	LC	A.2	G	-	-
Sylvidae	*Acrocephalus arundinaceus*	Great Reed-warbler	An-II	LC	A.3	G	-	-
Sylvidae	*Hippolais icterina*	Icterine Warbler	An-II	LC	A.3	G	-	-
Sylvidae	*Hippolais pallida*	Olivaceous Warbler	An-II	LC	A.3	G	-	-
Sylvidae	*Sylvia melanocephala*	Sardinian Warbler	An-II	LC	A.3	Y	-	-
Sylvidae	*Sylvia hortensis*	Western Orphean Warbler	An-II	LC	A.2	G	-	-
Sylvidae	*Sylvia curruca*	Lesser Whitethroat	An-II	LC	A.2	G	-	-
Sylvidae	*Sylvia atricapilla*	Eurasian Blackcap	An-II	LC	A.2	G	-	-
Sylvidae	*Sylvia borin*	Garden Warbler	An-II	LC	B.3	T	-	-
Sylvidae	*Sylvia communis*	Greater Whitethroat	An-II	LC	A.3	G	-	-
Sylvidae	*Phylloscopus trochilus*	Willow Warbler	An-II	LC	A.3	T	-	-
Sittidae	*Sitta europaea*	Eurasian Nuthatch	An-II	LC	A.3	Y	-	-
Sittidae	*Sitta neumayer*	Western Rock Nuthatch	An-II	LC	A.2	Y	-	-
Sittidae	*Sitta tephronota*	Eastern Rock Nuthatch	An-II	LC	A.2	Y	-	-
Fringillidae	*Carduelis cannabina*	Common Linnet	An-II	LC	A.3	KZ	-	-
Fringillidae	*Carduelis carduelis*	European Goldfinch	An-II	LC	A.3	Y	-	-
Fringillidae	*Fringilla coelebs*	Common Chaffinch	An-III	LC	A.4	Y	An-I	-
Emberizidae	*Emberiza cirlus*	Cirl Bunting	An-II	LC	A.2	Y	-	-

Reference: *Demirsoy, A., 1997, Omurgalılar "Sürüngenler, Kuşlar ve Memeliler" (Vertebrates "Reptiles, Birds and Mammals") Meteksan A.Ş., Ankara.*
Reference: *Kiziroğlu, İ, 1993, The Birds of Türkiye (Species List in Red Data Book), TTKD, Ankara.*
(*)*= Republic of Turkey Ministry of Forestry and Water Affairs, "2017-2018 Hunting Season, Decisions of Central Hunting Commission"*
According to the publication titled "The Birds of Türkiye", prepared by Prof. Dr. İlhami Kiziroğlu, the definitions of the symbols used in connection with the protection condition and the status of the bird species are as follows:
A : Species in category "A" are either native ones that stay in Türkiye all the year around, or summer migrants – those migrant birds that leave Türkiye after breeding.
A.1.0. : These are species that went extinct without doubt and that cannot be observed in natural habitats any more.
A1.1 : These are domesticated species whose natural population no longer exists or has not been observed within the last fifteen or twenty years, yet which exist in aviaries, cages or and other artificial mediums.
A1.2 : Population sizes of these bird species has fallen dramatically all around Türkiye.

A2 : The number of these species ranges between 11 and 25 pairs (22-50 individuals) in the regions where they are observed.
A3 : Population sizes of these species in Türkiye ranges between 26 and 250 pairs (52-500 individuals) in regions observed.
A.3.1. : Populations of these species displays a decline in the regions observed. Their population sizes change between 251 and 500 pairs (502-1000 individuals)
A4 : Population density of these species does not, as yet, show any tendency toward the risk of extinction; yet there is a trend toward a decrease in local population and they are likely to face the risk of extinction in time. Population of these species ranges between 501 and 5000 pairs (1002 – 10000 individuals) in regions observed.
A5 : There is neither a decline in population size nor a risk of extinction for these species.
A6 : These species have not been studied sufficiently and there is no authoritative data about them.
A7 : For the moment, it is not possible to make an evaluation about these species because records concerning these species are far from being reliable.
B : These species either choose to spend winter in Türkiye or use Türkiye as a passage on their migration routes
B1.0. : There are no samples for the group of species which are reported to have spend winter in Türkiye but which have gone extinct.
B1.1. : These species either spend winter in Türkiye or use Türkiye as a passage on their migration routes, but their population is under a grave risk of extinction.
B1.2. : The number of these species has fallen dramatically and they are represented by 1 individual – 10 pairs (1-20 individuals) in regions observed.
B2 : The number of these species ranges between 11 and 25 pairs (22-50 individuals) in regions observed.
B3 : Population of these species observed in Türkiye generally ranges between 26 and 250 pairs (52-500 individuals).
B3.1. : There is a decline in the populations of these species. Their populations range from 215 to 500 pairs (502-1000 individuals).
B4 : Despite the fact these species do not face a risk of extinction in regions observed in terms of population size, a relative decline is observed in populations. Their populations in regions observed ranges between 501 and 5000 pairs (1002-10000 individuals).
B5 : There is no observed decline in the population of these species, nor do they face a risk of extinction.
B6 : There are insufficiently analyzed species, about which very few records exist.
B7 : It is not possible to make any assessment about these species because records available are both small in number and far from being reliable.
Y : Yearly-resident (native) bird species; these species breed in an area and spend winter in the same area.
G/KZ : Migrant species leave Türkiye in winter to migrate to warmer countries.
K : Winter visitors. They arrive in Türkiye to spend winter mainly in the Lake Region and warmer regions in the south.
T : Transit migrants. These species migrate via Anatolia in spring and fall.
R : Vagrant species.
N : Rare species.

According to the IUCN categories of the bird species identified along the project route, *Oxyura leucocephala* and *Falco cherrug* are in EN, *Aythya farina*, *Aquila heliacal* and *Streptopelia turtur* are in VU, *Falco vespertinus*, *Vanellus vanellus* and *Anthus pratensis* are in NT and the rest 105 bird species are listed in LC category.

Of the bird species identified along the route, 68 species are listed in Annex 2 and 37 species are listed in Annex 3 of the Bern Convention. According to CITES, *Aquila heliaca* and *Falco peregrinus* are listed in Appendix 1 and *Phoenicopterus roseus, Oxyura leucocephala, Buteo rufinus, Circus aeruginosus, Circus cyaneus, Aquila chrysaetos, Buteo buteo, Falco cherrug, Falco tinnunculus, Falco naumanni, Falco columbarius, Falco vespertinus* and *Athene noctua* are listed in Appendix 2.

The pictures of the bird species that live in the project area are given between the Picture 4.13.8.4. and Picture 4.13.8.21.

Picture 4.13.8.4. *Anas crecca* (Common Teal)

Picture 4.13.8.5. *Anas querquedula* (Garganey)

Picture 4.13.8.6. *Circus aeruginosus* (Western Marsh-harrier) and *Ardea alba* (Great White Egret)

Picture 4.13.8.7. *Actitis hypoleucos* (Common Sandpiper)

Picture 4.13.8.8. *Anthus pratensis* (Meadow Pipit)

Picture 4.13.8.9. *Podiceps cristatus* (Great Crested Grebe)

Picture 4.13.8.10. *Larus ridibundus* (Black-headed Gull)

Picture 4.13.8.11. *Sturnus vulgaris* (Common Starling) and *Buteo rufinus* (Long-legged Buzzard)

Picture 4.13.8.12. *Sturnus vulgaris* (Common Starling)

Picture 4.13.8.13. *Athene noctua* (Little Owl)

Picture 4.13.8.14. *Garrulus glandarius* (Eurasian Jay)

Picture 4.13.8.15. *Phoenicurus ochruros* (Black Redstart)

Picture 4.13.8.16. *Falco tinnunculus* (Common Kestrel)

Picture 4.13.8.17. *Alauda arvensis* (Eurasian Skylark)

Picture 4.13.8.18. *Carduelis cannabina* (Common Linnet)

Picture 4.13.8.19. *Circus cyaneus* (Hen Harrier)

Picture 4.13.8.20. *Tringa glareola* (Wood Sandpiper)

Picture 4.13.8.21. *Phoenicopterus roseus* (Greater Flamingo)

Reptiles

Within the scope of the Project, observations regarding reptiles were carried out at 20 stations.

At these stations 15 species were identified. Detailed information about the reptile species identified on the project is given in Table 4.13.8.3.

Table 4.13.8.3. Observed Reptile Species

Name of family and species	English Common Name	IUCN	CITES	BERN	Habitat
Testudinidae					
Testudo graeca	Spur-thighed Tortoise	VU	App-II	An-II	in the forest, forest openings, roadsides, water sides, stony-rocky areas, grasslands, scrub, field, vineyards, gardens and in the steppes
Agamidae					
Stellagama stellio	Starred Agama	LC	-	An-II	Road sides, rocky-stony areas and semi-desert environments
Lacertidae					
Lacerta media	Three-lined Lizard	LC	-	An-III	In forest, forest openings, water sides, Valley slopes and rocky-stony areas
Ophisops elegans	Snake-eyed Lizard	-	-	An-II	Forest openings, stone-rocky areas, fields, shrubs, steppes and semi-desert environments
Parvilacerta parva	Lizard of Asia Minor	LC	-	An-II	Rocky-stony areas, steppe and half-desert environments
Scincidae					
Eumeces schneideri	Gold Skink	-	-	An-III	Forest openings, rocky-stony areas and semi-desert environments
Colubridae					
Dolichophis caspius	Caspian whipsnake	-	-	An-III	Rocky-stony areas, pastures, fields, vineyards and horticulture
Dolichophis jugularis	Large Whip Snake	LC	-	An-II	Water sides, valley slopes, rocky-stony areas, vineyards and gardens
Eirenis modestus	Ring-Headed Dwarf Snake	LC	-	An-III	Rocky-stony areas
Elaphe sauromates	East-Four-lined Ratsnake	-	-	An-II	Forests, forest openings, road sides, rocky-stony areas, pastures, fields, vineyards, horticulture, shrubs and steppes
Malpolon insignitus	Eastern Montpellier Snake	-	-	An-III	Rocky-stony areas
Platyceps najadum	Dahl's Whip Snake	LC	-	An-II	In-Forest, rocky-stony areas and shrubs
Natricidae					
Natrix natrix	Grass Snake	LC	-	An-III	Forests, water sides and meadows
Natrix tessellata	Tessellated Water Snake	LC	-	An-II	Water sides
Typhlopidae					
Xerotyphlops vermicularis	Eurasian Blind Snake	-	-	An-III	Rocky-stony areas

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According to the IUCN categories of the repitle species identified along the project route, *Testudo graeca* is in VU, *Stellagama stellio*, *Lacerta media, Parvilacerta parva, Dolichophis jugularis, Eirenis modestus, Platyceps najadum, Natrix natrix* and *Natrix tessellata* are in LC category.

Of the reptile species identified along the route, 8 species are listed in Annex 2 and 7 species are listed in Annex 3 of the Bern Convention. According to CITES, *Testudo graeca* is listed in Appendix 2.

The pictures of the reptile species that live in the project area given between the Picture 4.13.8.22. and Picture 4.13.8.24. respectively.

Picture 4.13.8.22. A General View of *Testudo graeca* Observed in the Project Area (Photo by Dr. Bahadır AKMAN)

Picture 4.13.8.23. A General View of *Ophisops elegans* in the Project Area (Photo by Dr. Bahadır AKMAN)

Picture 4.13.8.24. The Skin of *Dolichophis caspius* Observed in the Project Area (Photo by Dr. Bahadır AKMAN)

Amphibians

Within the scope of the Project, observations regarding amphibians were carried out at 20 stations.

At these stations 3 species were identified. Detailed information about the amphibian species identified on the project is given in Table 4.13.8.4.

Table 4.13.8.4. Observed Amphibian Species

Name of family and species	English Common Name	IUCN Red List	Bern	CITES	Habitat
BUFONIDAE					
Bufo bufo	European Toad	LC	An-III	-	Lives in humid stony places of less vegetation or forested areas. Hides under stones, in cavities and holes in the ground.
Bufotes variabilis	Varying Toad	DD	An-III	-	Active at night; hides under stones or holes in the ground in gardens and open land.
RANIDAE					
Pelophylax ridibundus	Marsh Frog	LC	An-III	-	Lives in ponds, lakes and slow-flowing streams abundant in vegetation. Does not leave water much.

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According to the IUCN categories of the amphibian species identified along the project route, *Bufotes variabilis* is in DD, *Bufo bufo* and *Pelophylax ridibundus* are in LC category.

Of the reptile species identified along the route, 3 species are listed in Annex 3 of the Bern Convention. There isn't an amphibian specie on the CITES appendix.

The pictures of the amphibian species that live in the project area are given Picture 4.13.8.25. and Picture 4.13.8.26.

Picture 4.13.8.25. A General View of *Pelophylax ridibundus* observed in the Project Area (Photo by Dr. Bahadır AKMAN)

Picture 4.13.8.26. A General View of *Bufotes variabilis* in the Project Area (Photo by Dr. Bahadır AKMAN)

Arthropods

Within the scope of the Project, observations regarding arthropods were carried out according to literature stdies.

At these stations 129 species were identified. Detailed information about the amphibian species identified on the project is given in Table 4.13.8.5.

Table 4.13.8.5. Observed Arthropod Species

Scientific Name	Habitat	Endemic	IUCN	CITES
Harpalus caspius Schauberger	Steppe	-	-	-
Zabrus iconiensis Ganglb.1905	Cultivated area	Endemic	-	-
Acinopus picipes (Olivier,1795)	Cultivated area	-	-	-
Calathus ambiguus (Paykull, 1790)	Steppe	-	NT	-
Calomera littoralis mandli (Mandl)	Steppe	-	-	-
Chlaenius festivus (Panzer, 1796)	Cultivated area	-	-	-
Chlaenius vestitus (Paykull, 1790)	Cultivated area	-	-	-
Agonum viridicupreum (Goeze, 1777)	Cultivated area	-	-	-
Anchomenus dorsalis (Pontoppidon, 1763)	Cultivated area	-	NT	-
Blaps lusitanica (Herbst, 1799)	Cultivated area	-	-	-
Aphodius fossor L. 1758	Steppe	-	-	-

Scientific Name	Habitat	Endemic	IUCN	CITES
Anatolica abbreviata (Gebler, 1830)	Cultivated area	-	-	-
Calyptopsis capnisiformis Reitter, 1903	Steppe	Endemic	-	-
Tentyria rotundata Brulle, 1832	Steppe	-	-	-
Mylabris aulica Menetries, 1832	Cultivated area	-	-	-
Lydus collaris (Fabricius, 1787)	Cultivated area	-	-	-
Cerocoma turcica Pardo, 1977	Cultivated area	-	-	-
Tilloidea unifasciata (Fabricius, 1787)	Steppe	-	-	-
Trichodes quadriguttatus Adams, 1817	Cultivated area	-	-	-
Thea 22-punctata (L.)	Cultivated area	-	-	-
Harmonia axyridis (Pallas)	Cultivated area	-	-	-
Coccinella 7-punctata (L.)	Cultivated area	-	-	-
Dorcadion escherichi Stephan, 1962	Steppe	-	-	-
Onthophagus spp.	Steppe	-	-	-
Hister quadrimaculatus (L., 1758)	Cultivated area	-	-	-
Malachius bipustulatus (L., 1758)	Cultivated area	-	-	-
Omophlus proteus Kirsch, 1869	Cultivated area	-	-	-
Cantharis rustica Fallen, 1807	Cultivated area	-	-	-
Cantharis livida L.,1758	Cultivated area	-	-	-
Cetonia aurata (L., 1761)	Cultivated area	-	-	-
Protaetia cuprea metallica (Herbst, 1782)	Steppe	-	-	-
Tropinota hirta (Poda, 1761)	Cultivated area	-	-	-
Oxythyrea cinctella (Schaum, 1841)	Cultivated area	-	-	-
Galeruca circassica Reitter, 1895	Cultivated area	-	-	-
Galeruca pomonae (Scopoli, 1763)	Steppe	-	-	-
Entomoccelis adonis (Palas, 1771)	Steppe	-	-	-
Chrysolina herbacea (Duftschmil, 1825)	Cultivated area	-	-	-
Eulasia bombyliformis (Palas, 1781)	Cultivated area	-	-	-
Tarisa fraudatrix Hv.	Steppe	-	-	-
Brachycarenus tigrinus (Schl.)	Steppe	-	-	-
Lygaeus saxatilis (Scop.)	Steppe	-	-	-
Nysius cymoides (Spin.)	Steppe	-	-	-
Oxycarenus pallens (H. S.)	Steppe	-	-	-
Piesma kolenatii (Fb.)	Steppe	-	-	-
Nabis sareptanus D.	Steppe	-	-	-
Nabis feroides Rem.	Steppe	-	-	-
Orthotylus minutus Jak.	Steppe	-	-	-
Psallopsis longicornis (Jak.)	Steppe	-	-	-

Scientific Name	Habitat	Endemic	IUCN	CITES
Solenoxyphus fuscovenosus (Fb.)	Steppe	-	-	-
Atomoscelis onustus (Fa.)	Steppe	-	-	-
Tuponia punctipes Rt.	Steppe	-	-	-
Sympetrum spp.	Dere kenarı	-	-	-
Orthetrum brunneum (Fonscolombe, 1837)	Steppe	-	-	-
Sympetrum sanguineum (Muller, 1764)	Steppe, Cultivated area	-	LC	-
Calopteryx splendens (Schneıder, 1984)	Steppe	-	LC	-
Neoaliturus fenestratus	Steppe	-	-	-
Aconurella prolixa (Leth.)	Steppe	-	-	-
Laburrus handlirschi (Matsumura, 1908)	Steppe	-	-	-
Euscelis lineolatus Brulle, 1832	Steppe	-	-	-
Colias croceus (Fourcroy, 1785)	Cultivated area	-	-	-
Pieris brassicae (L., 1758)	Cultivated area	-	LC	-
Plebeius argyrognomon (Bergst., 1779)	Cultivated area	-	-	-
Pontia daplidice (L., 1758)	Waterfront, Steppe	-	LC	-
Chazara briseis (L. 1764)	Waterfront	-	**CR**	**-**
Brenthis daphne (Denis&Schiff., 1775)	Cultivated area	-	**EN**	**-**
Argynnis paphia (L., 1758)	Cultivated area	-	-	-
Xylocopa violacea (L., 1758)	Waterfront	-	-	-
Anthidium spiniventre malacopygum Friese, 1917	Steppe	-	-	-
Chalicodoma (Pseudomegachile) flavipes (Spinola, 1838)	Steppe	-	-	-
Chalicodoma (Pseudomegachile) foersteri albescens (Friese, 1898)	Steppe	-	-	-
Vespula vulgaris (L., 1758)	Cultivated area	-	-	-
Chalybion (s. str.) walteri (Kohl, 1889)	Steppe	-	-	-
Chalybion (Hemichalybion) femoratum (Fabricius, 1781)	Steppe	-	-	-
Sceliphron madraspatanum (Fabricius, 1781)	Steppe	-	-	-
Sphex flavipennis Fabricius, 1793	Steppe	-	-	-
Sphex leuconotus Brullé, 1833	Steppe	-	-	-
Palmodes melanarius (Mocsary, 1883)	Steppe	-	-	-
Palmodes strigulosus (A.Costa, 1858)	Steppe	-	-	-
Prionyx kirbii (Van derLinden, 1827)	Steppe	-	-	-
Prionyx lividocinctus (A.Costa, 1858)	Steppe	-	-	-
Prionyx niveatus (Dufour, 1853)	Steppe	-	-	-
Prionyx nudatus (Kohl, 1885)	Steppe	-	-	-
Prionyx subfuscatus (Dahlbom, 1845)	Steppe	-	-	-
Prionyx viduatus (Christ, 1791)	Steppe	-	-	-
Podalonia fera (Lepeletier, 1845)	Steppe	-	-	-

Scientific Name	Habitat	Endemic	IUCN	CITES
Podalonia hirsuta mervensis Radoszkowski, 1887	Steppe	-	-	-
Podalonia tydei (Le Guillou, 1841)	Steppe	-	-	-
Eremochares dives (Brullé, 1833)	Steppe	-	-	-
Ammophila heydeni Dahlbom, 1845	Steppe	-	-	-
Ammophila terminata F.Smith, 1856	Steppe	-	-	-
Mimesa crassipes A. Costa, 1871	Steppe	-	-	-
Diodontus minutus (Fabricius, 1793)	Steppe	-	-	-
Astata boops (Schrank, 1781)	Steppe	-	-	-
Astata minor Kohl, 1885	Steppe	-	-	-
Bombus terrestris (Linnaeus, 1758)	Steppe	-	-	-
Halictus sp.	Cultivated area	-	-	-
Copla quinquecincta (Fabricius, 1793)	Steppe	-	-	-
Scolia hirta (Schrank, 1781)	Steppe	-	**VU**	**-**
Scolia sexmaculata (O.F. Müller1786)	Steppe	-	-	-
Scolia galbula (Palas, 1771)	Steppe	-	-	-
Scolia fallax (Eversmann, 1849)	Steppe	-	-	-
Gryllus campestris L., 1758	Steppe	-	NT	-
Laphystia erberi (Schiner, 1865)	Channel front	-	-	-
Bombylius spinulosus Hasbenli & Zaitzev, 2000	Cultivated area	Endemic	-	**-**
Bombylius aksarayensis Hasbenli & Zaitzev, 2000	Cultivated area	Endemic	-	**-**
Episyrphus balteatus (De Geer, 1776)	Steppe	-	-	-
Meliscaeva auricollis (Meigen, 1822)	Steppe	-	-	-
Metasyrphus (Metasyrphus) corollae (Fabricius, 1794)	Steppe	-	-	-
Scaeva albomaculata (Macquart, 1842)	Steppe	-	-	-
Sphaerophoria scripta (Linnaeus, 1758)	Steppe	-	-	-
Syrphus ribesii (Linnaeus, 1758)	Steppe	-	-	-
Syrphus vitripennis (Meigen, 1822)	Steppe	-	-	-
Xanthogramma pedissequum (Harris, [1776])	Steppe	-	-	-
Chrysotoxum festivum (Linnaeus, 1758)	Steppe	-	-	-
Chrysotoxum parmense (Rondani, 1845)	Steppe	-	-	-
Melanostoma mellinum (Linnaeus, 1758)	Steppe	-	-	-
Paragus (Pandasyophthalmus) tibialis (Fallén, 1817)	Steppe	-	-	-
Paragus (Paragus) bicolor (Fabricius, 1794)	Steppe	-	-	-
Lejogaster splendida (Meigen, 1822)	Steppe	-	-	-
Eumerus strigatus (Fallén, 1817)	Steppe	-	-	-
Eumerus tricolor (Fabricius, 1798)	Steppe	-	-	-
Eristalinus (Lathyrophthalmus) aeneus (Scopoli, 1763)	Steppe	-	-	-

Scientific Name	Habitat	Endemic	IUCN	CITES
Eristalis (Eoseristalis) arbustorum (Linnaeus, 1758)	Steppe	-	-	-
Eristalis (Eristalis) tenax (Linnaeus, 1758)	Steppe	-	-	-
Helophilus (Helophilus) parallelus (Harris, [1776])	Steppe	-	-	-
Syritta pipiens (Linnaeus, 1758)	Steppe	-	-	-
Apotophysis caspica Semenov, 1901	Cultivated area	-	-	-
Zabrus corpulentus Schaum, 1864	Cultivated area	-	-	-
Lytta magister Horn, 1870	Cultivated area	-	-	-

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16. *The biodiversity of Tuz Gölü, SEPA Project 2005-2007*

As a result of literature studies, 129 insect species have been identified in the Tuz Gölü SEPA. 4 species are endemic (*Calyptopsis capnisiformis, Bombylius aksarayensis, Bombylius spinulosus, Zabrus iconiensis*).

With the exception of 119 species, the rest of the insect are included in the IUCN Red List categories. 1 specie (*Chazara briseis*) is categorized as "CR", 1 specie (*Brenthis daphne*) is categorized as "EN", 1 specie (*Scolia hirta*) is categorized as "VU", 3 species (*Calathus ambiguous*, *Anchomenus dorsalis* and *Gryllus campestris*) are categorized as "NT" and 4

species (*Sympetrum sanguineum*, *Calopteryx splendens*, *Pieris brassicae* and *Pontia daplidice*) are categorized as “LC”.

Key Baseline Findings And Conclusions

Mammals

On the project area, 14 mammalian species belonging to 11 families were observed as a result of the field studies. Of these species, 1 belong to the Leporiedae, 1 belongs to Erinaceidae, 2 belong to Cricetidae, 2 belongs to Canidae, 1 belongs to Sciuridae, 1 belongs to Spalacidae, 1 belongs to Rodentia, 1 belongs to Mustelidae, 2 belongs to Vespertilionidae, 1 belongs to Rhinolophidae and 1 belongs to Mustelidae (Figure 4.13.8.28.).

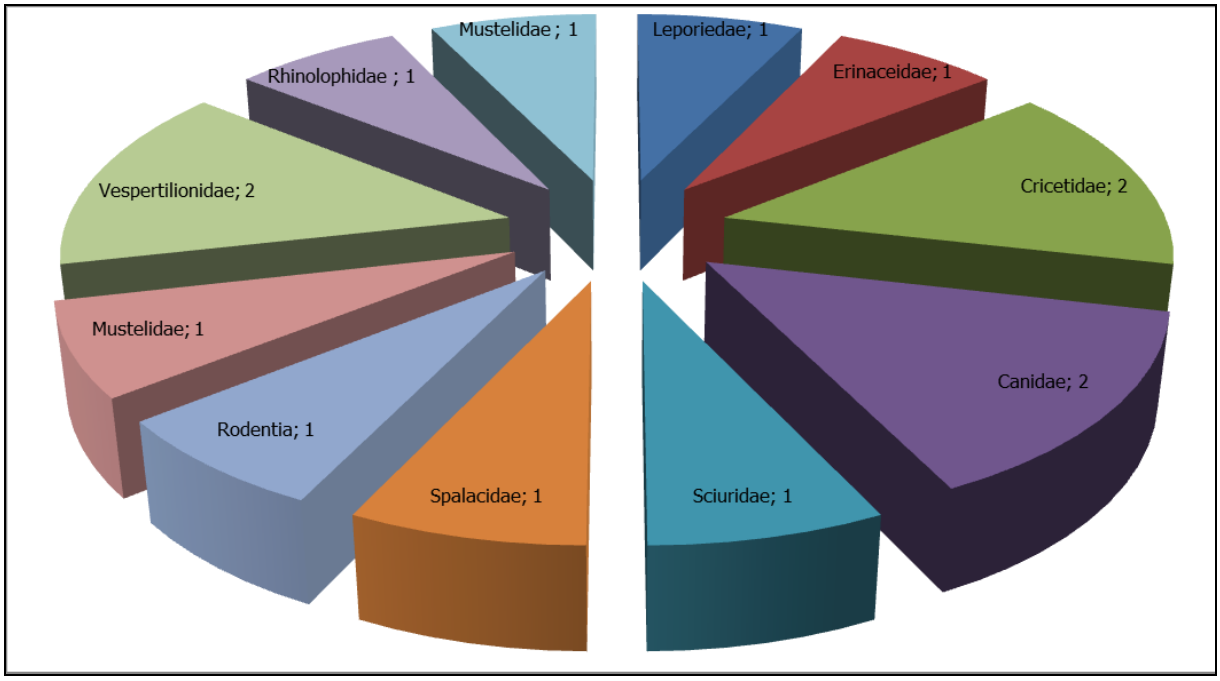


Figure 4.13.8.28. Distribution of the Number of Species Identified in the Project Area

All together 15 mammalians species belonging 11 families were observed in the habitat based field studies along the project area. Of these observed species, in accordance with the IUCN, *Spermophilus xanthoprymnus* is in the NT category; *Nannospalax nehringi* is in the DD category; other 13 species are in the LC category. In accordance with the Bern Convention, 3 Species (*Canis lupus*, *Myotis blythii* ve *Rhinolophus hipposideros*) are listed in Annex 2 while 5 species (*Lepus europaeus*, *Microtus nivalis*, *Mustela nivalis*, *Pipistrellus pipistrellus* and *Meles meles*) are listed in Annex 3. According to CITES, 1 specie (*Canis lupus*) is listed in Annex 2, and the one (*Vulpes vulpes*) is listed in Annex 3.

Due to suitable areas around the project area and large distribution of the mammal species around the project area no species of conservation significance is determind.

Birds

At the 20 stations 113 bird species were identified. According to the IUCN categories of the bird species identified along the project route, *Oxyura leucocephala* and *Falco cherrug* are in EN, *Aythya farina*, *Aquila heliacal* and *Streptopelia turtur* are in VU, *Falco vespertinus*, *Vanellus vanellus* and *Anthus pratensis* are in NT and the rest 105 bird species are listed in LC category. Of the bird species identified along the route, 68 species are listed in Annex 2 and 37 species are listed in Annex 3 of the Bern Convention. According to CITES, *Aquila heliaca* and *Falco peregrinus* are listed in Appendix 1 and *Phoenicopterus roseus, Oxyura leucocephala, Buteo rufinus, Circus aeruginosus, Circus cyaneus, Aquila chrysaetos, Buteo buteo, Falco cherrug, Falco tinnunculus, Falco naumanni, Falco columbarius, Falco vespertinus* and *Athene noctua* are listed in Appendix 2.

Among the bird species identified in the project area, the bird species which are in the threat categories (CR - EN) of IUCN and / or which have quite low population in Turkey, which form colony (congregatory) and which show limited diversity (restricted range) were classified as "critical species". In this context, *Phoenicopterus roseus* (LC), *Oxyura leucocephala* (EN), *Aquila heliaca* (VU), *Falco cherrug* (EN) and *Streptopelia turtur* (VU) were determined and evaluated. Especially the affect of the water level is evaluated for these species, birding places and generally on their behavior. *Aythya ferina* (VU), feeds in groups on aquatic organisms. Prefers less than 6 meters depth and open waters. It is found in abundant places, where it can find sunken macrophytes and animal food. It is likely to pass the winter in Tuz Gölü. It is not expected to be affected by the increase in water level. It is envisaged that the presence of the specie will not be affected by the project activities. *Oxyura leucocephala* (EN), is seen in the inner waters of Turkey in winter. It usually occurs in compact, closed, semi-permanent or transient fresh waters, coarse waters or eutrophic ponds, including Phragmites or Typha. Prefers large wetlands such as 0,3-0,5 m depth lakes. The project area is not the ideal breeding place for the white-headed duck, but it is likely to be seen in winter. It is unlikely to be affected by the increase of water level. *Aquila heliaca* (VU) is seen in forests, steppes, large wooded fields, plains, river forests and semi-deserts. It breeds in forests, steppes, large wooded farming areas with altitudes of 1000 m and more. This specie is seen at the project area and the surrounding, also it is not thought to be affected because it is not a direct water dependent species. *Falco cherrug* (EN) is seen in step, half-desert, open mountain area and sometimes at water edges. This specie feeds on birds and domesticated pigeons. This specie is seen at the project area and the surrounding, also it is not thought to be affected because it is not a direct water dependent species. *Streptopelia turtur* (VU) is found in shrubs, agricultural land, dry and sunny habitats, parks and gardens. This specie is seen at the project area and the surrounding, also it is not thought to be affected because it is not a direct water dependent species. *Phoenicopterus roseus* might be the most affected specie when the project is evaluated. This specie feeds and breeds at the Tuz Lake. The increase of the water level is a enhancing affect on feeding. Because, the increase of water level forms ponds, where this spicie can feed easily. Breeding places of the specie containes high river banks. The increase of water level without evaporation is 5-24 cm

within 6 years. But for a significant evaluation when evaporation, which is % 84 at the area, is considered a 1-5 cm increase of the water level will appear within 6 years. Thus won't have a negative affect of the breeding places of the flamingos, due to flamingos nests are 15-45 cm higher than the water level. Elsewhere with the brine discharge new feeding habitats are formed.

The Tuz Gölü has a great significance as a feeding and breeding ground, especially in the flamingo surface of aquatic birds. Flamingos (Phoenicopterusroseus), which uses the lake as a feeding and breeding ground, are fed mainly by filtering the suspended particulate matter in the water, planktonic organisms and sludge (Zweers et al., 1995). Artemia, a dominant planktonic organism living in Tuz Gölü, constitutes an indispensable circle for the feeding of water birds (Ayvaz et al., 2015) who stay and hatch here (Başbuğ, 1999a).

Artemia salina, called as "brine shrimp" can live in the water where salinity varies between %o45 and 340 (Persone et al., 1980). On the other hand a study conducted in the previous years in the Tuz Gölü indicated that *A. salina* is spread only in the adjacency of Devekonağı and Çalören (north coasts of the lake) and it is not spread in the adjacency of Kurutlutepe, Kaldırımlı, Kayacık and Yavşanlı (Başbuğ, 1999a). Therefore, this plankton is not found in all of the lake. This should not be ignored in plankton abundance evaluation studies to be done. In the above-mentioned study, it was also noted that the salinity of A. salina in the areas where it is spread varied from %o94 to %o368 (Başbuğ, 1999b). Therefore, it is predicted that the lake discharge (~%o86) will not pose a risk to Artemia in terms of salinity. The results of a study conducted by Akbulut and Dügel (2008) by selecting 3 stations on the Tuz Gölü are of interest. One of the selected stations in this study is located very close to the point where the Natural Gas Storage area is discharged with salty water. The data of this study is very important in that it is an independent study carried out in the same field.

In the study of Akbulut and Dügel (2008) it has been recorded that pH varied between 8.1-9.3, EC between 1400-16000 µS/cm, and sulphite between 380-4200 mg/L. Toxicological studies of Artemia have reported that they are not as sensitive to heavy metals as other organisms (Nunes et al., 2006). Kokkali et al. (2011), found the 48 hrs LC50 values of cadmium as 710 mg/L and Kissa et al. (1984) as 160 mg/L. Kokkali et al. in their study calculated the 48 hrs LC50 value of zinc as 1000 mg/L.

These figures show that plankton species found in the Tuz Gölü have very high tolerance in terms of toxic substances such as heavy metals. In this respect, by considering the potential heavy metal increase calculated in Section 5.6.8 of this ESIA Report and the distance between the brine discharge location and situation (near to north cost of the Tuz Gölü) of plankton species, no impact regarding population decrease of planktons is expected due to brine discharge which may cause an increase in terms of heavy metal concentrations. On the other hand, it should be noted that Artemia can collect the toxic compounds in its structure (Sarabia et al., 2002). However, there is no clear data (which requires long term analysis) in terms of bio-accumulation of heavy metals in Artemia. With this intention, during the

monitoring study, bio-accumulation of heavy metal in the plankton samples shall be determined in addition to their abundance.

Besides, it is known that *Dunaliealla salina*, which is able to store plenty of beta carotene in its body and has an important place in terms of feeding *Artemia*, is abundant in the lake. This type of microalgae causes the Tuz Gölü, even periodically, to appear red. There are studies indicating that *D. salina* which is at an earlier stage of the food chain has a higher tolerance against the heavy metal pollution (Folgar et al., 2009). Therefore, it can be said that the contribution of this living being to the transfer of heavy metals to the subsequent steps of this food chain is weak.

Reptiles

Within the scope of the Project, observations regarding reptiles were carried out at 20 stations. At these stations 15 species were identified. According to the IUCN categories of the repitle species identified along the project route, *Testudo graeca* is in VU, *Stellagama stellio*, *Lacerta media, Parvilacerta parva, Dolichophis jugularis, Eirenis modestus, Platyceps najadum, Natrix natrix* and *Natrix tessellata* are in LC category. Of the reptile species identified along the route, 8 species are listed in Annex 2 and 7 species are listed in Annex 3 of the Bern Convention. According to CITES, *Testudo graeca* is listed in Appendix 2.

Testudo graeca is categorized as "VU" and is not under threat, because it is distributed in a large area in Turkey and has a dense population. However, agricultural activities and collecting from nature to be sold as pet animals are affecting the population. Therefore, before and during the construction period a biologist should control the excavation area and transport the specie to appropriate habitats.

Amphibians

Within the scope of the Project, observations regarding amphibians were carried out at 20 stations. At these stations 3 species were identified. According to the IUCN categories of the amphibian species identified along the project route, *Bufotes variabilis* is in DD, *Bufo bufo* and *Pelophylax ridibundus* are in LC category. Of the reptile species identified along the route, 3 species are listed in Annex 3 of the Bern Convention. There isn't an amphibian specie on the CITES appendix.

In the field studies in respect to amphibians carried out along the project, among the observed amphibian species, no species endemic to Turkey nor species in the CR or EN category in accordance with the IUCN was identified. All amphibian species identified are species that can be regarded as having wide distribution.

Arthropods

Within the scope of the Project, observations regarding arthropods were carried out according to literature stdies. At these stations 129 species were identified. As a result of literature studies, 129 insect species have been identified in the Tuz Gölü SEPA. 4 species

are endemic (*Calyptopsis capnisiformis, Bombylius aksarayensis, Bombylius spinulosus, Zabrus iconiensis*). With the exception of 119 species, the rest of the insect are included in the IUCN Red List categories. 1 specie (*Chazara briseis*) is categorized as “CR”, 1 specie (*Brenthis daphne*) is categorized as “EN”, 1 specie (*Scolia hirta*) is categorized as “VU”, 3 species (*Calathus ambiguous*, *Anchomenus dorsalis* and *Gryllus campestris*) are categorized as “NT” and 4 species (*Sympetrum sanguineum*, *Calopteryx splendens*, *Pieris brassicae* and *Pontia daplidice*) are categorized as “LC”.

According to the literature 4 endemic species, 1 “CR” catogorised and 1 “EN” categorised were determined. Due to the distribution of these insects species of conservation significance haven’t been choosen.

4.13.9. Habitat Impact Rates and Measures

At the project area (including licence area, gas pipeline area, brine discharge line area) 5 habitat types according to EUNIS has been identified. Even if only one of the brine discharge line will be choosen both of them are evaluated. These are Irano-Anatolian steppes (E1.2E), continental inland salt steppes and marshes (E6.2), littoral zone of inland surface waterbodies (C3), arable land with unmixed crops grown by low-intensity agricultural methods (I1.3) and low density buildings (J2). The total area and distribution of these habitats are given at Table 4.13.9.1 and Figure 4.13.9.1.

Table 4.13.9.1. The Total Area of the Habitats

Habitat Type	Area (ha)
Irano-Anatolian steppes (E1.2E)	4778,83
Continental inland salt steppes and marshes (E6.2)	1093,42
Littoral zone of inland surface waterbodies (C3)	49,92
Arable land with unmixed crops grown by low-intensity agricultural methods (I1.3)	12512,80
Low density buildings (J2)	67,75
Sum	**18518,31**

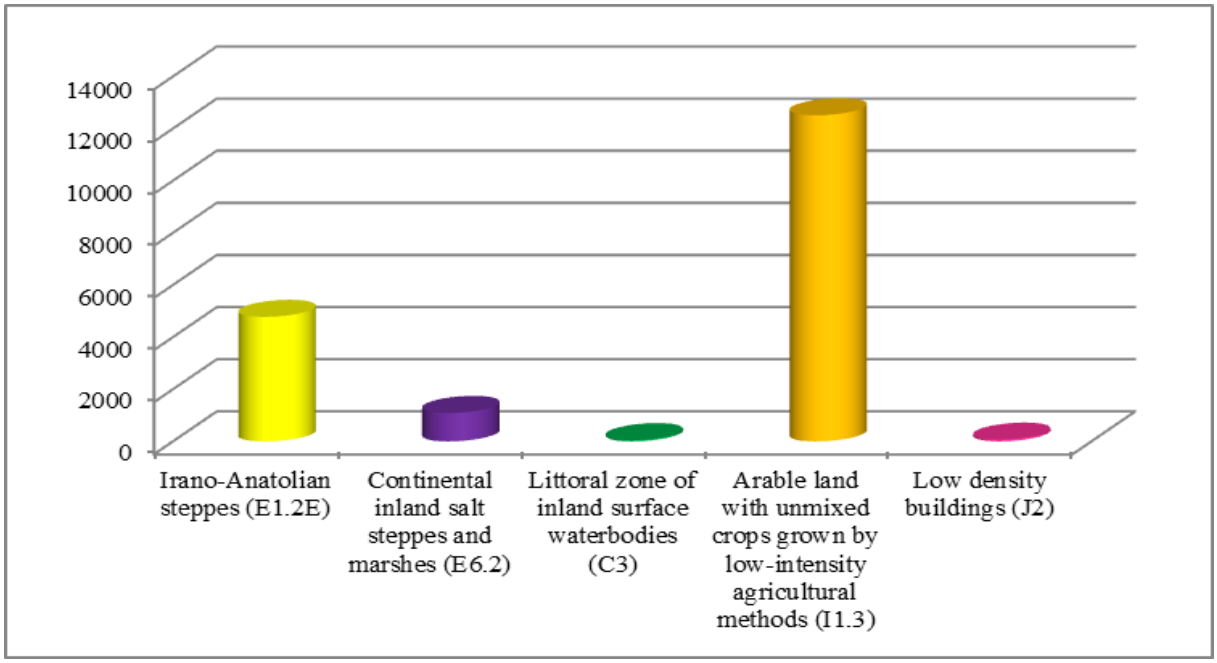


Figure 4.13.9.1. The Distribution of the Habitats

The project was divided into 7 (Gas Pipeline, Brine Discharge line, Fresh Water line, UGS's, Surface Facilities and ST5) to evaluate the affects on flora, fauna and habitats. The habitat types at these areas are given at Table 4.13.9.2 and the distributions at figures between the Figure 4.13.9.2. and Figure 4.13.9.7. below for every area.

Table 4.13.9.2. The Habitats Types at the Project Structures

Habitat Types	Gas Pipeline	Brine Discharge line	Fresh Water line	UGS	Surface Facilities	ST5
Irano-Anatolian steppes	1795,3 ha	1795,3 ha	2370,8 ha	18,9 ha	-	0,2 ha
Continental inland salt steppes and marshes	-	831,5 ha	-	-	-	-
Littoral zone of inland surface waterbodies	-	-	39,7 ha	-	-	-
Arable land with unmixed crops grown by low-intensity agricultural methods	8329,0 ha	8330,0 ha	11750,7 ha	28,8 ha	0,8 ha	-
Low density buildings	-	-	19,8 ha	0,2 ha	-	-

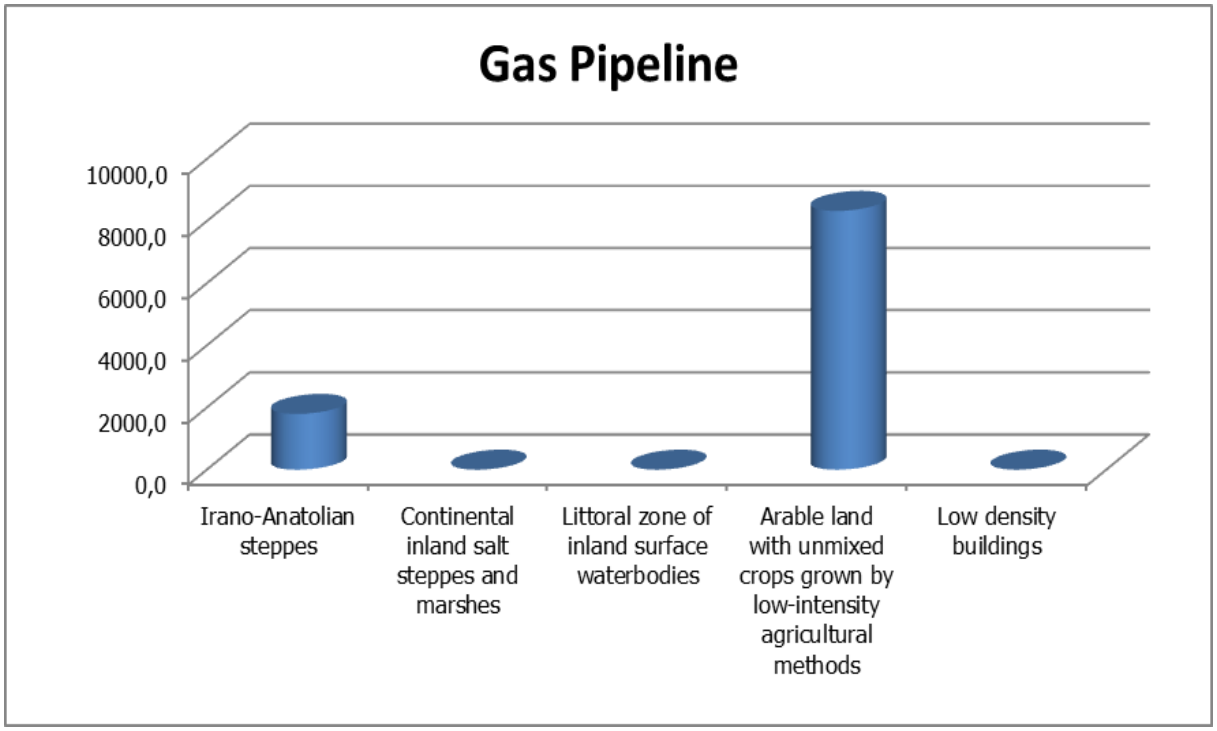


Figure 4.13.9.2. The Distribution of the Habitats at Gas Pipeline

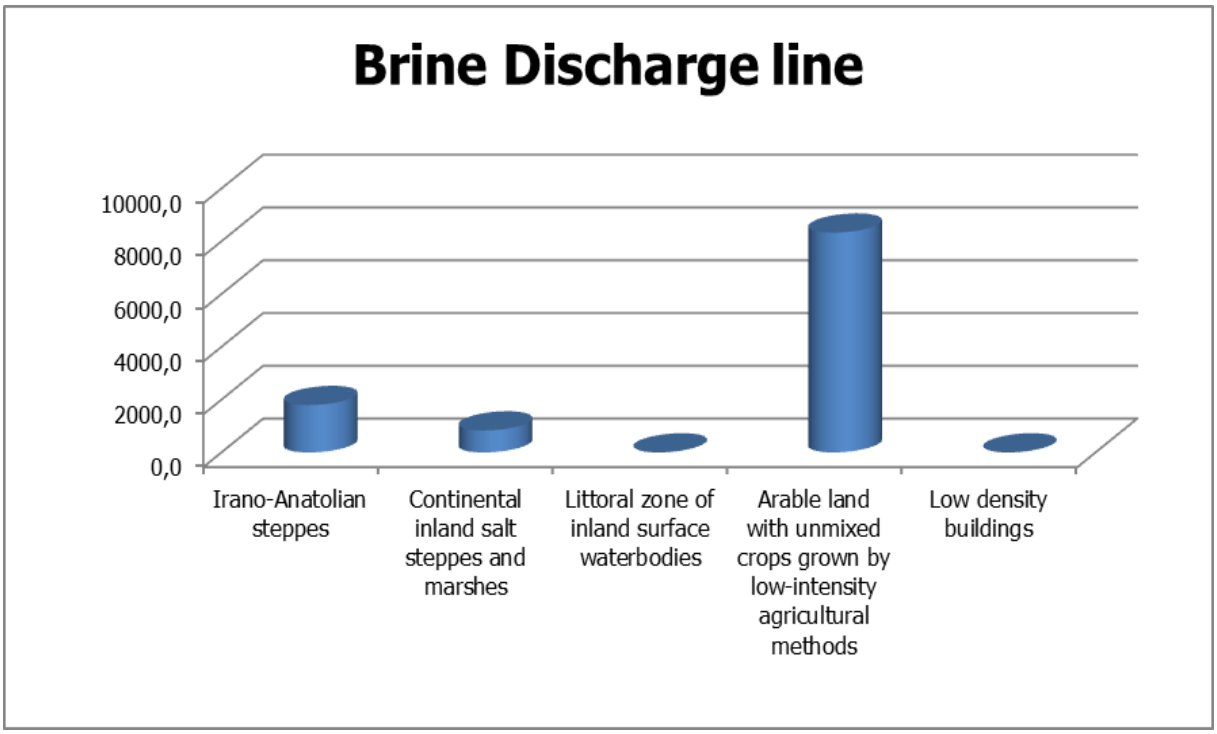


Figure 4.13.9.3. The Distribution of the Habitats at Brine Discharge Line

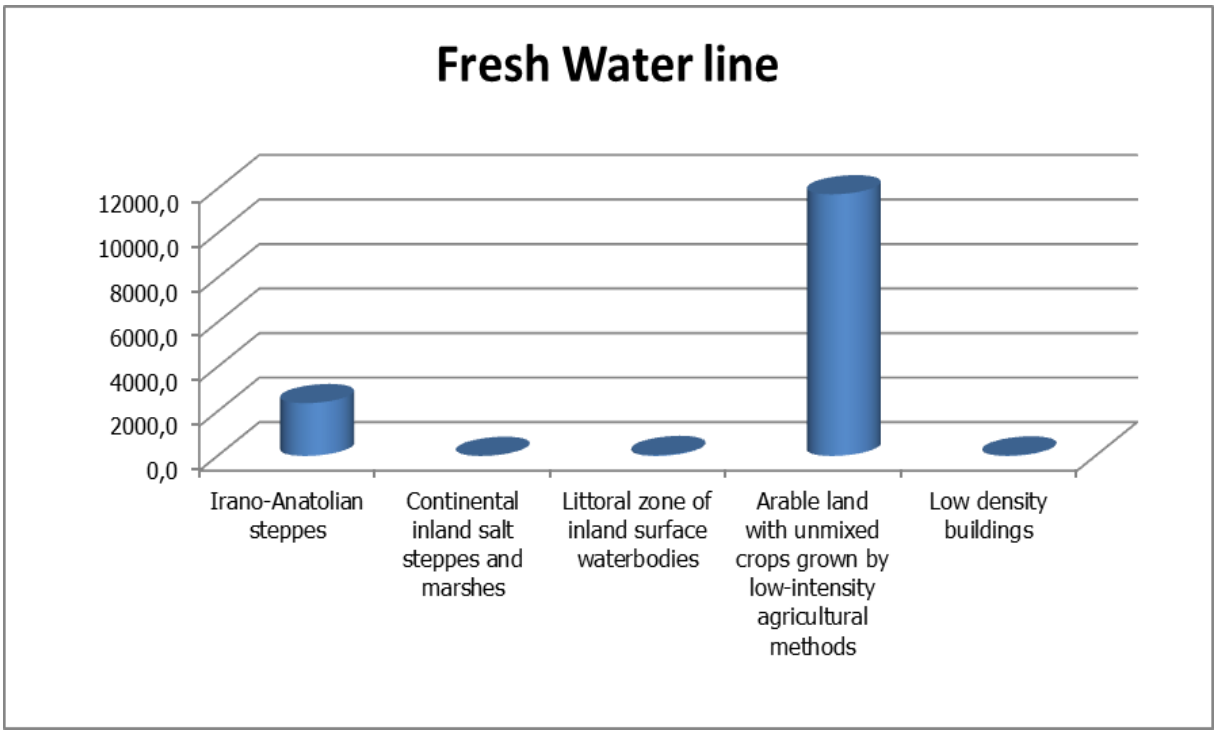


Figure 4.13.9.4. The Distribution of the Habitats at Fresh Water Line

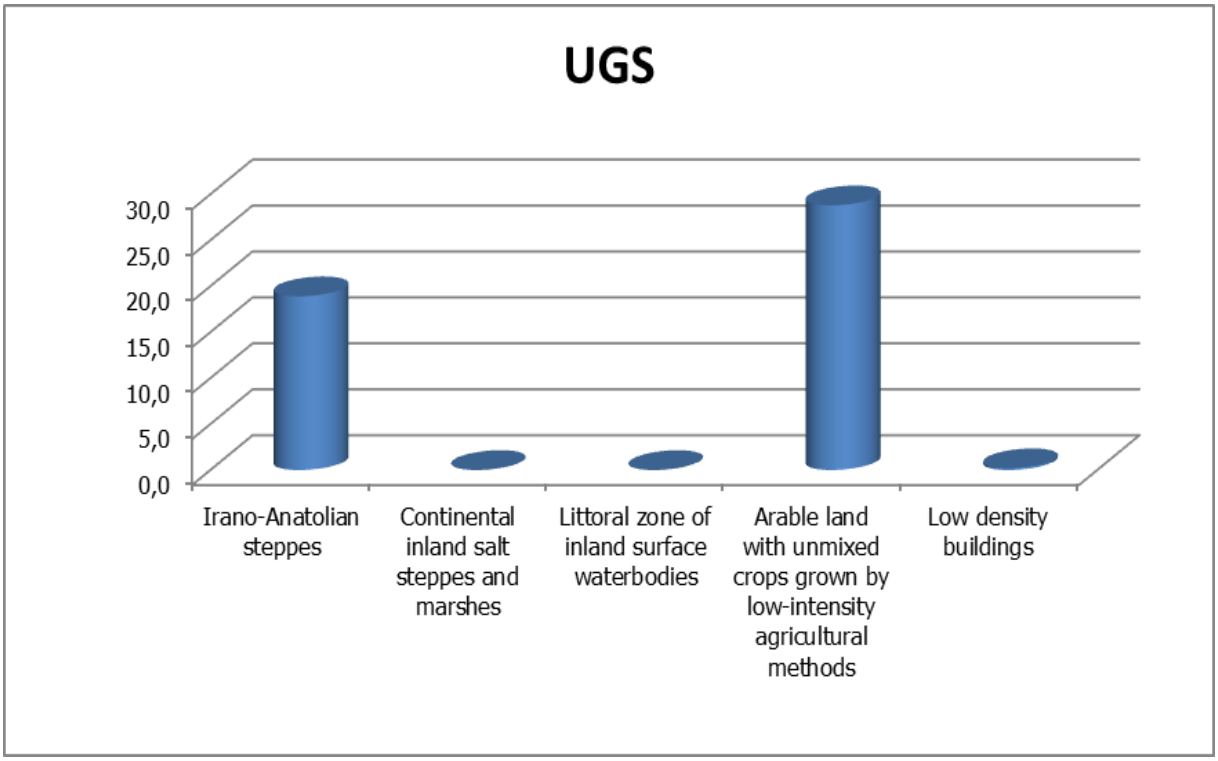


Figure 4.13.9.5. The Distribution of the Habitats at UGS's

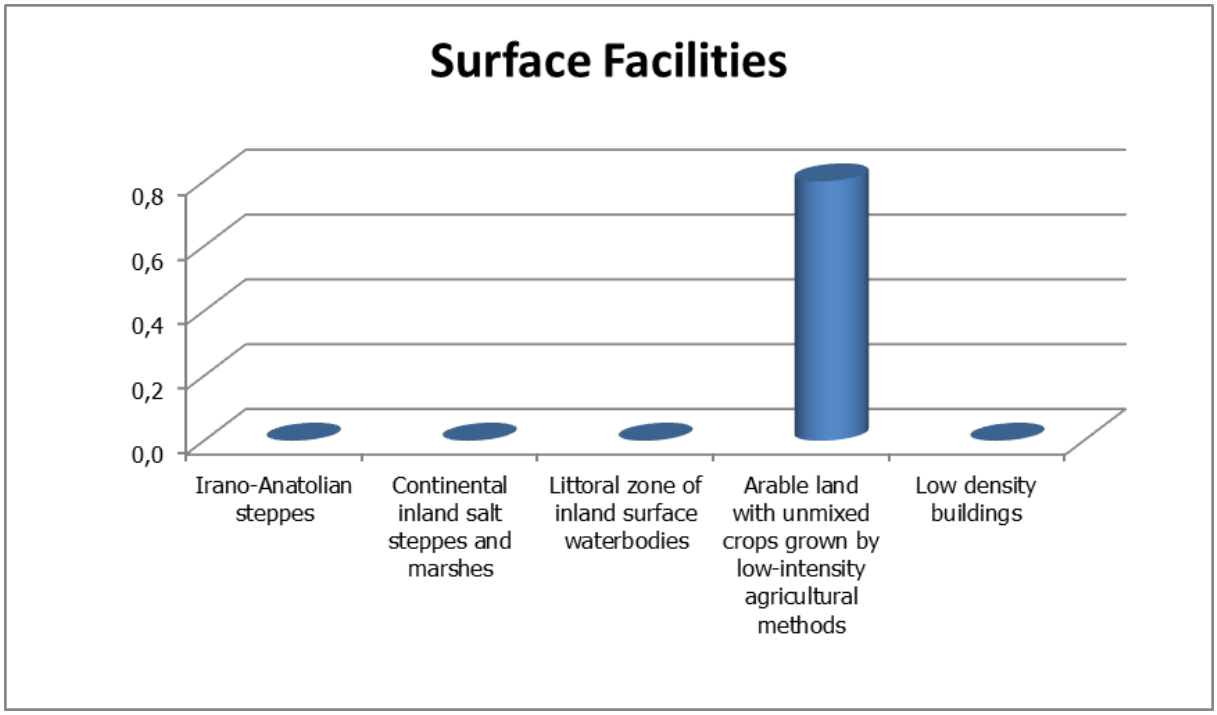


Figure 4.13.9.6. The Distribution of the Habitats at Surface Facilities

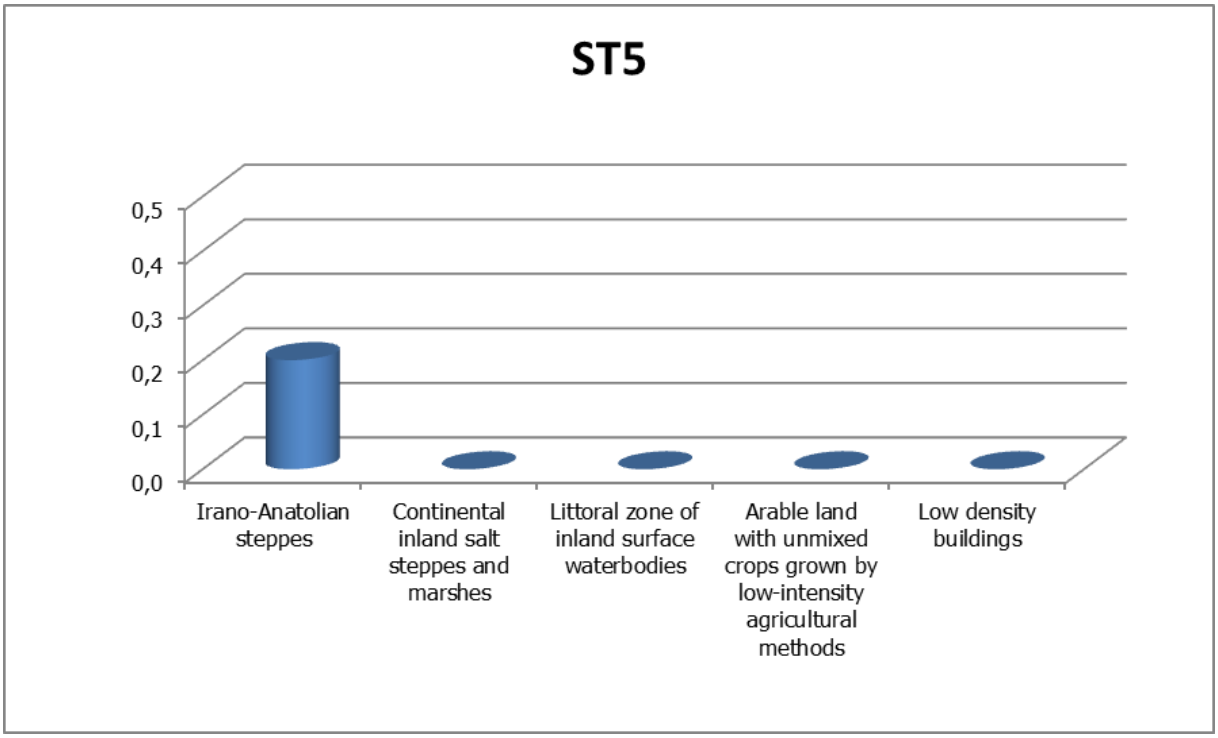


Figure 4.13.9.7. The Distribution of the Habitats at ST5

The affects of the project structures (Gas Pipeline, Brine Discharge 1 line, Brine Discharge 2 line, Fresh Water line, UGS, Surface Facilities and ST5) at the habitat types are given in Table 4.13.9.3 with the ha areas and the percentage and also graphics are given below.

Table 1.12.9.3. The Habitats Types Affected by the Project Structures

Habitat Types	Gas Pipeline		Brine Discharge line		Fresh Water line		UGS		Surface Facilities		ST5	
	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
Irano-Anatolian steppes	43,8	5,40%	32,9	3,20%	92,1	5,40%	18,9	1,30%	-	-	0,2	0,02%
Continental inland salt steppes and marshes	-	-	23,8	2,90%	-	-	-	-	-	-	-	-
Littoral zone of inland surface waterbodies	-	-	-	-	1,7	5,40%	-	-	-	-	-	-
Arable land with unmixed crops grown by low-intensity agricultural methods	43,7	3,90%	21,5	1,30%	223,2	5,40%	28,8	0,40%	33,6	0,40%	-	-
Low density buildings	-	-	-	-	0,4	2,20%	0,2	0,002%	-	-	-	-

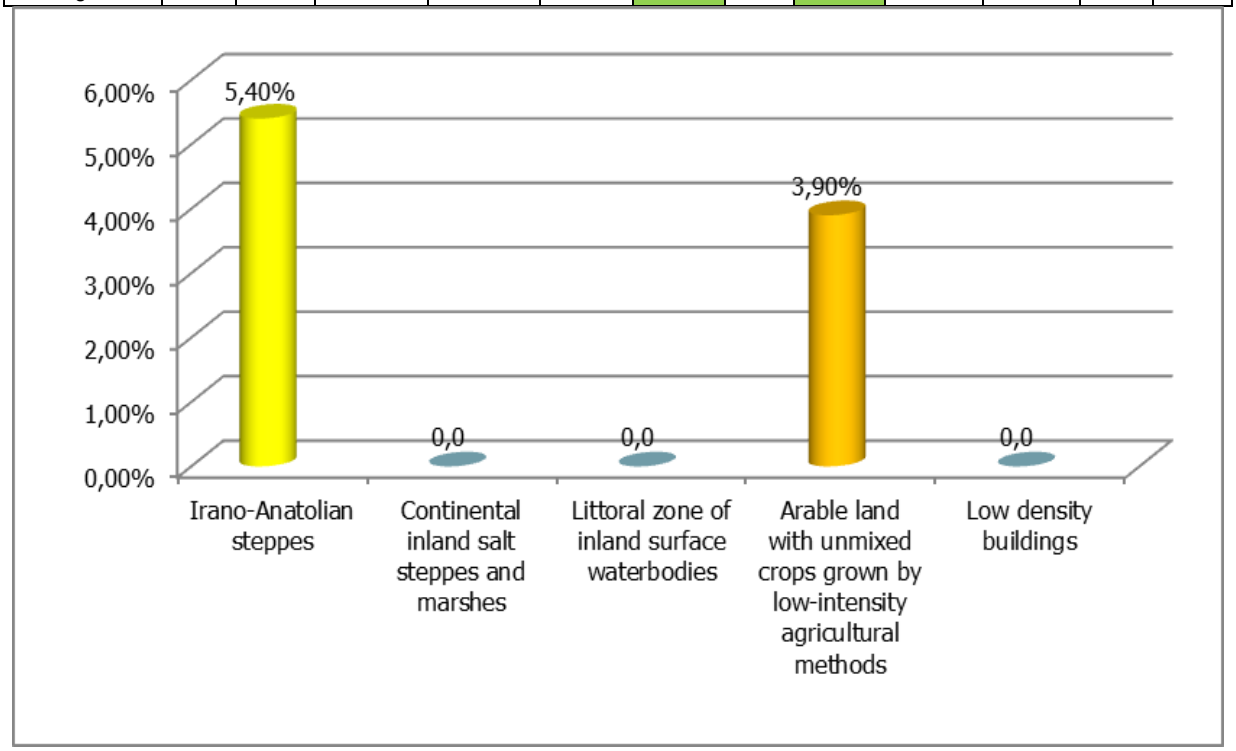


Figure 4.13.9.8. The Affected Ratio of the Habitats at Gas Pipeline

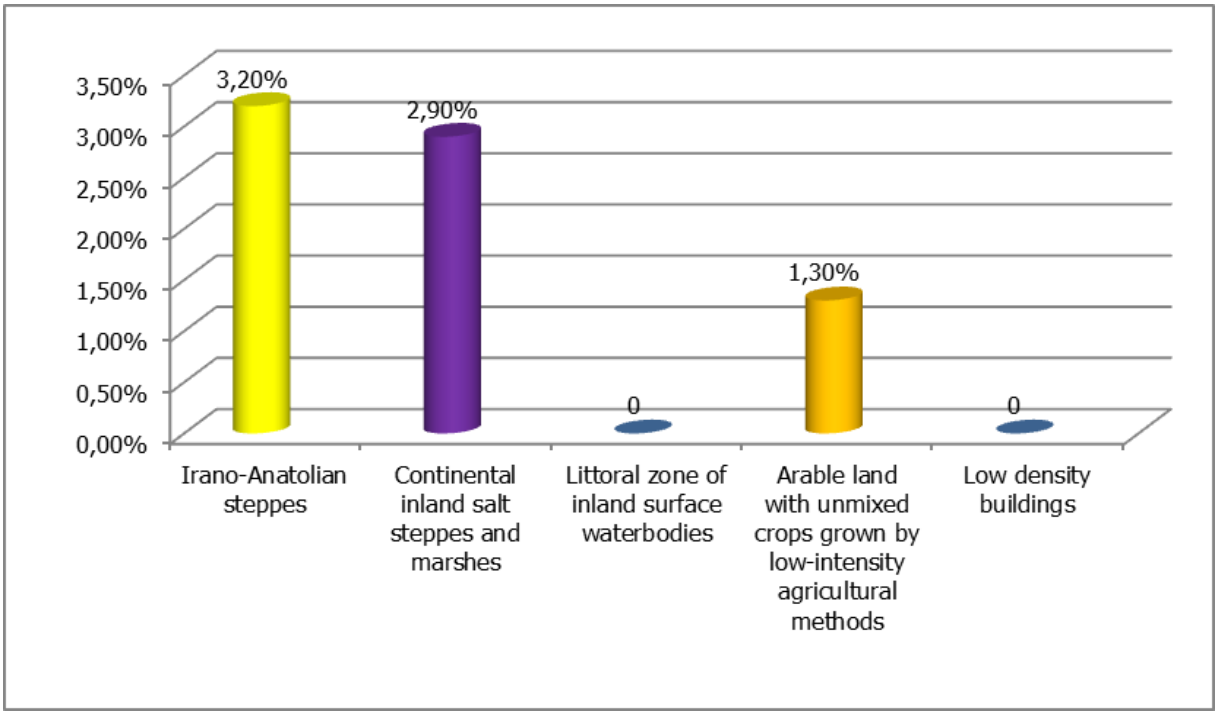


Figure 4.13.9.9. The Affected Ratio of the Habitats at Brine Discharge line

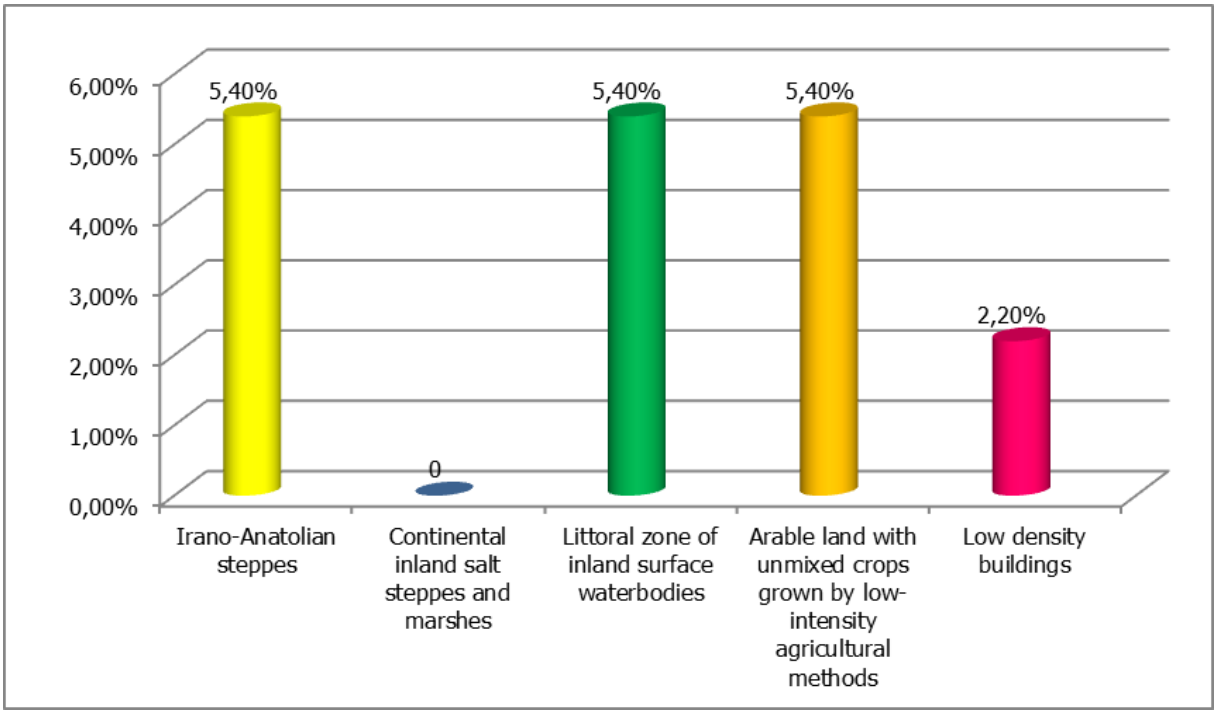


Figure 4.13.9.10. The Affected Ratio of the Habitats at Fresh Water line

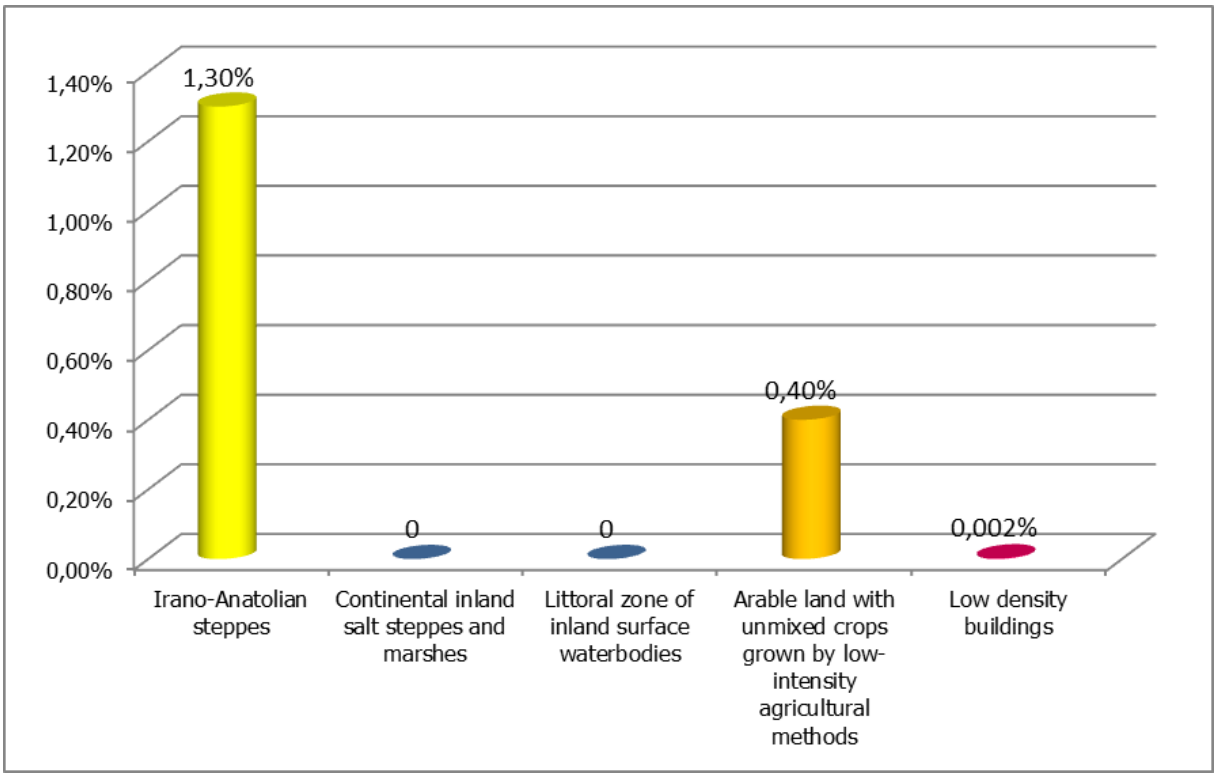


Figure 4.13.9.11. The Affected Ratio of the Habitats at UGS

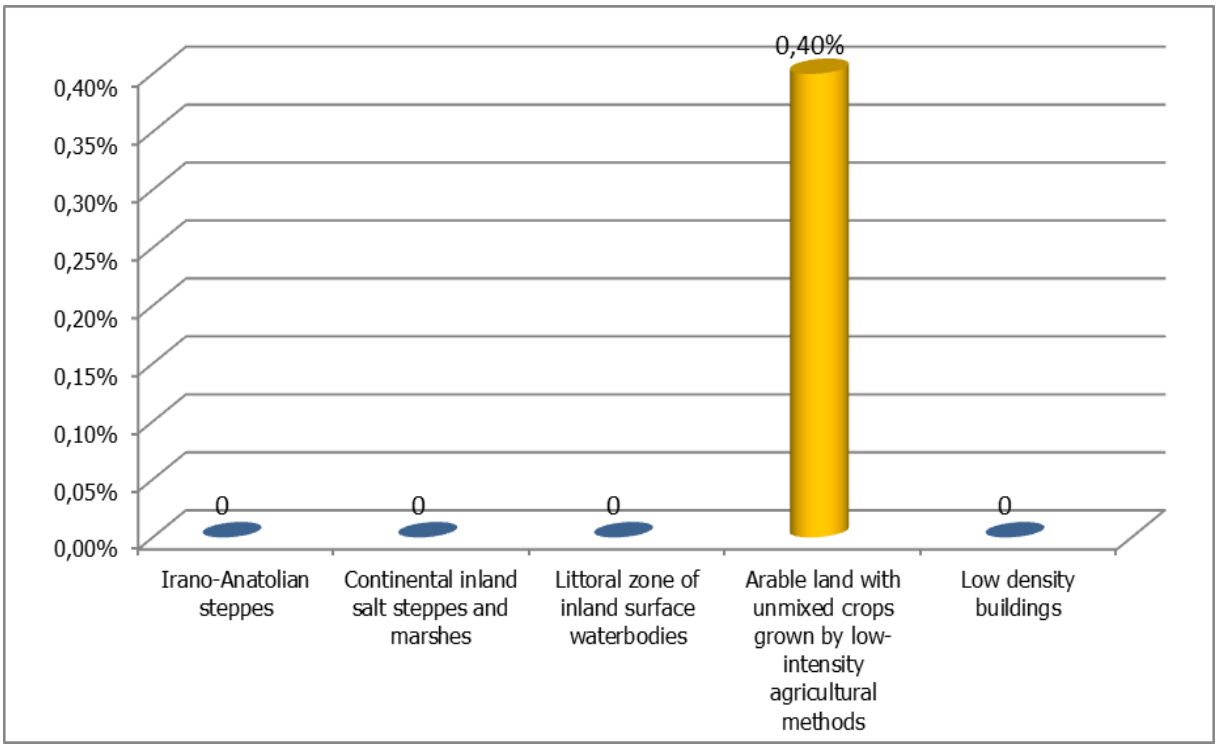


Figure 4.13.9.12. The Affected Ratio of the Habitats at Surface Facilities

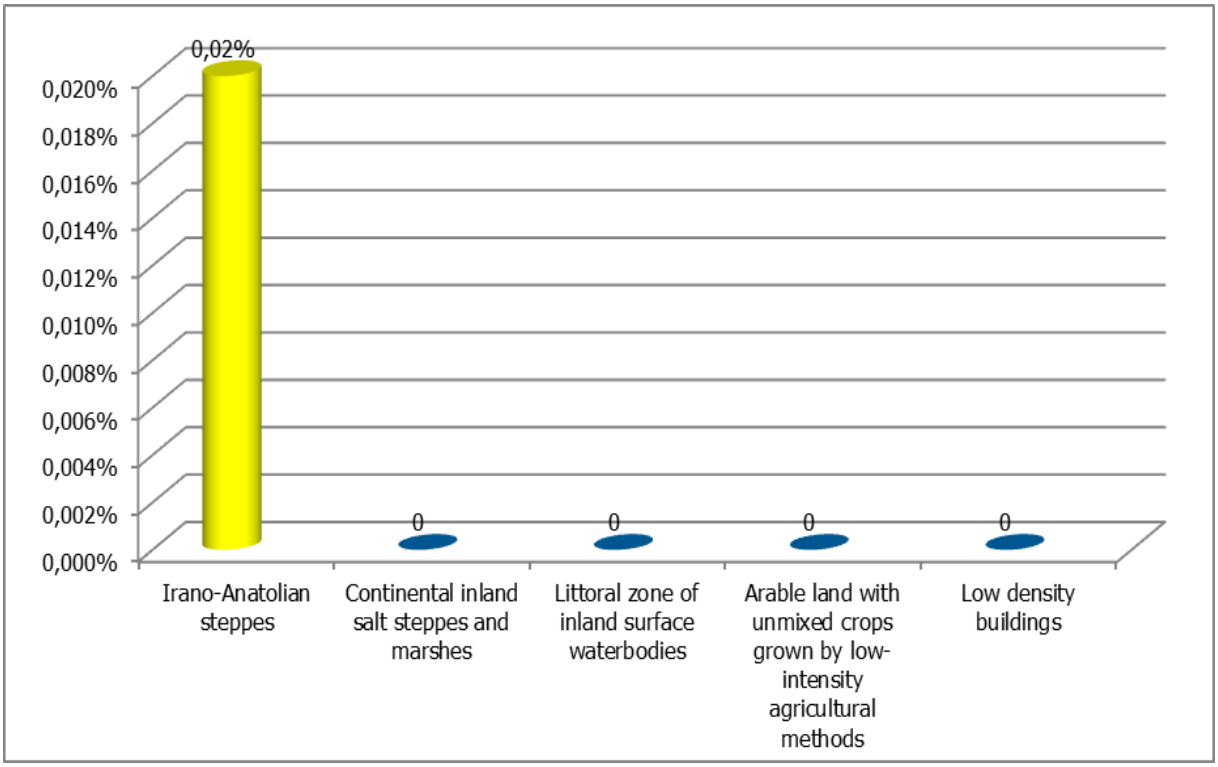


Figure 4.13.9.13. The Affected Ratio of the Habitats at ST5

According to Table 1.12.9.3 the affect on the habitats is max % 5,4. This affect is evaluated as minimum. Also to minimize the affect top soil managemed should be performed as stated in Section 5.5.6.

4.13.10. Effects of Water Transfer on Biodervisity

Chemical properties of water obtained from Hirfanlı Dam Lake

Some chemical parameters and heavy metal analysis results related to the water supplied by the water intake structure in the Hirfanlı Dam Lake (January 2017) are tabulated below (Table 4.13.10.1.).

Table 4.13.10.1. Hirfanlı Dam Water Analyses (January 2017) and Water Quality Classes

Parameters	Water Intake Structure	Water Quality Class
Dissolved Oxygen (mg/L)	**13.17**	**I**
pH	**8.73**	**I**
Electrical Conductivity (µS/cm)	**1718**	**III**
COD (mg/L)	**24.0**	**I**
BOD (mg/L)	**5.90**	**II**
Zinc (mg/L)	**<0.005**	**-**
Nickel (mg/L)	**<0.005**	**-**

Cadmium (mg/L)	**<0.0005**	**-**
Lead (mg/L)	**<0.0005**	**-**
Mercury (mg/L)	**<0.0001**	**-**

According to the analysis results, the oxygen level and pH value of the water taken by the water intake structure are in the optimum value range in terms of carrying out vital activities. The EC value was measured as 1718 µS/cm and according to Turkish Surface Water Quality Regulation this means it is Class III water. An independent study carried out in the Hirfanlı dam lake in 2012 also reported that the EC value is similar (1414 µS / cm) (Kavurmacı et al., 2012).

It is also important to determine the rate at which oxygen in the water is consumed as well as the amount of oxygen in the water. A low rate indicates that microorganisms in the water are dead or dying. BOD; refers to the amount of oxygen required to break up organic matter by microorganisms under aerobic conditions. The BOD value is used as an indirect measurement of the pollution load of water. COD measurement is a method based on the chemical decomposition of organic substances in the water and not biologically. During the BOD analysis, some of the organic matter is oxidized while the COD is entirely oxidized. Therefore, COD values are always higher than BOD. According to the results of water analysis carried out from the transferred water with the water intake structure from Hirfanlı Dam Lake, BOD and COD values are observed to be very low. Water samples were evaluated as II class in terms of BOD and I class quality water in terms of COD.

According to the result of the heavy metal analysis performed, it is observed that the level of zinc, nickel, cadmium, lead and mercury from Hirfanlı Dam Lake is under the detection limit. Nevertheless, it is inevitable that these values indicate periodic variation depending on the factors such as illegal discharges to the inland waters, especially to the rivers, precipitation, erosion, agricultural activities, etc., For this reason, it should be monitored whether the analyzes are repeated at certain intervals and they exceed the critical level.

When looking at the data sets of the past years (Table 4.13.10.2.), it is possible to make a similar interpretation according to the measurement results made twice a year in the period between 2014 and 2016. It is seen that the level of dissolved oxygen is in the range of 5.8-10.6 mg / L, pH is in the range of 7.6-9.3 and EC is in the range of 1144-1862 µS / cm. These values fall within the seasonal normal values during which analyzes are carried out. Similarly, COD and BOD values are seen to be quite low.

Table 4.13.10.2. Hirfanlı Dam Water Analyses

Parameters	May 29 2014	June 25 2014	July 18 2014	Aug. 18 2014	Jan. 20 2015	May 30 2015	Sept. 30 2015	Jan. 15 2016	July 14 2016
Dissolved Oxygen (mg/L)	8.44	6.82	6.78	6.66	10.6	6.37	5.82	8.9	8.08
pH	8.26	8.15	9.3	7.98	7.25	7.62	8.79	8.63	8.55
Electrical Conductivity (µS/cm)	1,175	1,212	1,199	1,180	1,198	1,144	1.862	1,455	1,504

COD (mg/L)	10.4	12.5	16.4	30.2	24.2	14.8	21.4	11.9	12.3
BOD (mg/L)	< 4.0	< 4.0	< 4.0	5.2	7	<4.0	5.2	<4.0	<4.0
Zinc (mg/L)	0.03	0.0105	<0.005	0.024	<0.005	0.0168	0.0071	0.006	0.017
Nickel (mg/L)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0559	<0.005	<0.005
Cadmium (mg/L)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Lead (mg/L)	0.00056	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Mercury (mg/L)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.016	<0.0001	<0.0001

When the results of the heavy metal analysis are examined, it is observed that the zinc values change between 6-30 ppp (Table 1.12.9.5). The lowest value was determined in January 2016 and the highest in May 2014. However, zinc is an essential element and it is both included in the structure of many metalloenzymes and regulates the functions of these enzymes (ValeeandAuld, 1990). Essentially, at very high doses, this element may also exhibit toxic effects. For example, for the planktonic species *Daphnia magna*, the 24-hour value of zinc was determined as 11.6 mg / L. (Ergönül et al., 2012). The measurable level of nickel could be only determined during September 2015 and it was 60 ppb. Cadmium did not reached to any measurement level in any of the sampling period. The lead level was 0.56 ppb during May 2014 and the mercury was measured as 16 ppb during September 2015.

These heavy metals are metals which presents unwanted effects even at the low levels and which have not any known function in the structure of the live being. However, according to the results of the analysis performed, in the water sampled from Hirfanlı Dam Lake, these heavy metals rarely reach to the measurement level.

In a toxicological study on the *Artemia* which has a key role in terms of food chain in the Tuz Gölü, some of heavy metals and the 24 hrs LC50 values determined for these metals are provided in the Table 4.13.10.3. below.

Table 4.13.10.3. 24 hrs LC50 values* of some of the heavy metals for *Artemia*

Heavy Metals	24 hrs LC_{50} values
Cooper	9.5
Zinc	17.8
Cadmium	1.7
Nickel	15.6
Lead	1.8
Iron	18.2

Compiled for Gajbhiye and Hirota's data (1990).

Within the light of these data it is estimated that the water transferred from Hirfanlı Dam Gole is not at a threatening level for *Artemia* which has a critical role in terms of food chain in the Tuz Gölü. However it will be suitable to perform minimum two times in a year the analyses of the heavy metals within the water intake structure of Hirfanlı Dam Lake by taking into

consideration the potential seasonal and periodic fluctuations. On the other side, it should also be pointed out that this is not the only possible source of pollution load on the Tuz Gölü. For example, it has been reported that arsenic, barium, chromium, copper, nickel, lead, tin and boron are transported to the Tuz Gölü from main drainage channel of Konya (Kalıpçı and Ceyhan, 2017). Likewise, Karataş (2006) reported a major pollution problem arising from the discharge of the household and industrial wastes of the city of Aksaray through the Uluırmak Channel to the Tuz Gölü.

For this reason, while considering possible bad scenarios for Tuz Gölü, such elements should be taken into account. This is a particular issue that needs to be considered when comparing data sets from past years belonging to the lake with current data.

Chemical Properties of the Discharge Brine Water

Analyzes (September, October and November - 2017) for water to be used to open underground salt galleries and discharge to Tuz Gölü are tabulated below (Table 4.13.10.4.). As it can be seen from the table the highest level for the heavy metals such as iron, cooper and zinc are 1.602, 0.135 and 0.584 mg/L respectively. These three heavy metals and the essential heavy metals and the elements needed up to certain levels in the structure of the living being. They may also present toxic effects in case the reach to very high concentrations. The sample values related to this were provided in Table 4.13.10.4. These values for arsenic, mercury, lead and chrome which are non essential heavy metals have been measured as 0.588, 0.013, 0.007 and 0.07 mg/L respectively. The non essential metals may present toxic effects even at low doses. In the studies conducted for *Artemia parthenogenetica* and *A. franciscana* the 24 hrs LC50 values for arsenic were found in the rage of 20-70 and 15-130 mg/L, respectively (Sanchez et al., 2016). In addition, it is seen that the other heavy metal levels are considerably lower than the values in Table 4.13.10.4.

Taking the whole picture into account, it is reasonable to conclude that the chemical composition of the brine discharge is very similar to the lake water (Table 4.13.10.4.). Thus, for future studies, if the levels of pollutants in lake water reach to a critical level, point sources of sewage discharge into lake via Konya and Aksaray drainage channels should also be evaluated for these pollutants to find the real source of pollution in Tuz Gölü. It has been reported that arsenic, barium, chromium, copper, nickel, lead, tin and boron are transported to the Tuz Gölü from main drainage channel of Konya (Kalıpçı and Ceyhan, 2017). Likewise, Karataş (2006) reported a major pollution problem arising from the discharge of the household and industrial wastes of the City of Aksaray through the Uluırmak Channel to the Tuz Gölü.

However, considering the annual 60 million m^3 saline discharge, which may include heavy metals depending on season, rainfall, drainage etc., plankton abundance should be monitored twice in a year. And if a correlation is found between the decrease in plankton abundance and the amount of heavy metals in the discharge water, the brine discharge may

be ceased temporarily and pumping only dam lake water to Tuz Lake, thus decreasing the concentration of metals in Tuz Gölü.

Because, when the results of salinity discharge analysis are compared with Hirfanlı Dam Lake, it is considered that the parameters related to pollution are associated to the in-lake and salt mines. Monthly analysis results for some chemical parameters in the nearest water body to the area where the saline discharge is made are tabulated below (Table 4.13.10.5.). According to the table the highest amounts for iron, cooper, zinc, arsenic, mercury and lead have been measured as 2.4, 0.51, 1.5, 0.03, 0.21 and 0.13 mg/L respectively. These values were found to be slightly higher than the analysis results made at selected points on the Tuz Gölü, but the area where the arsenic level was discharged was found to be lower. Therefore, as explained in Section 2 above, basing pollution loads in the lake on a single source (such as discharge water) may provide misleading results.

Table 4.13.10.4. Analyzes of water and Tuz Gölü carried from Hirfanlı Dam Lake and used for melting and discharge to Tuz Gölü.

Parameters	November 2017 Tuz Gölü	September, 2017 Brine Discharge Point	October, 2017 Brine Discharge Point	November, 2017 Brine Discharge Point
Iron (mg/L)	1.026	1,524	<0,005	1,602
Copper (mg/L)	0.145	<0.001	<0,001	0,135
Zinc (mg/L)	0.353	0.584	<0,001	0,192
Arsenic (mg/L)	0.577	0,018	0,012	0,588
Mercury (mg/L)	0.0084	<0,0001	0,013	<0,0001
Lead (mg/L)	0.0072	0,00197	0,00748	0,019
Total Chromium (mg/L)	0.069	<0,001	<0,001	0,075

Table 4.13.10.5. Monthly Analysis Results of Some Chemical Parameters Analysed for Brine Water (Nearest Pond to Diffusors)

Parameters	January 16, 2016	February 18, 2016	March 16, 2016	April 14, 2016	May 12, 2016	June 15,2016	July 14, 2016	August 12, 2016	September 20, 2016	October 14, 2016	November 11, 2016	December 14, 2016
Iron (mg/L)	2.38	1.3	1.32	1.64	1.36	1.69	1.61	0.773	0.744	0.725	<0.005	<0.005
Copper (mg/L)	<0,.001	<0.001	<0.001	<0.001	<0.001	0.16	<0.001	0.044	0.034	0.514	<0.001	<0.001
Zinc (mg/L)	0.156	<0.005	<0.005	0.758	<0.005	0.228	1.5	<0.005	<0.005	0.889	<0.005	<0.005
Arsenic (mg/L)	0.031	0.019	<0.0005	0.013	0.018	0.026	0.031	0.015	<0.0005	0.015	<0.0005	0.02
Mercury (mg/L)	<0.0001	<0.0001	0.107	0.037	0.037	0.064	0.03	0.219	0.027	0.022	<0,0001	0.017
Lead (mg/L)	<0.0005	<0.0005	<0.0005	0.04	0.019	0.009	0.027	<0.0005	<0.0005	0.133	<0.0005	<0.0005

4.13.11. Invasive Species

Biological diversity faces many threats throughout the world. One of the major threats to native biological diversity is now acknowledged by scientists and governments to be biological invasions caused by Alien Invasive Species (AIS). The impacts of AIS are immense and insidious. They may be as damaging to native species and ecosystems on a global scale as the loss and degradation of habitats.

The spread of AIS is now recognised as one of the greatest threats to the ecological and economic well-being of the planet. These species are causing damage to biodiversity and the valuable natural agricultural systems upon which we depend. The effects are exacerbated by global change and chemical and physical disturbance to species and ecosystems.

Preventing introduction of potentially alien invasive species is by far the preferred strategy. To prevent spread, every alien species should be treated as potentially invasive unless and until convincing evidence indicates that this is not so. For deliberate introductions it is recommended that standardised risk analysis and risk management procedures be developed. Preventive measures must be taken at both the source and the destination of the invasion.

Invasive species already alter nutrient cycling, hydrology, fire regimes, light penetration levels, regeneration of native species populations and physical habitat structure throughout once healthy ecosystems. The long-term effects of these changes are unknown, but their rate of occurrence raises concern about the ability of native species to adapt, particularly in the face of reducing habitat availability, increasing human encroachment and the effects of climate change. We have anecdotal evidence that a number of species of special concern are declining and may be lost in the state as a result of invasive species. Recent research has shown that some invasive species can interact to cause the populations of even common species to collapse.

Transportation and utility corridors are at-risk sites for the introduction and spread of invasive plants. A corridor is a strip of land upon which linear facilities such as pipelines, roads, and power or communication lines are built and maintained. Regular use and the associated potential for soil disturbance within corridors provide opportunities for the movement of invasive plants through the landscape. Transportation and utility corridors may even cross geographic barriers that previously limited the spread of invasive plants.

According to the AIS List for Turkey taken from Global Invasive Species Database, there is no available information on regional distribution of AISs in Turkey. The list does not include information about AIS distribution on the regions where the project is located.

Alien Invasive Species Pathways

The means and routes by which invasive species are imported and introduced into new environments are called “pathways”.

The diversity of known and potential AIS is enormous and includes all taxonomic groups from micro-organisms to mammals and species from across the terrestrial, freshwater and marine plant and animal kingdoms.

AIS are generally spread of direct and indirect pathways:

Direct pathways may result from intentional and unintentional activities. Many species have been intentionally introduced to new environments for agricultural, horticultural, commercial and recreational purposes and, in many instances, for aesthetic reasons. Others have been unintentionally introduced as ‘hitchhikers’ on goods such as fresh produce and nursery stock, or as ‘stowaways’ on aircraft, vessels, in packing material, sea containers, ballast water and hull fouling.

Indirect pathways relate principally to habitat alteration and degradation, which allow AIS to gain a foothold and become established. Examples include the removal of vegetation, changes to drainage or land contours and actions that eliminate certain key predator species.

In practice, indirect ecological disturbance and the direct introduction of AIS often happen concurrently, such as in the movement of tracked construction vehicles over exposed soil. This can greatly increase the risk of invasion.

The oil and gas industry is certainly not unique in its potential to create direct and indirect pathways for AIS. However, it often works in remote areas with little or no previous human activity, moving specialized equipment and personnel between sites and developing large-scale linear features such as trans-boundary pipelines. These characteristics set it apart from many other sectors and increase the likelihood and potential severity/consequences of invasion if appropriate measures are not implemented.

There are five main pathways for the introduction of AIS into new environments associated with onshore operations:

1. Physical introduction
2. Ecological disturbance
3. Corridor / physical pathways
4. Inappropriate reinstatement / reclamation
5. Personnel-related pathways

Physical introduction

- This includes the direct accidental introduction of reproductive bodies (e.g. seeds/eggs/spores) or whole organisms (e.g. insects/snakes) via personnel, temporary accommodation and vehicles (e.g. on tyres and tracked vehicles, and in supplies).
- Containers and packaging material used to transport equipment, materials, vehicles and supplies may also carry these bodies.
- Containers carry a high risk of AIS introduction: microorganisms, seeds, molluscs, insects and other small animals can stow away or ‘hitchhike’, and containers are difficult to inspect adequately. In one extreme case, a raccoon survived for about five weeks in a container while it was shipped from the USA to Europe, and was still able to walk out of the container.
- AIS can be found in or on the containers themselves, in the materials used for packaging and in the goods.
- Raw, untreated wood used in wooden crates, pallets and other timber supports is commonly found in shipments, and serves as a pathway for insects and plant diseases.

Other packaging materials include plant material such as straw, hay or rice husks that may also harbour alien insect pests and diseases.

- While physical introduction is not unique to the oil and gas industry, it is significant because oil and gas activities may operate both on a large scale (e.g. cross-country pipelines) and, potentially, in remote, pristine or sensitive areas.

Ecological disturbance

- Human-induced imbalance in environmental systems may facilitate the establishment of AIS, which are, by their very nature, opportunistic and best able to establish themselves in degraded habitats. An example is the vine/climber AIS; its seeds can persist in undisturbed forest environments without growing, but once (anthropogenic) canopy removal causes changes in conditions, it can become invasive and smother native vegetation.
- Similarly, clearance of vegetation, and soil disturbance, can encourage colonization of the disturbed areas by invasive plants, and subsequent spreading of these species into undisturbed areas.
- Storage of soil is often necessary where excavations occur, such as in pipeline construction. Bare soil presents a prime habitat for opportunistic AIS.

Corridor/physical pathways

- Certain onshore oil and gas activities, such as construction/burial of long-distance pipelines can create the same AIS risk associated with all major linear disturbances (for example, highways and railroads). Pipeline ROW is thought to be one of the main ways for some AIS flora species.
- Linear disturbances may also facilitate movement of more motile AIS, such as feral cats, pigs and rats, and open up new areas to human hunters, affecting predator/prey dynamics and thus creating new opportunities for AIS.

Inappropriate reinstatement/ reclamation

- Some oil and gas activities create large-scale soil disturbance and it is common for such developments to be reinstated/reclaimed by reseeding of the soil, replanting and other techniques to promote the growth of vegetation and soil stabilization.
- Use of inappropriate seed mixes, for example, can result in the introduction of AIS seeds either directly or indirectly through the creation of a native plant community that is more prone to AIS invasion via other pathways.
- This aspect interacts closely with the ecological disturbances described above, which may exacerbate the effects of AIS introduction. Use of certain equipment during reclamation activities can aggravate, rather than address, ecological disturbance. For example, standard earthmoving equipment may cause compaction, resulting in a

higher level of disturbance and increased opportunities for AIS to become established in preference to native plants. Finally, the timing of reinstatement/reclamation activities is important; for example, performing work in a season better suited to AIS than native vegetation may increase the risk of AIS establishment.

Personnel-related pathways

- In general, the health, safety and environmental restrictions for oil and gas projects and operations prevent the deliberate introduction of AIS by personnel. However, apparently innocuous activities at, for example, staff accommodation facilities (e.g. keeping cats and/or birds as pets or for pest control; growing ornamental or food plants; keeping fish in aquaria; or stocking water bodies with ornamental or game fish) may represent potential AIS pathways.
- In addition, while facilities such as base camps may not directly introduce AIS, they can provide refuges (and an initial 'staging post') for rats and mice moving towards new environments.

Also water is a potential AIS pathway for onshore operations. It may be moved on, off and between sites for a number of purposes, including:

- drainage;
- dust abatement on pipeline spreads;
- hydrotesting;
- vehicle/facility cleaning; and
- irrigation of vegetation (e.g. on-site landscaping or restoration of habitats).

A number of potential pathways exist for the transmission of smaller AIS such as fungal spores, plant seeds, and micro-invertebrates, particularly where water is collected from 'open' sources such as rivers or lakes.

Prevention

Prevention involves attention to the most common vectors of transmission, including contaminated seed, mulch, or soils; movement of unlearned equipment or machinery from an invasive weed-contaminated area to a non-contaminated area; and a lack of restoration or revegetation after construction.

The detailed prevention measures for AIS are given below.

Overall Prevention Principles

- *Take time to plan:* Proper planning can reduce future maintenance costs by reducing the potential for invasive plant introduction and spread. A good first step is to conduct a

pre-activity assessment of the work area to determine which activities could spread AIS and which Best Management Plans (BMP) are applicable.

- *Stop movement of invasive species materials:* The movement of workers, materials and equipment can carry AIS between sites. In general, conduct field activities to minimize contact between equipment and potential sources of invasive species, particularly mud and weeds. This can include the following:

  -Avoid walking, driving, or mowing through weed patches when seeds are present.

  -Stay on trails and avoid walking through areas of tall grass or brush**.**

- *Minimize soil and vegetation disturbance:* Disturbance can allow invasive plants to colonize a new area. Disturbance should be minimized, and when it is unavoidable, managers should conduct follow-up monitoring to ensure early detection of any invasive plants that may have been introduced.
- *Maintain desired plant communities:* A healthy plant community with native and desirable species provides resistance to invasive plant establishment.
- *Practice Early Detection and Rapid Response (EDRR):* Early detection and eradication of small populations helps prevent the spread of invasive plants and significantly reduces weed management costs. Regular monitoring increases the chances of success.

Brushing (Physical Removal)

- Brushing is considered to be moderately effective in removing the majority of plant and/or other AIS material from equipment or gear. A follow-up with water washing, high-pressure air blasting, or high-pressure wash is also recommended.
- If there is a nap to fabric (e.g., upholstery, carpeting, or clothing), brush with the nap rather than against it.
- Brushing against the nap could further embed small seeds and/or insects into the material. High-pressure compressed air blasting may be used to assist soil removal.
- A combination of soft and stiff bristles of varying length is recommended for use on carpeting or components made of rubber, nylon, or plastic.
- Bristles of medium length and stiffness are desired for removal of soil and other matter from fabrics and upholstery.
- Stiff bristles are recommended for the tread of wheels that become encrusted with soil and mud. Metal bristles may also be used to remove soil or concrete in treads, but heavier wear and tear to the equipment will result.

Vacuuming (Physical Removal)

- Vacuuming equipment or clothing with a brush attachment is suggested to remove most loose particle matter, but care should be taken because small seeds may become further embedded in materials. To prevent contained plant and soil matter from being redeposited following the cleaning process, collected matter should be bagged and incinerated or disposed of in a sanitary landfill. A follow-up with water washing, high-pressure air blasting, or high-pressure wash is also recommended.

Use of Adhesive Roller (Physical Removal)

- Adhesive roller is considered to be moderately effective in removing plant material from equipment or gear. Seed and fragment materials readily attach to the adhesive sheets and are effectively lifted out of seams and the weave of loose particle fabrics; however, proper attention and care given during removal is a direct reflection of the potential efficiency of this technique. To prevent contained plant and soil matter from being redeposited following the cleaning process, adhesive sheets should be bagged and incinerated or disposed of in a sanitary landfill. A follow-up with water washing, high-pressure air blasting, or high-pressure wash is also recommended.

Thermal Treatment

- Thermal treatments involve the use of extremely hot temperatures in order to kill all invasive material. Using steam, hot air, or hot water to clean vehicles and field equipment has proven to be especially effective when used to bring the object's surface temperature up to 140 °F for 30 seconds. A hand-held infrared thermometer can be used to verify the surface temperature. Disadvantages to the use of thermal treatments are the apparent risk of burns, its labor-intensive nature, and the initial investment cost of equipment.

Cleaning with water

  - Wash on a paved surface to avoid creating mud. Contain waste water and splash to prevent invasive plant parts and seed from spreading.
  - High pressure washers (preferably with 2,000-psi): wash once for six minutes or two to three times for three minutes for best results.
  - Portable commercial wash unit with under carriage washers and pressure hoses.

- Clean carpet, rubber, nylon or plastic materials using:
  - A vacuum cleaner
  - A variety of brushes with bristles of varying length and texture.
- Use special gear as appropriate:
  - Nylon gaiters to cover socks and laces
  - Leather laces on leather boots

        - Rubber boots
    - Carry appropriate equipment to help remove soil, seed, and plant parts. This may include wire brushes, small screwdrivers, boot brushes, extra water free of invasive species, and bags for plant materials.
- Clean clothing, footwear and gear before leaving infested areas.
    - Inform workers about possible seeds and invasive plant parts and/or other AIS carried on their clothing, footwear and gear.
    - Clean clothing, footwear and gear for soil, seeds and plant parts before leaving infested areas.
    - Wear fabrics that do not retain invasive plant material:
        - Cotton duck (canvas)
        - Nylon
        - Leather
- Prepare worksites to limit the introduction and spread of invasive plants and/or other AIS.
    - Determine the degree that site preparation is needed for each activity and worksite. Not all prevention measures are needed when the worksite is already widely infested; however, all cleaning and waste-disposal BMPs should be implemented before leaving worksites to prevent spread to new areas.
    - Position activity boundaries to exclude areas infested with invasive plants and/or other AIS. Activity boundaries include staging areas, access roads and other temporary facilities. If this is not feasible, treat infested areas prior to their use.
- Minimize soil and vegetation disturbance.
    - Retain soil cover and native/desirable vegetation in and around the activity area to the greatest extent possible to minimize the introduction and spread of invasive plant and/or other AIS.
    - Consider the impacts of different types of equipment. Plan to use equipment that minimizes soil and vegetation disturbance.
    - Minimize the frequency of soil disturbance when feasible. If a site has to be cleared of vegetation regularly for maintenance (such as roadside blading or ditch clearing), consider paving or otherwise protecting the site by using weed-free materials (gravel, mulch, decomposed granite), deep mulching, or a soil stabilizer.
    - Maintain topsoil or ensure quality soil placement to establish desirable plant community.

- Stabilize disturbed soils using erosion control or storm water pollution prevention BMP methods.
- After disturbing soil, encourage prompt regeneration of desirable vegetation to limit introduction of invasive plants.

- After activities, monitor worksites for invasive plants.
  - Monitor and maintain revegetation and landscaping at the site to support establishment of desired plant species.
  - Monitor during multiple growing seasons, especially at times of germination and flowering, for a minimum of three years after project completion to ensure that any invasive plants are promptly detected and controlled. Monitoring areas include:
    - On-site cleaning areas and waste disposal areas
    - Areas where project or maintenance activities are performed
    - Areas where project materials are imported
    - Access routes, roads and other areas of concentrated use
    - Areas near watering sites, loading/ unloading areas
    - If three years is not sufficient to control the re-establishment of invasive populations, monitoring and treatment should to be continued until confident that invasion has been controlled.

4.14. Social Baseline

The socio-economic baseline provides a demographic and economic overview of the Project area and also describes the physical infrastructure and services available in the communities visited. The data presented in this section had been collected through field survey, literature review and analysis of official statistics obtained from public institutions. The purpose of collecting this information is to provide a basis upon which the impact assessment can be conducted, and to enable the monitoring and measurement of changes over time. The baseline description has the following main objectives to:

• focus on receptors that were identified during scoping as having the potential to be significantly affected by the Project,

• describe and, where possible, quantify their characteristics (demography, economy, education, health, etc.),

• provide data to aid the prediction and evaluation of possible impacts and,

• inform judgments about the sensitivity, vulnerability and/or importance of resources/receptors.

Methodology

Primary and secondary data sources were utilized to depict the socio-economic profile of the Project area. Secondary data sources are mainly based on the government records including population census and other relevant records of governmental institutions (Turkish Statistical Institute, State Planning Organization, Governorships and Provincial Directorates of Environment and Forestry, Health etc.).

Both qualitative and quantitative instruments were used for primary data collection which is listed below:

- ✓ Questionnaires (at settlement level),
- ✓ Focus Group Discussions
- ✓ In-depth Interviews with Key Informants

Table 4.14.1. below demonstrates the number of used survey tools and number of attendees during the field study which was conducted on November, 2016. Baseline study has been conducted in the project-affected settlements which are defined in Section 4.10.1. A total of 71 PAPs have been attended to the site visit. The survey tools have been determined based on a collective decision of BOTAŞ and ÇINAR.

Table 4.14.1. Survey Tools Used for Baseline Data Collection and Number of Attendees

Survey Tool	Number of Surveyed Settlement	Number of Attendees
Questionnaires (at settlement level)	9	12
Survey Tool	**Number of Focus Group Discussions**	**Number of Attendees**
Focus Group Discussions (with seasonal workers, women and elderly)	7	52
Survey Tool	**Number of In-depth Interviews**	**Number of Attendees**
In-depth Interviews with Key Informants	2	7

In addition to the above mentioned baseline data collection study, an additional site visit was carried out to investigate whether the water intake process of BOTAŞ from the Hirfanlı Dam had any social impact on irrigation activities there. For this purpose, Acıkuyu, Şanlıkışla, Büyükbıyık, Küçükbıyık, Büyükcamili, Kesikköprü, Büğüz, Kargınyenice, Savcıkurutlu, Hirfanlı and Töklümen settlements were visited on May 17, 2017 and 11 questionnaires were conducted with Mukhtars, and if the Mukhtars were not found, village members or people who had information about the village were interviewed. The questionnaires used for data collection in Hirfanlı Dam are attached in the Appendix-8.

Questionnaires

Questionnaires were used to collect quantitative and qualitative data at settlement level. The details of questionnaires are as explained below:

Settlement Questionnaires

A general settlement questionnaire was devised for the route in order to collect information on the settlement as a whole (total population, population distribution, total number of households, infrastructure, livelihoods, education and health facilities etc.) as well as information about village problems, issues of concern, development opportunities and environmental and social features. Settlement questionnaires were conducted with the Muhtars or other identified community leaders of the settlements visited.

The questionnaire is made of a mix of closed questions (mainly regarding statistical data) and open or semi-open questions (mainly to obtain qualitative information), covering all issues of concern that have emerged from desktop studies.

Focus Group Discussions

A focus group discussion is a structured group process used to obtain detailed information about a particular topic. A focus group is composed of six to ten participants who are brought together to discuss a clearly defined topic. Typically, focus groups are composed of homogeneous people, all representing a particular segment of the population. A group facilitator keeps the discussion on track by asking a series of open-ended questions meant to stimulate discussion.

Focus Group Discussions were used during the baseline surveys to get information about the populations groups that are not covered within the questionnaire survey as well as to provide important information on the dynamics, relationships, strengths and social capital within the communities.

In-depth Interviews

In depth interviews were carried out with key informants in the settlements visited for the survey. Within this context, the key informants were considered as local administrative leaders (i.e. sub-governors and mayors) as well as representatives of pertinent organizations and associations etc.

4.14.1. Population and Demography

Provincial and District Level

Provincial and district based demographic information obtained from the official records of Address-Based Population Register System of the Turkish Statistical Institute (TUİK) is provided in the tables below (between Table 4.14.1.1. and Table 4.14.1.4.) The well area of the project is located within the boundaries of the Sultanhanı district. There is no district based demographic information about Sultanhanı since the district status is just given in 2017. According to the latest TUİK records (2016), the population of male population in Sultanhanı town is 5215, the number of female population is 4870 and total population is 10,085. Until the previous year, Sultanhanı was affiliated to Aksaray province Central district.

Therefore, the demographic information about Central district of Aksaray is provided in the tables below.

Table 4.14.1.1. Province and District Centers, Town and Village Populations

				(%) Population rate of the province/district center and town/village population in scope of total population	
	Total	**Province and District Centers**	**Towns and Villages**	**Province and District Centers**	**Towns and Villages**
Konya	2,079,225	2,079,225	-	100.0	-
Emirgazi	9,324	9,324	-	100.0	-
Aksaray	382,806	239,740	143,066	62.63	37.37
Central District	273,999	189,977	84,022	69.33	30.67
Eskil	26,178	17,033	9,145	65.07	34.93

TÜİK, Selected Province Indicators, 2013

The distribution of the population by sex in province and district basis is presented in the table below. The distribution of female and male population within the total population is generally close to each other.

Table 4.14.1.2. Population Distribution by Gender

	Male	**Female**	**Total**
Aksaray	197.362	199.311	396.673
Central District	146.032	147.599	296.631
Eskil	13.193	12.986	26.179
Konya	1.073.631	1.087.672	2.161.303
Emirgazi	4.394	4.368	8.762

TÜİK, 2016

The table below shows the distribution of the population by province and district based on both gender and literacy status. When the total number of literate people is evaluated in terms of the gender distribution, it is seen that the number of literate men is higher than the number of literate women in the three affected districts.

Table 4.14.1.3. Population Distribution by Gender and Literacy Status (6 +Age)

	Literacy	**Total**	**Male**	**Female**
Emirgazi	Illiterate	300	55	245
	Literate	11,059	5,518	5,541
	Unknown	66	38	28

	Literacy	Total	Male	Female
	Total	**11,425**	**5,611**	**5,814**
Aksaray / Central District	Illiterate	11,896	1,610	10,286
	Literate	225,608	116,036	109,572
	Unknown	3,055	1,648	1,407
	Total	**240,559**	**119,294**	**121,265**
Aksaray / Eskil	Illiterate	968	93	875
	Literate	21,986	11,299	10,687
	Unknown	46	12	34
	Total	**23,000**	**11,404**	**11,596**

TÜİK, Selected Province Indicators, 2013

It is seen that the average household number per province and district is the lowest in Konya. The average number of households in the central province of Aksaray, where Sultanhanı district is affiliated, is 3.96, slightly more than the Aksaray province (3,91).

Table 4.14.1.4. Average Household Size According to Provinces and Districts

Average household size	
	Total
Aksaray	3.91
Central District	3.96
Eskil	4.26
Konya	3.63
Emirgazi	4.06

TÜİK, Selected Province Indicators, 2013

Employment:

Aksaray provincial urbanization rate is below the Turkey average in terms of gross domestic product per capita and the total employment rate of those working in the industrial sector. The annual population growth rate and the total employment rate of those working in agriculture are above the Turkish average.

Aksaray's unemployment rate is 5.8% for 2013, labor force participation rate is 50.1% and employment rate is 47.2%. In TR34 Kırıkkale, Aksaray, Niğde, Nevşehir and Kırşehir regions, the labor force participation rate of the population aged 15 years and over in 2013 is 48.3% while the unemployment rate is 6.5%. In TR71 Kırıkkale, Aksaray, Niğde, Nevşehir and Kırşehir regions, 46.3% of the population aged 15 years and over is employed in service sector and 37.1% is employed in the agricultural sector. Employment in the industrial sector is 16.3% comes after employment in agriculture. In 2013, the ratio of people employed in Aksaray province is 47.2%, which is the 41st rank in Turkey with this ratio.

The unemployment rate for 2013 is 5.8% in Aksaray and it is the 7th province with the lowest unemployment rate.

Konya's unemployment rate for 2013 is 4.7%, labor force participation rate is 48.4% and employment rate is 46.2%. In TR52 Konya-Karaman region, 42.6% of the population aged 15 years or over are employed in service sector are 32.7% are employed in agriculture sector in 2013. The proportion of those employed in the industrial sector is 24.7% after agriculture.

The unemployment rate for 2013 is 4,7% in Konya and it is the 2nd province with the lowest unemployment rate (the unemployment rate of Turkey is 9,7%). In 2013, the ratio of people employed in Konya province is 46.2%, which is the 52nd rank in Turkey with this ratio.

Settlement Level

The presence of multiple components for the Expansion Project causes project-affected settlements to differ on a component basis. Project-affected settlements are given in Table 4.14.1.5. together with approximate number of households and population. For the pipeline components (fresh water, brine water and natural gas pipeline), only one settlement (Sapmaz village in the Central District of Aksaray Province) is affected which has a population of 542 people in 2016 and approximately 138 households.

Table 4.14.1. 5. Population of Project-Affected Settlements

District	Settlement	Affected by which Project Component	Approximate Number of Households	Population
Sultanhanı District of Aksaray Province	Bucak Plateau	Surface facilities, well areas, connection lines between UGS sites	40	200
	Mağrul Plateau		21	70
	Tömü Plateau		12	55
	Enver Kara Plateau		5	16
	Cülcülü Plateau		5	20
	Eminleryurdu Plateau		1	4
	Bekmezci Plateau		1	5
	Bezirci Village		50	150
Central District of Aksaray Province	Sapmaz Village	Natural gas pipeline, fresh water lines, brine water lines	65	542
TOTAL			200	1062

Source: Field Survey, 2016

The map below shows the distribution of settlements within the license area and the salt dome boundaries (Figure 4.14.1.1.). The settlements in the area are mostly rural settlements with low population. There are even settlements where only one household lives. Among these settlements, some of the plateaus with low population are connected to other plateaus with more dense populations. Hacı Osman Koyuncu, Musa Dağlı, Kazım Koyuncu and Sadıktelli Plateaus are connected to Mağrul Plateau and the population of these settlements is added to the Mağrul Plateau in the table above.

Although the center of Gazi Quarter is located neither within the boundaries of license area not the salt dome, irrigated and dry agricultural lands of Gazi Quarter are located in the license area (the northern side). Besides, Taşoba, Eminleryurdu, Bekmezci and Tömü

Plateaus are connected to Gazi Quarter. Besci village and Büyükekşi Plateau are also not located within the license area. However, the pasture lands in the south-west and south-east sides of license area are used for grazing activities of Besci village and Büyükekşi Plateau. Therefore, Gazi Quarter, Besci village and Büyükekşi Plateau are also considered as indirectly affected settlements. The population and approximate number of households of these settlements are given in the table below (Table 4.14.1.6.).

Table 4.14.1. 6. Population of Indirectly-Affected Settlements

District	Settlement	Approximate Number of Households	Population
Emirgazi District of Konya Province	**Besci Village**	85	347
Sultanhanı District of Aksaray Province (Sultanhanı)	**Gazi Quarter***	16	470
	Büyükekşi Plateau	17	55
TOTAL		118	872

Source: Field Survey, 2016

**The population of Tömü, Eminleryurdu and Bekmezci Plateau is not added to the population of Gazi Quarter since they are given in directly-affected settlements above. But the population of Taşoba Plateau is included.*

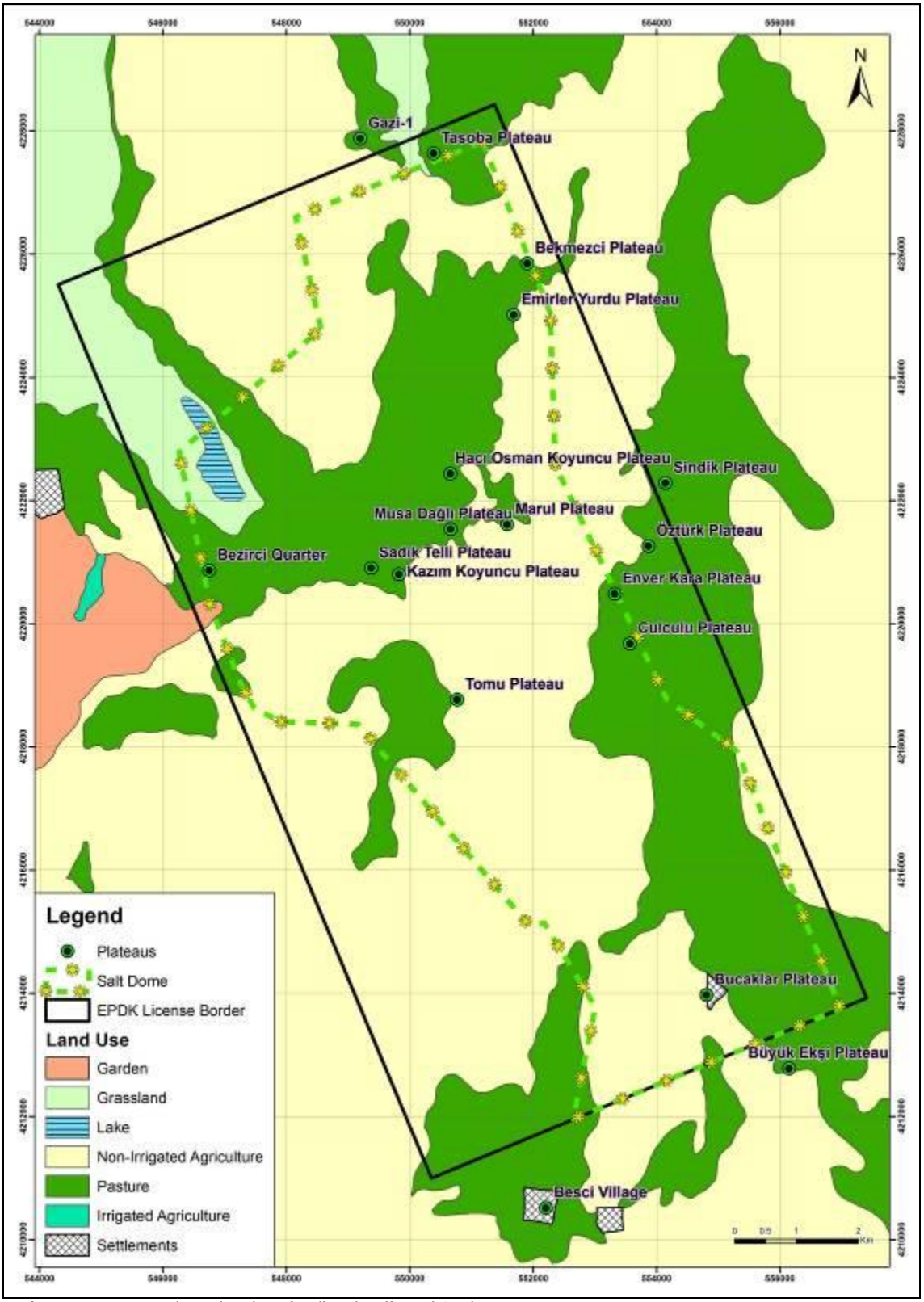


Figure 4.14.1.1. Project Directly anf Indirectly Affected Settlements

4.14.2. Economy and Land Use

Provincial and District Level

70% of the active population in Aksaray proves its subsistence from agriculture and animal husbandry. The reason for the high percentage of population engaged in agriculture is that the industry and the service sector are less developed. Industry is mainly located in the city center, there are a few feed and milk factories in Ortaköy District, and there are no industrial facilities in other districts. The distribution of industrial establishments according to sectors varies. The most common industrial establishments are food industry, automotive and metal industry. There are two feed factories in Eskil District, which produces raw sunflower oil plants. 54.4% of province lands are suitable for agriculture and the remaining 45.6% are meadows, pastures, deciduous forests and non-arable forest lands. 86% of arable land is dry and 14% is irrigated. The distribution of land use in Aksaray province is given in the table below (Table 4.14.2.1.).

Table 4.14.2.1. Distribution of Land Use in Aksaray Province

Land Type	Amount (Ha.)	Percentage (%)
Agricultural Land	420.430	54,46
Pasture Land	277.803	35,97
Forest Land	12.528	1,62
Non-agricultural lands (Including settlements)	10.376	1,34
Total water surfaces (Including lakes and ponds)	51.048	6,61
TOTAL	772.185	100,00

Economy in Konya Province is majorly based on agriculture and especially on wheat farming. 75% of active population engaged in agriculture, animal husbandry, fishing, hunting and forestry. 40% of annual net income is derived from agriculture. Livestock is also common in the province of Konya, which has large meadows and pasture lands. 59% of province lands are suitable for agriculture and the remaining 41% are meadows, pastures, deciduous forests and non-arable forest lands (Table 4.14.2.2.).

The industry in Konya has also developed considerably in recent years. Automotive subsidiary industry and machinery industry are the leading industrial sectors in Konya. Other developed sectors are machine production, casting industry, plastic paint and chemical industry, construction materials industry, paper and packaging industry, food and shoemaking industry etc. The diversity of production and the development of industrial sites stimulate the labor market and create employment areas.

Table 4.14.2.2.. Distribution of Land Use in Konya Province

Land Type	Amount (Ha.)	Percentage (%)
Agricultural Land	2.247.857	59
Pasture Land	761.461	19
Forest Land	540.189	14
Non-agricultural lands (Including settlements)	180.962	5
Other lands (reeds, marsh, dune etc.)	102.729	3
TOTAL	**3.833.189**	100,00

The table below shows the production of grain and other crops grown on provincial and district basis (Table 4.14.2.3.). The most produced agricultural products in the region are wheat, barley, corn (silage), potato and sugar beet. Sugar beet, especially because of its high profit rate, is the most cultivated product in irrigated lands. The production amounts of selected vegetable and fruit products in the region are given in Table 4.14.2.4. and Table 4.14.2.5. Also animal production amounts are given in Table 4.14.2.6.

Table 4.14.2.3. Selected Grain and Other Plant Products Production (Tons)

Location	Wheat	Barley	Corn (Silage)	Potato	Sugar beet
Aksaray	258,793	261,616	334,262	173,756	1,080,135
Merkez	112,900	147,812	190,000	93,600	539,394
Eskil	108,247	27,003	134,792	-	425,600
Konya	2,291,930	838,491	1,150,112	420,755	4,773,791
Emirgazi	50,223	32,135	22,750	-	2,342

TÜİK, Selected Province Indicators, 2013

As presented in the table below, the most produced vegetable is tomato in the Central district of Aksaray province. The second is onion which is grown in dry farming. The vegetables produced in Konya and Aksaray are mostly similar. The only difference is that most produced vegetable is carrot in Konya province. There is no record of vegetable production in the Emirgazi district.

Table 4.14.2.4. Selected Vegetable Products Production (Tons)

Location	Tomato	Cucumber	Onion (Dry)	Watermelon	Garlic (dry)
Aksaray	25,003	4,495	22,727	2,972	4,490
Merkez	20,446	3,230	14,450	2,100	4,225
Eskil	-	-	-	-	-
Location	**Tomato**	**Cucumber**	**Carrot**	**Watermelon**	**Melon**
Konya	172,126	28,765	344,401	40,744	62,745
Emirgazi	-	-	-	-	-

TÜİK, Selected Province Indicators, 2013

Provincial and district based fruit production is given in the table below. It is seen that the most produced fruit is grapes in Aksaray province, apple in the Central district. Fruit production is very low in Eskil district and the produced fruits are apple, apricot and pear. Likewise, fruit production is not common in the Emirgazi district too. Only apple and grapes are produced in the district. Most produced fruits in Konya province are also apple and grapes.

Table 4.14.2.5. Selected Fruit Products Production (Tons)

Location	Apple	Pear	Cherry	Grapes	Apricot
Aksaray	10,103	1,321	512	13,971	974
Merkez	3,005	736	109	1,255	545
Eskil	209	34	-	-	82
Location	**Apple**	**Strawberry**	**Cherry**	**Grapes**	**Sour Cherry**
Konya	75,666	14,920	49,893	66,096	25,882
Emirgazi	238	-	-	73	-

TÜİK, Selected Province Indicators, 2013

Animal husbandry is an important source of livelihood in both Aksary and Konya provinces and districts, although not as much as agricultural production. It is seen that cattle livestock is more common than sheep livestock. 62% of the number of sheep in Aksaray is in the Central district.

Table 4.14.2.6. Animal Production

Location	No. of cattle	No. of sheep	No. of goats	Milk production (kg)	Honey Production (kg)	No. of poultry animals
Aksaray	220,092	375,031	33,831	304,450	348	321,945
Merkez	139,210	236,131	19,692	172,943	305	248,478
Eskil	46,266	55,332	751	72,927	-	13,320
Konya	716,172	1,928,807	213,732	962,806	929	12,043,554
Emirgazi	22,142	56,400	2,470	37,165	3	12,200

TÜİK, Selected Province Indicators, 2013

Settlement Level

Livelihood activities are majorly based on agriculture and livestock in project-affected settlements. There are no other income source except the agriculture and livestock. There is no specialization in other professions since the age average is quite high, and most of the people do not have the possibility to carry out another job. Percentage of population according to the engagement in agriculture and livestock is presented in the table below (Table 4.14.2.7.). The percentages of engagement in agriculture and livestock are high especially in directly-affected settlements. All PAPs are engaged in agriculture and livestock in Tömü, Enver Kara, Cülcülü, Eminleryurdu and Bekmezci plateau.

Table 4.14.2.7. Livelihoods in the Project-Affected Settlements

Settlement	Percentage of Population Engaged in Agriculture (%)	Percentage of Population Engaged in Livestock (%)
Bucak Plateau	90%	100%
Mağrul Plateau	80%	42%
Tömü Plateau	100%	100%
Enver Kara Plateau	100%	100%
Cülcülü Plateau	100%	100%
Eminleryurdu Plateau	100%	100%
Bekmezci Plateau	100%	100%
Bezirci Village	70%	100%
Sapmaz Village	80%	20%
Gazi Quarter	100%	100%
Besci Village	90%	100%
Büyükekşi Plateau	60%	70%

Source: Field Survey, 2016

In some of the project-affected settlements (Besci Village, Sapmaz village, Bucak and Büyükekşi plateau), only rainfed agriculture is performed and in other settlements both irrigated and rainfed agriculture are performed. The most frequently planted crops are alfalfa, sugar beet, corn, wheat and barley. Agricultural products grown with rainfed agriculture are generally used as animal feed (Table 4.14.2.8.). The yield of alfalfa and beet grown in irrigated agriculture is very high and therefore preferred by PAPs. An average 3,000-3,500 TL profit is obtained from the beet per hectare.

Table 4.14.2.8. Products Grown in Dry or Irrigated Agriculture

Settlement	Products Grown in Dry or Irrigated Agriculture
Bucak Plateau	Wheat and barley (rainfed)
Mağrul Plateau	Wheat, barley, alfalfa
Tömü Plateau	Alfalfa, wheat, corn, barley, beet
Enver Kara Plateau	Alfalfa, wheat, barley, beet
Cülcülü Plateau	Wheat, barley, beet
Eminleryurdu Plateau	Wheat, barley, alfalfa
Bekmezci Plateau	Wheat, barley, alfalfa
Bezirci Village	Wheat, barley, corn grains, beet, alfalfa, potato
Sapmaz Village	Wheat, barley, garlic (rainfed)
Gazi Quarter	Corn, alfalfa, beet, sunflower, barley, wheat, beet, turnip seed
Besci Village	Wheat and barley (rainfed)
Büyükekşi Plateau	Wheat and barley (rainfed)

Source: Field Survey, 2016

Livestock is sustained for not only household consumption but also as a market-oriented and income generating activity. Livestock information of project-affected settlements is given in the table below (Table 4.14.2.9.). The reason for the higher number of sheep is that livestock is generally performed for the sale purposes. Cattle are not usually grazed in the pastures; house feeding is carried out since cheap and quality feed can be produced from sugar beet pulp which is commonly grown in the region.

Table 4.14.2.9. Livestock Information of Project-Affected Settlements

Settlement	Number of Sheep	Number of Cattle	TOTAL
Bucak Plateau	2000	750	2750
Mağrul Plateau	2200	130	2330
Tömü Plateau	600	50	650
Enver Kara Plateau	330	-	330
Cülcülü Plateau	700	-	700
Eminleryurdu Plateau	200	-	200
Bekmezci Plateau	350	-	350
Bezirci Village	800	200	1000
Sapmaz Village	150	50	200
Gazi Quarter *	2300	550	2850
Besci Village	1200	1000	2200
Büyükekşi Plateau	1000	150	1150
TOTAL	**11.830**	**2.880**	**14.710**

Source: Field Survey, 2016
**Including the livestock information of Taşoba Plateau*

Land Use

Most of the land affected by the multiple components of the Project is owned by individuals and mostly used for agricultural production. The affected lands are registered as arable land, pasture land, vineyard, trashing field, road, marshy land, fountain, garden, cemetery, raw earth, drilling area, pole location, grass land, grove or willow grove in the Cadastral records. As indicated in the figure below (Figure 4.14.2.1.), about 76% of the lands affected by the Project are arable lands, followed by pasture lands (14%) and vineyards (2%). Grain production is predominant in arable lands in the region. Wheat and barley are the mostly cultivated products in the region. Irrigated agriculture has been observed to increase along the pipeline route and within the license area; products such as corn, beet, and alfalfa are produced commonly in the irrigated lands. There are titles of affected agricultural lands, but informal uses are especially common on the pasture or public lands within license area for the purposes of building residential area or livelihood stocks. PAPs were identified who resides in rural settlements within the license area and do not have titles for the residential houses. Although the number of illegal users will be determined during RAP studies, it is

expected that land title ownership would be high on agriculture lands, but would be low on lands where PAPs have structures, based on observations obtained in baseline studies.

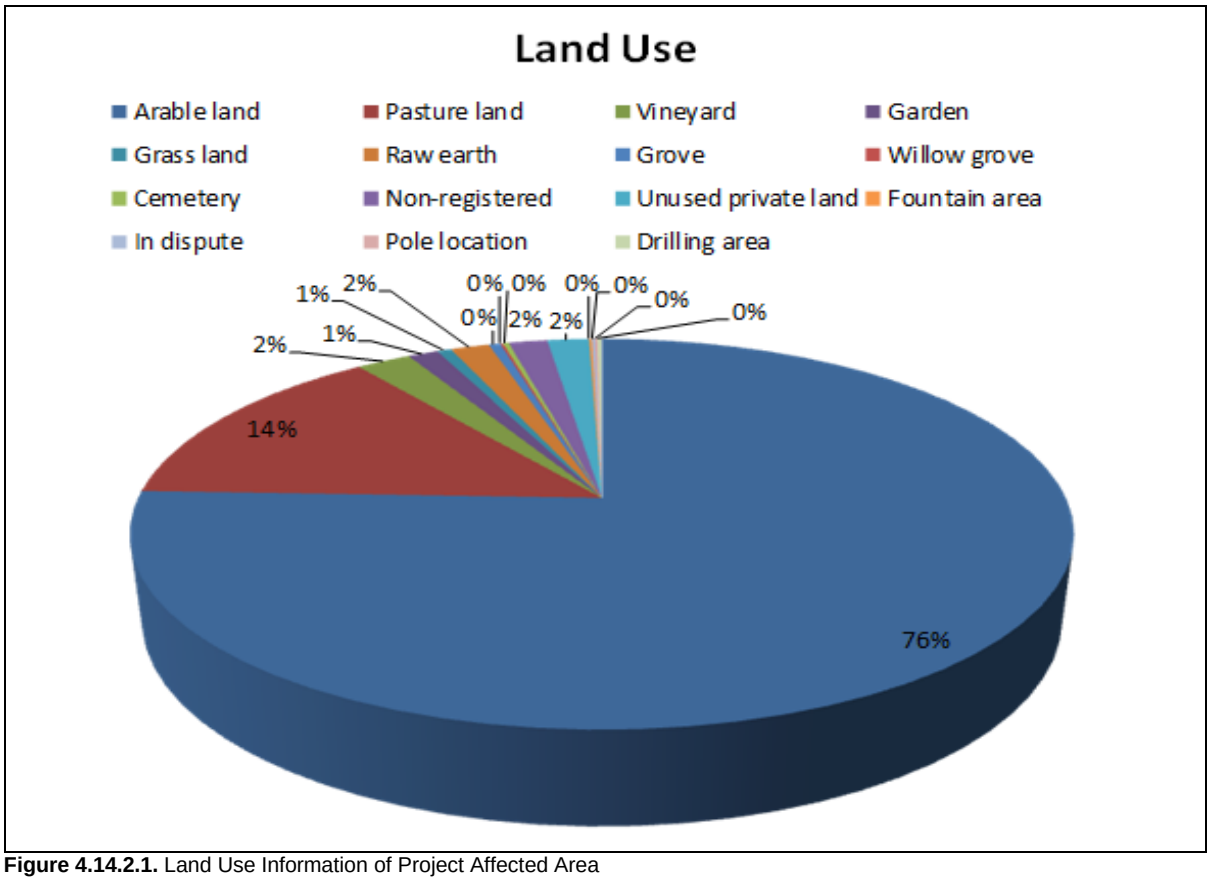


Figure 4.14.2.1. Land Use Information of Project Affected Area

Use of Pasture Land

14% of project-affected lands are pasture land which is used for grazing activities of local settlements. A total of 240 parcels which are registered as pasture land are affected by the multiple components of the Project (fresh water, brine water, gas pipeline, AGIs and well areas). 91% of affected pasture lands are located within the license area boundaries of Sultanhanı District and used for grazing activities by project-affected rural settlements where livestock is one of the main sources of income. Although the boundaries of pasture lands continue towards the outside of the license area, total area of pasture lands within the license are is 4350,2 ha. Some parts of pasture lands outside the license area are also used by project-affected settlements as alternative grazing areas. The pasture lands used for grazing activities of PAPs and located within or outside the license area are numbered in the following figure (Figure 4.14.2.2.).

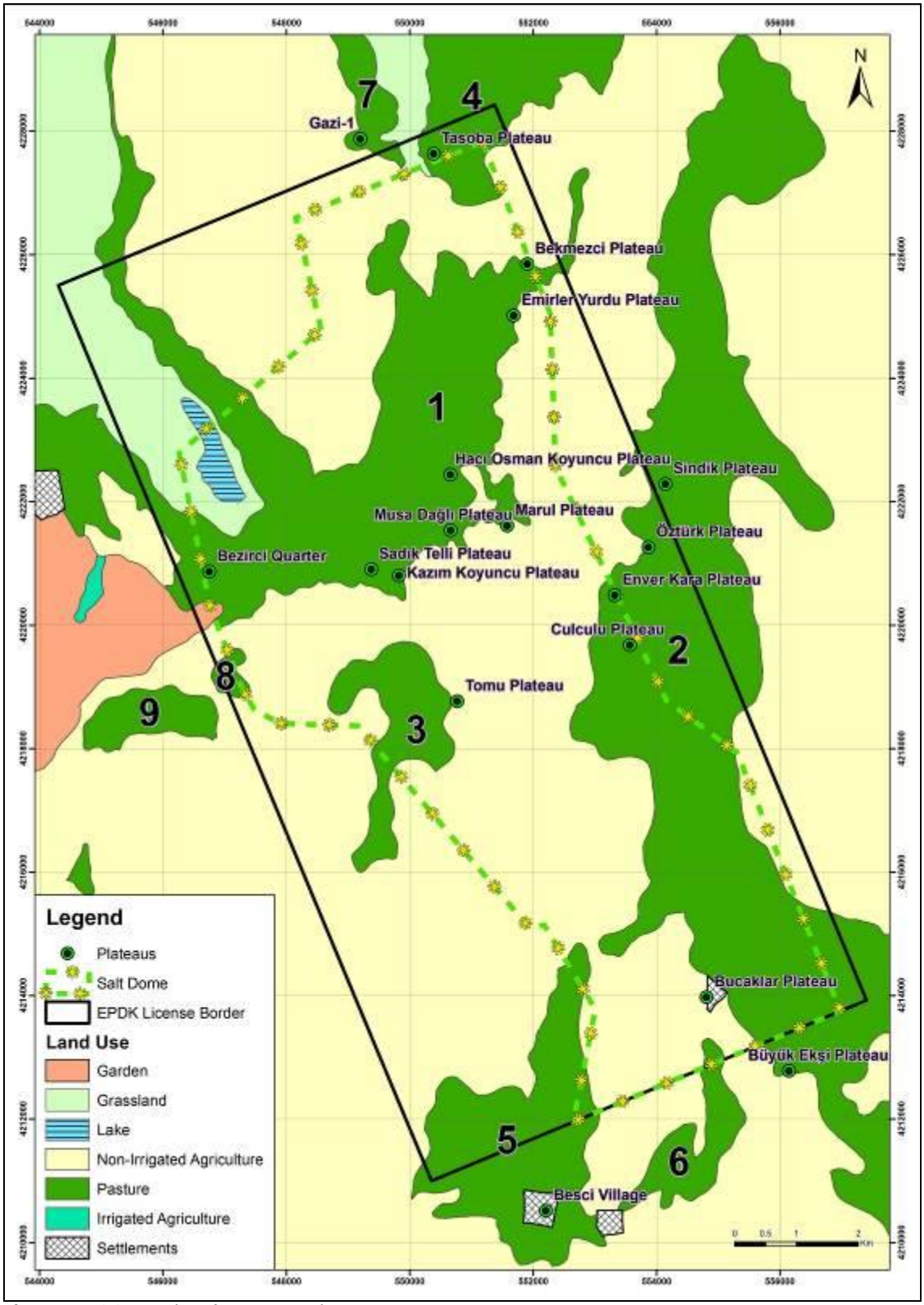


Figure 4.14.2.2. Location of Pasture Lands

The following table (Table 4.14.2.10.) shows the total area of affected pasture lands, number of animals grazed and the settlements using these pasture lands. Animals are generally grazed in pasture lands during spring and summer season, barn-feeding is performed during winter season. P-1 is the largest pasture land within the license area and used for grazing of total 7.380 animals. Some of the settlements (Gazi Quarter, Tömü Plateau and Bezirci village) using P-1 for grazing, have alternative pasture lands. P-4 and P-7 which has total of 2.623 ha area are also used for grazing activities of Gazi Quarter. Bezirci Village has also other pasture lands with total area of 181,9 ha (P-8 and P-9). Tömü Plateau has one alternative pasture land with area of 305 ha.

Second largest pasture land is P-2 and used for grazing of 5.140 animals. Most of the settlements using P-2 for grazing have no alternative pasture lands except Büyükekşi and Öztürk Plateaus (both are not directly affected by the Project). –Büyükekşi and Öztürk plateaus are using both P-2 and P-6 (outside the license borders) pasture lands.

The size of pasture land that may become inaccessible due to project is equal to the total size of 48 wells (assuming that 48 wells are located on the pasture lands) which corresponds to 48 ha (100x100 mt area for each well) while the total area of pasture lands within the license are is 4350,2 ha. It is also shown in above paragraphs that the settlements affected by the project usually have alternative and sufficient pasture lands. The settlements that use a single pasture land for grazing activities are Mağrul, Bekmezci, Eminleryurdu, Cülcülü, Bucak and Enver Kara Plateaus.

Table 4.14.2.10. Use of Pasture Lands

Pasture Land	Total Area of Pasture Land (Ha)	Pasture Area Remaining Within the Boundaries of License Area (Ha)	Settlements Using the Pasture	Number of Sheep Grazed in the Pasture	Number of Cattle Grazed in the Pasture	Total Number of Animals Grazed in the Pasture
P-1	2,191.1	1,817.8	Gazi Quarter, Mağrul (Hacı Osman Koyuncu, Musa Dağlı, Kazım Koyuncu, Sadık telli) Plateau, Tömü Plateau, Bezirci Village, Bekmezci and Eminler yurdu Plateau	6,450	930	**7,380**
P-2	5,310.6	1,642.4	Bucak, Cülcülü, Enver Kara, Öztürk and Büyükekşi Plateau	4,230	910	**5,140**
P-3	305	305	Tömü Plateau	600	50	**650**
P-4	2,470.5	142.6	Gazi Quarter	2,300	550	**2,850**
P-5	749	398.5	Besci Village	1,200	1,000	**2,200**
P-6	188.8	10.8	Besci Village, Büyükekşi Plateau	2,200	1,150	**3,350**
P-7	152.8	7.8	Gazi Quarter	2,300	550	**2,850**
P-8	31.2	25.2	Bezirci Village	800	200	**1,000**
P-9	150.7	-	Bezirci Village	800	200	**1,000**

Every pasture land has a certain grazing capacity. The number of animals that can be grazed for long years without harming the pasture is called "grazing capacity".

Some factors affect the grazing capacity of a pasture land. These are;

- The structure and mixture of the plants that form the pasture land,
- The frequency of plant cover,
- Precipitation,
- The type of grazing animal,
- Grazing time,
- Maintenance and fertilization.

Grazing capacity can also be calculated over the grass yield of the pasture. For example, if we consider the P-1; the daily feed need of 6450 sheep is about 32,250 kg (assuming that each sheep is 50 kg and daily feed need (10%) is 5 kg). Besides that, the average weight of cattle varies between 250 and 800 kg in Turkey. Cattle usually graze about 7 hours in a day and they can consume 70 kg of pasture grass during this time[3]. The daily feed need of 930 cattle grazing in P-1 is about 46,500 kg (assuming that each cattle is 500 kg and daily feed need (10%) is 50 kg). Dry grass yields of pastures in different ecological regions of Turkey range from 45-100 kg[4]. Assuming the pasture grass yield is at least 45 kg at 0,01 ha[5], the total grass yield of an area of 1817.1 hectares (P-1) is calculated as 8,176,950 kg in the worst case which is more than enough to cover the calculated need of 6450 sheep and 930 cattle. Even if all of the 48 wells are located on pasture land P-1; the grass yield of the remaining 1769.1 ha area is calculated as 7,960,950 which is still more than enough to feed the current size of livestock. Besides, as mentioned in the above paragraphs, P-1 is not used consistently by the affected settlements since they have alternative pasture lands too. The calculation is similar for other pasture lands too, for example, the total grass yield of P-2 is 7,390,800 kg and the daily feed need of 4230 sheep and 910 cattle is only about 66,650 kg. In general, grazing capacity of all pasture lands (considering that other parts outside the licensed area is also used for grazing) already meet the current livestock needs. It is clear that even in the worst case scenario, the remaining accessible pasture land is more than enough to meet the feed need of grazing livestock.

4.14.3. Infrastructure Facilities

Information about the road conditions, drinking water sources and quality, availability of sewage system, methods of waste disposal, availability and continuity persistence of electricity supply, availability of telephone landline, energy sources for heating, cooking and water heating, access to mobile phone network and internet in the project-affected settlements are given in Table 4.14.3.1.

[3] "Pasture Feed", Giresun Governorship, Provincial Directorate of Food, Agriculture and Animal Husbandry, 2014
[4] Altın, M., Gokkus, A. and Koc, A. 2011. "Grazing Capacity, Meadow and Pasture Management" General Directorate of Agricultural Production and Development, T.C. Ministry of Agriculture and Rural Affairs.
[5] http://www.bingol.edu.tr/documents/Tarla%20Bitkileri.pdf, 01.12.2017

All project-affected settlements have water supply network and quality of water was stated to be good in 75% of surveyed settlements. 91% of surveyed settlements have no sewerage system and cesspools are used instead. Incineration method is commonly used (58%) as a method of waste disposal in the settlements where wastes are not collected by Municipality. All project-affected settlements have available and continuous electricity infrastructure and telephone landline. However, 75% of surveyed settlements have no access to mobile phone network and internet. Different heating sources are used by affected settlements like wood, coal, dried dung or solar energy.

Table 4.14.3.1. Infrastructure Information of the Settlement Areas

Village	Road Condition	Drinking Water Source	Quality of Drinking Water	Availability of sewage system	Methods of waste disposal
Bucak Plateau	Stabilized	Municipality Network	Bad	Cesspool	Collected by the municipality or incinerated
Mağrul Plateau	Stabilized	Municipality Network	Good	Cesspool	Incineration
Tömü Plateau	Stabilized	Municipality Network	Good	Cesspool	Incineration
Enver Kara Plateau	Asphalt	Municipality Network	Bad	Cesspool	Incineration
Cülcülü Plateau	Unpaved	Municipality Network	Good	Cesspool	Incineration
Eminleryurdu Plateau	Asphalt	Municipality Network	Good	Cesspool	Incineration
Bekmezci Plateau	Unpaved	Municipality Network	Good	Cesspool	Incineration
Bezirci Village	Stabilized Low quality asphalt	Municipality Network	Good	Cesspool	Collected by the municipality
Sapmaz Village	Asphalt	Municipality Network	Good	Sewerage system	Collected by the municipality
Gazi Quarter	Stabilized Low quality asphalt	Municipality Network	Good	Cesspool	Collected by the municipality
Besci Quarter	Keystone- low quality asphalt	Municipality Network	Good	Cesspool	Collected by the municipality
Büyükekşi Plateau	Keystone- low quality asphalt	Municipality Network	Bad	Cesspool	Incineration

Village	Availability and continuity persistence of electricity supply	Availability of telephone landline	Energy sources for heating, cooking and water heating	Access to mobile phone network and internet
Bucak Plateau	✓	✓	Wood / coal / solar energy	**x**
Mağrul Plateau	✓	✓	Wood / coal / solar energy	**x**
Tömü Plateau	✓	✓	Wood / coal / solar energy	**x**
Enver Kara Plateau	✓	✓	Wood / coal / solar energy	**x**
Cülcülü Plateau	✓	✓	Wood / coal / solar energy	**x**
Eminleryurdu Plateau	✓	✓	Wood / coal / solar energy	**x**
Bekmezci Plateau	✓	✓	Wood / coal / solar energy	**x**
Bezirci Village	✓	✓	Wood / coal / solar energy	✓
Sapmaz Village	✓	✓	Wood / coal / solar energy	✓
Gazi Quarter	✓	✓	Wood / coal / solar energy	✓
Besci Quarter	✓	✓	Wood / coal / solar energy	**x**
Büyükekşi Plateau	✓	✓	Wood / coal / solar energy	**x**

Source: Field Survey, 2016

4.14.4. Vulnerable Groups

Vulnerable groups have been identified and assessed through consultation with key stakeholders in the study area and the definition is informed by an understanding of the study area. Vulnerable groups are defined as:

- ✓ Women, in particular female-headed households;
- ✓ Informal users;
- ✓ Elderly;
- ✓ People with disabilities
- ✓ Seasonal workers
- ✓ PAPs whose land will be expropriated for the second time

Women: Women are considered vulnerable for several reasons. Women have less and sometimes no formal education in the study area. Women are not empowered to make significant decisions in their households, as men and the elderly are the main decision makers in the home. Women typically enter into marriages arranged by their families; however their consent is received prior to formalizing the arrangement. The women are often financially dependent on the men in the household and it is only the relative independence of involvement in animal husbandry and some other basic subsistence economic activity that provides women a stake in the economic power relations within the community.

Elderly: The minimum age defined for being an elder is accepted as the retirement age in Turkey, which are 65. Elderly people are considered as vulnerable since they are more likely to leave farming and livestock if they are economically or physically displaced.

People with disabilities: People with disabilities may come across in the area of influence and they may be more likely to have difficulties in access to information, raising their grievances or concerns, finding other jobs to sustain their livelihoods etc.

Informal users: PAPs were identified who do not have title deeds of their houses and other livelihood related structures in the well area where potential physical displacement impacts will take place. These PAPs are not entitled to resettlement within the context of national law and therefore are very likely to be affected adversely by the Project.

Seasonal workers: The settlements located in the study area receive seasonal workers predominantly from the southern side of Turkey or Syria for harvesting or other agricultural work. The majority of the seasonal workers come from Hatay, Kilis, Şanlıurfa provinces of Turkey or from Syria to work between July and September, and the majority of these workers are Syrian immigrants. They are working in agriculture (mostly in beet hoeing) as uninsured and low-paid. The seasonal workers coming to the region usually stay in their own tents and do not pay for their accommodation. Seasonal workers on agricultural lands may be in-directly affected in terms of livelihood loss by the Project land acquisition and other construction activities. The abandonment of agricultural activities on permanently expropriated lands may indirectly lead to job loss for seasonal workers. However, the region-wide of Konya-Aksaray receive many seasonal workers, so they have mobility to other

agricultural areas in the region. While the impact on seasonal workers is expected to be negligible, the presence of this group will be considered again during RAP baseline studies

PAPs whose land will be expropriated for the second time: Although the parcels to be affected by project components are known, it is not yet defined how much of these parcels will be expropriated. Therefore the persons whose land have been expropriated within the scope of the UGS Project, and will be expropriated for the second time in the Expansion project could not been identified. However, those PAPs whose land will be expropriated for the second time, if any, are considered as vulnerable since the residual lands may not be economically viable anymore.

Identification of vulnerable people: The quantitative settlement level surveys have been used to identify vulnerable groups who may face with additional difficulties by the Project. No statistical data was available for the number of vulnerable groups living in the social study area; however the categories were discussed with Muhtars during settlement surveys.

Vulnerable groups will be identified in detail during the RAP preparation study of the census of persons and inventory of assets affected by the Project. The entitlement cut-off date will be established to a time when the census of persons and their property in the area is carried out. After the cut-off date, any affected person will not be considered and will not be eligible for compensation or resettlement assistance. Before the census, BOTAŞ will publish information about the cut-off date in local newspapers, informing all owners and users of the initiation of the expropriation process. The cut-off date will also be publicly disclosed on notice boards in local communities and relevant municipalities and at consultation meetings, with an accompanying explanation. The public announcement will also be posted, as necessary, on frequently visited locations throughout the affected areas. During the consultations with landowners, the presence of illegal or legal users, tenants, seasonal workers or any structure/shelter will be questioned. Questiones such as how many landowners are there on the subject land, who uses the land, who owns the structure, etc. if so, whether it is informal use or not will be asked. Elderly, women and PAPs whose land will be expropriated for the second time will also be identified during the negotiations with landowners.

5. POTENTIAL IMPACTS OF THE PROJECT AND THE MEASURES TO BE TAKEN

Impact area has been defined in EIA studies in scope of the Turkish Regulations and EIA and ESIA studies have been performed as to the requirements of the national and international standards such as IFC, European Council Directives, World Bank Policies, etc. on around of the pipelines, pump and water storage stations, facilities, drilling sites, camp sites, access roads and planned energy transmission lines those are in licensed 250m widened areas from the pipeline axes and facility borders in parallel of the Underground Gas Storage Project that will uses the same areas.

It is experienced that, during the expansion project, same impacts as to the Underground Gas Storage Project will be occurred mostly for;

- Linear impacts on the pipelines, access roads and energy transmission lines, etc.
- Areal impacts at the facilities, drilling sites, pump and water storage stations, camps sites, etc.

Environmental impacts will be occurred at the project areas during the Gas Storage Expansion Project works given below with the reasons.

- **Environmental Impacts on the Linear Project Activities**

Lineal impacts occur along the pipelines, access roads and energy transmission lines and will decrease after the completion of the linear works at the mentioned areas except the access roads. Environmental impacts will be continuously ongoing at the access roads and measures will be taken as to the requirements that given in this section. Lineal impacts can be categorized according to the affecting type as below;

- Air emissions, dust emissions, exhaust emissions,
    - Probable air pollution risks such as dust, exhaust, etc. occurred due the vehicle and work machine movements during the pipeline works.
- Wastes, hazardous wastes,
    - Improper waste/hazardous waste discharges into the agricultural lands, pasturelands, water lands, field and access roads, etc.
- Waste waters, progress waters, washing waters, oily waters,
    - Improper waste water, hydro-test water discharges, oily water discharges,
- Waters, potable waters, ground waters, surface waters,
    - Impacts to ground waters, surface waters, potable water systems of the settlements,
- Fuel, oil and chemical pollutions
    - Improper fuel, oil and chemical discharges, spillages, leakages, environmental incidents, etc.

- Brine discharges,
    - Uncontrolled and improper brine discharges, spillages and leakages into the unpermitted areas along the brine discharge line,
- Soil pollution, improper soil management,
    - Impacts on soil ground, pollution of the soil structure around of the project areas and topographical distortion,
- Ecological damages at the habitat areas;
    - Impacts to floristic areas, fauna individuals, agricultural products, pasturages, forestry areas, aquatic ecosystem.

In the scope of the Gas Storage Expansion Project linear impacts are given in Figure 5.1. and Figure 5.2. below.

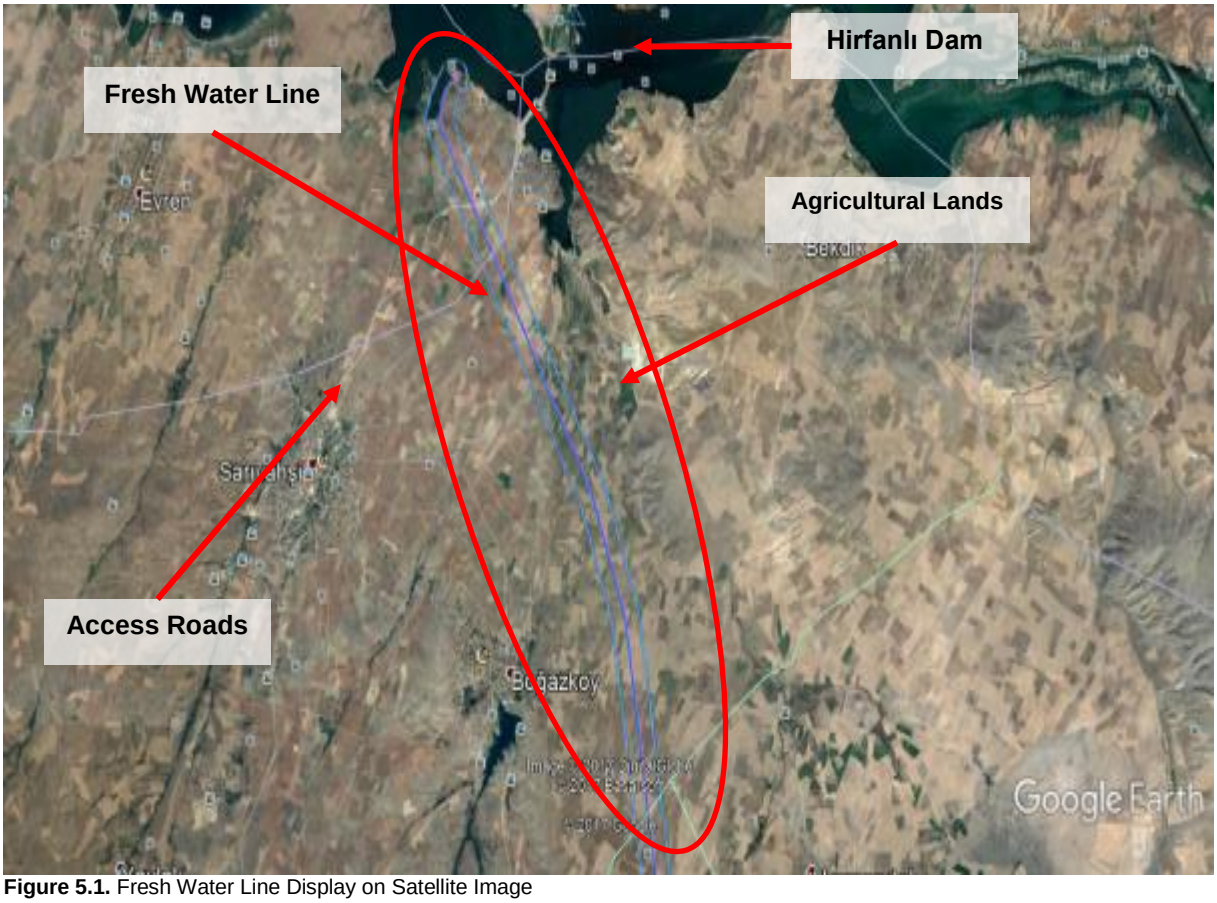


Figure 5.1. Fresh Water Line Display on Satellite Image

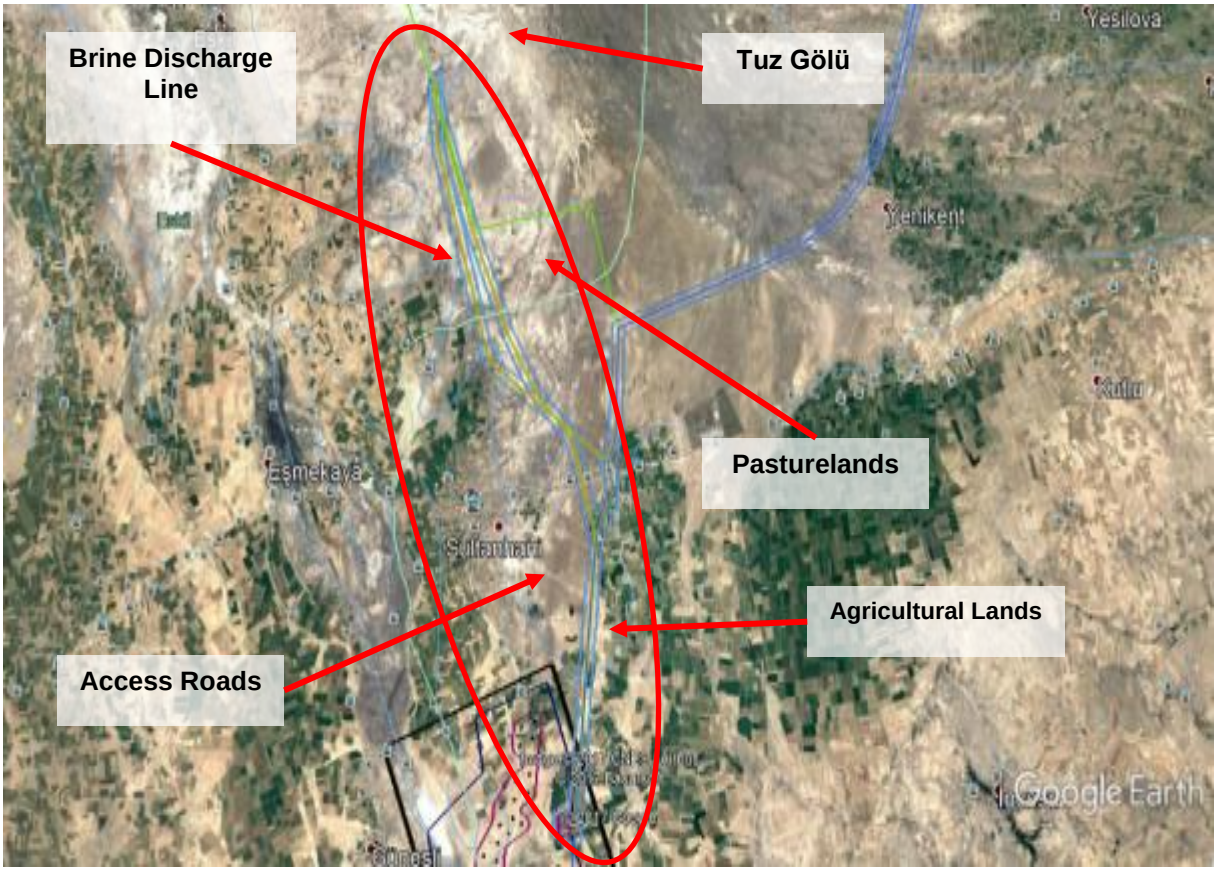


Figure 5.2. Brine Discharge Line Display on Satellite Image

- **<u>Environmental Impacts at the Areal Project Activities;</u>**

Areal impacts continuously ongoing during the construction works of surface facilities, drilling sites, camp sites, etc. unlike the other impacts (Figure 5.3.). Construction, mechanic, piping, drilling, leaching and camp management activities will continue until to the operation phase and measures will be taken as to the requirements that given in this section. Areal impacts can be categorized according to the affecting type as below;

- Air emissions, dust emissions, exhaust emissions,
    - Probable air pollution risk such as dust, exhaust, flue gases, etc. occurred during the excavation and construction works and also operation phase.
- Wastes, hazardous wastes,
    - Improper waste/hazardous waste discharges into the agricultural lands, pasturelands, receiving environments etc.
- Waste waters, progress waters, washing waters, oily waters, insoluble effluents,

- Improper waste water, hydro-test waters, oily washing waters and the other effluent discharges into the agricultural lands, pasturelands, receiving environments etc.

- Waters, potable waters, ground waters, surface waters,
  - Impacts to ground waters, surface waters, potable water systems of the settlements,
- Fuel, oil and chemical pollutions
  - Improper fuel, oil and chemical discharges, spillages, leakages on around of the project areas, environmental incidents, etc.
- Soil pollution, improper soil management,
  - Impact tosoil ground, lack of top/sub soil management, damages on topographic shapes, improper construction material usages, etc.
- Ecological damages at the habitat areas;
  - Impact to flora habitats, fauna individuals, agricultural products, pasturages.

Project will cause to the environmental impacts along the pipelines, access roads, energy transmission lines, on around of the main facilities, drilling sites and camp sites. Affected areas will be protected with the explained methods and protection level of these areas will be continuously monitored and inspected by BOTAŞ, Consultant(s) and the Contractor(s). Affected areas can be categorized as below;

- Agricultural lands,
- Pasturelands,
- Water bodies,
- Rivers,
- Natural drainages,
- Natural Habitats,
- Special protection areas,
- Cultural and Historic Areas.

Areas on around of the Gas Storage Expansion Project will be affected locally during the project works mainly the installation of;

- Fresh water line that will be installed from Hirfanlı Dam to the surface facilities,
- Brine discharge line that will be installed from the surface facilities to Tuz Gölü.
- Natural gas branchman line that will be installed from the surface facilities to main gas pipeline of Kayseri – Konya.

And construction of;

- Surface facilities,
- Pump stations and water storage tanks,
- Drilling sites,
- Camp sites,

And operation of;

- Drilling and leaching activities at UGS sites.

Agricultural and pasturage activities will be performed by the farmers and villagers while the construction works of the pipelines are ongoing. During the installation of the pipelines, environmental impacts will be increased at these areas with air, water and soil pollutants sourced from truck and vehicle movements and human activities.

Pipeline works will be performed near the great water body which is Hirfanlı Dam and also seasonal rivers, irrigation channels and also natural drainages at the Gas Storage Expansion Project. Most environmental impact to these water bodies and rivers can be defined as high sedimentation problem, affecting of flora and fauna individuals and improper waste and wastewater discharges. Measures to be taken by BOTAŞ and the contractor(s) against to the probable pollution risks in the aquatic areas have been detailed in following sections.

Gas Storage Expansion Project will affect the habitats, special protection areas and cultural/historical areas until to the end of the project. Violence of the affect may be caused to the permanent damages in these areas and probable impacts will be decreased with the mitigation/control measures given in following sections.

Moreover, after the reinstatement activities of the pipeline routes at the Gas Storage Expansion Project, impacts will be monitored by BOTAŞ and solutions will be established for the probable residual impacts. BOTAŞ and the contractor(s) will prepare the assessment reports about pipeline reinstatement conditions and monitoring results for residual impacts after the completion of the pipelines in scope of the construction phase of the Gas Storage Expansion Project.

Construction activities of the Gas Storage Expansion Project will be realized in the borders of the licensed area mostly and probable impacts will be occurred at the impact areas of the project same with the pipelines installation works. All lineal and areal environmental impacts have been detailed and mitigation/control measures to be taken for pollutants during the pipeline installations have been given in following sections below.

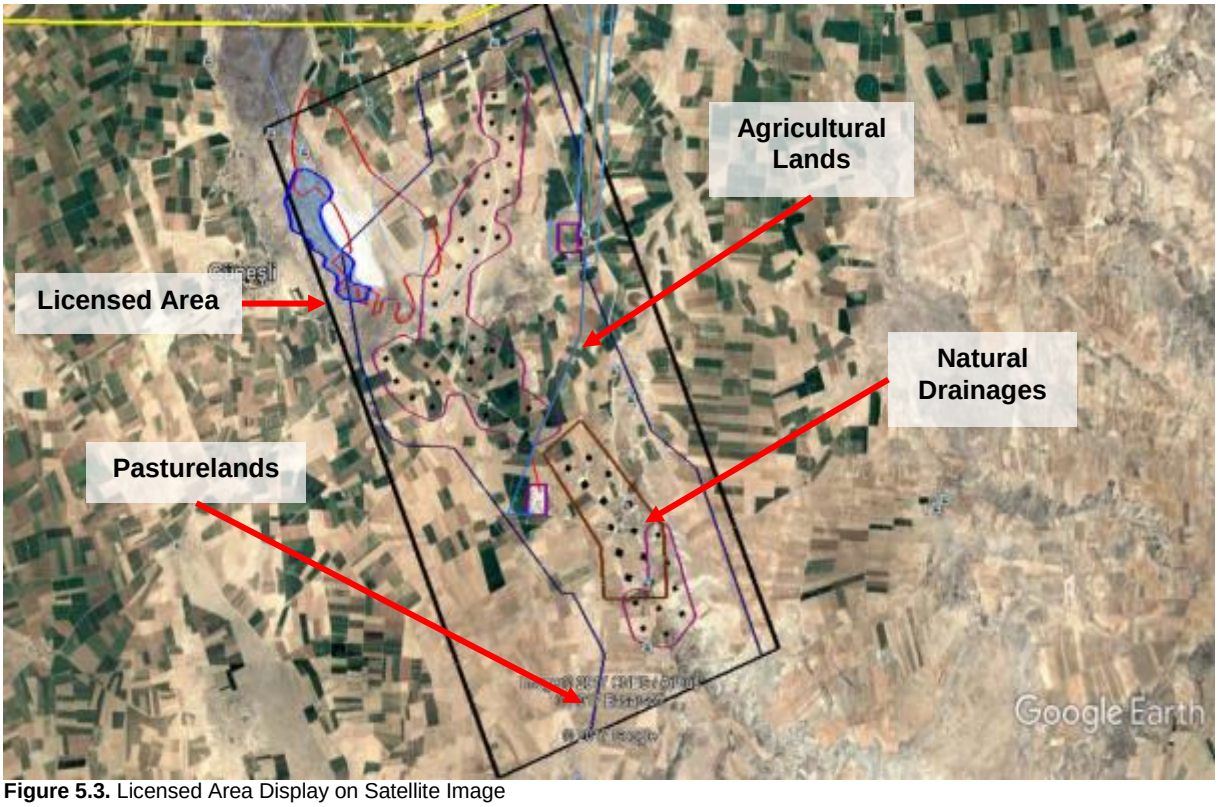


Figure 5.3. Licensed Area Display on Satellite Image

According to all defined impacts; mitigation measures and monitoring plan have been prepared in tabular form to prevention of the lineal and areal impacts of the project. Prepared tables included the project phase, impact definition, mitigation measure and responsibility titles. Impacts have been explained according to the realized project phase and mitigation measures given to prevention of the affected areas. During the Gas Storage Expansion Project, most responsibility will be for the project owner BOTAŞ and all measures to be taken by the contractor(s) will be strictly followed by BOTAŞ. Responsibility to the environmental requirements will be shared with the contractor(s) by BOTAŞ in prepared specifications.

Monitoring plan given in following sections will be detailed in prepared management plan and procedures by the responsible parties and implemented for all project areas. BOTAŞ, Consultant(s) and the Contractor(s) will have the monitoring teams in different professional disciplines according to the monitoring issues and monitoring reports will be shared with BOTAŞ Project Management after the monitoring activities at all project areas in daily, weekly, monthly basis and also quarterly if required. Report titles, observation subjects and reporting periods will be clearly determined and reports will include the required data in scope of EIA and ESIA studies. Monitoring plan will be an indispensable requirement for implementation of the project activities and mitigation measures to be used during the Gas Storage Expansion Project.

Environmental management plan and procedures will be prepared by the contractor(s) according to the plans outlined in appendices of ESIA Report and submitted to BOTAŞ at the pre-construction phase. Planned project works will be started after the final revisions of the prepared plans and procedures apply for construction. The contractor(s) will take necessary actions according to their plan and procedures and they will be responsible to realizing of all commitment. As a result of definition of the probable impacts, measures to be taken and monitoring of all issues will be conducted according to the commitment of the environmental management plan and procedures in scope of EIA and ESIA Reports.

The environmental and social impacts during the Gas Storage Expansion Project works will be reviewed in five stages as given below:

- Pre-construction Phase,
- Construction Phase,
- Drilling and Leaching Phase.
- Operation phase,
- Decommissioning phase.

5.1. Pre-Construction Phase

Preparation works will be performed at this phase before the start of the Gas Storage Expansion Project in parallel with the feasibility studies at the project areas. Pipeline routes, pump and storage tank stations, main and auxiliary units, drilling areas, new energy transmission routes and access roads will be determined at the project sites in parallel with the office works of the project. Temporary camp sites can be established during the preparation works and the project's start-up works such as equipment transportation and storages, infrastructure and superstructure works, route marking works, fuel and oil station works, top soil stripping works, etc. can be started in part. As a result of those activities, some environmental impacts are envisaged to occur at the beginning of the preparation works as listed below:

- Dust emission arising from vehicles movements,
- Organic, recyclable and possible hazardous waste generation,
- Wastewater accumulation in sewage tanks,
- Noise impacts,

The listed environmental impacts will be minimized together with the measures taken at the project sites. Vehicle movements will be minimized if not necessary, the current energy transmission lines and access roads will be used, organic and recyclable wastes will be transported to the waste collection points of the municipalities, wastewaters will be taken by the municipality's septic trucks and potential noise pollution will be prevented at the project sites.

Land acquisition and census surveys will be carried out during the pre-construction period and consultation meetings will be held to inform the public about land acquisition and the RAP process simultaneously. The local people will probably want to be informed about the areas to be expropriated for Project components and organize their livelihood activities accordingly. It is very important to answer the questions of PAPs clearly in order to prevent irreversible losses and reduce uneasiness of PAPs. During pre-construction phase, there will be adequate consultation and involvement of the local communities and PAPs. Specifically, PAPs will be informed about project activities and facilities. Public consultations will provide information to affected persons' about their options and rights pertaining to resettlement and compensation; process of and proposed dates for resettlement and compensation; effective compensation rates at full replacement cost for loss of assets and services; and proposed measures and costs to maintain or improve their living standards. Along with the consultations, as mentioned in RPF, a Guide to Land Acquisition and Resettlement will be prepared by BOTAŞ and distributed to PAPs during the initial consultations to inform public on the Project's land requirements, entitlements and GRM. There may be social requests made by the public at the project areas, such as information requests on the project, employment opportunities, field rental necessities, procurement of material, etc. during the preparation works. The stated social issues will be managed by the social team of BOTAŞ, Consultant and Contractor through various means as explained in detail in the SEP.

In addition, all contracts will be made between BOTAŞ, the contractors and licensed companies on consulting and monitoring activities, waste/wastewater disposal, air/noise measurements, fuel/oil supply, etc. and these will be completed.

5.2. Construction Phase

The principal environmental and social impacts will be expected to occur once the entire pipeline and construction works are carried out by the contractors at this phase of the project. Excavation and installation of the pipelines, preparation works of the project areas, the establishment of the camp sites, installation of the energy transmission lines and main access road establishment will be performed at this section of the project. Negative environmental and social impacts should be minimized and the positive impacts of these should be improved at this phase of the project. Therefore, the main environmental works and social studies will be carried out by BOTAŞ, the contractors and subcontractors.

Excavation operations, excavated material transportations, vehicle movements and the other construction works will cause probable dust emission on the pipelines, construction areas and transportation routes of the project, similar to the Underground Gas Storage Project. In such a case, the access roads on the pipeline routes, construction areas and stabilized sections of the transport routes will be regularly watered by the sprinkler trucks to fight heavy dust pollution. However; the contractor must be taken measures below against the dust deposition problem in the agricultural lands in the vicinity of the pipeline routes and construction areas:

- Excavated material will be protected from wind and rain (e.g. using nylon covers and compaction with binding materials),
- All transportation vehicles that will carry excavation material will be covered,
- The speed of the vehicles will be restricted with 30 km/hour on unpaved roads.
- Any exposed dust prone areas (e.g. roads) will be regularly watered by the sprinkler trucks particularly during hot, dry, windy weather conditions.

In addition, dust, flue gas and exhaust emissions will be regularly checked via the air quality measurements by the licensed companies.

Environmental noise levels during the pipeline installation and construction activities will be checked with the periodical noise measurements around the project works. Noise shields and isolators will be used by the contractors for heavy tonnage work machinery, generators and the other noisy equipment against noise pollution.

The waste produced during pipeline and construction works will be accumulated temporarily in portable waste containers along the pipeline routes and construction areas. A Central Waste Accumulation Area (CWAA) will be established in the surface facilities for the temporary accumulation of the separated wastes (recyclable wastes, inert wastes, hazardous wastes, etc.) up to the disposal time during this phase of the project. Waste will be accumulated in the waste containers at the working areas and transported to the CWAA on a daily basis. The CWAA will include recyclable waste rooms, inert waste area, hazardous waste room and environmental and safety materials such as O/W separators, spill kits, fire extinguishers, etc., similar to the Underground Gas Storage Project. The waste amount register will be updated daily by the contractor.

- Organic wastes will be carried to the waste collection point or transfer stations of the municipalities or determined waste points at the project's construction areas on a daily basis.
- Recyclable and non-hazardous wastes will be sent to the contracted and licensed companies,
- Inert wastes will be sent to the permitted disposal facilities,
- Hazardous wastes, waste oils, waste vegetable oils and medical wastes will be disposed by the contracted and licensed disposal companies.
- Excess excavation soil piles will be transported to the permitted dump sites.
- The other wastes such as waste batteries, accumulators, electronic wastes and inert tires will be disposed of according to the relevant regulations

For the domestic wastewater to be generated at the facility; the wastewater treatment plant based on the biological treatment system to be used in the operation phase will be used, the wastewater will be discharged into the recipient ambiences, such as seasonal creeks and natural drainages to be identified pursuant to discharge permissions to be obtained in the

event that effluent qualities are in conformity after the wastewater is treated. Within the context of discharging the wastewater into the recipient ambiences, as a result of treating the domestic wastewater in the package treatment plant, the 4th Regional Directorate of DSI (State Water Works) will be consulted. Moreover, the treated water will be potentially used for the irrigation of landscapes pursuant to agricultural irrigation permissions.

Portable toilets will be used for the hygienic needs of the workers during the pipeline works and the wastewaters which occur will be disposed of by the municipality's septic trucks.

The washing waters to emerge in the scope of the Gas Storage Expansion Project shall consist of washing and cleaning works in the camp sites, workshops and other working areas together with the concrete washing area on the concrete batching plants and truck mixer and concrete washing waters on the project sites. The washing and cleaning waters on the camping, workshops and working areas shall be connected to oily water collection system or direct infrastructure system which will be set up in parallel to the main infrastructure with specially designed closed systems.

The oily waters to be collected in appropriate areas in these parts shall be passed through the oil traps which will be established separately or commonly and will be taken to a common domestic wastewater treatment facility pursuant to a quality assessment to be made with laboratory analysis, in case it is deemed necessary.

Along with the project construction activities and operation periods, the rain waters falling into project sites and being drained shall be moved away from the construction area with rain water collection channels to be established on and around the construction area. They will be discharged from the balancing and settling pools to natural drainages to be set up at the end of collection and accumulation channels for preventing possible sediment carriage from the construction areas to the areas surrounding the project areas.

The environmental impacts of these waste and effluents and the measures taken to decrease the negative impacts of these have been explained in this stage, below.

During the construction phase of the Project, potential land based impacts will be as follows;

- Temporary loss of land for agricultural cultivation
- Damages to crops in plots neighboring the pipeline construction corridor due to, for example, spillover of earth or intrusion of equipment
- Temporary disruption to grazing activities and/or reduced access to agricultural land and pastures
- Interruption of irrigation or drainage affecting crops in uncompensated plots
- Severance of access to cultivated plots during construction, impeding farmers' access to a plot and resulting in total or partial loss of crop
- Accidents to livestock as a result of Project activities resulting in livelihood loss.
- Physical displacement of house; movement of livestock pen(s):
- Loss of standing crops and trees
- Loss of grazing and pasture lands

Other social impacts which are expected to occur during the construction phase and measures to mitigate the adverse impacts on affected land and livelihoods are detailed in Section 5.6.7.

The social impacts will be regularly monitored by BOTAŞ. A mechanism for the provision of information, requests and complaints will be improved through the setting up of a grievance mechanism (as detailed in Section 7.4)). In addition, the employment needs of the project for non-technical personnel will be fully met from the public settlements in the vicinity of the project areas.

5.3. Drilling and Leaching Phase

At this stage; all environmental and social impacts and solution methods for these will be same as the construction phase of the project, except the generation of some special wastes such as drilling mud and formation wastes as a result of the drilling and leaching operations and probable impacts at Hirfanlı Dam and Tuz Gölü due to the fresh water intake and brine discharge activities explained in section 6.6.5. In addition, it has been experienced during the monitoring activities of the Underground Gas Storage Project that effluents which consist of mud water, insoluble effluents, brine (salt water) and insoluble sludge of brines etc., will be generated during this phase. The environmental impacts of these types of special wastes and effluents, as well as the measures to be taken to decrease the negative impacts at this stage have been explained below. Portable toilets will be used for the hygienic needs of the workers during the drilling and leaching works and the wastewaters which have been generated will be disposed of by the municipality's septic trucks.

5.4. Operation Phase

The possible dust emissions occurring at the operation phase will arise from vehicle movements in small amounts on the permanent access roads of the project and these routes will be regularly watered by sprinkler trucks to fight against possible dust pollution. In additional, dust, flue gas and exhaust emissions will be regularly checked via air quality measurements by the licensed companies.

Probable high environmental noise problems occurring during the operation phase will arise from the gas circling equipment such as compressors, generators, etc. and checked the periodically with noise measurements in the vicinity of the facilities. Noise shields and isolators will be used by BOTAŞ if needed, to fight against noise pollution.

The waste produced during the operation phase will be temporarily accumulated in the portable waste containers at the facility and;

- Organic wastes will be carried to the waste collection point of the municipalities on a daily basis.
- Recyclable and non-hazardous wastes will be sent to the contracted and licensed companies,

- Hazardous wastes, waste oils, waste vegetable oils and medical wastes will be disposed of by the contracted and licensed disposal companies.
- The other wastes such as waste batteries, accumulators, electronic wastes and inert tires will be disposed of according to the relevant regulations.

For the domestic wastewaters to be generated at the facility during the operation phase, the wastewater treatment plant based on a biological treatment system will be installed.

Along with the project construction activities and operation periods, the rain waters falling into project sites and being drained shall be moved away from the construction area with rain water collection channels to be established on and around the construction area. They will be discharged from the balancing and settling pools to natural drainages to be set up at the end of collection and accumulation channels for preventing possible sediment carriage from the construction areas to the surrounding areas of the project.

While many social impacts are expected to occur during the construction phase, most of the impacts will not be proceeding in operation phase such as damages to crops and lands, temporary disruption of grazing activities or reduced access to agricultural lands and pastures, disruption of irrigation/drainage infrastructure etc. Even so, there may be residual impacts such as livelihood income losses and loss of agricultural productivity on affected lands. Impacts related to labor influx and community health and safety is also expected to proceed during operation. The social impacts will be regularly monitored and a full-time social team will be assigned by BOTAŞ during the operation phase.

5.5. Decommissioning Phase

In the scope of the Gas Storage Expansion Project; it will be ensured that the equipment are maintained regularly and that the equipment which has reached the end of their service lives are renewed and re-operated in order to ensure usability of the project throughout its economic life. Depending on the current conditions at the end of the license period, the project can be reused for storage purpose with revisions that can be made to the facility.

When the project site and facilities are planned to be reused for similar purposes, it will be appropriate to carry out environmental impact assessment studies again in order to examine the impacts of the Project on the ecosystem during 30 years of operation, reveal its difference from recent conditions and establish new measures.

If the facility is completely shut down and is not used for any other purposes, the units will be disassembled and the opened wells will be closed before land reclamation. In this context, all surface facilities will be disassembled and the caverns where all of the stored gas inside has been withdrawn will be filled with water or salt water (brine), and inlet ports will be closed with concrete after being filled with the filler material. Natural landscaping will be performed in the areas covered by the facilities using reinstatement, revegetation and restoration applications. These applications will be carried out according to the restoration and

rehabilitation projects and plans which will be prepared considering the conditions of the period after operation (land, climate, geomorphological conditions, etc.).

Contours of the surrounding area will be adapted as much as possible during the land leveling works. Topsoil layer, which is the most important element for plant growth, will be laid out by providing surface drainage systems suitable for the natural structure in the field and, if necessary, by providing erosion precautions suitable for the topographical structure. In the phase after laying out the topsoil layer, revegetation will be done suitable for the existing plant cover and the damaged areas will be repaired in a short time. Monitoring, maintenance and control phases are of great importance in order to achieve the planned target.

The purpose of the revegetation and rehabilitation works to be performed is not only greening the field but also making the used land suitable for its natural structure and ensuring that the land is used for the most appropriate purpose after the activity. In this context, the main purpose should be also to bring the classes of land use depending on the socio-cultural and economical needs of the people living nearby to the field while repairing the nature and bringing it closer to its former structure, For this reason, all of these practices will be carried out depending on the land usages to be determined in accordance with the conditions of the period and socio-economic structure .

If the facility is completely shut down and is not used for any other purposes, it is planned to start land reclamation works in 2053 after 30 years of service life according to the time schedule of Gas Storage Expansion Project, and no interference will be made on existing groundwater and surface water sources during the land reclamation works.

Atmospheric emissions will not be released after the completion of the operation activities and necessary precautions will be taken against wind erosion and consequent dust emissions during the reinstatement, revegetation and restoration works. In this context, adverse impacts on existing groundwater and surface water sources, and air quality are not expected after the decommissioning of the Gas Storage Expansion Project.

All equipment and material transportation works will be started at the end of the operation phase and reinstatement works will be conducted at the same time. The environmental impacts at this phase will be similar to the pre-construction phase of the project.

Social impacts will be similar to those in the operation phase and the social team of BOTAŞ will continue managing these impacts of the project during the abandoning and reinstatement works.

5.6. Detailed Environmental and Social Impacts of Gas Storage Expansion Project

During the Gas Storage Expansion Project, the environmental plan and procedures will be prepared by BOTAŞ and the contractors in the scope of the pre-construction works of the project as listed below:

- Environmental Management and Monitoring Plan
- Waste Management Plan/Procedure
- Wastewater Management Plan/Procedure
- Water Management Plan/Procedure
- Pollution Prevention Plan/Procedure
- Spill Response Plan/Procedure
- Aggregate Management Plan/Procedure
- Ecological Restoration & Reinstatement Plan/Procedure
- Air Quality Management Plan/Procedure
- Noise Management Plan/Procedure
- Environmental Training Procedure
- Fuel Handling Procedure
- Soil Pollution Procedure
- Chemical Inventory Procedure
- Rainwater Management Procedure
- Groundwater Management Procedure

5.6.1. Excavation Works

Within the scope of the site preparation and construction works of the Project, site grading works, excavations for the foundation of structures, construction, manufacture of coarse and fine fabrications, installation of the machines and equipment, installation of the heating, ventilation and sanitary system, and finally landscaping activities will be performed.

A Right-of-Way with a 28 m width is foreseen for each route of the planned pipelines, this width will be raised to 50 m where the pipelines (fresh water line, brine discharge line, natural gas branchman line and the connection lines between the wells) are built in parallel. The area of each well location is 1 ha, and the general layout for these areas is shown in Section 3.1. For the surface facilities to be constructed within the scope of the Project, the area where the excavation is carried out and the amount of the excavated material for the units to be erected according to the general layout shown in Figure 1.2.5 for the surface facility area of the Underground Gas Storage Project, the construction of which is underway, are presented below.

In the scope of the Project, topsoil stripping, digging, excavation and backfilling activities will be performed during the construction preparation works for pipelines to be erected, pump stations, water storage stations, surface facilities, storage well areas and the supporting units such as access roads to these facilities and electricity transmission line pylon points. The topsoil stripped to at least 30 cm in thickness during these activities will be stored on the construction corridor, in the opposite direction of the pipeline trench and in the vicinity of the areas and the excavation works will be commenced after storage.

Surplus excavated materials will remain after the pipeline covering, bedding and backfilling operation. During these operations on the pipeline routes, excavated materials will be stored

on the opposite side of the route for the pipeline works and also in licensed areas of the facility for the construction works.

Excavated materials occurred during the pipeline installations and facility constructions will be transported to the permitted dump sites of the nearest municipalities according to directives of the relevant regulation. There will not any randomly, uncontrolled and temporary excavated waste storage area along the pipelines and also construction sites. All excavated soil wastes and similar wastes will be transported to the permitted dump sites by the contractors. Before the installation of all pipelines and facility construction works, all excavated, construction and demolition waste dump areas will be inspected by the experts of BOTAŞ, Consultant(s) and Contractor(s) and assessment reports will be prepared to determination of the environmental and social impacts of the excavation waste transportation and disposal activities.

Occurred excavation waste amount at all sites of the project will be calculated and recorded to the waste inventory. Impacts of the excavation wastes will be easy manageable if prepared waste management plans and directives of the relevant regulations are applied by the contractor(s). There will not any severe impact of these wastes during the project if the requirements are managed by the contractor(s) and followed by BOTAŞ.

During the excavation works of the Project, potential social impacts are as follows;

- Damages to crops in plots neighboring the pipeline construction corridor due to, for example, spillover of earth or intrusion of equipment,
- Dust emissions and crop damages on lands neighboring the pipeline construction caused by dust emissions,
- Temporary disruption to grazing activities and/or reduced access to agricultural land and pastures,
- Interruption of irrigation or drainage affecting crops in uncompensated plots,
- Severance of access to cultivated plots during excavation works, impeding farmers' access to a plot and resulting in total or partial loss of crop,
- Accidents to livestock,
- Planned or unplanned disruption or damages on community infrastructure and utility distribution,
- Temporary land use which may be required for stocking material or soil, opening additional access roads etc.

Social impacts which are expected to occur during the excavation works and measures to mitigate the adverse impacts on affected land and livelihoods are detailed in Section 6.6.7.

Fresh Water Line, Pump Stations and Storage Tanks

The excavation works will not be started before the stripping and storing of the topsoil of 30 cm in thickness, over the fresh water line of approximately 130 km in length and the construction corridor of 28 m wide. Accordingly, the amount of topsoil to be stripped and stored will be;

130,000 m x 28 m x 0.3 m = ~ 1,092,000 m^3 and the stripped topsoil will be stored as at least 1 m stockpiles along the fresh water line and will be available for reinstatement works.

It is estimated that, a 130,000 m long fresh water line x 1.6 m^2 (∅=56'') pipe cross-section area = 208,000 m^3 excess excavated material in pipe volume will occur and be transported into the permitted dump sites of the municipalities.

3 pump stations which are considered to be erected on the fresh water line are the structures that provide the pumping of fresh water taken from the water intake structure to the surface facilities through the fresh water line. The excavation activities will be started only after stripping the topsoil of a thickness of 30 cm over the construction area for the pump stations whose dimensions will be approximately 50 m x 50 m and will be built inside the construction corridor, which is 500 m wide and currently uses existing fresh water.

5 water storage stations which are considered to be built on the fresh water line are the structures that provide storage along the fresh water line, pressure reducing and flow control of the fresh water taken from the water intake structure. 2 water storage stations will be located inside the pump stations with approximately 30 m x 30 m dimensions, and for 3 water storage stations to be built inside the construction corridor, which is 500 m wide and currently uses existing fresh water. Line–centered excavation works will be started only after the stripping of the topsoil with a thickness of 30 cm, over the construction area.

Brine Discharge Line

During the construction of the brine discharge line, excavation activities will not begin before the stripping and the storing of the topsoil segment of a thickness of 30 cm over the pipeline of approximately 27.9 km in length and the construction corridor of 28 m wide. Accordingly, the amount of topsoil to be stripped and stored will be;

27,900 m x 28 m x 0.3 m = ~ 234,360 m^3 and the stripped topsoil will be stored as at least 1 m stockpiles along the brine discharge line and will be available for reinstatement works.

It is estimated that, 45,000 m length brine discharge line x 1.6 m^2 (∅=56'') pipe cross-section area = 72,000 m^3 excess excavated material in pipe volume will occur and be transported into the permitted dump sites of the municipalities.

Natural Gas Branchman Line

During the construction of the Natural Gas Branchman Line, excavation activities will not be starded before stripping and storing of the topsoil with a thickness of 30 cm over the pipeline of approximately 21 km in length, coming to the new surface facilities to be erected and the construction corridor of 28 m in width. Accordingly, the amount of topsoil to be stripped and stored will be;

21,000 m x 28 m x 0.3 m = 176,400 m^3 and the topsoil stripped will be stored in at least 1 m stockpiles along the natural gas branchman line and will be available for reinstatement works.

It is estimated that, 21,000 m length natural gas branchman line x 0.8 m^2 (∅=40'') pipe cross-section area = 16,800 m^3 excess excavated material in pipe volume will occur and be transported into the permitted dump sites of the municipalities.

Connection Lines between the UGS Sites

Connection lines will be erected between the storage wells for the connection of the fresh water, brine solution, natural gas and the cushion gases such as nitrogen, which are required for the storage well sites to be built inside the Project area. There will be 1 fresh water line, 1 brine line, 1 natural gas transfer line and 1 cushion gas line between each of two storage wells with diameters varying between ~27 cm and ~ 42 cm (10 in – 16 in). The average lengths of the connection lines which will be determined according to the safety distances between the wells are foreseen as 450 m, and these lines will be erected in the construction corridor with a width of 50 m.. The number of the planned lines is 47 and the excavation work will not begin before the stripping and the storing of the topsoil of a thickness of 30 cm. Accordingly, the amount of topsoil to be stripped and stored will be;

450 m x 47 x 28 m x 0.3 m = 317,250 m^3 and the stripped topsoil will be stored in at least 1 m (high) stockpiles along the natural gas branchman line and will be available for reinstatement works.

Surface Facilities

In the surface facilities, which are planned to be constructed, there will be a leaching (leachate) pumping station, brine collection basins, firefighting tanks, control building, compressor building, filtration units, heating and cooling systems, oil separator units, pressure reducing units, regeneration unit, measurement units, dehydration unit, package wastewater treatment unit, offices, workshop and social buildings. During the construction of these facilities, the excavation for the foundation will be carried out with a dimension of 650 m x 800 m, i.e. the total area of surface facilities will be w x l = 650 m x 800 m = 520,000 m^2.

Over this total area of 520,000 m^2 with a thickness of 30 cm;

520,000 m^2 x 0.3 m = 156,000 m^3 topsoil will be stripped and collected alongside of the surface facilities and will be available for the reinstatement works.

UGS Sites

During the construction of the 48 gas storage areas, each with a dimension of 100 x 100, excavations for the foundation will be carried out and each storage area with a dimension of approximately 100m x 100m will have a surface area of w x l = 10,000 m^2.

Then over the total area of 480,000 m^2, with a thickness of 30 cm;

480,000 m^2 x 0.3 m = 144,000 m^3 topsoil will be stripped and collected on the boundary of each gas storage area. In the same way, excavation work will be performed only for mud basins (10m x10m) in gas storage areas; no excavated soil is expected since excavation will be carried out on the backfilling of the excavation-filling and grading of the area.

5.6.2. Impacts on Air Quality

Land Preparation and Construction Stage

The calculations for dust emissions, which could occur during the land preparation and construction works, have been made by using "Emission Factors Used in Calculation of Mass Flow of Dust Emission" (Table 5.6.2.1.) and EPA emission factors (Cowherd C., Development of Emission Factors for Fugitive Dust Sources, EPA, 1974) described in Table 12.6 of the "Regulation on the Control of Industrial Air Pollution" which came into force after being published in the Official Gazette dated July 03, 2009 and numbered 27277 (amended in the Official Gazette dated December 20, 2014 and numbered 29211) and the said emission factor includes all of the elements of excavations such as digging, filling, loading, emptying and storing which are carried out on unit area in construction works. The dust emissions which shall occur while carrying the excavations have been calculated by using the emission factors determined in the "Emission Factor Documentation (1998, EPA).

Table 5.6.2.1. Emission Factors Used in Calculation of Mass Flow of Dust Emission stated in the Table 12.6 of RCIAP

PROCESS	EMISSION FACTOR	
	Uncontrolled	Controlled
Removal of Materials	0.025 kg/ton	0.0125 kg/ton
Loading of Materials	0.01 kg/ton	0.005 kg/ton
Carrying of the Materials (Total round trip distance)	0.7 kg/km	0.35 kg/km
Emptying	0.01 kg/ton	0.005 kg/ton
Storage	5.8 kg dust/ha day	2.9 kg dust/ha day

It has been anticipated that the time to commence operation with all of the units of the project shall take 84 months from the beginning; however, it has been anticipated that excavation works shall continue for 60 months in different periods of time. The works shall be carried out at daytime and have been limited to 12 hours. Excavation intensity is taken as 1.6 ton/m^3 in the calculations and all the calculations have been described below:

Methodology

The American Meteorological Society (AMS) / Environmental Protection Agency (EPA) Regulatory Model Improvement Committee (AERMIC) was formed to introduce state-of-the-art modelling concepts into the EPA's air quality models. Through AERMIC, a modelling system, AMS/EPA Regulatory Model (AERMOD), was introduced that incorporated air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex

terrain. The AERMOD Model that has acceptance under international standards, is used for estimation of pollutant concentrations by researchers, supervisors and authorities worldwide.

With the model based on constant Gaussian distribution, pollutant distributions (point, area, line and volume) of various emission sources can be modelled at the same time or separately.

The model is an advanced computer model that can estimate the hourly, daily and annual Ground Level Concentration (GLC) values based on real time data that differs by time.

The model runs on a network system identified by user and the calculations are conducted for corner points of each receiver environment member that form the network system. The network system that model is used on can be defined as polar or cartesian and also, discrete receiver points out of network system can be defined and more detailed calculations on these points can be conducted.

The model was run based on worst case scenario, assuming the concentrations of the pollutants don't ever decrease due to any wet or dry precipitation. Additionally; the pollutants were assumed to distribute without any radioactive decay and transformation into sub-products.

For modelling three different inputs described below are used:

- Representative meteorological dataset
- Network system defined as receiving environment
- Information on emission source

The modelling study that ensures prediction of concentrations of pollutants in gaseous and dust phases in ambient air via mathematical calculations is composed of steps below:

1. Step: identification of inspection areas in indicated project impact area networks and its impact area,
2. Step: addition of representative meteorological dataset and
3. Step: identification of emission sources.

With the modelling study conducted, average hourly, daily and annual Ground Level Concentration of pollutants in the region were determined and these values were compared with limit values provided in the regulation. As a result of these comparisons, impacts of emissions to be released into atmosphere on air quality were detected.

Representative Meteorological Dataset

In order to be used in modelling studies, hourly ground level atmospheric information (temperature, wind direction, wind speed, cloudiness and cloud base height) and main level drilling data were obtained.

The meteorological data required for the modelling studies were gathered from the meteorological stations existing in the region. Meteorological Stations were chosen together with General Directorate of Meteorology/Ministry of Forestry and Water Affairs among the stations to represent the project areas the best by means of climatic conditions. In the cases that Upper Air data that is a type of Rawinsonde data could not be measured in the chosen meteorological station, the data of this parameter were obtained from Rawinsonde Meteorological Station close to the project area (Table 5.6.2.2.).

Table 5.6.2.2. Meteorological Stations used in Modelling and Data Years

Most Appropriate Year	Surface Station Name	Surface Station No	Rawisonde Station Name
2013	Aksaray /Merkez	17192	Ankara

In order to obtain information about the general meteorological conditions in the region, averages of the Aksaray Central meteorological station have been investigated and the meteorological data of 1960-2015 were selected for use in the model because they represent the characteristic conditions of the region. The long-term wind diagram from the General Directorate of Meteorology is given below. AERMOD provides the meteorological data required for the model by AERMET, the preprocessor.

Project Impact Area

As the Project impact area was being determined, Project Impact Area definition provided in RCIAP that came into force by being published in Official Gazette dated 03.07.2009 and numbered 27277 and the closest residential areas, Project area and the surrounding topography were considered.

In App.-2 of RCIAP there states “Facility Impact Area: The area that has a radius of 50 (fifty) times of stack height values determined according to the principles provided in App.-4 of this regulation, starting from the centre of the emissions. For the facilities with effective height ($\Delta h+h$) of emissions from the ground less than 30 m, the facility impact area is the square area with one border length of 2 km. If the surface distributions of emission sources except stacks (areal sources) are higher than 0.04 km2, the facility impact area is the square area with a border length of 2 km with the source located at the middle point of the square. The determination of the surface distribution of emission sources is based on the impact area of the facility”.

The stack heights of the compressors are provided above the Regulation on the Control of Industrial Air Pollution (RCIAP), Table 2-4. Since the stack height is 17.6 m, a square area with at least one 2 km length border should be selected as impact area.

Conclusion and Evaluations

With the assumption that **ALL THE PROCESSES SHALL BE CARRIED OUT AT THE SAME TIME** in the land preparation and construction works, the amount of dust emission which shall occur due to the works has been calculated as **285.89 kg/hour.**

The "Regulation on the Control of Industrial Air Pollution" (RCIAP) which came into force after being published in the Official Gazette dated July 03, 2009 and numbered 27277 (amended in the Official Gazette dated December 20, 2014 and numbered 29211) states that "if the dust emission diffused from the places other than smokestack is below 1 kg/hour, it is not necessary to determine the values representing air pollution, values of air quality obtained from measurements, values of contribution to air pollution obtained via calculations and total values of pollution constituted with these values."

When considering the situation (the worst scenario) in which removal, loading, emptying, transportation processes of the excavation taken out within the scope of the land preparation and construction works of the project, the dust emissiosn which will occur have been calculated above and the total dust emission has been determined as **285.89 kg/hour.** According to this, since the value calculated for dust emissions, which is expected to occur at the land preparation stage of the project (under the most adverse circumstances) is **285.89 kg/hour,** modeling for air quality has been made in order to determine the air quality contribution values.

In this context, the "Values of Contribution to Air Pollution" of PM10 have been calculated by using the AERMOD Model in order to determine the effects of the dust emissions which shall occur depending on the processes to be made in the construction area on the air quality and atmospherical diffusion profile of these dust emissions.

The values (STV and LTV) obtained as a result of modeling have been compared with the limit values (STL and LTL) stated in Table 2.2 of the Appendix 2 of RCIAP and according to this daily (STV) and annual (LTV) average pollutant LGC in the regions has been determined together with this work. TheSTV, LTV and STL, LTL values regarding atmospheric pollutants are described in RCIAP as follows:

- Short-Term Value (STV): the value corresponding to 95% of the measurement results When maximum daily average values or all the statistically measured results are ranged according to numerical quantity,

- Long-Term Value (LTV): The value which is the arithmetic average of all the measurement results made,

As a result of these comparisons, the effects of the emissions released to the atmosphere on air quality have been determined. As a result of the modeling works carried out, maximum LGC values have been obtained for pollutant emissions, STV and LTV and the RCIAP STL and LTL and WHO Ambient Air Quality Guidelines limit values are described in Table 5.6.2.3.

Table 5.6.2.3. Maximum LGC Values, STV, LTV and RCIAP Limit Values Obtained with Modelling Works for Possible Dust Emissions in Land Preparation Works

EMISSION	AVERAGE PERIOD	STV (35. VALUE µg/m³)			LTV (Max. µg/m³)			RCIAP Table 2.2. LIMIT VALUES (STV and LTV) (2024 year)	WHO Ambient Air Quality Guidelines
		Model 1	Model 2	Model 3	Model 1	Model 2	Model 3		
PM	For 24 hours (Daily)	18.66	8.44	1.21	-	-	-	50 µg/m³ (it is not exceeded more than 35 times in a year)	50 µg/m³ (PM 24-hour value is the 99th percentile)
	Annually	-	-	-	10.53	4.34	0.55	40 µg/m³	20 µg/m³
EMISSION	**AVERAGE PERIOD**	**STV (Max. VALUE mg/m²day)**			**LTV (Max. mg/m²day)**			**RCIAP Table 2.2. LIMIT VALUES (STL and LTL) (2024 year)**	**WHO Ambient Air Quality Guidelines**
		Model 1	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**		
Decayed dust	STL	32.91	12.49	3.06	-	-	-	390 mg/m²day	N/A
	LTL	-	-	-	18.80	6.56	0.80	210 mg/m²day	N/A

As seen in Table 5.6.2.3., the STV and LTV values obtained from the maximum LGC values obtained with modeling works for possible dust emissions in the land preparation works, provide the limit values (STL and LTL) described in Table 2.2 of RCIAP.

Although it has been determined that measures such as modeling results provide limit values, filling and emptying in emission source without watering or spinning, improvement of the roads, covering the vehicles with canvas during transportation of the materials and keeping top of the material in 10% moisture shall be taken in order to minimize the dusting which could occur in the land.

Furthermore, in order to minimize the dusting which could occur in the land, the provisions meeting the air quality standards relating to the dusty accumulation materials stored in the open yard stated in Appendix-1 of the RCIAP “Emission Limits for the Permit-Required Facilities” shall be complied with.

Profiles showing the distributions of the maximum Ground Level Pollution (GLP) values obtained from modeling in the project area and circumference are presented in the following figures (between the Figure 5.6.2.1. and 5.6.2.9.).

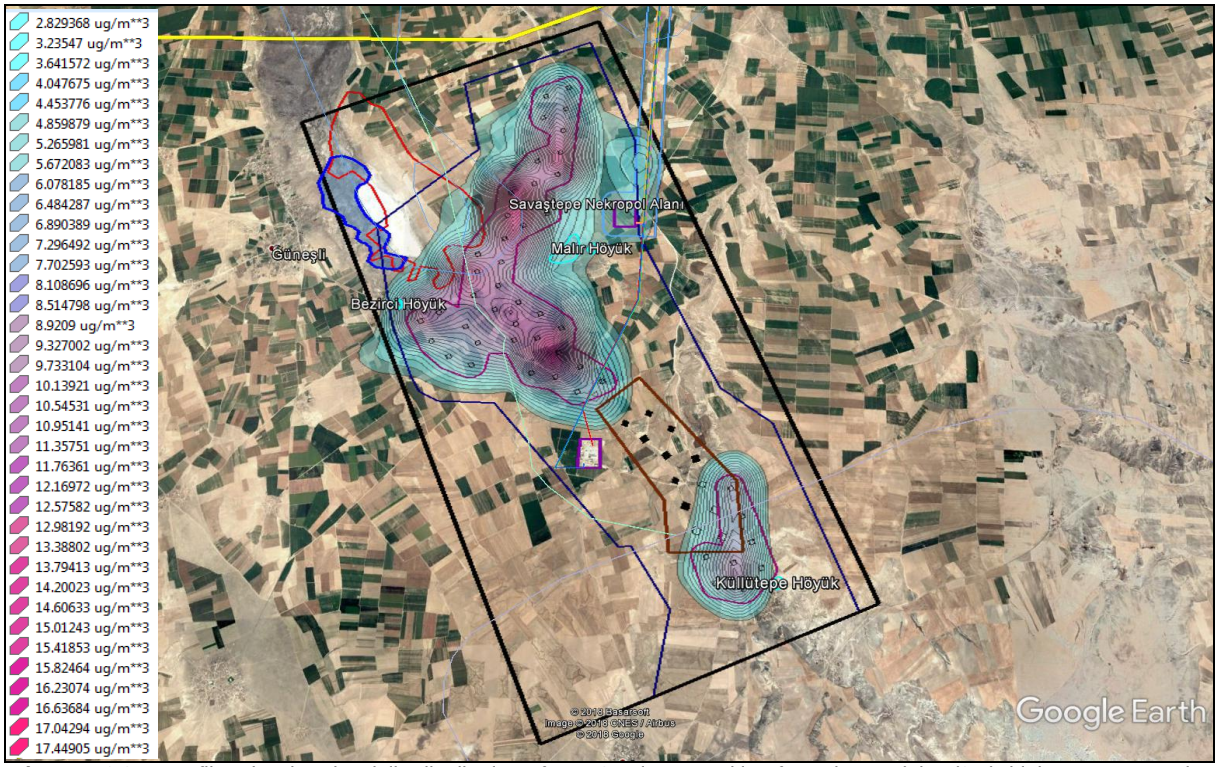


Figure 5.6.2.1. Profiler showing the daily distribution of PM10 values resulting from the model 1 (35th highest concentration 18.66 µg / m^3)

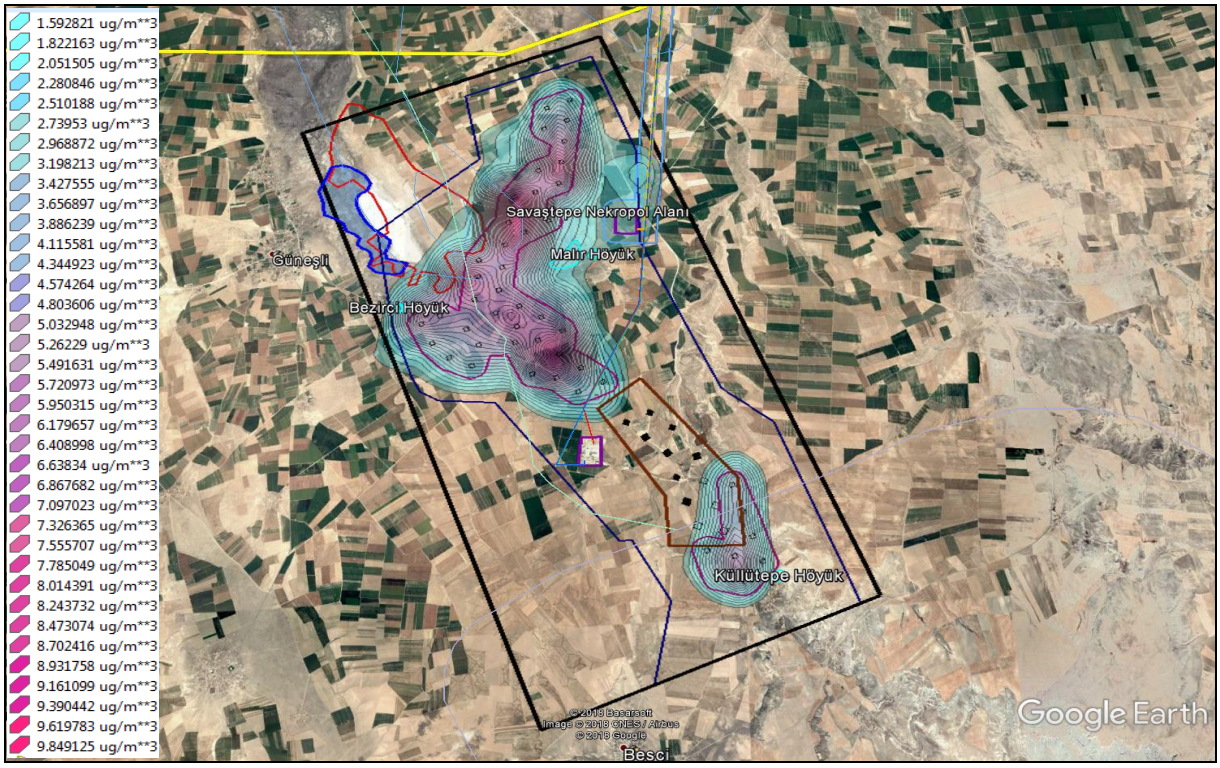


Figure 5.6.2.2. Profiles showing the annual distribution of PM10 values resulting from the model 1 (10,53 µg / m^3)

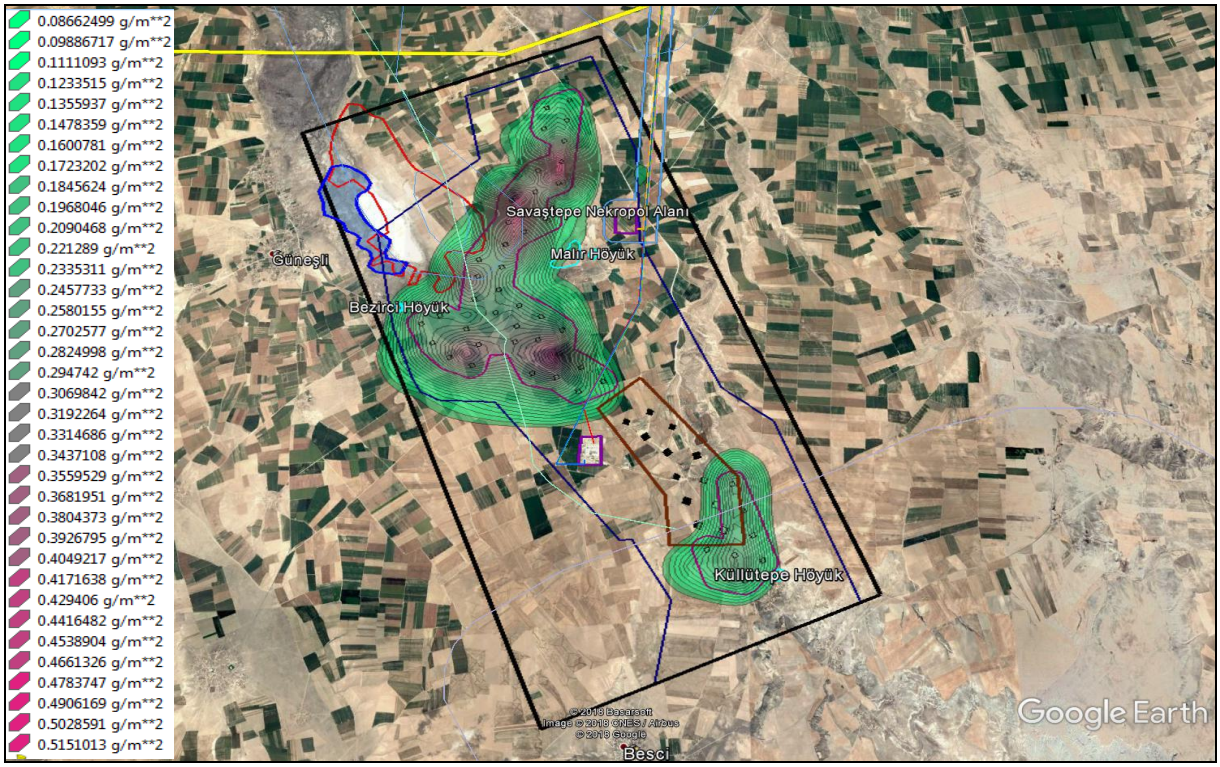


Figure 5.6.2.3. Profiles showing the monthly distribution of total deposition values resulting from the model 1 (18,80 µg / m^3)

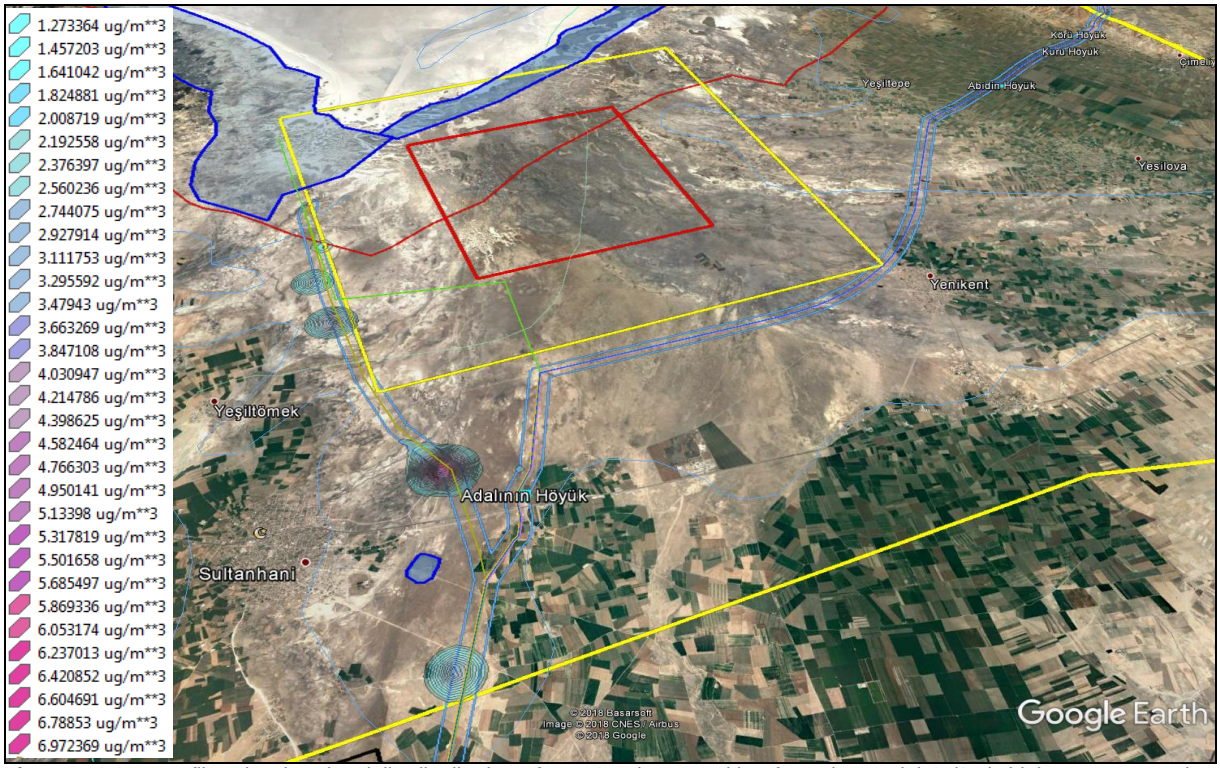


Figure 5.6.2.4. Profiler showing the daily distribution of PM10 values resulting from the model 2 (35th highest concentration 8.44 µg / m^3)

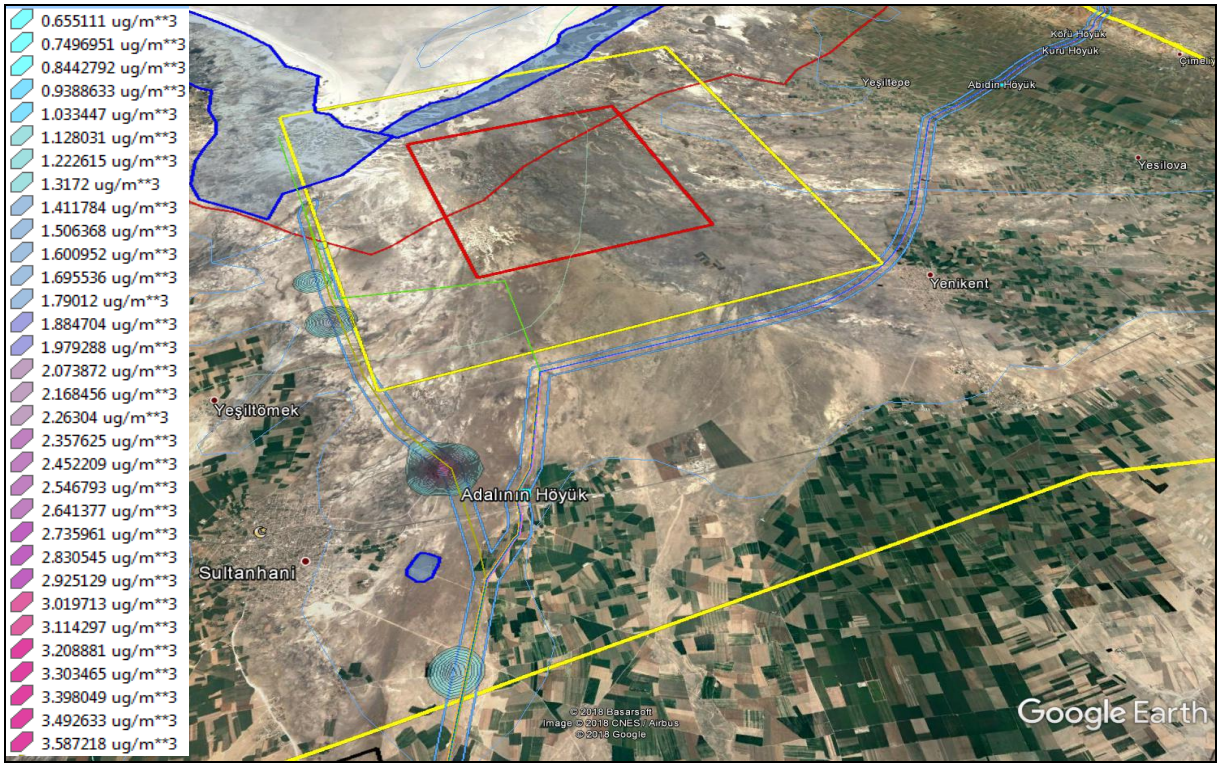


Figure 5.6.2.5. Profiles showing the annual distribution of PM10 values resulting from the model 2 (4,34 µg / m^3)

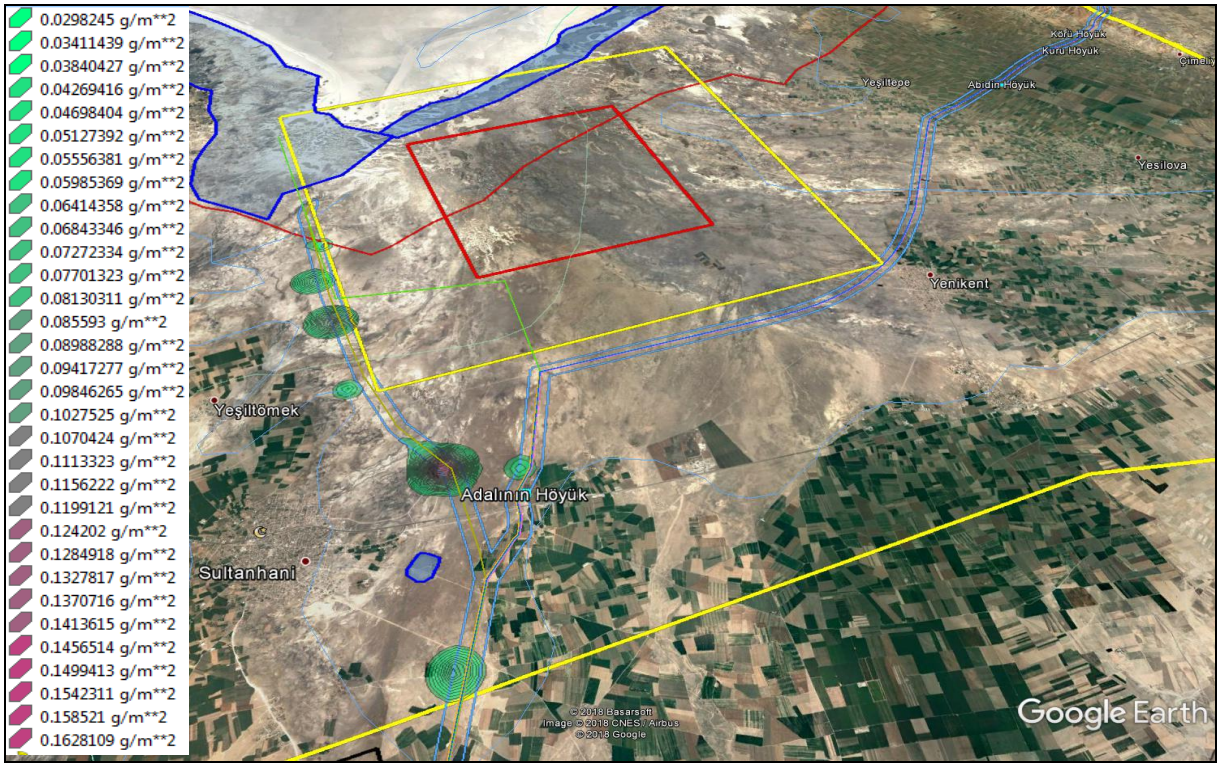


Figure 5.6.2.6. Profiles showing the monthly distribution of total deposition values resulting from the model 2 (6,56 µg / m^3)

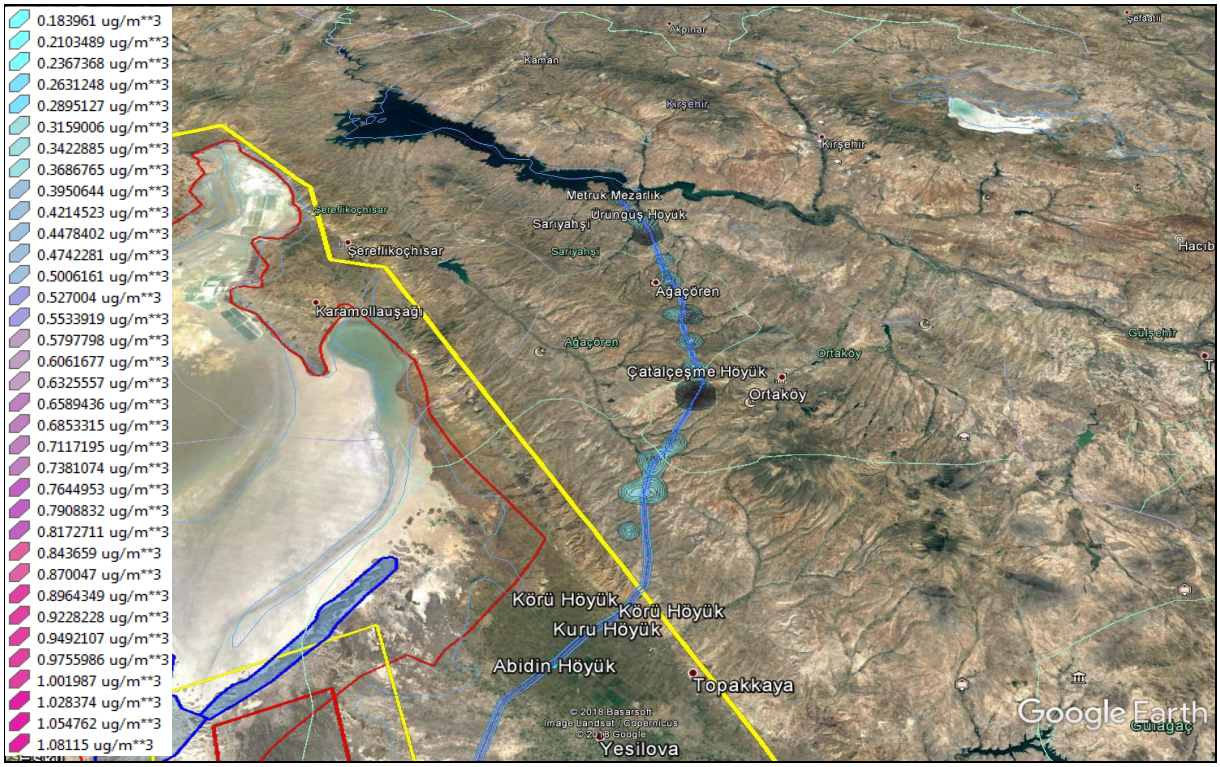


Figure 5.6.2.7 Profiles showing the daily distribution of PM10 values resulting from the model 3 (35th highest concentration 1.21 µg / m^3)

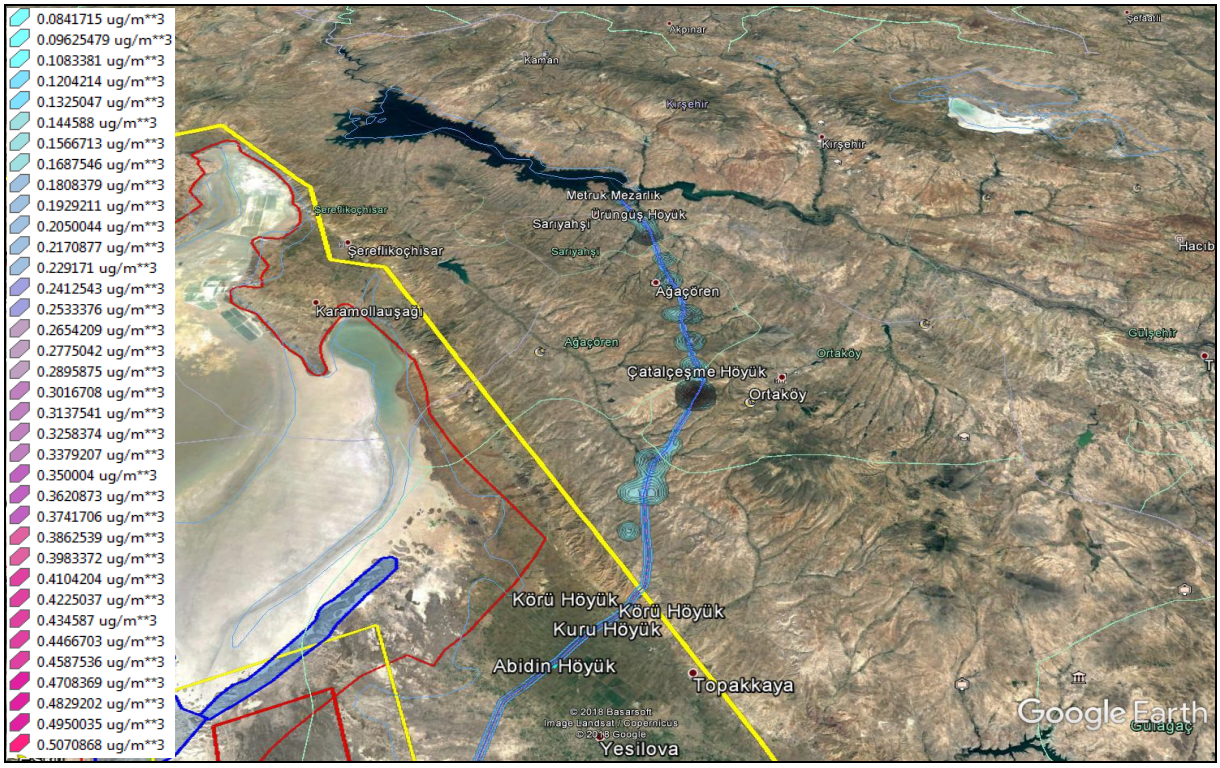


Figure 5.6.2.8 Profiles showing the annual distribution of PM10 values resulting from the model 2 (0,55 µg / m^3)

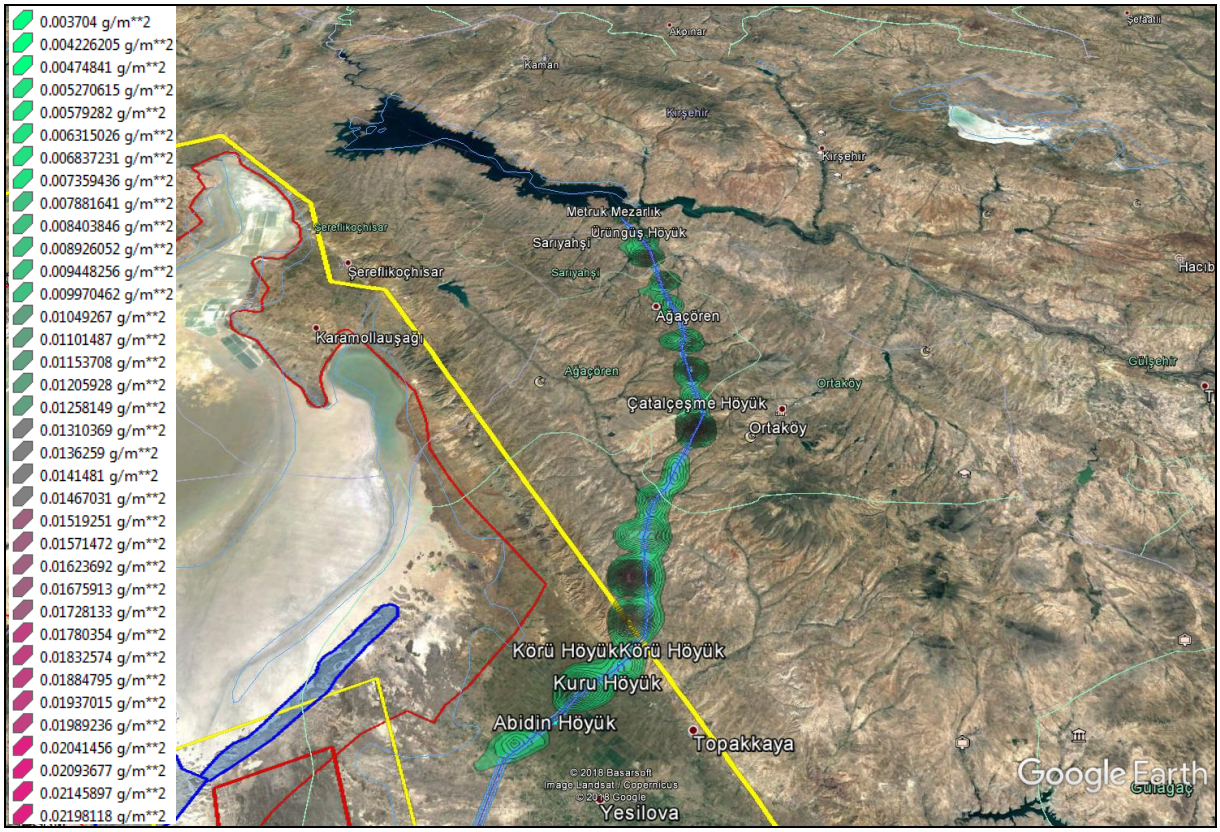


Figure 5.6.2.9 Profiles showing the monthly distribution of total deposition values resulting from the model 2 (0,80 µg / m^3)

At the land preparation and construction stage of the planned project fuel shall not be used in any process except for fuel usage of the different heavy construction machinery such as graders, excavators, dozers, trucks, compressors and mobile cranes.

Diesel fuel shall be generally used in heavy construction machinery and vehicles and since gasoline-powered vehicles shall be rarely used, it is anticipated that gasoline consumption shall be much less than diesel consumption. The fuels to be used shall be supplied from the stations which have a permit to operate or from tanks of which the bottom is leak-proof and where measures have been taken against fire and spillage.

In order to minimize the emissions arising from the vehicles which will work within this scope; pursuant to the Regulation on the Control of Exhaust Emission and Quality of Gasoline and Diesel Fuel which came into force after being published in Official Gazette dated November 30, 2013 and numbered 28837, routine controls of all the vehicles and equipment to be used shall be carried out and the vehicles which need maintenance shall be taken to service and other vehicles shall be used in the works until the maintenance is over. Furthermore, they shall be warned to work pursuant to the Traffic Act and it is crucial to load pursuant to the loading standards.

Operation Stage

Emissions Arising from the Fuels to Be Used in the Process

Two types of compressors will be used within the context of the Gas Storage Expansion Project. in order to compress the natural gas to be stored underground.

Piston compressors will be used in construction phase while turbo compressors will be used in operation phase. Piston compressors and turbo compressors will not be operate at the same time. Both of them will work with natural gas.

Piston Compressors:

2 piston compressors will be used for first gas filling in construction phase. After completion of first gas filling of all wells, piston compressors will not be used any more. It is planned that one piston compressor will work about 150 days continuously in order to fill one well. When they work at maximum capacity (1000 rpm), their flowrates are 23.870,01 Nm^3/h (3% O2), NOx emissions are 500 mg/Nm^3, CO emissions are 650 mg/Nm3 and SOx emissions are 60 mg/Nm^3. According to these values, mass flowrates for emissions are calculated for each compressor as follows:

- NO_x Emission (assuming that all NO_x emissions is as NO_2)

  23.870,01 Nm^3/h x 500 mg/Nm^3 = 11,93 kg/h

- SO_x Emission (assuming that all SOx emissions is as SO_2)

  23.870,01 Nm^3/h x 650 mg/Nm^3 =15,51 kg/h

- CO Emission

  23.870,01 Nm^3/h x 60 mg/Nm^3 = 1,43 kg/h

Calculated mass flowrates of stack gas emissions are compared with the emisision limit values stated in Appendix 2 of RCIAP are mentioned in Table 5.6.2.4.

Table 5.6.2.4. Comparison of Mass Flowrates of Emissions for Piston Compressors with the Limits Values in RCIAP

POLLUTANT	MASS FLOWRATE FOR 1 COMPRESSOR (kg/h)	MASS FLOWRATE FOR 2 COMPRESSORS (kg/h)	Limit Values in Appendix 2 of RCIAP (kg/h)
SO_2	15,51	31,02	60
NO_x (as NO_2)	11,93	23,86	40
CO	1,43	2,86	500

In Article 6.g of RCIAP it is stated that "for newly-established facilities, if the flowrates exceeds the limits mentioned in Table 2.1, a dispersion model must be used in order to calculate contribution of the facility to air pollution".

As seen in Table 5.6.2.4., mass flowrates of the pollutants do not exceed the limit values even if they work at the same time. Therefore, there is no need to use any dispersion model.

Turbo Compressors:

4 turbo compressors and 1 auxiliary compressor will be used in operation phase during injection period. In the worst case 4 of them will be used at the same time. It is planned that turbo compressors will operate for 40 days continuously in one year. For each stack emissions arising from the compressor in the modeling studies is taken as 25 ppm for CO and NO_2.

Stack Information for each turbo compressor are as follows (Table 5.6.2.5.):

Table 5.6.2.5. Stack Information of Compressors to be Used in Project Scope

Stack Height	**17,60 m**
Stack Area (rectangular stack)	2174mm x 4992 mm (10,8526 m^2)
Flue Gas Flow	698.297 m3/h
Operation Time	40 days continuously in one year.
Exit Velocity	17,87 m/s

Mass flowrates for emissions for each compressor are as follows:

- ***NO_x Emission***

(25 ppm NO_x)\[22,4/ 46(molecular weight)] =51,34 mg/Nm^3

In IFC Environmental, Health, and Safety Guidelis for Thermal Power Plants Table 6(B)-Emission Guidelines for Combustion Turbine (Natural Gas-Fired and Unit ≥ 50 MWth), 50 mg/Nm^3 (~25ppm) is the limit for Non-Degraded aershed. For this reason, 50 mg/Nm^3 is used in emission calculation (Table 5.6.2.6.).

Exhaust Flow Rate = [(Actual Exhaust Mass Flow Rate t/h) x 1000 kg/t x 22,4 mol/]/ (Molecular Weight of Natural Gas g/mol)

= (303,48 t/h x 1000 kg/t x22,4 l/mol)/ 28,33 g/mol

= 239.956 Nm^3/h

Table 5.6.2.6. NO_x Concentration Corrected to 15% Oxygen (NOx at 15% O_2), mg/Nm^3

Actual Nox (as NO_2), mg/Nm^3	Nox (as NO_2), mg/Nm^3, dry	Nox (as NO_2), mg/Nm^3 @15%O2, dry	Nox (as NO_2) Emission Rate (kg/h)	Nox (as NO_2) Emission Rate (g/s)
61,38	67,57	50,00	14,7284	4,0912
49,10	54,06	40,00	11,7827	3,273
36,83	40,54	30,00	8,8370	2,4547

Emission Rate =61,38 mg/Nm^3 x 239.956 Nm^3/h =14,7284 kg/h = 4.0912 g/s

The figure of AERMOD model inputs for NO_x is given below (Figure 5.6.2.10.).

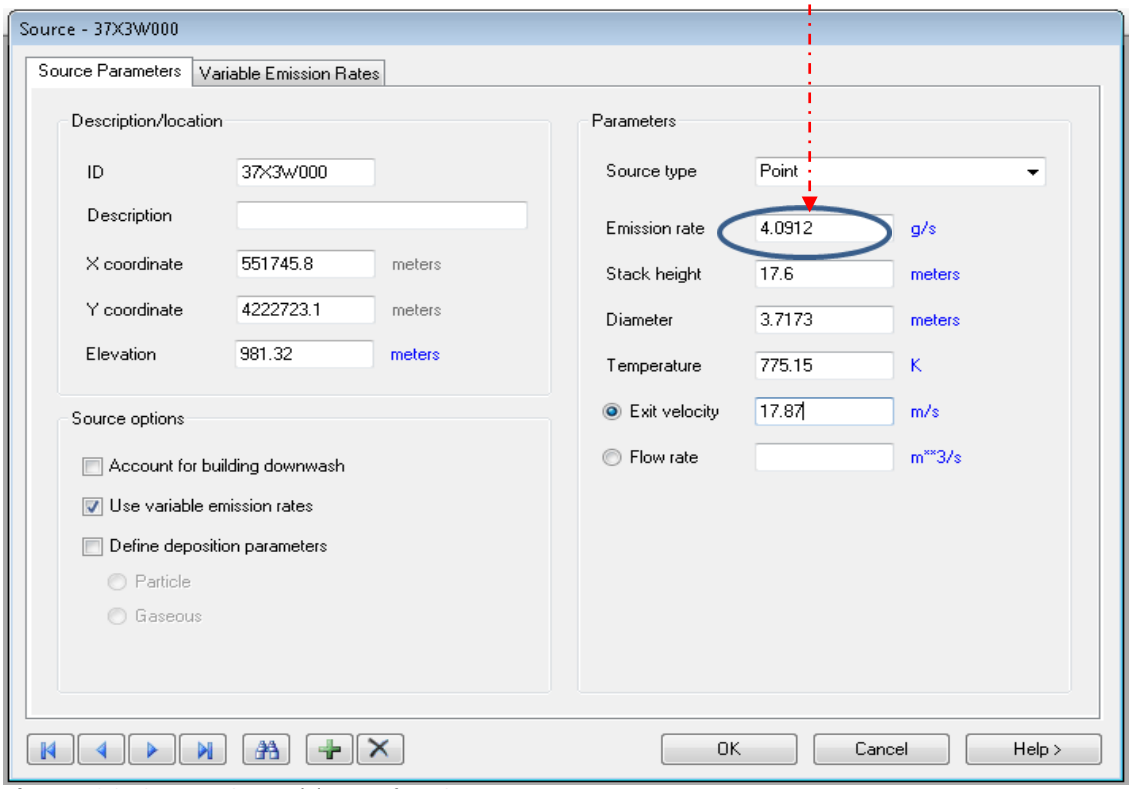


Figure 5.6.2.10. AERMOD Model Inputs for **NOx**

- ***CO Emission***

(25 ppm CO)\[22,4/ 28(molecular weight)] =31,25 mg/Nm^3

Actual Exhaust Mass Flow Rate: 84,3 kg/s: 303,48 t/h

Exhaust Flow

Rate = [(Actual Exhaust Mass Flow Rate t/h) x 1000 kg/t x 22,4 mol/]/ (Molecular Weight of Natural Gas g/mol)

= (303,48 t/h x 1000 kg/t x22,4 l/mol)/ 28,33 g/mol

= 239.956 Nm^3/h

Actual Exhaust

Flow Rate = 239.956 Nm^3/h x (273,1 + 501)/ (273,1x 1atm)

=698.297 m^3/h

Flue Area = 2174mm X 4992 mm =10,8526 m^2 ➡ D:3,7173

Exit Velocity =698.297 m^3/h /10,8526 m^2 = 63.402,3 m/h = 17,87 m/s

Emission Rate =31,25 mg/Nm3 x 239.956 Nm3/h =7.498.625 mg/h = 2.083 g/s

The figure of modeling data entered also shows the coordinate and elevation of stack is given below (Figure 5.6.2.11.).

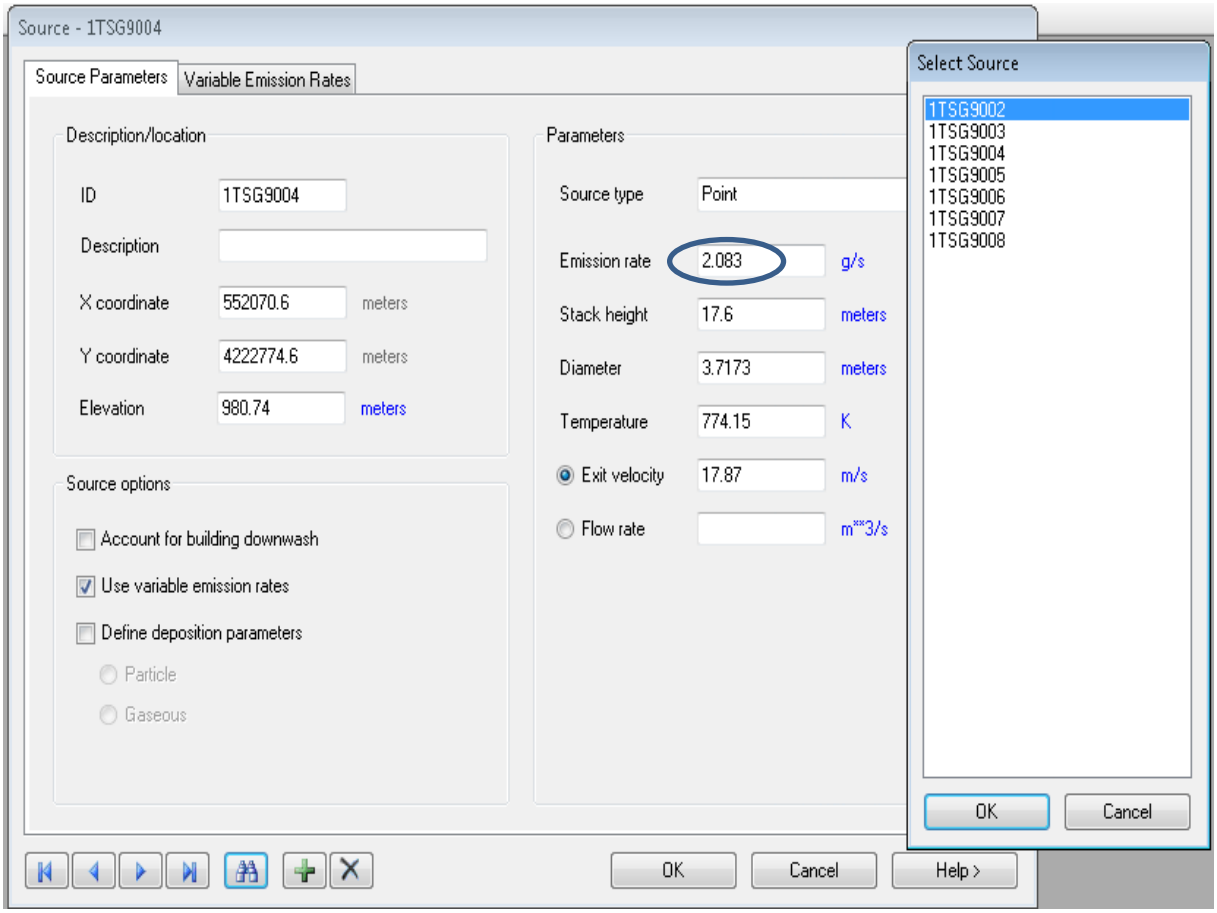


Figure 5.6.2.11. AERMOD Model Inputs for **CO**

Mass flowrates of stack gas emissions are compared with the emisision limit values stated in Appendix 2 of RCIAP and mentioned in Table 5.6.2.7.

Tablo 5.6.2.7. Comparison of Mass Flowrates of Emissions for Piston Compressors with the Limits Values in RCIAP

POLLUTANT	MASS FLOWRATE FOR 1 COMPRESSOR (kg/h)	MASS FLOWRATE FOR 5 COMPRESSORS (kg/h)	Limit Values in Appendix 2 of RCIAP (kg/h)
SO_2	-	-	60
NO_x (as NO_2)	2.1075	10.5375	40
CO	2.1075	10.5375	500

As seen in Table 5.6.2.7., mass flowrates of the pollutants do not exeed the limit values even if all of them work at the same time. Although there is no need to run any dispersion model for compressors, it was run in order to see distribution and compare with the regulation limit values of RCIAP.

As a result of the modeling works carried out, maximum CO and NOx values have been obtained for pollutant emissions, STV and LTV and the RCIAP and WHO Air Quality Guidelines STL and LTL limit values are described in Table 5.6.2.8.

Tablo 5.6.2.8. STL and LTL limit values of RCIAP and WHO Air Quality Guidelines

POLLUTANT	AVERAGE PERIOD	OPERATION STAGEMODEL RESULTS	RCIAP Table 2.2. LIMIT VALUES (STL and LTL) (2024 year)	WHO Ambient Air Quality Guidelines
NO_x (NO_2 Cinsinden) ($\mu g/m^3$)	**For 24 hours (Daily)**	27,3 (18th VALUE) (Max Value = 42,92)	**200 $\mu g/m^3$** (it is not exceeded more than 18 times in a year	**200 $\mu g/m^3$ (1 h Daily Max)**
	Annually	0,4625	**40 $\mu g/m^3$**	**40 $\mu g/m^3$**
CO ($\mu g/m^3$)	**Maximum Daily 8 Hour Average**	4,499	**10.000 $\mu g/m^3$**	**10 mg/m^3**

Profiles showing the distributions of the NO_x and CO values in operation stage obtained from modeling in the compressor area and circumference are presented in the following figures. (between the Figure 5.6.2.12. and 5.6.2.14.).

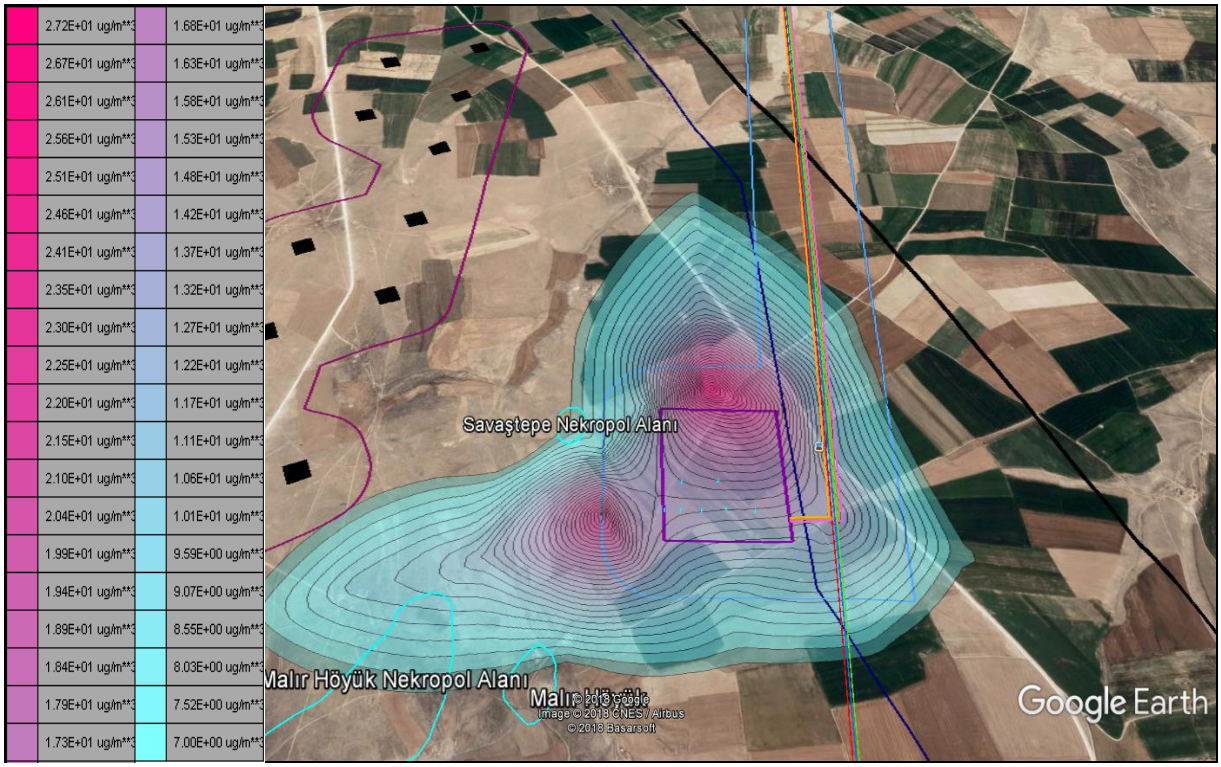


Figure 5.6.2.12. Profiler showing the hourly distribution of NOx values in operation stage (18th highest concentration 27.17 µg / m^3)

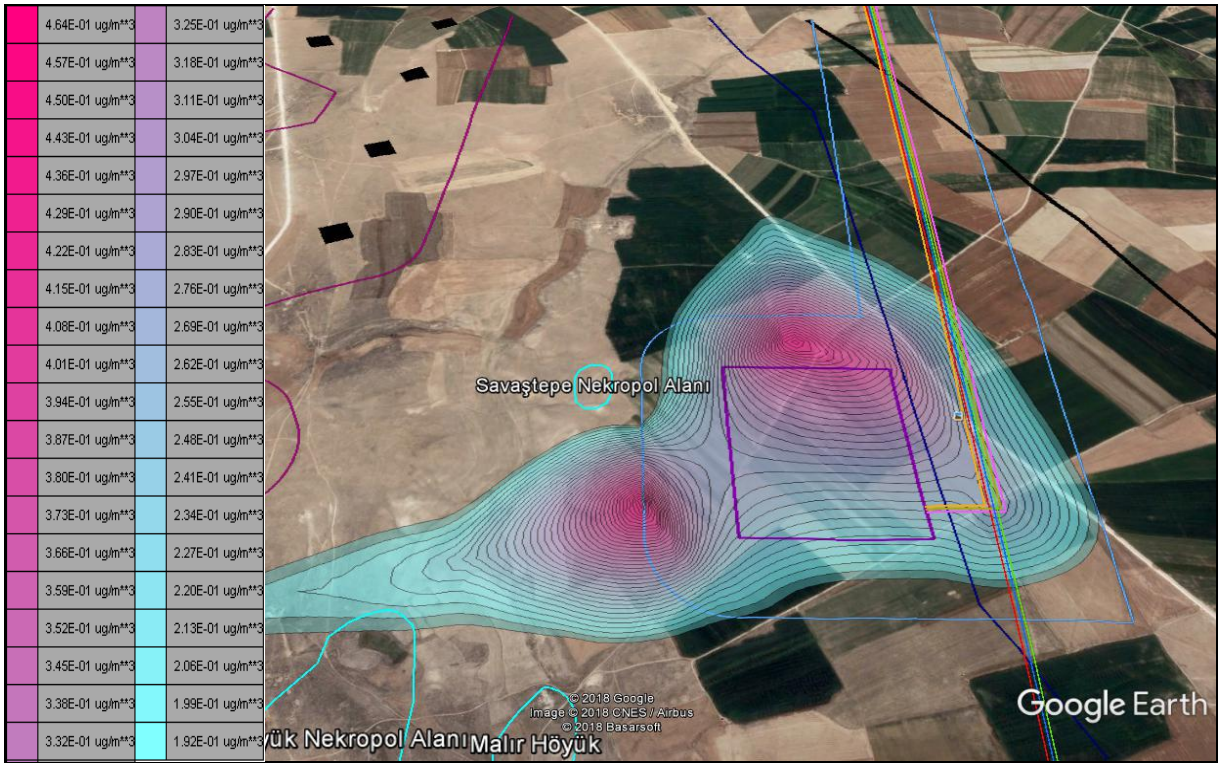


Figure 5.6.2.13. Profiler showing the annual distribution of NOx values in operation stage (0.464 µg / m^3)

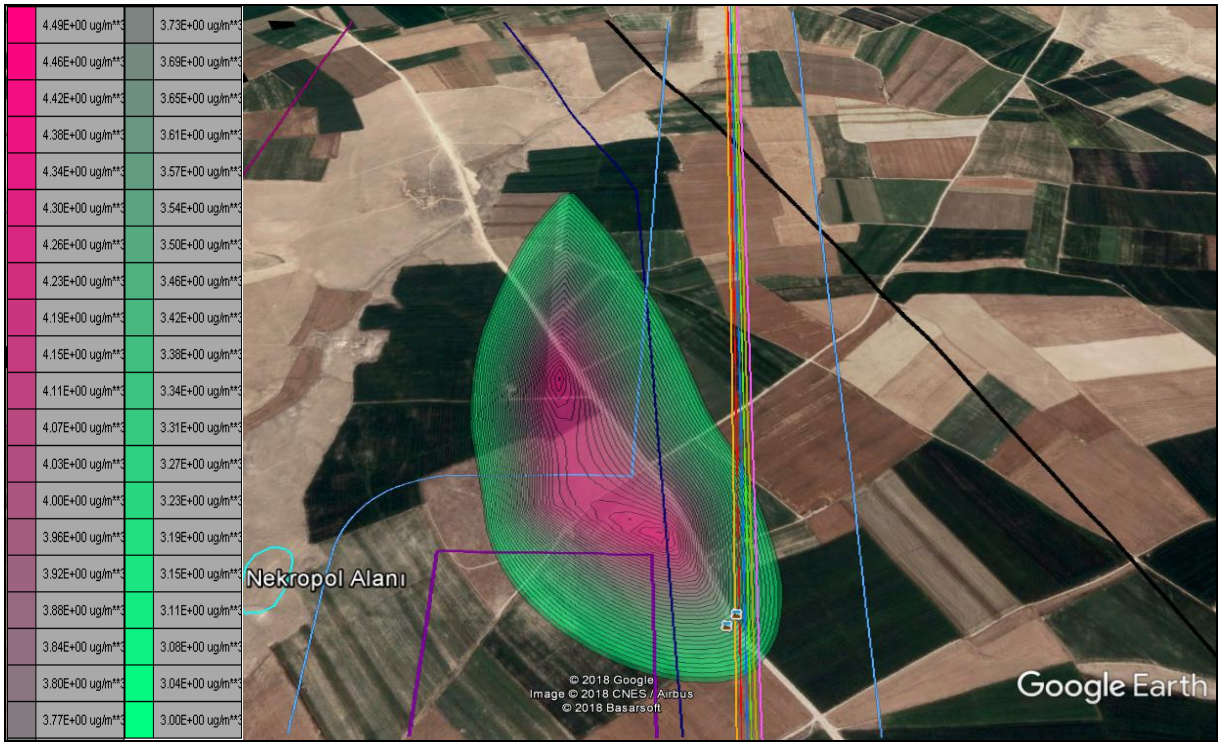


Figure 5.6.2.14. Profiler showing maximum daily 8 hour average distribution of CO values in operation stage (4,49 µg / m^3)

In the scope of the Gas Storage Expansion Project, air quality modeling results and maps are given Appendix 13.

5.6.2.1. Greenhouse Gas Emissions

The emission of greenhouse gases (GHGs) during construction and operation activities will be released from a number of activities that are common to both phases (use of electricity by pump stations during construction or emissions caused by the operation of compressor stations during the operation phase). As emissions occur from a range of sources and activities, key emission factors during both of these phases of the Gas Storage Expansion Project have been taken into consideration.

The key GHG emission generating activities were separately considered for construction and operation phases as follows:

Construction Phase

- Fuel use by mobile vehicles and construction machines
- Electricity use by pump stations and camp facilities

Operation Phase

- Fuel use by mobile vehicles
- Fuel use by stationary sources such as compressor stations, generators etc.
- Electricity use by site infrastructure (site administrative units)

Construction Phase

The emission of GHGs during the construction phase is mainly related to the fuel (diesel) combustion by construction vehicles and machines, electricity use by pump stations and camp facilities.

The estimate of GHGs emissions caused by fuel consumption by construction vehicles and machines is given below (Table 5.6.2.1.1.);

Tablo 5.6.2.1.1. The Estimate of GHGs Emissions Caused by Fuel Consumption by Construction Vehicles and Machines (Cons. Phase)

	Unit	
Average annual fuel use [6]	Million liter	6.83
Emission factor (diesel) [7]	kg CO_2 per gallon	10.21
	kg CO_2 per liter	2.7
CO2 Emissions	kg CO_2 per year	18,425,530
	TCO_2 per year	**18,425.53**

The emissions of GHGs caused by the use of grid electricity by 3 pump stations and camp facilities during the construction activities is estimated as follows (Table 5.6.2.1.2.);

Tablo 5.6.2.1.2. The Emissions of GHGs Caused by the Use of Grid Electricity by 3 Pump Stations and Camp Facilities (Cons. Phase)

	Unit	
Amount of water	m^3 water per year	45,000,000
Pump Stations	kWh per m3 water	3.16
	kwh per year	142,200,000
Camp Facilities	kw	1,000
	kwh per year	8,760,000
Total electricity consumption	kwh per year	150,960,000
Emission factor (for Turkey) [8]	kg CO_2 per kwh	0.865
CO2 Emissions	kg CO_2 per year	130,580,400
	TCO_2 per year	**130,580.4**

The total emission of GHGs in the construction phase is estimated as **149,005.93 TCO_2 per year.**

[6] The average annual fuel use is estimated based on the number and type of construction vehicles to be used during the construction activities

[7] EPA Center for Corporate Climate Leadership, Emission Factors for Greenhouse Gas Inventories (https://www.epa.gov/sites/production/files/2016-09/documents/emission-factors_nov_2015_v2.pdf)

[8] Electricity-specific emission factors for grid electricity (https://ecometrica.com/assets/Electricity-specific-emission-factors-for-grid-electricity.pdf)

Operation Phase

The primary GHG emission sources during the operation are considered as fuel use by mobile vehicles and stationary sources like compressor stations and electricity usage by the on-site administrative facilities.

The estimate of GHGs emissions caused by fuel consumption by mobile vehicles and machines is given below (Table 5.6.2.1.3.);

Tablo 5.6.2.1.3. The Estimate of GHGs Emissions Caused by Fuel Consumption by Construction Vehicles and Machines (Ope. Phase)

	Unit	
Average annual fuel use [9]	liter	101,760
Emission factor (diesel)	kg CO_2 per gallon	10.21
	kg CO_2 per liter	2.7
CO2 Emissions	kg CO_2 per year	274,467
	TCO_2 per year	**274.47**

Natural gas will be used as fuel for the operation of compressor stations and diesel will be used for the generators. According to the number and power of compressors, generators and other sources, the emissions of GHGs resulted from the operation of compressor stations, generators etc. during the operation phase is estimated as **526,488 TCO_2 per year.**

The emissions of GHGs caused by the use of grid electricity by on-site administrative facilities during operation is estimated as follows (Table 5.6.2.1.4.);

Tablo 5.6.2.1.4. The Emissions of GHGs Caused by the Use of Grid Electricity by On-Site Administrative Facilities (Ope. Phase)

	Unit	
Electricity use by administrative facilities	kw	1,000
	kwh per year	8,760,000
Emission factor (for Turkey)	kg CO2 per kwh	0.865
CO2 Emissions	kg CO2 per year	7,577,400
	TCO2 per year	**7,577.4**

The total emission of GHGs in the operation is estimated as **534,339.87 TCO_2 per year.**

Based on the most recent data on GHG emissions in Turkey, the total GHG emissions in Turkey in 2015 amounted at 475.1 GtCO2eq/yr [10.] The energy sector amount for 71.6% of the total GHG emissions, followed by the industrial sector at 12.8%.

The contribution of the Project to the national balance of GHG emissions in Turkey will be 0.03% during construction and 0.11% during operation on an annual basis.

[9] The average annual fuel use is estimated based on the number and type of vehicles to be used during operation
[10] http://www.tuik.gov.tr/PreHaberBultenleri.do?id=24588

5.6.3. Wastes

PRE-CONSTRUCTION PHASE

During this phase; due the ongoing feasibility works and site visits performed by the project people, minor waste impacts will be occurred that consisted from the organic waste and package wastes if temporary camp residential is establish by the contractor(s). Organic wastes and package wastes will be accumulated in separate containers temporarily and given to the waste collection system of the nearest municipality. Waste management practices at the pre-construction phase will be assessed by the contractor and managed until to the construction phase of the project in scope of the prepared waste management plan and procedure.

However, probable unpermitted actions may occur as opposed to the principles of the waste management despite to all plan and procedures but there will not any impact expected during the pre-construction phase if the requirements of the waste management plan and procedures properly applied by the contractor.

CONSTRUCTION PHASE

As a result of any other activity to be realized in the process of field surveys, soil stripping and digging works, construction activities, mechanic and pipe works, site preparation and any other activity to be realized within the construction process,

- Meal preparation and organic wastes after meal,
- Packaging wastes such as paper, plastic, metal, glass, composite etc.,
- İnert/safe wastes such as wood, cable waste, outfit, metal scraps etc.,
- Hazardous wastes such as Paint, thinner, construction and mechanical chemicals, fuel wastes, contaminated wastes, toner, cartridge, etc.,
- Waste oils after the oil change and maintenance works,
- Waste vegetable oils accumulated in the kitchen and oil trap,
- Battery and accumulator wastes pursuant to office, workshop and maintenance works,
- End-of-life tires,
- Medical wastes sourcing from hospital services,
- Drilling mud and formation wastes during drilling activities,
- Insoluble mud wastes during leaching activities,
- Digging wastes to emerge as a result of digging and demolition works will occur.

When the fact that 500 people in total, 150 of which have worked in the scope of pipeline installation, construction of pump stations and water storage tanks for 18 months, is foreseen considering that approximately 1,08 kg solid waste will emerge daily per person (TURSTAT Journal No: 18777, Date: 28.12.2015);

It is assumed that 500 people x 1.08 kg solid waste /person-day = 540 kg/day solid waste would be generated.

"The regulation on Waste Management" which was published on Official Gazette dated April 02, 2015 and No 29314 on the disposal of all solid wastes generated during the land preparation-construction studies and operation phase shall be complied with.

Organic Wastes

Organic wastes are formed after meal preparation and the meals of the employees working during the predecessor activities such as field surveys, detection, upper soil stripping, digging works etc., as a priority in the project. Organic wastes formed within the scope of these activities shall be temporarily disposed of in closed, leak-proof, portable waste boxes and / or containers to be placed in work areas and removed from work areas at the end of work and disposed of at waste collection points of provincial and district municipalities.

Organic wastes will be formed in the kitchen and dish washing areas of the camp sites, tea houses of the office parts and personnel dormitories in small numbers pursuant to the establishment of project camp sites. Organic wastes will be collected in portable, capped, leak-proof waste containers in these areas and will be accumulated temporally in waste containers labeled in waste collection points which exist in camp sites regularly, in a day. Due to the distortion and smell problems of organic wastes especially in hot days, the accumulated amounts will be taken daily with hydraulic compacted garbage trucks of the closest province/district municipality or contractor to solid waste regular storage areas or waste transfer stations of the province/districts. The packaging wastes which do not lose the recycling quality within organic wastes will be taken to packaging waste accumulation areas by being sorted out among organic wastes. No other quality and type of waste will be thrown into the organic wastes formed.

Waste inventory and amounts will be established by detecting the approximate daily amounts of domestic organic wastes which are given from camp sites to regular storing areas and project areas apart from the camp sites to non-project collection system and will be placed in the registry system to be prepared.

The fact that tipping the domestic solid wastes (organic wastes as meal wastes) to the seas, lakes and similar recipient ambiences, streets is forbidden needs to be paid maximum attention to and disposal will be ensured by delivering to the solid waste collection systems of the related municipality in the scope of Article 8 of "Waste Management Regulation" which entered into force after being published on the Official Gazette dated April 02, 2015 and numbered 29314.

Packaging Wastes and Recyclable Wastes

Packaging waste will exist in any area where project activities are realized. The packaging wastes will be accumulated temporally in the places where activities are carried out separately from other wastes during the pipeline studies and will be brought to the waste collection point or central waste area on the closest camping area in order to be delivered to the collection system at the end of each day. The packaging wastes accumulated in areas

such as pipeline, pumping station, water storage station will be delivered to the packaging waste collection system of the closest province/district which continues outside the camp sites.

The type and amount of the packaging wastes delivered to non-project collection system and accumulated outside the camp sites shall be detected daily and added to the project records.

Packaging wastes formed as a result of activities such as surface facilities construction, gas storage areas and connection lines installation studies, camping and office activities will be accumulated in temporal packaging waste container and boxes separately from other wastes in camp sites. The amounts of the accumulated packaging wastes and other recyclable wastes will be identified and taken to the labelled packaging waste and recyclable waste accumulation rooms which are separately designed in Central Waste Accumulation Area (CWAA), on a daily basis.

However, the packaging wastes being formed in the project and their amounts as per the types of recyclable wastes will be daily detected and recorded to the waste registry system to be prepared.

The packaging wastes as paper, plastic, metal, glass and composite accumulated temporally in Central Waste Accumulation Area (CWAA) will be delivered to the packaging waste recycling companies having CSF (Collection, Separation, Facility) Licence in accordance with the articles of “Regulation on Packaging Wastes Control” (RPWC) which entered into force after being published in the Official Gazette dated August 24, 2011 and numbered 28035 in certain periods.

Inert/Non-Hazardous Wastes

Inert/Safe wastes such as wood, cable wastes, work clothes, iron scraps etc. form as a result of any activity realized throughout the planned Gas Storage Expansion Project. These wastes emerge pursuant to production activities, are not signed as hazardous in regulations and are the ones moved away from the environment with disposal methods. They will be large and rough in volume. Inert / safe wastes will be sent to regular and licenced waste storage facilities by being stored temporally in appropriately designed parts close to the working areas. Inert/safe waste amounts shall vary as per the construction, mechanic and electrical techniques to be applied and the waste amounts will be detected daily according to the types and recorded in the waste registry system.

Hazardous Wastes

The types of hazardous wastes which could cause adverse effect on the environment and human health in short and long term to be generated as a result of the activities carried out throughout the project are;

- Waste oils,
- Filters,

- Battery and accumulator,
- Solvents such as liquid paint, thinner and ink,
- Containers such as dirt bins and barrels,
- Waste solid paint and paint muds,
- Fuel and chemical wastes,
- Any type of treatment mud,
- Laboratory materials and chemicals,
- Concrete chemicals, solid substances,
- Cartridge, toner and fluorescent lamps,
- Cleaning disinfectants, room sprays,
- Greasy mud, glue and paint protectors,
- Materials such as dirty clothes, cloth and ointment,
- Wastes such as contaminated rock with hazardous substances, soil etc.,
- Overalls, glove, mask, shoes, cloth, rock, soil contaminated with hazardous wastes and
- Wastes such as dehydrated drilling and process muds.

Maximum caution will be exercised during the disposal of the above listed hazardous wastes according to the related legislations concerning the reduction at the source, prevention of the formation. The project workers will be trained on the reduction of the amounts of such wastes at the source and especially big amounts of hazardous waste formation will be prevented by minimizing the possible environmental accidents (leakage, spil, diffusing, contamination etc.) during especially the works carried out with hazardous substances with the measures to be taken.

During the project studies away from the camp sites, such as pipelines and other predecessor activities, no hazardous waste formation is expected apart from the contaminated material and contaminated soil possibly to occur pursuant to environmental accidents such as possible leakage and spills. In case of a possible hazardous waste formation, the activity on the contaminated area is ceased temporally and contaminated areas and materials will be cleaned out from that area; they will be accumulated in labelled, portable, closed and leak proof containers with dangerous and warning signs.

The hazardous wastes accumulated until a weight of 50 kg at most will be placed in hazardous storage rooms in the CWAA by being brought to the camp sites at the end of each working day (Figure 5.6.3.1.). Large amounts of hazardous waste will be sent to licensed hazardous waste disposal facilities via licenced hazardous waste carriage companies from the areas where the wastes exist. The disposal works shall be carried out by licenced companies to be agreed in line with the provisions of “Regulation on Waste Management” published on the Official Gazette dated April 02, 2015 and numbered 29314.

Hazardous wastes will occur as the residues and wastes of the chemicals and wastes contaminated with these substances pursuant to the works carried out with dangerous oils

and chemicals during the activities to be carried out in camp sites, surface facilities and gas storage areas. Permanent areas where dangerous chemicals are used such as workshops, paint sites, fuel filling and maintenance-inunction areas shall be constructed on leak-proof concrete ground and diffusion of the hazardous wastes to the environment which occurred as a result of setting up sufficient drainage systems will be prevented. The drainage carried out in these areas shall be connected to the main infrastructure system ending with treatment facility by filtering through the grease traps. The oils kept in grease traps will be periodically cleaned and stored temporally in the CWAA hazardous waste room. The spill kits will be kept ready against the environmental risks such as possible leakage, spill etc. and the area will be cleaned after a possible environmental accident.

The chemicals in temporary process areas against the hazardous wastes occur due to fuel, oil and chemicals in dangerous form, to be possibly used during the construction, mechanic and electrical activities shall be kept in closed areas and leak-proof dripping trays. The spill kits will be kept ready against the environmental risks such as possible leakage, spill etc. and the area will be cleaned after a possible environmental accident. Possible hazardous waste amounts will be added to waste registry system by detecting daily according to their kinds.

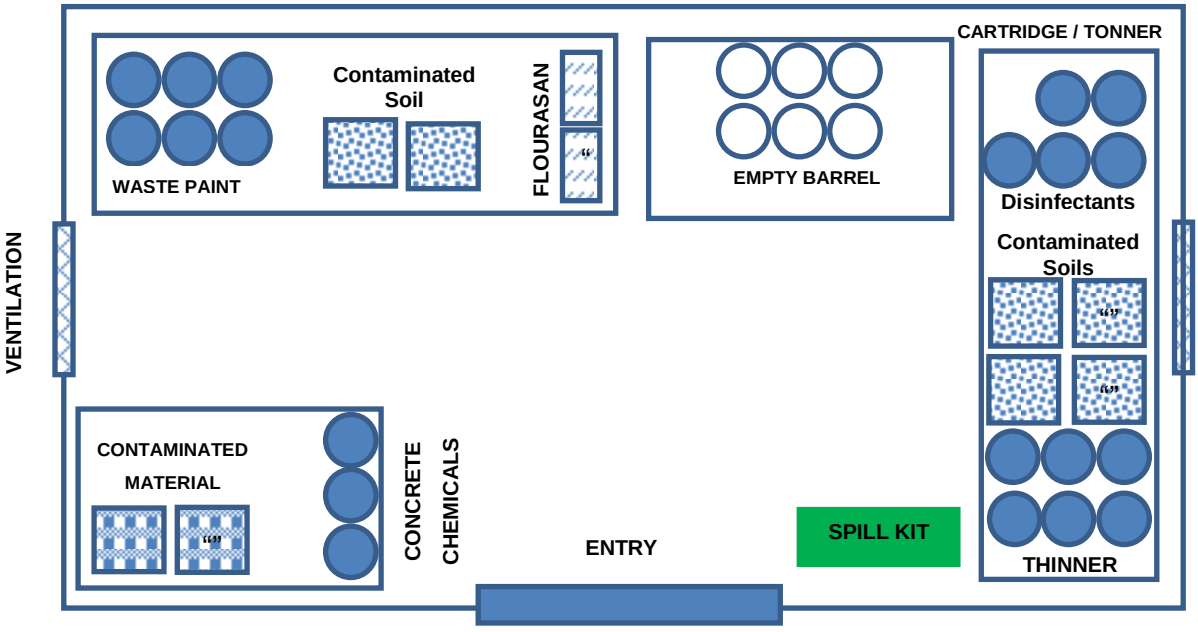


Figure 5.6.3.1. Hazardous Waste Storage Room Layout Plan

Waste Oil

Maintenance works and changes of motor oil and hydraulic oil of the vehicles and construction equipment which are used within the project shall be carried out by the services of the vehicles in the service locations as far as possible. In the event that providing a service in the service locations is not possible, oil change and maintenance works shall be carried out in the maintenance areas which will be built in the camp areas and construction areas. The necessary oil pick-up and effluent drainage systems shall be installed in the

maintenance areas which will be built on concrete floor and effluents shall be conveyed to the central infrastructure system after the oil/water separator.

The necessary measures shall be taken in order to prevent any waste oil arising during the maintenance and the waste oils shall be temporarily accumulated inside the labelled metal barrels having been put inside the drip trays in the specially-designed rooms within the Central Waste Accumulation Area in accordance with the conditions provided in the Parts 4 and 5 of the Regulation on Control of Waste Oil in such a way that spillage response kit is available and without mixed with other waste oil types. Oil quality classification of the accumulated waste oil shall be determined by having it analyzed in an accredited laboratory. In accordance with the result of analysis, waste oils shall be disposed by the firms which have taken license from the Ministry of Environment and Urbanization in accordance with the Part 2 of the Regulation on Control of Waste Oil (Amended in Official Gazette dated November 05, 2013 and numbered 28813) which came into force after being published in the Official Gazette dated July 30, 2008 and numbered 26952.

Waste Vegetable Oils

Waste vegetable oils are comprised of the leftover frying oils and the oils which have been trapped in the oil trap located in kitchen drains in all the kitchens within the Project. The top oils of the oil trap and leftover frying oils used in the dining hall within the facility area shall be gathered in a clear and lidded container separately from other wastes. Waste vegetable oils shall not be spilt to the sewerage system, soil and such like receiving environment in order to protect the environment. Within this scope, the provisions of the Regulation on Control of Waste Oil which came into force after being published in Official Gazette dated June 06, 2015 and numbered 29378 shall be fulfilled in order for the disposal of the waste vegetable oils.

Waste Batteries and Accumulators

During the Project activities, waste batteries shall originate from the electronic devices, two-way radios, telephones and office equipment. The battery wastes shall be temporarily reserved inside the labelled waste battery boxes in a closed area of which bottom leak-proof is provided within the Project area in accordance with the provisions of the Regulation on Control of Waste Battery and Accumulator (Amended in the Official Gazette dated December 23, 2014 and numbered 29214) which came into force after being published in Official Gazette dated August 31, 2004 and numbered 25569. The accumulated waste batteries shall be disposed of by giving them to licensed recycling firms. The maintenance of the vehicles, construction machine and accumulator supplied equipment shall be carried out by the authorized services and the formation of waste accumulator shall be minimized.

Waste Electrical and Electronic Equipment

The formation of waste electric and electronic appliance and material is not expected during the project activities. However; in the event of the possible formation of a WEEA, these wastes shall be accumulated in the labelled waste bins in the closed, leak-proof areas and

shall be disposed in accordance with the provisions of the Regulation on Control of Waste Electrical and Electronic Equipment which came into force after being published in Official Gazette dated May 22, 2012 and numbered 28300.

End-of-Life- Tires (ELT)

The Works related to the maintenance and change of the tires of the rubber-tyred vehicles and construction machines shall be carried out in authorized and special services and it is predicted that wastes of end-of-life tires will not be generated during the Project operation activities. The disposal of the vehicle tires arising from the vehicles which will work at the land-arranging and operational stages of the project shall be carried out in accordance with the provisions of the "Regulation on Control of End-of-Life Tires" of 26357 on November 25, 2006 (Amended in the Official Gazette dated March 11, 2015 and numbered 29292). The tires in question shall be temporarily stored inside the project area in accordance with the Articles 15 and 16 of the aforementioned Regulation and shall be disposed by means of the licensed firm with which agreement will be made.

Medical Wastes

In order to respond to the health problems of the persons who will work at the construction stage of the project in question, the infirmary unit without bed shall be installed in an attempt of ambulatory treatment in the camp areas pursuant to the Article 11 of the "Regulation on Occupational Health and Safety Services" which came into force after being published in the Official Gazette dated December 29, 2012 and numbered 28512. Although the amount of the wastes occurred in infirmary unit cannot be determined, it is predicted that the amount shall be very low.

All the possible medical wastes possible to be generated in infirmary unit shall be put in red plastic sacks which are resistant to tearing, puncturing, blowing out and carrying; are produced as leak-proof, double-floor welded and without bellows from the original medium-density polyethylene raw material, of which thickness of double wings is 100 microns, of which lifting capacity is at least 10 kg and on which there will be a "ATTENTION: MEDICAL WASTE" sentence and "International Biohazard" emblem on each side in a visible size. The sacks shall be filled maximum in a ratio of ¾ and shall be tightly tied, and if necessary, each sack shall be put in another sack which have the same features and absolute leak-tightness shall be provided. The wastes which have the feature of sharp shall be gathered separately from other wastes in the containers or boxes, made up from plastic or laminated carton which has the same features, on which there is an "ATTENTION! SHARP MEDICAL WASTE" sentence and "International Biohazard" emblem and which are resistant to puncturing, tearing, breaking or blowing out and are waterproof and leak-proof and of which opening or mixing is impossible. These accumulation bins shall be filled maximum in the ratio of ¾ and shall be tightly tied and shall be put in the red plastic bags. After sharp waste bins are filled, they shall not be compressed, opened, emptied and recycled.

The medical wastes which emerge shall be accumulated separately from other wastes pursuant to "the responsibilities of producers of medical waste" determined in the Article 8 of the "Regulation on Control of Medical Wastes" which came into force after being published in the Official Gazette dated January 25, 2017 and numbered 29959 and shall be provided to be disposed by making a protocol with licensed firms.

Excavation and Demolition Wastes

Soil, rock and materials remaining from the digging which shall occur during the digging and construction works within the scope of project and concrete wastes and other demolition wastes occurring after the maintenance and repair, excavation and demolition waste shall be temporarily accumulated in the specially-designed areas and action will be in accordance with the provisions of "Regulation on Control of Excavation Soil, Construction and Demolition Wastes" which came into force after being published in Official Gazette dated March 18, 2004 and numbered of 25406, during the works.

DRILLING and LEACHING PHASE

Drilling Mud and Formation Wastes

Within the scope of the project, drilling works shall be done in the gas storage areas as a preparation before the leaching operation. These drillings shall be between 0 – 1,500 m and special drilling methods shall be used while passed to the area where leaching operation shall be done. During these drillings made, drilling mud approximately at the volume of 850-1,000 m^3 shall occur in each drilling station and the muds occurred shall be temporarily accumulated in the leak-proof, ferroconcrete pools built next to the drilling locations.

Within the scope of the project conducted at the present, it has been observed that these muds occurred during the drilling activity have generally eco-toxic hazardous character due to its salt and sulphate content. It is thought that the drilling muds occurred within this project will be sent to the licensed storage areas with waste code taken from the Ministry of Environment and Urbanization without having any influence on the project environment by keeping away from the wetland areas and water sources after the analyses to be made.

After drilling application ends in the wells planned to be dug, accumulated drilling mud shall be analyzed and its classification shall be determined within the scope of the "Regulation on Regular Storage of Wastes". In the event that drilling mud is not hazardous, it shall be disposed as non-hazardous waste; in the event that it is hazardous, it shall be disposed by conveying to the licensed disposal facilities together with the waste code given by the Ministry of Environment and Urbanization. Due to its high eco-toxic character, drilling mud shall be kept away from the project areas in case of any harmful effect on groundwater and agricultural land and pasture areas near the project areas and shall be conveyed to the proper disposal facilities.

In order not to increase the level of the pollution of the drilling muds accumulated temporarily in the pools, another polluted material or waste shall not be spilt into the pool and the pools shall be isolated against external effects.

During the direct leaching which will be carried out at the first stage of leaching activities, which will begin after the completion of the drilling works, the formation of wastes such as insoluble mud waste including chloride and sulfate in high quantities such as drilling mud, shall occur. Insoluble mud wastes which shall occur during the first 10-month direct leaching process shall be pumped into the salt-water pools thought to be founded in surface facilities together with the salt-water occurring after the leaching operation and salt-water shall accumulate at the bottom of the pools and shall turn into the insoluble mud deposit. In order to use salt-water pools regularly and properly, insoluble mud wastes accumulating as deposit at the bottom of the pools shall be wiped out from the pools once every 15 days by turns and shall be accumulated inside the leak-proof, ferroconcrete pools.

The analysis of the insoluble mud wastes which arise from the wells of which leaching process continue and which accumulate in salt-water pools shall be carried out and their classification shall be determined within the “Regulation on Regular Storage of Wastes”. In the event that insoluble mud waste is not hazardous, it shall be disposed as non-hazardous waste according to the analysis values; in the event that it is hazardous, it shall be disposed by conveying to the licensed disposal facilities together with the waste code given by the Ministry of Environment and Urbanization. Due to its high eco-toxic character, insoluble mud waste shall be kept away from the project areas in case of any harmful effect on groundwater and agricultural land and pasture areas near the project areas and shall be conveyed to the proper disposal facilities.

Insoluble Sludge Wastes

These wastes will occur at the bottom of the brine pools located at the surface facilities and included the settled insoluble particulates of the brines while the balancing in the pools before discharges via the brine discharge line. Insoluble sludge wastes will be white in color and very dense characteristic and also contain high sulphate and chloride pollutants. These wastes will be similar to the sulphate sludge of drinking water treatment plants and could be classified as non-hazardous wastes. Specially designed and leak-proof concrete pools will be established for these wastes to storing after the stripping operation from the bottom of the mud pools periodically until to the disposal time. Insoluble sludge wastes will be disposed periodically via the licensed companies due the non-hazardous features.

OPERATION PHASE

After the construction and building process of the project are completed and put in operation, then during the activities of the facility,

- Organic wastes during and after food preparation,
- Packing wastes such as paper, plastic, metal and glass after the purchasing and storage activities,
- Waste oils and chemicals occurring after the works such as flushing, changing oil, oiling, maintenance of the equipment's such as valve, generator, compressor and turbine,
- Waste vegetable oils accumulating in the kitchen unit and oil trap,
- Battery and accumulator wastes occurring after the office, workshop and maintenance works.
- Medical wastes arising from the infirmary services shall occur.

Accepting that approximately 1.08 kg solid waste shall occur per person (Turkish Statistical Institute Bulletin Number: 18777, Date: December 28, 2015), when 100 people are expected to work during the facility operation; total organic wastes to be generated daily calculated as below:

100 people x 1.08 kg /person-day = 108 kg/day

The disposal of all the solid wastes occurring as a result of the facility activities carried out during the operation of the project shall be in accordance with the "Regulation on Waste Management" which came into force after being published in Official Gazette dated April 02, 2015 and numbered of 29314.

Organic Wastes

Organic wastes are formed after meal preparation and the meals of the employees in kitchens and dish washing areas. tea houses of the office parts and personnel accommodation areas in small amounts. Organic wastes will be collected in portable, capped, leak-proof, lidded waste containers in these areas and will be accumulated temporally in waste containers labelled in waste collection points in the operation areas. Due to the distortion and smell problems of organic wastes especially in hot days, the accumulated amounts will be taken daily with hydraulic compacted garbage trucks of the closest province/district municipality or contractor to solid waste regular storage areas or waste transfer stations of the province/districts. Among the organic wastes, packing wastes which have not lost its feature of recycling shall be taken into the packing waste accumulation areas after separating from the organic wastes. Other wastes which are of a different type and having different features shall not be included in the organic wastes.

The fact that tipping the domestic solid wastes (organic wastes as meal wastes) to the seas, lakes and similar recipient ambiences, streets is forbidden needs to be paid maximum attention to and disposal will be ensured by delivering to the solid waste collection systems of the related municipality in the scope of Article 8 of "Waste Management Regulation" which entered into force after being published on the Official Gazette dated April 02, 2015 and numbered 29314.

Packing Wastes and Recyclable Wastes

Packing wastes such as paper, plastic, metal and glass shall occur after activities such as all kinds of purchasing, storing of material, canteen, buffet, which shall occur during the realizing of the facility activities. These packing wastes, which shall occur shall be put into the facility separately from other wastes and be accumulated in the containers in the temporary accumulation locations of packing wastes. After the amounts of the accumulated packing wastes and other recyclable wastes are determined according to their types, the wastes shall be taken to the labeled packing waste and recyclable waste accumulation rooms which are designed differently from other waste rooms in Central Waste Accumulation Area (CWAA) on daily basis.

The packing wastes such as paper, plastic, metal and glass which are temporarily accumulated in Central Waste Accumulation Area (CWAA) shall be periodically given to the packing waste recycling firms having Collecting and Segregation Facility (CSF) license pursuant to the articles of the “Regulation on Control of Packing Wastes” which came into force after being published in Official Gazette dated August 04, 2011 and numbered 28035.

Hazardous Wastes

The types of hazardous, harmful and pollutant wastes which could cause an adverse effect on the environment and human health in the short and long term, to be generated as a result of the activities carried out throughout the project are:

- Waste oils,
- Filters,
- Battery and accumulator,
- Containers such as dirt bins and barrels,
- Fuel and chemical wastes,
- Any type of sewage mud,
- Cartridge, toner and fluorescent lamps,
- Cleaning disinfectant, air sprays,
- Materials such as dirty clothes, fabric, cotton waste,
- Wastes such as stone, soil which are contaminated by hazardous materials,
- Wastes such as coveralls, gloves, mask, shoes, fabric, stone, soil which are contaminated by hazardous wastes.

It is thought that in the maintenance of the valve and generator during the operation of the facility there shall be hazardous grease oil waste and grease oil package during oiling of valve and waste oil and oil package after changing oil. Apart from that, it is predicted that waste machine and turbine oil in small quantities due to spillage and leakage during oil supplementation activities to be done during the compressor and turbine maintenances. During all these maintenance and oiling works which shall be done with oil, wastes such as dirty package, coveralls, gloves, mask, shoes, fabric, stone, soil shall occur in small quantities in the event of possible leakage, spillage, contamination.

In addition to the maintenance carried out during the facility activities, waste chemicals and contaminated waters shall occur as a result of the flushing of turbines and maintenance of accumulators made through pure water or acid and all of these wastes shall be temporarily accumulated as hazardous waste in the CWAA (Central Waste Accumulation Area). The hazardous wastes which are temporarily accumulated shall be sent to the licensed hazardous waste disposal facilities. The disposal processes shall be carried out by the licensed firms to be agreed in line with the provisions of the "Regulation on Waste Management" published in Official Gazette dated April 02, 2015 and numbered 29314. In the event that the annual amount of hazardous waste accumulation capacity is over the determined capacity, license for temporary waste accumulation shall be taken.

Necessary measures shall be taken in order to prevent any formation of waste oil during the maintenance and the waste oils shall be temporarily accumulated inside the labelled metal barrels having been put inside the drip trays in the specially-designed rooms within the Central Waste Accumulation Area in accordance with the conditions provided in the Parts 4 and 5 of the Regulation on Control of Waste Oil in such a way that spillage response kit is available and without mixed with other waste oil types. Oil quality classification of the accumulated waste oil shall be determined by having analysed in an accredited laboratory. In accordance with the result of analysis, waste oils shall be disposed by the firms which have taken license from the Ministry of Environment and Urbanization in accordance with the Part 2 of the Regulation on Control of Waste Oil (Amended in the Official Gazette dated November 05, 2013 and numbered 28812) which came into force after being published in Official Gazette dated July 30, 2008 and numbered 26952.

The necessary attention shall be paid in order to prevent the formation, reduction of the above-mentioned hazardous wastes in their source and dispose in accordance with the related legislations during the facility operation activity. The workers of the project shall be informed by means of trainings on the reduction of these types of wastes in their source and possible environmental incidents (such as leak-proof, spillage, diffusion, contamination) especially in the works carried out with hazardous materials shall be minimized by means of the measures to be taken, so that the formation of hazardous waste is avoided.

After the possible formation of hazardous waste during the processes such as maintenance, oiling within the facility activities, the activity in the contaminated area shall be temporarily ceased and contaminated areas and materials shall be purified and shall be temporarily accumulated inside the labelled, closed, leak-proof portable containers on which there are hazardous and warning signs and which shall be in these areas.

The workshops built during the facility operation and permanent areas where hazardous fuel, oils and chemicals are used such as fueling and maintenance-oiling areas shall be built on the leak-proof concrete grounds and the diffusion of the hazardous waste shall be avoided by means of enough drainage systems. The drainage made in these areas shall be passed through the oil traps and shall be linked to the main infrastructure system which ends through purification facility. The oils kept in oil traps shall be periodically cleaned and shall be

temporarily stored as waste oil in CWAA hazardous waste room. The chemicals in temporary operation areas shall be kept in leak-proof drip trays in closed areas against the hazardous wastes which shall occur due to the hazardous fuel, oil and chemicals which are possibly used during maintenance activities. In such areas, spillage response kits shall be available against the environmental risks such as possible leakage, spillage and the area shall be cleaned after possible environment incident.

Similarly, the hazardous wastes such as cartridge, toner, fluorescent, cleaning chemicals, air sprays which occur during facility office and cleaning works shall be temporarily accumulated in the specially prepared areas in the CWAA hazardous waste room until disposal time.

The amounts of hazardous waste that occurred shall be determined according to their types on a daily basis and shall be included to the waste recording system.

Waste Vegetable Oils

Waste vegetable oils shall be comprised of the post-frying oils in all kitchens and the oils kept in oil traps in the kitchen drain within the facility. These frying oils used and the top oils of the oil trap which shall occur in the dining halls inside the facility area shall be accumulated in a clear and lidded vessel separately from other wastes. Waste vegetable oils shall not be spilt on to the sewerage system, soil and such like receiving environment in order to protect the environment. Within this scope, the provisions of the Regulation on Control of Waste Oil which came into force after being published in Official Gazette dated June 06, 2015 and numbered 29378 shall be fulfilled in order for the disposal of the waste vegetable oils.

Waste Battery and Accumulators

During the Project activities, waste batteries shall originate from the electronic devices, two-way radios, telephones and office equipment. The battery wastes shall be temporarily reserved inside the labelled waste battery boxes in a closed area of which bottom leak-proof is provided within the Project area in accordance with the provisions of the Regulation on Control of Waste Battery and Accumulator (Amended in the Official Gazette dated December 23, 2014 and numbered 29214) which came into force after being published in Official Gazette dated August 31, 2004 and numbered 25569. The accumulated waste batteries shall be disposed of by giving them to licensed recycling firms.

The maintenance of the vehicles, construction machine and accumulator supplied equipment shall be carried out by the authorized services and the formation of waste accumulator shall be minimized.

Waste Electrical and Electronic Equipment

The formation of waste electric and electronic appliance and material is not expected during the project activities. However; in the event of the possible formation of a WEEA, these wastes shall be accumulated in the labelled waste bins in the closed, leak-proof areas and shall be disposed in accordance with the provisions of the Regulation on Control of Waste

Electrical and Electronic Equipment which came into force after being published in Official Gazette dated May 22, 2012 and numbered 28300.

End-of-Life Tires (ELT)

The Works related to the maintenance and change of the tires of the rubber-tyred vehicles and construction machines shall be carried out in authorized and special services and it is predicted that wastes of end-of-life tires will not be generated during the Project operation activities. The disposal of the vehicle tires arising from the vehicles which will work at the land-arranging and operational stages of the project shall be carried out in accordance with the provisions of the "Regulation on Control of End-of-Life Tires" of 26357 on November 25, 2006 (Amended in the Official Gazette dated March 11, 2015 and numbered 29292). The tires in question shall be temporarily stored inside the project area in accordance with the Articles 15 and 16 of the aforementioned Regulation and shall be disposed by means of the licensed firm with which agreement will be made.

Medical Wastes

In order to respond to the health problems of the persons who will work at the operation stage of the project in question, the infirmary unit without bed shall be installed in an attempt of ambulatory treatment in the camp areas pursuant to the Article 11 of the "Regulation on Occupational Health and Safety Services" which came into force after being published in the Official Gazette dated December 29, 2012 and numbered 28512. Although the amount of the wastes occurred in infirmary unit cannot be determined, it is predicted that the amount shall be very low.

All the possible medical wastes possible to be generated in infirmary unit shall be put in red plastic sacks which are resistant to tearing, puncturing, blowing out and carrying; are produced as leak-proof, double-floor welded and without bellows from the original medium-density polyethylene raw material, of which thickness of double wings is 100 microns, of which lifting capacity is at least 10 kg and on which there will be a "ATTENTION: MEDICAL WASTE" sentence and "International Biohazard" emblem on each side in a visible size. The sacks shall be filled maximum in a ratio of ¾ and shall be tightly tied, and if necessary, each sack shall be put in another sack which have the same features and absolute leak-tightness shall be provided. The wastes which have the feature of sharp shall be gathered separately from other wastes in the containers or boxes, made up from plastic or laminated carton which has the same features, on which there is an "ATTENTION! SHARP MEDICAL WASTE" sentence and "International Biohazard" emblem and which are resistant to puncturing, tearing, breaking or blowing out and are waterproof and leak-proof and of which opening or mixing is impossible. These accumulation bins shall be filled maximum in the ratio of ¾ and shall be tightly tied and shall be put in the red plastic bags. After sharp waste bins are filled, they shall not be compressed, opened, emptied and recycled.

The medical wastes which emerge shall be accumulated separately from other wastes pursuant to "the responsibilities of producers of medical waste" determined in the Article 8 of

the “Regulation on Control of Medical Wastes” which came into force after being published in the Official Gazette dated July 22, 2005 and numbered 25883 and shall be provided to be disposed by making a protocol with licensed firms.

For the operation period within the scope of the planned Gas Storage Expansion Project, a sample of the layout plan and waste area of operation facility belonging to the surface facilities have been described Figure 5.6.3.2.

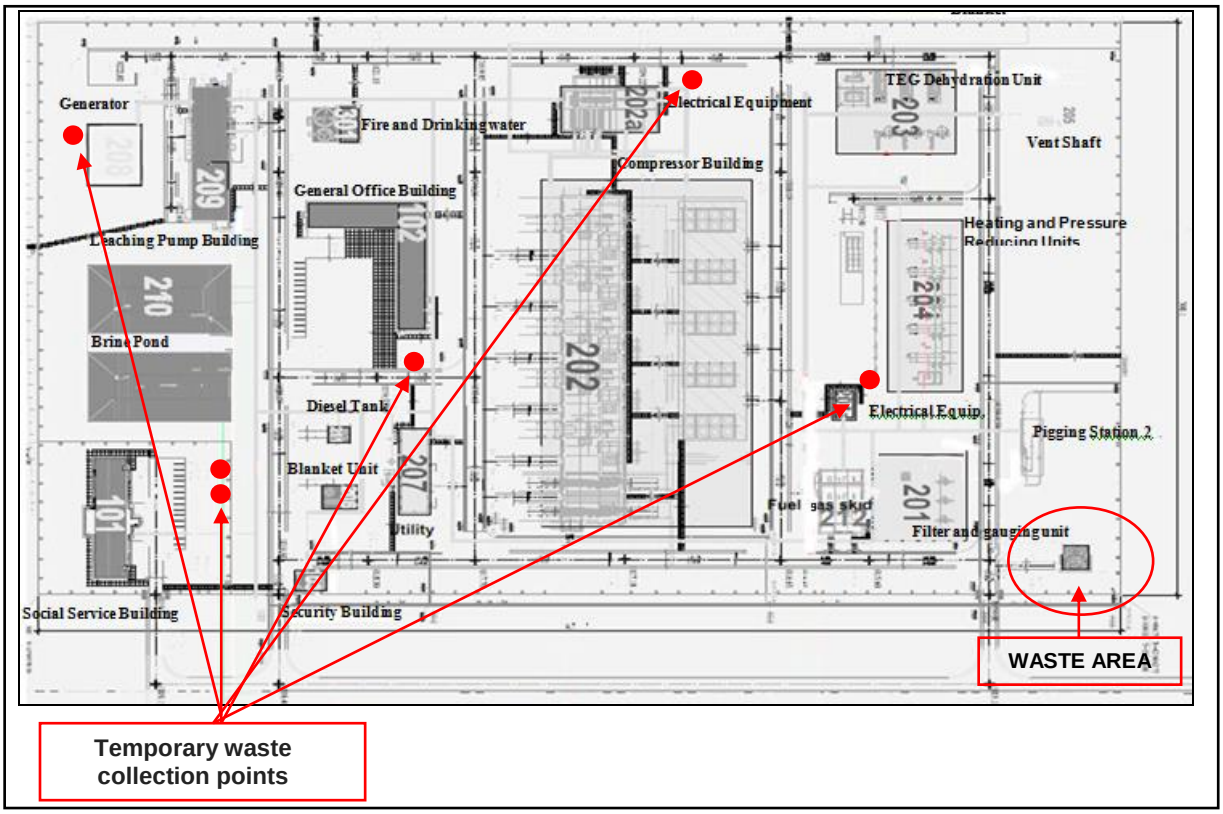


Figure 5.6.3.2. Surface Facilities Sample Layout Plan and Operation Facility Waste Area

5.6.4. Noise and Vibration

Background Noise Measurements

Within the scope of the Gas Storage Expansion Project planned by the ÇINAR Environmental Laboratory Co. between the dates December 10-14, 2016, noise measurements have been conducted at 5 different points in the morning, at noon and at night (Picture 5.6.4.1.).

Picture 5.6.4.1. A View from the Noise Measurement Studies Performed Within the Scope of the Gas Storage Expansion Project

As a result of the assessments made by considering the project site and the vicinity as the basis, noise measurements have been conducted at 5 different points in the morning, at noon and at night.

The measurements have been performed at the points of Bucak Neighborhood (Bucak plateau homes) entrance, Besci Village entrance, Tömü plateau, Bezirci neighborhood connected to Güneşli and the district of Sultanhanı.

When comparing the results of the values of the measurements performed with the limit values of the Leq (dBA), stated in the RAMEN, it has been found that the measurement results have remained below the limit values.

Noise Modeling Studies and Assessments

It is expected for noise to form during the excavation works and plant installations to be carried out during the land preparation and construction phases of the project along with the utilization of machines, tools and equipment during the construction of wells.

During the operational phase of the project, since it is expected for noise to arise only due to the administration of natural gas storage and vehicles entering and exiting the project site as well as due to equipment such as pumps, compressors, etc.

Modeling methodology

To run the model it is necessary to provide some input information about meteorological conditions, source details and receptors. The data used in SoundPLAN 7.3 software to create the model is given in below Table 5.6.4.1.

Table 5.6.4.1. Modeling methodology with SoundPLAN 7.3

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 (TR) - Industry
Grid Noise Map	Grip Space (m)	10
	Height above ground	4

Construction Phase

Within the context of the project, the units will operate between times 07.00-19.00 as a single shift in works to be performed in an open field during the land preparation and construction phases. Attention will be paid for equipment that emits noise not to be used outside of hours from 07.00-19.00.

On the other hand, the storage of natural gas is planned in the operational phase of the project, by working 24 hours each day. Within the framework of the project, pipelines (fresh water line, fresh water discharge line and natural gas branchman line), auxiliary surface facilities (pump stations and water tanks) and surface facilities-well sites will be constructed.

It is expected for the construction phase of the project to last for 7 years and its economic life is estimated to be 30 years. It is planned for 48 new wells to be constructed within the project in groups of 6.

The machinery, tools and equipment that will operate during the land preparation and construction phase within the scope of the project along with their amounts are provided in Table 5.6.4.2.

Table 5.6.4.2. Machinery and Equipment to be used in Construction Works

Project Site		Equipment	Amount
Pipelines	Fresh Water Line	Excavator	2
		Truck	2
		Loader	1
		Tractor	1
		Grader	1
		Mobile crane	1
		Concrete mixer	1
		Concrete pump	1
		Sideboom	4
		Trailer	4
		Bobcat	1
		Compactor	2
		Motor pump	1

Project Site		Equipment	Amount
	Brine Water Discharge Line	Excavator	2
		Truck	2
		Loader	1
		Tractor	1
		Grader	1
		Mobile crane	1
		Concrete mixer	1
		Concrete pump	1
		Trailer	4
		Bobcat	1
		Compactor	2
		Motor pump	1
	Natural Gas Branchman Line	Excavator	2
		Truck	2
		Loader	1
		Tractor	1
		Grader	1
		Mobile crane	1
		Concrete mixer	1
		Concrete pump	1
		Sideboom	4
		Trailer	4
		Bobcat	1
		Compactor	2
		Motor pump	1
Auxiliary Surface Facilities	Pump Stations (for the construction of 3)	Excavator	6
		Truck	6
		Loader	3
		Digger-loader	3
		Tractor	3
		Mobile crane	3
		Concrete mixer	12
		Concrete pump	3
		Trailer	3
		Compactor	6
		Motor pump	3
	Water Tanks (for the construction of 3)	Excavator	6
		Truck	6
		Loader	3
		Digger-loader	3
		Tractor	3
		Mobile crane	3
		Concrete mixer	12
		Concrete pump	3
		Trailer	3
		Compactor	6
		Motor pump	3

Project Site		Equipment	Amount
Surface Facilities and Well Sites	Surface Facilities	Excavator	4
		Truck	8
		Loader	1
		Digger-loader	2
		Tractor	1
		Mobile crane	4
		Concrete mixer	8
		Concrete pump	2
		Trailer	4
		Water truck	1
		Compactor	2
		Concrete plant	2
		Motor pump	1
	Well Sites (for the construction of 6)	Excavator	6
		Truck	6
		Loader	6
		Digger-loader	6
		Grader	6
		Vibratory roller	6
		Tractor	6
		Mobile crane	6
		Concrete mixer	12
		Concrete pump	6
		Trailer	4
		Compactor	2
		Motor pump	1

The machinery and equipment indicated in the table will operate in a certain order; while based on the most negative scenario in the noise measurements made, it has been assumed that all the vehicles to operate at the project sites will function at the same time. For the purpose of determining the total level of noise to be created during the land preparation and construction works of the planned project, the Sound PLAN 7.3 program has been utilized. As for the information on the noise levels of the vehicles and equipment that have been chosen as the source of noise in the measurements conducted, it has been obtained from the database found in the program's library.

The elevation model of the natural ground, which directly influences noise dispersion, has first been formed. While reflecting the natural ground on to the program, the topographic data obtained from Google Earth program have been digitized.

Following the digitization of the elevations, a DGM (digital ground model) has been formed so that the program will be able to detect the digitized elevations. After a DGM has been formed, the source of noise has been drawn in conformity with its standard by entering its data into the software. As a result of these works which have been performed, the area of measurement where the noise level will be measured has been determined and after the

receiving points have been defined, the levels of noise arising from the machine and equipment to operate in this area have been measured for these points.

In the measurements conducted, the project site has been separated into 8 portions indicated below while noise emissions to be created in these portions have been modeled separately.

1. Fresh water line, pump stations and water tanks portion
2. Fresh water line portion-2
3. Fresh water line portion-3
4. Fresh water line portion-4
5. Fresh water line portion-5
6. Fresh water line portion-6
7. Fresh water line and natural gas branchman line portion
8. Surface facilities and well sites portion

Noise maps and modeling results have been provided in the Appendix 14, as can be understood from the maps, the level of the noise arising from vehicles to operate during the construction works of the project increase to high values, especially in the area where the vehicles are working.

The limit values of environmental noise for the construction site indicated in Table-5 of Annex-VII of the “RAMEN”, which came into force by being published in the Official Gazette dated June 04, 2010 and numbered 27601, are provided in Table 5.6.4.3.

Table 5.6.4.3. Limit Values of Environmental Noise for the Construction Site

Type of activity (construction, demolition and repair)	L_{day} (dBA)
Building	70
Road	75
Other sources	70

The IFC General EHS Guideline addresses the impacts of noise beyond the property boundary of the facilities. According to the Guideline, noise impacts should not exceed the levels presented in Table 5.6.4.4. below, or result in a maximum increase in background levels of 3 dBA at the nearest receptor location off-site. Since, noise sensitive receptor is located in a residential area in this project, noise level limits of 55 dBA and 45 dBA are considered for daytime and nighttime guideline L_{Aeq} limits, respectively. EU Directive on the assessment and management of environmental noise does not define noise limits but refer “limit value” to be determined by the Member States.

Table 5.6.4.4. IFC General EHS Guidelines Noise Limits

IFC General EHS Guidelines - Noise Standards based on WHO Guidelines (Section 1.7 Table 1.7.1)		
Receptor	**One Hour Leq (dBA)**	
	Daytime 07:00 - 22:00	**Night time 22:00 - 07:00**
Residential; institutional; educational	55	45
Industrial; commercial	70	70

The results of the construction phase model are given in below tables with 8 portions;

Table 5.6.4.5. Modeling Results of Fresh Water Line, Pump Stations and Water Tanks Portion

Receiver	X m	Y m	Z m	Ld dB(A)
Ağaçören	3776204,01	4677014,0	1201,90	44,8
Boğazköy	3772796,01	4689336,8	943,91	39,0
Camili	3778537,12	4676214,5	1164,25	48,1
Evren	3763913,05	4697662,9	903,34	21,0
Güzelgöz	3771979,74	4678502,6	1191,79	21,0
Harmandalı	3778761,78	4685133,4	992,90	36,9
Kütüklü	3776486,13	4683569,5	1040,05	49,0
Sarıyahşi	3768753,32	4692822,6	939,22	24,2
Yenişabanlı	3770914,06	4675852,2	1277,52	32,5

Table 5.6.4.6 . Modeling Results of Fresh Water Line Portion-2

Receiver	X m	Y m	Z m	Ld dB(A)
Hacıahmetlitepeköy	3782725,16	4667776,7	1233,60	17,2
Hacıs mailli	3775611,50	4665613,9	1272,27	27,2
Kederli	3778822,70	4669685,2	1275,50	37,6

Table 5.6.4.7 . Modeling Results of Fresh Water Line Portion-3

Receiver	X m	Y m	Z m	Ld dB(A)
Çatalçeşme	3777871,64	4660083,1	1326,20	21,0
Hacıibrahimuşağı	3780076,03	4653275,8	1354,88	24,2
Hacımahmutuşağı	3778948,33	4656057,6	1350,86	28,2
Hıdırlı	3778576,35	4651085,5	1316,25	22,2
Namlıkışla	3783426,78	4660741,3	1361,53	12,1
Pınarbaşı	3777958,93	4653678,9	1312,07	28,1

Table 5.6.4.8. Modeling Results of Fresh Water Line Portion-4

Receiver	X m	Y m	Z m	Ld dB(A)
Bostanlık	3773312,41	4639436,6	1286,43	39,0
Camuzluk	3776351,23	4645264,8	1260,48	27,6
Ishaklı karapınar	3775624,91	4648873,8	1268,72	36,2
Karapınar	3775514,12	4649605,3	1283,37	31,8
Oğuzlar	3778015,29	4647607,6	1298,08	30,1

Table 5.6.4.9 . Modeling Results of Fresh Water Line Portion-5

Receiver	X m	Y m	Z m	Ld dB(A)
Acıpınar-1	3770382,00	4624772,5	982,05	50,5
Acıpınar-2	3769719,03	4624047,8	969,74	52,3
Baymış	3770396,51	4623538,2	968,54	44,2
Sapmaz-1	3772584,62	4627564,0	1038,25	72,5
Sapmaz-2	3772500,84	4627350,1	1033,86	67,2
Sapmaz-3	3772480,16	4627162,2	1029,80	71,7
Sapmaz-4	3772366,23	4627204,8	1030,61	72,8

Table 5.6.4.10. Modeling Results of Fresh Water Line Portion-6

Receiver	X m	Y m	Z m	Ld dB(A)
Yenikent	3756213,35	4603126,8	924,44	32,5

Table 5.6.4.11. Modeling Results of Fresh Water Line And Natural Gas Branchman Line Portion

Receiver	X m	Y m	Z m	Ld dB(A)
Küçük Katırcı Highland	3741491,56	4584108,2	938,05	54,7
Osman Böge Highland	3740886,95	4582067,8	937,80	60,5
Sultanhanı	3738448,32	4588164,4	932,11	28,8
Süleyman Mutlu Highland	3741193,23	4585896,0	936,07	46,1

Table 5.6.4.12. Modeling Results of Surface Facilities and Well Sites Portion

Receiver	X m	Y m	Z m	Ld dB(A)
Bezirci	3736955,59	4571637,3	976,89	53,5
Bucak Highland	3742971,36	4563091,1	998,53	43,3
Tömü Highland1	3737872,93	4569260,9	995,79	58,0
Tömü Highland2	3738123,08	4569073,5	997,33	57,3

When comparing the noise dispersion results modeled in the receiving environments, it can be seen that the noise levels have been exceeded at Sapmaz Neighborhood, passing through the fresh water line and noise impacts will be occurred at Sapmaz Neighborhood during the pipeline installation works. However, the other settlements those are Bucak Plateau, Besci Village, Tömü Plateau, Bezirci Neighborhood and the town of Sultanhanı will be exposed to the noise impacts slightly due the vehicle movements mostly.

During the construction phase noise measurements should be made during the construction activities and it should be checked whether it is within the limits of the local noise legislation in areas where noise levels such as Sapmaz neighborhood are expected to be high. According to the measurement results, additional measures will be taken in areas where noise limit values are exceeded.

Since modeling has been carried out in the measurements conducted by assuming that all machinery and equipment will operate at the same time and since the noise levels emanating from the vehicles have been measured without taking any precautions in the modeling, with the measures to be taken during the construction phase the noise levels will be able to be drawn under 70 dBA which is the Regulation limit value. It can be seen that the limit value will be ensured in all areas apart from this one.

The limit values of environmental noise for the construction site indicated in Table-5 of Annex-VII of the “RAMEN” which came into force by being published in the Official Gazette dated June 04, 2010 and numbered 27601 will be complied to during the land preparation and construction phase of the project.

Since land preparation works within the scope of the project will be conducted in an open field, it will be quite difficult to take measures against noise. Noise will show alterations all day throughout the works performed, but since the works will be conducted in the day (07.00-19.00), noise formation will have been limited.

By taking into consideration article 9 of the Regulation on the conditions to conform to in highway vehicles and article 13 on the conditions to conform to in equipment used in open field, the necessary measures will be taken in the works within the scope of the project in order to minimize the formation of noise.

Furthermore, regarding noise to develop at the project site during the construction phase, the points indicated in Article 23 on “noise criteria for construction sites” indicated in section 4 of the “Regulation on Assessment and Management of Environmental Noise” will be accorded with and vehicles whose inspections, exhaust gas measurements and maintenances have been made, will be used.

In order to protect workers from noise arising from the machinery and equipment used during construction and when required; in accordance with the principles of the “RAMEN”, regulated according to the Article 78 of the Labor Law numbered 4857 which came into force

by being published in the Official Gazette dated June 04, 2010 and numbered 27601 the necessary measures will be taken for the protection of the workers from risks which may arise in terms of health and safety as a result of being exposed to noise and in particular from risks associated with hearing. By providing the workers working with machinery and equipment during construction with appropriate protective tools and equipment like helmets, headphones or ear plugs, it will be ensured that workers will not be affected by noise.

Operation Phase

In the operational phase of the project, will be working 24 hours each day. The machinery, tools and equipment that will operate during the operation phase within the scope of the project along with their amounts are provided in Table 5.6.4.13.

Table 5.6.4.13. Machinery and Equipment to be used in Operation Phase

Project Site	Equipment	Amount
Surface Facilities	Compressor 10 - 30 cbm/min, sound tire muffled	7
	Car	5

Noise maps and modeling results have been provided in the Appendix-14, as can be understood from the maps, the level of the noise arising from vehicles to operate during the operation works of the project increase to high values, especially in the area where the vehicles and machinery are working.

The limit values of environmental noise for the surface facilities site (industrial facilities) indicated in Table-4 of Annex-VII of the “RAMEN”, which came into force by being published in the Official Gazette dated June 04, 2010 and numbered 27601, are provided in Table 5.6.4.14.

Table 5.6.4.14. Turkish Limit Values of Environmental Noise for the Industrial Facilities (Operation Phase)

Areas	L_{day} (dBA)	$L_{evening}$ (dBA)	L_{night} (dBA)
Noise sensitive areas such as place of education, cultural activities, health center and summer resorts and camping sites	60	55	50
Areas with both noise sensitive areas and industrial activities (predominantly residential)	65	60	55
Areas with both noise sensitive areas and industrial activities (predominantly industrial)	68	63	58
For each facilities that are in organized industrial zone or industrial region	70	65	60

The results of the operation phase model is given in below Table 5.6.4.15.;

Table 5.6.4.15 Modeling Results of Surface Facilities (Operation Phase)

Receiver	X m	Y m	Z m	Lden dB(A)	Ld dB(A)	Le dB(A)	Ln dB(A)
Bezirci	3736955,59	4571637,3	976,89	37,7	31,3	31,3	31,3
Tömü Highland-1	3737872,93	4569260,9	995,79	30,0	25,0	25,0	25,0
Tömü Highland-2	3738123,08	4569073,5	997,33	30,0	25,0	25,0	25,0

According to the noise modelling results, calculated noise levels are below the limits in Turkish Limit Values of Environmental Noise for the Industrial Facilities and IFC guidelines (Table 5.6.4.4) as explained. According to the results in the residential area, the noise level is around 30 dBA in case that there is not any temporary external noise source.

Modeling studies were carried out at the noise measurement points realized at 5 points for the current state studies. The values obtained as a result of the modeling studies and the values obtained in the measurement results are cumulatively calculated according to the following formula.

$L_{eq} = 10 \times Log_{10} (10^{L1/10} + 10^{L2/10} + \ldots\ldots 10^{Ln/10})$

L_{eq} = Equivalent continuous noise level [dB (A)]
L_1 = Sound pressure level [dB (A)]
n = Number of sources

The details of the cumulative calculation are given in the following Table 5.6.4.16.

Table 5.6.4.16. Cumulative Noise Assessment for Operation Phase

Measurement & Calculated Point	Cumulative Assesment								
	Average Values for Measurement [dB (A)]			Cumulative Values with Logarithmic Sum [dB (A)]			Limit Value [dB (A)]		
	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night
NMP-1	49.8	47.0	44.6	**49.8**	**47.0**	**44.6**	65	60	55
NMP-2	63.3	58.7	54.4	**63.3**	**58.7**	**54.4**	65	60	55
NMP-3	48.5	47.7	47.1	**48.5**	**47.7**	**47.1**	65	60	55
NMP-4	54.7	52.4	50.1	**54.7**	**52.4**	**50.1**	65	60	55
NMP-5	56.9	53.4	50.8	**56,9**	**53,406**	**50,81**	65	60	55

Note: *If there is a difference of 20 dB or more between the noise levels, the value which is high in the cumulative total result does not change.*

As can be seen from the table above, the noise levels caused by the operation phase will not have an import effect on the measured noise levels at the nearest settlement points.

5.6.5. Wastewater

The water needs of the personnel to work in construction and operation phases will be met by buying water with tankers from Sultanhanı Municipality, as per the case in the Underground Gas Storage Project, the construction of which is continuing. In addition to this, in case of need in the Gas Storage Expansion Project, two ground water wells are planned and the required licenses will be obtained as per the Groundwater Law No 167. For the domestic wastewater to be generated at the facility; the wastewater treatment plant based on biological treatment system to be used on operation phase will be used, the wastewater will be discharged into the recipient ambiences such as seasonal creeks and natural drainages to be identified pursuant to discharge permissions to be taken in case that the effluent qualities are in conformity after the wastewater is treated. Moreover, the treated water will be possibly used for irrigation of landscapes pursuant to the agricultural irrigation permissions.

The package wastewater treatment plant in the project shall be endorsed in the scope of Wastewater Treatment / Deep Sea Discharge Facility Project Approval Circular (2014/07) dated March 04, 2014 and No 2746. “Environmental Permit Certificate” shall be taken for discharging the treated wastewater in accordance with the provisions of the “Regulation on Environmental Permit and Licence” which came into force by being published in the Official Gazette dated September 10, 2014 and numbered 29115 for Wastewater Treatment Plant. In addition, within the context of discharging the wastewater into the recipient ambiences as a result of treating the domestic wastewater in package treatment plant, the 4th Regional Directorate of DSİ will be consulted.

Current flood protection structures shall not be damaged, the excess excavation materials and waste-like wastes which are not going to be used for the project shall not be poured into the stream bed in the scope of all construction activities to be carried out for the surface facilities among the permanent fixed production and the well/cavern locations, during the land preparation and construction works. Wastewater with domestic properties which are made harmless with the package wastewater treatment plant shall be removed according to the Water Pollution Control Regulations and Water Products Regulations provisions and criteria. 1380 numbered Water Products Law provisions shall be followed at all stages of the project.

Domestic Wastewater

500 people will work in land preparation construction studies and 100 people will work in operation phases in the scope of the Gas Storage Expansion Project.

According to the information received from the official website of TURKSTAT, the amount of water withdrawn per person will be 180 lt / day-person. Assuming that the water to be used shall be transformed into wastewater by 80%;

It is calculated that 500 people x (180 lt/day-person x 80/100) = 72 m^3/day for land preparation and construction phase and 100 people x (180 lt/day-person x 80/100) = 14.4 m^3/day for operation phase.

The formation of wastewater arising from any personnel apart from the domestic wastewater sourcing from the personnel working in construction phase is not a matter of concern. As mentioned above, the domestic wastewater amount to source from the personnel working in construction will be 72 m^3 per day.

As for the operating phase, domestic wastewater formation from various processes and people working in operation will be possible. The 14.4 m^3/day amount of the domestic wastewater from the working personnel are assumed to be generated and 80% of the water used will be transformed into wastewater.

For the domestic wastewater to be generated at the facility; the wastewater treatment plant based on the biological treatment system to be used on operation phase will be used, the wastewater will be discharged into the recipient ambiences such as seasonal creeks and natural drainages to be identified pursuant to discharge permissions to be taken in case that the effluent qualities are in conformity after the wastewater is treated. Within the context of discharging the wastewater into the recipient ambiences as a result of treating the domestic wastewater in package treatment plant, the 4th Regional Directorate of (SHW) will be consulted. Moreover, the treated water will be possibly used for irrigation of landscapes pursuant to the agricultural irrigation permissions.

The package wastewater treatment plant in the project shall be endorsed in the scope of Wastewater Treatment / Deep Sea Discharge Facility Project Approval Circular (2014/07) dated March 04, 2014 and No 2746. “Environmental Permit Certificate” shall be taken for discharging the treated wastewater in accordance with the provisions of the “Regulation on Environmental Permit and Licence” which came into force by being published in the Official Gazette dated September 10, 2014 and numbered 29115 for Wastewater Treatment Plant.

The recipient ambiance values and wastewater discharge criteria in the Regulation and Law on Water Products No 1380 and “Regulation on Water Pollution Control (Amendment: R.G-March 25, 2012- 28244)” which came into force by being published in the Official Gazette dated December 31, 2004 and numbered 25687 shall be complied for any type of water to be discharged into stream beds and branches within the project.

It is possible to summarize the process wastewater to be generated in Gas Storage Expansion Project as brine, insoluble effluent, mud water, washing water and oily water.

Brine

In the scope of the project, during the leaching activities of wells/caverns which will be the underground storing tanks and which will be carried out on a certain height in the underground homogeneous salt rocks, fresh waters brought with the fresh water pipeline from the Hirfanlı Dam and salt water throughout the leaching process, and which will be used for leaching the salt domes will occur.

The salt water occurring throughout the leaching process shall be pumped from the surface facilities to the salt water accumulation pools by Glass Fiber Reinforced Plastic (GRP). The salt water depots which will be balanced here shall be discharged from the pools arid lands of Tuz Gölü Basin by gravity flow and GRP pipe and through established salt water discharge lines.

The discharge will be transferred to the Tuz Gölü Basin through diffusers after the coordinate and discharge permissions are taken

The discharge will be transferred to the Tuz Gölü Basin through diffusers after the coordinate and discharge permissions are taken from Directorate General for Preservation of Natural Heritage, of the Ministry of Environment and Urbanization and it is foreseen that the salt water with same density with the Tuz Gölü water character will be accumulated in the Tuz Gölü by passing through the arid lands within the basin as observed in the Underground Gas Storage Project (Picture 5.6.5.1.). It is envisaged that around 8 - 9 m^3 fresh water would be used to leach 1 m^3 salt mass. Nevertheless, it is planned that around 60 million m^3 of salt water would be discharged into the Tuz Gölü Basin annually, with the assumption of no evaporation and loss in water volume occurs after leaching with annual 60 million m^3 of fresh water to be obtained from Hirfanlı Dam Lake.

Picture 5.6.5.1. View from the Brine Discharge Line Diffuser Point belonging to Underground Gas Storage Project under leaching studies

Due to the fact that the density of discharged brine is the same with the density of the Tuz Gölü water mass, in the scope of the project being currently executed, it was observed from the experience of the monitoring activities of the ongoing Underground Gas Storage Project that no effect had been on flora, fauna, soil and water structures in Tuz Gölü ecosystem. In addition to this, as in the Underground Gas Storage Project under construction, in monthly periods and weekly when needed, salt water samples will be taken from the exit point of Brine Discharge Line, the closest depots formed by brine discharged and depots formed by possibly the most far point.

In these samples, the following parameters shall be checked; pH, Electrolytic Conductivity (EC), Salinity, Total Dissolved Solids (TDS), Suspended Solids (SS), Sulphate, Chloride, Alkalinity, Nitrate, Nitrite, Ammonium Nitrogen, Sodium, Magnesium, Calcium, Copper, Zinc, Arsenic, Mercury and Lead. In these analyses, the amounts of the values such as SSs formation in salt water, Anion-Cation Balance, heavy Metals etc. shall be determined and monitored.

In addition to brine analysis, soil samples will be taken, again in monthly periods in order to identify the characteristics of the soil structure in the salt water range and in these samples, parameters such as saturation with water, pH, resoluble ions and changeable cations (calcium, Magnesium, sodium, potassium, etc.), CEC (Cation Exchange Co-efficiency) will be examined and monitored by comparing with the characteristic of soil structure before discharging shall be realized. In addition to this, the construction activities will be stopped between March and August, the migration time in the Tuz Gölü Basin, which is a natural bird migration area, and the possible effects on the accommodation and reproductive habits of migratory birds will be reduced.

Furthermore, the possible effects on the ecosystem's current structure will be observed and reported with monitoring activities to be carried out over a period of time with bird and reptilian scientists and flora experts.

Insoluble Effluent

In the scope of the Gas Storage Expansion Project, a series of works including the leaching works carried out on leaching sites, placing leaching equipment, fresh water intake, leaching operation, placing the test equipment after removing the leaching equipment, leached volume measurement, placing leaching equipment after removing test equipment and continuing leaching will be realized in certain periods and the insoluble effluent including molecule and components not dissolving in water, chloride and sulphate and remaining in the equipment during the equipment removing and placing in the well and these water will be collected in leak-proof concrete pools constructed near the wells where the leaching works are carried out.

These waters envisaged to have eco-toxic polluter quality due to high chloride and sulphate content, but not in dangerous character will be accumulated in leak-proof pools open to the atmosphere which have high and sufficient volumes and it will be ensured that it will not contaminate to the possible aquatic ambiances and agricultural, pastoral areas, although not being superficial water mass. The insoluble effluent amounts remaining at the end of evaporation throughout the process will vary as per the processes and will be removed as per the legislations, on a periodic basis.

It is foreseen that small amounts of insoluble effluent would be formed during only the first gas filling at the beginning of operation and would not be formed at the rest of the operation.

Mud Water

The wells planned to be constructed between 0-1.500 m for carrying out leaching studies of the Gas Storage Expansion Project will be formed and drilling work for this will be done. During drilling, formation wastes and drilling mud waste will occur and these wastes will be stored in leak-proof mud pools with sufficient volumes near the drilling points in the form of liquid mud.

The waters occurring after the pre-treatment studies such as dehydration, passing through oil trap in case of need during the process of disposal of mud pursuant to the identification of disposal methods and waste characteristics of mud in accredited laboratories with the samples taken from the mud in the pools shall be named as mud water and these waters will be accumulated in drilling mud pools which are emptied.

It will be ensured that these waters foreseen to have Eco toxic polluter quality due to high chloride and sulphate, but not in a hazardous character as insoluble effluent would be collected in leak-proof, high pools with sufficient volumes open to atmosphere and it will not contaminate the soil and the aquatic ambiances in the surroundings. The mud water to remain pursuant to evaporation throughout the process shall be around 10% of the drilling mud amount which occurs and it will be approximately 150 m^3 for each drilling site. The mud waters remaining after the disposal of drilling mud shall be removed to the urban infrastructure systems, chemical wastewater treatment plants or licensed hazardous waste disposal facilities as per the legislations, on a periodical basis, if the physical and chemical parameters of the mud waters are fit to the accepting standards of these facilities.

The mud waters shall be formed only after drilling mud disposal and they will not be generated throughout the operation.

Washing Water

The washing waters to emerge in the scope of the Gas Storage Expansion Project shall consist of washing and cleaning works in the camp sites, workshops and other working areas together with the concrete washing area on the concrete batching plants and truck mixer and concrete washing waters on the project sites. The washing and cleaning waters on the camping, workshops and working areas shall be connected to oily water collection system or direct infrastructure system which will be set up in parallel to the main infrastructure with specially designed closed systems.

The concrete washing works shall be carried out on specially designed areas in the concrete plant and the washing waters will be taken to the concrete washing pools with sufficient volume from these areas via channels. Due to the possible chemical content of concrete washing waters, the residuum accumulated in concrete washing pools to be constructed from the soil ground, shall be collected in certain periods and will be able to be used in manufacturing the filling after being dried with laying method on special areas.

The washing works to be carried out by truck mixers on areas far from the concrete plants site shall be carried out again in these temporal washing pools to be set up on these sites and the area will be returned to the previous condition by cleaning in an appropriate way after the completion of concrete works. The washing waters will not definitely discharged into any area apart from specially designed collection and storing systems.

The wastewater (washing water) to occur during ready mixed concrete manufacturing shall be subjected to physical treatment on the site in order to meet the limit values stated in the Table 7.5 (Sector: Mining Industry (Cement, Stone Crushing, Tile, Plate Making, Marble Processing, Soil, Industry, and Similar) of the "Regulation on Water Pollution Control (RWPC) Amendment O.G dated March 25, 2012 and numbered 28244)" which entered into force by being published in the Official Gazette dated December 31, 2004 and numbered 25687. After meeting the standards, recycling process will be applied in the scope of "Circular on Wastewater Treatment/Deep Sea Discharge Facility Project Approval No 2014/07". However, in case of discharge, the discharge criteria mentioned in Table 7.5 RWPC shall be met in wastewater treatment facility which will be constructed in this scope and will be discharged into the closest recipient ambiance. Approval will be obtained for the wastewater treatment facility in the scope of the Circular on Wastewater Treatment/Deep Sea Discharge Facility Project Approval (2014/07) dated March 04, 2014 and No 2746. "Environmental Permit Certificate" will be taken for the discharge of treated wastewater as per the provisions of "Environment Permit and Licence Regulation" entered into force by being published on Official Gazette dated September 10, 2014 and No 29115 and the facility will be put into operation simultaneously with the project.

Throughout the operation, the washing waters to emerge after cleaning to be made in fuel storage areas and pursuant to the maintenance, repair works of compressor units and other auxiliary units will be taken to main infrastructure system with specially designed collection system after pre-treatment.

Oily Water

In the scope of the Gas Storage Expansion Project, it is foreseen that oily waters would occur in case of states such as discharge, washing etc., in parts such as workshops, waste collection points, chemical storage rooms, fuel filling points etc.

The oily waters to be collected in appropriate areas in these parts shall be passed through the oil trap system which will be established separately or commonly and will be taken to common domestic wast water treatment facility pursuant to quality assessment to be made with laboratory analysis, in case deemed necessary.

Moreover, oily water collection line will be established ending with oil trap in parallel with the domestic wastewater collection system during the construction of surface facilities infrastructure system and the oily water will be collected in this line and will be taken to main wastewater collection system after degreasing.

Throughout the operation, the oily waters to emerge in the fuel storage areas and pursuant to the maintenance, repair works of compressor units and other auxiliary units will be taken to main infrastructure system with specially designed collection system after pre-treatment.

Hydrotest Effluents

The water produced from the hydrostatic test activities to be conducted for the leaking and pressure resistance measurements of the pipes and equipment when the installation and montages are completed will be discharged to suitable areas after the analysis of the contaminating parameters (mainly, pH, suspended soils, oil and grease, iron, dissolved oxygen and also total residual chlorine if chlorinated water is used). During the discharge, the potential pollutants in the hydrotest water (e.g. oil-grease, suspended solid) will be subjected to preliminary treatment using a variety of equipment including geomembrane and different structures (e.g. sedimentation ditch) at the outputs of the systems before being discharged into the receiving bodies. The example hydrotest drain trench paln is given Figure 5.6.5.1. below.

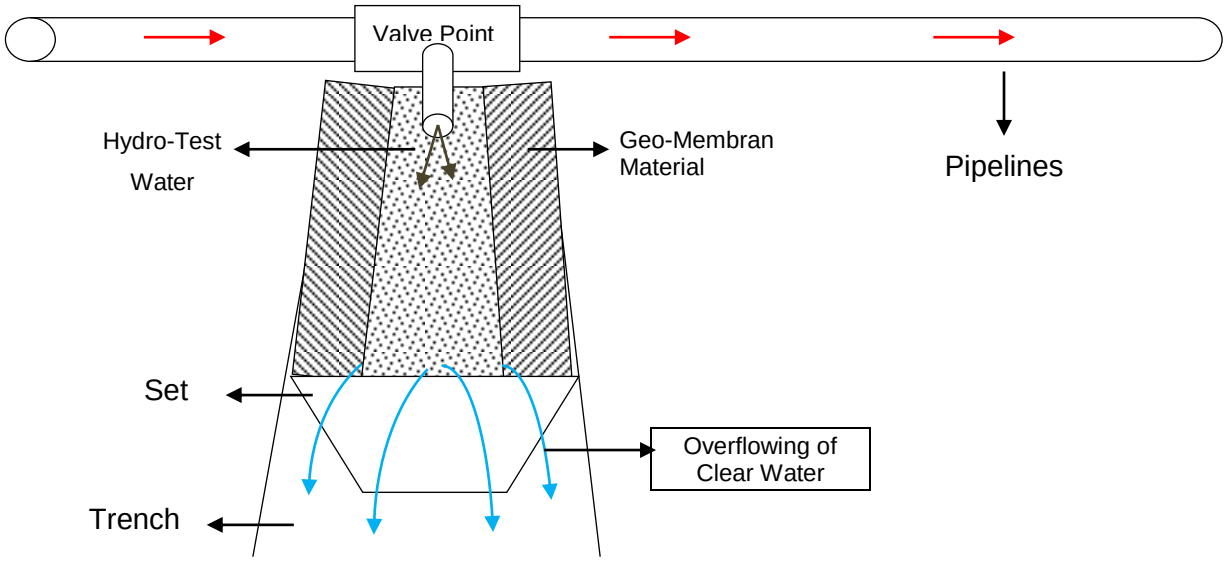


Figure 5.6.5.1. Example Hydrotest Drain Trench Plan

Rain Waters

Along with the project construction activities and operation periods, the rain waters falling into project sites and being drained shall be moved away from the construction area with rain water collection channels to be established on and around construction area. They will be discharged from the balancing and settling pools to natural drainages to be set up at the end of collection and accumulation channels for preventing the possible sediment carriage from the construction areas to the surrounding of the project areas (Figure 5.6.5.2.).

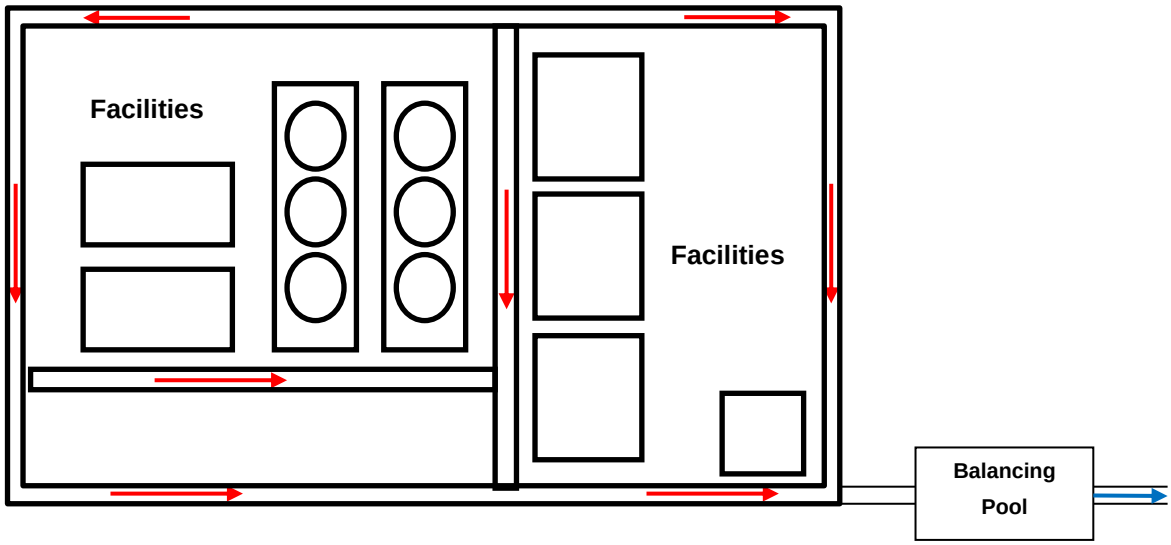


Figure 5.6.5.2. Example Environmental Rain Water Collection Channel and Balancing Pool Plan

In the operation area rain water discharge will be performed by raising the surface of slope to the rain water collecting channels to be installed indoor and closed system against the accumulation of rain. Throughout the operation, rain water drainage will be realized with rain water collection channels to be connected to natural drainages and to be installed inner sites and around the facilities.

5.6.6. Impacts on Topsoil

During the construction period of the Gas Storage Expansion Project landscape and environmental protection studies will be implemented as well as the site arrangements for the purpose of conforming the alterations (occurrence of new areas, patches and corridors etc.) which may occur during construction period and afterwards in the function and structure of natural landscape to the existing structure, and minimizing the impacts. During these studies priority will be given to minimizing the disturbance of the existing structure and then the necessary measures will be taken to rehabilitate.

In this way, it is necessary to start the environmental protection and implementation works together with the commencement of the construction works. Success of the remediation, restoration and rehabilitation works to be made after construction depends significantly on this issue. In this regard, within the scope of the planned expansion project the works related with the working area boundaries, stripping topsoil and storage, taking the temporary precautions for erosion control, and sedimentation controls will be applied. Applications related with these works are detailed below.

The potential negative impacts on the top soil during construction activities will directly affect the agricultural productivity of affected lands. Loss of agricultural productivity is identified as a social impact in Section 6.6.7 due to direct adversity on agricultural income of PAPs.

Measures which are described in detail below will help mitigating the adverse social impact regarding the top soil management.

Definition of Work Area Boundaries

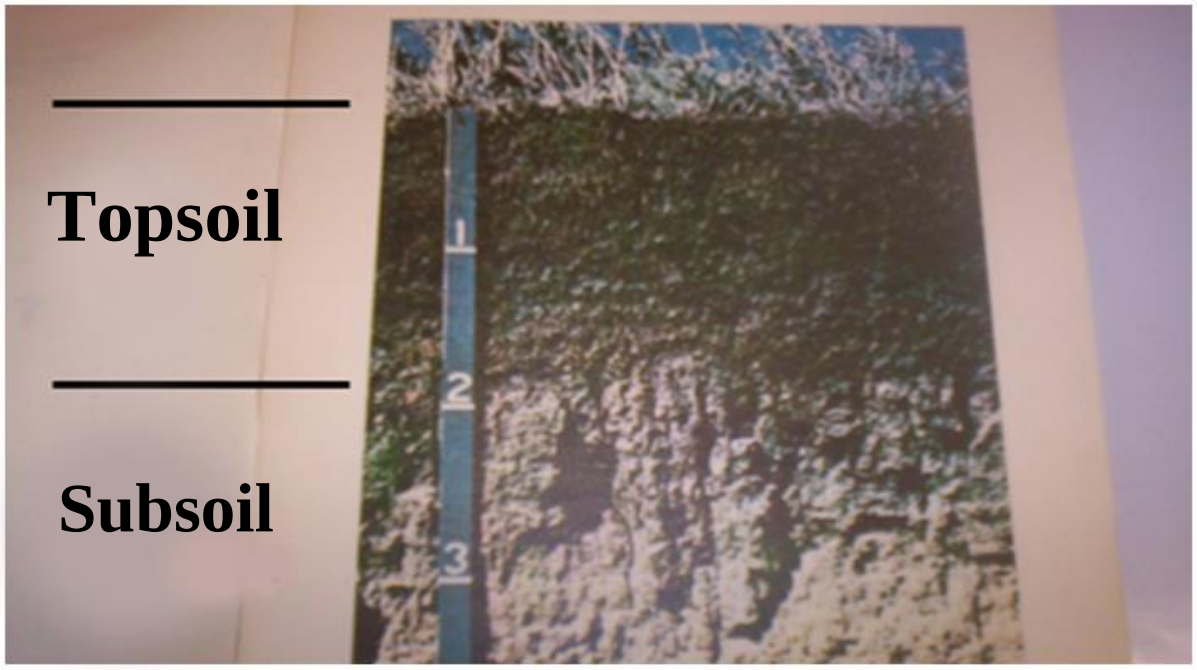
It is necessary to provide information to and raise the awareness of the personnel who will work at site during construction period about the natural landscape values in the area. For this purpose the first step is to provide environmental training to all employees, to put up the visual communication aids such as posters, bills at various points of site, and to prevent the activities of the employees outside the work area in both aspects, i.e. constructional (building roads without permission, extra use of area etc.) and social (all types of hunting, setting fire etc.) by defining boundaries of the job site and construction site in order to prevent the further disturbance of natural structure. Especially considering that the larger part of the planned project area is located inside agricultural lands and pasture areas it is unavoidable to take these precautions.

Stripping the Topsoil and Storage

Soil is a production factor which meets all types of needs of human beings such as nutrition, drinking, fuel, clothing, but, cannot be reproduced. Soil is a material originating from the cracking and fracturing of the bedrock and is called regolith. Climate, living organisms, main components, topography and time can be defined as the main factors affecting the formation of soil.

In landscape remediation plans, soil is evaluated through the management of the topsoil and surplus excavated subsoil, and the main goal is to protect the topsoil in activity areas during construction and to return it to its original location without any damage after completion of the project.

Topsoil which is the main layer for the development of the plant roots is a living layer which contains organic matter in maximum amounts, mineral materials, seeds, microorganisms, and meets the needs of plants such as nutrients and water. It is ploughed and cultivated (Picture 5.6.6.1.). Therefore, for the success of the vegetation works to be ensured in the post-construction period it is very important to protect the characteristics, quality, especially the structure of topsoil by taking all the required precautions for soil preservation, and to lay it down by making the necessary arrangements in the areas affected from the Project. Additionally, since topsoil is a natural gene bank for seeds of the plant species found in the area, this is important to sustain the plant life cycle. Therefore, the most important step to be paid attention during the construction period is a sound “Topsoil Management”.



Picture 5.6.6.1. Topsoil Layer in Landscape Remediation Works

In all areas where the construction activities are to be carried out within the scope of the Project, under suitable soil conditions (including vertical and inclined side areas) it is necessary to take the required precautions for the protection of topsoil in a manner that will ensure topsoil will not be mixed with subsoil during the stripping and construction period, that it will not be mixed with the contaminants and foreign materials, and that loss of the topsoil is prevented. In the course of the construction works, maximum attention shall be paid to the following issues during the stripping and storage works in order to protect topsoil existing in the Project area. These are:

In the areas outside the agricultural lands topsoil will be stripped down up to a depth of 15 cm minimum and 30 cm maximum (Picture 5.6.6.2.) In agricultural lands soil depth may reach to 45 cm and in these areas topsoil should be stripped up to 45 cm deep maximum. The areas where the depth of the topsoil is less than 15 cm topsoil will be stripped very carefully. The examples for the topsoil stripping works are given in Picture 5.6.6.3.

Picture 5.6.6.2. Topsoil Stripping Works, Control of Stripping Depth, Photo: B. ERDEM , 2015

Picture 5.6.6.3. Topsoil Stripping Works during Construction Period, Photo: B. ERDEM

In the regions where the character of topsoil is rocky and stony, first of all the rock and stone blocks among the topsoil layers are removed and stored in a separate place, then the topsoil stripping works will be performed (Picture 5.6.6.4.).

Picture 5.6.6.4. Topsoil Stripping Works in Stony Areas, Photo B. ERDEM, 2015

Topsoil will be stored in places where it is not compacted by vehicles and construction equipment or not exposed to contamination, in conditions that its loss and/or degradation is minimized (Picture 5.6.6.5.). Topsoil will not be mixed with subsoil, they will be stored in separate areas and potential mixing will be prevented by some physical means such as stone supports, geotextile sheeting, silt fences etc.

Picture 5.6.6.5. continued In the scope of topsoil storage methods a-Stone support, b,c-Geotextile sheeting, and d,e,f-silt fence applications, Photos B. ERDEM, 2006

Additionally, topsoil piles will be identified with warning and caution signs/ plates to protect them against potential damage (Picture 5.6.6.6.).

Picture 5.6.6.6. Works related with the warning plates in topsoil storage areas, Photos: B.ERDEM, 2014

Topsoil will be stored in a manner that it is drained freely and the drainage of the run-off water channels/ditches around the piles will be provided. Drainage channels will be connected to the natural drainages and to the surface water flow points. Possible scours/erosions will be prevented through building wasteway structures, outlet points in these junction points (Picture 5.6.6.7.).

Picture 5.6.6.7. Drainage channels dug in the topsoil storage areas, Photos: B. ERDEM, 2015

In order to permit reasonable accesses (animal passages, vehicle passages etc.) and in the low areas where the surface water may be collected beside the stockpiles gaps will be left between topsoil stacks (Picture 5.6.6.8.).


Picture 5.6.6.8. Gaps left between the stockpiles in the topsoil storage areas, Photos: B. ERDEM, 2015

In storage areas, topsoil will be stored in stockpiles of not more than 2m high with side slopes less than 45° (Picture 5.6.6.9.).


Picture 5.6.6.9. Control of slope angles and height of the stockpiles, Photos: B.ERDEM, 2015

The surface of the stockpile will be slightly compacted to reduce rainfall penetration, but in a manner that promotion of anaerobic conditions is prevented (Picture 5.6.6.10.).


Picture 5.6.6.10. Works for Compaction of Stockpiles in Topsoil Storage Areas, Photos: B. ERDEM, 2015

Where necessary, the stockpiles will be protected from flooding by placing stabilization supports around the perimeter (Picture 5.6.6.11.).

Picture 5.6.6.11. Silt fence applications in topsoil storage areas for the purpose of protection, Photos: B. ERDEM, 2015

Under no circumstances will topsoil be used as padding and filling material. Thus, for the revegetation process after completion of construction, soil (fertile/topsoil layer) which is the most important factor for plant growth will be protected, its loss will be prevented and the suitable medium will be provided for replanting.

Subsoil Transport and Storage

Subsoil arising from the excavation works for pipeline trenches and the excavation works for pump stations, water storage tanks and well areas, whose quantities are given in the Excavation Works Section within the scope of the Expansion Project will be transported as excavation surplus to the excavated material dumping area designated by district municipalities. When extra area is required for the storage of topsoil and subsoil the necessary procedure will be followed and permits will be obtained in accordance with the stipulations of EIA.

Taking Temporary Measures against Erosion

Another important issue to pay attention to in the course of construction is the assessment of the Projects sites with respect to erosion risk. During the construction activities all required temporary erosion control measures should be taken especially in the excavation zones and storage areas until the completion of construction since

- Topsoil is stripped,
- Soil surface and woodland are disturbed,
- Existing vegetation cover is removed,
- Land topography is altered and
- Existing stable soil plasticity is disturbed.

A very serious erosion risk is not foreseen during the Project activities since the areas where the Project facilities will be built have a flat and immobile geomorphological structure. However precautionary measures should be taken for erosion control against the probability of occurrence of soil erosion in storage areas of excavated soil and excavation sites. Otherwise, in unexpected situations, loss of soil and reduction in land productivity, decrease in water quality because of the sediment transport and geomorphological changes resulting from a potential landslide may occur.

Therefore, during construction works after stripping the topsoil, primarily, subsoil will be removed in a manner that it is not affected by, or is the cause of erosion. The following temporary measures for erosion control will be performed within the scope of activities during the land preparation, construction and installation stages:

- Material deposits will be left to retard the surface flow and prevent the ground scour (Figure 5.6.6.1.).
- When it is required to break the slopes mini weirs will be built, so these provide the flow discharge down along the slope.
- Continuous monitoring will be provided to prevent the cases such as slumping, loss of soil.

These measures to be taken are the essential applications to prevent both confrontation with the dangerous situations (wreckage, landslide, demolition etc.) and occurrence of further damages in land topography.

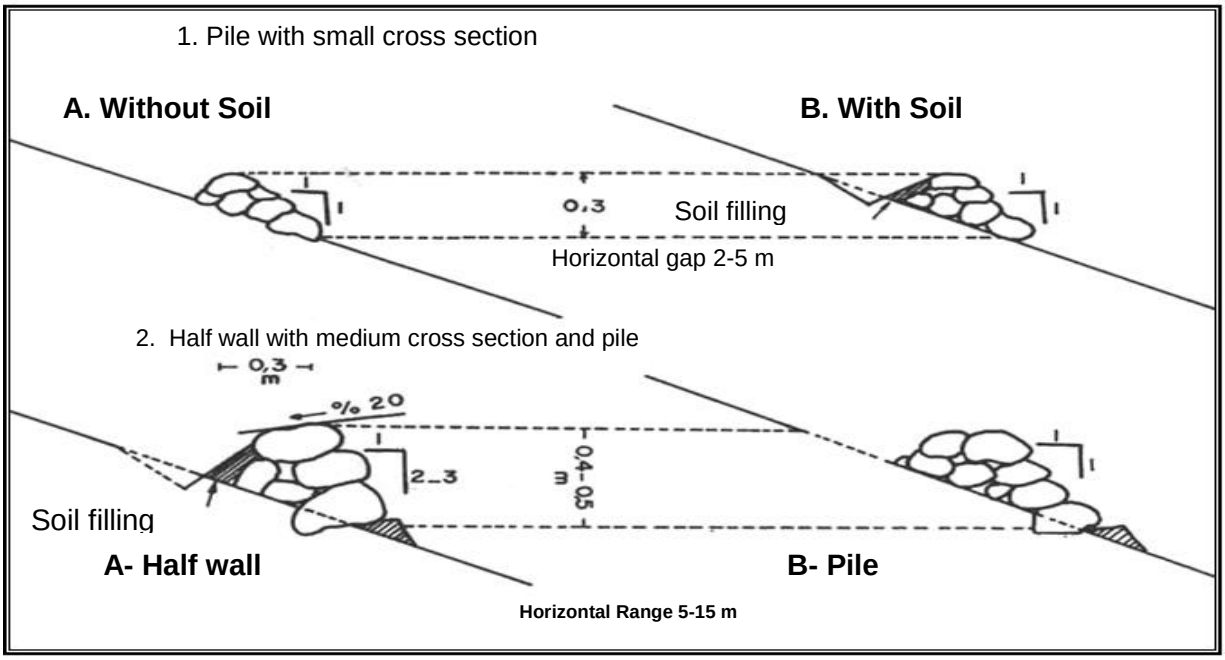


Figure 5.6.6.1. Material deposits and piles built within the scope of erosion prevention methods

Sedimantation Control

Sediments arising from soil erosion, which may occur in the Project area, may contaminate the water sources in the vicinity (Figure 5.6.6.2.). Sediment traps like silt fences or straw bale will be built to prevent the entering of sediment carrying water in places where this risk exists; in the water passages and in locations where the work areas intersect or be in parallel with stream beds (Picture 5.6.6.12.)

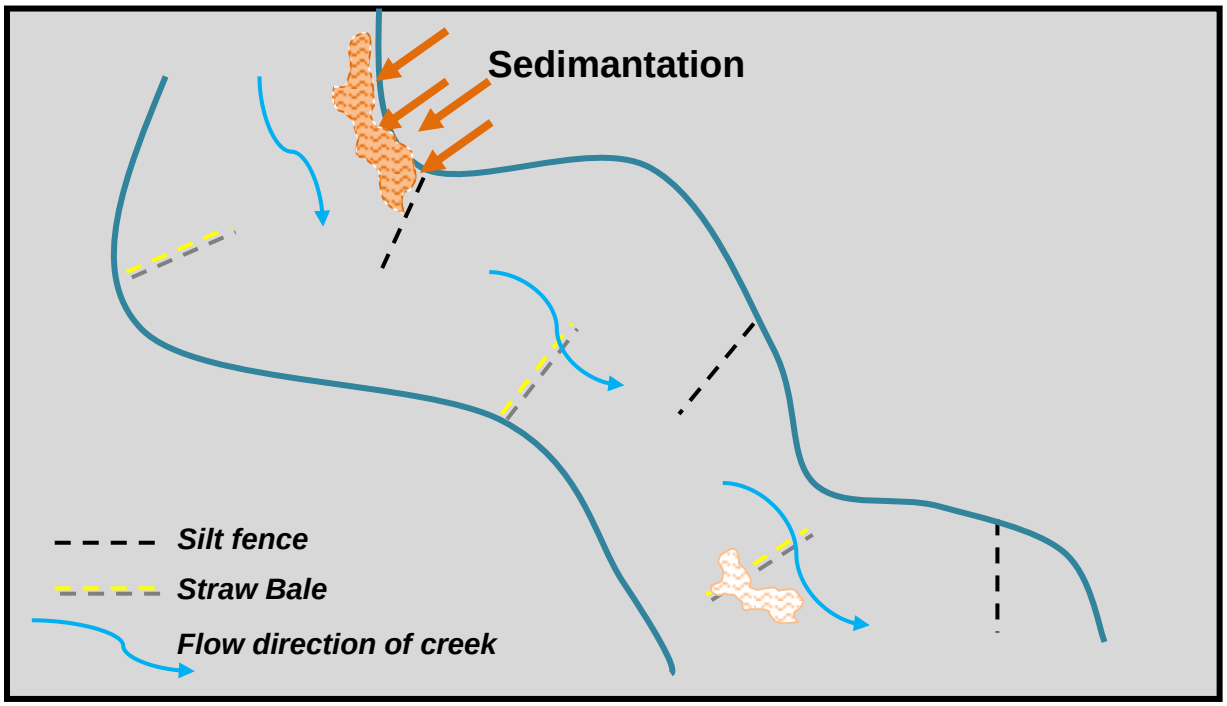


Figure 5.6.6.2. Methods to minimize or prevent water pollution caused by sediments; silt fence, straw bale, Photo B. ERDEM, 2011

In the areas where topsoil is stripped and the vegetation cover is disturbed, sediment filters and sediment traps are the applicable solutions in the sites which is expected to be left uncovered during rainy periods. Within the region of the Gas Storage Expansion Project, Peçenek Creek (Bostanlık C.), Camızlıközü Creek, Çırçıl Creek, Karasakal Creek, Karacaören Creek, Kocabağ Creek, Çelikgöl Creek, Kocaöz Creek, Derin Creek and Küçükhortu Creek may be considered as the most important surface waters in the northeastern direction. Also, Hirfanlı Dam is the most important water reservoir to which attention should be paid during the construction of water intake structure. Depending on changing conditions and construction activities, the required measures should be strictly taken in the course of the construction in the areas where sedimentation risk exist and especially during the potential water discharge activities.

Picture 5.6.6.12. Silt Fence Application for Sedimentation Control, Photo B. ERDEM, 2005

Owing to the environmental protection measures taken during the construction and the applications executed it is seen that less area is disturbed and construction activities go on in a controlled and environment-respecting manner. Moreover, it is seen that the areas that are disturbed and damaged during construction can remedy themselves in a shorter period of time through landscaping activities performed after completion of the construction. Therefore, paying attention to the above mentioned issues is very important for the protection of natural environment and sustainability of ecosystem.
After the completion of construction activities remediation and rehabilitation works of these areas will be commenced. In this scope, the primary work to be made at site is contouring. For this purpose, photographs which are taken before the commencement of the site preparation works for the areas where facility units will be built are going to be used. During these works efforts will be made to return the site to the contour that is compatible to the existing contours (iso-elevation curves) in the surroundings of the area as much as possible.

After contouring at necessary points both at the surface and in the underground drainage systems will be provided and the works for re-spreading the topsoil which is stripped during the period prior to construction will be commenced.

In addition to all mitigation measures, during the topsoil stripping, clearing and grading works, any pesticides and/or any agricultural chemicals will not be used for removal of the vegetation cover.

5.6.7. Social Impacts and Mitigation Measures

Although there have been amendments in national environmental legislation regarding the social aspects within the framework of the European Union adaptation process, the lack of social impact assessment process still continues. Turkish EIA legislation does not cover social environment and only limited its scope to the physical and ecological environment. The social environment topics that are included in national legislation are limited to stakeholder engagement and resettlement processes. Therefore, in order to cover the national gaps, the international financial institutions are taken into a consideration for investment projects to minimize environmental and social risks and take actions in equitable and transparent forms.

This section identifies and assesses impacts to the population and society in the social study area for the construction, operations and closure phases of the Project. Major social issues subject to assessment are;

- Migration (In-migration/out-migration)
- Employment
- Labor Influx
- Community Health and Safety
- Occupational Health and Safety
- Land and Livelihoods

5.6.7.1. Migration

Impact

None of the settlement heads reported that they receive in-migration from different settlements; instead they emphasized that population declines due to lack of job opportunities and other social opportunities. Participants of the in-depth interviews stated that there have currently been no impacts of the Project regarding the magnitude of population.

However, temporary work may become necessary during construction and following stages depending on the project conditions. The Project will cause the existence of temporary jobs, arrival of people looking for a job from various places is likely expected to the Project-affected area. Still, the people arriving the Project area is not expected to live in less-populated and non-developed rural settlements. Instead, they would certainly prefer living in the Sultanhanı District which is indirectly affected and more urbanized with higher population. Impacts related to in-migration of temporary workers are also discussed in Labor Influx Guidelines (Appendix 7.3.).

Out-migration was preferred mostly by the young population due to the lack of job opportunities in the rural settlements. Project's demand for temporary jobs especially for unskilled works may contribute to decelerate the out-migration of remaining young population. Impact on population table is given Table 5.6.7.1.1.

Table 5.6.7.1.1. Impacts on Population

Impact Type	Phase	Impact Extent	Impact Magnitude	Likelihood of Impact	Significance
In-migration	Construction / Operation	Local	Low	Likely	Insignificant adverse
Reducing out-migration	Construction / Operation	Local	Medium	Likely	Minor positive

Mitigation Measures

Despite that the Project provides job opportunities for the affected rural settlements; it may also cause in-migration by people arriving the Project area for job opportunities. Although in-migration is not expected to occur in rural settlements, by trying to maximize local employment, which includes setting standards and guidelines for local employment among its contractors, BOTAŞ will minimize the number of newcomers. Besides, in order to prevent any adverse impact that may rise from the in-migration of outsiders, BOTAS and Contractors will provide updated and clear information on the availability of relevant skilled or unskilled positions. Information will be periodically posted on websites and hung in public places, distributed through channels such as local newspapers as well as by providing info to local authorities starting from settlement heads to sub-governorships.

Enhancement Measures

Prioritizing the recruitment of young population from the affected rural settlements will contribute to the reducing of out-migration caused by the lack of job opportunities in the rural area.

5.6.7.2. Labor Influx

Impact

The labor influx caused by bringing workers to work for Project is expected to occur during the construction and operation phases of Project. The majority of the construction work force will be engaged by contractors, the Project will ensure that relevant requirements of WB OP 4.01 and Turkish legislation will be applied to all workers. Although the contractor and sub-contractors are not determined yet, the Project's need for qualified workers is expected to increase since the local workforce is not sufficient to meet the Project demands and the Project's sub-contractors may be national or international firms/companies. Indirect influx which means people arriving to the Project area with expectations such as finding employment or other business opportunities, etc. is not expected to occur since the project area is not urbanized to attract followers and have rural characteristics.

The total number of workers (accumulated total) in the existing project was 1004, 591 of them were Turkish and 413 were Chinese workers. There are currently 350 workers at site working for existing project including BOTAŞ, Contractor and subcontractors' workers. It is envisaged that those 350 workers will continue to work until the end of the existing project in

2021. During the construction phase of GSEP which is expected to last approximately 7 years, starting from 2019, a total of 500 people are planned to be employed, with approximately 400 workers, 30 managers, 50 experts / engineers and 20 office workers. Thus, there will be an overlap and the number of workers on site between 2019 and 2021 years is expected to be 820 since the number of common workers is 30 (BOTAŞ personnel). During the operation phase of GSEP, a total of 100 people are planned to be employed, with approximately 60 workers, 20 managers, 10 experts / engineers and 10 office workers. Duration of operation phase is planned to be 30 years. The Project's need for skilled workers is expected to increase since the local workforce is not sufficient to meet the Project demands and the Project's sub-contractors may be national or international firms/companies. BOTAŞ and Contractors will comply with the National Labor Law, Social Security and General Health Insurance Law, The Law on Work Permits of Foreigners, International Labor Force Law, Foreigners and International Protection Law and relevant international standards of WB OP 4.01.

The workers coming from outside the area will be accommodated in a camp site. There will be separate camp sites for the UGS and GSEP projects and therefore, no additional labor influx will occur in the existing camp site. The camp site will provide the workers with amenities and facilities to meet their needs such as accommodation, cafeteria, laundry, health facility, recreational facility etc. Transport for workers from Sultanhanı settlement to the camp site is already provided in the Project which may reduce incentives for foreign workers to live in less populated settlements which are in the vicinity of the camp site.

Labor influx can lead potential impacts on the Project-affected settlements. The population of the Sultanhanı district, which is the most populated the closest settlement to the project license area, is 10,085 in 2016, 48% of the population is female and 52% is male. The other small rural settlements in the region are scattered and have low populations, but the households live here continuously. The nearest rural settlement to the camp site is Tömü plateau with a population of 55 people. The distance from camp site to the Tömü plateau is approximately 1,1 km. The cultural structure in the region is characterized by conservatism and tradition. The income source of people living here is agriculture and animal husbandry; there is no specialization in any profession. The population of children is very low in scattered rural settlements and the age average is generally high, usually over 40 years old.

Both adverse and positive impacts are expected to occur due to labor influx of the Project. Appropriately managed labor influx can provide potential benefits for the community. These benefits are typically related to economic opportunities through employment and/or training by the project, procurement of goods and services from the local suppliers in the region (such as hotel stays, apartment rentals, shopping from local vendors) and contribution to local economy. Improved communication, transport links, economic linkages, monetization of rural economies and new markets for local products and services will increase economic opportunities in the region.

Adverse social impacts that may arise from labor influx are expected to be low when it is considered that the people of the region are acquainted with the existence of the foreign workers due to the present project and that there were not any problems/conflicts occurred between the workers and the local people until today. Due to the large number of Syrian and Arab seasonal workers in the region, the experience of the local people in living together with different cultures is considered to be an important factor in the absence of any problems. There were no cases of gender based violence associated with the Existing Project which operates for 6 years and impact risk of gender based violence is very unlikely to occur considering the past experiences and social structure of the region. While the gendarmerie is responsible for the security of the existing project site since the camp site is located within rural region, police is responsible for the security of nearest settlement, Sultanhanı. The gendarmerie is patrolling at night in the project area, especially 2-3 times a day, to ensure the security of region.

The contribution of labor influx to the local economy by procurement of good and services is very likely to occur since it's already known that local grocery stores are tended to sell Chinese products specifically for the needs of workers.

The adverse social impacts (risks) that can be caused by labor influx in Expansion Project are such as;

- Conflicts arising between the Project workers and the local people, which may be related to religious, cultural or ethnic differences, disturbance of local people by the presence of foreign workers or tensions between different groups within the labor force,
- Increase in criminal activity such as theft, physical assaults, sexual harassment of women and girls (gender based violence), exploitative sexual relations, human trafficking, alcohol and drug abuse, smuggling etc.
- Increased risk of communicable diseases including sexually transmitted diseases (STDs)
- Increase in traffic and rise in related accidents, as well as additional burden on the transportation infrastructure.

The adverse social and environmental impacts caused by labor influx are explained in detail in the Labor Influx Guidelines presented in the Appendix-7.3. and also given in Table 5.6.7.2.1.

Table 5.6.7.2.1. Impacts on Socio Cultural Process Caused by Labor Influx

Impact Type	Phase	Impact Extent	Impact Magnitude	Likelihood of Impact	Significance
Contribution to local economy	Construction / Operation	Local	Medium	Certain	Moderate positive
Risk of Social Conflict	Construction / Operation	Local	Medium	Likely	Moderate adverse
Increase in Criminal Activity	Construction / Operation	Local	High	Likely	High adverse
Increased Risk of Communicable Diseases Including Sexually Transmitted Diseases (STDs)	Construction / Operation	Local	High	Unlikely	Moderate adverse
Increase in traffic and rise in related accidents	Construction / Operation	Local	Low	Likely	Low adverse

Mitigation Measures

The most important aspect to mitigating the negative impact of influx is related to the management of workers in BOTAŞ and those in contractors. How and where people are housed, how they behave and how they treat current residents will all influence how the change affects community cohesion.

Labor Influx Guidelines has been prepared by BOTAŞ in order to identify, assess and manage the risks of adverse social and environmental impacts that are associated with the temporary labor influx. The Contractor will also prepare their own Labor Influx Management Plan based on the Labor Influx Guidelines. Contractors are also suggested to prepare a Workers' Camp Management Plan to avoid or reduce negative impacts on the community and maintain constructive relationships between local communities and workers' camps; and establish standards on worker welfare and living conditions at the camps that provide a healthy, safe and comfortable environment. Regardless of the accommodation of camp sites or other options that may be preferred by Contractors, all workers of Contractor and sub-contractors will be liable to Labor Influx Management of BOTAŞ.

The Project will prioritize the recruitment of labor, particularly for temporary contracts, and low skilled workforce, from candidates who are identified as 'local', i.e. from project affected settlements (identified in Section 4.10.1 *Population and Demography*), districts and provinces. Providing mandatory cultural sensitization trainings to workers in order to introduce the cultures and social habits of the region and to prevent possible conflicts between local people and workers will be important to mitigate the impacts caused by labor influx. The employees will not start work before completing mandatory trainings. Engagement with local communities is another significant measure to understand their concerns, raise awareness of risks and opportunities, and identify solutions to issues relating to labor influx.

BOTAŞ will implement regular community meetings in settlements surrounding campsites, to ensure that the presence of workers does not create situations of conflict and tension. Code of Conduct will be prepared by the Contractors and workers will be informed about the Code of Conduct at the moment of the signing the employment contract and during social induction trainings. Also, the Grievance Mechanism established by BOTAŞ will provide easy access for local communities to raise their complaints and concerns. The grievance mechanism will also be provided for workers to raise workplace concerns.

Mandatory and repeated training will be provided for the workforce about refraining from unacceptable conduct toward local community members, specifically women. The Project will introduce sanctions (e.g., dismissal) for workers involved in criminal activities. Workers will be informed about national laws that make sexual harassment and gender based violence a punishable offence which is prosecuted. Areas and activities that workers can spend their leisure time within the camp site will be created and adequate salaries for workers will be paid to reduce incentive for theft and salaries shall be paid into workers' bank accounts rather than in cash.

BOTAŞ's Social Department will be responsible for monitoring the performance of contractors for the actions defined in their contracts relating to influx management and local hiring (workers and businesses). The Contractors will have a designated person submitting weekly reports on influx issues to BOTAŞ's Social Specialist. Compliance with the procedures will be audited by BOTAŞ and a third party.

5.6.7.3. Employment

Impact

The Project will prioritize the recruitment of labor, particularly for temporary contracts, and low skilled workforce, from candidates who are identified as 'local', i.e. from project affected settlements, districts and provinces.Local workers are defined as workers who live in the project directly or indirectly affected settlements as identified in Section 4.10.1 Population and Demography. Currently, 65 local workers are employed (for positions such as security, driver, warehouse attendant, civil worker, cleaner, cook, nurse, doctor) and 54 of them are from the nearest settlement, Sultanhanı. The creation of employment opportunities during construction and operation phases of the Expansion Project will clearly provide a positive impact in reducing the unemployment by recruiting local people to the extent possible.

Local employment in different job branches and trainings to be provided for workers by the Project may contribute to the increasing of occupational specialization in the region, capacity enhancement (technical capacity, earning capacity, wealth accumulation, purchasing power and network building), individual, household, and community empowerment.

In the scope of the project, impacts on local employment are given in Table 5.6.7.3.1.

Table 5.6.7.3.1. Local Employment Impacts

Impact Type	Phase	Impact Extent	Impact Magnitude	Likelihood of Impact	Significance
Local Employment opportunities	Construction / Operation	Local	Medium	Likely	Moderate positive

Enhancement Measures

Local Employment and Training Plan (Appendix-7.5.) includes local hiring policy which will be followed by BOTAŞ and Contractors during the recruitment process of the Project. This recruitment policy will be communicated through local employment offices and village heads. The Project will preferentially hire unskilled labor from local communities using a transparent process for distribution of opportunities developed in consultation with the local community and taking into account other impacts on individual settlements. BOTAS and Contractors will provide updated and clear information on the availability of relevant skilled or unskilled positions. Information will be periodically posted on websites and hung in public places, distributed through channels such as local newspapers as well as by providing info to local authorities starting from settlement heads to sub-governorships. Contractors will maximize the local employment for unskilled and semiskilled workforce and also make sure that there is non-discriminatory, transparent, open to all and fair recruitment process. Workers will be provided with information including, but not be limited to, entitlement to wages, hours of work, overtime arrangements and overtime compensation, and any benefits (such as leave for illness, maternity / paternity or holiday). All workers will be able to join trade unions of their choice and have the right to collective bargaining. Contracts will be verbally explained to all workers where this is necessary to ensure that workers understand their rights prior to any employment contract to be signed.

5.6.7.4. Community Health and Safety

Impact

It is expected for noise to form during the excavation works and plant installations to be carried out during the land preparation and construction phases of the project along with the utilization of machines, tools and equipment during the construction of wells. Since it is only expected for noise to arise due to the administration of natural gas storage and vehicles entering and exiting the project site as well as due to equipment such as pumps, compressors etc. that will operate in closed buildings during the construction phase, no noise impact is expected to occur during the operation phase.

Dust emissions are also expected to occur during the land preparation and construction works of the Project. During the interviews, PAPs stated they experienced dust problems as the facility vehicles frequently use the common road of settlement. Emissions caused by vehicle exhausts used to carry the equipment, tools, workers and construction materials may cause negative impacts on the nearby communities.

Transportation impacts directly related with the Project such as traffic problems by exceeding speed limits and causing danger for communities may occur during the construction phase of the Project. Health and safety risks associated with traffic loads from heavy vehicles will disappear once the construction stage is over.

In the scope of the project, impacts on public health are given Table 5.6.7.4.1.

Table 5.6.7.4.1. Impacts on Public Health

Impact Type	Phase	Impact Extent	Impact Magnitude	Likelihood of Impact	Significance
Noise	Construction	Local	Low	Likely	Minor adverse
Dust emissions	Construction / Operation	Local	Low	Likely	Moderate adverse
Transportation/Traffic impacts	Construction	Local	High	Likely	High adverse

Mitigation Measures

BOTAŞ has prepared a Community Health and Safety Management Plan (Appendix-7.2.) to identify the impacts more in detail and determine measures to be taken accordingly.

Within the context of the project, the units will operate between times 07.00-19.00 as a single shift in works to be performed in an open field during the land preparation and construction phases. Attention will be paid for equipment that emits noise not to be used outside of hours from 07.00-19.00. The machinery and equipment indicated in the table will operate in a certain order; while based on the most negative scenario in the noise measurements made, it has been assumed that all the vehicles to operate at the project sites will function at the same time.

Although it has been determined that measures such as modelling results provide limit values, filling and emptying in emission source without watering or spinning, improvement of the roads, covering the vehicles with canvas during transportation of the materials and keeping top of the material in 10% moisture shall be taken in order to minimize the dusting which could occur in the land. In addition to these measures, dust emissions will be reduced through the regular watering of roads, especially unpaved ones.

For the transportation impacts, Traffic Management Plan (Appendix-7.7.) is prepared to adequately manage traffic in the access roads used by communities. Contractors will also prepare and implement a site specific Traffic Management Plan. In case of disturbing access roads, the BOTAŞ and its contractors will be responsible to improve the roads back to their original status. Communities will be informed about schedules of transportation and also on safety and security measures to be taken at the level of individuals. The Project will implement an awareness raising information disclosure with local stakeholders regarding the risks related to the movement of heavy vehicles and increased traffic in the area. The main focus of this campaign will be during the construction phase and will focus on local residents and children. It will be implemented in coordination with local community groups such as Mukhtars.

5.6.7.5. Occupational Health and Safety

Impact

The risks that pose a threat to workers' health and safety that may occur during the construction works in scope of the Project are related to the possible accidents during construction and operation phases. In the scope of the GSEP, impacts on occupational health and safety are given in Table 5.6.7.5.1.

Table 5.6.7.5.1. Occupational Health and Safety

Impact Type	Phase	Impact Extent	Impact Magnitude	Likelihood of Impact	Significance
Occupational Health and Safety	Construction / Operation	Local	Medium	Likely	Moderate adverse

Mitigation Measures

The EPC Contractor shall prepare the Project Health and Safety Plan according to the outline given in Appendix-11.1. It will not be possible to start any work prior to the approval of this Plan by BOTAŞ. The Contractor and all sub-contractors have to ensure they are competent and meet all relevant legal requirements, industry standards and BOTAŞ's minimum OHS performance requirements prior to commencing any work on the Project.

The construction works will be conducted in accordance with the provisions of the Regulation on Occupational Health and Safety in Constructional Work, which came into force on October 05, 2013 (O.G. No. 28786) by the Ministry of Labor and Social Security, including the minimum health and safety conditions to be provided in construction sites.

The project will be in compliance with the Law No. 1593 on Public Health in Turkey, and the Law No. 6331 on Occupational Health and Safety, and the regulation, regulations and relevant legislation made or to be made by virtue of these laws will be complied with. Any health and safety rules determined within the scope of the relevant regulations shall be obeyed with the aim to prevent any possible risks threatening human health at the operating stage of the project. In addition, the General Public Health Law No. 1593, and any by-laws, regulations and directives enacted and to be enacted as per the Laws mentioned herein shall be obeyed within the scope of the project.

The security of the working areas has a significant importance related to this project. Security staff will be recruited or subcontracted in order to ensure the security of the working areas. A project specific Security Management Plan will be developed and implemented by BOTAŞ.

During the project, all working sites will be surrounded by wire fences, and the entrances and departures will be controlled at all times, preventing unpermitted and unauthorized entrance. Similarly, the materials and equipment belonging to the project work will be kept in areas protected by wire fences. Unarmed security foces have being emloyed by the contractor in GSDP in order to protect the construction site and this will continue till operational acceptance. After operational acceptance, facility will be protected by armed private security hired by BOTAŞ.

5.6.7.6. Gas Storage Risks

Impact

The potential risks posed by the GSEP relating to the gas storage aspects are assessed in this part. Gas storage aspects of the GSEP pose several risks in scope of activities related to both sub-surface facilities and surface facilities including pipelines/manifolds. Hazard sources may be external or on-site.

External hazard sources for leaching may be:

- nature (earthquake, weather, soil composition, lightning, flooding, external explosion and fire)
- environment (release, soil contamination, atmospheric release)
- human activity (sabotage/human error, vehicles, aircraft)

On-site hazard sources for leaching may be:

- geology (geological gas, aquifer, salt mass map and composition,)
- geomechanics (model)
- wells (equipment, design, tightness, column collapse, corrosion)
- processes (block, pressure control, temperature, logging, operation)

External hazard sources for debrining and gas operation may be:

- nature (earthquake, weather, soil subsidence, lightning, flooding, external explosion and fire)
- environment (soil contamination, atmospheric release)
- human activity (sabotage/human error, vehicles, aircraft, explosion)

On-site hazard sources for leaching may be:

- geology (geological gas)
- geomechanics (model)
- wells (equipment, operation, tightness, column collapse, corrosion)
- processes (operation)

Hazard sources mentioned above, may cause risks that can be categorized according to the severity of the consequences. These consequences may include personal injury/death, salt fracturation and migration path to surface, damage to wellhead and uncontrolled release of gas at surface, well cavern and well collapse, leaching string blocked by insolubles, well damage, line rupture, release of brine, well outside salt, loss of integrity, release of nitrogen, release of gas into aquifer, hydrate formation, damage to environment, explosion, wrong cavern development, collapse of well, decompression of well etc.

Potential hazards for the operations phase may be due to:

- higher/lower pressure
- more flow/no or less flow/reverse flow
- more/less temperature
- higher/lower level
- Composition other than expected
- too much erosion/corrosion
- loss of utility

Potential hazards mentioned above, may cause risks that can be categorized according to the severity of the consequences. These consequences may include personal injury/death, waterhammer, risk of explosive atmosphere, environmental problems, uncontrolled release of cavern blanket cavern collapse, cavern cemented casing damage due to too fast pressurization, damages of pipe, valve, instrument, nitrogen tank, cavern casing shoe or degassing vessel, loss of pipe containment, pipe blockage, cavitation in line, nitrogen and gas in the injection lines, water freezing (blocked flow, incorrect instrument readings, Joule-Thomson effect), high brine level in the degassing vessel, tank overflow, corrosion issues, damage of insulation, crystallization in basin and Tuz Gölü diffusers.

Mitigation Measures

For the UGS Project, an HAZOP (Hazard and Operability) review was held in 2014 in order to ensure the safe operability of the leaching installations of the 12 salt caverns. The results of the review were documented in the worksheets where potential hazards, their corresponding causes, consequences and associated safeguards are reported (see Appendix-11.2). The Probability Level and Severity Level of each consequence (taking into account the existing protections) were then semi-quantitatively evaluated and their criticality determined. The HAZOP review team then formulated the recommendations.

This HAZOP review was completed by an Underground Cavern Aspects HAZID (Hazard Identification) review which was carried out independently. The aim of this HAZID review study was to check the underground facilities design from a safety point of view and to identify potential hazards which could arise during the leaching phase, the de-brining phase and the gas operation phase of the UGS Project.

Detailed tables of the underground risk assessment review icluding all the recommendationsand detailed HAZID tables are annexed to this document. (see Appendix-11.2)

A full HAZOP/HAZID study for the GSEP shall be organised and defrayed by the EPC Contractor soon after the final design has been completed. Together with the Contractor's team, BOTAŞ team and Project Management Consultant will also participate in these studies.

An Explosion Protection Document (ExPD) shall also be prepared by the EPC Contractor as per the Regulation on the Protection of Employees From the Hazards of Explosive Atmospheres (published in the Official Gazette No. 28633, dated 30.04.2013) The ExPD will include P&IDs, Safety Data Sheets (SDSs), equipment and line lists, hazardous area classifications and equipment lists in the Zone 0 and Zone 1. All equipment and materials to be installed in potentially explosive zones shall conform to requirements.

A preliminary Gas Storage Risk Assessment for the Project is given in Appendix-11.2. In this context, a thorough risk assessment of the GSEP shall be undertaken by the EPC Contractor soon after the final design has been completed.

As required by the Regulation on Prevention of Large Industrial Accidents and Reduction of Their Effects (published in the Official Gazette No. 28867, dated 30.12.2013), BOTAŞ will prepare an on-site emergency plan and support the Local Authority in the preparation of the off-site emergency plan. These emergency plans will be reviewed regularly and updated as necessary. The on site emergency plan will detail how the operator will respond to an emergency and liaise as necessary with the emergency services. A key aspect of the plan will be the provision of adequate procedures to ensure that the caverns and gas supply will be isolated in the event of an emergency on-site, thereby limiting the potential consequences of any accident. The off site emergency plan will detail the roles to be carried out by emergency services, Local Authorities and other organisations, including the arrangements established to help with the emergency response on-site. The off-site emergency plan will be subject to regular testing and training drills, including practising responses by the emergency services.

5.6.7.7. Land and Livelihoods

This section covers potential impacts on land, including land ownership, land use and land related livelihoods, during construction and operation of the Project, as well as associated impact minimization, avoidance and compensation measures. This section provides a summary of the impact identification and assessment, and further details will be provided in the specific land acquisition planning document developed for BOTAŞ (Resettlement Policy Framework). Therefore, this section must be read in conjunction with the RPF (Appendix-10).

The Project will require establishing ownership rights, temporary and permanent easement rights of land and thus it is anticipated to have land based impacts. While the lines (gas, brine water, freshwater pipelines and connection lines between UGS sites) will require temporary and permanent easement rights to be established, ownership rights will be established for well areas,surface facilities and pole locations of energy transmission lines. Total of 1502 parcels will be affected by the land acquisition of fresh water, brine water, gas pipeline and surface facilities. 1209 parcels in total are private land and remaining 293 parcels are registered as public land according to the results of the land identification studies carried out from February 2017 up to today by sub-contractor firm (Anakent). Distribution of total number of parcels according to project components is given in Table 5.6.7.7.1. below.

Table 5.6.7.7.1. Number of Parcels and Area Hectares According to Project Components

Project Components	Number Of Parcels[11]			Area (Ha)		# Of Landowners
	Total	Public	Private	Temporary Easement	Permanent Easement	
Fresh Water Pipeline (120km)	1057	73	984	72	264	3457
Brine Water Pipeline (40km)	216	110	106	24	88	312
Gas Pipeline (20km)	210	109	101	12	40	306
Sub Total-1	**1483**	**292**	**1191**	**108**	**392**	**4075**
Project Components	**Number Of Parcels**			**Area (Ha)**		**# Of Landowners**
	Total	**Public**	**Private**	**Ownership Right**	**Permanent Easement**	
Surface Facilities	19	1	18	59,5	0	10
Well Locations[12]	-	-	-	48	150	-
Other Areas[13]	-	-	-	2,05	0	-
Sub Total-2	**19**	**1**	**18**	**109,55**	**150**	**10**
General Total	**1502**	**293**	**1209**	**N/A[14]**	**542**	**4085**

The total number of parcels to be expropriated within the scope of the Expansion Project is not yet known since the exact locations of well areas are not determined yet. The worst case scenario would be to assume that all area within the salt dome is expropriated because of the uncertainty of exact well locations. Assuming that well area (salt dome) is expropriated completely, it is known that there are 669 parcels and 1165 ha in total. However, ownership rights of a maximum of 48 ha will be permanently acquired (100x100 mt area for each of the 48 planned wells) within the salt dome and permanent easement rights will be established for 50 mt along the connection lines between UGS sites. As also indicated in the figure in Section 4.14.2 (Figure 4.14.2.1.), 76% of the lands affected by the Project are arable lands, followed by pasture lands (14%).

The following Project activities can potentially affect land ownership, land use and livelihoods in PACs;

[11] The number of parcels given may be subject to changes during the basic engineering studies as the Project footprint will be made definite.
[12] Due to the uncertainty of exact locations of well areas, no parcel or owner information is given. (Area information is calculated as 100x100 mt for 48 wells and for 50 mt along the connection lines between UGS sites).
[13] Pump Stations, Water Storage tanks, energy transmission line pole locations, valve chambers etc.
[14] Not applicable

- The construction, commissioning and operation of natural gas pipeline, energy transmission lines, fresh water lines, brine water lines
- Construction, commissioning and operation of surface facilities and well areas.

These two types of facilities entail different modalities of land access and different types and durations of impacts as a result.

Impacts of Natural Gas Pipeline, Energy Transmission Lines, Fresh Water Lines, Brine Water Lines

Temporary easement rights will be established for these project components in which BOTAŞ has a right to use land during construction while the ownership rights will remain registered in the name of landowner(s). Although the linear nature of these project components is expected to create minimal impacts (low to negligible and short term) on affected parcels, several impacts born from construction of pipelines can be listed as below:

- *Temporary loss of land for agricultural cultivation:* Landowners and users will not be able to temporarily use the land they use in these lines during construction. It is identified that there are very few settlements in the region (which are quite far from the construction area) where the fresh water, brine water and natural gas pipelines pass, and that these lines mostly pass by arid lands. Therefore, it is expected that the impacts of these project components will be lower than that of the well area. However, some agricultural lands which are far from settlements remain within the construction area of lines (brine water, freshwater, natural gas), so the agricultural activities and agricultural income are expected to disrupt due to the expropriation of land.
- *Damages to crops in plots neighboring the pipeline construction corridor due to, for example, spillover of earth or intrusion of equipment:* During operations, and in addition to restrictions upon land discussed previously, the most likely potential impact would be damages to crops in the pipeline corridor or nearby resulting from maintenance activities or vehicular access.
- *Temporary disruption to grazing activities and/or reduced access to agricultural land and pastures:* Pasture areas above the lines may be temporarily unavailable due to construction work, or access to pasture areas may be restricted which are both important impacts for livestock activities. Leaving the transition points at certain intervals during the construction will ensure that this impact on grazing activities is low.
- *Disruption of beekeeping activities:* Although no beekeeping activity is identified within the well area, there may be areas where beekeeping is performed throughout the natural gas and transmission line routes. Beekeepers may be adversely affected by dust generation due to construction activities. In order to assess the economic significance of this activity, beekeeping areas will be identified during the pre-construction surveys.

Compensation principles for all land acquisition/usage actions are presented in the RPF.

In addition to impacts within the designated and compensated corridor, pipeline construction may cause disruption, severance and damage to neighboring, uncompensated pieces of land, in the following situations:

- Interruption of irrigation or drainage affecting crops in uncompensated plots
- Severance of access to cultivated plots during construction, impeding farmers' access to a plot and resulting in total or partial loss of crop
- Loss of agricultural productivity of the land during the Project construction period and the reinstatement period can be both a primary and secondary impact
- Accidents to livestock as a result of Project activities resulting in livelihood loss.
- Temporary land use which may be required for stocking material or soil, opening additional access roads etc.

Impacts of Surface Facilities and Well Areas

The subject lands for surface facilities and well areas will be permanently acquired and the rights of BOTAŞ will be registered in the relevant title deed records. Owners of the land to be expropriated for these project components will probably be affected to a greater extent than the landowners to be expropriated for the pipeline. Unlike the construction of the pipeline, the surface facilities and well areas will not be in line with the linear principle, and will therefore significantly affect a higher proportion of parcels than the pipeline. Owners of the parcels, that surface facilities and well areas will be established on, will be fully compensated at replacement cost.

- *Physical displacement of house; movement of livestock pen(s):* There are identified PAPs who do not have the title deed of the houses or livestock pens and they are expected to be highly affected by the project since they have no right to claim according to the national law when the structures or shelters are required to be removed. National expropriation law compensates informal users' assets on treasury land but there is no such provision for pasture lands. According to the provision of Turkish Civil Code No. 4721, Article 713, possession through usucapion is only for immovables not registered in the title deed.
- *Loss of land and agricultural income:* According to the data obtained from baseline studies carried out in the ESIA stage, irrigated and dry farming is common in the region and is the most important livelihood source. The affected plots are used primarily for cultivation and most landowners use all their land, including the portion affected, for direct income generation. Baseline data shows that in recent years in the region, farmers have taken irrigation pipes by borrowing credits to do irrigated agriculture. Therefore, losing their lands will directly cause a reduction in their agricultural income. The impact on loss of land and agricultural income may also indirectly affect the seasonal workers in terms of livelihood loss. The majority of the seasonal workers come from Hatay, Kilis, Şanlıurfa provinces of Turkey or from Syria to work between July and September, and the majority of these workers are Syrian

immigrants. The abandonment of agricultural activities on permanently expropriated lands may indirectly lead to job loss for seasonal workers. However, the region-wide of Konya-Aksaray receive many seasonal workers, so they have mobility to other agricultural areas in the region. While the impact on seasonal workers is expected to be negligible, the presence of this group will be considered again during RAP baseline studies.

- *Loss of standing crops and trees:* Crops and trees planted on lands which are subject to acquisition for well areas and surface facilities will be lost.
- *Loss of grazing and pasture lands:* Grazing and pasture lands, which are located within the license area of Expansion Project, will be permanently lost due to the construction of well areas and surface facilities these project components. However, this impact is considered as insignificant; as detailed in Section 4.14.2. *Use of Pasture Lands*, pasture lands within the license area have quite large areas and have the capacity to meet current livestock grazing exceedingly. There are also alternative pasture lands used by PAPs which are not affected by the Project components or less likely to be affected. Thus, livestock activities are not expected to be adversely affected by the land acquisition of the project. While a loss of livelihood impact such as the abandonment of livestock activities due the project is not expected, this will also not have an adverse impact on the herders who work for livestock owners as wage earners.

In the scope of the project, impacts on land and livelihood are given in Table 5.6.7.7.2.

Table 5.6.7.7.2. Land and Livelihood Impacts

Impact Type	Phase	Impact Extent	Impact Magnitude	Likelihood of Impact	Significance
Permanent or temporary loss/severance of agricultural land or property	Construction / Operation	Local	High	Likely	High adverse
Loss of structures (i.eHouses, barns);	Land Preparation and Construction	Local	High	Likely	High adverse
Temporary disruption to grazing activities and/or reduced access to agricultural land and pastures	Construction	Local	Low	Unlikely	Minor adverse
Loss of land based income	Construction / Operation	Local	High	Likely	Highadverse
Accidents to livestock resulting in livelihood loss	Construction	Local	Low	Unlikely	Moderate adverse
Loss of standing crops and trees	Land Preparation and Construction	Local	Moderate	Likely	Moderate adverse

Impact Type	Phase	Impact Extent	Impact Magnitude	Likelihood of Impact	Significance
Damages to crops in plots neighboring the pipeline construction corridor	Land Preparation and Construction	Local	Low	Likely	Minor adverse
Disruption of irrigation/drainage infrastructure	Land Preparation and Construction	Local	Low	Unlikely	Minor adverse

Mitigation Measures

Compensation: Key compensation principles applied for the Project are the following (see further details in the RPF):

- Land acquisition for BOTAŞ shall be carried out as per the RPF, which shall adhere to both Turkish law and WB OP4.12.
- Cash compensation at full replacement cost will be provided to private land owners for loss of land due to permanent land acquisition in surface facilities and well areas
- Cash compensation at full replacement cost will be provided to private land owners, legal and informal users for loss of structures
- Easement value for permanent and temporary easement right which is determined in accordance with criteria specified by national law will be paid to land owners
- Cash compensation for lost annual/perennial crops or plants (based on the market value of the crops and trees after valuation by a specialized committee) will be provided to private land owners, legal and informal users
- If small remaining plot parts are made uneconomic as a result of the purchase or occupation, they will be eligible to compensation as “orphan land” subject to conditions. The crop payments will be paid for orphan lands under the RAP Fund.
- If any physical resettlement is required, transportation costs (up to 1000 TL, with submission of invoice) will be paid by RAP Fund to PAPs who are physically resettled due to the Project activities.
- Livelihood losses due to the inability to use pasture lands will be compensated by RAP Fund.
- Transitional livelihood support will be paid from RAP Fund in the amount of 6 minimum wages for informal users who do not have a regular income over 1 year and whose livelihood is mainly based on agriculture but may be supplemented by other income activities such as livestock, beekeeping, seasonal works etc.
- Transitional livelihood support will be paid from RAP Fund in the amount of 6 month’s minimum wages for land owners whose land is expropriated more than 20%, who do not have a regular income over 1 year and whose livelihood is mainly based on agriculture but may be supplemented by other income activities such as livestock, beekeeping, seasonal works etc.

- All impacts related to land and livelihoods will be both internally and externally monitored and reported by BOTAŞ and its' independent third party monitoring consultant.

Other Measures:

- Residential areas will be avoided to the extent possible in determining the locations of well areas. The no-go-areas specified in the following section will be considered during the location determining.
- Gaps will be left in pipe strings where safe to do so and necessary to allow people, wildlife and livestock to cross the ROW.
- The Project will consult with local government authorities, landowners and land users, including grazers, before restricting access to land.
- The Project will seek to identify whether any herders use the construction areas and aim to consult with them on potential restrictions during construction.
- The Project will provide a substitute for watering holes used by livestock that cannot be used due to Project-related actions. The substitute will be of a type, and in a location, to be agreed with herders or livestock owners
- Vehicle movements will be restricted to defined access routes and demarcated working areas in order to prevent possible damages to the lands outside the ROW and working areas.
- The Contractor will aim to maintain the integrity and viability of functional irrigation and drainage systems will be maintained throughout construction. Any disrupted irrigation or drainage system will be reinstated on completion of construction to a standard at least equal to their original condition.
- Agricultural land will be reinstated before handover to the landowner in accordance with the Reinstatement Plan (Appendix-7.9.).
- Contractor will identify any beekeepers whose hives are within 300m of the pipeline and facility construction, camp and pipe storage areas or access routes before the start of the honey production season. Contractor will be in contact with the producer and beekeeper unions (especially for mobile beekeeping) to find agreed additional solutions which can include finding areas to move beehives during construction activities, planning construction activities during bee hibernation, reducing dust emissions in specific areas and identifying enhancement measures.
- Beekeepers will be compensated by RAP Fund for their seasonal losses and their expenses incurred in moving the hives.
- Vulnerable people will be identified during the negotiation and land acquisition process using interviews with Muhtars in communities which will include questions specifically addressing vulnerability categories identified in Section 4.14.5. Informal users are identified as vulnerable group and they are entitled to compensation for loss of livelihood or loss of structures. Other vulnerable groups (women, elderly, seasonal workers etc.) are need to be precisely found out to evaluate their losses in terms of livelihood restoration.

- All livelihood losses to be compensated by RAP Fund also cover informal users and squatters.
- Grievance Mechanisms will be put in place that allow individuals to express grievances about project related activities and employees. The mechanism is described in details in the RPF and SEP (Appendix-9) documents.
- Finally, BOTAŞ will employ qualified company staff supported by external experts to ensure that unavoidable economic and physical impacts on PAPs are assessed in advance and mitigated in line with the RPF (Appendix-10).

No-Go Areas

Although the well areas which will require permanent land acquisition with potential impacts such as physical and economic displacement have not been determined yet, it is important to identify the critical areas such as residential houses, farms, barns, gardens etc. to be avoided to the extent possible. The following map (Figure 5.6.7.7.1.), shows residential areas (including a farm, trees, houses and barns etc.) along with planned well locations, surface facilities and stations. Identified no-go zones also cover vulnerable groups identified in Section 4.10.4. Avoiding the areas which are defined as “no-go zones” will ensure that most of the land and livelihood impacts mentioned above do not occur at all or are less likely to occur.

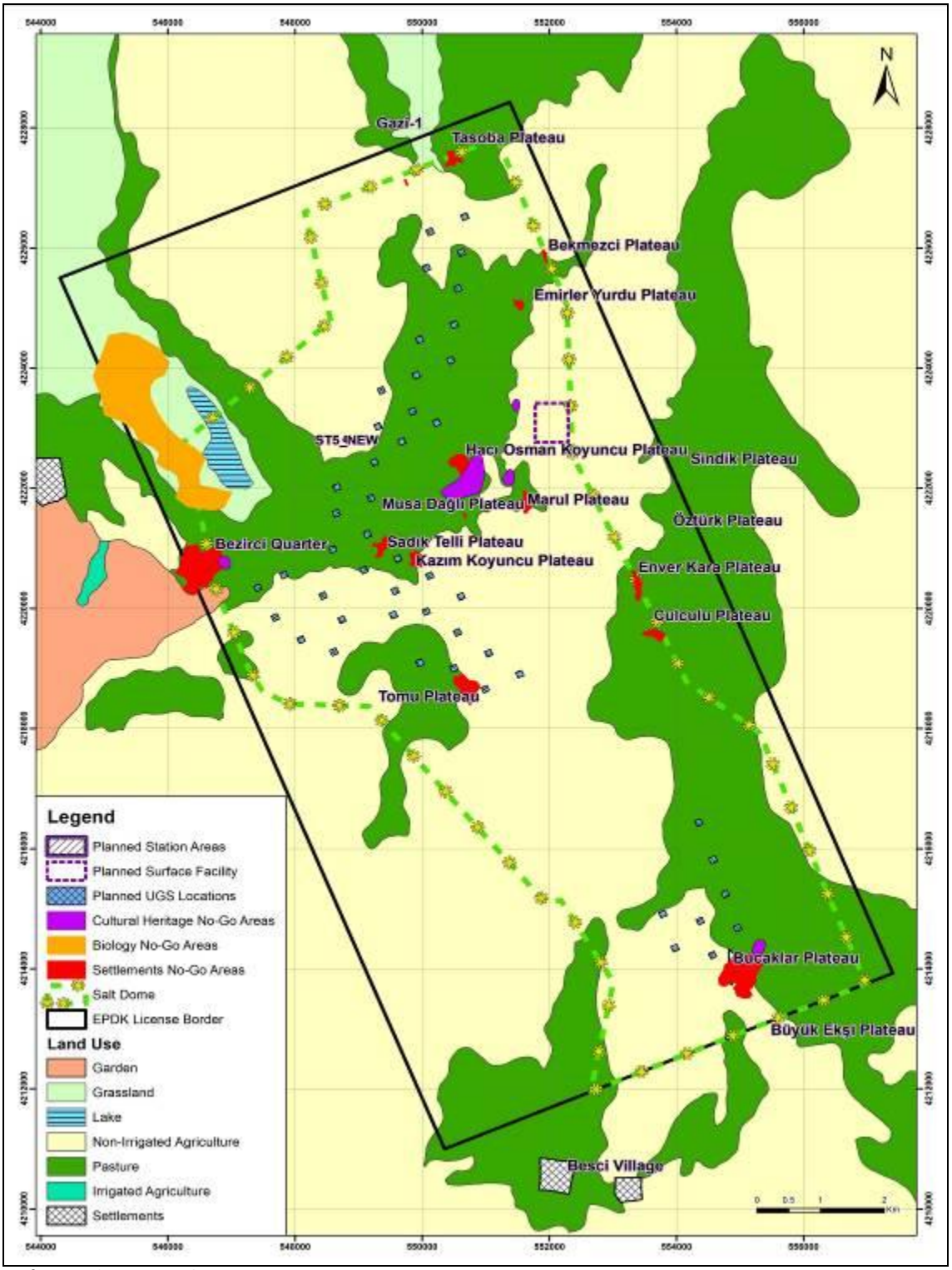


Figure 5.6.7.7.1. No-Go Areas

5.6.7.8. Lessons Learned from UGS Project

The most important lesson learned from the UGS Project is that not only economic displacement but also physical displacement will be a potential impact and those who may be affected by physical resettlement may be persons without legal titles. Studies and consultations starting from 2001 during the LAP preparation process of the UGS Project had determined that the Project primarily involves economic displacement, rather than physical displacement. After the completion of the land acquisition process, a RAP Completion Report was prepared during the second quarter of 2016. The RAP Completion Report had put forth the impacts of land take, how they were addressed and compensated for. Both during land acquisition implementation and the preparation of the RAP Completion Report, no households were required to be physically displaced. However, during November 2016, four households located in Zeybek Plateau which is situated nearly 100 meters from the UGS-8 well-area were notified to evacuate their houses due to safety concerns of the first gas pump into the UGS-8 cavern and then physically displaced in December 2016. PAPs could not receive any compensation from BOTAŞ in first place due to not being eligible (not having title deed of immovable) according to national law in force. According to The Turkish Civil Law No. 4721, Article 713; "A person who holds an immovable property that is not registered in the title deed and who has possession of the immovable property for two decades without any trial and ownership as an owner may request that the right of ownership on the whole, one part or one part of the immovable property be registered in the title deed". In accordance with this provision, possession by usucapion is only for immovable property which is not registered in the title deed. However, since the land, in which four households' immovables were located, was registered as pastureland, the possession by usucapion status was not the case.

The LAP prepared for the Project did not anticipate any physical displacement; therefore the entitlement matrix did not specify any measures to be taken when such incidents occur. However, since the borrower under a WB funding agreement, in this case BOTAŞ, is responsible to ensure that Project implementation is fully consistent with WB policies, a RAP Fund has been established to provide cash compensation and transitional support to the informal users by following WB OP 4.12, although there is no claim for compensation under local legislation.

In order to be fully in compliance with WB policies, additional documentation and site visits were performed in order to fully understand the losses of displaced PAPs and a Social Audit Report has been prepared including the key findings of studies and corrective actions to be taken. Finally, four households were compensated for the losses suffered by them and transportation/moving costs.

It is possible to encounter with similar cases during the GSEP. It is inevitable that GSEP's construction activities will lead to either land acquisition and/or denial of, restriction to or loss of access to economic assets and resources and therefore, ultimately to the land acquisition and compensation and, possibly, resettlement of people. No other immovable, such as a

barn/stockyard or house are identified in the expropriated well area of UGS Project. As the expropriation process has not been started yet, and no compensation has been provided to PAPs for the GSEP, no observations have been made on these issues such as adequacy of compensation (e.g., sufficient to cover replacement costs of lost assets, housing conditions, compensation/entitlements, income restoration), level of participation of affected people in decisions regarding compensation rates, effectiveness of livelihood restoration mechanisms etc. However, if any case in which the physical displacement required is encountered, BOTAŞ is committed to follow the policies of WB OP 4.12 by application of RAP Fund which is established within the body of BOTAŞ. Within the scope of GSEP, all livelihood and economic losses arising from construction activities, which are not covered in Turkish Legislation, will be compensated from RAP Fund. Rap Fund Management Guideline has been prepared to determine the implementation process of fund, to succeed a fair and transparent evaluation process and to provide proper compensation of economic losses of PAPs.

BOTAŞ has also prepared a Resettlement Policy Framework (RPF) (Appendix-10) to mitigate the impacts associated with proposed land acquisition activities within the scope of GSEP. In order to avoid similar problems, all activities of the GSEP must be carried out in accordance with the methods specified in the prepared RPF and in continuous communication with the stakeholders.

5.6.8. Specific Environmental and Social Impacts

Environmental and Social Impacts on Hirfanlı Dam Reservoir

The fresh water intake operation will be started at the leaching phase of the project and approximately 45 million m^3 fresh water will be abstracted per year from the Dam Reservoir via the water intake structure at first pump station for the leaching operations of the Gas Storage Expansion Project and totally 60 million m^3 fresh water will be used together with the Underground Gas Storage Project. Relation of the Gas Storage Expansion Project with Hirfanlı Dam will be only for water intake process and for this reason, environmental and social impacts will be mainly in terms of water amount in Hirfanlı Dam body however some other environmental impacts such as waste spread into the coastline, washing water leaks around the station site, sedimentation problem sourced from the rainwater flows and etc. may arise.

Impact of Fresh Water Usage on Hirfanlı Dam

During the leaching process of the expansion project, around 60 million m^3 per year fresh water will be pumped to the salt caverns from the Hirfanlı Dam. In order to interpret the effect of pumped fresh water on overall water storage capacity of Dam, the Level-Area-Volume relation data and last 10 years (2007-2016) monthly average water levels of Hirfanlı Dam are obtained from DSI and used in calculations (Figure 5.6.8.1. and Table 5.6.8.1.)

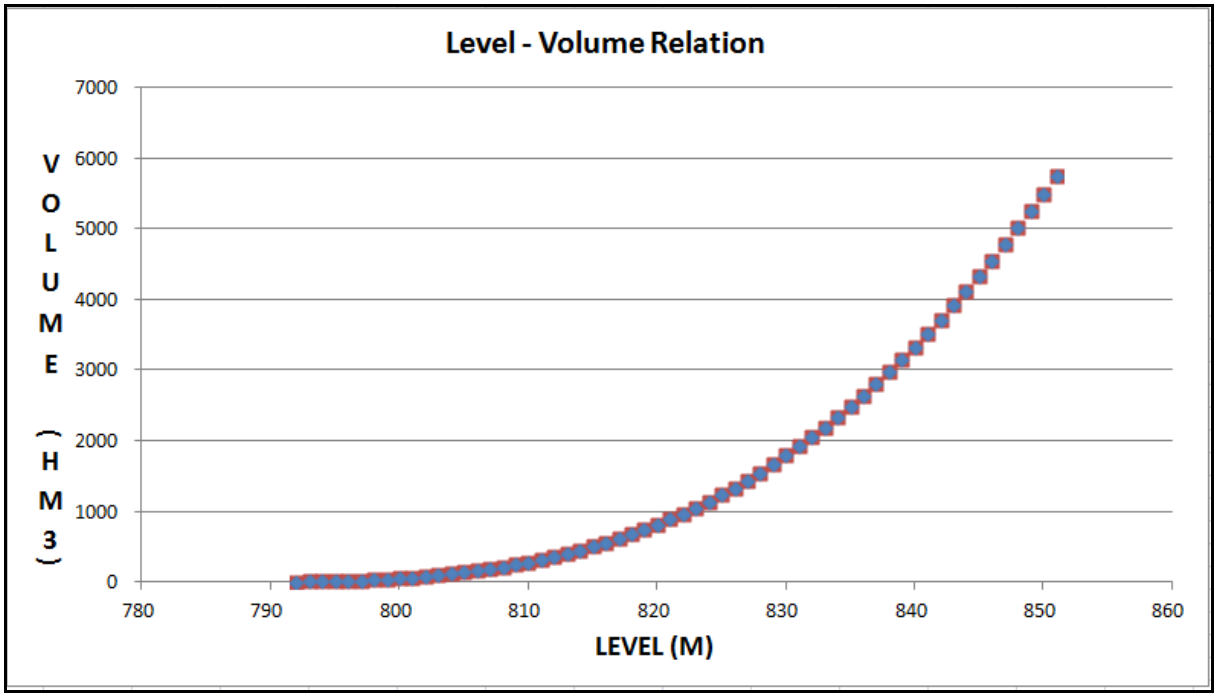


Figure 5.6.8.1. The Level-Volume Relation of Hirfanlı Dam

As seen in the following table, there is no drastic change in the water level of Hirfanlı Dam throughout the whole year due to the seasonal changes.

Table 5.6.8.1. The Long Term Monthly Average Water Levels (m) of Hirfanlı Dam(*)

Year / Month	Jan	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
2007	844.54	844.12	844.14	844.24	844.14	844.30	844.18	843.77	843.37	843.33	843.38	843.28
2008	843.31	842.90	842.82	843.21	843.47	843.47	843.47	843.47	843.47	843.47	843.47	843.47
2009	842.98	843.06	843.55	844.24	844.91	845.38	845.34	845.37	845.29	845.41	846.03	846.69
2010	847.51	848.33	848.60	848.98	849.89	850.17	850.13	849.55	849.25	849.51	849.77	849.94
2011	850.05	849.95	850.02	849.77	850.00	850.12	850.13	849.73	849.38	849.20	849.72	849.88
2012	850.23	850.20	849.89	849.60	849.81	849.71	849.79	849.10	848.23	848.15	848.13	848.13
2013	848.29	848.58	84882	849.12	849.30	849.81	849.88	849.56	849.28	849.13	849.15	849.55
2014	849.44	849.61	849.69	849.81	849.93	849.91	849.70	849.30	848.76	848.41	848.56	848.68
2015	848.92	848.89	849.25	849.60	849.85	849.83	849.60	849.09	848.59	848.38	848.29	848.42
2016	848.58	848.58	848.94	849.17	849.31	849.25	849.03	848.56	848.32	847.83	847.61	848.25
Total Average Value	847.39	847.42	847.57	847.77	848.06	848.20	848.13	847.75	847.39	847.28	847.41	847.63

**Water levels are in meters and represents average topographic elevation of water level monthly*

Due to the leaching process in the project, around 5 hm^3/month of water will be abstracted from the Hirfanlı Dam and the effect of this monthly water usage on the total water storage capacity (volume) of dam is given in the Table 5.6.8.2. below.

Table 5.6.8.2. The Effect of Water Usage on Volume (hm^3) of Hirfanlı Dam(*)

Volume / Month	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Annual Total / Average
Total Volume of Dam (hm^3)	4859.06	4867.77	4903.07	4950.61	5018.16	5049.69	5033.22	4944.96	4861.18	4834.82	4865.18	4916.49	4925.35
Pumped Water (hm^3)	5,00	5,00	5,00	5,00	5,00	5,00	5,00	5,00	5,00	5,00	5,00	5,00	60,00
% Ratio (Used Water / Total Volume)	0.103	0.103	0.102	0.101	0.100	0.099	0.099	0.101	0.103	0.103	0.103	0.102	1.22

**The volumes are in hectometer cube (hm^3) i.e: 1 hm^3 = 1000 000 m^3*

As a result, the effect of abstracted fresh water on the monthly average volume of dam is between 0.099% - 0.103%, whereas the used water is only affecting 1.22% of the dam volume when the average annual volume of the dam is considered. In the region during the period from May to October, the temperature values are above the total annual average temperature and it is seen that there is no significant difference in the effect of used fresh water seasonally, through the year. So, any negative impact resulting from the water abstraction is not foreseen on the Hirfanlı Dam volume through the year.

There was no impact observed or any complaint received during the leaching operation ongoing for three years at the environmental monitoring activities of the Underground Gas Storage Project. However, regular surface water analyses sampled at the water intake structure were conducted for the surface water classification of Hirfanlı Dam and no negative impact was observed according to the analysis results, except once in three parameters (September 30, 2015), that might probably have been caused by the seasonal changes.

In addition, while Hirfanlı Dam Reservoir was defined as an energy supply and flood control reservoir, it is not used for irrigation purposes in principal for the agricultural lands currently. However, there is no official user for Hirfanlı Dam according to the statement of the DSI. It is estimated that there will be no negative impact to the farmers during the project according the experienced observations during the monitoring activities at the Underground Gas Storage Project in three years.

Some measured parameters of the analyses conducted on scope of the surface water classification have been given under the “Baseline Studies” title in this report of Gas Storage Expansion Project.

In addition, on the date March 9, 2017, an inspection has been realized by the Dam Safety Expert of World Bank, Dam Safety and Operation Experts from DSI Ankara Regional Directorate, BOTAŞ and EÜAŞ on current conditions of Hirfanlı Dam Reservoir such as, stability, leaking, capacity, maintenance periods, etc. issues and it has been determined that weekly, quarterly and yearly maintenance of Hirfanlı Dam is realized by DSI. Inspection report may be added to the final revision of ESIA.

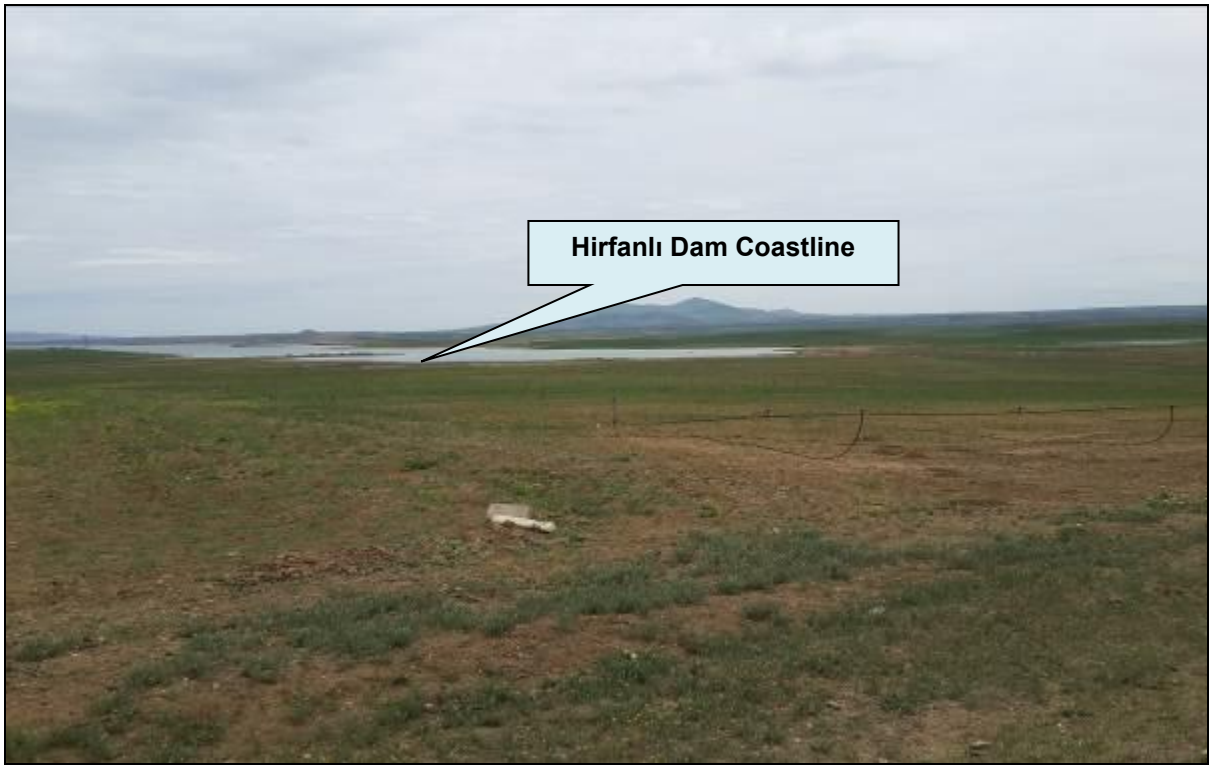
In addition to the above explanations, an additional site visit was carried out to investigate whether the water intake process of BOTAŞ from the Hirfanlı Dam had any social impact on irrigation activities there. All the settlements around the Hirfanlı Dam and the Kesikköprü Dam downstream were visited and a survey was conducted with local people. It was aimed to obtain information about how agriculture is done in these settlements (irrigated or dry agriculture), which crops are planted, if irrigated agriculture is carried out, how the land is being irrigated and where the water is provided from. At the same time, it was also asked whether they have information about the water intake process of BOTAŞ at the Hirfanlı Dam and observed any impacts about it.

For this purpose, Acıkuyu, Şanlıkışla, Büyükbıyık, Küçükbıyık, Büyükcamili, Kesikköprü, Büğüz, Kargınyenice, Savcıkurutlu, Hirfanlı and Töklümen settlements were visited on May 17, 2017, interviews were conducted with Mukhtars, and if the Mukhtars were not found, village members or people who had information about the village were interviewed (Picture 5.6.8.1., Picture 5.6.8.2. and Picture 5.6.8.3.).

According to the information obtained from the interviews; irrigated agriculture is currently carried out in some of these settlements such as Şanlıkışla, Büyükbıyık, Kesikköprü, Büğüz, Savcıkurutlu, Hirfanlı and Töklümen. In other villages, rainfed agricultureis carried out, where only barley and wheat crops are planted, which is why the geographical location of these villages is not suitable for water abstraction from the dam. Irrigation for agricultural purposes from Kesikköprü Dam is carried out legally, but irrigation from Hirfanlı Dam is carried out illegally. According to the observations, irrigated agricultural lands are very large (about 500-1,000 acres each) and mostly seasonal agricultural workers are employed in these lands during summer season. Seasonal workers usually come from other provinces such as Şanlıurfa and Diyarbakır, and stay in tents along the Hirfanlı Dam. Most people have no information about the water intake process of BOTAŞ at the Hirfanlı Dam and they did not experience a water decrease in recent years. Only in some periods there is a decrease in the water level, which is thought by users to be caused by climatic conditions. It is also indicated by users that there has been a decrease in rainfall in recent years and that drought has been experienced.

Picture 5.6.8.1. Interview with Acıkuyu Village Member

Picture 6.6.8.2. Interview with seasonal worker at Şankışla Village Boundary



Picture 6.6.8.3. Irrigation Activites at Agricultural Lands of Şanlıkışla Village

Environmental and Social Impacts on the Tuz Gölü Basin

During the leaching operation at the Underground Gas Storage Project, approximately 45 (± 5) million cubic meters brine have been discharged into the arid areas of Tuz Gölü and there was not any negative impact observed on salt water characteristic of Tuz Gölü according to the performed analyses and also monitoring activities. However, arid zones at the south of Tuz Gölü have been reanimated due the discharged brine in three years. Similarly, it is estimated that environmental impacts of the Gas Storage Expansion Project will be similar with the Underground Gas Storage Project.

Impact of Brine Discharge to Tuz Gölü

During the leaching process of the expansion project, nearly 60 million m^3/year brine will be discharged to Tuz Gölü. In order to interpret the effect of this discharge to Tuz Gölü, the lake level observations station (E16G019) monthly average water level values of DSI between 2007-2015, is obtained and used. On the other hand, the relationship between the Water Level-Area-Volume for the Tuz Gölü is obtained and calculated by a series of surface analyses carried out by the GIS (Geographic Information System), where the results are presented in Figure 5.6.8.2. and Table 5.6.8.3., given below.

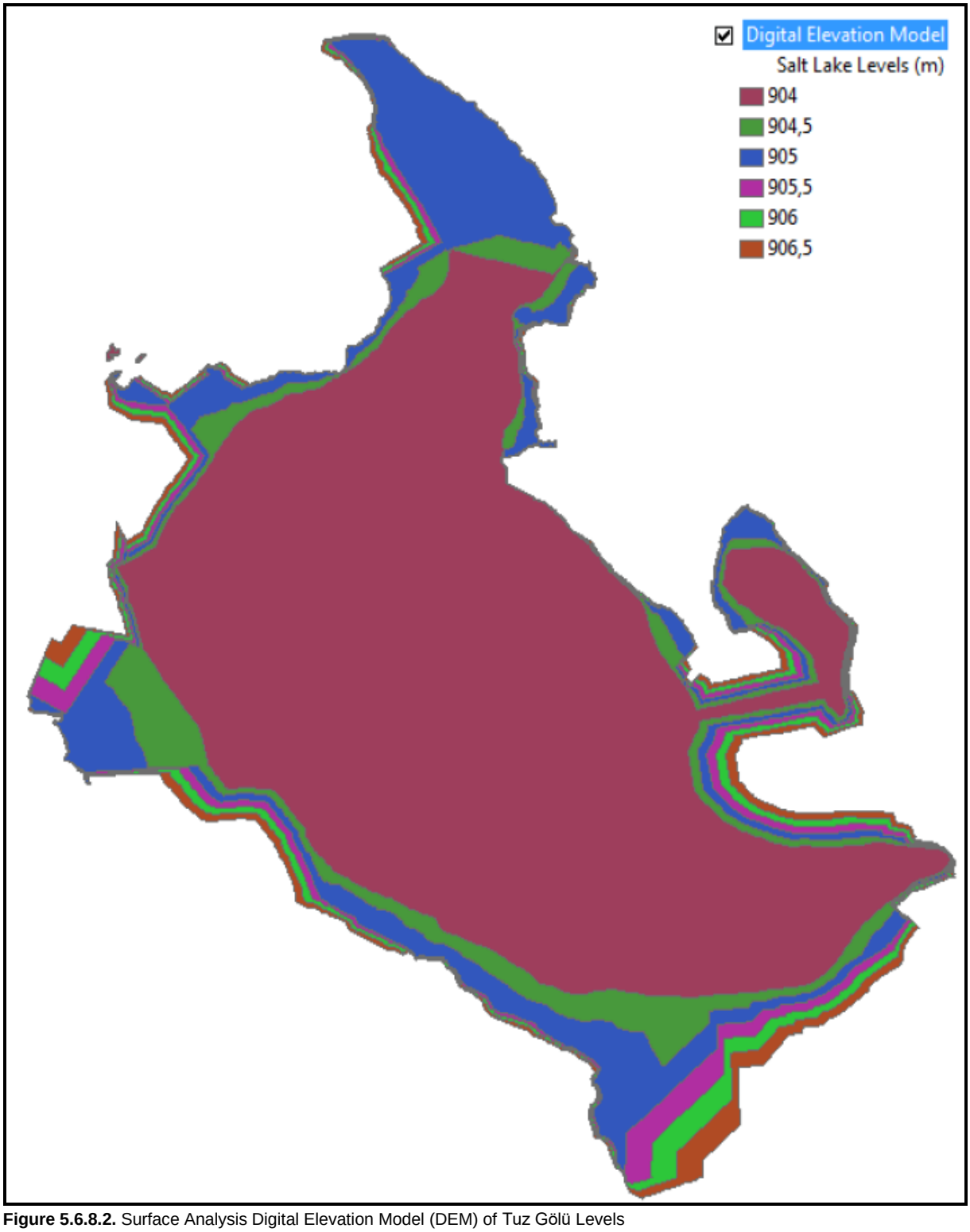


Figure 5.6.8.2. Surface Analysis Digital Elevation Model (DEM) of Tuz Gölü Levels

Table 5.6.8.3. The Tuz Gölü Water Level-Area-Volume Relationship

Water Level Range (m)		Area (m^2)	Volume (m^3)
903.5	904.0	1,131,812,280	565,906,140
904.0	904.5	1,271,942,547	1,201,877,413
904.5	905.0	1,523,984,692	1,963,869,759
905.0	905.5	1,597,700,159	2,762,719,839
905.5	906.0	1,664,640,489	3,595,040,084
906.0	906.5	1,727,023,549	4,458,551,858

According to the official data of lake level observation station since 2007; the Tuz Gölü level changes between 904.20 m and 905.90 m with an average water level of 905.02 m. As a result, the effect of discharge of 60 million m^3/year brine to the Tuz Gölü for six years is calculated annually and given in Table 5.6.8.4. below.

Table 5.6.8.4. The Brine Discharge Effect on Tuz Gölü Annual Water Level

Average Water Level		1st Year	2nd Year	3th Year	4th Year	5th Year	6th Year
Water Level (m)	905.02	905.07	905.11	905.15	905.19	905.22	905.26
Volume (m^3)	1,995,823,763	2,055,823,763	2,115,823,763	2.175,823,763	2,235,823,763	2,295,823,763	2,355,823,763
Brine Addition (m^3)	-	60,000,000	60,000,000	60,000,000	60,000,000	60,000,000	60,000,000
Change in water level (m)	-	0.05	0.09	0.13	0.17	0.20	0.24

As seen, the change in the Tuz Gölü water level due to brine discharge is between 0.05-0.24 m, which is in the normal water range (904.20-905.90 m) of Tuz Gölü, even with an estimate of zero evaporation.

In the region, according to the Şereflikoçhisar Meteorological Station hydrologic water budget close to Tuz Gölü surface evaporation is approximately 84% per year. Considering that amount of evaporation, it can be thought that the added brine to Tuz Gölü will drop down to 9,600,000 m^3/year. Then we obtain the following table given below (Table 5.6.8.5.) for the case of effect with evaporation where the water level change in Tuz Gölü changes between 0.01-0.05 m which is also in the normal water range (904.20-905.90 m) of Tuz Gölü.

Table 5.6.8.5. The Brine Discharge Effect on Tuz Gölü Annual Water Level with Evaporation

Average Water Level		1st Year	2nd Year	3th Year	4th Year	5th Year	6th Year
Water Level (m)	905.02	905.03	905.04	905.05	905.05	905.06	905.07
Volume (m^3)	1,995,823,763	2,005,423,763	2,015,023,763	2,024,623,763	2,034,223,763	2,043,823,763	2,053,423,763
Brine Addition (m^3)	-	9,600,000	9,600,000	9,600,000	9,600,000	9,600,000	9,600,000
Change in water level (m)	-	0.01	0.02	0.03	0.03	0.04	0.05

In addition, according to the pollutant type and amounts to be transferred and accumulated in Tuz Gölü Basin via the water transfers from Hirfanlı Dam and also discharges of brine, some parameters such as Zinc (Zn), Lead (Pb) and Mercury (Hg) that were analyzed in both basins can be calculated according analyzed values/yearly minimum water volume in Tuz Gölü) as below (Table 5.6.8.6 for worst case scenario and Table 5.6.8.7 for last analysis results).

Table 5.6.8.6. Mass balance calculation table for some pollutant parameters to be accumulated in Tuz Gölü Basin that regularly measured in both basins (analyzed maximum pollutant values in all times/yearly minimum water volume in Tuz Gölü).

Parameters	Sourced From Hirfanlı Dam			Sourced From Brine Discharges		
	Zinc	Lead	Mercury	Zinc	Lead	Mercury
Analyses Values (mg/L) (Maximum Values in All Times)	0.03	0.00056	0.016	1.5	0.133	0.219
Yearly Transferred Water Amount (Billion Liters)	60	60	60	60	60	60
Pollutant Amount in Yearly Transferred Water Amount (kg)	1800	33.6	960	90000	7980	13140
Yearly Minimum Volumes of Discharge Basin (Tuz Gölü) (Billion Liters)	566	566	566	566	566	566
Rate of Transferred Water Between Basins to Total Volume (%)	10.60%	10.60%	10.60%	10.60%	10.60%	10.60%
Pollutant Amount Accumulated in Tuz Gölü Basin (kg/year)	190.81	3.56	101.77	9540.64	845.64	1392.93
Pollutant Amount Accumulated in Tuz Gölü Basin During the Project (kg/ 6 years)	1144.88	21.37	610.60	57243.82	5075.62	8357.60

Table 5.6.8.7. Mass balance calculation table for some pollutant parameters to be accumulated in Tuz Gölü Basin that regularly measured in both basins (Hirfanlı – Tuz Gölü).

Parameters	Sourced From Hirfanlı Dam			Sourced From Brine Discharges		
	Zinc	Lead	Mercury	Zinc	Lead	Mercury
Analyses Values (mg/L)	0.005	0.0005	0.0001	0.192	0.019	0.0001
Yearly Transferred Water Amount (Billion Liters)	60	60	60	60	60	60
Pollutant Amount in Yearly Transferred Water Amount (kg)	300	30	6	11520	1140	6
Yearly Minimum Volumes of Discharge Basin (Tuz Gölü) (Billion Liters)	566	566	566	566	566	566
Rate of Transferred Water Between Basins (%)	10.60%	10.60%	10.60%	10.60%	10.60%	10.60%
Pollutant Amount Accumulated in Tuz Gölü Basin (kg/year)	31.80	3,18	0.64	1221.20	120.85	0.64
Pollutant Amount Accumulated in Tuz Gölü Basin During the Project (kg/ 6 years)	190.81	19.08	3.82	7327.21	725.09	3.82

According to the mass balance calculation table; it can be easily seen that, the pollutant amounts sourced from Hirfanlı Dam (via water transfers between both basins) will be accumulated in Tuz Gölü Basin very less than discharged brines during the project.

However, total pollutant accumulation in Tuz Gölü has been calculated for six years and given in Table 5.6.8.8 as compaired with the worst case scenario below;

Table 5.6.8.8. Total Pollutant Accumulation in Tuz Gölü after the Project

TOTAL POLLUTANT ACCUMULATION IN TUZ GÖLÜ (Hirfanlı Dam + Brine Discharges)						
Parameter	FOR THE LAST RESULTS			FOR WORST CASE SCENARIO		
	Zinc	Lead	Mercury	Zinc	Lead	Mercury
Pollutant Amount Accumulated in Tuz Gölü Basin (kg/year)	1253	124	1	9731	849	1495
Pollutant Amount Accumulated in Tuz Gölü Basin During the Project (kg/ 6 years)	7518	744	8	58389	5097	8968
Pollutant Amount Accumulated in Tuz Gölü Basin During the Project for 6 years (mg/L)	0.013	0.0013	0.00002	0.103	0.009	0.016

In the last analysis of Tuz Gölü (Sample 2, Table 4.7.2.3.6.); sampled heavy metals values had been measured as;

- Zinc 0.353 mg/L
- Lead 0.0072 mg/L
- Mercury 0.0084 mg/L

And if the worst case scenario realized during the expansion project, values of the heavy metal parameters will increase in Tuz Gölü except Zinc parameter and it will be meaned to the stop the brine discharges.

According to those compared results; pollutant impacts of the water transfers between the basins and discharged brine on the Tuz Gölü basin are at the lowest level generally according to the measured parameters of Tuz Gölü, and it could be foreseen to be close to minimum during the project.

The discharged brine samples will be taken from the diffuser point and nearest and farthest points and also soil samples will be taken at the brine spread areas and physical, chemical and heavy metal parameters will be analyzed by BOTAŞ and the Consultant during the Gas Storage Expansion Project same as Underground Gas Storage Project. However, regular monitoring activities will be performed on general conditions of the brine discharge areas such as status of the flora and fauna individuals, etc. at the site visits. Seasonal monitoring activities on flora fauna individuals will be ongoing during the Gas Storage Expansion Project.

In addition, any social impact is not foreseen resulting from the leaching operation of the Gas Storage Expansion Project since there will not any area invasion at brine spread areas.

Impact of the Water Transfer Between Kızılırmak and Tuz Gölü Basins

Water transfer between basins can be defined as an artificial means of transporting / transferring water from any basin to another basin with a pipeline or canal.

In many regions of the world, water transfer projects have been implemented due to inability of existing water resources to meet the needs of industrial, agricultural and urban water, restoration of water resources, drought, increasing the performance and flexibility of the existing water supply system, energy production, etc.

The most important parameters of such projects are the amount of water transferred and the distance. Both parameters determine the cost of transfer, environmental and sociocultural effects (Table 5.6.8.9.).

Table 5.6.8.9. Classification of Water Transfer Projects

Category	Transferred Water, W (km^3/year)	Distance, L (km)	Index, WL (km^3/yıl.km)
Small	<1	<100	<100
Middle	1-2.5	100-400	100-1,000
Large	2.5-5	400-1,000	1,000-5,000
Very Large	5-10	1,000-2,500	5,000-25,000
Largest	>10	>2,500	>25,000

Amount of water to be transferred annually under the Tuz Gölü Gas Storage Expansion Project;

60 million m^3 = 0.06 km^3 (Small Scale)

Within the scope of the Gas Storage Expansion Project, the effects of water transfer in the Hirfanlı Dam to be supplied have been discussed in the following 3 titles.

- ✓ The effects on the environment of Hirfanlı Dam,
- ✓ Socio-economic effects,
- ✓ Ethics

Within the scope of the above mentioned items;

- Calculating the amount of water according to the lowest dam volume of Hirfanlı,
- The minimum volume of water to be taken and percentage of the Hirfanlı Dam reservoir area is the worst,
- Impacts of local people on irrigation activities and
- The effects of the water to be transferred to the Tuz Gölü (impacts on water quality, flora and fauna components of Tuz Gölü)

Detailed evaluations on the subjects mentioned above within the scope of impact of the water transfer between Kızılırmak and Tuz Gölü Basins are given in the *Chapter 5.6.8. Specific Environmental and Social Impacts* and *Chapter 4.13. Flora and Fauna.*

5.6.9. Biodiversity Impacts and Mitigation Measures

Impacts

- Brine discharge may change the salinity of the topsoil, which may affect the endemic flora species at the No-Go Areas.
- Freshwater line and brine discharge line constructions are habitat blockers for mammal and reptile species. Also, the use of excavator at these areas may harm *Testudo graeca*.
- The increase of water level at Tuz Gölü may affect the flamingo breeding places.
- The brine discharge may affect toxicity to plankton from heavy metal accumulation and the food web (especially flamingo species).
- The water intake and the salty discharge may affect the water quality of the Tuz Gölü.

Mitigation Measures

The change of salinity of the topsoil should be monitored before and during brine discharge. Therefore, soil salinity composition determination should be prepared and monitored according to Biodiversity Action Plan (BAP) (see Appendix 7.13.). This impact is a significant impact. During monitoring if an abnormal change in salinity is analyzed, the discharge should be diluted immediately.

Before excavator usage at the area, *Testudo graeca* species should be collected and transport the specie to appropriate habitats. This impact is a low impact, which can be mitigated easily.

Habitat blockers are moderate impacts. The effects of habitat blockers may be minimized, when top soil laying will be performed in short time.

The increase of water level at Tuz Gölü is a low impact. The increase of the water level will be 5 cm in 6 years. Flamingo species are breeding on hills 15 – 45 cm. Therefore no effect on breeding of flamingo species is expected.

Toxicity to plankton from heavy metal accumulation is a significant impact. Therefore;

- Periodic heavy metal analysis of water samples taken from Hirfanlı Dam Lake and change of the position of water intake structure if continuous pollution is detected other than seasonal / periodic fluctuations. For example, positioning in the center of the lake and close to the surface. As is known, many heavy metals tend to sediment in the lake.

- Periodically, the discharged water shall be examined in terms of heavy metal before the discharged water is transferred to the lake and assessed whether it exceeds the critical level. It shall be discharged by dilution, if necessary.
- Take precautions if there is a correlation between the minimum amount of plankton (*Artemia salina*) per year at the location closest to the discharge area and a possible decrease in the level of pollutants in the discharged water and possible drop in abundance. For example, the brina discharge is temporarily stopped and the pollutant concentration in the area is reduced by discharge of the dam reservoir water for a while.
- Considering that the level of pollutant in Hirfanlı Dam Lake is low, it is foreseen that the operation of water pumps for a while when the capacity increase works are completed will have a positive effect on lake water supply.

5.6.10. Cumulative Impact Assessment

The cumulative impacts arise from adding the impacts of the project on to the impacts of the current or planned projects. While each and every project causes major and minor impacts, the cumulative impacts imply the overall direct and indirect impacts resulting from two or more projects in the same locality. The cumulative impacts of the planned activities need to be taken into consideration. The impacts that occur due to each and every project may not seem important in themselves, but the total damage, in other words, the cumulative impacts can be extremely important.

Within the context of the Gas Storage Expansion Project, the cumulative impacts of the underground natural gas storage projects are set out in this cumulative impact assessment as below:

- Underground Gas Storage Project: **UGS Project**
- Gas Storage Expansion Project: **GSEP**
- The ATLAS Petroleum Gas Co. Natural Gas Storage Project: **Atlas Project**

All of the projects mentioned above, one of which is the *UGS Project* and one of which is the planned *Gas Storage Expansion Project,* are both realized in the Tuz Gölü Basin by BOTAŞ, while the third one is a *Private Project* realized by a private sector company. The Gas Storage Expansion Project within the scope of the ESIA Report is being implemented by BOTAŞ about 40 km south of Tuz Gölü and about 17 km south of the Sultanhanı Municipality, subordinated to the Merles District of the Aksaray Province in the same areas as the Underground Gas Storage Project. The EIA process of the Gas Storage Expansion Project is continuing and the construction works of the project will be started in middle of the year 2017.

The Private Project, for which the EIA process has been completed and the Final EIA Report of which awaits approval, is being implemented by ATLAS Petroleum Gas Importation

Exportation Marketing Trading Co. (ATLAS) within the boundaries of the Central and Skill Districts of the Aksaray Province and the Emirgazi District of the Konya Province and at a distance of about 2,500 m to the surface facilities of the Underground Gas Storage Project and 1,600 my from the UGS locations of the planned Gas Storage Expansion Project of BOTAŞ. The topographic map presenting the surface facilities and the other units of these projects is given in Figure 5.6.10.1.

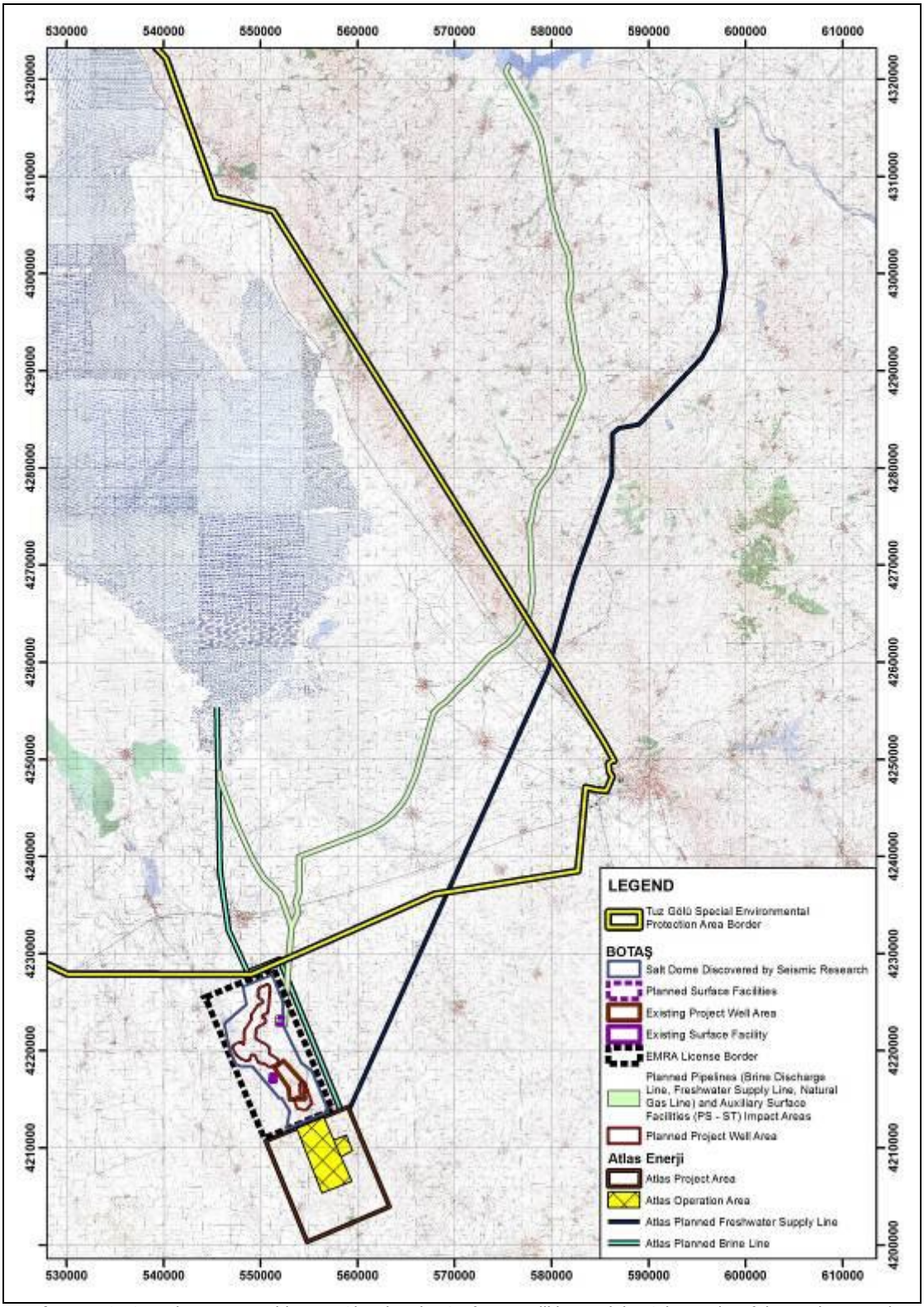


Figure 5.6.10.1. The Topographic Map Showing the Surface Facilities and the Other Units of the Underground Natural Gas Storage Projects Being Implemented In the Tuz Gölü Basin

As can be seen in Figure 5.6.10.1., all projects are located very close to each other and the fresh water required for the leaching operations as part of all projects is withdrawn from the Hirfanlı Dam Lake. The salt water (brine) generated due to the leaching operations will be discharged into Tuz Gölü via different discharge lines with the current leaching operations of the Underground Gas Storage Project. Through the Cumulative Impact Assessment studies carried out as part of the ESIA Report of the Gas Storage Expansion Project, the overall impacts of the fresh water supply lines and the discharge lines to be constructed as well as the activities to be performed within the scope of all of the projects on the flora and fauna species found in the project sites and their surroundings, will be evaluated. The physical characteristics of both projects are provided in Table 5.6.10.1.

Table 5.6.10.1. The Physical Characteristics of the Underground Natural Gas Storage Projects Being Implemented in the Tuz Gölü Basin by BOTAŞ and ATLAS

Physical Characteristics	BOTAŞ		ATLAS
	UGS Project	GSEP	Atlas Project
The Time required to Create Caverns (month)	77	66	96
The No. of Caverns to be Leached	12 caverns (In groups of 6)	48 caverns (In groups of 6)	12 caverns (In groups of 2)
The Volume of Each Cavern (m^3)	630,000	630,000 – 750,000	630,000
The Point of Fresh Water Withdrawal	Hirfanlı Dam Lake (via pipeline to be constructed)	Hirfanlı Dam Lake (via pipeline to be constructed)	Hirfanlı Dam Lake (via pipeline to be constructed)
The Quantity of the Fresh Water Required (million m^3/year)	15	45	10.8
The Point of Discharge	Tuz Gölü arid zone (via pipeline to be constructed)	Tuz Gölü arid zone (via pipeline to be constructed)	Tuz Gölü arid zone (via pipeline to be constructed)
The Volume of the Salt Water to be Discharged (million m^3/year)	Tuz Gölü 15 (contains ~1,760,000 m^3 of salt)	Tuz Gölü 45 (contains ~5,300,000 m^3 of salt)	Tuz Gölü 10.8 (contains ~1,260,000 m^3 of salt)

Reference: The EIA Report of the above-mentioned project by ATLAS and the EIA Reports of the Underground Gas Storage Project and Gas Storage Expansion Project of BOTAŞ

In an effort to estimate the maximum potential impacts as part of the Cumulative Impact Assessment studies, the construction activities (the leaching and the discharge operations) of all projects are considered to be undertaken simultaneously and the impacts that might arise consequently are listed below;

- The impacts of the simultaneous fresh water withdrawal from the Hirfanlı Dam Lake throughout the leaching operations within the scope of either of the projects on the dam lake and the other users (villagers and farmers),
- The impacts of the simultaneous discharge of the salt water on the receiving environment which is Tuz Gölü,
- The impacts that might occur during the fresh water withdrawal and the brine discharge operations on the flora and fauna species found in the project sites and their surroundings,
- The impacts that might occur due to labor influx in means of incoming workers to the area affected by three Projects and
- The impacts on livelihood losses that might occur due to close proximity of components of UGS Project and GSEP of BOTAŞ.

As can be inferred from Table 5.6.10.1., the total quantity of the fresh water necessary for the leaching of the 69 salt caverns (Leaching of 3 caverns have been completed in the scope of the Underground Gas Storage Project) in total for all projects is 70.8 million m^3 per year. The fresh water required will be procured via independent fresh water supply lines from various points of the Hirfanlı Dam Lake as demonstrated in Figure 8.1. As the total quantity of the fresh water to be procured, constitutes 1.22% of the total average volume of the Hirfanlı Dam Reservoir, the necessary authorizations granted by the General Directorate of State Hydraulic Works (DSİ) have been obtained for all of the projects and the protocols will be signed for the water use of the Gas Storage Expansion Project. Therefore, no negative impacts are anticipated to occur on the other farmers and villagers living on around the Hirfanlı Dam Lake and also floristic and fauna individuals of dam ecology in or in the vicinity of the project sites due to the fresh water withdrawal as part of all projects from the Hirfanlı Dam Reservoir, either at the same time or at different times In that case, there will be no effects on farming and other irrigational activities. In addition to this, different water sources can be used for the agricultural irrigation activities such as Peacenik Dam and the Evren Pond Irrigation Projects, being operated by the DSİ 5^{th} Regional Directorate near Hirfanlı Dam.

Another cumulative impact might arise in connection with the discharge of the salt water resulting from the leaching operations into the receiving environment which is Tuz Gölü. Within the scope of the projects, salt water with a total volume of 70.8 million m^3, containing about 8,320,000 m^3 of salt, will be discharged from three different points with an approximate distance of 5,000 – 6,000 meters, into Tuz Gölü per year, via three independent discharge lines. Under these circumstances, Tuz Gölü which is subject to continuous loss of water and thus faces the risk of drying out is envisaged to be positively affected as stated in the ESIA

Report of Gas Storage Expansion Project and the EIA Reports of the other two projects. In this regard, the necessary sampling and analyses have been undertaken within the framework of the EIA Reports mentioned above and the results of these analyses indicated that the salt water to be discharged into Tuz Gölü presents characteristics similar to Tuz Gölü and their sources are found to be the same. However, in the scope of the 3rd Party Monitoring Activities of Underground Gas Storage Project, brine distribution in the arid areas of Tuz Gölü is clearly seen on the satellite images taken for last two years given below (Figure 5.6.10.2. and Figure 5.6.10.3.).

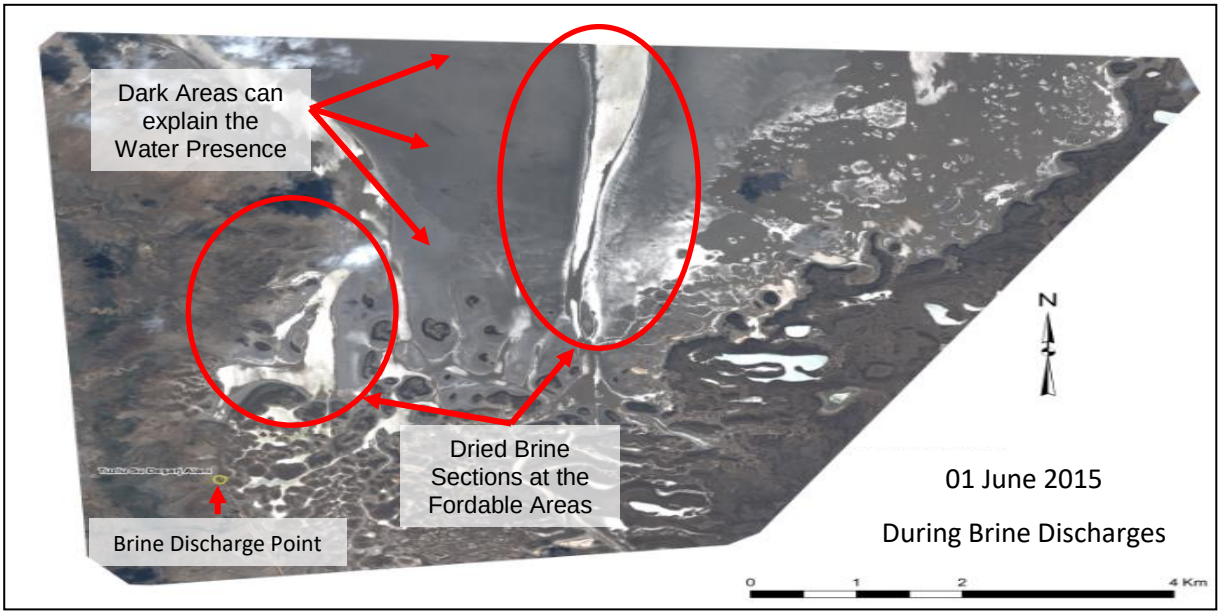


Figure 5.6.10.2. Satellite Images of Brine Spread Areas at Tuz Gölü on June 01, 2015

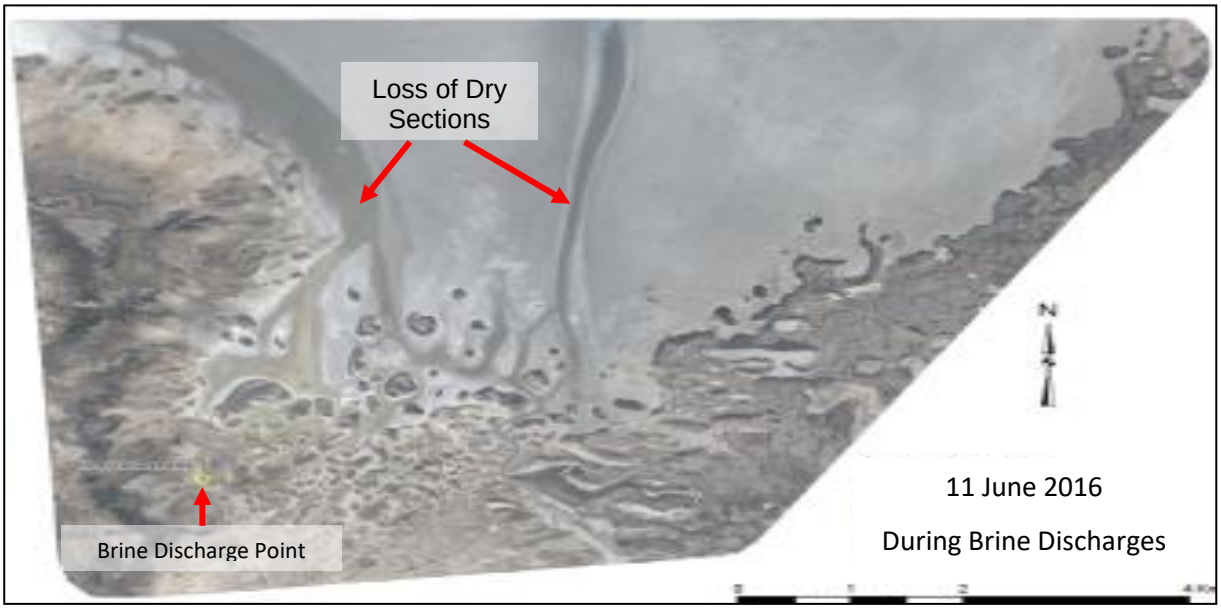


Figure 5.6.10.3. Satellite Images of Brine Spread Areas at Tuz Gölü on June 11, 2016

Furthermore, the associated principles described in the Tuz Gölü Special Environmental Protection Area Water Resources Management Plan Project / Section 9 Water Resources Management Plant and its Principles also suggest that the external supplements to Tuz Gölü contribute significantly to the sustainability of Tuz Gölü. The respective principles are;

- Keeping the water level in the lake under control through the controlled release of the water from the Mamasın Dam. Water of Melendiz Brook which is one of the most important rivers feeding Tuz Gölü with its surface flow has to be released from Mamasın Dam and the water level in the lake will be kept under control [(15)].

- As provided in Section 5.6.8., (the volume of Tuz Gölü varies between 565,906,140 m^3 and 3,595,040,084 m^3, and assuming the average water level of Tuz Gölü where evaporation will take place, the total amount of the water to be discharged during the leaching phase is calculated to cause 1-5 cm increase in the level of the lake. The salt water discharged into Tuz Gölü is expected to result in a very small increase in the water level of the lake which is assumed not to cause any negative impacts on Tuz Gölü[(16)].

In accordance with the issues specified above, it is foreseen that the discharge of the salt water arising from the leaching operations into Tuz Gölü as part of all projects either at the same time or at different times during the construction works will not create negative impacts and in case the negative impacts occur, they will be prevented by taking mitigative majors through monitoring and auditing practices.

As part of the cumulative impact assessment studies, the last issue to be addressed is the overall impacts that might occur on the flora and fauna species found on the project routes and their surroundings during the construction of the facilities associated with the fresh water procurement and the salt water discharge operations. In Part 4.1 entitled “The Flora and Fauna” of the ESIA Report of the Gas Storage Expansion Project, the possible impacts that might arise during the establishment of the project units within the scope of the Gas Storage Expansion Project and Underground Gas Storage Project and the measures to be taken have been described. Through these measures, the temporary impacts on the flora and fauna species will be minimized.

As shown in Figure 5.6.10.1., the project units of the Atlas Project will be constructed along the different routes which suggests that the cumulative impacts that might occur on the flora and fauna species found in the project site and in the vicinity under the circumstance that the construction activities of all projects are performed at the same time, would be minimized by taking the same measures specified in Part 4.1 of the report and by the monitoring practices carried out by the biology experts.

[15] Tuz Gölü Special Environmental Protection Area Water Resources Management Plan, May 2010, Ankara.
[16] Tuz Gölü Special Environmental Protection Area Water Resources Management Plan, May 2010, Ankara.

The fact that the three Projects are realized in close proximity to each other can also lead to social cumulative impacts. Since the Private Project does not take place in the same area as the other two projects of BOTAŞ, a cumulative impact is not expected in terms of land expropriation and livelihood losses. However, due to the close proximity of components of the GSEP and UGS Project, PAPs whose lands are expropriated second time may experience additional livelihood losses since the residual lands may not be economically viable anymore. Therefore they are considered as vulnerable group in Section 4.14.4. Although the parcels to be affected by Expansion project components are known, it is not yet defined how much of these parcels will be expropriated. Therefore the persons whose land have been expropriated within the scope of the UGS Project, and will be expropriated for the second time in the Expansion project could not been identified. Those PAPs will be precisely found out to evaluate their losses in terms of livelihood restoration during the negotiation and land acquisition process. Livelihood impacts on these vulnerable groups will be assessed and compensation will be provided by RAP Fund where necessary.

As a cumulative impact arising from the three projects, will be the labor influx resulting from the project workers coming to the region. The labor influx impacts, assessed in detail in Section 5.6.7.2, may be further increased by the fact that the Private Project is in close proximity and probably will cause similar impacts in terms of incoming workers. The technical workforce will also be required under the Private Project and the arrival of workers from other provinces or countries is likely to occur. Labor Influx Management Guideline has been prepared by BOTAŞ in order to identify, assess and manage the risks of adverse social and environmental impacts that are associated with the temporary labor influx. The Contractor will also prepare their own Labor Influx Management Plan based on the Labor Influx Management Guideline. The Labor Influx Management Plan should assess in detail what impacts may arise due to the presence of foreign workers in the local region and what measures should be taken to mitigate these impacts. If a different impact occurs, which is not identified in the Plan and caused by the cumulative impact of all three Projects, the Plan will be updated by the Contractor and additional measures will be identified as soon as possible.

5.6.11. Residual Impacts

Residual impacts arise due to uncontrolled environmental and social management, seasonal restrictions, incomplete works, heavy damages to environment, etc. Basically, residual impacts may be occurred during the Gas Storage Expansion Project due the reasons that are given below;

- Lack of training,
- Lack of the environmental and social management,
- Insufficient amount of waste disposal,
- Uncontrolled and continuous drainage,
- Uncontrolled interference in natural resources,
- Improper effluent discharges,

- Accident, explosion, sabotage, etc. incidents and
- Tough seasonal conditions.

In the currently Underground Gas Storage Project, there are some residual impacts which have been observed due to the lack of the reinstatement activities on the pasturelands and uncontrolled discharges, but these impacts would be easily mitigated with the special studies and works to be performed during the project works.

Residual impacts will be caused mostly due to the improper managements for the air quality, waste (hazardous wastes, mud wastes, etc.), wastewater (washing/oily water, hydrotest water, mud water, etc.), noise control and soil arguments performed during the Gas Storage Expansion Project. If required corrective actions not taken in scope of the impact assessments according to the management plans these impacts will caused to the non-removable traces at the project areas after the operation phase of the Gas Storage Expansion Project. Potential sources of the residual impacts are explained below;

Air Quality

Dust emissions consisted from the excavation works, excavated material transports, access roads, etc. will be caused to the dust pollution on around of the project areas. Dust emissions might be caused some residual impacts as to;

- Decreasing of the agricultural productivity,
- Negative impacts to the pasturage activities,
- Affecting of the endemism,
- Leaving of the fauna individuals from its the habitats

if required corrective actions not taken such as using of permitted access roads, regular road watering activities, dust emission measurements and control, dustless road covering measures, etc. during the Gas Storage Expansion Project.

However, flue/exhaust gases will not be caused to any residual impacts if the project requirements realized during the construction and operation works.

Corrective actions against to the potential residual impacts due to air quality arguments will be detailed in the procedures on pollution prevention, construction impacts, aggregate management that prepared in pre-construction phase of the Gas Storage Expansion Project.

Table 5.6.11.1. Residual Impact Assessment Table on Air Quality Arguments

Argument	Potential Impact	Impact Intensity	Impact Duration	Residual Impact	Risk Factor After Corrections
Dust Emission	Dust Pollution	High	Continuously	Probable	Minimum
Flue/Exhaust Gases	Pollutant Gas Emission	Average	Continuously	None	-

Wastes

Wastes to be produced during the Gas Storage Expansion Project will be caused to the main residual impacts after the operation phase, if corrective actions not taken and proper waste management principal not performed according to the prepared management plans.

Hazardous wastes will be most pollutant waste for the project areas. These wastes may be caused to the soil, surface water, groundwater pollution if required corrective actions not taken during the construction and operation phase of this project.

Hazardous wastes will be temporarily stored in closed and special designed areas with taken environmental measures. Hazardous waste inventory will be recorded in daily basis and input and output amount of these wastes will be strictly followed by the contractors under the control of BOTAŞ Environmental Management against to the probable residual impacts to be left at the project areas. Hazardous wastes will be managed according to the principals of EIA and ESIA reports, requirements of the relevant environmental regulations of Environment Law and also procedures on waste management, pollution prevention, construction impacts and emergency response that prepared in pre-construction phase of the Gas Storage Expansion Project.

Residual impact potential of the construction, demolition and excavated wastes might be after the operation phase of the Gas Storage Expansion Project but it will be manageable at the decommissioning phase also.

Mud and the other formation wastes will be disposed from the project areas after the drilling and leaching operation phases of the Gas Storage Expansion Project and will not be kept at site during the operation phase. Amount of mud and formation wastes will be controlled by BOTAŞ Environmental Management against probable to the residual impacts.

Table 5.6.11.2. Residual Impact Assessment Table on Waste Arguments

Argument	Potential Impact	Impact Intensity	Impact Duration	Residual Impact	Risk Factor After Corrections
Hazardous Wastes	Severe Pollution	High	Continuously	Strongly Probable	Minimum
Construction, Demolition and Excavated Wastes	Visual Pollution	Average	Continuously	Probable	None
Mud and Formation Wastes	Soil and Groundwater Pollution	Average	Temporarily	Probable	None
Domestic Wastes	Visual Pollution	Minimum	Continuously	None	-
Recyclable Wastes	Visual Pollution	Minimum	Continuously	None	-
Inert Wastes	Visual Pollution	Minimum	Periodically	None	

Wastewaters

Washing waters, oily waters and mud waters will be great pollutant sources for the ecological surround of the project areas. These effluents will be transport and temporarily stored in closed, leak-proof infrastructure systems and storage tanks with the installed pre-treatment systems such as o/w separator, balancing tanks, package treatments, etc., if not, might be caused to the residual impacts at the project areas after the operation phase of the Gas Storage Expansion Project. Hazardous characteristic of these effluents will be determined with the required analyses and treatment methods will be evaluated according to this. Wastewaters will be managed according to the principals of EIA and ESIA reports, requirements of the relevant environmental regulations of Environment Law and also procedures on pollution prevention, construction impacts and emergency response that prepared in pre-construction phase of the Gas Storage Expansion Project.

Insoluble effluents that contain the high chloride characteristic will be hazardous for the ecological surround of the project especially agricultural lands and pasturelands but it will be manageable according to the disposal methods.

Brine might be caused to the residual impacts at the brine spread areas, if anion-cation rate changed or heavy metal containment increased. Regular analyses conducted during the Gas Storage Expansion Project will be given information about the potential impacts of the brines.

Due the bio-degradable characteristic, domestic wastewaters will not have any potential residual impacts after the operation phase of the Gas Storage Expansion Project.

Table 5.6.11.3. Residual Impact Assessment Table on Wastewater Arguments

Argument	Potential Impact	Impact Intensity	Impact Duration	Residual Impact	Risk Factor After Corrections
Washing Waters	Severe Pollution	High	Instantly	Probable	Minimum
Oily Waters	Severe Pollution	High	Instantly	Probable	Minimum
Mud Waters	Severe Pollution	High	Periodically	Probable	Minimum
Brine	Pollution	Average	Continuously	Probable	None
Insoluble Effluents	Pollution	Average	Periodically	None	-
Domestic Wastewaters	Visual Pollution	Minimum	Continuosly	None	-

Noise Control

Noise pollution will be caused to the negative impact at the public settlements and not be left any residual impact but in scope of the living areas of the fauna individuals, some residual impact may be occurred such as leaving of the fauna individuals from its the habitats, etc. These impacts will be monitored during the Gas Storage Expansion Project and managed according to the construction impact management procedure that prepared in pre-construction phase of the Gas Storage Expansion Project.

Table 5.6.11.4. Residual Impact Assessment Table on Noise Control

Argument	Potential Impact	Impact Intensity	Impact Duration	Residual Impact	Risk Factor After Corrections
Loud Noise	Stress	Average	Periodically	Probable	None

Soil

A proper and usable soil management system will be required during the Gas Storage Expansion Project. Top soil and sub soil management will be clearly defined in the procedures on construction impacts and erosion, reinstatement and landscaping managements. However, due the occurred surplus excavation wastes, waste management procedure will contains the proper disposal methods against to the residual impacts.

Table 5.6.11.5. Residual Impact Assessment Table on Soil Management

Argument	Potential Impact	Impact Intensity	Impact Duration	Residual Impact	Risk Factor After Corrections
Top Soil Management	Erosion	Average	Continuously	Probable	None
Sub Soil Management	Erosion, Land Invasion	High	Continuously	Probable	Minimum

As an aim of the Gas Storage Expansion Project, mitigation measures should definitely be applied with the support of plans and procedures to be prepared by the project owner and its contractors for the minimization of the residual impacts given above during the Gas Storage Expansion Project works. Residual impacts will be discussed and handled in a plan and procedures prepared by BOTAŞ and the Contractors. Residual impacts will be minimal at all project phases, provided that recommended risk mitigation measures are taken.

In the scope of the Gas Storage Expansion Project the prepared environmental and social management plan, which is a follow-up according to the monitoring and mitigation plans, were given in Section 5.7 and 5.8. below.

5.7. Mitigation Plan

Stage	SUBJECT	MITIGATION MEASURES	RESPONSIBILITY
Preparation Works	Non-agricultural Use of Agricultural Fields	After the construction works, agricultural activities can be carried out along the fresh water line, natural gas branchman line and brine discharge line within the scope of the project, and for areas such as surface facilities and drilling locations in which agricultural activities will not be able to be carried out, a "Non-Agricultural Use Permission" will be obtained by applying to the Aksaray Directorate of Provincial Food, Agriculture and Livestock, by preparing the "Soil Preservation Project" as required by Article 13 of the Law no.5403 on "Soil Preservation and Land Utilization".	- BOTAŞ
Preparation Works	The Provision of Ground Safety	All construction works within the scope of the project will be carried out in compliance with the provisions of the "Regulation on Buildings That Will Be Constructed On Earthquake Areas" which entered into force with Official Gazette dated March 06, 2007 and numbered 26454, of the former Ministry of Public Works and Settlement.	- BOTAŞ
Preparation Works	Historical, cultural, and archaeological assets	Where concerned individuals come across any cultural and natural assets during the implementation stage of the project (field preparation and construction), they will inform the closest Directorate of Museum or Regional Directorate of Cultural and Natural Heritage Conservation Board about this issue.	- BOTAŞ - Museum Management, - Regional Directorate of Conservation Board
Preparation Works	Preparing of HSE Plan and Procedures	The HSE plan and procedures as well as the relevant documents to be a guide at the project works will be prepared by BOTAŞ and the Contractor according to the determined principles of the Project EIA and ESIA Reports.	- BOTAŞ - Contractor Company
Preparation Works	Contracts with the Licensed Companies	All contracts will be made between BOTAŞ, consultants, the contractors and licensed companies on consulting and monitoring activities, waste/wastewater disposal, air/noise measurements, fuel/oil supply, etc. will be completed and the social assessment and requirements of the project will be started.	- BOTAŞ - Contractor Company - Licensed Companies
Preparation Works	Start-Up Works	Temporary camp sites can be established and the project's start-up works such as equipment transportation and storages, infrastructure and superstructure works, route marking works, fuel and oil station works, top soil stripping works, etc. can be started in part,according the HSE plan and procedures of the project and the relevant legislations.	- BOTAŞ - Contractor Company
Preparation Works	Environmental Management	Vehicle movements will be minimized if not necessary, current energy transmission lines and access roads will be used, organic and recyclable wastes will be transported to the waste collection points of the municipalities, wastewaters will be taken by the municipality's septic trucks and probable noise pollution will be prevented.	- BOTAŞ - Contractor Company
Preparation Works	Social Management	Social management will be carried out by both BOTAŞ, its' Consultant and Contractors to ensure that the requirements of plans such as Community Relations, Community Health and Safety, Labor Influx, Stakeholder Engagement, Employment and Training Plan, Resettlement Policy Framework are followed in order to minimize or mitigate the social impacts identified in Section 5.6.7.	- BOTAŞ - Consultant - Contractor Company

Stage	SUBJECT	MITIGATION MEASURES	RESPONSIBILITY
Construction Phase	Excavations	Excavations will be carried out during the construction phase of the project in accordance with the planned office works along the pipelines and at the main and auxiliary units. Access road establishment and top soil stripping activities will be performed along the pipeline before the trench excavations. The necessary measures such as route and access road watering, closure of the top of the excavated material carriying trucks, determination of top soil and excavation soil storage area on the route and around the units, etc. will be taken during these activities against the possible dust emission problem. All wastes will be temporarily stored at the working areas and removed to the determined waste collection points daily. Portable toilets will be placed into the working areas and the wastewaters of these toilets will be disposed by the septic trucks of the municipalities at the pipeline routes.	- BOTAŞ - Contractor Company
Construction Phase	Topsoil Management	The pipeline to be placed in the project fields will be stored in the fields that will be located in the inner side of the construction corridor in the pipelines, surface facilities, and the drilling fields in order to be used later in the restoration of the surface facilities and drilling areas after the construction, by stripping the topsoil off to a sufficient depth (~15-30 cm) before the digging. These storage works will be conducted with the purpose of keeping the herbal topsoil stable until the restoration including its organic content, and the topsoil will not be used for any other activity. Within the context of the project, topsoil management will be continually checked by Soil and Bio-restoration / Restoration Experts.	- BOTAŞ - Contractor Company
Construction Phase	Excavation Wastes	Excavations will be carried out during the construction phase of the project in accordance with the Regulation on Control of Excavation Soil, and Construction and Demolition Wastes, which came into force on March 18, 2004 (O.G. No 25406).	- BOTAŞ - Contractor Company - Concerned Municipality
Construction Phase	The Effects on Flora and Vegetation	In the field preparation and construction stages of the project, plant types will lose biomass due to the vegetal soil being stripped off. In addition, there is the existence of endemic plants in the field. These plants are included in the LC (lc) category, and there are no threats posed against them. However, most plant types will re-germinate, and the stripped field will become grassy again after the stripping and storing of the topsoil under appropriate circumstances during excavation or topsoil work and the re-laying of the topsoil following the completion of the constructional work. In this way, the plant types in the field will be protected from disappearing, and the vegetation cover will be created with the same plants. In addition, Flora Experts will conduct examinations and monitoring on a monthly basis during the construction, and make sure that the construction activities have no effect on the flora and vegetation around them.	- BOTAŞ - Contractor Company

Stage	SUBJECT	MITIGATION MEASURES	RESPONSIBILITY
Construction Phase	The Effects on Fauna Individuals	During the construction work, Fauna Experts will conduct examinations and monitoring on a monthly basis with the purpose of determining the effect of the construction on the sensitive and protected fauna individuals, and ensuring that the construction activities have no effect on the fauna. During this monitoring and observation, the information about the migration periods and routes as well as reproduction timeframes and areas will be compiled and improved, and the construction work will, if necessary, be planned again to reduce the potential effects of it.	- BOTAŞ - Contractor Company
Construction Phase	Air Emissions	During the field preparation work, the project will follow the criteria stated in Industrial Air Pollution Control Regulation Appendix-1. In order to minimize the possible dust on the field, the project will take certain precautions related to the emission source including the completion of filling and discharging operations before the hurling, reformation of the roads, covering the vehicles with canvas during the transportation of the equipment, and keeping the top of the equipment with a 10% moisture. In addition, the roads will be watered with a water truck whenever needed with the aim of reducing the dust on the roads during the transportation of the equipment.	- BOTAŞ - Contractor Company
Construction Phase	Vehicle Emissions	In order to minimize the emissions created by the vehicles, all vehicles and equipment to be used will be taken to a routine control, and the vehicles that need maintenance will be taken to repair in accordance with the Regulation on Control of Exhaust Gas Emission and Diesel Oil Quality which came into force on November 30, 2013 (O.G. No. 28837), using other vehicles until the end of their repair. Moreover, the drivers will be warned to work in accordance with the Traffic Law, and they will be watched to make loading by the loading standards.	- BOTAŞ - Contractor Company
Construction Phase	Flood Prevention and Drainage	Considering that the perched water and surface water included in the sand and gravel layer may reach the foundation during the digging of the foundation pit, the necessary pumping precautions will be taken. In addition, the required isolation precautions will be taken as well as the drainage precautions under the foundations against the surface and seepage water.	- BOTAŞ - Contractor Company - Regional Directorate of State Hydraulic Works
Construction Phase	Wastewater	In the wastewater treatment plant in the surface facility construction site and the campsites, the 72 m^3 of wastewater to be generated by approximately 500 people and other domestic usage will be treated, and it will be discharged to the nearest receiving environment after obtaining discharging permission. In order to check whether the wastewater parameters abide by the receiving environment standards, the treated wastewater samples taken monthly will be analyzed.	- BOTAŞ - Contractor Company
Construction Phase	Wastewater	The domestic wastewater to be produced in portable restrooms and bathrooms during the construction work conducted out of the surface facility construction site and camp sites will be accumulated in water proof wastewater tanks, and discharged by a sewage truck to the nearest infrastructure system that has a treatment plant at the ending point.	- BOTAŞ - Contractor Company

Stage	SUBJECT	MITIGATION MEASURES	RESPONSIBILITY
Construction Phase	Hydrostatic Test Water	The water produced by the hydrostatic test to be conducted for the leaking and pressure resistance measurements of the pipes and equipment of which the production and montage are completed, will be discharged to suitable areas after the analysis of the contaminating parameters (e.g. oil and grease, suspended solid). During the discharge, the potential contaminators in the hydrotest water (e.g. oil-grease, suspended solid) will be subjected to preliminary treatment using a variety of equipment including geomembrane and different structures (e.g. sedimentation ditch) in the entrance of the discharge.	- BOTAŞ - Contractor Company
Construction Phase	Rain Water and Flood Prevention Structures	During the construction work, environmental and inner rain water collection systems will be established with the aim of discharging the rain water falling on the construction site, and the contaminators including sediments and suspended solid carried by the rain water will be prevented from reaching the discharging points by structures such as sedimentation ditch to be constructed at the end of collection systems.	- BOTAŞ - Contractor Company
Construction Phase	Solid Wastes	Of the site waste, the recyclable waste (e.g. paper, plastic, metals) and the non-recyclable waste (e.g. organic waste) will be separately collected in the waste containers (garbage bins) to be placed on different points in the project site. The recyclable waste will be given to the licensed recycling firms and be disposed by them, and the non-recyclable wastes will be given to the permitted disposal facilities as well as those of the province and administrations where the projects sites are located, and disposed by them. Additionally, there will be more solid waste including lump iron, steel, and packaging material created by field preparation and construction work, and the project is unable to determine the certain amount since they will vary. However, the waste will be collected as scrap, and stored in a suitable area in the project site (construction site, and the recyclable waste will be re-used and/or be given to the licensed recycling firms. The non-recyclable waste will be given to the solid waste collection system of the relevant municipality, and disposed by them. In summary, the workers will be warned about the fact that it is forbidden to litter the solid waste (e.g. food waste) produced by the workers during the field preparation and construction work into the sea, lakes, and other receiving environments as well as onto the streets and forests, and the criteria of Waste Management Regulation will be followed.	- BOTAŞ - Contractor Company - Sultanhanı Municipality - Province and Town Municipalities - Licensed Recycling Firm
Construction Phase	Packaging Wastes	Other waste including packaging paper, plastic bottles, and glass bottles will be collected in accordance with Article 23 of the Regulation on Control of Packaging Waste in a separate place from the other waste regardless of their materials and the source that created them and given to licensed firms to be recycled. If there is any packaging waste that is classified as hazardous, it will be given to the firms that have the license related to this issue, and the waste will be carried by licensed vehicles.	- BOTAŞ - Contractor Company - Licensed Recycling Firm
Construction Phase	Non-Hazardous and Inert Wastes	Non-hazardous and inert waste, which will be produced during the construction activities of the project, will be kept in specifically designed areas in the construction site, and disposed by licensed firms.	- BOTAŞ - Contractor Company - Licensed Firms

Stage	SUBJECT	MITIGATION MEASURES	RESPONSIBILITY
Construction Phase	Hazardous Wastes	All hazardous waste to be generated during the construction activities withiin the scope of the project will be temporarily stored in specifically designed, closed and ventilated rooms that have no drainage and placed on the impermeable grounds that are located in the central storage fields, in construction sites; this waste will be sent to licensed hazardous waste recycling, burning, and regular storage facilities by licensed hazardous waste transportation firms. Around the rooms, there will be intervention kits against fire (e.g. fire extinguisher, fire valve) and spilling (e.g. absorbent materials, absorbent wood dust), personal protective equipment (e.g. masks, gloves, goggles) kept ready all the time, and Environmental Intervention Team and Quick Response Team will perform fire and environmental accident practices regularly with the purpose of getting used to interfering in potential problems as soon as possible.	- BOTAŞ - Contractor Company - Licensed Hazardous Waste Firms
Construction Phase	Medical Wastes	There is no determination of the amount of waste to be produced by the infirmary unit of treatment that will be built with the aim of intervening in the health problems of the individuals to work in the field preparation and construction stages; it is estimated, though, that it will be a very small amount. The medical waste to be generated will be collected separately in accordance with the Medical Waste Producer Liability stated in Article 8 of the Regulation on Medical Waste Management which came into force on January 25, 2017 (O.G. No. 29959). The generated medical waste will be given for disposal to the medical waste collection system by the licensed health firms that manage the infirmary unit and/or by the Licensed Medical Waste Transportation Vehicle of Aksaray Municipality. The provisions of the regulation regarding the separation of the medical waste at the resource and accumulation shall be followed.	- BOTAŞ - Sultanhanı Municipality - Aksaray Municipality
Construction Phase	Waste Oils	The maintenance and repair of the vehicles to be used in the construction stage will be conducted in their authorized services. However; if a compulsory situation occurs for conducting and maintenance and repair inside the vehicles in case of the production of waste oil, the waste oil will be accumulated in a closed and non-leaking metal container with the aim of preventing it from getting mixed with soil and/or water within the scope of the Regulation on Waste Oil Management which came into force on July 30, 2008 (O.G. No. 26952), and be given to the licensed recycling firm in accordance with an agreement. If the maintenance and repair of the vehicles will be conducted inside the facilities, this practice will be performed in the area located within the construction site that is provided with non-leaking ground and a porch on it in accordance with the provisions of the Regulations on the Control of Soil Contamination and Contaminated Fields with Point Sources which came into force on June 08, 2010 (O.G. No. 27605).	- BOTAŞ - Contractor Company - Licensed Recycling Firm
Construction Phase	Waste Vegetable Oils	The used frying oil to be generated in the dining hall that will be established inside the facility will be collected separately from the other waste, and kept in a clean and closed container. The used frying oil will not be poured into the sewage, soil, sea, and other receiving environments with the aim of protecting the environment. In this context, the provisions of the Regulation on Waste Vegetable Oil Control (O.G. dated and numbered June 06, 2015 and numbered 29378) will be satisfied for the disposal of herbal waste oil.	- BOTAŞ - Contractor Company - Licensed Vegetable Waste Oil Firm
Construction Phase	Waste Batteries and Accumulators	The expired batteries and accumulators will be collected and accumulated separately from the domestic waste and be given to be disposed to licensed collection points and temporary storage sites in accordance with Article 13 of the Regulation on Control of Waste Batteries and Accumulators (O.G. dated August 31, 2004 and numbered 25569) with the aim of preventing from being poured into receiving environments directly or indirectly, in a way to harm human health and the environment.	- BOTAŞ - Contractor Company - Licensed Recycling Firm

Stage	SUBJECT	MITIGATION MEASURES	RESPONSIBILITY
Construction Phase	End-of-life tires	Except for bicycle and solid tires, all other end-of-life tires will be accumulated separately without mixing them with other wastes, and they will be sold to the licensed firms. In this context, the project will fulfil the conditions set out by the Regulation on Control of the End-of-life Tires which came into force on November 25, 2006 (O.G. No. 26357).	- BOTAŞ - Contractor Company - Licensed Recycling Firm
Construction Phase	Storage and Transportation of Fuel, Oil, and Hazardous Substances	As required by the Labor Law, the Regulation on Classification, Labeling, and Packaging of Mixtures, and the Regulation on Control of Large Scale Industrial Accidents, all types of fuel, oil, chemicals and other dangerous substances will be stored during the construction work in closed and ventilated rooms that have no drainage and have been designed specifically on the non-leak ground together with Material Safety Data Sheets, and the intervention kits for fire (e.g. fire extinguisher, fire valve) and spilling (e.g. absorbent materials, absorbent wood dust) will be kept ready near to the rooms together with personal protective equipment (e.g. masks, gloves, goggles).	- BOTAŞ - Contractor Company
Construction Phase	Housing and Other Technical/ Social needs of Personnel	The staff, particularly qualified and non-qualified workers, will be hired among the people living in the local area, and the individuals coming from outside the area will be able tostay in the camp site. The needs of the employees will be met in the camp site as far as possible and in the closest residential areas when this is not possible.	- BOTAŞ - Contractor Company
Construction Phase	Security of the Construction Sites	During the project, all working sites will be surrounded by wire fences, and the entrances and departures will be controlled at all times, preventing unpermitted and unauthorized entrance. Similarly, the materials and equipment belonging to the project work will be kept in areas protected by wire fences. Unarmed security foces have being emloyed by the contractor in GSDP in order to protect the construction site and this will continue till operational acceptance. After operational acceptance, facility will be protected by armed private security hired by BOTAŞ.	- BOTAŞ - Contractor Company
Construction Phase	Transportation	Within the scope of the project, it will be considered that the entire transportation will be conducted through the available roads, the supplies will be brought to the site by ring routes, all vehicles and equipment to be used are taken under routine controls and be maintained when it is necessary, other vehicles will be used until the maintenance is completed, and especially the loading operations will be consistent with the loading standards. In all stages of the project, the work will be consistent with the Law No.2918 on Highway Traffic as well as all laws and regulations related to the highways.	- BOTAŞ - Contractor Company
Construction Phase	In-Migration / Out-Migration	BOTAŞ will minimize the number of newcomers by trying to maximize local employment, which includes setting standards and guidelines for local employment among its contractors, although in-migration is not expected to occur in rural settlements. Prioritizing the recruitment of young population from the affected rural settlements will contribute to the reducing of out-migration caused by the lack of job opportunities in the rural area. BOTAŞ and Contractors will provide updated and clear information on the availability of relevant skilled or unskilled positions. Information will be periodically posted on websites and hung in public places, distributed through channels such as local newspapers as well as by providing info to local authorities starting from settlement heads to sub-governorships.	- BOTAŞ - Contractor Company

Stage	SUBJECT	MITIGATION MEASURES	RESPONSIBILITY
Construction Phase	Community Safety	- Within the context of the project, the units will operate between times 07.00-19.00 as a single shift in works to be performed in an open field during the land preparation and construction phases. Attention will be paid for equipment that emits noise not to be used outside of hours from 07.00-19.00. - The machinery and equipment indicated in the table will operate in a certain order; while based on the most negative scenario in the noise measurements made, it has been assumed that all the vehicles to operate at the project sites will function at the same time. - Modelling results provide limit values, filling and emptying in emission source without watering or spinning, improvement of the roads, covering the vehicles with canvas during transportation of the materials and keeping top of the material in 10% moisture shall be taken in order to minimize the dusting which could occur in the land - Dust emissions will also be reduced through the regular watering of roads, especially unpaved ones - Traffic Management Plan is prepared to adequately manage traffic in the access roads used by communities - Contractors will also prepare and implement a site specific Traffic Management Plan - In case of disturbing access roads, the BOTAŞ and its contractors will be responsible to improve the roads back to their original status - Communities will be informed about schedules of transportation and also on safety and security measures to be taken at the level of individuals - The Project will implement an awareness raising information disclosure with local stakeholders regarding the risks related to the movement of heavy vehicles and increased traffic in the area	- BOTAŞ - Contractor Company
Construction Phase	Reinstatement Works	In the context of the construction work included in the project, the completed pipelines will be reinstated by covering with the pre-stored topsoil after bedding, covering, and backfilling are all completed. In order for the reinstating practices to be successful, improvement activities will be performed in the pasturage, including fertilization and insemination. In addition, the damage made by the project to the public spaces will be compensated by repairing the damage and deformation in all of the roads that are used together with the local people after checking then in routine controls during the project, and be renovated during the reinstating practices as well.	- BOTAŞ - Contractor Company
Construction Phase	Labor Influx	- Labor Influx Guidelines has been prepared by BOTAŞ in order to identify, assess and manage the risks of adverse social and environmental impacts that are associated with the temporary labor influx. - The Project will prioritize the recruitment of labor, particularly for temporary contracts, and low skilled workforce, from candidates who are identified as 'local', i.e. from project affected settlements, districts and provinces - Providing mandatory cultural sensitization trainings to workers in order to introduce the cultures and social habits of the region and to prevent possible conflicts between local people and workers - The employees will not start work before completing mandatory trainings - BOTAŞ will implement regular community meetings in settlements surrounding campsites, to ensure that the presence of workers does not create situations of conflict and tension - Code of Conduct will be prepared by the Contractors and workers will be informed about the Code of Conduct at the moment of the signing the employment contract and during social induction trainings - The Grievance Mechanism established by BOTAŞ will provide easy access for local communities to raise their complaints and concerns. - Mandatory and repeated training will be provided for the workforce about refraining from unacceptable conduct toward local community members, specifically women	- BOTAŞ - Contractor Company

Stage	SUBJECT	MITIGATION MEASURES	RESPONSIBILITY
		- The Project will introduce sanctions (e.g., dismissal) for workers involved in criminal activities - Areas and activities that workers can spend their leisure time within the camp site will be created and adequate salaries for workers will be paid to reduce incentive for theft and salaries shall be paid into workers' bank accounts rather than in cash	
Construction Phase	Occupational Health and Safety	- Contractors will develop an Occupational Health and Safety Plan before the implementation of the project - The construction work will be conducted in accordance with the provisions of the Regulation on Occupational Health and Safety in Constructional Work, which came into force on October 05, 2013 (O.G. No. 28786) by the Ministry of Labor and Social Security, including the minimum health and safety conditions to be provided in construction sites. - The project will be in compliance with the Law No. 1593 on Public Health in Turkey, and the Law No. 6331 on Occupational Health and Safety, and the regulation, regulations and relevant legislation made or to be made by virtue of these laws will be complied with. - The General Public Health Law No. 1593, and any by-laws, regulations and directives enacted and to be enacted as per the Laws mentioned herein shall be obeyed	- BOTAŞ - Contractor Company
Construction Phase	Land and Livelihoods	- Land acquisition for BOTAŞ shall be carried out according to the RPF which adheres to Turkish law and B OP 4.12. - Cash compensation at full replacement cost will be provided to private land owners for loss of land due to permanent land acquisition in surface facilities and well areas - Cash compensation at full replacement cost will be provided to private land owners, legal and informal users for loss of structures - Easement value for permanent and temporary easement right which is determined in accordance with criteria specified by national law will be paid to land owners - Cash compensation for lost annual/perennial crops or plants (based on the market value of the crops and trees after valuation by a specialized committee) will be provided to private land owners, formal and informal users - If small remaining plot parts are made uneconomic as a result of the purchase or occupation, they will be eligible to compensation as "orphan land" subject to conditions. The crop payments will be paid for orphan lands under the RAP Fund. - If any physical resettlement is required, transportation costs (up to 1000 TL, with submission of invoice) will be paid by RAP Fund to PAPs who are physically resettled due to the Project activities. - Livelihood losses due to the inability to use pasture lands will be compensated by RAP Fund. - Cash subsistence support will be paid from RAP Fund in the amount of 6 minimum wages for informal users who do not have a regular income over 1 year and whose livelihood is based entirely on agriculture. - Cash subsistence support will be paid from RAP Fund in the amount of 6 minimum wages for land owners whose land is expropriated more than 20%, who do not have a regular income over 1 year and whose livelihood is majorly based on expropriated lands. - Residential areas will be avoided to the extent possible in determining the locations of well areas. The no-go-areas specified in the following section will be considered during the location determining. - Gaps will be left in pipe strings where safe to do so and necessary to allow people, wildlife and livestock to cross the ROW. - The Project will consult with local government authorities, landowners and land users, including grazers, before restricting access to land.	- BOTAŞ - Contractor Company

Stage	SUBJECT	MITIGATION MEASURES	RESPONSIBILITY
		- The Project will seek to identify whether any herders use the construction areas and aim to consult with them on potential restrictions during construction. - The Project will provide a substitute for watering holes used by livestock that cannot be used due to Project-related actions. The substitute will be of a type, and in a location, to be agreed with herders or livestock owners - Vehicle movements will be restricted to defined access routes and demarcated working areas in order to prevent possible damages to the lands outside the ROW and working areas. - The Contractor will aim to maintain the integrity and viability of functional irrigation and drainage systems will be maintained throughout construction. Any disrupted irrigation or drainage system will be reinstated on completion of construction to a standard at least equal to their original condition. - Agricultural land will be reinstated before handover to the landowner in accordance with the Reinstatement Plan. - Contractor will identify any beekeepers whose hives are within 300m of the pipeline and facility construction, camp and pipe storage areas or access routes before the start of the honey production season. Contractor will be in contact with the producer and beekeeper unions (especially for mobile beekeeping) to find agreed additional solutions which can include finding areas to move beehives during construction activities, planning construction activities during bee hibernation, reducing dust emissions in specific areas and identifying enhancement measures. - Seasonal losses of beekeepers will be compensated by the RAP Fund. - Vulnerable people will be identified during the negotiation and land acquisition process using interviews with Muhtars in communities which will include questions specifically addressing vulnerability categories identified in Section 5.4.5. - Grievance Mechanisms will be put in place that allow individuals to express grievances about project related activities and employees. The mechanism is described in details in the RPF and SEP documents. - BOTAŞ will employ qualified company staff supported by external experts to ensure that unavoidable economic and physical impacts on PAPs are assessed in advance and mitigated in line with the RPF	
Drilling and Leaching Activities	Formation Wastes, Drilling Mud, and Insoluble sludge of brine	1. The formation waste and drilling mud to be produced during drilling and leaching practices will be temporarily accumulated in the non-leak, concrete mud pools in the drilling areas, 2. Disposed by licensed firms after the identification of waste characterization with appropriate waste codes. 3. Due to their high chloride content, the formation wastes and drilling mud expected to have an eco-toxic character and will on no account be discharged into watery and soil environments. 4. The non-solving mud deposits, which are created as a result of the waiting process of the salt water produced by the leaching processes in brine ponds, will be stored using similar methods after the identification of waste characterization, and be disposed as well.	- BOTAŞ - Contractor Company - Licensed Firms
Drilling and Leaching Activities	Mud Water and Insoluble Effluents	1. Disposal of formation waste and drilling mud generated in drilling process, 2. Insoluble mud water generated in equipment exchange during leaching process will be temporarily collected in impermeable reinforced concrete mud pond in the drilling area, 3. Effluents will be disposed by licensed companies with the appropriate waste code obtained after waste characterization. 4. Mud water, which is projected to be in ecotoxic character due to its high chloride and sulfate, and insoluble effluent, will be on no account discharged to soil and aquatic environment.	- BOTAŞ - Contractor Company - Licensed Firms

Stage	SUBJECT	MITIGATION MEASURES	RESPONSIBILITY
Drilling and Leaching Activities	Brine	1. After the brine generated by the leaching activities is taken to the brine ponds in the surface facilities, 2. They will be discharged to the Salt Water Basin with the force of gravity flow. 3. There will be continuous monitoring and observation through the discharge line of the brine, and the potential leaks and flows will be determined in order to intervene immediately. 4. After the brine is discharged by the diffusers, salt water samples will be taken from the puddles near and distant from the discharging point, and checked regarding the physical and chemical parameters of the salt water as well as the heavy metals and anion-cation balance. 5. At the same time, soil samples that are taken monthly will be analyzed with the purpose of determining the effect of the salt water on the soil structure of the Tuz Gölü Basin, and the potential changes in the soil structure will be monitored.	- BOTAŞ - Contractor Company
Drilling and Leaching Activities	Washing Waters and Oily Waters	1. It will be forbidden to randomly pour and discharge the concrete waste and washing water, which will be produced in the concrete plant, in the project site, 2. The concrete washing water will be kept in the sedimentation ponds through the canals that will be built in the plant area. 3. Similarly, the washing water to be produced in the workplaces will be passed through the oil trap together with the oily waters, and be taken to the oily water line and/or to the main infrastructure system. 4. The oil accumulated in the oil trap will be discharged by licensed firms under category of dangerous oil. 5. Discharge and contact of contaminating water with water and soil environments will definitely be prevented, and the staff will be trained regarding this issue.	- BOTAŞ - Contractor Company - Licensed Firms
Drilling and Leaching Activities	Noise and Vibration	1. The people living in the local area will be informed beforehand about the works to be carried out. 2. The construction work will be realized within the working hours stated in the relevant regulations. 3. It will also be ensured that a minimum number of vehicles will be operated at the same time during the construction work.	- BOTAŞ - Contractor Company
Drilling and Leaching Activities	Environmental Management	All environmental management issues such as waste management, wastewater management, water management, hydrotest water management, air quality management, noise management, HS management, etc. will be conducted as in the construction phase.	- BOTAŞ - Contractor Company

Stage	SUBJECT	MITIGATION MEASURES	RESPONSIBILITY
Operation Phase	Solid Wastes	Of the site waste, the recyclable waste (e.g. paper, plastic, metals) and the non-recyclable waste (e.g. organic waste) will be separately collected in the waste containers (garbage bins) to be placed on different points in the project site. The recyclable waste will be given to the licensed recycling firms and be disposed by them, and the non-recyclable wastes will be given to the permitted disposal facilities as well as those of the province and administrations where the projects sites are located, and disposed by them. Additionally, there will be more solid waste including lump iron, steel, and packaging material created by field preparation and construction work, and the project is unable to determine the certain amount since they will vary. However, the waste will be collected as scrap, and stored in a suitable area in the project site (construction site, and the recyclable waste will be re-used and/or be given to the licensed recycling firms. The non-recyclable waste will be given to the solid waste collection system of the relevant municipality, and disposed by them. In summary, the workers will be warned about the fact that it is forbidden to litter the solid waste (e.g. food waste) produced by the workers during the field preparation and construction work into the sea, lakes, and other receiving environments as well as onto the streets and forests, and the criteria of Waste Management Regulation will be followed.	- BOTAŞ - Sultanhanı Municipality - Licensed Recycling Firm
Operation Phase	Packaging Wastes	Wastes such as packing paper, plastic bottles and glass bottle shall be accumulated separately from other wastes regardless of the material used and source in which they occurred pursuant to Article 23 of the “Regulation on the Control of Packing Wastes” and shall be assessed by selling them to the licensed recycling firms. In the event of hazardous packing wastes, they shall be disposed by giving them to the firms which have the license related to that issue and the wastes shall be transported by licensed firms.	- BOTAŞ - Licensed Recycling Firm
Operation Phase	Non-hazardous and Inert Wastes	Non-hazardous and inert wastes which will occur during the operation shall be kept in the specially-designed areas in construction areas and shall be disposed by the licensed firms.	- BOTAŞ - Licensed Firms
Operation Phase	Hazardous Wastes	All the hazardous wastes which will occur during the operation shall be temporarily stored in the rooms which are specially-designed, closed, air-conditioned and which do not have drainage on the leak-proof ground inside the central waste accumulation areas in the construction areas in the labelled areas and will be sent to the licensed hazardous waste recycling, burning and regular storage facilities. Fire and environmental accident practices shall be done by means of the Environmental Response Team and Emergency Response Team which will be consistently available in order to gain response practice for the possible problems in a short time together with the response kits against fire around the rooms (fire-extinguisher, fire valve etc.) and spillages (absorbent material, absorbing wood dust and personal protective equipment (mask, gloves, eyeglasses etc.).	- BOTAŞ - Licensed Hazardous Waste Firms

Stage	SUBJECT	MITIGATION MEASURES	RESPONSIBILITY
Operation Phase	Medical Wastes	The amount of the wastes which will occur from the infirmary unit in order for treatment to be done in order to intervene the health problems of the people which will work during the operation cannot be determined and it is anticipated that the amount will be in a small quantity. The medical wastes which occur shall be accumulated separately from other wastes pursuant to the "Obligations of medical waste producers" stated in Article 8 of the "Regulation on the Control of Medical Wastes" which came into force after being published in Official Gazette dated January 25, 2017 and numbered 29959. The medical wastes which occur shall be disposed by giving them to the medical waste accumulation system by licensed health firms operating infirmary unit and/or the vehicle which has license to Transport Medical Waste of Aksaray Municipality. The conditions of the regulation relating to separating and accumulating medical wastes in their source.	- BOTAŞ - Sultanhanı Municipality - Aksaray Municipality
Operation Phase	Waste Oils	Within the project, the disposal of the end-of-life waste oils shall be carried out in the licensed disposal facilities as stated in the Part 2 of the "Regulation on the Control of Waste Oils" which came into force after being published in the Official Gazette dated July 30, 2008 and numbered 26952. Furthermore; the solid wastes which are contaminated by hazardous materials such as waste oils shall be disposed by sending them to the disposal facilities. Until they are conveyed to the disposal facilities, the conditions provided in the Parts 4 and 5 of the "Regulation on the Control of Waste Oils" shall be fulfilled and they shall be stored separately according to their categories in appropriate temporary storages and they shall be transported. The transportation of the waste oils to the disposal facilities shall be carried out via a licensed vehicle. Waste oil producer shall fully comply to the obligations as stated in the Article 9 of the "Regulation on the Control of Waste Oils".	- BOTAŞ - Licensed Recycling Firm
Operation Phase	Waste Vegetable Oils	The used frying oils which will occur in the dining hall which will be built inside facility area shall be accumulated in a clean and closed vessel separately from other wastes. The used frying oils shall not be spilt to canalization, soil, sea and suchlike receiving environments in order to protect the environment. In this respect, the provisions of the "Regulation on the Control of Waste Vegetable Oils" which came into force after being published in Official Gazette dated June 06, 2015 and numbered 29378 for the disposal of waste vegetable oils.	- BOTAŞ - Licensed Waste Vegetable Oil Firm
Operation Phase	Waste Batteries and Accumulators	Any end-of-life batteries and accumulators in the enterprise shall be collected and accumulated separately from domestic wastes, and delivered to the licensed collecting points and temporary storing places as set forth in Article 13 of the "Regulation on Control of Waste Batteries and Accumulators" as published in the Official Gazette dated August 31, 2004 and numbered 25569 and came into force accordingly for the purpose of preventing such waste batteries and accumulators to be given to the receiving environment directly or indirectly in such a way to damage human health and environment.	- BOTAŞ - Licensed Recycling Firm
Operation Phase	End-of-Life Tires	Any end-of-life tires excluding bicycle and solid tires shall be collected separately from any waste materials, and shall be sold to the licensed companies. In this context, the terms and conditions set forth in the "Regulation on Control of End of Life Tires" as published in the Official Gazette dated November 25, 2006 and numbered 26357 and came into force accordingly, shall be fulfilled.	- BOTAŞ - Licensed Recycling Firm

Stage	SUBJECT	MITIGATION MEASURES	RESPONSIBILITY
Operation Phase	Storage and Transportation of Fuel, Oil and Hazardous Materials	Any fuels, oils, chemicals and other hazardous materials to be used during any construction works and activities shall be stored with their labels and Material Safety Data Sheets in the aerated rooms especially designed over the sealed ground, and having no closed drainage system, and being distant from the living spaces of the operating area, and any necessary fire protection equipment (such as fire extinguishers, fire valves, etc.) and struggling kits against fallings and scrapings (such as absorbents, absorbing wood dusts, etc.) and any personal protective equipment (such as masks, gloves, goggles, etc.) shall be made available together and permanently around these rooms as per the Labor Law, the Regulation on Classification, Labeling and Packing of Substances and Mixtures, and the Regulation on the Control of Major Industrial Accidents.	- BOTAŞ
Operation Phase	Washing Waters and Oily Waters	Any wash waters to accumulate in the workshops at the operating areas shall be passed through the oil trap together with oily waters, and transferred to the oily water line and/or to the main infrastructure system. And any oils collected in the oil trap shall be removed as waste oil by means of the relevant licensed companies. The draining and draggling of such polluting waters to the water and soil media around the operating areas shall be absolutely prevented, and any necessary training for this purpose shall be given to the relevant personnel.	- BOTAŞ - Licensed Recycling Companies
Operation Phase	Noise and Vibration	After the facilities have been commissioned, the noise measurements related thereto shall be made, and in the event that noise is determined to be higher than the allowable limit values, the workers shall be given the protective clothes and equipment such as ear buds, ear plugs and the like as stipulated in the “Occupational Health and Safety Code No. 6331.	- BOTAŞ
Operation Phase	Health and Safety	Any health and safety rules determined within the scope of the relevant regulations as well as the provisions of the relevant regulations of the Occupational Health and Safety Law No.6331 shall be obeyed with the aim to prevent any possible risks threatening human health at the operating stage of the project. In addition, the General Public Health Law No. 1593, and any by-laws, regulations and directives enacted and to be enacted as per the Laws mentioned herein shall be obeyed within the scope of the project.	- BOTAŞ
Operation Phase	Fire Protection System	Any fire struggling and extinguishing equipment in the operating areas shall be checked in the periods of time as set forth in the relevant legal regulations, and kept available against any possible fire. Furthermore, through periodical practices to be performed within the scope of any risk assessment schedules and emergency action plans to be determined and prepared, the response period of intervention in the events shall be decreased.	- BOTAŞ
Operation Phase	Leakage and Explosion	Any possible gas leaking and explosion risks to be determined in the operating areas shall be strictly monitored within the scope of any risk assessment schedules and emergency action plans to be determined and prepared.	- BOTAŞ

Stage	SUBJECT	MITIGATION MEASURES	RESPONSIBILITY
Operation Phase	Transportation	Within the scope of the Project, utmost attention shall be paid to make all the transportations with/from the existing road, and to provide the bringing of any supplies alternately, and to make the routine checks of any equipment and vehicles to be used, and to make maintenance of any equipment and vehicles when and if required, and to use other equipment and vehicles until such maintenance works are finished, and to make loading conforming to the loading standards. At all the stages of the Project, all the works and operations shall be performed in compliance with Highway Traffic Law No. 2918, and with any Laws and Regulations enacted as related with the highways.	- BOTAŞ
Operation Phase	Houses and Other Technical/ Social needs of Personnel	The personnel and workers to be employed for the Project shall be provided from the local region, and the needs of the persons to come from outside of the local region for houses and other technical/social infrastructure shall be provided in the vicinity.	- BOTAŞ
Operation Phase	In-Migration / Out-Migration	BOTAŞ will minimize the number of newcomers by trying to maximize local employment, which includes setting standards and guidelines for local employment among its contractors, although in-migration is not expected to occur in rural settlements. Prioritizing the recruitment of young population from the affected rural settlements will contribute to the reducing of out-migration caused by the lack of job opportunities in the rural area. BOTAŞ and Contractors will provide updated and clear information on the availability of relevant skilled or unskilled positions. Information will be periodically posted on websites and hung in public places, distributed through channels such as local newspapers as well as by providing info to local authorities starting from settlement heads to sub-governorships.	- BOTAŞ - Contractor Company
Operation Phase	Community Safety	- Within the context of the project, the units will operate between times 07.00-19.00 as a single shift in works to be performed in an open field during the land preparation and construction phases. Attention will be paid for equipment that emits noise not to be used outside of hours from 07.00-19.00. - The machinery and equipment indicated in the table will operate in a certain order; while based on the most negative scenario in the noise measurements made, it has been assumed that all the vehicles to operate at the project sites will function at the same time. - Modelling results provide limit values, filling and emptying in emission source without watering or spinning, improvement of the roads, covering the vehicles with canvas during transportation of the materials and keeping top of the material in 10% moisture shall be taken in order to minimize the dusting which could occur in the land - Dust emissions will also be reduced through the regular watering of roads, especially unpaved ones - Traffic Management Plan is prepared to adequately manage traffic in the access roads used by communities - Contractors will also prepare and implement a site specific Traffic Management Plan - In case of disturbing access roads, the BOTAŞ and its contractors will be responsible to improve the roads back to their original status - Communities will be informed about schedules of transportation and also on safety and security measures to be taken at the level of individuals - The Project will implement an awareness raising information disclosure with local stakeholders regarding the risks related to the movement of heavy vehicles and increased traffic in the area	- BOTAŞ - Contractor Company

Stage	SUBJECT	MITIGATION MEASURES	RESPONSIBILITY
Operation Phase	Labor Influx	- Labor Influx Guidelines has been prepared by BOTAŞ in order to identify, assess and manage the risks of adverse social and environmental impacts that are associated with the temporary labor influx. - The Project will prioritize the recruitment of labor, particularly for temporary contracts, and low skilled workforce, from candidates who are identified as 'local', i.e. from project affected settlements, districts and provinces - Providing mandatory cultural sensitization trainings to workers in order to introduce the cultures and social habits of the region and to prevent possible conflicts between local people and workers - The employees will not start work before completing mandatory trainings - BOTAŞ will implement regular community meetings in settlements surrounding campsites, to ensure that the presence of workers does not create situations of conflict and tension - Code of Conduct will be prepared by the Contractors and workers will be informed about the Code of Conduct at the moment of the signing the employment contract and during social induction trainings - The Grievance Mechanism established by BOTAŞ will provide easy access for local communities to raise their complaints and concerns. - Mandatory and repeated training will be provided for the workforce about refraining from unacceptable conduct toward local community members, specifically women - The Project will introduce sanctions (e.g., dismissal) for workers involved in criminal activities - Areas and activities that workers can spend their leisure time within the camp site will be created and adequate salaries for workers will be paid to reduce incentive for theft and salaries shall be paid into workers' bank accounts rather than in cash	- BOTAŞ - Contractor Company
Operation Phase	Occupational Health and Safety	- Contractors will develop an Occupational Health and Safety Plan before the implementation of the project - The construction work will be conducted in accordance with the provisions of the Regulation on Occupational Health and Safety in Constructional Work, which came into force on October 05, 2013 (O.G. No. 28786) by the Ministry of Labor and Social Security, including the minimum health and safety conditions to be provided in construction sites. - The project will be in compliance with the Law No. 1593 on Public Health in Turkey, and the Law No. 6331 on Occupational Health and Safety, and the regulation, regulations and relevant legislation made or to be made by virtue of these laws will be complied with. - The General Public Health Law No. 1593, and any by-laws, regulations and directives enacted and to be enacted as per the Laws mentioned herein shall be obeyed	- BOTAŞ - Contractor Company
Operation Phase	Community Safety	- Modelling results provide limit values, filling and emptying in emission source without watering or spinning, improvement of the roads, covering the vehicles with canvas during transportation of the materials and keeping top of the material in 10% moisture shall be taken in order to minimize the dusting which could occur in the land - Dust emissions will also be reduced through the regular watering of roads, especially unpaved ones	- BOTAŞ - Contractor Company
Operation Phase	Land and Livelihoods	- Land acquisition for BOTAŞ shall be carried out according to the RPF which adheres to Turkish law and WB OP 4.12. - Cash compensation at full replacement cost will be provided to private land owners for loss of land due to permanent land acquisition in surface facilities and well areas - Cash compensation at full replacement cost will be provided to private land owners, formal and informal users for loss of structures - Easement value for permanent and temporary easement right which is determined in accordance with criteria specified by national law will be paid to land owners - Cash compensation for lost annual/perennial crops or plants (based on the market value of the crops and trees after	- BOTAŞ - Contractor Company

Stage	SUBJECT	MITIGATION MEASURES	RESPONSIBILITY
		valuation by a specialized committee) will be provided to private land owners, formal and informal users - If small remaining plot parts are made uneconomic as a result of the purchase or occupation, they will be eligible to compensation as "orphan land" subject to conditions. The crop payments will be paid for orphan lands under the RAP Fund. - If any physical resettlement is required, transportation costs (up to 1000 TL, with submission of invoice) will be paid by RAP Fund to PAPs who are physically resettled due to the Project activities. - Livelihood losses due to the inability to use pasture lands will be compensated by RAP Fund. - Cash subsistence support will be paid from RAP Fund in the amount of 6 minimum wages for informal users who do not have a regular income over 1 year and whose livelihood is based entirely on agriculture. - Cash subsistence support will be paid from RAP Fund in the amount of 6 minimum wages for land owners whose land is expropriated more than 20%, who do not have a regular income over 1 year and whose livelihood is majorly based on expropriated lands. - Residential areas will be avoided to the extent possible in determining the locations of well areas. The no-go-areas specified in the following section will be considered during the location determining. - Gaps will be left in pipe strings where safe to do so and necessary to allow people, wildlife and livestock to cross the ROW. - The Project will consult with local government authorities, landowners and land users, including grazers, before restricting access to land. - The Project will seek to identify whether any herders use the construction areas and aim to consult with them on potential restrictions during construction. - The Project will provide a substitute for watering holes used by livestock that cannot be used due to Project-related actions. The substitute will be of a type, and in a location, to be agreed with herders or livestock owners - Vehicle movements will be restricted to defined access routes and demarcated working areas in order to prevent possible damages to the lands outside the ROW and working areas. - The Contractor will aim to maintain the integrity and viability of functional irrigation and drainage systems will be maintained throughout construction. Any disrupted irrigation or drainage system will be reinstated on completion of construction to a standard at least equal to their original condition. - Agricultural land will be reinstated before handover to the landowner in accordance with the Reinstatement Plan - Contractor will identify any beekeepers whose hives are within 300m of the pipeline and facility construction, camp and pipe storage areas or access routes before the start of the honey production season. Contractor will be in contact with the producer and beekeeper unions (especially for mobile beekeeping) to find agreed additional solutions which can include finding areas to move beehives during construction activities, planning construction activities during bee hibernation, reducing dust emissions in specific areas and identifying enhancement measures. - Seasonal losses of beekeepers will be compensated by the RAP Fund. - Vulnerable people will be identified during the negotiation and land acquisition process using interviews with Muhtars in communities which will include questions specifically addressing vulnerability categories identified in Section 5.4.5. - Grievance Mechanisms will be put in place that allow individuals to express grievances about project related activities and employees. The mechanism is described in details in the RPF and SEP documents. BOTAŞ will employ qualified company staff supported by external experts to ensure that unavoidable economic and physical impacts on PAPs are assessed in advance and mitigated in line with the RPF	

Stage	SUBJECT	MITIGATION MEASURES	RESPONSIBILITY
Decommissioning Phase	Landscape	Landscape arrangement shall be made for eliminating visual pollution within the scope of the Project.	- BOTAŞ
Decommissioning Phase	Reinstatement Works	All the temporary structures and drilling areas and around thereof completed within the framework of construction activities of the Project with shall be covered with the stored top soil, and be restored accordingly. For such restoration activities to be successful, the improvement works such as fertilization, semination, etc. particularly in pasture areas. However, any damages and deteriorations occurring in any roads used jointly together with the local people during the continuation of the project's construction works shall be repaired and renewed; moreover, any damages which the Project has caused in the common use areas shall be compensated as well.	- BOTAŞ
Decommissioning Phase	Effects after activities in operating area, and Measures to be taken	At the end of the Project's economic life, a policy in compliance with the economic and social conditions of that time shall be constituted. In this context, at the end of this period, any storing equipment may be modernized, and serve the country's economy for the purposes of same use. Before commencement of the land preparation works, the photos of the areas where the facility units shall be built shall be taken, and the existing visual situations of such areas shall be determined. After closing of the operating area for the said works and activities, such lands shall be re-arranged in compliance with their original situations through planting works.	- BOTAŞ
Decommissioning Phase	Residual Impacts	Residual impacts may be occurred during the Gas Storage Expansion Project will be minimized with the prepared sub management plan and procedures by BOTAŞ and the Contractors.	- BOTAŞ

5.7.1 Methodology for Determination of Effectiveness of Mitigation Measures

Assessment of the environmental and social impacts of the gas storage expansion project has been studied on some parameters explained below;

- **Forecast:** What will be the outcome of the project as a result of this project?
- **Assessment:** Will the impact be beneficial or unfavorable? How large is your change expected?
- **Mitigation Measures:** If the impact is a concern, can something be done to avoid, mitigate, or balance it?
- **Lessons Learnt:** Is there any concerned impact observed in similar after the activities of the ongoing gas storage project? Can be taken measures provide the mitigation of the impacts?
- **Remaining Impact:** After the impact mitigation measures, is the effect still a source of concern?

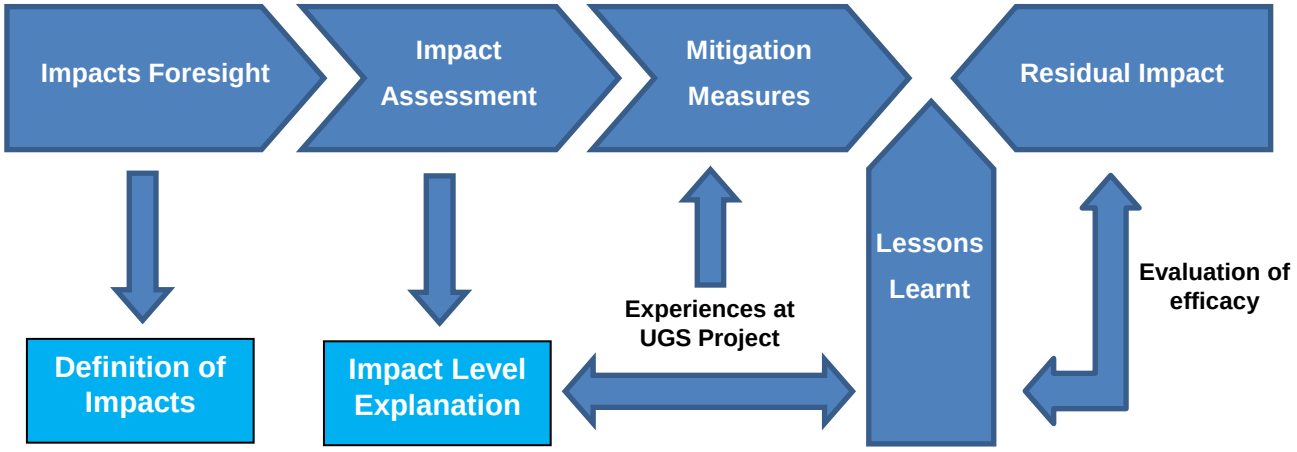


Figure 5.7.1.1 Impact Assessment Methodology Process

Foreseen impacts of the GSEP will be similar with the UGS Project. Definition of the impacts has been made according to the impact range of the environmental and social components such as air, waste, wastewater, noise, reinstatement, land use changes, etc. After the definition of the impacts, assessment studies have been performed in line with the experiences that learnt at UGS Project and results of the studies have been used to creating of the mitigation measures to avoid of the impacts.

Experiences at the UGS Project have been combined with the literature studies in similar projects and mitigation measures have been formed to use during the gas storage expansion project. Impacts to be remained after taken mitigation measures have been compared with the acquired experiences again. Remaining impact levels will be shown the effectiveness of the taken mitigation measures.

The remaining impact reflects what remains after the implementation of the measures to reduce and manage the effects, and thus expresses the ultimate level of impact on the development of the

Project. The remaining impacts also serve as a focus of management and monitoring activities implemented throughout the project implementation process to verify that the actual impacts of the Project are the same as those predicted in this ESIA Report. For some types of impacts, there are several experimental, objective and defined criteria to determine the significance of the potential impact (eg violation of a standard or damage to a protected area). However, in some cases the assessment criteria are more subjective and require a higher level of professional evaluation. For the purposes of this Project, the criteria used in assessing the effects of the planned activities are defined in terms of two components: impact level and receiver sensitivity. In order to facilitate the structural definition of the level of the impact, a scale is defined which is negligible, small, medium or large in size (Table 5.7.1.1.). The receiver sensitivity defines how sensitive a particular receiver is to the particular impact. The receiver sensitivity takes into account the durability and value of the receiver (Table 5.7.1.2.).

Table 5.7.1.1. Matrix for Important of Impact

		Receiver Sensitivity			
		Negligible	Low	Moderate	High
Impact Level	Negligible	Not Important	Not Important	Not Important	Not Important/ Low Important
	Minor	Not Important	Low Important	Low/Moderate Important	Moderate Important
	Medium	Not Important	Low/Moderate Important	Moderate Important	High Important
	Major	Low Important	Moderate Important	High Important	High Important

Table 5.7.1.2 Definitions of Important of Impact

High Important	These impacts tend to disrupt the function and value of the source / receiver and may lead to wider systematic results. These effects are prioritized in order to avoid or reduce the effectiveness of the impact. Continuously control required after the mitigation measures.
Moderate Important	These impacts tend to be noticeable and can lead to permanent effects on existing conditions; which may lead to difficulties or degradation conditions for the source / receiver. Periodically control required after the mitigation measures.
Low Important	These impacts do not cause difficulties or deterioration for the source / receiver or the general function and value of the source / receiver are not lost. Instantly monitoring required after the mitigation measures.
Not Important	It is not foreseen that the impact will make a difference that can be distinguished from the current situation or level of natural change. These impacts do not require mitigation measures and are of no importance in the decision-making process.

It is important for the ESIA process to assess whether an activity is assessed positively or negatively (impact result) and how it relates to the Project (type of impact: eg direct, indirect). In particular, how an effect is managed and how it can be modified by mitigation measures varies by impact and result; Table 5.7.1.3. contains the relevant definitions.

Table 5.7.1.3 Impact Assessment Terminology

Subject	Definition
Impact Result	
Negative Impact	The effect that is thought to cause a negative change or an undesirable factor to occur in the current conditions.
Positive Impact	The effect that is believed to cause an improvement in the current conditions or to produce a desired factor
Impact Type	
Direct Impact	Impacts from direct interaction between a project activity and the receiving environment
Indirect Impact	The primary interactions between the project and the recipient environment, and the consequences of interactions that occur during ongoing processes
Cumulative Impact	Cumulative impacts on the same environmental resource or buyer, along with other existing, planned and future impacts from reasonably foreseeable projects and developments

Proposed suggestions in the mitigation plan for the project activities that may be caused to the impacts to environmental and social components on around of the project area have been assessed with the impact and sensitivity level matrixes to usability of the mitigation measures during the Gas Storage Expansion Project. Assessment matrixes will allow to seen at a glance of the effectiveness of mitigation measures and comparisons.

Assessment matrixes have been prepared according to the specific project impact level and environmental sensitivity level tables. 5 levels have been chosen to detailed the specific and major impacts of the Gas Storage Expansion Project to the environmental sensitivities such as; very low, low, normal, high and very high parameters given below and impact and affecting levels has been calculated from the multiplying of these numbers;

Matrix Elements

IMPACT LEVEL	1	Very Low
	2	Low
	3	Moderate
	4	High
	5	Very High

SENSITIVITY LEVEL	1	Very Low
	2	Low
	3	Moderate
	4	High
	5	Very High

Level ratings for the impacts and environmental and social components have been marked with three main colors to assessing of the mitigation measures.

Environmental impacts that will occur during the Gas Storage Expansion Project has been listed in the table line of the assessment matrix and impact level points has been given for each impact according to the source classes such as air quality, wastes, wastewaters, etc. given below;

Table Line of the Assessment Matrix

ENVIRONMENTAL IMPACTS												
Dust	Flue Gases	GHG	Wastes	Organic Wastes	Hazardous Wastes	Spillages	Wastewater	Washing Waters	Noise	Brine	Mud Wastes	Reinstatement
4	1	1	4	2	5	5	4	5	4	4	5	3

Ratings of the probable impacts of the Gas Storage Expansion Project have been established according to the experiences of the monitoring activities at the Underground Gas Storage Project.

Sensitive environmental and social components that affected during the Gas Storage Expansion Project has been listed in the table column of the assessment matrix same with the impacts and sensitivity level points have been given for each affected environmental component such as agricultural lands, pasturelands, groundwater, surface waters, etc. given below.

Table Column of the Assessment Matrix

AFFECTED ENVIRONMENTAL AND SOCIAL COMPONENTS	Agricultural Lands	4
	Pasturelands	3
	Groundwater	5
	Surface Waters	5
	Residences	3
	Flora	3
	Fauna	4
	Access Roads	3
	Hirfanlı Dam	5
	Tuz Gölü	5

Ratings of the affected environmental and social components have been established according to the experiences of the monitoring activities at the Underground Gas Storage Project.

Matrix table has been assessed according to the comparison tables and effectiveness of mitigation measures has been given with the explanations. Prepared matrix has been evaluated according to the comparison tables of the impacts and affected components that established from the results of the scoring between the table line and columns given below;

Table 5.7.1.4. Assessment Matrix for Environmental Impacts and Affected Components

			ENVIRONMENTAL IMPACTS													
			Dust	Flue Gases	GHG	Wastes	Organic Wastes	Hazardous Wastes	Spillages	Wastewater	Washing Waters	Noise	Brine	Mud Wastes	Reinstatement	TOTAL SCORE
		SCORE	4	1	1	4	2	5	5	4	5	4	4	5	3	
AFFECTED ENVIRONMENTAL AND SOCIAL COMPONENTS	Agricultural Lands	4	16	4	4	16	8	20	20	16	20	16	16	20	12	188
	Pasturelands	3	12	3	3	12	6	15	15	12	15	12	12	15	9	141
	Groundwater	5	20	5	5	20	10	25	25	20	25	20	20	25	15	235
	Surface Waters	5	20	5	5	20	10	25	25	20	25	20	20	25	15	235
	Residences	3	12	3	3	12	6	15	15	12	15	12	12	15	9	141
	Flora	3	12	3	3	12	6	15	15	12	15	12	12	15	9	141
	Fauna	4	16	4	4	16	8	20	20	16	20	16	16	20	12	188
	Access Roads	3	12	3	3	12	6	15	15	12	15	12	12	15	9	141
	Hirfanlı Dam	5	20	5	5	20	10	25	25	20	25	20	20	25	15	235
	Tuz Gölü	5	20	5	5	20	10	25	25	20	25	20	20	25	15	235
	TOTAL SCORE		160	40	40	160	80	200	200	160	200	160	160	200	120	

Affected Component Comparison (Total Score)	< 188	Low
	188	Average
	> 188	High
Impact Comparison (Total Score)	< 145	Low
	145	Average
	> 145	High

Table 5.7.1.5. Affecting Level and Mitigation Assessment of the Environmental and Social Components

Components to be Affected	Affecting Level	Description of Potential Impacts	Affecting Level After Taken Mitigation Measures
Agricultural Lands	Average	Agricultural lands may be affected on less productivity, product loss and contamination risks	Minimum – Periodically Control
Pasturelands	Low Sensitivity	Pasturelands may be affected in low level on vegetation loss and contamination risks	Minimum – Instantly Monitoring
Groundwater	High Sensitivity	Groundwaters may be affected in high level on contamination risks	Minimum – Continuously Control
Surface Waters	High Sensitivity	Surface waters may be affected in high level on contamination risks	Minimum – Continuously Control
Residences	Low Sensitivity	Local public may be affected in low level on dust emission and noise pollution risks	Minimum – Instantly Monitoring
Flora	Low Sensitivity	Flora individuals may be affected in low level on dust emission and contamination risks	Minimum – Instantly Monitoring
Fauna	Average	Fauna individuals may be affected on dust emission, noise pollution and displacement risks	Minimum – Periodically Control
Access Roads	Low Sensitivity	Access roads may be affected in low level on damage, pollution and high traffic risks	Minimum – Instantly Monitoring
Hirfanlı Dam	High Sensitivity	Hirfanlı Dam may be affected in high level on contamination risks	Minimum – Continuously Control
Tuz Gölü	High Sensitivity	Tuz Gölü may be affected in high level on contamination risks	Minimum – Continuously Control

Table 5.7.1.6. Impact Level and Mitigation Assessment of the Environmental Impacts

Impacts	Impact Level	Impact Level After Taken Mitigation Measures
Dust	Major Impact	Minimum – Impact will be continuously kept under the control of BOTAŞ during the capacity expansion project
Flue Gases	Minor Impact	Minimum – Impact will be monitored by BOTAŞ during the Gas Storage Expansion Project
GHG	Minor Impact	Minimum – Impact will be monitored by BOTAŞ during the Gas Storage Expansion Project
Wastes	Major Impact	Minimum – Impact will be continuously kept under the control of BOTAŞ during the Gas Storage Expansion Project
Organic Wastes	Minor Impact	Minimum – Impact will be monitored by BOTAŞ during the capacity expansion project
Hazardous Wastes	Major Impact	Minimum – Impact will be continuously kept under the control of BOTAŞ during the Gas Storage Expansion Project
Spillages	Major Impact	Minimum – Impact will be continuously kept under the control of BOTAŞ during the Gas Storage Expansion Project
Wastewater	Major Impact	Minimum – Impact will be continuously kept under the control of BOTAŞ during the Gas Storage Expansion Project
Washing Waters	Major Impact	Minimum – Impact will be continuously kept under the control of BOTAŞ during the Gas Storage Expansion Project
Noise	Major Impact	Minimum – Impact will be continuously kept under the control of BOTAŞ during the Gas Storage Expansion Project
Brine	Major Impact	Minimum – Impact will be continuously kept under the control of BOTAŞ during the Gas Storage Expansion Project
Mud Wastes	Major Impact	Minimum – Impact will be continuously kept under the control of BOTAŞ during the Gas Storage Expansion Project
Reinstatement	Minor Impact	Minimum – Impact will be monitored by BOTAŞ during the Gas Storage Expansion Project

5.8. Monitoring Plan

Stage	Which Parameter will be Monitored?	Where is the Parameter to be Monitored?	How will the Parameters be Monitored? Type of Monitoring Equipment	When will the Parameters be Monitored? Monitoring or Continuous Measuring?	Why is the Parameter Monitored?	Responsible Corporation/ Organization
Preparation Works	Permission for Agricultural Areas for non-Agricultural Purpose	In case of any Project units and/or equipments occupy agricultural areas	Visually, with the written permission	Before land preparation and construction works	Prevention of the use of agricultural lands for non-agricultural purposes without permission	- BOTAŞ - Provincial Directorate of Food, Agriculture and Livestock
Preparation Works	Provision of Ground Safety	In all the Project units	Any measurements and analyses to be made through drilling machines and at the soil laboratories	Before land preparation and construction works	As per the provisions of the "Regulation on Structures to Be Built in Disaster Areas" of the former Ministry of Public Works and Settlement as published in the Official Gazette dated May 03, 2007 and numbered 26511 and came into force accordingly	- BOTAŞ
Preparation Works	Historical, cultural and archeological assets	In all the Project units	Observational	In the event that any cultural and archeological asset is encountered	Protection of cultural and archeological assets	- BOTAŞ - Contractor Company - Directorate of Museum - Regional Directorate of Conservation Board
Preparation Works	Preparing of HSE Plan and Procedures	Office	Documentational	Before land preparation and construction works	Applicable HSE Management during the project activities	- BOTAŞ - Consultant - Contractor Company
Preparation Works	Contracts with the Licensed Companies	Office	Documentational	Before land preparation and construction works	Applicable HSE Management during the project activities	- BOTAŞ - Consultant - Contractor Company

Stage	Which Parameter will be Monitored?	Where is the Parameter to be Monitored?	How will the Parameters be Monitored? Type of Monitoring Equipment	When will the Parameters be Monitored? Monitoring or Continuous Measuring?	Why is the Parameter Monitored?	Responsible Corporation/ Organization
Preparation Works	Start-Up Works	At the project areas	Observational	Before land preparation and construction works	Determination of potential environmental and social impacts during the works	- BOTAŞ - Contractor Company
Preparation Works	Environmental Management	At the project areas	Observational	Before land preparation and construction works	Determination of potential environmental and social impacts during the works	- BOTAŞ - Consultant - Contractor Company
Preparation Works	RAP preparation and Stakeholder Engagement Activities	At the project areas	Document reviewing, recording and reporting	Before land preparation and construction works	Determination of potential environmental and social impacts during the works	- BOTAŞ - Consultant - Contractor Company
Construction Phase	Excavations	In any excavation works made in all the Project units, pipelines, surface facilities and drilling areas	Visual inspection, recording and reporting	Continuously during excavation works	For the proper site preparation principals according to the defined rules of the project during the excavation works	- BOTAŞ - Contractor Company
Construction Phase	Top Soil Management	In any excavation works made in all the Project units, pipelines, surface facilities and drilling areas	Visual inspection, recording and reporting	Continuously during excavation works	Keeping top soil stable and together with its organic ingredients until the restoration Works	- BOTAŞ - Contractor Company

Stage	Which Parameter will be Monitored?	Where is the Parameter to be Monitored?	How will the Parameters be Monitored? Type of Monitoring Equipment	When will the Parameters be Monitored? Monitoring or Continuous Measuring?	Why is the Parameter Monitored?	Responsible Corporation/ Organization
Construction Phase	Excavation Wastes	In any excavation works made in all the Project units, pipelines, surface facilities and drilling areas	Visual inspection	Continuously during excavation works	As per the necessity of conforming to the Regulation on Excavation Soil, Construction and Demolition Waste Control	- BOTAŞ - Contractor Company - Provincial, district, and county municipalities
Construction Phase	Effects on Flora and Vegetation Areas	Along the Pipeline Routes, at the Surface Facilities Area, UGS Sites and Other Units	Visual inspection, recording, reporting, observational materials	Within certain monthly periods	Observation of the effects of the Project construction works on the flora and vegetation cover at all project sites and the activities for reducing any possible effects.	- BOTAŞ - Contractor Company
Construction Phase	Effects on Fauna Individuals	Around the Project areas	Visual inspection, recording, reporting, observational materials	Within certain monthly periods	Observation of the effects of the Project construction works on precious fauna individuals (especially *Phoenicopterus ruber* (Flamingo) and *Oxyura leucoephala* (White-headed Duck)) around the Project areas, which are under protection, the activities of planning construction works and reducing possible effects compiling any information about their time of migration, roads of migration, time of reproduction, areas of reproduction, etc.	- BOTAŞ - Contractor Company

Stage	Which Parameter will be Monitored?	Where is the Parameter to be Monitored?	How will the Parameters be Monitored? Type of Monitoring Equipment	When will the Parameters be Monitored? Monitoring or Continuous Measuring?	Why is the Parameter Monitored?	Responsible Corporation/ Organization
Construction Phase	Air emissions	Construction Works in all the Project units, and in all the Access roads	Provided that any measurements for dust emissions are made by accredited and qualified companies	During excavation works and use of access roads by measuring dust deposition and particulate matter quarterly and whenever there is a complaint	As per the Regulation on the Controlling of Industrial Air Pollution, and the Regulation on Occupational Health and Safety	- BOTAŞ - Contractor Company
Construction Phase	Vehicle Emissions	In construction equipment and vehicles	Exhaust emission measuring devices	During periodical maintenance of vehicles	To comply with the Regulation on Controlling of Exhaust Gas Emission and the Quality of Gasoline and Diesel Oil	- BOTAŞ - Contractor Company
Construction Phase	Wastewater	Wastewater treatment plant for the surface facility construction areas and the camping areas.	Provided that the measurements are made by qualified and accredited company for wastewater treatment	Monthly	As per the Regulation on Water Pollution Control, and the Regulation on Environmental Permit and License	- BOTAŞ - Contractor Company
Construction Phase	Wastewater	Sealed wastewater tanks in the construction areas	Observational	Daily	Collecting wastewaters continuously, and draining the same to the infrastructure systems terminated with the wastewater treatment plants	- BOTAŞ - Contractor Company

Stage	Which Parameter will be Monitored?	Where is the Parameter to be Monitored?	How will the Parameters be Monitored? Type of Monitoring Equipment	When will the Parameters be Monitored? Monitoring or Continuous Measuring?	Why is the Parameter Monitored?	Responsible Corporation/ Organization
Construction Phase	Hydrostatic Test Waters	During hydrostatic tests of pipes and equipment	Observational, experimental	Continuously	Controlled draining of hydrostatic test waters after completion of oil-grease and suspended solid analyses as per the Regulation on Water Pollution Control, and the Regulation on Control of Soil Pollution and Point Source Polluted Areas	- BOTAŞ - Contractor Company
Construction Phase	Rain Waters	In the Project areas	Observational	Continuously	Controlled draining of storm waters around the Project areas and natural drainages through suitable collecting and draining systems as per the Regulation on Water Pollution Control, and the Regulation on Control of Soil Pollution and Point Source Polluted Areas	- BOTAŞ - Contractor Company
Construction Phase	Solid Waste and Packaging Wastes	In the working areas during the Project construction works	Visual inspection, recording and reporting	Daily	As per the Regulation on Waste Management	- BOTAŞ - Contractor Company - Sultanhanı Municipality - Aksaray Municipality - Licensed Recycling Company

Stage	Which Parameter will be Monitored?	Where is the Parameter to be Monitored?	How will the Parameters be Monitored? Type of Monitoring Equipment	When will the Parameters be Monitored? Monitoring or Continuous Measuring?	Why is the Parameter Monitored?	Responsible Corporation/ Organization
Construction Phase	Non-hazardous and Inert Wastes	In the working areas during the Project construction works	Visual inspection, recording and reporting	Daily	As per the Regulation on Waste Management	- BOTAŞ - Contractor Company - Sultanhanı Municipality - Aksaray Municipality - Licensed Recycling Company
Construction Phase	Hazardous Wastes	In the working areas during the Project construction works	Visual inspection, recording and reporting	Daily	As per the Regulation for Waste Management	- BOTAŞ - Contractor Company - Licensed Hazardous Waste Company
Construction Phase	Medical Wastes	In the infirmary	Visual inspection, recording and reporting	Daily	As per the Regulation on Control of Medical Wastes	- BOTAŞ - Contractor Company - Aksaray Municipality - Licensed Medical Waste Transport Company
Construction Phase	Waste Oils	In the vehicle maintenance and repair stations	Visual inspection, recording and reporting	Daily	As per the Regulation on Control of Waste Oils	- BOTAŞ - Contractor Company - Licensed Recycling Company
Construction Phase	Waste Vegetable Oils	In the dining halls	Visual inspection, recording and reporting	Daily	As per the Regulation on Control of Waste Vegetable Oils	- BOTAŞ - Contractor Company - Licensed Vegetable Waste Oil Recycling Company

Stage	Which Parameter will be Monitored?	Where is the Parameter to be Monitored?	How will the Parameters be Monitored? Type of Monitoring Equipment	When will the Parameters be Monitored? Monitoring or Continuous Measuring?	Why is the Parameter Monitored?	Responsible Corporation/ Organization
Construction Phase	Waste Batteries and Accumulators	In the Project construction areas	Visual inspection, recording and reporting	Daily	As per the Regulation on Control of Waste Batteries and Accumulators	- BOTAŞ - Contractor Company - Licensed Waste Vegetable Oil Recycling Company
Construction Phase	End-of-Life Tires	In the Project construction areas	Visual inspection, recording and reporting	Daily	As per the Regulation on Control of End of Life Tires	- BOTAŞ - Contractor Company - Licensed Recycling Company
Construction Phase	Storage and transportation of fuel, oil and hazardous materials	In the working areas during the Project construction	Visual inspection, recording and reporting	Daily	As per the Labor Law, and as per the Regulation on Classification, labeling and Packaging of Substances and Mixtures, and as per the Regulation on Control of Major Industrial Accidents	- BOTAŞ - Contractor Company

Stage	Which Parameter will be Monitored?	Where is the Parameter to be Monitored?	How will the Parameters be Monitored? Type of Monitoring Equipment	When will the Parameters be Monitored? Monitoring or Continuous Measuring?	Why is the Parameter Monitored?	Responsible Corporation/ Organization
Construction Phase	Community Health and Safety (Number of community safety initiatives implemented, number of community safety trainings done)	In the working areas during the Project construction and public road crossings	Recording and reporting	Monthly	Prevention of possible risks and accidents especially if there are settlements close to construction area	- BOTAŞ - Independent Consultant
Construction Phase	Labor Influx (number of complaints related to conflicts or tensions between local people and workers, number of Social Trainings for workers etc.)	Office and project affected settlements	- Documentational - Site visit, consultations with PAPs	Monthly	Prevention of possible conflicts and tension that may arise due to the existence of foreign workers	- BOTAŞ - Independent Consultant
Construction Phase	Traffic Management (number of complaints related to traffic issues, number of Traffic trainings provided to workers)	Office	Documentational	Monthly	Prevention of the possible risks and accidents that may cause due to not obeying the traffic rules such as speed limits etc.	- BOTAŞ - Independent Consultant

Stage	Which Parameter will be Monitored?	Where is the Parameter to be Monitored?	How will the Parameters be Monitored? Type of Monitoring Equipment	When will the Parameters be Monitored? Monitoring or Continuous Measuring?	Why is the Parameter Monitored?	Responsible Corporation/ Organization
Construction Phase	Land and Livelihood Impacts (Loss of income source due to expropriation of lands, loss of pasture lands, loss of agricultural lands etc.)	Project directly and indirectly affected settlements	Regular consultations with PAPs, regularly produced field reports on RAP implementation	Monthly	To ensure that no negative impact on PAPs livelihoods have been made due to the project activities	- BOTAŞ - Independent Consultant
Drilling and Leaching Activities	Formation Wastes, Drilling Mud, Insoluble Sludge of Brine	In sealed mud pools in drilling areas during the Project construction	Visual inspection, recording and reporting	Daily	As per the Regulation on Control of Water Pollution, and the Regulation on Control of Soil Pollution and Point Source Polluted Areas	- BOTAŞ - Contractor Company - Licensed Waste Company
Drilling and Leaching Activities	Mud Waters and Insoluble Effluents	In sealed mud and outlet water pools in drilling areas during the Project construction	Visual inspection, recording and reporting	Daily	As per the Regulation on Control of Water Pollution, and the Regulation on Control Soil Pollution and Point Source Polluted Areas	- BOTAŞ - Contractor Company - Licensed Waste Company

Stage	Which Parameter will be Monitored?	Where is the Parameter to be Monitored?	How will the Parameters be Monitored? Type of Monitoring Equipment	When will the Parameters be Monitored? Monitoring or Continuous Measuring?	Why is the Parameter Monitored?	Responsible Corporation/ Organization
Drilling and Leaching Activities	Brine	In salt water pools and salt water discharging areas during the Project construction	Observational, experimental	Weekly	Controlled discharging of brine after completion of necessary physical and chemical and heavy metal analyses as per the Regulation on Control of Water Pollution, and the Regulation on Control Soil Pollution and Point Source Polluted Areas	- BOTAŞ - Contractor Company
Drilling and Leaching Activities	Wastewaters and oily waters	In workshops and concrete plants available in construction areas	Visual inspection, recording, reporting and oil trap	Daily	Compliance of wash waters and oily waters formed and accumulated in the Project areas with suitable pre-treatment techniques, main infrastructure systems such as oil trap, settlement pool, etc. and receiving body criteria	- BOTAŞ - Contractor Company - Licensed Waste Company
Drilling and Leaching Activities	Noise and vibration	At working areas and sensitive locations around working areas	Noise measurement shall be carried out through the noise and vibration measuring device by a qualified and accredited Company.	In the event that noise occurred one a month, and when there is a complaint.	As per the Regulation onEnvironmental Noise Assessment and Management	- BOTAŞ - Contractor Company
Drilling and Leaching Activities	Environmental Management	At the project areas	Observational	During the drilling and leaching operations	Determination of potential environmental and social impacts during the works	- BOTAŞ - Consultant - Contractor Company
Operation Phase	Health and Safety	In all works	As written, through a report to be handed over to the workers	Continuously	As per the Labor Law	- BOTAŞ

Stage	Which Parameter will be Monitored?	Where is the Parameter to be Monitored?	How will the Parameters be Monitored? Type of Monitoring Equipment	When will the Parameters be Monitored? Monitoring or Continuous Measuring?	Why is the Parameter Monitored?	Responsible Corporation/ Organization
Operation Phase	Security of construction sites	In the Project areas	Observational	Continuously	Safety of construction site, materials, equipment and personnel	- BOTAŞ
Operation Phase	Transportation	In- and out-Facility roads	Observational	Continuously	Safety of Life and property, as per the Highway Traffic Law	- BOTAŞ
Operation Phase	Reinstatement Activities	In and around pipelines and temporary Project areas	Observational	Continuously	Improvement of Agricultural Lands as per the Pasture Law	- BOTAŞ
Operation Phase	Wastewater	Surface Facilities wastewater treatment plant in the operating area	Observational, experimental	Monthly	Provision of discharging standards as per the Regulation on Control of Water Pollution	- BOTAŞ
Operation Phase	Rain Water and Flood Prevention and Drainage Structures	In the operating areas	Observational	Continuously	Controlled discharging of storm waters around and the Project areas and natural drainages through suitable collecting and drainage systems as per the Regulation on Control of Water Pollution, and the Regulation on Control of Soil Pollution and Point Source Polluted Areas	- BOTAŞ

Stage	Which Parameter will be Monitored?	Where is the Parameter to be Monitored?	How will the Parameters be Monitored? Type of Monitoring Equipment	When will the Parameters be Monitored? Monitoring or Continuous Measuring?	Why is the Parameter Monitored?	Responsible Corporation/ Organization
Operation Phase	Solid Wastes	In the operating areas	Visual inspection, recording and reporting	Daily	The Regulation on Waste Management	- BOTAŞ
Operation Phase	Packing Wastes	In the operating areas	Visual inspection, recording and reporting	Daily	As per the Regulation on Control of Packing Wastes	- BOTAŞ - Licensed Recycling Company
Operation Phase	Non-hazardous and Inert Wastes	In the operating areas	Visual inspection, recording and reporting	Daily	As per the Regulation on Waste Management	- BOTAŞ - Sultanhanı Municipality - Aksaray Municipality - Licensed Recycling Company
Operation Phase	Hazardous Wastes	In the operating areas	Visual inspection, recording and reporting	Daily	As per the Regulation on Waste Management	- BOTAŞ - Licensed Hazardous Waste Company
Operation Phase	Medical Wastes	In the infirmary	Visual inspection, recording and reporting	Daily	As per the Regulation on Control of Medical Wastes	- BOTAŞ - Aksaray Municipality - Licensed Medical Waste Transport Company -
Operation Phase	Waste Oils	During maintenance and repair of any compressors, machinery and equipment available in the operating area	Visual inspection, recording and reporting	Daily	As per the Regulation on Control of Waste Oils	- BOTAŞ - Licensed Recycling Company
Operation Phase	Waste Vegetable Oils	In the dining halls	Visual inspection, recording and reporting	Daily	As per the Regulation on Control of Waste Vegetable Oils	- BOTAŞ - Licensed Waste Vegetable Oil Recycling Company

Stage	Which Parameter will be Monitored?	Where is the Parameter to be Monitored?	How will the Parameters be Monitored? Type of Monitoring Equipment	When will the Parameters be Monitored? Monitoring or Continuous Measuring?	Why is the Parameter Monitored?	Responsible Corporation/ Organization
Operation Phase	Waste Batteries and Accumulators	In the operating areas	Visual inspection, recording and reporting	Continuously	As per the Regulation on Control of Waste Batteries and Accumulators	- BOTAŞ - Licensed Recycling Company
Operation Phase	Vehicle Emissions	In vehicles and construction machines	Exhaust gas emission measuring devices	During periodical maintenance works	Compliance with the Regulation on Control of Exhaust Gas Emission and the Quality of Gasoline and Diesel Oil	- BOTAŞ
Operation Phase	Emissions	In the nearest settlement unit	Provide that the measurements are made by the qualified and accredited Company	When there is a complaint	For prevention of possible air polluting effects of the operating facilities on the environment	- BOTAŞ
Operation Phase	Noise	In the operating areas and at sensitive locations in the vicinity of the working areas	Visual inspection and if necessary, by a qualified and accredited Company through any Noise Measuring Device.	When there is a complaint	As per the Regulation on Environmental Noise Assessment and as per the Regulation on Occupational Health and Safety.	- BOTAŞ
Operation Phase	Health and Safety	During all the works	In writing, through a report to be handed over to the workers	Continuously	As per the Labor Law	- BOTAŞ
Operation Phase	Fire Protective System	In the operating areas	Through visual and regular exercises	Firstly within 3 months, and then in the periods of 3 months each	As per the Labor Law	- BOTAŞ
Operation Phase	Leakage and Explosion	In the operating areas	Observational	Continuously	As per the Labor Law	- BOTAŞ
Operation Phase	Transportation	In- and out-facility roads	Observational	Continuously	As per the Safety of Life and Property, and the Highway Traffic Law	- BOTAŞ

Stage	Which Parameter will be Monitored?	Where is the Parameter to be Monitored?	How will the Parameters be Monitored? Type of Monitoring Equipment	When will the Parameters be Monitored? Monitoring or Continuous Measuring?	Why is the Parameter Monitored?	Responsible Corporation/ Organization
Operation Phase	Land and Livelihood Impacts (Loss of income source due to expropriation of lands, loss of pasture lands, loss of agricultural lands etc.)	Project directly and indirectly affected settlements	Regular consultations with PAPs	Quarterly	To ensure that no negative impact on PAPs livelihoods have been made due to the project activities	- BOTAŞ - Independent Consultant
Operation Phase	Labor Influx (number of complaints related to conflicts or tensions between local people and workers, number of Social Trainings for workers etc.)	Office and project affected settlements	- Documentational - Site visit, consultations with PAPs	Quarterly	Prevention of possible conflicts and tension that may arise due to the existence of foreign workers	- BOTAŞ - Independent Consultant
Decommissioning Phase	Reinstatement Activities	In and around the operating areas	Observational	Continuously	As per the Pasture Law, and the Improvement of Agricultural Lands	- BOTAŞ

5.9. Commitment Register for Future Activities of GSEP

In the scope of the Gas Storage Expansion Project, commitment register was prepared for the some project components and activities such as access roads, ETL's, camp sites and etc. that will be determined after the final design (Table 5.9.1.).

Table 5.9.1. Commitment Register for ESIA of Gas Storage Expansion Project

No	Phase	Unit	Component	Commitment		Monitoring / Inspection		Related Management Plan	WB Informing Method	ESIA Chapter
				Action	Responsibility	Frequency	Starting / Reporting			
1.	Pre-Construction	CWAA	Wastes	CWAA construction at the surface facilities	BOTAŞ Contractor	Daily	During the camp site construction, Daily Reports	Waste	For information	C- 5.6.3
2.	Pre-Construction	CWAA	Hazardous Wastes	Temporary storage permission to be taken from MoEU	Contractor	Weekly	After the completion of CWAA, Weekly Reports	Waste	For information	C- 2.1 C- 5.6.3
3.	Pre-Construction	All Project Areas	Project Changes	Approval of project changes according to EIA Regulation	BOTAŞ	Weekly	After the final design, Weekly Reports	-	For information	C- 2.1
4.	Pre-Construction	All Project Areas	Access Roads	Addendum study for E&S assessment after final design	BOTAŞ	In 3 months	After the final design, Addendum to ESIA and Revision of monitoring plan	-	Issued for review	C- 1.4
5.	Pre-Construction	All Project Areas	Access Roads Connection Roads	Permission from Regional Directorate of Highways	BOTAŞ Contractor	Weekly	After the final design, Weekly Reports	-	For information	C- 1.4
6.	Pre-Construction	All Project Areas	Energy Transmission Lines (ETL)	Addendum study for E&S assessment after final design	BOTAŞ	In 3 months	After the final design, Addendum to ESIA and Revision of monitoring plan	-	Issued for review	C- 1.4
7.	Pre-Construction	All Project Areas	Agricultural Lands	Permission for Agricultural Areas for non-Agricultural Purpose	BOTAŞ MoFA&H	Weekly	After the final design, Weekly Reports	-	For information	C- 5.8
8.	Pre-Construction	All Project Areas	Management Plans	Preparing of all management plans given in ESIA	BOTAŞ Contractor	In a month	After the final design, Addendum to ESIA and Revision of monitoring plan	-	Issued for review	C- 6.1
9.	Pre-Construction	All Project Areas	H&S	Project Health and Safety Plan	Contractor	In two months	After EPC contract awarded, as revision needed	Occupational H&S Management Guideline	Issued for review	C- 6.2.15

No	Phase	Unit	Component	Commitment		Monitoring / Inspection		Related Management Plan	WB Informing Method	ESIA Chapter
				Action	Responsibility	Frequency	Starting / Reporting			
10.	Pre-Construction	All Project Areas	H&S	Emergency Response Plans (Based on Contractor and Sub-contractor Activities)	Contractor and Sub-contractors	In a month	After EPC contract and specific contracts for sub-contractors awarded, as revision needed	Emergency Response Plan	For information	C- 6.2.11
11.	Pre-Construction	All Project Areas	H&S	Full Risk Assessment	Contractor	In three months	After the final design, as revision needed	Gas Storage Risk Assessment	For information	C- 6.2.16
12.	Pre-Construction	All Project Areas	H&S	Full HAZOP/HAZID Study	Contractor	In three months	After the final design, as revision needed	Gas Storage Risk Assessment	For information	C- 6.2.16
13.	Pre-Construction	All Project Areas	H&S	Explosion Protection Document (ExPD)	Contractor	In three months	After the final design, as revision needed	Gas Storage Risk Assessment	For information	C- 6.2.16
14.	Pre-Construction	Pipelines	Road Crossings	Permission to be taken Regional Directorate of Highways	BOTAŞ Contractor	In a month	After the final design, Addendum to ESIA and Revision of monitoring plan	Construction Impacts	Issued for review	C- 6.2.1
15.	Pre-Construction	Pipelines	River Crossings	Permission to be taken from DSİ	BOTAŞ Contractor	In a month	After the final design, Addendum to ESIA and Revision of monitoring plan	Construction Impacts	Issued for review	C- 6.2.1
16.	Pre-Construction	Tuz Gölü Basin	Brine Discharge in Tuz Gölü SEPA	Permission to be taken from General Directorate for the Protection of Natural Assets	BOTAŞ	In a month	After the final design, Addendum to ESIA and Revision of monitoring plan	Construction Impacts	Issued for review	C- 6.2.1
17.	Pre-Construction	Camp Sites	Camp site establishment	Camp sites to be located at the project areas	BOTAŞ Contractor	In 4 months	After the final design, Addendum to ESIA and Revision of monitoring plan	-	Issued for review	C- 5.1
18.	Pre-Construction	Hirfanlı Dam	Water Intake Structure	Permission to be taken from DSİ	BOTAŞ Contractor	Weekly	After the final design, Addendum to ESIA and Revision of monitoring plan	Construction Impacts	Issued for review	C- 3.3.1

No	Phase	Unit	Component	Commitment		Monitoring / Inspection		Related Management Plan	WB Informing Method	ESIA Chapter
				Action	Responsibility	Frequency	Starting / Reporting			
19.	Pre-Construction	Licensed Area	Drilling Sites	Determination of the drilling areas	BOTAŞ Contractor	Continuously	After the final design, Addendum to ESIA and Revision of monitoring plan	Construction Impacts	Issued for review	C- 3.3.1
20.	Pre-Construction	Hirfanlı Dam	Surface Water	Samples to be taken from Hirfanlı Dam to determination of the last base values of surface water parameters before the impacts of the construction activities.	BOTAŞ	Monthly	Before the construction of water intake structure, Monthly Reports	Pollution Prevention	For information	C- 6.2.9
21.	Pre-Construction	Licensed Area	Groundwater	Samples to be taken from the nearest wells at licensed area to determination of the last base values of groundwater parameters before the impacts of the construction activities.	BOTAŞ	Monthly	Before the drilling activities, Monthly Reports	Pollution Prevention	For information	C- 6.2.9
22.	Pre-Construction	Licensed Area	Soil	Samples to be taken at the licensed area to determination of the last base values of the soil parameters before impacts of the construction activities.	BOTAŞ	Monthly	Before the drilling and construction activities Monthly Reports	Pollution Prevention	For information	C- 6.2.9
23.	Pre-Construction	All Project Areas	Potable Water	Samples to be taken from the municipality's drinking water system to controlling before using at the project.	BOTAŞ	Monthly	Before the camp site construction, Monthly Reports	-	For information	C- 6.2.9
24.	Pre-Construction	All Project Areas	Electricity	Permission to be taken from the regional electric distribution company	BOTAŞ	Weekly	Before the construction activities, Weekly Reports	-	For information	C- 3.3
25.	Pre-Construction	All Project Areas	Rain Water	Establishment of Rainwater drainages	BOTAŞ Contractor	Weekly	Before the construction activities, Weekly Reports	Pollution Prevention	For information	C- 5.6.5 C- 6.2.9

No	Phase	Unit	Component	Commitment		Monitoring / Inspection		Related Management Plan	WB Informing Method	ESIA Chapter
				Action	Responsibility	Frequency	Starting / Reporting			
26.	Pre-Construction	Drilling Sites	Mud Pools	Establishment of the mud pools	BOTAŞ Contractor	Weekly	Before the drilling activities, Weekly Reports	Pollution Prevention	For information	C- 5.6.3 C- 6.2.9
27.	Pre-Construction	Drilling Sites	Drilling Water Demand	Contract to be made with the nearest well owners	BOTAŞ Contractor	Weekly	Before the drilling activities, Weekly Reports	-	For information	C- 5.6.3
28.	Pre-Construction	External Sites	Wastewater	Contract with the nearest municipalities on wastewater disposal	BOTAŞ Contractor	Weekly	Before the construction activities, Weekly Reports	Pollution Prevention	For information	C- 5.6.5 C- 6.2.9
29.	Pre-Construction	Camp Sites	Wastewater	Establishment of the infrastructure system at the camp sites and contract with the nearest municipalities on wastewater disposal	BOTAŞ Contractor	Weekly	Before the construction activities, Weekly Reports	Pollution Prevention	For information	C- 5.6.5 C- 6.2.9
30.	Pre-Construction	All project areas	Access roads	Preparation of appraisal site checklist for potential social impacts on community health and safety	Contractor	In two weeks	Before site selection, Appraisal Forms are submitted to BOTAŞ	Community Health and Safety / Traffic Management Plan	For information	C – 5.6.7.4
31.	Pre-Construction	All project areas	Energy transmission lines (ETL)	Preparation of appraisal site checklist for potential social impacts on land and livelihoods	Contractor	In two weeks	Before site selection, Appraisal Forms are submitted to BOTAŞ	Resettlement Action Plan	For information	C – 5.6.7.6
32.	Pre-Construction	All Project Areas	Camp sites	Preparation of appraisal site checklist for potential social impacts on labor influx, land and livelihoods	Contractor	In two weeks	Before site selection, Appraisal Forms are submitted to BOTAŞ	Labor Influx Management Plan / Resettlement Action Plan	For information	C – 5.6.7.6 C – 5.6.7.2
33.	Pre-Construction	All Project Areas	Access roads / Energy transmission lines / Camp sites and other extra lands	Identification of assets and consultation with landowners/users	Contractor	In a week	Before the construction activities, Monthly reports	Resettlement Action Plan / Stakeholder Engagement Plan	For information	C – 7.2 C – 7.3

No	Phase	Unit	Component	Commitment		Monitoring / Inspection		Related Management Plan	WB Informing Method	ESIA Chapter
				Action	Responsibility	Frequency	Starting / Reporting			
34.	Construction	All Project Areas	Air Quality	Air quality measurements at the project areas	BOTAŞ	Monthly	During the construction phase, Monthly Reports	Pollution Prevention	For information	C- 6.2.9
35.	Construction	All Project Areas	Noise	Environmental noise measurements at the project areas	BOTAŞ	Monthly	During the construction phase, Monthly Reports	Pollution Prevention	For information	C- 6.2.9
36.	Construction	All Project Areas	Waste	Waste register inspection	BOTAŞ	Weekly	During the construction phase, Weekly Reports	Pollution Prevention	For information	C- 6.2.9
37.	Construction	All Project Areas	Wastewater	Wastewater register inspection	BOTAŞ	Weekly	During the construction phase, Weekly Reports	Pollution Prevention	For information	C- 6.2.9
38.	Construction	All Project Areas	H&S	Internal Emergency Response Plan	BOTAŞ	In a month	Before Operation, as revision needed	Emergency Response Plan	For information	C- 6.2.11
39.	Construction	All Project Areas	Reptiles	Control of the excavation area and transport *Testudo graeca* to appropriate habitats, control of other reptile species	BOTAŞ	Seasonally	During top soil stripping continuously, after the construction seasonally	Biodiversity Action	For information	C- 6.2.12
40.	Construction	All Project Areas	Birds	Control of bird species especially flamingo (*Phoenicopterus roseus*)	BOTAŞ	Seasonally	During and after construction seasonally	Biodiversity Action Plan	For information	C- 6.2.12
41.	Construction	All Project Areas	Mammals	Control of mammal species	BOTAŞ	Seasonally	During and after construction seasonally	Biodiversity Action Plan	For information	C- 6.2.12
42.	Drilling and Leaching	Brine Discharge Areas	Brine	Sample takes from the brine discharge areas	BOTAŞ	Monthly	After the starting of the leaching operation, Monthly Reports	Pollution Prevention	For information	C- 6.2.9
43.	Drilling and Leaching	Brine Discharge Areas	Soil	Sample takes from the brine discharge areas	BOTAŞ	Monthly	After the starting of the leaching operation, Monthly Reports	Pollution Prevention	For information	C- 6.2.9
44.	Drilling and Leaching	Brine Discharge Areas	Settled Sludge in Tuz Lake	Sample takes from Tuz Lake	BOTAŞ	Monthly	After the starting of the leaching operation, Monthly Reports	Pollution Prevention	For information	C- 6.2.9

6. ENVIRONMENTAL AND SOCIAL MANAGEMENT

6.1. Environmental and Social Management System

BOTAŞ and its contractors are responsible for development of their own internal environmental and social management systems (ESMS). The systems ultimately have the same aim ensuring that:

- The Project meets its legal and other Project requirements;
- The Project Environmental and Social aspects are identified and potential impacts are controlled (or enhanced in the case of positive impacts) as far as possible and as per Project commitments; and
- The Project demonstrates continual improvement in its environmental and social management.

To assure appropriate management of environmental and social risks that could compromise the efficiency of project development and execution, BOTAŞ is establishing an environmental and social management system (ESMS) which is required to meet national and international standards and best practices. This ESMS will be planned and implemented throughout the different project phases as described in Table 6.1.1. This will include the design of the ESMS to conform to the requirements of the last version of ISO 14001 Standard.

Table 6.1.1. Project Phases Relevant to the Environmental and Social Management System

Phases of the Project	Development and Implementation of ESMS
Appraisal Phase	Initiate Environmental and Social Impact Assessment (ESIA) process Scoping of Project Environmental and Social Impacts (in parallel with Project Definition) Environmental and Social Baseline Studies in Area of Influence to Support ESIA Assessment of Aspects and Determination of Mitigation Measures Development of draft final ESIA Report Development of RPF Development of Environmental and Social Management Plans Disclosure of draft final ESIA Report, RPF and the plans Establish GRM Establish RAP Fund Final ESIA Report, RPF and its supporting EMS Plans Obtaining required approvals, e.g. from Lenders
Pre-Construction Phase	Preparation of RAPs
Engineering, Procurement and Construction Phase **Commissioning & Operation Phases**	Preparation of Contractor's Plans and Procedures in line with the ESIA and other project requirements Implementation and monitoring of the commitments of ESIA and the management plans Implementation and monitoring of RAPs (Management of RAP Fund) Social and Environmental investment to assure that positive impacts result in the Project Affected Communities
Decommissioning Phase	Implementation and monitoring of the commitments of ESIA and the management plans

6.1.1. Environmental and Social Performance Requirements of GSEP

The environmental and social performance of GSEP will be governed by the requirements which can be summarized as follows;

- The requirements to comply with international standards within the natural gas industry,
- National legislation and international conventions,
- Applicable International Environmental and Social Policies and Guidelines; and
- BOTAŞ Integrated Management System Policy.

In the below sections the elements of ESMS of BOTAŞ are described and will set the basis for the Contractors and Sub-contractors of BOTAŞ.

6.1.1.1. BOTAŞ Integrated Management System (IMS) Policy

BOTAŞ has developed an integrated Management System in 2002 and since then this system has been implementing by all directorates of BOTAŞ. This integrated system includes ISO 9001-Quality Management, OHSAS 18001-Occupational Health and Safety Management, ISO 14001-Environmental Management and ISO 50001-Energy Management. Within this framework BOTAŞ has developed and committed an Integrated Management System Policy including the principles and overall objectives of all Quality, Occupational Health and Safety, Environmental and Energy management systems and defined by BOTAŞ that:

"Improving the efficiency of Quality, Occupational Health and Safety, Environment and Energy Management Systems continuously, complying with the regulations and other requirements, ensuring that participation of all interested parties in this policy, transforming awareness of Integrated Management Systems into corporate culture by conducting training programs to all related levels."

The following principles form an integral part of BOTAŞ's IMS policy:

- Giving priority to Occupational Health and Safety
- Minimizing the risk to which employees, guests and local community can be exposed
- Minimizing occupational accidents and illnesses by providing healty and safe working environment
- Protecting the environment by respecting the people and the environment
- Managing the environmental size and impacts at every level of organization

BOTAŞ will periodically review the policy and revise as required according to the project's new objectives related to Quality, Occupational Health and Safety, Environmental and Energy Management and as system evolves.

Within the context of the GSEP, Integrated Management System Standards will be applied besides ESMS described in this Chapter.

6.1.1.2. Project Requirements for BOTAŞ and the Contractors

a. Compliance with Regulatory Requirements

BOTAŞ and the Contractors will ensure that its activities comply with all relevant Turkish legislation and international requirements listed in Chapter 2 of the ESIA Report. The Contractor will also ensure that other Project standards and best practices in natural gas industry stipulated in ESIA Report of the project are complied with.

b. Compliance with BOTAŞ Policy, ESIA and ESMS Requirements

According to BOTAŞ's Integrated Management System Policy Contractors shall act in line with BOTAŞ policies and standards. Contractors shall have required capacity to conform to BOTAŞ Integrated Management System Policy.

The Contractors and sub-contractors will be responsible for implementation of, and adherence to, all relevant mitigation measures and requirements outlined in BOTAŞ's ESIA and Environmental and Social Management Plans (ESMPs). The Contractors will be required to demonstrate to the satisfaction of BOTAŞ that the relevant mitigation measures identified in the ESIA and ESMPs are being properly considered, implemented and monitored during execution of the works.

The ESMS will comprise E&S Management Plan(s) and Procedures which will be submitted to BOTAŞ for review and approval.

The ESMS will also submit "Outline of the Applicable ESIA Requirements and Commitments" and get approval from BOTAŞ and will;

- Describe how applicable ESIA requirements, commitments and contractual requirements will be met,
- Describe procedures (e.g. design changes, additional land areas) in terms of environmental and social aspects,
- Describe how Contractor will ensure the commitments and contractual/legal requirements,
- Describe the procedures to ensure that the project related concerns and grievances will be managed in terms of BOTAŞ stakeholder engagement plan,
- Provide a set of E&S Key Performance Indicators (KPIs) to at least cover the following areas (but not be limited to) based on the outline of the applicable commitments and contractual requirements:
    - Compliance with the ESMS,
    - E&S Incidents,
    - Environmental Emissions,
    - Waste Management,
    - Water and Wastewater Management,
    - Local Employment,
    - Project Related Complaints and

- Reinstatement

- Describe how Contractor will record and report their compliance,
- Describe how appropriately experienced and qualified personnel will be employed in the role of Contractor's E&S representative(s) and on-site inspectors subject to the approval of BOTAŞ,
- Describe the responsibilities of the dedicated E&S team clearly,
- Describe workforce training to ensure that all personnel are aware of their E&S responsibilities with reference to Contractor E&S Management Plan(s),
- Describe how the performance of all contractors and subcontractors with respect to the E&S requirements will be met and
- Describe E&S records including based on the outline of the applicable commitments and contractual requirements.

c. Compliance with ISO 14001 and OHSAS 18001 Standard Requirements

BOTAŞ established Integrated Management System including Environmental and Occupational Health & Safety Management Systems in 2002.

The Contractors are required to have/establish its own ESMS in compliance with the last version of the requirements of ISO 14001 Environmental Management System Standard and OHSAS 18001 Occupational Health & Safety Management System Standard and ensure that ESIA and ESMP requirements are addressed and met.

d. Organizational and Capacity Requirements

BOTAŞ and the contractors shall have the primary responsibility to fulfill all project requirements with adequate and qualified personnel working under an appropriate organizational structure and further to ensure that their sub-contractors also comply with the project requirements. Adequate and qualified personnel will be employed by contractors to allow the proper management of environment, community relations and natural resources within the scope of its operations (Refer to Section 6.1.3 for the planned organization).

The contractors will ensure that the following competencies are included in their teams as relevant to their scope of work:

1. Cultural Heritage Experts
2. Ecological/Biological Experts
3. Soil/Landscaping Experts
4. Social/Community Relations Experts
5. Environmental Inspectors
6. Environmental and Social Trainers

In order to provide smooth application of E&S requirements on site, Contractor will be

responsible for ensuring that all of its personnel (including contractor and sub-contractor personnel) are aware of their E&S responsibilities.

6.1.1.3. BOTAŞ's Management System Elements Relevant to the Overall ESMS Structure

Top down leadership in developing policies to support the ESMS in implementation by assigning qualified experienced human resources and assuring a functional ESMS is recognized as the means to achieve the desired positive results.

Key high level principles related to the ESMS which should serve to guide participants in the project and attain the desired E&S goals are;

- Show respect for the national culture, and inter-cultural sensitivities and universal human rights and natural resources, and contribute to environmental protection measures and improvement in the quality of life in the areas where the Company operates,
- Embrace the concept of corporate social responsibility,
- Adhere to the UN Declaration of Human Rights,
- Measure, benchmark and audit E&S performance against national standards, World Bank standards and industry best practice to ensure continuous improvement,
- Set a high value on active and open dialogue with stakeholders to build trust between the BOTAŞ Organization and Project Affected Communities so that the Company's image is enhanced and
- Promote ethical business practice and a good corporate image in the Project area by providing just compensation and timely response to complaints as well as implementation of all ESIA related commitments.

The main elements of BOTAŞ ESMS include the following stages and associated tasks. BOTAŞ has completed the assessing and planning stage of its ESMS by delivery of ESIA Report. Other tasks are planned or implemented as described in Table 6.1.1.3.1.:

Table 6.1.1.3.1. Tasks performed/will be performed within ESMS

Assessing and Planning	
Task 1: Identification and Assessment of Significant Environmental and Social Aspects and Impacts	BOTAŞ has fulfilled this task by developing GSEP ESIA Report. The project will also apply an "Environmental and Social Management of Change" procedure for the identification of possible new environmental and social aspects due to the project changes in next phases of the project.
Task 2: Legal and Other Requirements - Identification and Management of Legal and Other Requirements	This task has been fulfilled during development of ESIA Report. In addition, BOTAŞ will ensure that the legal requirements are followed-up, integrated into the project management system and implemented.
Task 3: Objectives and Targets - Defining Environmental and Social Objectives and Targets and Developing Management Programs	This task has also been fulfilled during development of GSEP ESMPs. The construction and operation phase objectives and management programs have been reflected in Environmental and Social Management Plans. (See Section 6.2)

Task 4: Establishment of Grievance Redress Mechanism (GRM)	BOTAŞ has developed and publicized a "Grievance Redress Mechanism" through which communities, individuals and other stakeholders affected by BOTAŞ's activities can formally communicate their concerns, complaints and grievances to the company and facilitate resolutions that are mutually acceptable by the parties, within a reasonable timeframe. (See Chapter 6 of ESIA Report)
Task 5: Communication - Management of Environmental and Social Communication	BOTAŞ has developed a "Stakeholder Engagement Plan" to ensure an effective communication with the stakeholders is established throughout the project (See Chapter 6 of ESIA Report)
Task 6: Resettlement and Livelihood Restoration	BOTAŞ has prepared a Resettlement Policy Framework (RPF) for management of resettlement related activities caused by GSEP. Future RAPs will be prepared according to the RPF.
Implementation and Operation	
Task 7: Structure and Responsibility - Resource Management	BOTAŞ will establish an HSSE Management Organization as described in Figure 6.1.2.1. to ensure that the project requirements and commitments are effectively managed and monitored during construction and operation phases
Task 8: Implementation of Stakeholder Engagement Plan	BOTAŞ will implement all stakeholder engagement activitied based on SEP.
Task 9: Resettlement Action Plan Implementation	BOTAŞ will ensure that the RAPs are implemented in accordance with project's requirements
Task 10: Training, Awareness and Competence Building	BOTAŞ will develop an environmental and social training program and implement during construction and operation phases
Task 11: Document Control - Management of ESMS Documentation and Information	BOTAŞ will develop a document control system (PMU) to ensure that the project documents are created, developed and reviewed in accordance with international standards. Environmental and Social management documentation will also be managed with this system.
Task 12: Operational Control - Environmental and Social Control of Operations	BOTAŞ has developed an Environmental and Social Management Plan (See Section 6.2) to ensure that the project activities are managed and controlled in accordance with project's requirements.
Task 13: Emergency Preparedness and Response - Management of Emergency Cases	The Emergency Response plan given in Section 6.2.11. has been developed and will be improved when the project design is completed. BOTAŞ will also conduct required studies to prepare internal emergency response plan before operation phase.
Checking and Corrective Action	
Task 14: Monitoring and Measurement - Performance Monitoring and Measurement of Environmental and Social Management System	BOTAŞ has developed the Environmental and Social Management Plan to describe how the environmental and social components of the systems will be measured and monitored (See Section 6.2). BOTAŞ will ensure sufficient resources, including a Third Party Monitoring Consultant, are allocated for monitoring of the activities.
Task 15: Non-Conformance - Evaluation of Compliance	BOTAŞ will develop tools and procedures to ensure that non-conformances are identified and corrected and the compliance to the requirements are regularly checked and evaluated within integrated management system of the project.
Task 16: Corrective and Preventive Action - Management of Non-conformities, Corrective and Preventive Actions.	Related procedures within integrated management system of BOTAŞ will be used for identification of non-conformities, and development of corrective and preventive actions.
Task 16: Records - Management of Environmental and Social Records	BOTAŞ will keep all records of environmental and social issues.
Task 17: ESMS Audits	Internal Audits will be managed with the integrated management system procedures including environmental and health and safety review activities
Reviewing	
Task 18: Management Review	BOTAŞ will ensure that the performance of the environmental and social management system is regularly measured, monitored, reported and reviewed by the management to ensure that deficiencies are corrected, new objectives are set and performance is continually improved
Continual Improvement	
Task 19: Continual Improvement	BOTAŞ will generally achieve this task by conducting an improvement analysis in predefined periods and improving the objectives and targets according to the results of this analysis. BOTAŞ will also update certain living documents (SEP) during Project life.

6.1.2. ESMS Organization of BOTAŞ GSEP

BOTAŞ has developed a comprehensive Environmental and Social Management Organization to effectively implement, manage, and monitor the project's commitments. Figure 6.1.2.1 demonstrates the overall HSSE Organization of BOTAŞ GSEP.

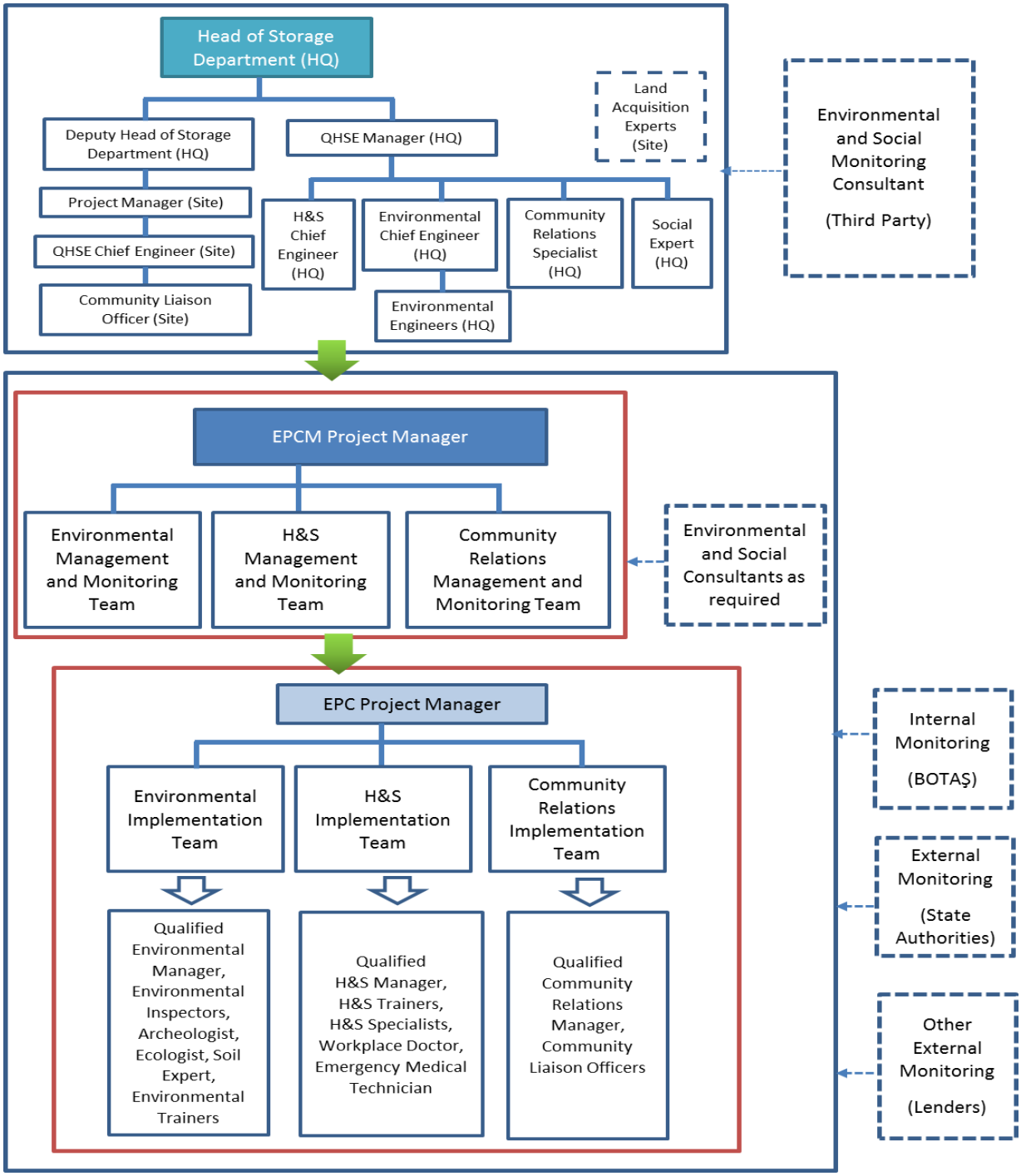


Figure 6.1.2.1. Organizational Structure of BOTAŞ GSEP

The overall responsibilities of main parties in the HSSE organisation during construction are summarised in Table 6.1.2.1. and detail roles and responsibilities for social managemet of the Project is given Table 6.1.2.2. below. Specific responsibilities are detailed in the specific management plans.

Table 6.1.2.1. Overall HSSE Organization of BOTAŞ GSEP

BOTAŞ Storage Department	✓ Responsible for monitoring and assurance of the environmental and social management system performance and requirements of the Project, ✓ Ensures that BOTAŞ's policies are periodically reviewed by the management and conveyed to all Project areas, ✓ Monitors performance through review of information provided by the EPCM (through KPIs, reports, etc.), audits, and meetings, ✓ Reports HSSE performance to senior management, shareholders, lenders, authorities and other related parties, ✓ Ensures that Environmental and Social Investment Programs are developed, implemented and monitored and ✓ Ensures that Archaeological Salvage Excavations are planned, implemented and monitored as required by State Authorities.
EPCM HSSE Management and Monitoring Team	✓ Develops Project's Environmental, Social, and HS Contractor Management plans and procedures, ✓ Ensures that EPC contractors develop and implement their site specific plans and procedures, ✓ Monitors implementation of all relevant management plans and procedures, including on site, ✓ Tracks the impacts of the Project against the project objectives and Key Performance Indicators as defined in the Management and Monitoring Plans and works with the EPC contractors where amendments to the mitigation measures are required, ✓ Identifies breaches of management plans, recommends corrective actions, ✓ Provides regular information to the BOTAŞ on performance, ✓ Stops work activities in the event of serious breaches of rules that may cause serious impacts on health and safety, environment and community or on the reputation of the Project and ✓ Ensures that Environmental/Social Management of Change are efficiently implemented.
EPC HSSE Implementation Team	✓ Ensures implementation of Project's overall management plans and procedures by all construction organization, ✓ Develops site specific management plans and procedures as required by the Project under supervision of EPCM, ✓ Inspects the performance of the works against Project's performance indicators, ✓ Identifies non-conformances and potential non-conformances, develop corrective and preventive actions, ✓ Provides trainings to workforce and community as required about the ES/HS requirements of the Project, ✓ Coordinates and implements required pre-construction activities under supervision of EPCM,, ✓ Report the performance of works to site managers and Construction Contractor, Environment, H&S, and Community Relations experts, ✓ Ensures adequate and sufficient experts are mobilized for execution of the work in accordance with the project requirements and ✓ Follow up and monitor the processing and resolution of complaints which are received from the affected settlements, stakeholders (NGOs, universities, media, etc.) and local authorities.

Table 6.1.2.2. Roles and Responsibilities for Social Management of the Project

Staff		Responsibility
BOTAŞ Head Office (Storage Department)	**QHSE Manager**	• Implements and improves processes related to grievance mechanism, RAP Fund management, RAP and stakeholder engagement issues • Expedites, monitors, follows up social team for proper implementation of processes related to grievance mechanism, RAP Fund management, RAP and stakeholder engagement issues • Coordinates with parties for proper implementation of processes related to grievance mechanism, RAP Fund management, RAP and stakeholder engagement issues
	Social Expert	• Receives and records the RAP Fund applications/complaints/request from the entitlement person under grievance mechanism regarding social issues and reports these to relevant units. Helps relevant units in taking required actions • Follows up and is informed about disclosure activities carried out within the scope of the RAP Fund applications/complaints/request received regarding social issues • Participates in interviews with environmental and Social Monitoring Consultant social team staff, and others involved in land acquisition, compensation disbursement or livelihood restoration activities to review progress and identify critical issues • Updating and monitoring the implementation of SEP • Prepares RAP Monitoring Plan • Monitors and reports on progress made with regards to commitments defined in RAP(s) • Does any other activities required to realize the objectives of RAP implementation • Examines whether RAP Fund applications are eligible or not • Provides all relevant materials, documents and data collected from implementation of RAP(s) to the External Auditors
	Community Relations Specialist	▪ Consults with affected households and with community leaders through brief questionnaires to ascertain their feedback on compensation payment, livelihood impact and delivery of other R&R assistance. Also interacts with various stakeholders to hear their views on RAP implementation ▪ Reviews grievance records to illustrate significant non-compliance issues or recurring problems regarding the land acquisition activities and coming up with actions ▪ Meets with Lenders' project safeguards and supervision teams and responds to queries as necessary ▪ Timely implementation of SEP ▪ Participates in the annual stakeholder's meeting carried out by BOTAŞ and to report on its outcomes ▪ By submitting required materials, informs the entitled person defined within the scope of RAP Fund in a planned way or in case of need

Staff		Responsibility
Site (BOTAŞ)	QHSE Chief Engineer	▪ Takes actions to resolve land acquisition induced grievances in coordination with land acquisition experts. ▪ Monitors activities of the construction contract and administers payments made for overspill and additional land rentals ▪ Participates in interviews with environmental and Social Monitoring Consultant social team staff, and others involved in land acquisition, compensation disbursement or livelihood restoration activities to review progress and identify critical issues ▪ Examines whether RAP Fund applications are eligible or not ▪ Studies community level responses to loss of community resources ▪ Verifies that livelihood restoration measures are implemented and assess their effectiveness ▪ Participates in overall assessment meeting at the end of each semi-annual reporting period with BOTAŞ social team ▪ Meets with Lenders' project safeguards and supervision teams and respond to queries as necessary ▪ Participates in the annual stakeholder's meeting carried out by BOTAŞ and to report on its outcomes
	Community Liaison Officer	• Gives information to the Project affected community about grievance mechanism, entitlements, construction works and schedule, community safety, compensation of economic losses, RAP Fund management • Ensures that the EPC Contractor informs the community about construction activities • Implements processes related to grievance mechanism, RAP Fund management, RAP and stakeholder engagement issues • Receives and records the RAP Fund applications/complaints/request from the entitlement person under grievance mechanism regarding social issues • Reports to BOTAŞ Head Office about community issues on a daily basis • Takes proper actions according to the information submitted from BOTAŞ Head Office • Helps filling application form samples that are created in case the entitled person wishes to apply
	Land Acquisition Experts	• Communicate regularly with land owners/users to inform about their rights • Identify informal land user on Public Lands • Collect and records grievances pertaining to land acquisition • Hand over any grievances associated with RAP Fund to RAP Fund Evaluation Committee • Perform all processes regarding land acquisition (BOTAŞ Land Acquisition Department manages and executes all land acquisition activities in conformity with the relevant Turkish Legislation) • Provide regular land acquisition data including grievances and logs of negotiation meetings etc.

Staff		Responsibility
Site (Environmental and Social Monitoring Consultant)	**Community Relations Specialist**	▪ Holds interviews with BOTAŞ social team staff, and others involved in land acquisition, compensation disbursement or livelihood restoration activities to review progress and identify critical issues ▪ Consults with affected households and with community leaders through brief questionnaires to ascertain their feedback on compensation payment, livelihood impact and delivery of other R&R assistance. Also interacts with various stakeholders to hear their views on RAP implementation ▪ Reviews grievance records to illustrate significant non-compliance issues or recurring problems regarding the land acquisition activities and coming up with actions ▪ Holds an overall assessment meeting at the end of each semi-annual reporting period with BOTAŞ social team ▪ Meets with Lenders' project safeguards and supervision teams and responds to queries as necessary ▪ Participates in the annual stakeholder's meeting carried out by BOTAŞ and to report on its outcomes ▪ Monitors and reports on progress made with regards to commitments defined in RAP(s) ▪ Performs any other activities required to realize the objectives of RAP implementation ▪ Responsible of conveying the applications in a timely manner to BOTAŞ for assessing the applications 'eligibility'
	Resettlement and Livelihood Restoration Specialist	▪ Monitors all the resettlement activities of the Project as specified in the RAP ▪ Reviews internal monitoring activities, records and reports to verify compliance with commitments in RAP(s) and identify problematic areas in RAP implementation and suggest ways of resolving those ▪ Holds interviews with BOTAŞ social team staff, and others involved in land acquisition, compensation disbursement or livelihood restoration activities to review progress and identify critical issues ▪ Consults with affected households and with community leaders through brief questionnaires to ascertain their feedback on compensation payment, livelihood impact and delivery of other R&R assistance. Also interact with various stakeholders to hear their views on RAP implementation ▪ Examines whether RAP Fund applications are eligible or not ▪ Studies community level responses to loss of community resources ▪ Monitors RAP Fund implementation and assess the appropriateness of Fund financed activities, including community based programs ▪ Verifies that livelihood restoration measures are implemented and assess their effectiveness ▪ Provides advice on corrective actions and measures to improve the implementation of RAP ▪ Holds an overall assessment meeting at the end of each semi-annual reporting period with BOTAŞ social team ▪ Meets with Lenders' project safeguards and supervision teams and respond to queries as necessary ▪ Participates in the annual stakeholder's meeting carried out by BOTAŞ and to report on its outcomes ▪ Reports on the progress in key result indicators related to social impacts outlined in the World Bank's PAD and RAPs ▪ Monitors and reports on progress made with regards to commitments defined in RAP(s) ▪ Performs any other activities required to realize the objectives of RAP implementation ▪ Prepares and submits a RAP Completion Report at the end of

Staff		Responsibility
	Resettlement and Livelihood Restoration Specialist	the resettlement activities ▪ Provides all relevant materials, documents and data collected from implementation of RAP(s) to the External Auditors, who will be appointed by BOTAŞ and will be responsible of doing an External RAP Progress Audit and an External RAP Completion Audit. The External RAP Progress Audit will cover all RAP(s) that are in progress by then and the timing of this will be decided by BOTAŞ and the World Bank. The External RAP Completion Audit, is a separate document from the RAP Completion Report. The latter will be conducted by the ESIA and RAP Monitoring Consultant to summarize all resettlement activities undertaken and completed in the Project. The former assignment will be undertaken by external independent auditors (to be appointed by BOTAŞ) to carry out a third-party independent audit
(Site) External Auditors	**Auditors**	▪ Doing an External RAP Progress Audit and an External RAP Completion Audit. ▪ The External RAP Progress Audit will cover all RAP(s) that are in progress by then and the timing of this will be decided by BOTAŞ and the World Bank.
Site (EPC Contractor)	**Community Relations Manager**	• Implements and improves Contractor's social policy • Ensures necessary resources for proper remedial actions • Follows up of the grievances and informing BOTAŞ social team about the resolution process accordingly
	Community Liaison Officers	• Carryies out day-to-day liaison activities • Acts as the principal point of contact with affected communities and other stakeholders • Coordinates of engagement activities • Records of grievances and any engagement activities performed • Reports any grievances and any engagement activities performed to BOTAŞ social team

6.1.3. Management of Environmental and Social Communication

a. Stakeholder Engagement

A Stakeholder Engagement Plan (SEP) has been developed jointly by BOTAŞ and its consultants to explain in detail how the project will engage with stakeholders throughout the entire lifespan of the Project.

The SEP aims to;

- Identify key stakeholders and ensure there are adequate mechanisms for stakeholder feedback and information sharing

- Provide an outline for consultation at the local, national and international levels, starting at the Project planning stage, and continuing throughout construction, operation and decommissioning of the pipeline
- Ensure issues raised by key stakeholders are addressed in the ESIA as well as in project decision-making and design phase; and
- Outline a grievance mechanism for all stakeholders

The SEP is a working document therefore it will be revised during the entire development of the Project to reflect changes and additions to the stakeholder engagement strategies and activities.

The stakeholder activities performed within BOTAŞ Project has been summarized in Chapter 7.

b. Grievance Mechanism

- The Grievance Mechanism is a management procedure through which communities, individuals and other stakeholders affected by BOTAŞ's activities can formally communicate their concerns, complaints and grievances to the company and facilitate resolutions that are mutually acceptable by the parties, within a reasonable timeframe. The grievance mechanism is a management tool designed to help address stakeholder concerns and facilitate a trustworthy and constructive relationship.
- The Grievance Mechanism of BOTAŞ includes the following processes:
  - Receiving and registering of the complaints
  - Assessment and investigation of the complaint
  - Resolution of the complaint
  - Response to the complainant within
  - Close out of the complaint

Detailed information about the Grievance Mechanism of BOTAŞ is given in Chapter 7.4 and the Stakeholder Engagement Plan.

6.1.4. Training, Monitoring and Audit Processes

6.1.4.1. Training and Capacity Improvement Program

BOTAŞ will develop and use procedures to ensure that BOTAŞ personnel and contractors of the project are aware of the following ESMS components:

- Environmental and social policy
- Requirements of ESMS
- Significant environmental aspects
- Environmental and social management plans and procedures
- Benefits of improved personal performance

- Roles and responsibilities
- Competency evaluation for personnel performing tasks which can cause a significant impact on the environment and social management system

The Contractor will develop and implement an E&S training programme to ensure that all site personnel fully understand all the aspects of E&S requirements of the project particularly in terms of potential impacts of activities, mitigation measures, sensitivities in study area, plans/procedures other project documents to be followed, action required in case of unforeseen incidents and roles and responsibilities of the Contractor staff and BOTAŞ representatives with respect to E&S issues. The E&S training programme will be submitted to BOTAŞ for review and approval within periods defined in related tender documents. Records of the trainings will be kept by the Contractor and will be submitted to BOTAŞ when required for auditing purposes.

The Contractor and the sub-contractors will ensure that all contractors' personnel participate in all training programme including regular site-specific training sessions on E&S issues throughout the course of their contract.

6.1.4.2. Environmental and Social Monitoring and Evaluation of Compliance Program

BOTAŞ will ensure that monitoring will proceed for all works to be conducted during all phases of the project from pre-construction to decommissioning and also compliance with required mitigation measures to reduce impacts, in accordance with the related national and international standards. BOTAŞ will assign the construction management and monitoring role to EPCM and also contract an independent third party monitoring company to ensure that all site activities are efficiently monitored, non-conformities are detected and managerial decisions are developed adequately to mitigate these deficiencies.

The Contractor will have its own methodology to follow-up the E&S performance of itself and its sub-contractors and will be required to develop its respective measurable key performance indicators in line with BOTAŞ's system performance requirements.

The key environmental and social subject areas (and the respective management plans) to be monitored during construction and operation are listed below:

- Air emissions (Pollution Prevention Plan)
- Ambient air quality (Pollution Prevention Plan)
- Noise and vibrations (Pollution Prevention Plan)
- Effluent water discharge (Pollution Prevention Plan)
- Brine water discharge (Construction Impacts Management Plan)
- Water abstraction – for water consumption in construction camps and hydrostatic testing (Pollution Prevention Plan)
- Groundwater quality and level in community wells and monitoring wells at compressor stations (Construction Impacts Management Plan)
- Waste production and disposal (Waste Management Plan)

- Soil contamination – oil spills etc. (Pollution Prevention Plan)
- Vegetation surveying and reinstatement (Erosion, Reinstatement and Landscaping Plan)
- Reinstatement of AoI focusing on ESAs and Critical Habitats (Erosion, Reinstatement and Landscaping Plan)
- Cultural and archaeological resources (Cultural Heritage Management Plan)
- Social indicators – queries and complaints from stakeholders, meetings (Community Relations Plan and Stakeholder Engagement Plan)
- Community/Social impact management (Community Relations Plan, Construction Impacts Management Plan, Employment and Training Plan, Community Health and Safety Management Plan)
- Resettlement Action Plan(s) (To be prepared after final design)

BOTAŞ shall have a right to request evidence on the performance follow-up and evaluation of the Contractor and the sub-contractors. The Contractor shall ensure that the system is being inspected, audited based on programme and findings are shared with respective departments for improvement.

BOTAŞ shall have a right to evaluate the management system compliance of the Contractor, with the committed management system. Evaluation will be done by audits, checklists, questionnaires etc. A certified body will also be considered for the audits on behalf of BOTAŞ. To this end, the Contractor will be required to demonstrate how its monitoring programme will take place in keeping with project ESMS requirements.

Monitoring works to be conducted by BOTAŞ and the Contractor shall be carried out as “internal monitoring activities”. However, external monitoring by the competent authority representatives and third parties, in the respective jurisdictions, are also expected during the construction phase to assure compliance with project commitments. The Contractor will be responsible for providing access to all necessary information and assistance to facilitate monitoring by BOTAŞ or any other approved organisation.

Performance monitoring intends to eliminate, mitigate or compensate the negative environmental and social impacts that might be caused by the works to be conducted during the implementation phase of the project. In this process, the works to be conducted by the Contractor shall be monitored in accordance with the Contractor’s ESMS and reported to BOTAŞ.

BOTAŞ will measure performance through key performance indicators (e.g. as defined in the Construction Impacts Management Plan) for environmental, community relations, public health and safety, employment and training as well as supply and provision within the scope of the environmental and social policies and management plans of the project. The efficiency of the solutions used or developed to eliminate, mitigate or compensate for the impacts shall be monitored and it will be the responsibility of both the Contractor and BOTAŞ.

6.1.4.3. Environmental and Social Audits and Inspection Program

Although primary responsibility for the day-to-day performance of the monitoring programme will reside with the Contractor, BOTAŞ will maintain an oversight and audit role for all aspects of the monitoring programme. This will include independent monitoring at selected sites to verify the results of Contractor monitoring programmes as defined in previous section. In addition, audit and inspection programmes will be undertaken by independent auditors (on behalf of the BOTAŞ), the Turkish authorities, and the World Bank. The Contractor will provide access to all work(s) sites and will provide all necessary assistance to facilitate audit and inspection programs by BOTAŞ or any other approved organisation.

BOTAŞ will review all monitoring data in order to assess compliance with the various Project standards. To facilitate this process, the Contractor will be required to supply all monitoring records and results to BOTAŞ on a monthly basis and to make all monitoring records available for reviewing. Where monitoring results indicate an area of concern or that Project standards are not being met, a corrective course of action will be followed on site by the Contractor as advised by BOTAŞ.

BOTAŞ may undertake E&S assurance audits of Contractor ESMS and works. Following an audit conducted by BOTAŞ, the Contractor will record findings and required corrective actions in the Action Tracking Register. Corrective actions will be undertaken by the Contractor in a timely manner.

The Contractor will also be required to demonstrate how the requirements of ESIA and ESMS, legal and other Project requirements are being complied with as requested by BOTAŞ, based on the outline of applicable commitments and contractual requirements. This will include a programme of E&S audits by the Contractor and/or third-parties. As per the inspections described above, issues of non-compliance will be recorded in the Contractor E&S Non-Compliance Register. The Non-Compliance Register will be submitted to BOTAŞ on a monthly basis (as part of the monthly report). The Contractor will prepare an Action Tracking Register to record all findings of the audit/inspections, etc. and the corrective actions and recommendations will be implemented by the Contractor accordingly. The updated Action Tracking Register will be submitted to BOTAŞ on a monthly basis (as part of the monthly report).

6.1.5. Environmental Management of Change Process

Environmental and Social departments will be consulted prior to implementing changes to the design or construction of the GSEP. When a design change is required, a design change notice will be initiated and will be reviewed and approved by the Environmental and Social departments. The Environmental and Social department will then take the appropriate action, whether by conducting further studies, liaising with the permitting department to pursue additional permits, or revising the Environmental and Social Impact Assessment to reflect this change.

Likewise, if a change is foreseen in the construction approach, the Environmental and Social departments will be consulted prior to approving the change, and it will take the appropriate action, as per with design changes. If a change occurs, which results a change in physical location of one of the project components (temporary or permanent), the environmental and social department will assess whether the new location is within the project Environmental and Social study area. If so, it will confirm that no unacceptable impacts result from this change prior to approving the change. If it is not within the project study area, the Environmental and Social departments will initiate the required studies; coordinate the change with the authorities and with the permitting department, and recommend appropriate mitigation measures if required.

E&S department of BOTAŞ will inform World Bank in case of any change in design or construction of GSEP.

6.2. Environmental and Social Management Plans

BOTAŞ's ESMS Documentation will establish and maintain information to describe the core elements of the management system and their interaction. ESMS documentation of GSEP will be managed (created, tracked, stored and maintained) in accordance with "Document Control System" plans and procedures of the project.

The core ESMS documentation consists of this ESIA Report, environmental and social management plans (ESMPs), procedures and relevant forms.

The overall Environmental and Social Management Plans explains general approach of Environmental Management System of GSEP and how the principles of ISO 14001 will be applied. The ESMP will be revised and reissued periodically to reflect the current status of environmental and social management system and its documentation.

This ESIA Report will form the basis for the environmental and social management system of construction and operation phases of the project. It reflects all requirements, project's environmental aspects and impacts and the respective mitigations. All construction and operation related plans and procedures will consider the outcomes of ESIA Report.

Environmental and Social Management Plans, in general, will be the documents explaining how environmental issues of specific concern will be managed by BOTAŞ and the Contractor. Plans set out in broad terms how BOTAŞ intends to manage these specific issues. The Contractor will prepare its own management plans in line with the requirements set in BOTAŞ Management Plans for its project specific activities. The Contractor's management plans will be subject to BOTAŞ approval.

Procedures relate to management controls for handling key environmental issues and contain details in terms of how an activity is undertaken, who does it, when it is done and what records are generated as a result of conducting the procedure. Procedures will be

developed and diversified as the system is improved. The Contractor will develop its procedures and submit to BOTAŞ approval for its specific activities.

Forms are type of procedures which explain how the information of a certain task should be managed. The EMS procedures indicate when and where the relevant forms will be used.

The final status of environmental documents will be registered and followed in Document Control System. Environmental and Social Team will periodically review ESMS plans, procedures, and forms to ensure that they remain updated and effective.

In order to make sure that the ESMS described above is effectively implemented; environmental and social management plans mentioned below and Mitigation and Monitoring Plans provided in Chapter 5.7 and Chapter 5.8 of the ESIA Report will form a basis for the improvement, renewal and continuity of the ESMS during the life of the Project.

ESMPs will be updated as required with the new site baseline; engineering and design information is available throughout the execution of the project. The ESMPs are available providing specific information for the construction phase of the project. These plans will be revised during the operation and decommissioning phases of the Project.

The following sections briefly summarize the scope of environmental and social management plans.

6.2.1 Construction Impacts Management Plan

This plan will aim to describe the mitigation measures to be in place during land preparation and construction in order to manage the environmental and social impacts of the project (Appendix-7.1.).

6.2.2. Community Health and Safety Management Plan

This plan will aim to reduce any project impacts on the health and safety of local residents due to the land preparation and construction activities (Appendix-7.2.).

6.2.3. Community Relations Plan

This Plan will aim to involve the local project affected people and institutions and groups and local stakeholders who may affect the project during the construction and operating phases of GSEP. The Community Relations Plan, to be developed as part of the ESIA will be a framework document that outlines the community relations policy to be implemented by the Contractor and will be developed further in conjunction with the SEP (Appendix-7.4.).

6.2.4. Employment and Training Plan

This plan will assure that local employment is maximized during the construction and operational phases of the Project by setting local employment targets. This plan provides at this stage of the Project a special focus on the land preparation and construction phase.

Accordingly, Employment and Training Plan will include the social commitments of the Project (Appendix-7.5.).

6.2.5. Aggregate Management Plan

Significant quantities of aggregate materials will be needed in order to construct the Project facilities (surface facilities, camping areas, storage areas etc.) and relevant infrastructure. This plan will identify potential impacts and recommendations for impact mitigation (Appendix-7.6.).

6.2.6. Traffic (Transport) Management Plan

There will be extensive transportation activities during the land preparation and construction phase of the Project. The traffic load due to the Project trucks movements before and during the construction works will contribute to an increase in the traffic. Moreover, entry and exit of the personnel working at different points of the Project area and transportation of equipment, construction materials and waste could also create heavy traffic. This plan describes the requirements for the management of traffic during land preparation and construction phase (Appendix-7.7.).

6.2.7. Cultural Heritage Management Plan

In general, the cultural heritage management strategy will assure avoidance of significant cultural and archaeological resources within the AoI of the project. This plan will include impact and mitigation measures during the construction phase with the aim of protecting all known cultural resources and the procedure for chance findings during construction and land preparation phase (Appendix-7.8.).

6.2.8. Erosion, Reinstatement and Landscaping Plan

The Erosion, Reinstatement and Landscaping Plan is including the reinstatement and biorestoration techniques and requirements for re-establishment of soil and vegetation after the construction activities to minimize the soil loses with erosion. This plan applies to pipeline routes (RoW), permanent and temporary AGIs (surface facilities, camp sites, pump stations and storage tanks) and UGS sites during the construction of the Project. (Appendix-7.9.).

6.2.9. Pollution Prevention Plan

The Pollution Prevention Plan outlines the actions to avoid or, when cannot be avoided, minimize the release of pollutants or spills to air, water and land during implementation of the Project (Appendix-7.10.).

6.2.10. Waste Management Plan

Waste Management Plan (WMP) includes the identification of waste streams and management actions including minimization, recycling, collection, storage, treatment and disposal of wastes which will be generated during site preparation, construction and operation phases of the Project (Appendix-7.11.).

6.2.11. Emergency Response Plan

The Emergency Response Plan (ERP) is prepared to define the Actions and Procedures which will be applied to prevent the emergencies or to response in a planned manner to minimize the respective potential damages owing to emergencies during Construction and Operation Phases of the Project. This document is providing support to the Project Emergency Response Plan prepared for the Project (Appendix-7.12.).

6.2.12. Biodiversity Action Plan

The aim of this plan is to identify the species and habitats, considering the priorities of national, international and local species and habitats and consequently to determine the applicable and area-specific actions to protect and conserve the biodiversity during the construction, operation and decommissioning phases of the Project (Appendix-7.13.).

6.2.13. Resettlement Action Plan

Resettlement Action Plan(s) (RAP) will be prepared by BOTAŞ in line with the Resettlement Policy Framework (RPF) for mitigating acquisition and resettlement impacts. The RPF which is prepared by BOTAŞ will serve as the framework for preparing the RAP(s) that will take into account the land based impacts of each Project component once their locations and specific impacts are defined.

The aim of RAP(s) is to ensure that a fair and transparent land acquisition process is implemented and to ensure that immovable assets affected both permanently and temporarily by the Project are compensated. RAP shall be completed before the construction works.

6.2.14. Labour Influx Management Guideline

This guideline aims to identify, assess and manage the risks of adverse social and environmental impacts that are associated with the temporary influx of labour resulting from GSEP. It aims to ensure the management and control of activities that may pose labour-related risks. This Guideline sets out potential impacts and consequences and describes how they will be mitigated (Appendix-7.3.).

6.2.15. Occupational Health and Safety Management Guideline

This guideline aims to manage the occupational health and safety (OHS) risks of Project activities, ranging from office work and transportation to construction activities.

The main objective of this guideline is to ensure the completion of appropriate OHS Plans, risk assessments and method statements, OHS information, training and instruction, as well as monitoring, inspection and audit for the entire Project lifecycle (all phases of the Project including construction and pre-commissioning, commissioning and operations and decommissioning).

This guideline applies to all Project personnel, including direct hire employees, advisors and consultants, the Contractor and sub-contractor personnel (Appendix-11.1.).

6.2.16. Gas Storage Risk Management

A preliminary Gas Storage Risk Assessment for the Project is given in Appendix-11.2. In this context, a thorough risk assessment of the GSEP shall be undertaken by the EPC Contractor soon after the final design has been completed.

This risk assessment assesses the potential health and safety risks posed by the Project relating to the gas storage aspects; environmental risk assessment is separately reported within the related chapters of ESIA Report.

A full HAZOP/HAZID study for the GSEP shall be organised and defrayed by the EPC Contractor soon after the final design has been completed. Together with the Contractor's team, BOTAŞ team and Project Management Consultant will also participate in these studies.

An Explosion Protection Document (ExPD) shall also be prepared by the EPC Contractor as per the Regulation on the Protection of Employees From the Hazards of Explosive Atmospheres (published in the Official Gazette No. 28633, dated 30.04.2013) The ExPD will include P&IDs, Safety Data Sheets (SDSs), equipment and line lists, hazardous area classifications and equipment lists in the Zone 0 and Zone 1. All equipment and materials to be installed in potentially explosive zones shall conform to the requirements.

6.3. Monitoring

The environmental and social impacts should be monitored regularly. This section introduces the monitoring plan and defines how, when and by whom the monitoring of environmental and social impacts will be carried out.

The monitoring and evaluation process should be planned to measure the effectiveness of the mitigation measures recommended in ESIA, to check whether the defined measures are applied, to identify the deficiencies and to make the necessary arrangements. Irrespective of the magnitude of the project risk and impacts, it is essential that the project would establish a participatory monitoring and evaluation framework.

- BOTAŞ should establish an internal monitoring program to monitor the key impacts identified through Environmental and Social Impact Assessment and the implementation of mitigation measures established.

- An independent monitoring of key impact indicators where this would not interfere with the safe operation of the project will be facilitated. BOTAŞ will contract an independent third party monitoring company to ensure that all Site activities are regularly monitored, non-conformities are detected and corrective actions are developed. The frequency of environmental and social external monitoring, selection method/required

qualifications of monitoring company is detailed in Section 6. The key environmental and social aspects to be monitored during construction and operation are listed in the Table 6.3.1. below.

- An affected, documented system in place to review the results of monitoring on a regular basis and to respond with timely and effective action as appropriate should be carried out.

Table 6.3.1. Environmental and Social Aspects

Environmental Aspects	Social Aspects
Soil Management	Stakeholder Engagement
Air Quality Management	Grievance Management
Waste/Hazardous Waste Management	Community Safety
Wastewater Management	Labor Influx Management
Water Management	Local Employment
Noise Management	Labor Rights and Working Conditions
Chemical and Hazardous Material Management	Land Acquisition and Land Based Losses (inc. livelihood)
Salt Water (Brine) Management	Traffic / Transportation
Formation Wastes and Drill Mud Management	
Flora - Fauna Management	
Public Health, Occupational Health and Safety Management	
Ecological Restoration and Reinstatement Management	

6.4. Relevant Laws and Regulations

Water Pollution Control Regulation/Table 21.2

Table 6.4.1. Domestic Wastewater Discharge Standards

Parameters	Discharge Limits	
	2 hours composite sample	24 hours composite sample
BOD_5 (mg/L)	50	45
COD (mg/L)	160	110
SS (mg/L)	60	30
pH	6-9	6-9

BOD: Biochemical Oxygen Demand
COD: Chemical Oxygen Demand
SS: Suspended Solids
Class 2: Pollutant load is 120-600 kg/day as raw BOD, population= 2,000-10,000

Worker Health and Occupational Safety Act/Article 22

The noise levels, where heavy and dangerous activities are not performed, shall not exceed 80 dBA. At the areas, where the working activities, generating higher noise levels due to the requirements are conducted, the noise levels shall be 95 dBA as a maximum. However, in

such a case, the workers shall be given protective equipments, i.e. special helmets, earphones or earplugs against noise.

Regulation on Assessment and Management of Environmental Noise (Table 4&5)

Environmental noise limit values for the construction site provided in Annex-VII Table-5 of ENAMR (Environmental Noise Assessment and Management Regulation) which entered into force upon publication in the Official Gazette dated June 04, 2010 and numbered 27601, are given in Table 6.4.2.

Table 6.4.2. Environmental Noise Limit Values for Construction Site

Activity Type (construction, demolition and repair)	$L_{daytime}$ (dBA)
Building	70
Road	75
Other source	70

Facilities requiring permit for noise management are defined in the Regulation on Permits and Licenses, required in Accordance with Environmental Law. Accordingly, Underground Gas Storage projects are exempted from the provisions regarding noise control of the environmental permit. However, for those facilities which are not listed in Annex-1 and Annex-2 of the relevant regulation, for opening and operating licenses to be given in the context of the regulation on Opening and Operating Permits of the Facilities which entered into force by being published in the Official Gazette dated August 10, 2005 and numbered 25902, the authorized administration will make an assessment in terms of environmental noise and if required environmental noise level assessment report will be requested and the positive opinion of the authorized administration for this report will be based on this.

Therefore, regarding the machinery and equipment which will be used in the context of the Project, the Regulation on Environmental Noise Emissions Generated by Equipment used in the Open Areas, which entered into force by being published in the Official Gazette dated December 30, 2006 and numbered 26392, will be obeyed. Certain limit values are defined for day, evening and night time frames in the operation phases of the industrial facilities in the Assessment and Management of Environmental Noise Regulation. These facilities are divided into four groups according to the sensitivity of the Project area. This Project is subject to the limit values defined for “the areas where houses are densely located within the sites of the commercial buildings existing together with the noise sensitive utilizations” (Table 6.4.3.). The project must not exceed the given limit values during the operation period.

Table 6.4.3. Environmental Noise Limit Values for Industrial Plants

Category Area	L_{day} (dBA)	$L_{evening}$ (dBA)	L_{night} (dBA)
The areas where houses are densely located within the sites of the commercial buildings existing together with the noise sensitive utilizations	65	60	55

Decisions of Central Hunting Commission

The protection status of species is defined by the Law No 4915 on Terrestrial Hunting which came into force upon publication in the Official Gazette dated July 11, 2003 and numbered 25165. The Law extends protection to certain designated areas under annual Central Hunting Commission decisions, closing certain areas to hunting temporarily or permanently. The areas placed under protection by the Terrestrial Hunting Law are Wild Life Protection Sites and Wild Life Development Sites.

Also, the Resolutions of the Central Hunting Commission for the Hunting Period 2012-2013, which came into force upon their publication in the Official Gazette dated June 07, 2012 and numbered 28316, from the Republic of Turkey, Ministry of Forestry and Water Affairs, are inserted in the tables. According to the latest lists reflecting the "2016-2017 Hunting Season, Decisions of Central Hunting Commission", which came into effect upon its publication by the Republic of Turkey Ministry of Forestry and Water Affairs, in the Official Gazette dated June 07, 2012 and numbered 79, bird species are included in the list of Annex-I, i.e. the list of "Wild Animals Put Under the Protection of the Ministry of Forestry and Water Affairs"; 16 bird species are included in the list of Annex-II, i.e. the list of "Hunting Animals Put Under the Protection of the Central Hunting Commission"; and 18 bird species are included in the list of Annex-III, i.e. the list of "Hunting Animals Permitted by the Central Hunting Commission to be Hunted for the Indicated Periods".

Bern Convention

In the context of the Bern Convention, in Article 6, for the special protection of the wild fauna species specified in Appendix II, the following will in particular be prohibited for these species:

(a) all forms of deliberate capture and keeping and deliberate killing;
(b) the deliberate damage to or destruction of breeding or resting sites;
(c) the deliberate disturbance of wild fauna, particularly during the period of breeding, rearing and hibernation, insofar as disturbance would be significant in relation to the objectives of this Convention;
(d) the deliberate destruction or taking of eggs from the wild or keeping these eggs even if empty;
(e) the possession of and internal trade in these animals, living or dead, including stuffed animals and any readily recognizable part or derivative thereof, where this would contribute to the effectiveness of the provisions of this article.

In Article 7, for the special protection of the wild fauna species specified in Appendix III measures to be taken shall include:

(a) closed seasons and/or other procedures regulating the exploitation;
(b) temporary or local prohibition of exploitation, as appropriate, in order to restore satisfactory population levels;

(c) regulation as appropriate of sale, keeping for sale, transport for sale or offering for sale of living and dead wild animals.

7. STAKEHOLDER AND COMMUNITY ENGAGEMENT

7.1. Previous Stakeholder Activities

Stakeholder engagement activities for the UGS Project were sustained both in the EIA process and during the land expropriations, and later in the RAP studies, starting from 2006. District Governors, mukhtars, land owners, project employees and other PAPs have been consulted many times for different purposes. Therefore, the stakeholders identified in the region have been aware about the UGS Project activities for long time.

Stakeholder engagement activities have been performed during the ESIA process of the GSEP and the continuity of these activities will be ensured during the construction, operation and closure phases as well. Public participation meetings were held and national and local institutions / organizations, local authorities, BOTAŞ officials and affected local people participated in the meetings. Also, focus group discussions and interviews were conducted during the baseline data collection studies. Stakeholder consultations made so far are detailed below.

7.1.1. Public Participation Meeting

The regulations and procedures on the execution of the Public Participation Meeting for the GSEP were carried out according to the EIA Regulation dated November 25, 2014 and numbered 29186. The related regulation article is below:

ARTICLE 9 – (1) *The Public Participation Meeting is to be organized at a place and hour determined by the Governorship, which can be accessed by the public, who are expected to be affected the most as the result of the project, easily, at a date determined by the Ministry with the participation of the institutions/organizations and project owner with the competence obtained from the Ministry, in order to inform the public about the investment and obtain their opinions and recommendations on the project.*

Three separate public participation meetings were held in Ankara, Konya and Aksaray (since the project is within the boundaries of these three provinces) with the aim of informing stakeholders about the GSEP and receiving their feedbacks (between Picture 7.1.1.1. and Picture 7.1.1.6.).

The meetings were advertised in local and national newspapers prior to the performing meetings. 33 people participated in the meeting held in the Evren District of Ankara, 52 people in the meeting held in the Sultanhanı District of Aksaray, and 26 people participated in the meeting held in the Besci Village of the Emirgazi District of Konya. During the public participation meeting;

- Officials of Provincial Directorate for Environment and Urbanization,
- Officials of BOTAŞ,

- Officials of ÇINAR Engineering Consultancy INC, gave information regarding the project and answered questions raised by PAPs.

Picture 7.1.1.1. A view from Public Participation Meeting-1 (Ankara)

Picture 7.1.1.2. A view from Public Participation Meeting-2 (Ankara)

Picture 7.1.1.3. A view from Public Participation Meeting-3 (Konya)

Picture 7.1.1.4. A view from Public Participation Meeting-4 (Konya)

Picture 7.1.1.5. A view from Public Participation Meeting-5 (Aksaray)

Picture 7.1.1.6. A view from Public Participation Meeting-6 (Aksaray)

Public Participation Meeting in Aksaray was held on November 22, 2016 at the Sultanhanı Municipality Council Chamber, under the chairmanship of EIA and Environmental Permits Deputy Branch Manager İdris Demirbaş, who works at the Aksaray Environmental and Urbanization Provincial Directorate, with the participation of the Aksaray Environment and Urbanization Provincial Directorate, Sultanhanı Mayor's Office, BOTAŞ authorities and local people.

Firstly, participants were informed about the purpose and importance of the GSEP, the environmental and social impacts that may occur during the construction and operation stages and the measures to be taken. The works to be carried out in the scope of the EIA legislation was mentioned afterwards. The questions of the local people who participated in the meeting were answered, and they were informed that their complaints and recommendations were being recorded.

The first issue expressed by local people in the meeting was whether the lands to be expropriated were determined or not. BOTAŞ authorities stated that the well locations were not finally determined and that the exact locations was going to be determined as the result of the seismic studies. It was stated that 36 of the 48 wells planned were within the borders of Aksaray and 12 were within the borders of Konya province.

Sultanhanı Gazi Quarter Mukhtar stated that the GSEP would cause damaging the irrigated farming lands, many people had agricultural land within the license area and agriculture is their main source of income. BOTAŞ authorities stated that irrigated farming lands may be avoided during determining the well locations while the Branch Deputy Director said the Ministry of Agriculture was going to make an assessment on the subject and that the locations might be changed if deemed necessary.

One person among the Aksaray locals stated that his agricultural lands were damaged during the UGS Project activities such as unauthorized entry of project vehicles into the cultivated lands, dust emissions causing damages on the agricultural products had been experienced and that he was worried that such damages would recur during the GSEP. BOTAŞ authorities stated that measures will be taken to ensure that Project vehicles will remain within the planned route as much as possible; otherwise the BİMER complaint mechanism would be ready to be used.

The local people stated that the arid lands can be determined with mutual agreement of PAPs and the well locations can be determined by preferring these arid lands. PAPs stated that they had cultivated their lands already, and it would not be possible to pay for the debts with the expropriation prices.

Another person stated that the Underground Gas Storage Project area was next to his land, that concrete, stone, insulation material packages were left to his land and he could not find anyone where he could address his complaints to. BOTAŞ authorities repeated that the BİMER complaint mechanism could be used.

Branch Manager Hasan Küçükaydın, who was responsible for the EIA and Environmental Permits, acted as the chairman of the second meeting at in the Emirgazi district of Konya Province, held at Besci Quarter town hall. Firstly, the information concerning the project was provided and then participants were encouraged to raise their concerns and worries.

It is observed that the local people want to receive information about the potential adverse impacts that may affect their income source as the result of the project (whether fence would be used to surround the well areas or license borders, if they could continue the agricultural and animal husbandry activities, etc.). It can be said that the people are worried about whether the settlement areas within the borders of the license areas might be removed or not.

When we generally look at the meetings, it is seen that the local people have not experienced an important problem with the Underground Gas Storage Project, but uneasiness has occurred in the region as the well locations are not determined yet. Local people have no other source of income other than agriculture and animal husbandry and the price they will receive if their lands become expropriated will not be a means of living for the future. It is thought the land owners, whose lands will be expropriated, will be able to obtain agricultural lands somewhere else, in order to continue their agricultural activities. However, irrigated farming lands are not widespread in the area and these people will have no choice but to focus on the dry farming lands and this will cause indirect losses of income.

7.1.2. Consultations with Local Authorities and PAPs

Focus group interviews were conducted with the participation of the village mukhtars and local residents (man and women) of the districts affected by the project during the baseline data collection in November, 2016, and semi-structured in-depth interviews were also conducted with the mukhtars. Although the local people and the mukhtars have been informed about the project through the public participation meeting, the questions about activities and restrictions that will be realized from the GSEP have been answered and negotiations made about the potential positive or adverse impacts.

Second round consultations have been held prior to the finalization of the ESIA report on 5th and 6th of March in 2018 at Sultanhanı district (Picture 7.1.2.1. and Picture 7.1.2.2.) and Ankara provinces respectively. With the first meeting; it was aimed to inform local PAPs especially on the land acquisition process and Grievance Mechanism. High level of participation has been provided by PAPs. Mayors of Sultanhanı, Eskil Districts have also been participated to the meeting.

Picture 7.1.2.1. View from Second Round Consultations in Sultanhanı-1

Picture 7.1.2.2. View from Second Round Consultations in Sultanhanı-2

Informative brochures which include detailed information about the Project facilities, land acquisition and contact information have been distributed to PAPs during the consultation meetings. Presentations have been also made to inform PAPs about the Project components visually. During the presentations, the locations of Project components, technical details, and land expropriation requirements have been explained by BOTAŞ authorities. Key PAP issues/concerns emerged from consultations is summarized in the table below (Table 7.1.2.1.). After receiving key issues of PAPs regarding the project were received, the authorities of BOTAŞ provided the necessary information especially emphasizing that the Grievance Mechanism should be used for all kinds of complaints and concerns. It was mentioned that transmitting complaints should not be considered as opposing against the Governments, on the contrary it will help BOTAŞ to solve the complaints related to PAPS. In addition, PAPs were informed that a Social Team in site will be responsible for all public relations and will receive complaints.

As also indicated in the table below, the issues/concerns raised by PAPs on the subjects such as resettlement, land acquisition and livelihoods were responded by BOTAŞ authorities informing about the entitlements and mitigation measures in Resettlement Action Plan and ESIA. PAPs' worries about traffic management and community safety such as dust generation, exceeding speed limits etc. were eliminated by explaining measures identified in Construction Management and Community Safety Management Plans. Also, information about local employment and grievance mechanism were provided in accordance with ESIA, Employment and Training Plan and Stakeholder Management Plan.

Table 7.1.2.1. Summary of Key Pap Issues/Concerns

Subjects	Key PAP Issues/Concerns
Resettlement	- Whether the settlements within the border of the license area will be removed or not (explained in accordance with RPF) - Worries about the removing of their houses due to the project since most of them have no title deed of houses (explained in accordance with RPF)
Land Acquisition	- Whether the consentingly expropriation is essential or not (informed about the legal framework on land acquisition in accordance with RPF) - Whether the lands to be expropriated were determined or not (explained in accordance with RPF) - Expropriation area of well areas and the presence of security borders (explained in accordance with RPF) - The distance between well locations and possibility of sustaining livelihood activities between wells (explained in accordance with RPF) - Expropriation of their lands is seen as a loss of profit in the long term (entitlements for livelihood losses determined in RPF were explained)
Socio-Economic / Livelihoods	- Loss of irrigated farming lands (as identified in RPF and Chapter 5.6.7.6 of ESIA) - Loss of pasture lands (as identified in RPF and Chapter 5.6.7.6 of ESIA) - Compensation methods for the lands that may become economically unviable due to project's land acquisition (entitlements for economically unviable lands determined in RPF were clarified) - Whether it is possible to determine the location of well areas by avoiding the irrigated farming lands or not (explained in accordance with RPF)

Subjects	Key PAP Issues/Concerns
	- Worries about the GSEP to cause problems such as damage to agricultural lands by project vehicles or dust problems causing damage to crops, as happened in the Underground Gas Storage Project (informed about the measures in Construction Impacts Management Plan and Community Health and Safety Management Plan) - Worries about productivity loss that may cause by not stocking top soil and subsoil properly (measures in Erosion, Reinstatement and Landscaping Plan were explained) - Concerns that the expropriation prices will not be enough to cover the loans they have received for their current agricultural activities (entitlements for livelihood losses determined in RPF were clarified) - Asking for information about the negative impacts of the project that may affect their livelihoods (informed about the entitlements for livelihood losses determined in RPF) - Whether fence would be used to surround the license borders or not, if they could continue the agriculture and husbandry activities (explained in accordance with RPF)
Local Employment	- Expectations about local employment through the project (explained as identified in Employment and Training Plan and Chapter 5.6.7.3 of ESIA)
Traffic Management / Community Health and Safety	- Dust problem caused by the usage of village roads by the project vehicles (informed about the measures in Construction Impacts Management Plan and Community Health and Safety Management Plan) - Speed limits are exceeded by the project vehicles and it causes danger especially for the children (measures in Community Health and Safety Management Plan were explained)
Grievance Mechanism	- Insufficient grievance mechanism (BIMER) to resolve their problems (informed about the grievance procedure as identified in Stakeholder Engagement Plan and Chapter 7.4 of ESIA)

There was misunderstanding of PAPs that all license area will be wired, that all people performing agricultural activities or living on this lands within the license area will be discharged. The authorities of BOTAŞ clarified this misunderstanding by mentioning that only a small area surrounding the well heads and surface facilities will be wired. Moreover, PAPs were informed that easement rights will be established for pipelines and once the construction ended; PAPs will be able to re-use their lands for livelihood purposes with some restrictions.

With the second meeting; it was aimed to inform especially NGO's and the related Governmental Institutions on GSEP (Picture 7.1.2.3.). Invitation letters have been sent to 51 different NGO's and Governmental Institutions (Appendix 1.9.). However, limited number of representatives has participated to the meeting. Presentations have been also made to the participants about the Project visually, by emphasizing especially on the environmental concerns.

Picture 7.1.2.3. View from Second Round Consultations in Ankara

Consultations with persons directly or indirectly affected by the project will continue during the construction and operation phases. Consultation meetings are required to inform the residents of the region about the possible impacts of the project to ensure that they are aware of the content of the project and how the planned activities will affect those residing in the area. Informative materials will be distributed and information about the expropriations to be made will be provided to formal and informal owners of the land in advance in order to enable them to consider the possible impacts on their livelihood and plan their livelihood activities accordingly. At the same time, it was observed that there were many seasonal workers working in the agricultural areas in the region, and that these workers were living in tents/cottages. Given that the expropriation to be made will indirectly affect the seasonal workers working in these agricultural areas, these persons will be included in the consultation activities to be carried out during the project and will be informed about the communication channels and the grievance mechanism of the project.

7.2. Stakeholder Identification

It is necessary to determine the stakeholders at the first stage of the project to be able to equally and justly realize stakeholder participation. Also, it is important to determine which consultation strategy is going to be implemented for each affected group (directly or indirectly) during the construction, operation and closure phases. A Stakeholder Engagement Plan is prepared separately to analyze the stakeholders and consultation strategies in detail

and to determine the timing of consultation activities, information sharing and level of participation.

The stakeholders that are expected to be directly or indirectly affected by the project are listed below;

- National and local state institutions and organizations (The Ministry of Environment and Urbanization, Aksaray Governorship, Sultanhanı Municipality etc.)
- PAPs including non-organized groups with particular areas of interest or that may be vulnerable (i.e., elderly, people with disabilities, etc.). PAPs include land owners and residents that may use communal land
- Seasonal workers
- Interest groups, such as universities and their foundations, cooperatives, local business establishments, business associations, chambers of commerce and others (i.e., labor, youth, religious, businesses, etc.)
- Project employees and
- Media

The detailed list of stakeholders will be presented in the SEP, and the persons or groups not listed here will be able to communicate with BOTAS and add their information to this list. The table below summarizes the details regarding the consultation and informing process with the identified stakeholders (Table 7.2.1.).

Table 7.2.1. Stakeholder Consultation Strategy

Stakeholder Groups	Directly/Indirectly Affected	Consultation Strategy
National and local state institutions and organizations	Indirectly	• Public participation meetings • Project Brochures • Presentations • Grievance Mechanism • Free hotline
People who directly or indirectly affected (PAPs)		
PAPs including non-organized groups with particular areas of interest or that may be vulnerable (i.e., elderly, people with disabilities, etc.). PAPs include land owners and residents that may use communal land	Directly	• Public participation meetings • Consultation meetings • Focus group discussion/surveys • Leaflet and posters to be hanged at public locations (cafe, Mukhtar's building, town hall etc.) • Project brochures • Presentations • Grievance Mechanism • Free hotline
Seasonal workers	Directly	
Interest groups, such as universities and their foundations, cooperatives, local business establishments, business associations, chambers of commerce and others	Indirectly	• Public participation meetings • Project Brochures • Presentations • Grievance Mechanism • Free hotline
Project employees	Directly	• Consultation meetings • Leaflet and posters to be hanged at working areas • Grievance Mechanism • Free hotline
Media	-	• Local press release • Free hotline

7.3. Stakeholder Engagement Approach

Stakeholder engagement is a continuous process that will continue throughout the life of the Project until decommissioning. BOTAS has prepared a SEP to clearly determine the methods and materials that will be used within the scope of the engagement starting from the scoping stage of the project until the operation and closure stages. The methods and materials to be used during this process and their timing and participation levels are explained in detail in the SEP. Public participation meetings, consultation meetings, focus group discussions, presentation, local media announcements, project brochures, grievance mechanism, free hotline and corporate website will be the key methods and material of communication with the stakeholders.

BOTAŞ will follow the SEP to ensure that all stakeholder engagement processes are in line with the national legislation and international safeguard standards. Social Team of BOTAŞ and Contractor will be the main responsible for coordinating stakeholder engagement activities as specified in the SEP. BOTAŞ's Social Team will have personnel to work in both Headquarters Office in Ankara and Sultanhanı local office of BOTAŞ. Collection of complaints, questions and feedbacks will be directly under the responsibility of BOTAŞ and Contractors. BOTAŞ will be in frequent coordination with its Consultants and Contractors to ensure that stakeholder engagement program is understood and adopted. Contractors will be reporting to BOTAŞ as per the terms of individual contracts. BOTAŞ will ensure the quality and consistency of the reports and on-site implementation activities. Detailed roles and responsibilities of BOTAŞ, Contractor and Consultants' Social Teams for the social management of Project is given in *Section 6 Environmental and Social Management System*.

If mutually agreedwith the local community, a Consultation Committee will be set up in cooperation with the local communities. This will include a number of key community representatives, may include the Municipality Head, community representatives of PAPs, representative of chambers of commerce and industry, a representative from the regional authority and from the local school (toplumun her kesiminin temsil edildiği). Local business owners and other groups such as young persons and landowners will also be invited to participate in these meetings. The Consultation Committee will be responsible of;

- coordinating on-going discussions on evolving issues,
- providing a mechanism to feedback to the project team on the requirements and concerns/grievances of the community.
- regular communication with social teams of BOTAŞ, Consultant and Contractor, transferring the grievances of PAPs,
- supporting the project implementation in sharing information with the public and other stakeholders about all activities during land acquisition, construction and operation periods

7.4. Grievance Mechanism

BOTAŞ is committed to open dialogue and building trustful and lasting relationships with the stakeholders identified in the SEP. A grievance mechanism both at local level and at Head Quarter level within the body of BOTAŞ, which is open to the use of all stakeholders that may directly or indirectly affected by the GSEP, have been established to receive complaints or expressions of concern from people potentially impacted by its Project activities. Contractors' GRM will align with BOTAŞ' GRM as specified. The BIMER system, which has been used for receiving and responding to complaints within the scope of the existing project, enables stakeholders to communicate directly with the headquarters of BOTAS, but a separate system has been established for the project in which the stakeholders can receive their responses locally and communicate their complaints. This grievance system has been established within the body of BOTAŞ, will be implemented and followed by both BOTAŞ and the Construction Company during the construction, operation and decommissioning/closure phases. GRM was announced to the PAPs in the second round consultation meeting realized in March 5, 2018 in Sultanhanı District, so that GRM have started to work.

For grievances regarding UGS Project have been transmitted to BOTAŞ only by means of BİMER System and verbally. This situation has been causing inconvenience in recording and tracking of grievances. Moreover, in in the second round consultation meeting PAPs stated that they could not find any way to transmit their grievances. By putting GRM into practice, transmitting of grievances by PAPs, recording and tracking them by BOTAŞ will be more convenient and this will be more easily accessible for stakeholders and will encourage them to voice their complaints. There will be only one GRM both for GSEP and UGS Project. In other words, all grievances related to both projects will be managed by the same GRM.

Establishing project level Grievance Redress Mechanism (GRM) within the body of BOTAŞ, which is open to the usage of all stakeholders that may be affected directly or indirectly by the Gas Storage Expansion Project, is very important to solve all worries and complaints of the stakeholders regarding the project in time, to prevent misunderstandings and to prevent material and non-material losses which are hard to compensate for.Grievance mechanism established by BOTAŞ includes both environmental and social issues as well as grievances of workers. Workers may transmit their grievances to by means of grievance mechanism. BOTAŞ and its' Contractors will implement the Workers Grievance Mechanism to provide opportunity for BOTAŞ and sub-contractor workers to raise their concerns and complaints. Information on how to make grievance will be provided to workers during induction training and request, suggestion and complaint forms will be provided in the areas where workers use in the construction camp like social units and dining area. A grievance register will be used to document all employee grievances, corrective actions and outcomes. All employee grievances will be registered to this register which will be used to record, track, report and evaluate all grievances including third parties, employees and sub-contractor workers and responses.

The Social Team of BOTAŞ and Contractor will be mainly responsible from the communication with the local communities and management of the complaints, recording of the complaints (e-mail, telephone, written or verbal), filing, taking action to solve the complaint, answering the owner of the complaint and closing the complaint within a determined time period.

The contact information of the toll free number of the BOTAŞ will be provided via the Project website, through public information meetings, baseline surveys and Project leaflets to raise awareness and offer transparency of how stakeholders can voice their grievances. The project staff (Social Team) has the primary role in resolving complaints as part of their day to day activities, as they interact with community members. 3 staff at Head Office of BOTAŞ and 2 staff at site will be responsible for management of social issues along with other social experts of Consultant and Contractor. Staff members who receive complaints verbally must put them in writing for them to be considered. Various channels for stakeholders to raise their grievances formally include:

- Telephone (Stakeholders can call BOTAŞ's head office on (0312) 297 29 91 - (0312) 297 29 64 or local office (0(382) 242 40 04) and request to speak to a contact officer)
- Email (Grievances can be sent to info@botas.gov.tr)
- Face to face (Stakeholders can voice their grievance to BOTAŞ Social Team at local office)
- Complaint register form (CRF) (Stakeholders can fill the forms that will be distributed to them in advance to voice their grievances, sample form is annexed in SEP)

The steps to be followed during the management of grievances will be as stated in the SEP:

- Receiving & Registering of Grievance

  - All Grievances received by all level of Project Staff; Contractors and subcontractors of Project, are registered by using Complaint Register Form (CRF) and a hard copy of the form is provided to Complainant. The completed form will be delivered to all relevant disciplines in both BOTAŞ and Contractor Company.
  - If the CRF cannot be filled out, following basic information is recorded and provided to relevant disciplines by e-mail or by an acceptable correspondence:

    - Name and surname of the Complainant (anonymous complaints will not be accepted);
    - Subject of the Grievance;
    - Location of the Grievance;
    - Contact details (phone/mobile number, address, e-mail etc.);
    - Organization name (if related)
    - Date & time

- All corrective actions suggested by Complainant are taken under registration via CRF.

Grievance Monitoring Table is filled out by BOTAŞ Social Department according to the received information

➢ **Assessment of the Grievance**

- All Grievances are reviewed to be classified whether they are genuine and related to Project activities or not. If the issues/disputes raised are not related to Project, guidance is provided to the Complainant to contact relevant party. Eligible complaints are responded according to Project social and environmental requirements which are identified in ESMP and ESIA.
- All Grievance received through the Toll Free Number (152) , direct phone calls e-mails and face-to-face meetings/communications are taken under registration and BOTAŞ Social Team gets contact with the Complaint within two (2) Business Days following registration in order to explain the Project response process to Grievance.
- BOTAŞ has ten (10) Business Days to investigate and respond the Complaints. If the case requires a more complex investigation, updated information is provided to the Complainant explaining the actions required to resolve Grievance, and the likely timeline.
- Responses aligning with the Project social mitigation measures and compensation items are defined beforehand according the Project standards.

➢ **Resolving the Grievance**

- Necessary corrective actions shall satisfy the Complainant.
- All parties get an agreement on the corrective actions during solution process.
- BOTAŞ Social Team aims to solve each complaint within thirty (30) Business Days after response, and this period is subject to extend upon written consent of Head of Department.
- When the Complainants are not satisfied with the decision of BOTAŞ and/or Contractors on their complaints, they may appy to court.

➢ **Close Out of the Grievance**

Proof documents of the corrective actions taken (photos from Site in subject or other evidence documents) are collected and a "Grievance Closure Protocol" is signed by BOTAS and the complainant.

➢ **Monitoring of Grievances**

Monitoring of grievances is made by filling out Grievances Monitoring Table including following headings:

- ✓ complaint register number,
- ✓ how complaint is received (grievance form, community meeting, telephone, other)
- ✓ level at grievance (contractor level, local BOTAS office level, through BOTAS Head Quarter)
- ✓ date of complaint received
- ✓ location of complaint received
- ✓ name of person in charge
- ✓ coordinates of the area subject to complaint
- ✓ land parcel number (if complaint is related to land)
- ✓ complaint information
    - name, surname
    - telephone/email
    - village-district-province
    - gender
- ✓ project component related to complaint
- ✓ grievance category (i) expropriation/land acquisition related grievances, ii) environmental issues iii) damages to crops and structure etc.)
- ✓ complaint summary
- ✓ grievance status (open, ii) closed and iii) pending/in process)
- ✓ action taken
    - responsible person/department
    - action planned
    - due date of the addressing the grievance
    - date of action taken
- ✓ supporting documents for grievance close out (bank receipt for compensation, grievance closure protocol)

The flow scheme of the grievance mechanism is as follows (Figure 7.4.1.):

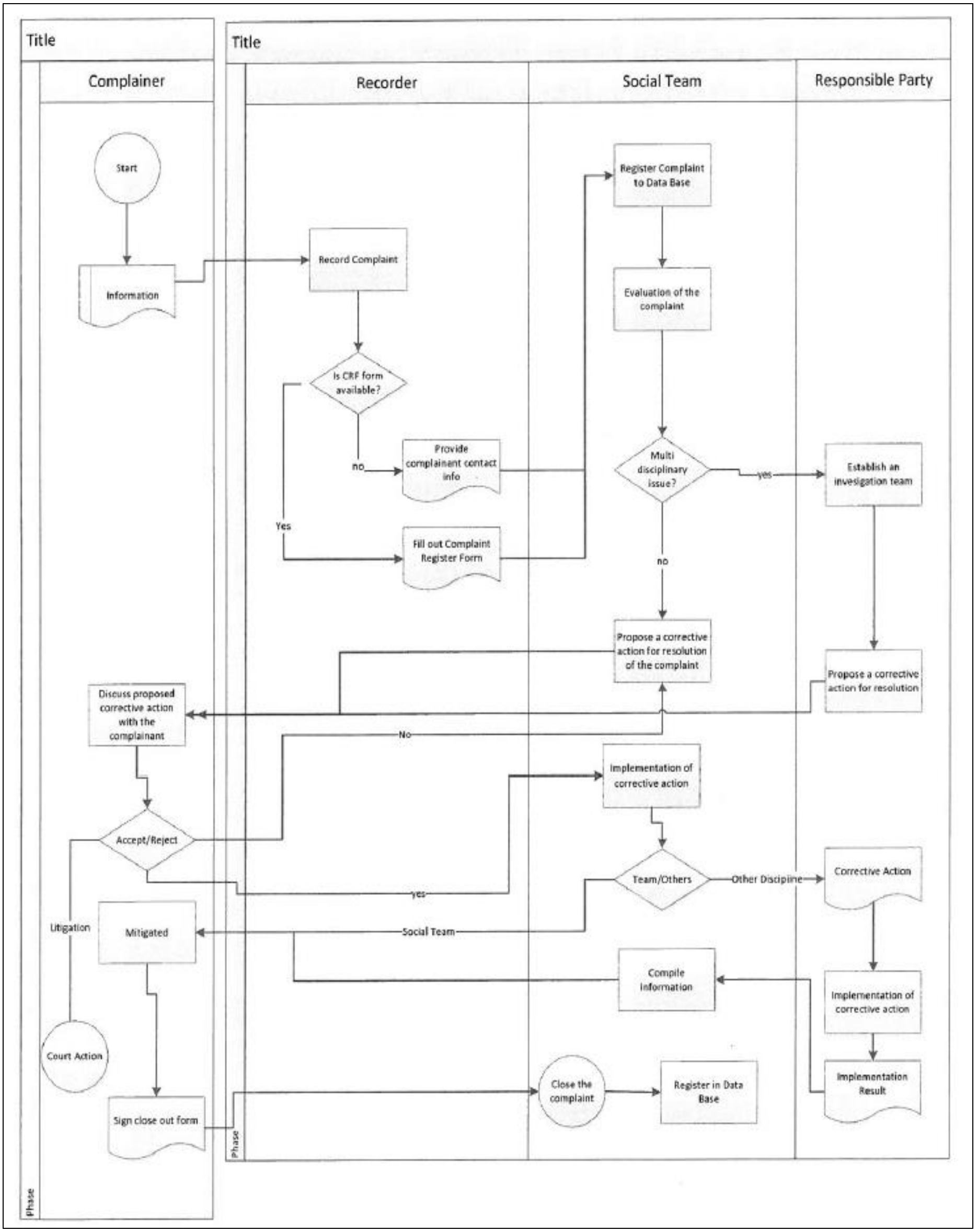


Figure 7.4.1. The Flow Scheme of the Grievance Mechanism of Underground Natural Gas Storage Projects

APPENDICES

APPENDIX-1. OPINIONS OF THE INSTITUTIONS AND OFFICIAL LETTERS

APPENDIX 1-1. EIA Positive Certificate

APPENDIX 1-2. Cover Letter of the Directorate General of State Hydraulic Works

APPENDIX 1-3. Cover Letter of the Ministry of Environment and Forestry

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APPENDIX 1-5. Cover Letter of the Ministry of Energy and Natural Resources, General Directorate of Mining Affairs (MİGEM)

APPENDIX 1-6. Cover Letter of the Department of Investigation, Planning and Allocations of the General Directorate of State Hydraulic Works

APPENDIX 1-7. Cover Letter of the Aksaray Governorship Provincial Directorate of Environment and Urbanization General Directorate of Preservation of Natural Heritage

APPENDIX 1-8. Cover Letter of the Ministry of Forestry and Water Affairs, General Directorate of State Hydraulic Works, Investigation, Planning and Allocations Department

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APPENDIX-2. TOPOGRAPHIC MAP OF THE GAS STORAGE EXPANSION PROJECT

APPENDIX-3. MAJOR SOIL GROUPS, LAND USE CAPABILITY CLASSES AND CURRENT LAND USE MAP OF THE GAS STORAGE EXPANSION PROJECT

APPENDIX-4. GEOLOGICAL MAP OF THE GAS STORAGE EXPANSION PROJECT

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APPENDIX-7. MANAGEMENT PLANS

APPENDIX-7.1. Construction Impacts Management Plan